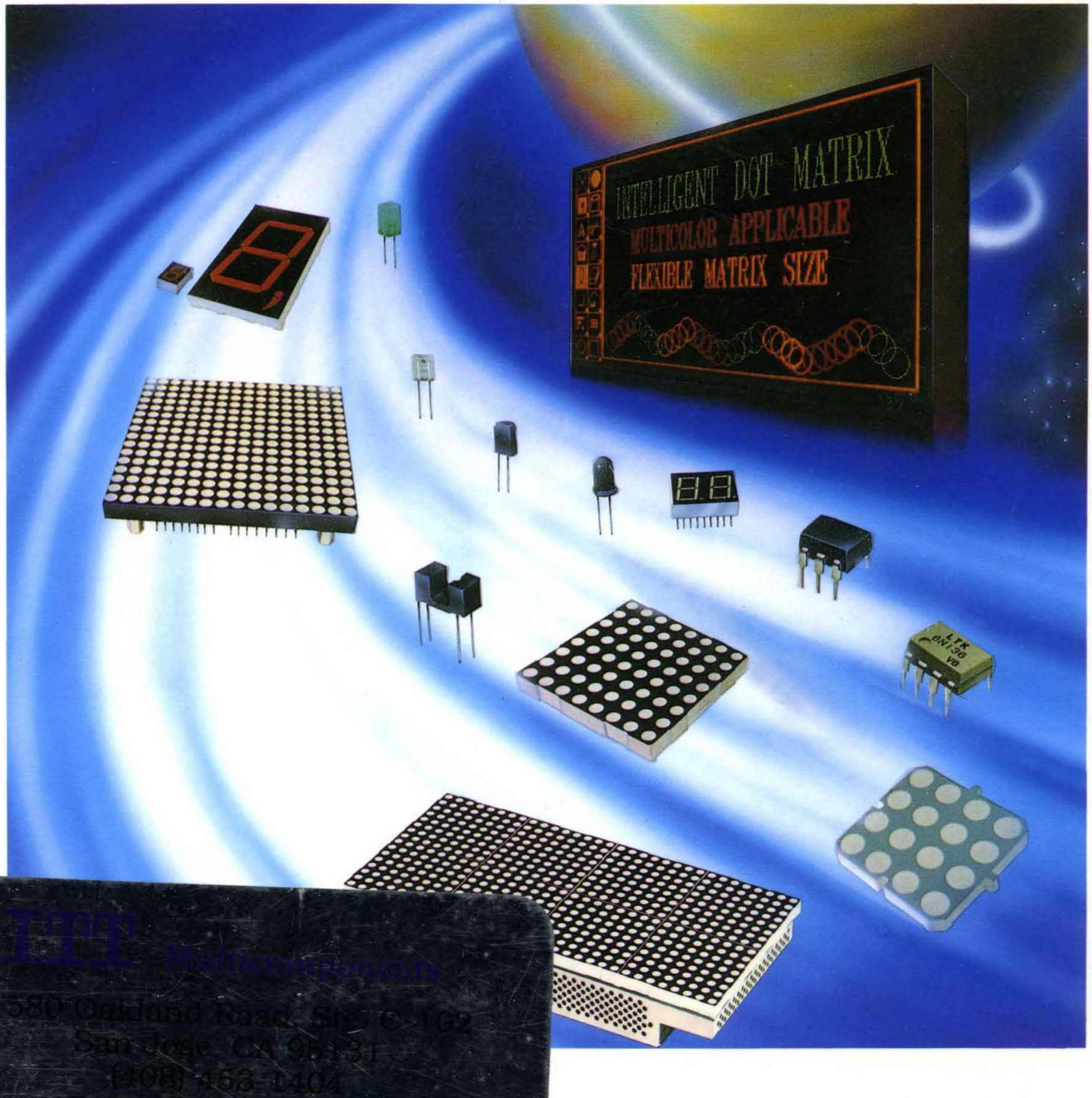
LITEON

Optoelectronics

Data Book 1991-1992



LITEON Optoelectronics Data Book 1991-1992

LITE-ON LIGHTING THE WAY IN OPTOELECTRONICS

As one of the world's largest independent manufacturers of optoelectronic products, LITE-ON INC. offers a wide range of reliable and economical optoelectronic design solutions.

We produce high quality LEDs, single, dual and multi-digit displays, visible and infrared discrete components, customer display modules and over 40% of the world's clock displays.

Our fully automated production facilities in Taiwan include approximately 300,000 sq, ft. of space and are capable of producing monthly orders of up to "50 million lamps, 7 million displays, 2.5 million clock displays, 5 million infrared discrete components and big capacity for customer OEM models."

It also features the very latest in production equipment — much of which was designed by Lite-On engineers — and provides the most comprehensive reliability test facilities in the industry.

Finally, the Lite-On product line is backed by a team of experienced support specialists. So you can be assured that your problems and questions will be met with professionalism and expediency.

For more information about Lite-On or Lite-On products, call (408) 946-4873. Or write to LITE-ON, INC. Semiconductor Division, 720 S. Hillview Drive, Milpitas, CA 95035.

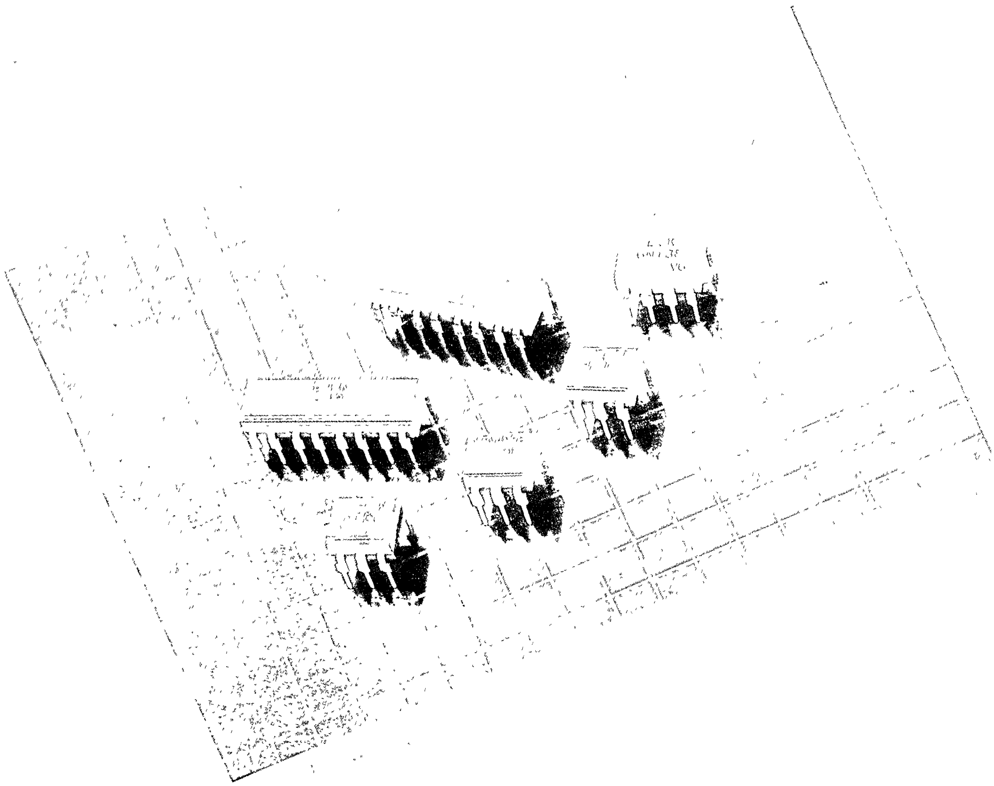
You may also wish to contact one of our national representatives. (See inside back cover).

TABLE OF CONTENTS

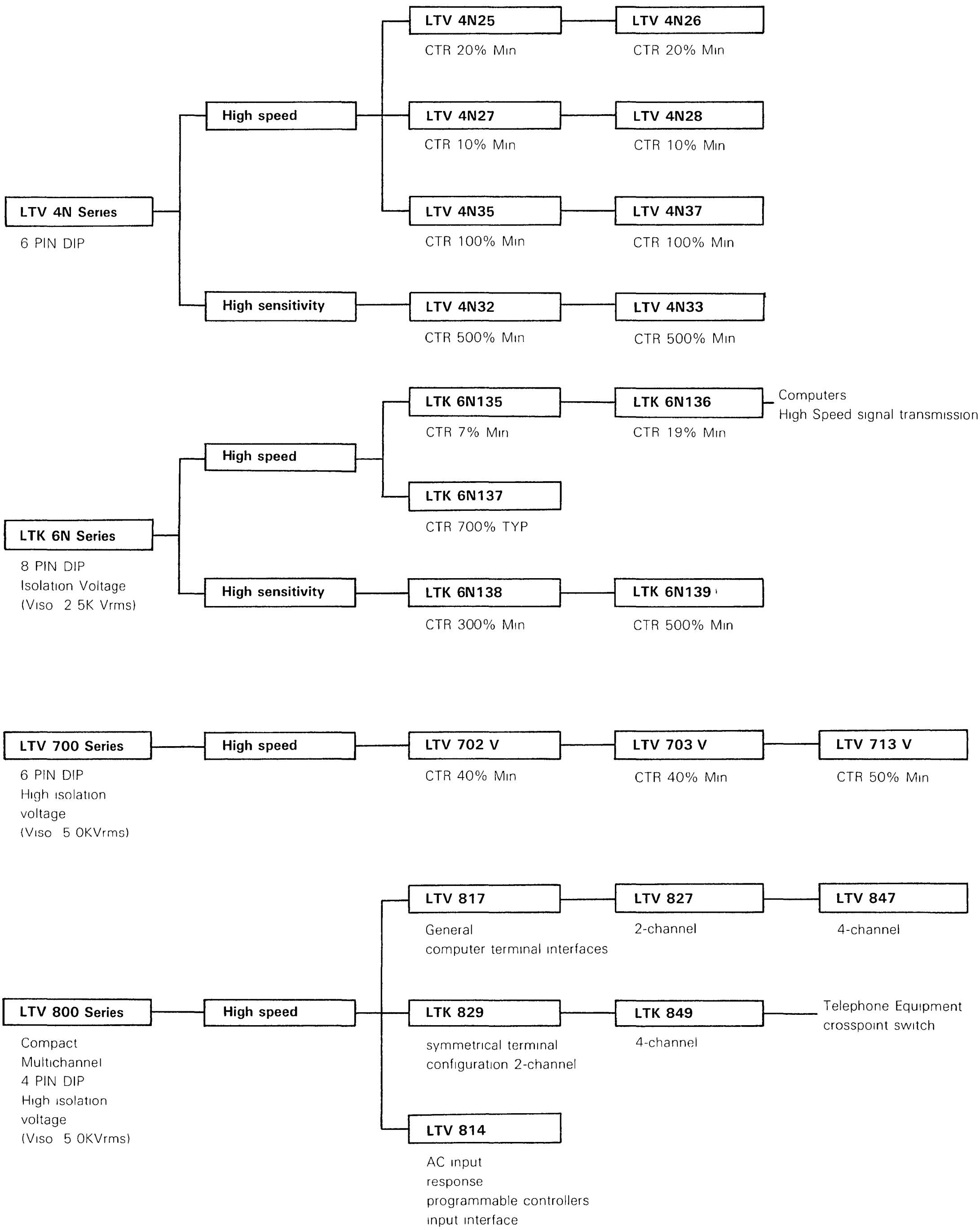
ALPHANUMERIC INDEX

A. Photocouplers

- PHOTOCOUPLERS CLASSIFICATION CHART
- PHOTOCOUPLERS COMPARISON TABLE
- QUICK REFERENCE GUIDE
- (LTV4N SERIES) . . . GENERAL PURPOSE 4N SERIES
- (LTK6N SERIES) . . . GENERAL PURPOSE 6N SERIES
- (LTV700 SERIES) . . . 6-PIN DIP VISO: 5KVRMS TYPE
- (LTV800 SERIES) . . . 4 -PIN OR MULTI-CHANNEL TYPE



Photocouplers Classification Chart



Photocouplers Comparison Table

LITEON MODEL NO	GE MODEL NO	GI MODEL NO	MOTOROLA MODEL NO	OPTRON MODEL NO	TELEFUNKEN MODEL NO	SIEMENS MODEL NO	TOSHIBA MODEL NO	MATSUSHITA MODEL NO	NEC MODEL NO	JRC MODEL NO	KODENSHI MODEL NO
LTV702V	H11A2 H11A3 H11A520	—	H11A2 H11A3	—	—	—	—	—	—	NJL5121D	—
LTV702VA	CNY17-1	CNY17-1	CNY17-1	CNY17/1 OP12253	—	CNY17-1	—	—	—	NJL5121DC	—
LTV702VB	CNY17-2	CNY17-2	CNY17-2	CNY17/2	CNY75A	CNY17-2	—	—	—	NJL5121DB	—
LTV702VC	CNY17 3	CNY17-3	CNY17-3	CNY17/3	CNY75B	CNY17-3	—	—	—	—	—
LTV702VD	CNY17-4	CNY17-4	—	CNY17/4 OP12100	CNY75C	CNY17-4	—	—	—	NJL5121DA	—
LTV703V	CNY47A GEPS2001 H11A5	—	H11A5	—	—	—	—	—	—	NJL5121D	—
LTV703VA	GFH601-1	—	—	—	—	SFH600-0 SFH601-1	—	—	—	NJL5121DC	—
LTV703VB	GFH600-1 GFH601-2	MCT2202	MCT2202	—	—	SFH600-1 SFH601-2	—	—	—	NJL5121DB	—
LTV703VC	GFH600-2 GFH601-3	MCT275	MCT275	—	—	SFH600-2 SFH601-3	—	—	—	—	—
LTV703VD	GFH600-3 GFH601-4 MCT210	MCT210	—	—	—	SFH600-3 SFH601-4	—	—	—	NJL5121DA	—
LTV713V	H11A1 H11A550	H11A1 MCT270	H11A1	—	CQY80N	IL1 IL74	—	ON3100	—	NJL5121D	—
LTV817	—	—	—	—	—	—	TLP521-1 LTP621	ON3161	PS2401-1	—	PC-17T1
LTV827	—	—	—	—	K827P	—	TLP521-2 TLP621-2	ON3112 ON3162	PS2401-2	—	PC-17T2
LTK829	—	MCT6 MCT66	—	—	CNY74-2	IL-CT6 ILD-1 ILD-74	TLP504A	—	—	—	—
LTV847	—	—	—	—	K847P	—	TLP521-4 TLP621-4	UN3164	PS2401-4	—	PC-17T4
LTK849	—	—	—	—	CNY74-4	ILQ-1 ILQ-74	TLP504A-2	—	—	—	—
LTV4N25	4N25	4N25	4N25	4N25	4N25	4N25	4N25	—	4N25 PS2010 PS2021	NJL5102D	4N25
LTV4N26	4N26	4N26	4N26	4N26	4N26	4N26	4N26	—	—	—	—
LTV4N28	4N28	4N28	4N28	4N28	4N28	4N28	4N28	—	—	—	—
LTV4N32	4N32	4N32	4N32	4N32	4N32	4N32	4N32	—	PS2012 PS2022	—	—
LTV4N33	4N33	4N33	4N33	4N33	4N33	4N33	4N33	—	—	—	—
LTV4N35	4N35	4N35	4N35	4N35	4N35	4N35	4N35	—	PS2021	NJL5104D	—
LTV4N37	4N37	4N37	4N37	4N37	4N37	4N37	4N37	—	—	—	—
LTK6N135	—	6N135	—	6N135	—	—	6N135	—	—	—	—
LTK6N136	—	6N136	—	6N136	—	—	6N136	—	6N136	—	—
LTK6N139	—	6N139	—	6N139	—	6N139	6N139	—	—	—	—

Quick Reference Guide

■ (LTV 4N Series) ... General Purpose 4N Series

Model No.	Features	Package	* 1 Output		With Base Terminal	Isolation Voltage Viso (Vrms)	Collector-emitter Voltage V_{CEO} (V)	Current Transfer Ratio CTR		Response Time t_r		Turn-on Time t_{on}		Page
		6-pin DIP	SPT	DPT				MIN. (%)	I_F mA)	TYP. (μs)	R_L (Ω)	MAX. (μs)	I_c (mA)	
LTV4N25	General purpose type	○	○		○	2,500	30	20	10	3	100	—	—	A-5
LTV4N26	General purpose type	○	○		○	1,500	30	20	10	3	100	—	—	A-5
LTV4N27	General purpose type	○	○		○	1,500	30	10	10	3	100	—	—	A-5
LTV4N28	General purpose type	○	○		○	500	30	10	10	3	100	—	—	A-5
LTV4N32	High transfer efficiency type	○		○	○	2,500	30	500	10	—	—	5	50	A-11
LTV4N33	High transfer efficiency type	○		○	○	1,500	30	500	10	—	—	5	50	A-11
LTV4N35	General purpose type	○	○		○	3,550	30	100	10	—	—	3	2	A-17
LTV4N37	General purpose type	○	○		○	1,500	30	100	10	—	—	3	2	A-17

■ (LTV6N Series) ... General Purpose 6N Series

Model No.	Features	Package	Output			With Base Terminal	Isolation Voltage Viso (Vrms)	Current Transfer Ratio CTR		Propagation Time			Page
		8-pin DIP	Photodiode + Transistor	Photodiode + Darlington transistor	Photodiode + Chipphoto IC			MIN. (%)	I_F (mA)	t_{PHL} TYP.(μs)	t_{PLH} TYP. (μs)	R_L(kΩ)	
LTK6N135	High speed, high noise reduction type	○	○			○	2,500	7	16	0.4	07	41	A-23
LTK6N136	High speed, high noise reduction type	○	○			○	2,500	19	16	03	05	1.9	A-30
LTK6N137	Ultra High speed, Low input current	○			○		2,500	700 (TYP.)	5	45ns	45ns	350Ω	A-37
LTK6N138	High transfer efficiency, High speed type	○		○		○	2,500	300	16	2	7	2.2	A-44
LTK6N139	High transfer efficiency, high speed type	○		○		○	2,500	500	1.6	5	5	4.7	A-49

■ (LTV700 Series) ... 6-pin DIP Viso: 5kVrms Type

Model No.	Features	Package	* 1 Output		With Base Terminal	Isolation Voltage V_{iso} (Vrms)	Collector-emitter voltage V_{CEO} (V)	Current Transfer Ratio CTR		Response Time t_r		Page
		6-pin DIP	SPT	DPT				MIN. (%)	I_F (mA)	TYP. (μs)	R_L (Ω)	
LTV702V	High collector-emitter voltage type	○	○		○	5,000	70	40	10	2	75	A-56
LTV703V	High collector-emitter voltage type	○	○		○	5,000	70	40	10	4	100	A-62
LTV713V	General purpose type	○	○		○	5,000	35	50	5	4	100	A-69

■ (LTV800 Series) ... 4-pin DIP or Multi-channel Type

Model No.	Features	Package			*1 Ouput		Isolation Voltage Viso (Vrms)	Current Transfer Ratio CTR		Response time t_r		Page
		4-pin DIP	8-pin DIP	16-pin DIP	SPT	DPT		MIN. (%)	I_F (mA)	TYP. (μs)	R_L(Ω)	
LTV814	AC input type (1-channel)	○			○		5,000	20	±1	4	100	A-76
LTV817	General purpose type (1 channel)	○			○		5,000	50	5	4	100	A-82
LTV827	General purpose type (2 channel)		○		○		5,000	50	5	4	100	A-82
LTV847	General purpose type (4-channel)			○	○		5,000	50	5	4	100	A-82
LTK829	Symmetrical terminal configuration type (2-channel)		○		○		5,000	50	5	4	100	A-90
LTK849	Symmetrical terminal configuration type (4 channel)			○	○		5,000	50	5	4	100	A-90

* 1 SPT Single transistor output DPT Darlington transistor output

Table of Models with UL Approval

■ PHOTOCOUPLERS

Model No.	UL	Remark
LTV4N25	○	UL file No. E113898 (S)
LTV4N26	○	
LTV4N27	○	
LTV4N28	○	
LTV4N32	○	
LTV4N33	○	
LTV4N35	○	
LTV4N37	○	
LTK6N136	○	
LTK6N137	○	
LTK6N138	○	
LTK6N139	○	
LTV702V	○	
LTV703V	○	
LTV713V	○	
LTV814	○	
LTV817	○	
LTV827	○	
LTV847	○	
LTK829	○	
LTK849	○	

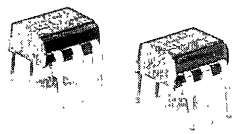
General Purpose Type Photocoupler LTV4N25/LTV4N26/LTV4N27/LTV4N28

FEATURES

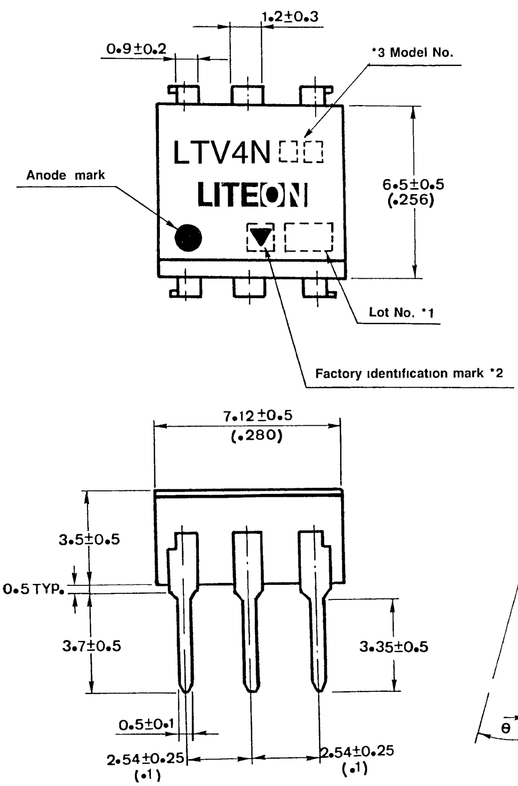
1. Response time
   tr: TYP. 3μs at V_{CE} = 10V, I_C = 2mA, R_L = 100 Ω
2. UL approved (No. E113898(s))

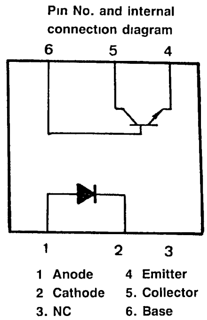
APPLICATIONS

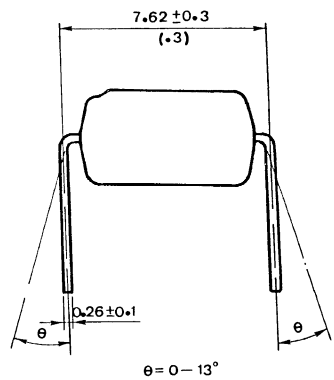
1. I/o interfaces for computers
2. System appliances, measuring instruments
3. Signal transmission between circuits of different potentials and impedances



OUTLINE DIMENSIONS (UNIT: mm)







*1 2-digit number marked according to DIN standard
*2 Factory identification mark shall be or shall not be marked.

* Model No.
LTV4N25
LTV4N26
LTV4N27
LTV4N28

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter			Symbol	Rating	Unit
Input	Forward current		I_F	80	mA
	*1 Peak forward current		I_{FM}	3	A
	Reverse voltage		V_R	6	V
	Power dissipation		P	150	mW
Output	Collector-emitter voltage		V_{CEO}	30	V
	Collector-base voltage		V_{CBO}	70	V
	Emitter-collector voltage		V_{ECO}	7	V
	Collector current		I_C	100	mA
	Collector power dissipation		P_C	150	mW
Total power dissipation			P_{tot}	250	mW
*2 Isolation voltage		LTV4N25	V_{iso}	2,500	V_{rms}
		LTV4N26		1,500	
		LTV4N27		1,500	
		LTV4N28		500	
Operating temperature			T_{opr}	−55 ~ +100	°C
Storage temperature			T_{stg}	−55 ~ +150	°C
*3 Soldering temperature			T_{sol}	260	°C

*1 Pulse width $\leq 1\mu s$, Duty ratio 0 001
*2 AC for 1 minute, 40 ~ 60% R.H.
*3 For 10 seconds

• Electro-optical characteristics

(Ta = 25°C)

	Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Input	Forward voltage		V_F	—	1.2	1.5	V	$I_F = 10mA$
Input	Reverse current		I_R	—	—	10	μA	$V_R = 4V$
Input	Terminal capacitance		C_t	—	50	—	pF	V = 0, F = 1kHz
Output	Collector dark current	LTV4N25/26	I_{CEO}	—	—	50	nA	$V_{CE} = 10V$, $I_F = 0$
Output	Collector dark current	LTV4N28	I_{CEO}	—	—	100	nA	$V_{CE} = 10V$, $I_F = 0$
Output	Collector-emitter breakdown voltage		BV_{CEO}	30	—	—	V	$I_C = 0.1mA$, $I_F = 0$
Output	Emitter-collector breakdown voltage		BV_{ECO}	7	—	—	V	$I_E = 10\mu A$, $I_F = 0$
Output	Collector-base breakdown voltage		BV_{CBO}	70	—	—	V	$I_C = 0.1mA$, $I_F = 0$
Transfer characteristics	*1 Collector current	LTV4N25/26	I_C	2	—	—	mA	$I_F = 10mA$, $V_{CE} = 10V$
Transfer characteristics	*1 Collector current	LTV4N27/28	I_C	1	—	—	mA	$I_F = 10mA$, $V_{CE} = 10V$
Transfer characteristics	Collector-emitter saturation voltage		V_{CE} (sat)	—	0.1	0.5	V	$I_F = 50mA$, $I_C = 2mA$
Transfer characteristics	Isolation resistance		R_{ISO}	5×10^{10}	1×10^{11}	—	Ω	DC500V, 40 ~ 60%R.H.
Transfer characteristics	Floating capacitance		C_f	—	1.0	—	pF	V = 0, f = 1MHz
Transfer characteristics	Response time (Rise)		t_r	—	3	—	μs	$V_{CF} = 10V$, $R_{BE} = \infty$, $R_L = 100\Omega$, $I_C = 2mA$
Transfer characteristics	Response time (Fall)		t_f	—	3	—	μs	$V_{CF} = 10V$, $R_{BE} = \infty$, $R_L = 100\Omega$, $I_C = 2mA$

*1 Pulse test: input pulse width = 300μs, Duty ratio ≤ 0.02 , CTR = $\frac{IC}{IF} \times 100\%$

■ SUPPLEMENT

- **Isolation voltage shall be measured in the following method.**

  (1) short between anode and cathode on the primary side and between collector, emitter and base on the secondary side.

  (2) The isolation voltage tester with a zero-cross circuit shall be used.

  (3) The waveform of applied voltage shall be a sine wave.

- **Inspection standard**

  Outgoing inspection standard for LITON products are shown below.

  (1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL(%)	Judgement
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

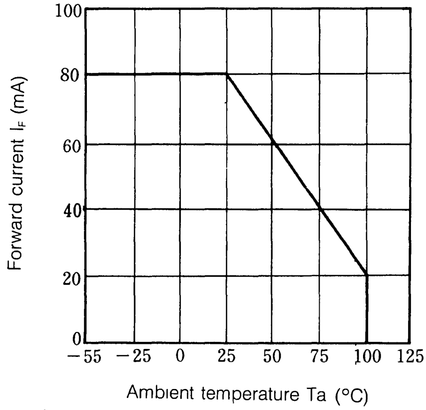


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

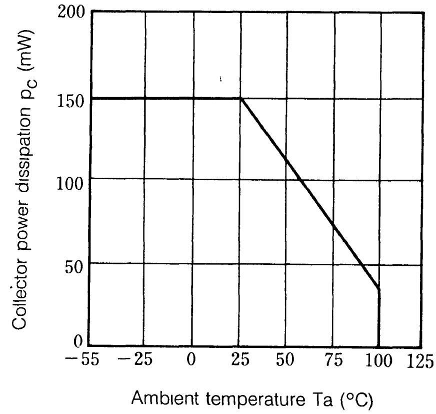


Fig. 3 Forward Current vs. Forward Voltage

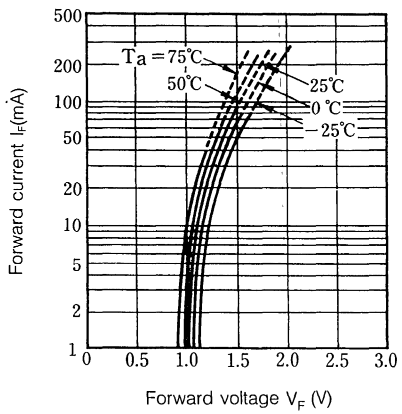


Fig. 4 Current Transfer Ratio vs. Forward Current

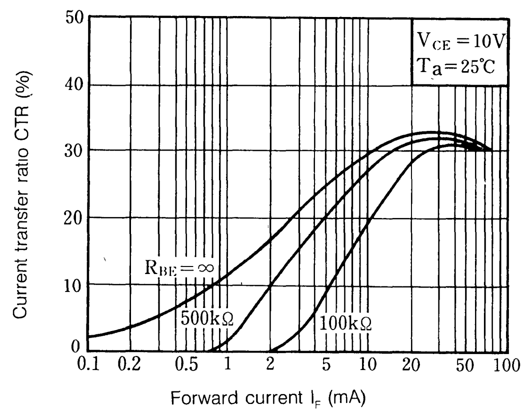


Fig. 5 Collector Current vs. Collector-emitter Voltage

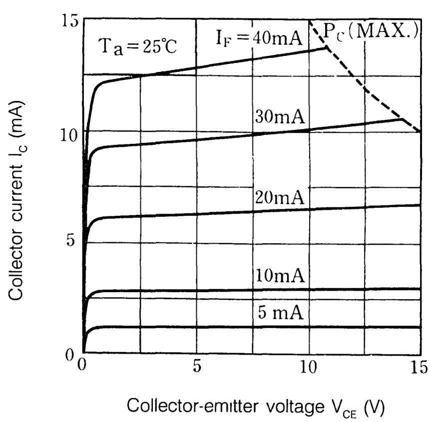


Fig. 6 Relative Current Transfer Ratio vs. Ambient Temperature

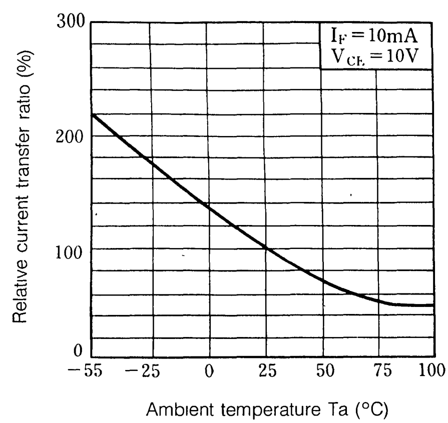


Fig. 7 Collector-emitter Saturation Voltage vs. Ambient Temperature

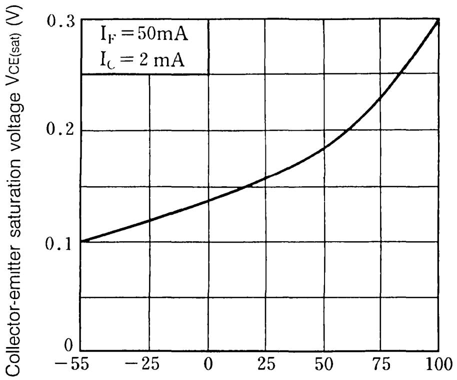


Fig. 8 Collector Dark Current vs. Ambient Temperature

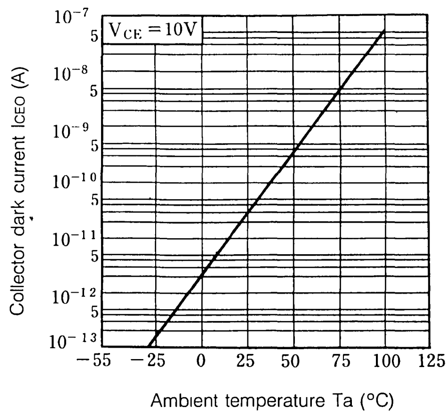


Fig. 9 Response Time vs. Load Resistance

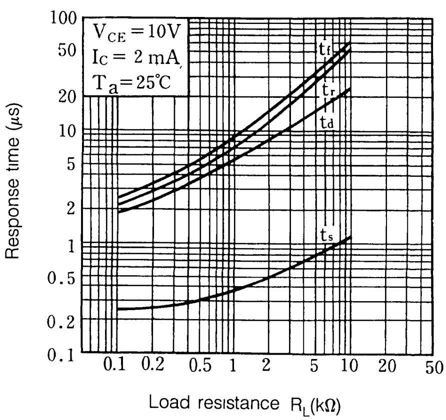


Fig. 10 Frequency Response

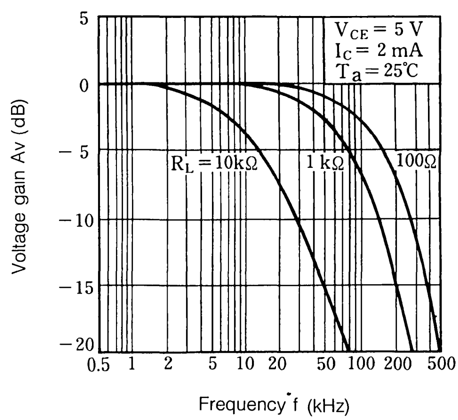
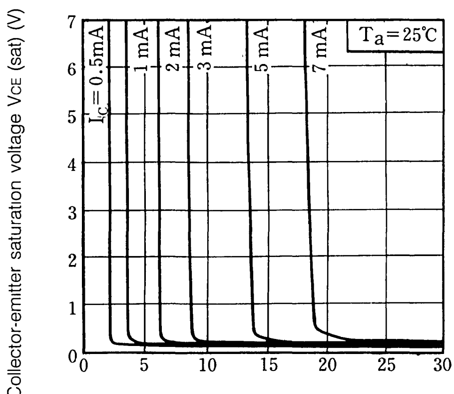
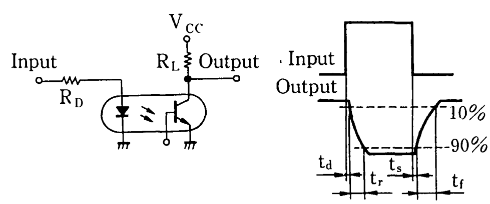


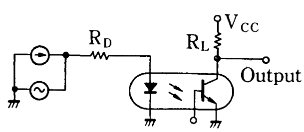
Fig. 11 Collector-emitter Saturation Voltage vs. Forward Current



Test Circuit for Response Time



Test circuit for Frequency Response



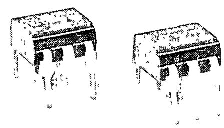
High Transfer Efficiency, General Purpose Type Photocoupler
LTV4N32/LTV4N33

■ FEATURES

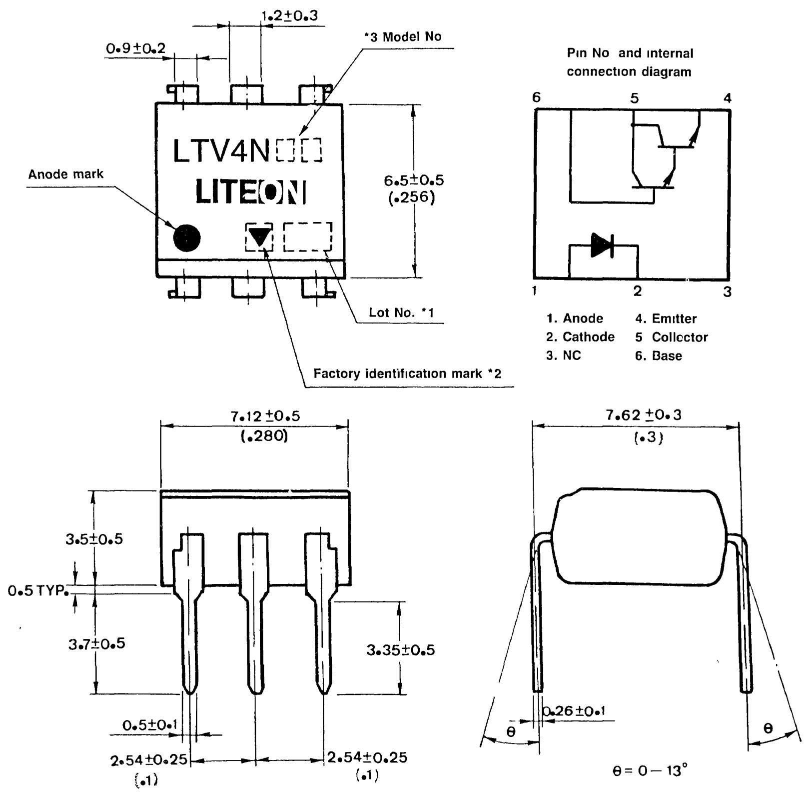
1. High current transfer ratio
   LTV4N32, LTV4N33
   (CTR:MIN. 500% at $I_F = 10mA$, $V_{CE} = 10V$)
2. Response time t_{on}:MAX. 5μs at $I_F = 200mA$
   $V_{CC} = 10V$, $I_C = 50mA$
3. UL approved (No E113898 (S))

■ APPLICATIONS

1. I/O interfaces for computers
2. System appliances, measuring instruments
3. Signal transmission between circuits of different potentials and impedances



■ OUTLINE DIMENSIONS (UNIT: mm)



*1 2-digit number marked according to DIN standard
*2 Factory identification mark shall be or shall not be marked

*3 Model No.
LTV4N32
LTV4N33

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter			Symbol	Rating	Unit
Input	Forward current		I_F	80	mA
	*1 Peak forward current		I_{FM}	3	A
	Reverse voltage		V_R	6	V
	Power dissipation		P	150	mW
Output	Collector-emitter voltage		V_{CEO}	30	V
	Collector-base voltage		V_{CBO}	30	V
	Emitter-collector voltage		V_{ECO}	5	V
	Collector current		I_C	100	mA
	Collector power dissipation		P_C	150	mW
Total power dissipation			P_{tot}	250	mW
* 2 Isolation voltage		LTV4N32	V_{iso}	2500	V_{rms}
		LTV4N33		1500	
Operating temperature			T_{opr}	−55 ~ +100	°C
Storage temperature			T_{stg}	−55 ~ +150	°C
* 3 Soldering temperature			T_{sol}	260	°C

*1 Pulse width ≤ 1 μs Duty radio 0 001
*2 AC for 1 minute 40 ~ 60% R.H.
*3 For 10 seconds

• Electro-optical characteristics

(Ta = 25°C)

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input	Forward voltage	V_F	—	1.2	1.5	V	$I_F = 10mA$
	Reverse current	I_R	—	—	10	μA	$V_R = 4V$
	Terminal capacitance	C_t	—	50	—	pF	V = 0, f = 1 kHz
Output	Collector dark current	I_{CEO}	—	—	100	nA	$V_{CE} = 10V$, $I_F = 0$
	Collector-emitter breakdown voltage	BV_{CEO}	30	—	—	V	$I_C = 0.1mA$ $I_F = 0$
	Emitter-collector breakdown voltage	BV_{ECO}	5	—	—	V	$I_E = 10\mu A$ $I_F = 0$
	Collector-base breakdown voltage	BV_{CBO}	30	—	—	V	$I_C = 0.1mA$ $I_F = 0$
Transfer characteristics	*1 Collector current	I_C	50	—	—	mA	$I_F = 10mA$ $V_{CE} = 10V$
	Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	1.0	V	$I_F = 8mA$ $I_C = 2mA$
	Isolation resistance	R_{iso}	5×10^{10}	1×10^{11}	—	Ω	DC500V 40 ~ 60% R.H.
	Floating capacitance	C_f	—	1.0	—	pF	V = 0, f = 1MHz
	Response time (Turn-on time)	t_{on}	—	—	5	μs	$I_F = 200mA$ ($tw \approx 1.0mS$) $V_{CC} = 10V$ $I_C = 50mA$
	Response time (Turn-off time)	t_{off}	—	—	100	μs	

*1 Pulse test: Input pulse width = 300μs Duty ratio ≤ 0.02 , $CTR = \frac{IC}{IF} \times 100\%$

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method.

(1) Short between anode and cathode on the primary side and between collector, emitter and base on the secondary side.
(2) The isolation voltage tester with a zero-cross circuit shall be used.
(3) The waveform of applied voltage shall be a sine wave.

• Inspection standard

Outgoing inspection standard for LITON products are shown below.
(1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL(%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

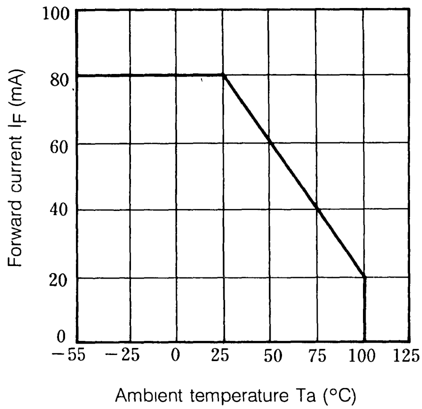


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

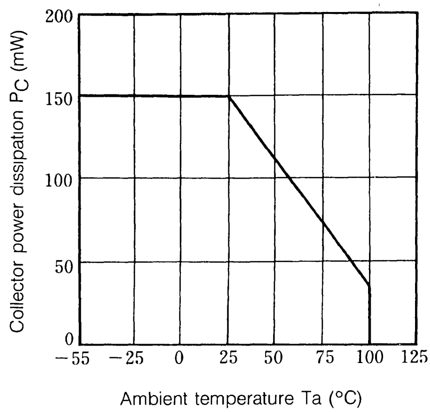


Fig. 3 Forward Current vs. Forward Voltage

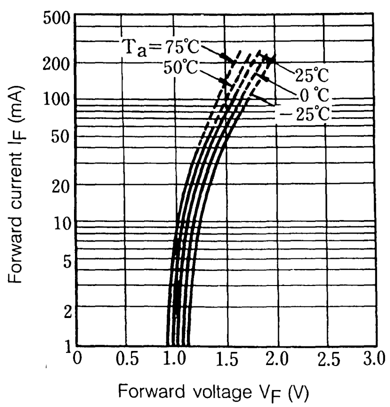


Fig. 4 Current Transfer Ratio vs. Forward Current

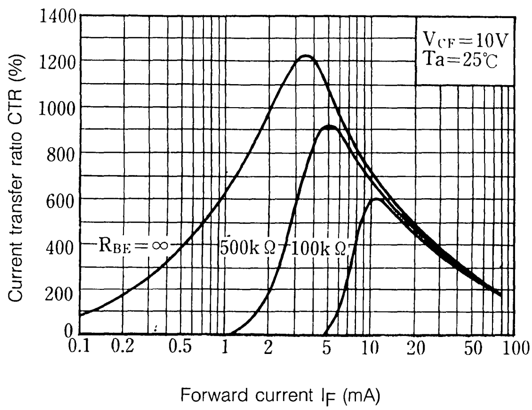


Fig. 5 Collector Current vs. Collector-emitter Voltage

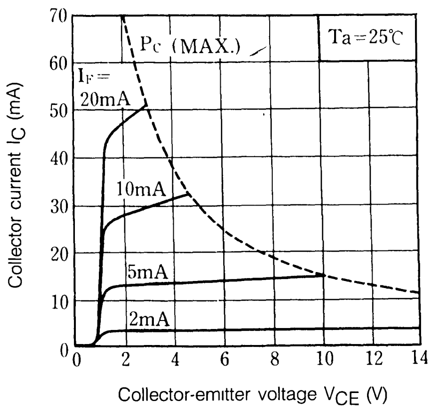


Fig. 6 Relative Current Transfer Ratio vs Ambient Temperature

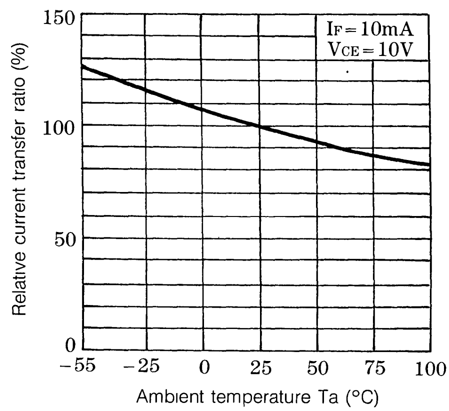


Fig. 7 Collector-emitter Saturation Voltage vs. Ambient Temperature

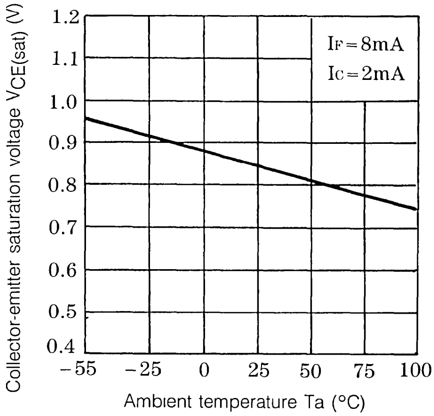


Fig. 8 Collector Dark Current vs. Ambient Temperature

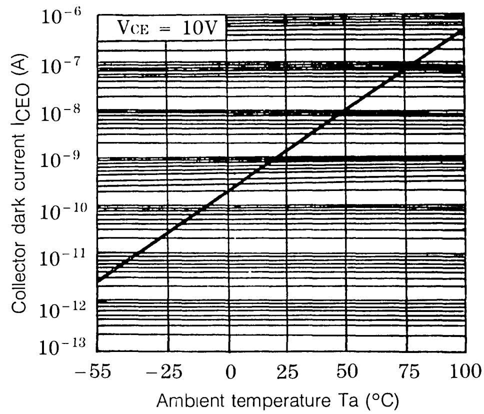


Fig. 9 Frequency Response

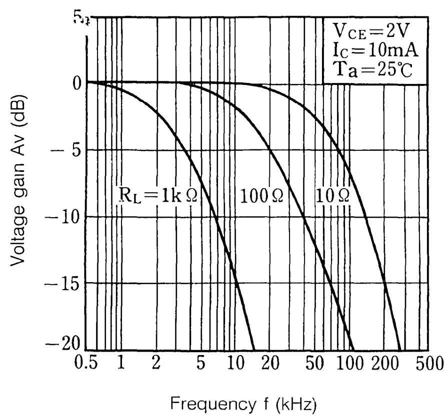


Fig. 10 Collector-emitter Saturation Voltage vs. Forward Current

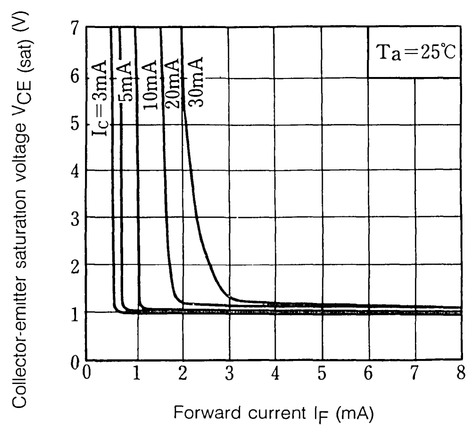


Fig.11 Test Circuit for Response Time

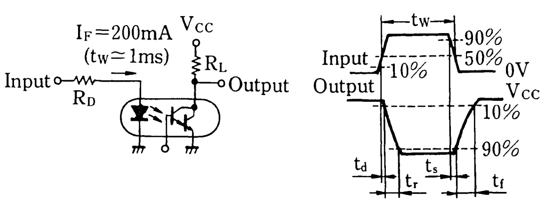
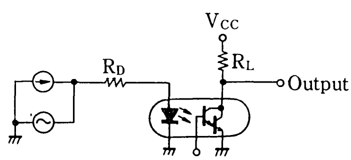


Fig. 12 Test Circuit for Frequency Response



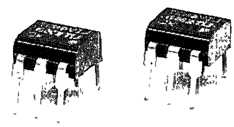
General Purpose Type Photocoupler LTV4N35/LTV4N37

■ FEATURES

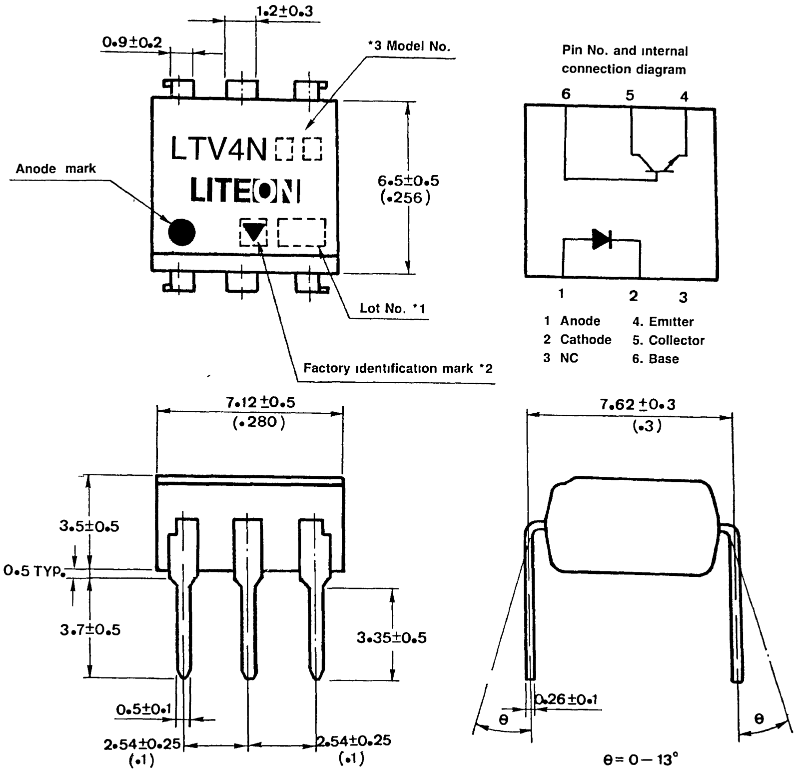
1. High current transfer ratio
   (CTR:MIN. 100% at $I_F = 10mA$, $V_{CE} = 10V$)
2. Response time
   t_{on}:TYP. $3\mu s$ at $V_{CC} = 10V$, $I_C = 2mA$, $R_L = 100\Omega$
3. Input-output isolation voltage: LTV4N35 (V_{iso}:3,550Vrms)
   LTV4N37 (V_{iso} 1,500Vrms)
4. UL approved (No. E113898 (S))

■ APPLICATIONS

1. I/O interfaces for computers
2. System appliances, measuring instruments
3. Signal transmission between circuits of different potentials and impedances



■ OUTLINE DIMENSIONS (UNIT: mm)



*1 2-digit number marked according to DIN standard
*2 Factory identification mark shall be or shall not be marked.

*3 Model No.
LTV4N35
LTV4N37

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	60	mA
	*1 Peak forward current	I_{FM}	3	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	100	mW
Output	Collector-emitter voltage	V_{CEO}	30	V
	Collector-base voltage	V_{CBO}	70	V
	Emitter-collector voltage	V_{ECO}	7	V
	Collector current	I_C	100	mA
	Collector power dissipation	P_C	300	mW
Total power dissipation		P_{tot}	350	mW
* 2 Isolation voltage	LTV4N35	V_{iso}	3,550	V_{rms}
	LTV4N37		1,500	
Operating temperature		T_{opr}	−55 ~ +100	°C
Storage temperature		T_{stg}	−55 ~ +150	°C
* 3 Soldering temperature		T_{sol}	260	°C

*1 Pulse width ≤ 1 μs, Duty radio 0.001
*2 AC for 1 minute 40 ~ 60% R.H.
*3 For 10 seconds

• Electro-optical characteristics

(Ta = 25°C)

Parameter			Symbol	Min.	Typ.	Max.	Unit	Conditions
Input	Forward voltage		V_F	—	1.2	1.5	V	I_F = 10mA
Input	Reverse current		I_R	—	—	10	μA	V_R = 4V
Input	Terminal capacitance		C_t	—	50	—	pF	V = 0, f = 1 MHz
Output	Collector dark current	Ta = 25°C	I_{CEO}	—	—	50	nA	V_{CE} = 10V,
Output	Collector dark current	Ta = 100°C	I_{CEO}	—	—	500	μA	V_{CE} = 30V
Output	Collector-emitter breakdown voltage		BV_{CEO}	30	—	—	V	I_C = 0.1mA I_F = 0
Output	Emitter-collector breakdown voltage		BV_{ECO}	7	—	—	V	I_E = 10μA I_F = 0
Output	Collector-base breakdown voltage		BV_{CBO}	70	—	—	V	I_C = 0.1mA I_F = 0
Transfer characteristics	*1 Collector Current	Ta = 25°C	I_C	10	—	—	mA	I_F = 10mA V_{CE} = 10V
Transfer characteristics	*1 Collector Current	Ta = −55°C	I_C	4	—	—	mA	I_F = 10mA V_{CE} = 10V
Transfer characteristics	*1 Collector Current	Ta = 100°C	I_C	4	—	—	mA	I_F = 10mA V_{CE} = 10V
Transfer characteristics	Collector-emitter saturation voltage		$V_{CE(sat)}$	—	—	0.3	V	I_F = 50mA I_C = 2mA
Transfer characteristics	Isolation resistance		R_{iso}	5×10^{10}	1×10^{11}	—	Ω	DC500V, 40～60% R.H.
Transfer characteristics	Floating capacitance		C_f	—	1.0	2.5	pF	V = 0, f = 1MHz
Transfer characteristics	Response time (Turn-on time)		t_{on}	—	3	10	μs	V_{CC} = 10V R_{BE} = ∞ R_L = 100Ω I_C = 2mA
Transfer characteristics	Response time (Turn-off time)		t_{off}	—	3	10	μs	V_{CC} = 10V R_{BE} = ∞ R_L = 100Ω I_C = 2mA

*1 Pulse test: Input pulse width = 300μs Duty ratio ≤ 0.02 , CTR = $\frac{I_C}{I_F}\times$ 100%

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method.

(1) Short between anode and cathode on the primary side and between collector, emitter and base on the secondary side.
(2) The isolation voltage tester with zero-cross circuit shall be used.
(3) The waveform of applied voltage shall be a sine wave.

• Inspection standard

Incoming inspection standard for LITON products are shown below.
(1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL(%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

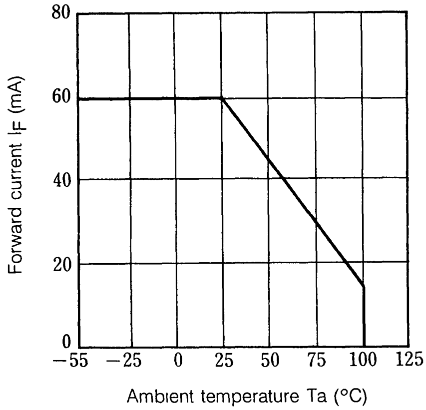


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

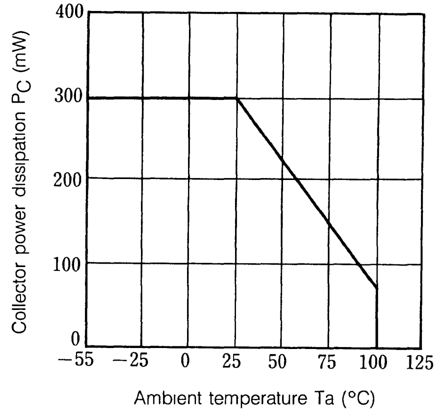


Fig. 3 Forward Current vs. Forward Voltage

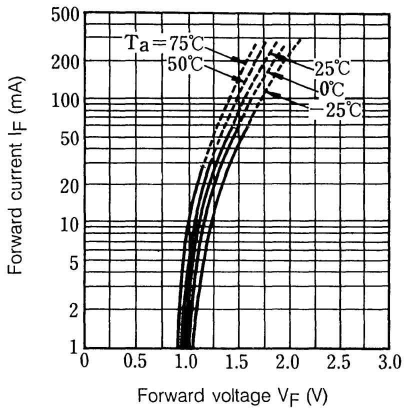


Fig. 4 Current Transfer Ratio vs. Forward Current

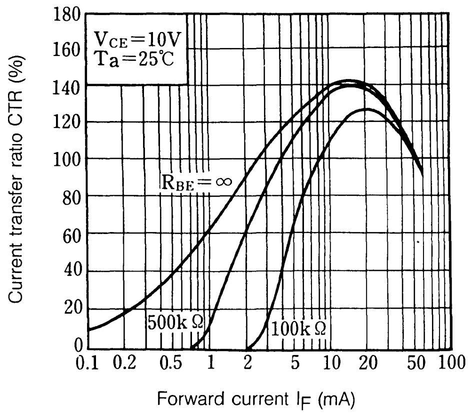


Fig. 5 Collector Current vs. Collector-emitter Voltage

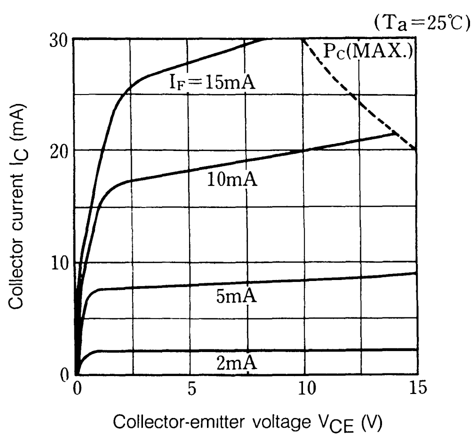


Fig. 6 Relative Current Transfer Ratio Ambient Temperature

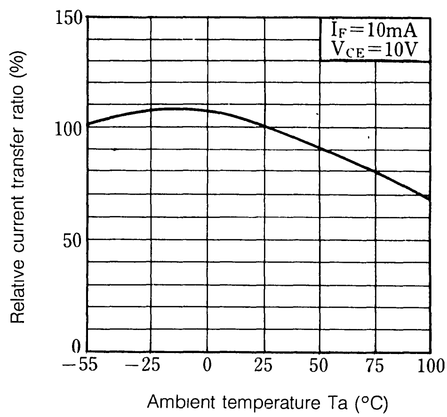


Fig. 7 Collector-emmitter Saturation Voltage vs. Ambient Temperature

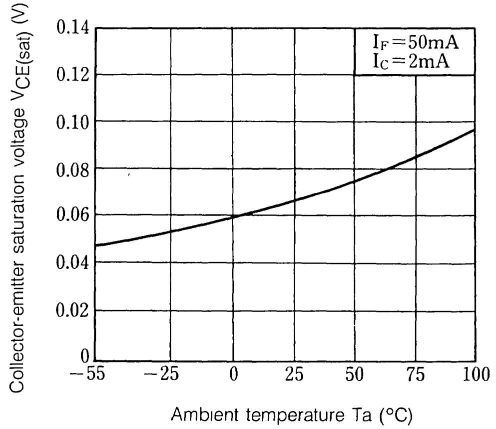


Fig. 8 Collector Dark Current vs. Ambient Temperature

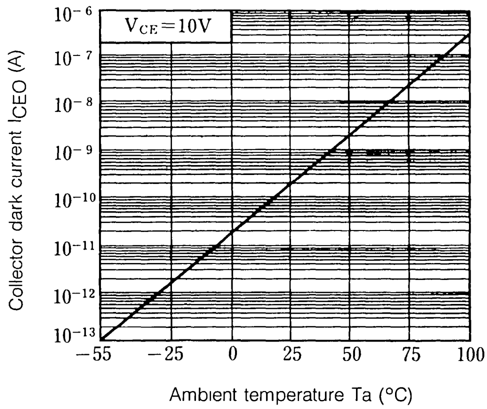


Fig. 9 Response Time vs. Load Resistance

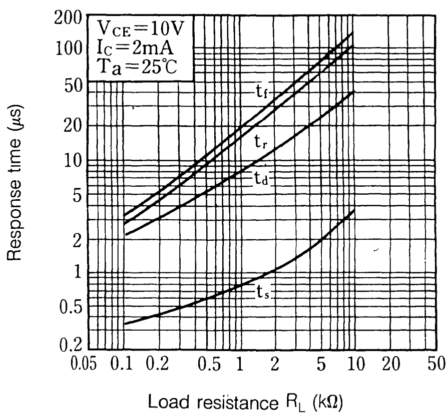


Fig. 10 Frequency Response

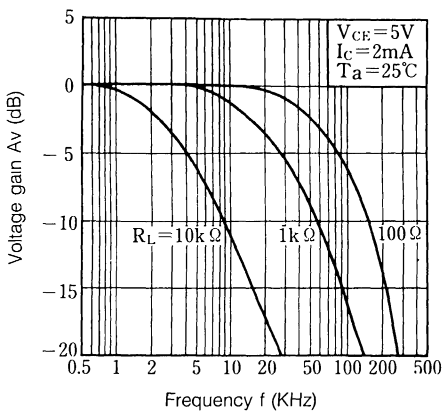
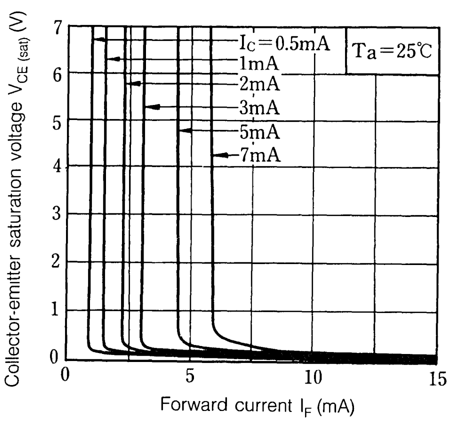
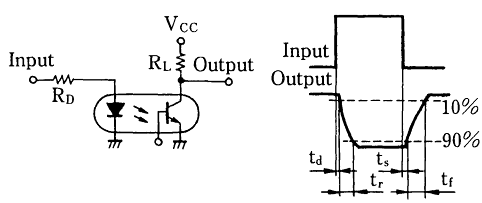


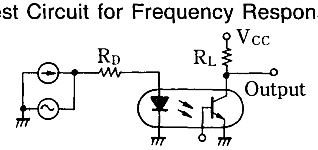
Fig. 11 Collector-emitter Saturation Voltage vs. Forward current



Test Circuit for Response Time



Test Circuit for Frequency Response



General Purpose Type Photocoupler LTK6N135

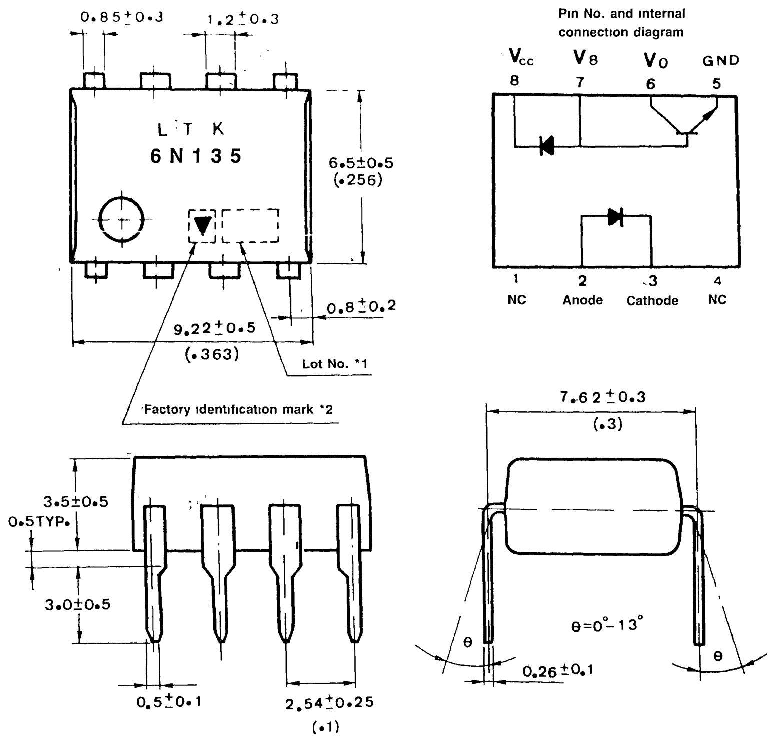
■ FEATURES

1. High speed response t_{PHL}, t_{PLH}
   (6N135: MAX, 1.5μs at $R_L = 4.1k\Omega$)
2. High instantaneous common mode rejection voltage
   (CM_H: TYP. 1kV/μs)
3. Standard dual-in-line package

■ APPLICATIONS

1. Computers, measuring instruments, control equipment
2. High speed line receivers, high speed logic
3. Telephone sets
4. Signal transmission between circuits of different potentials and impedances

■ OUTLINE DIMENSIONS (UNIT: mm)



*1 2-digit number marked according to DIN standard
*2 Factory identification mark shall be or shall not be marked.

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

	Parameter	Symbol	Rating	Unit
Emitting side	*1 Forward current	I_F	25	mA
	*2 Peak forward current	I_F	50	mA
	*3 Peak transient forward current	I_{FM}	1	A
	Reverse voltage	V_R	5	V
	*4 Input power dissipation	P	45	mW
Detecting side	Average output current	I_O	8	mA
	Peak output current	I_{OP}	16	mA
	Emitter-base reverse withstand voltage (5 ~ 7 pin)	V_{EBO}	5	V
	Supply voltage	V_{CC}	−0.5 ~ +15	V
	Output voltage	V_O	−0.5 ~ +15	V
	Base current (7 pin)	I_B	5	mA
	*5 Output power dissipation	P_O	100	mW
Operating temperature		T_{opr}	−55 ~ +100	°C
Storage temperature		T_{stg}	−55 ~ +125	°C
*6 Isolation voltage		T_{iso}	2500	Vrms
*7 Soldering temperature		T_{sol}	260	°C

*1 Decreases at the rate of 0.8mA/°C if the atmospheric temprature is higher than 70°C
*2 Duty cycle = 50%, pulse width = 1ms. Decreases at the rate of 1.6mA/°C if the atmospheric temperature is higher than 70°C
*3 Pulse width ≤ 1μS, 300pps.
*4 Decreases at the rate of 0.9mW/°C if the atmospheric temperature is higher than 70°C.
*5 Decreases at the rate of 2.0mW/°C if the atmospheric temperature is higher than 70°C.
*6 AC or 1 minute. 40 ~ 60% R.H.
*7 For 10 seconds.

• Electro-optical characteristics

(Unless otherwise specified Ta = 0 ~ 70°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
*1 Current transfer ratio	CTR (1)	Ta=25°C, I_F=16mA V_O=0.4V, V_{CC}=4.5V	7	18	—	%
	CTR (2)	I_F=16mA V_O=0.5V, V_{CC}=4.5V	5	13	—	%
Logic (0) output voltage	V_{OL}	I_F=16mA V_{CC}=4.5V, I_O=1.1mA	—	0.1	0.4	V
Logic (1) output current	$I_{OH(1)}$	Ta=25°C I_F=0mA, V_{CC}=V_O=5.5V	—	3.0	500	nA
	$I_{OH(2)}$	Ta=25°C I_F=0mA, V_{CC}=V_O=15V	—	0.01	1.0	μA
	$I_{OH(3)}$	I_F=0mA, V_{CC}=V_O=15V	—	—	50	μA
Logic (0) supply current	I_{CCL}	I_F 16mA V_O open, V_{CC}=15V	—	70	—	μA
Logic (1) supply current	$I_{CCH(1)}$	Ta=25°C, I_F=0mA V_O=open, V_{CC}=15V	—	0.02	1.0	μA
	$I_{CCH(2)}$	I_F=0mA V_O=open, V_{CC}=15V	—	—	2.0	μA
Input forward voltage	V_F	Ta=25°C, I_F=16mA	—	1.7	1.95	V
Input forward voltage temperature coefficient	$\frac{\triangle VF}{\triangle Ta}$	I_F=16mA	—	−1.9	—	mV/°C
Input reverse voltage	BVR	Ta=25°C, I_R=10μA	5.0	—	—	V
Input capacitance	C_{IN}	V_F=0, f=1 MHz	—	60	—	pF
*2 Leak current (input-output)	$I_{I\text{-}O}$	Ta=25°C, 45%R.H. t=5s $V_{I\text{-}O}$=3kV, dc	—	—	1.0	μA
*2 Isolation resistance (input-output)	$R_{I\text{-}O}$	$V_{I\text{-}O}$=500V, dc	—	10^{12}	—	Ω
*2 Capacitance (input-output)	$C_{I\text{-}O}$	f=1MHz	—	0.6	—	pF
Transistor current amplification factor	hFE	V_O=5V, I_O=3mA	—	100	—	—

Note: Typical value Ta=25°C

* 1. Current transfer ratio is defined as the ratio of input current to output current expressed in %

* 2. measured as a 2-pin element (Short 1.2.3 and 4 Short 5.6.7 and 8)

• Switching characteristics

($Ta=25°C$, $V_{CC}=5V$, $I_F=16mA$)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
* 2 Propagation delay time Output (1)→(0)	t_{PHL}	$R_L=4.1k\Omega$	—	0.4	1.5	μs
* 2 Propagation delay time Output (0)→(1)	t_{PLH}	$R_L=4.1k\Omega$	—	0.7	1.5	μs
* 1,2 Common mode transient immunity at logic (1) output	CM_H	$I_F=0mA$, $V_{CM}=10V_{P-P}$ $R_L=4.1k\Omega$	—	1000	—	$V/\mu s$
* 1,2 Common mode transient immunity at logic (0) output	CM_L	$V_{CM}=10V_{P-P}$, $I_F=16mA$ $R_L=4.1k\Omega$	—	−1000	—	$V/\mu s$
* 3 Bandwidth	BW	$R_L=100\Omega$	—	2.0	—	MHz

* 1 Common mode transient immunity in logic (1) is defined as a common mode voltage variation that can hold the output at level (1) ($V_O>2.0V$).
  Common mode transient immunity in logic (0) is defined as a common mode voltage variation that can hold the output at level (0) ($V_O<0.8$)
* 2 $R_L=4.1k\Omega$ is equivalent to one TTL and $5.6k\Omega$ pull − up resistor
* 3 Bandwidth denotes a point 3 dB down with AC input

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method.

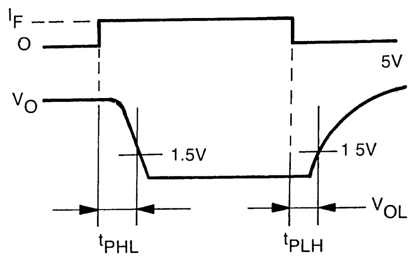
(1) Short between pin 1 and 4 on the primary side and between pin 5 and 8 on the secondary side.
(2) The isolation voltage tester with a zero-cross circuit shall be used.
(3) The waveform of applied voltage shall be a sine wave.

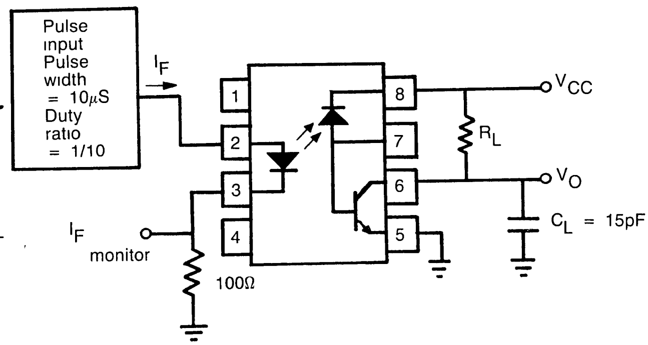
• Inspection standard

Outgoing inspection standard for LITON products are shown below.
(1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL(%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

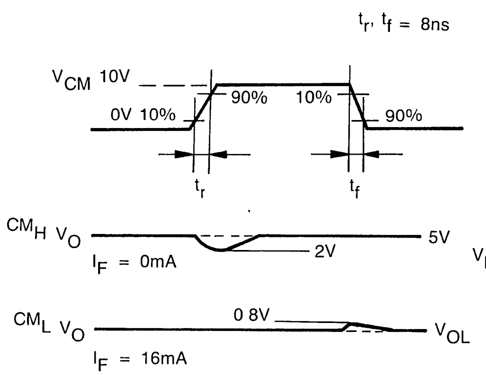
• **1 Test Circuit for propagation delay time**





• **2 Test circuit for CM_H and CM_L**

tr, tf = 8ns



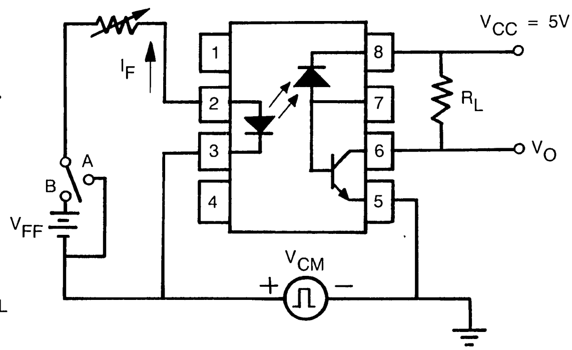


Fig. 1 Forward Current vs. Ambient Temperature

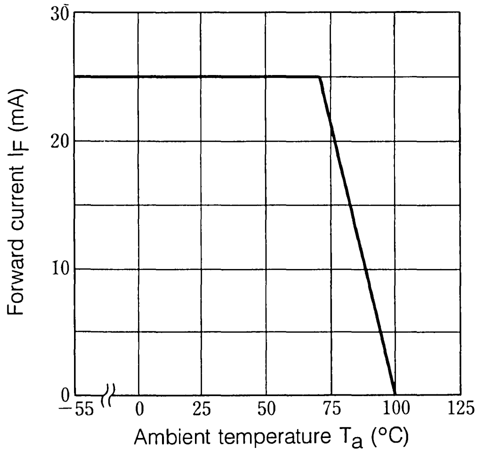


Fig. 2 Power Dissipation vs. Ambient Temperature

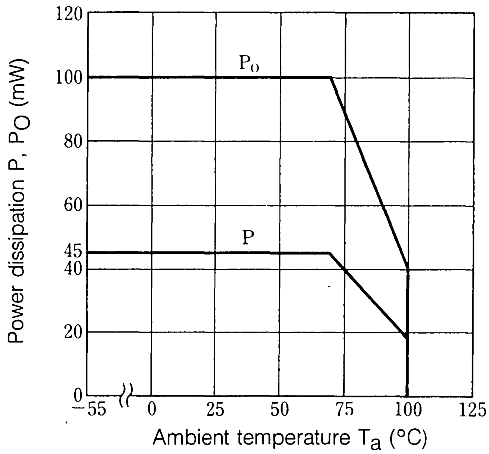


Fig. 3 Forward Current vs. Forward Voltage

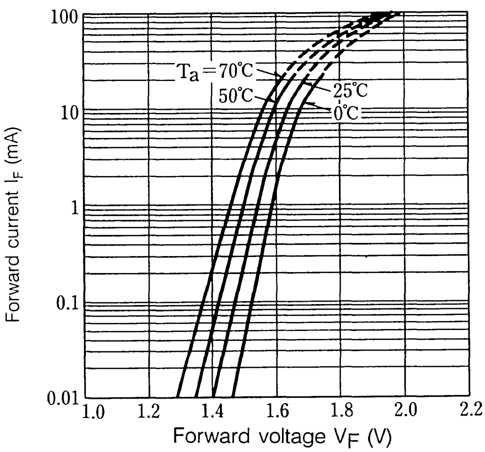


Fig. 4 Relative Current Transfer Ratio vs. Forward Current

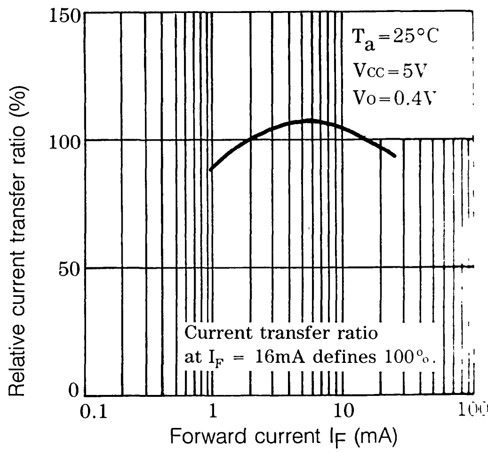


Fig. 5 Output current vs. Output Voltage

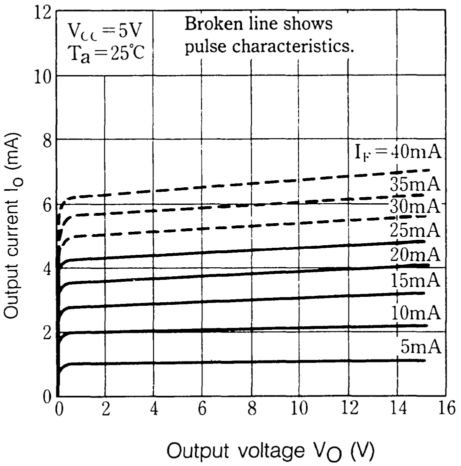


Fig. 6 Logic (1) Output Current vs. Ambient Temperature

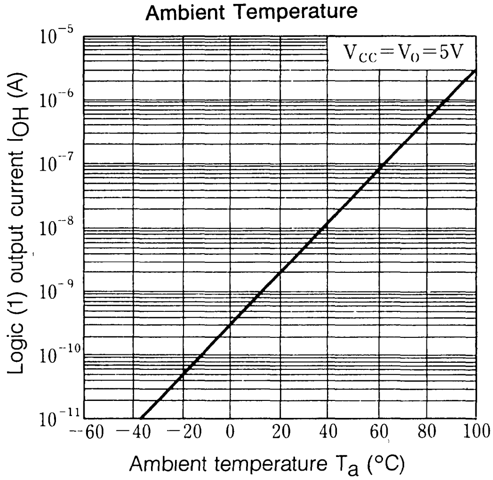


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

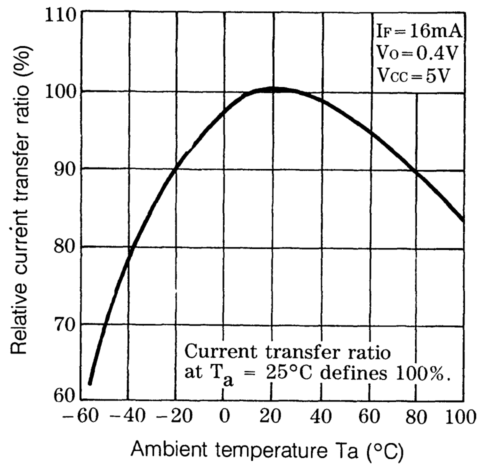
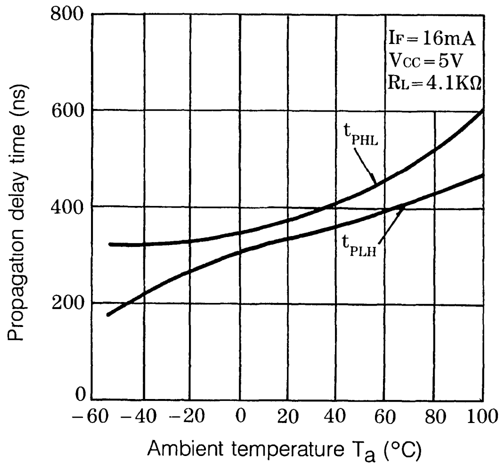


Fig. 8 Propagation Delay Time vs. Ambient Temperature



- **Test Circuit for Frequency Response**

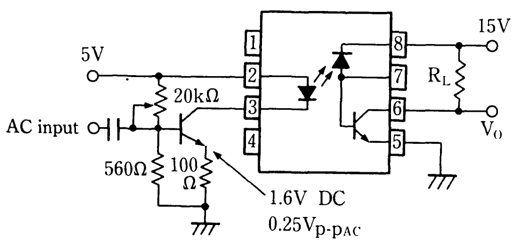
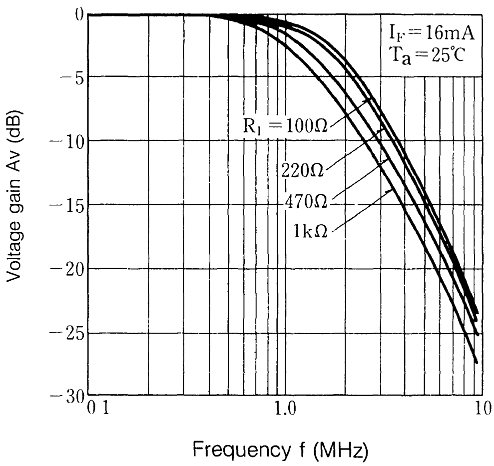


Fig. 9 Frequency Response



■ PRECAUTION FOR USE

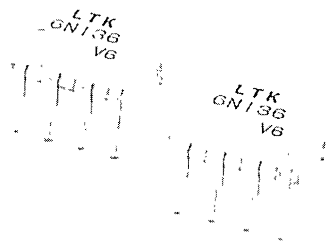
The minute design makes the transistor on the bipolar structured detector vulnerable to static electricity.
To prevent damages and degradation in characteristics due to static electricity, take general measures against static electricity.

LITEON

General Purpose Type Photocoupler LTK6N136

■ FEATURES

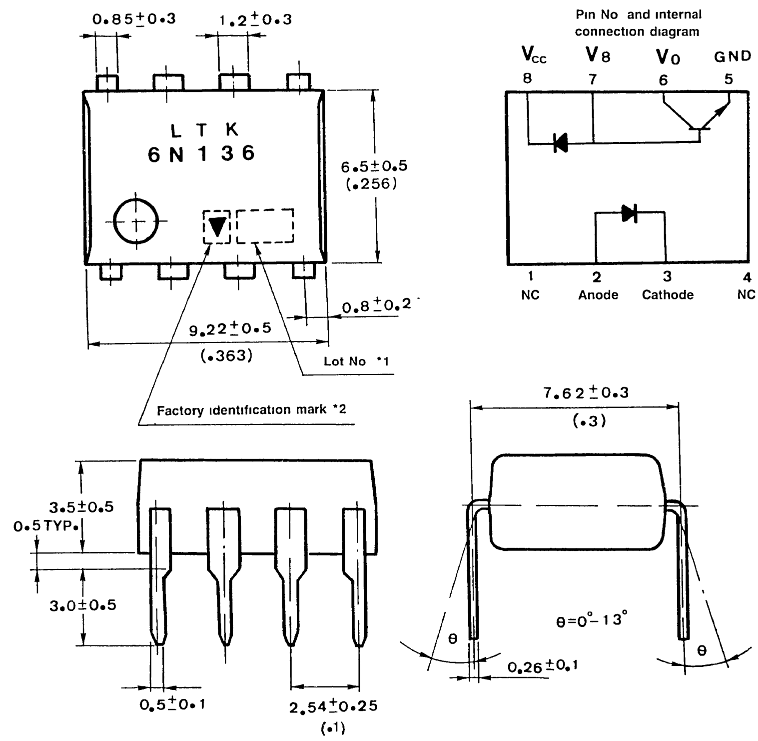
1. High speed response t_{PHL}, t_{PLH}
   (6N136: MAX. 0.8μs at R_L = 1.9 kΩ)
2. High instantaneous common mode rejection voltage
   (CM_H: TYP. 1kV/μs)
3. Standard dual-in-line package
4. UL approved (No. E113898(s))



■ APPLICATIONS

1. Computers, measuring instruments, control equipment
2. High speed line receivers, high speed logic
3. Telephone sets
4. Signal transmission between circuits of different potentials and impedances

■ OUTLINE DIMENSIONS (UNIT: mm)



*1 2-digit number marked according to DIN standard
*2 Factory identification mark shall be or shall not be marked.

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Emitting side	*1 Forward current	I_F	25	mA
	*2 Peak forward current	I_F	50	mA
	*3 Peak transient forward current	I_{FM}	1	A
	Reverse voltage	V_R	5	V
	*4 Input power dissipation	P	45	mW
Detecting side	Average output current	I_O	8	mA
	Peak output current	I_{OP}	16	mA
	Emitter-base reverse withstand voltage (5 ~ 7 pin)	V_{EBO}	5	V
	Supply voltage	V_{CC}	−0.5 ~ +15	V
	Output voltage	V_O	−0.5 ~ +15	V
	Base current (7 pin)	I_B	5	mA
	*5 Output power dissipation	P_O	100	mW
Operating temperature		T_{opr}	−55 ~ +100	°C
Storage temperature		T_{stg}	−55 ~ +125	°C
* 6 Isolation voltage		V_{iso}	2500	Vrms
*7 Soldering temperature		T_{sol}	260	°C

*1 Decreases at the rate of 0.8mA/°C if the atmospheric temperature is higher than 70°C.
*2 Duty cycle = 50%, pulse width = 1ms. Decreases at the rate of 1.6mA/°C if the atmospheric temperature is higher than 70°C.
*3 Pulse width ≤ 1μs, 300pps
*4 Decreases at the rate of 0.9mW/°C if the atmospheric temperature is higher than 70°C
*5 Decreases at the rate of 2.0mA/°C if the atmospheric temperature is higher than 70°C
*6 AC for 1 minute, 40 ~ 60% R.H.
*7 For 10 seconds.

• Electro-optical characteristics

(Unless otherwise specified Ta = 0 ~ 70°C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
*1 Current transfer ratio	CTR (1)	Ta = 25°C, I_F = 16mA V_O = 0.4V, V_{CC} = 4.5V	19	35	—	%
	CTR (2)	I_F = 16mA V_O = 0.5V, V_{CC} = 4.5V	15	35	—	%
Logic (0) output voltage	V_{OL}	I_F = 16mA V_{CC} = 4.5V, I_O = 2.4mA	—	0.1	0.4	V
Logic (1) output current	I_{OH} (1)	Ta = 25°C I_F = 0mA, V_{CC} = V_O = 5.5V	—	3.0	500	nA
	I_{OH} (2)	Ta = 25°C I_F = 0mA, V_{CC} = V_O = 15V	—	0.01	1.0	μA
	I_{OH} (3)	I_F = 0mA, V_{CC} = V_O = 15V	—	—	50	μA
Logic (0) supply current	I_{CCL}	I_F = 16mA V_O = open, V_{CC} = 15V	—	70	—	μA
Logic (1) supply current	I_{CCH} (1)	I_F = 0mA Ta = 25°C V_O = open, V_{CC} = 15V	—	0.02	1.0	μA
	I_{CCH} (2)	I_F = 0mA V_O = open, V_{CC} = 15V	—	—	2.0	μA
Input forward voltage	V_F	Ta = 25°C, I_F = 16mA	—	1.7	1.95	V
Input forward voltage temperature coefficient	$\frac{\Delta VF}{\Delta Ta}$	I_F = 16mA	—	−1.9	—	mV/°C
Input reverse voltage	BVR	Ta = 25°C, I_R = 10μA	5.0	—	—	V
Input capacitance	C_{IN}	V_F = 0, f = 1MHz	—	60	—	pF
*2 Leak current (input-output)	$I_{I\text{-}O}$	Ta = 25°C, 45% R.H. t = 5s $V_{I\text{-}O}$ = 3kV, dc.	—	–	1.0	μA
*2 Isolation resistance (input-output)	$R_{I\text{-}O}$	$V_{I\text{-}O}$ = 500V, dc.	—	10^{12}	—	Ω
*2 Capacitance (input-output)	$C_{I\text{-}O}$	f = 1MHz	—	0.6	—	pF
Transistor current amplification factor	h_{FE}	V_O = 5V, I_O = 3mA	—	100	—	—

Note: Typical value: Ta = 25°C
*1 Current transfer ratio is defined as the ratio of input current to output current expressed in %.
*2 Measured as a 2-pin element (Short 1, 2, 3, and 4, short 5, 6, 7 and 8).

- **Switching characteristics** (Ta=25°C, V_{CC} = 5V, I_F = 16mA)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
*2 Propagation delay time Output (1)→(0)	t_{PHL}	R_L = 1.9kΩ	—	0.3	0.8	μs
*2 Propagation delay time Output (0)→(1)	t_{PLH}	R_L = 1.9kΩ	—	0.5	0.8	μs
*1, 2 Common mode transient immunity at logic (1) output	CM_H	I_F = 0mA, V_{CM} = 10V_{P-P} R_L = 1.9kΩ	—	1000	—	V/μs
*1, 2 Common mode transient immunity at logic (0) output	CM_L	V_{CM} = 10V_{P-P}, I_F = 16mA R_L = 1.9kΩ	—	-1000	—	V/μs
*3 Bandwidth	BW	R_L = 100Ω	—	2.0	—	V/μs

*1 Common mode transient immunity in logic (1) is defined as a common mode voltage variation that can hold the output at level (1) (V_O > 2.0V)
Common mode transient immunity in logic (0) is defined as a common mode voltage variation that can hold the output at level (0) (V_O < 0.8V).
*2 R_L = 1.9kΩ is equivalent to one TTL and 5.6kΩ pull-up resistor.
*3 Bandwidth denotes a point 3 dB down with AC input.

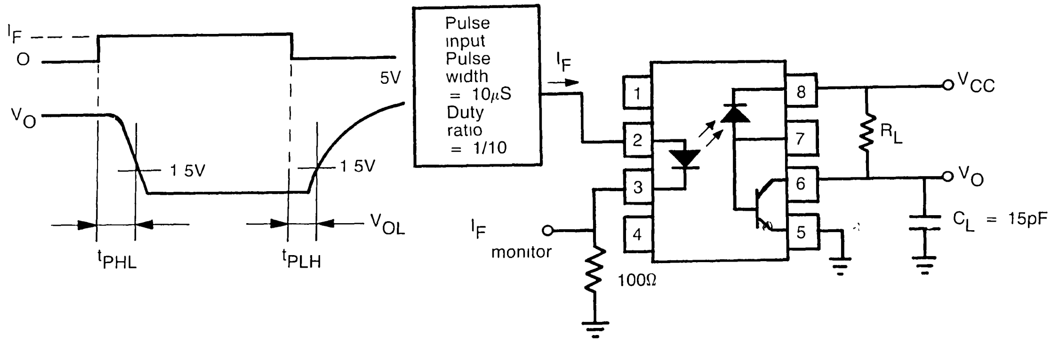
■ SUPPLEMENT

- **Isolation voltage shall be measured in the following method.**
  (1) Short between pin 1 and 4 on the primary side and between pin 5 and 8 on the secondary side.
  (2) The isolation voltage tester with a zero-cross circuit shall be used.
  (3) The waveform of applied voltage shall be a sine wave.

- **Inspection standard**
  Outgoing inspection standard for LITON products are shown below.
  (1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the insecption items are shown below.

Defect	Inspection item	AQL(%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

•1 Test circuit for propagation delay time



•2 Test circuit for CM_H and CM_L

tr, tf = 8ns

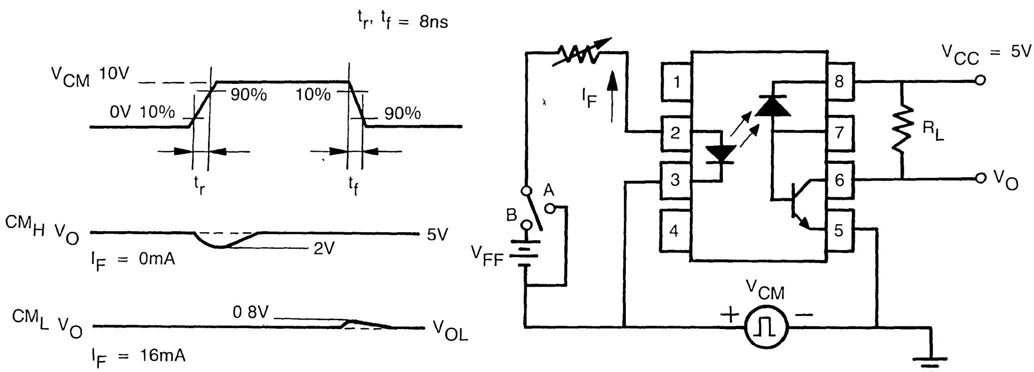


Fig. 1 Forward Current vs. Ambient Temperature

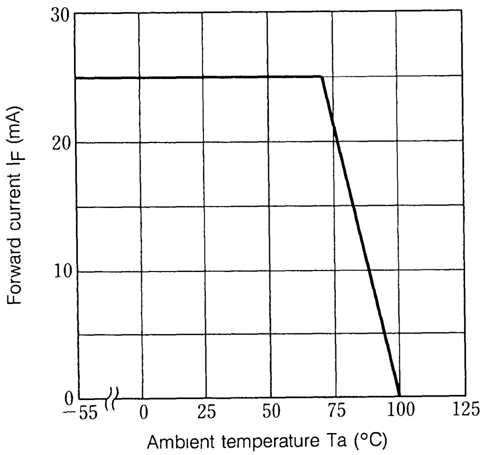


Fig. 2 Power Dissipation vs. Ambient Temperature

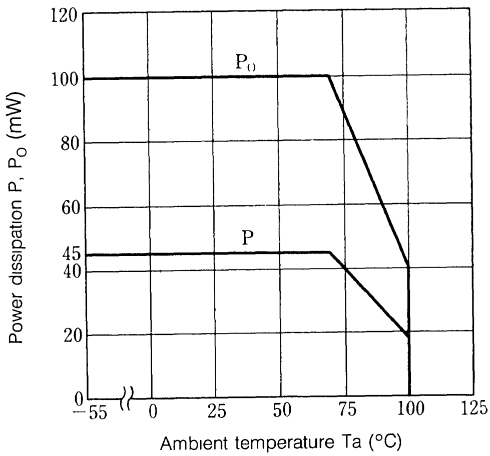


Fig. 3 Forward Current vs. Forward Voltage

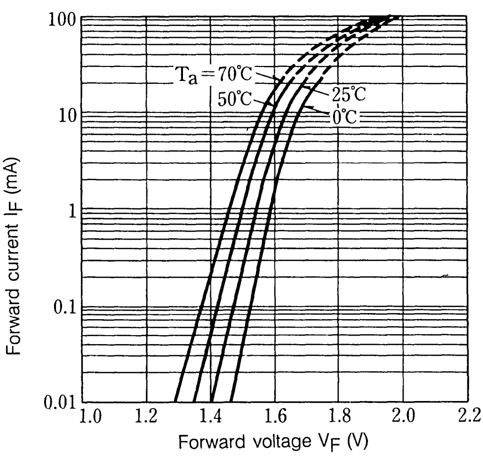


Fig. 4 Relative Current Transfer Ratio vs. Forward Current

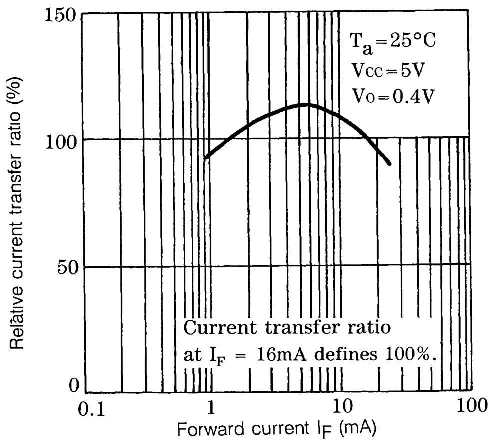


Fig. 5 Output Current vs. Output Voltage

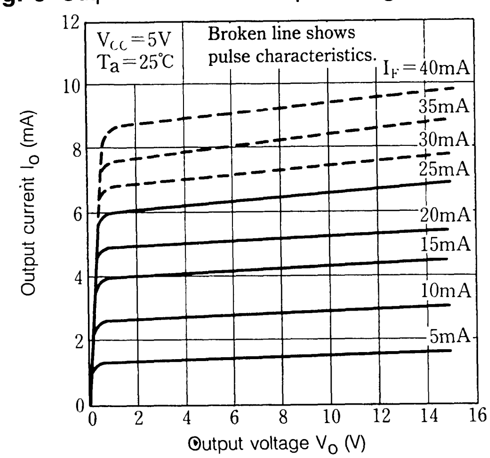


Fig. 6 Logic (1) Output current vs. Ambient Temperature

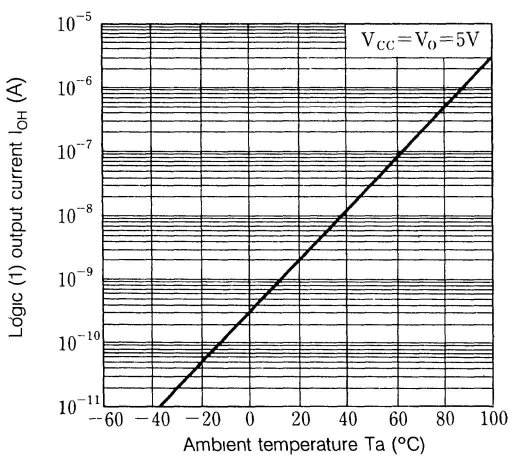


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

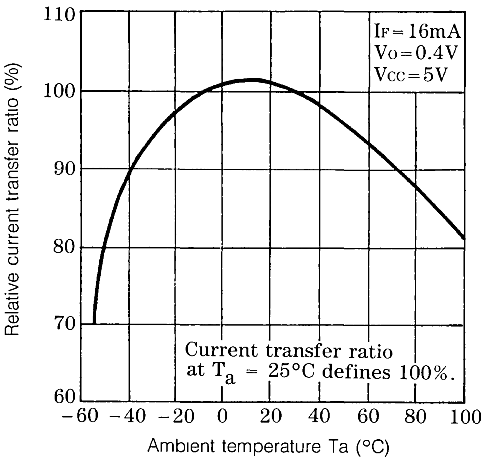
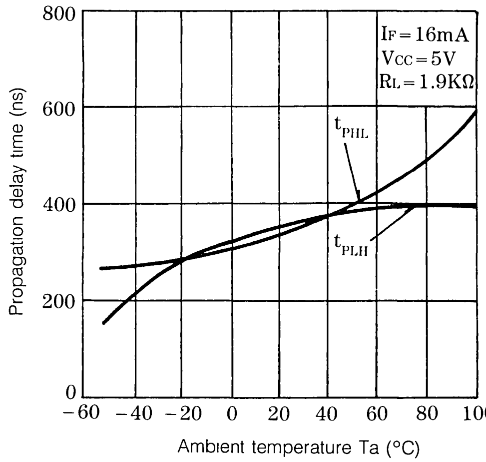


Fig. 8 Propagation Delay Time vs. Ambient Temperature



Test circuit for Frequency Response

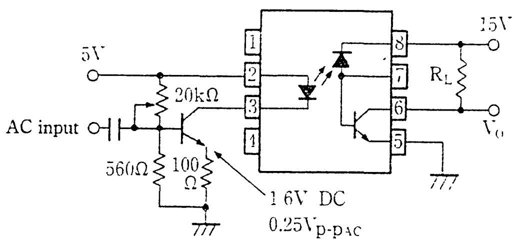
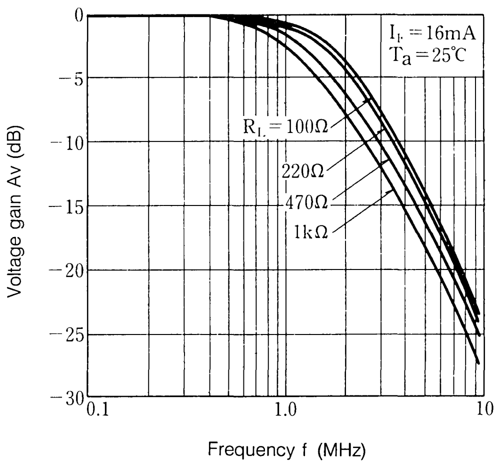


Fig. 10 Frequency Response



■ PRECAUTION FOR USE

The minute design makes the transistor on the bipolar structured detector vulnerable to static electricity.
To prevent damages and degradation in characteristics due to static electricity, take general measures against static electricity.

GaAs IRED & PHOTO IC LTK6N137

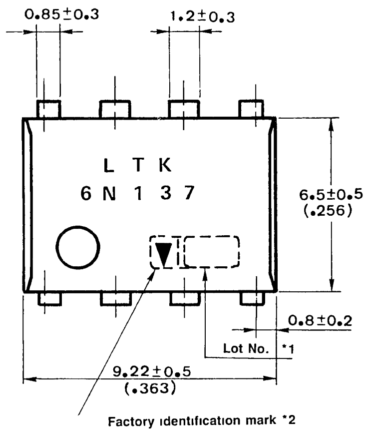
■ FEATURES

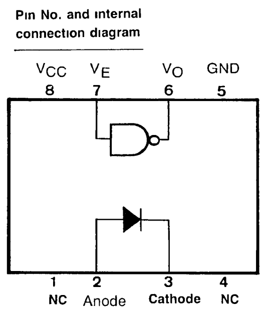
1. LSTTL/TTL Compatible: 5V Supply
2. Ultra High Speed
3. High Isolation Voltage: 2500 Vrms
4. UL approved (No. E 113898(s))

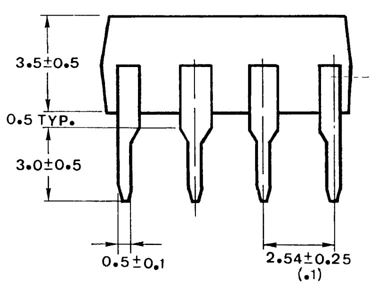
■ APPLICATIONS

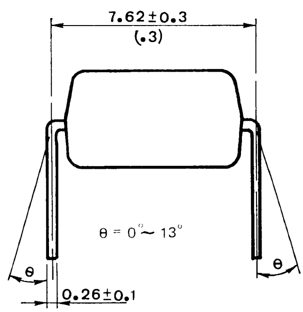
1. Computer interfacing.
2. Tele communication.
3. Analog data equipment control.

■ OUTLINE DIMENSIONS (UNIT: mm)









*1 2-digit number marked according to DIN standard
*2. Factory identification mark shall be or shall not be marked.

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

	Parameter	Symbol	Rating	Unit
Emitting side	Forward current	I_F	20	mA
	*1 Peak forward current	I_F	40	mA
	Reverse voltage	V_R	5	V
Detecting side	*2 Supply voltage	V_{CC}	7	V
	*3 Enable voltage	V_E	5.5	V
	Output current	I_O	50	mA
	Output voltage	V_O	7	V
	Dissipation current (Output collector)	P_C	85	mW
Operating temperature		T_{opr}	0 ~ +70	°C
Storage temperature		T_{stg}	−55 ~ +125	°C
*4 Isolation voltage		V_{iso}	2500	Vrms
*5 Soldering temperature		T_{sol}	260	°C

*1. Pulse width ≤ 1 msec.
*2. For 1 minute (MAX.)
*3. It shall not exceed 500mV or more over supply voltage (V_{CC}).
*4 AC for 1 minute, 40 ~ 60% R.H.
*5 10 sec. or less, 2mm or more from the root of lead pins.

• Electro-optical characteristics

(Unless otherwise specified Ta = 0 ~ 70°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Logic (1) output current	I_{OH}	—	2	250	μA	$V_{CC} = V_O = 5.5V$ $I_F = 250\mu A$, $V_E = 2.0V$
Logic (0) output voltage	V_{OL}	—	0.4	0.6	V	$V_{CC} = 5.5V$, $I_F = 5mA$ $V_{EH} = 2.0V$ I_{OL} (sinking) = 13mA
Logic (1) enable current	I_{EH}	—	−0.8	—	mA	$V_{CC} = 5.5V$, $V_E = 2.0V$
Logic (0) enable current	I_{EL}	—	−1.2	−2.0	mA	$V_{CC} = 5.5V$, $V_E = 0.5V$
Logic (1) supply current	I_{CCH}	—	7	15	mA	$V_{CC} = 5.5V$, $I_F = 0mA$ $V_E = 0.5V$
Logic (0) supply current	I_{CCL}	—	13	18	mA	$V_{CC} = 5.5V$, $I_F = 10mA$ $V_E = 0.5V$
*1 Leak current	$I_{I\text{-}O}$	—	—	1.0	μA	Relative humidity = 45% Ta = 25°C, t = 5s $V_{I\text{-}O} = 3000Vdc$
*1 Isolation resistance (Input-Output)	$R_{I\text{-}O}$	—	10^{12}	—	Ω	$V_{I\text{-}O} = 500V$, Ta = 25°C
*1 Capacitance (Input-Output)	$C_{I\text{-}O}$	—	0.6	—	pF	f = 1MHz, Ta = 25°C
*2 Input forward voltage	V_F	—	1.6	1.75	V	$I_F = 10mA$, Ta = 25°C
Input reverse breakdown voltage	BV_R	5	—	—	V	$I_R = 10\mu A$, Ta = 25°C
Input capacitance	C_{IN}	—	60	—	pF	$V_F = 0$, f = 1MHz
*3 Current transfer ratio	CTR	—	700	—	%	$I_F = 5.0mA$, $R_L = 100\Omega$

Note: All typical value shall be at $V_{CC} = 5V$, Ta = 25°C
*1 Device considered a 2 terminal device: pins 2 and 3 shorted together, and pins 5, 6, 7 and 8 shorted together.
*2 At $I_{in} = 10mA$, V_F decreases with increasing temperature at the rate of 1.6mV/°C
*3 DC current transfer ratio is defined as the ratio of the output collector current to the forward bias input current.

• Switching characteristics

(Ta = 25°C, Vcc = 5V)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Conditions
*1 Propagation delay time Output (0)→(1)	t_{PLH}	—	45	75	ns	$R_L = 350\Omega$, $C_L = 15pF$ $I_F = 7.5mA$
*2 Propagation delay time Output (1)→(0)	t_{PHL}	—	45	75	ns	$R_L = 350\Omega$, $C_L = 15pF$ $I_F = 7.5mA$
Output rise-fall time (10%-90%)	tr, tf	—	20, 30	—	ns	$R_L = 350\Omega$, $C_L = 15pF$ $I_F = 7.5mA$
*3 Propagation delay time of enable (1)→(0)	t_{ELH}	—	40	—	ns	$R_L = 350\Omega$, $C_L = 15pF$ $I_F = 7.5mA$, $V_{EH} = 3.0V$ $V_{EL} = 0.5V$
*4 Propagation delay time of enable (0)→(1)	t_{EHL}	—	15	—	ns	$R_L = 350\Omega$, $C_L = 15pF$ $I_F = 7.5mA$, $V_{EH} = 3.0V$ $V_{EL} = 0.5V$
*5 Common mode transient immunity at logic (1) output	CM_H	—	500	—	V/μs	$V_{CM} = 10V$, $R_L = 350\Omega$ V_O (MIN.) = 2V, $I_F = 0mA$
*5 Common mode transient immunity at logic (0) output	CM_L	—	−500	—	V/μs	$V_{CM} = 10V$, $R_L = 350\Omega$ V_O (MAX.) = 0.8V $I_F = 5mA$

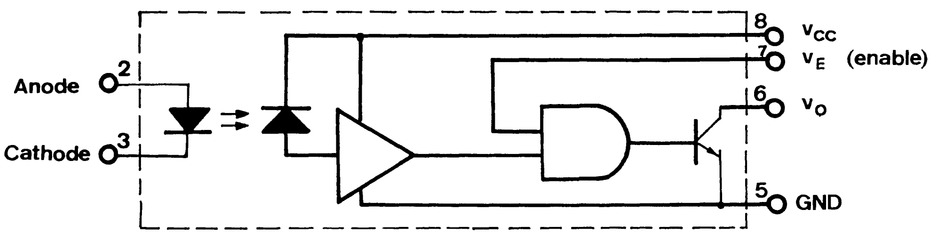
*1 *2 Refer to the Fig. 1
*3 *4 Refer to the Fig. 2
*5 Common mode transient immunity in logic (1) output is the maximum tolerable (positive) dV_{CM}/dt on the leading edge of the common mode pulse, V_{CM}, to assure that the output will remain in a Logic (1) state.
Common mode transient immunity in logic (0) output is the maximum tolerable (negative) dV_{CM}/dt on the trailing edge of the common mode pulse signal, V_{CM}, to assure that the output will remain in a Logic (0) state.

• Recommended operating conditions

Parameter	Symbol	Min.	Max.	Unit
Input current, Low level each channel	I_{FL}	0	250	μA
Input current, High level each channel	I_{FH}	6.3*	15	mA
High level enable voltage	V_{EH}	2.0	V_{CC}	V
Low level enable voltage	V_{EL}	0	0.8	V
Supply voltage	V_{CC}	4.5	5.5	V
Fan out (TTL load)	N	—	8	—
Operating temperature	T_{opr}	0	70	°C

1. No external pull-up is required in the condition of high level of enable input.
2. Ceramic capacitor (0.01 ~ 0.1μA) for bypass shall be connected between V_{CC} and GND at the position of 1cm from terminals.
3. *6.3mA condition permits at least 20% CTR degradation guardband. Initial switching threshold is 5mA or less.

• Block diagram of circuit, Truth table



Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H

L: Logic (0)
H: Logic (1)

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method.

(1) Short between pin 1 and 4 on the primary side and between pin 5 and 8 on the secondary side.
(2) The isolation voltage tester with a zero-cross circuit shall be used.
(3) The waveform of applied voltage shall be a sine wave.

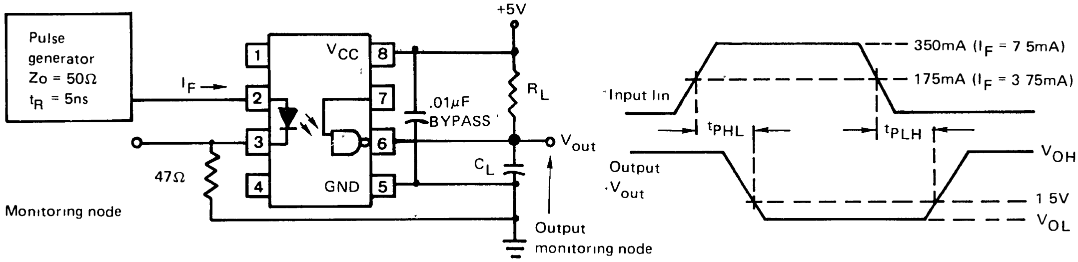
• Inspection standard

Outgoing inspection standard for LITON products are shown below . . . .

(1) A single sampling plan, normal inspection level II based on MIL-STD-105D. is applied. The AQL according to the inspection items are shown below.

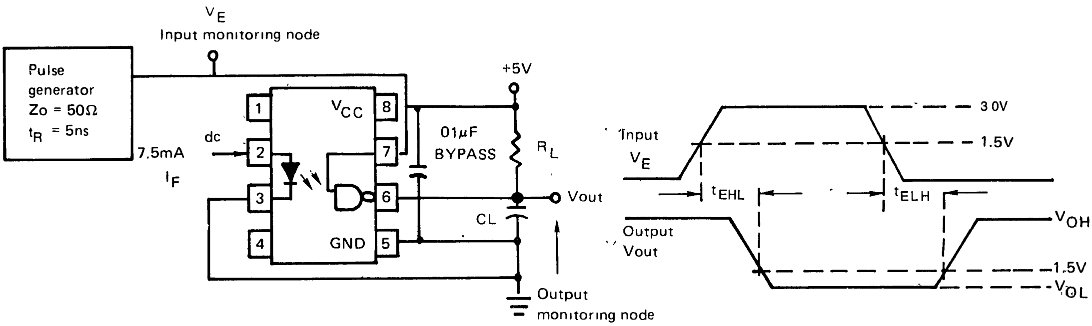
Defect	Inspection item	AQL(%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

Fig. 1 Test circuit for t_{PLH} and t_{PHL}



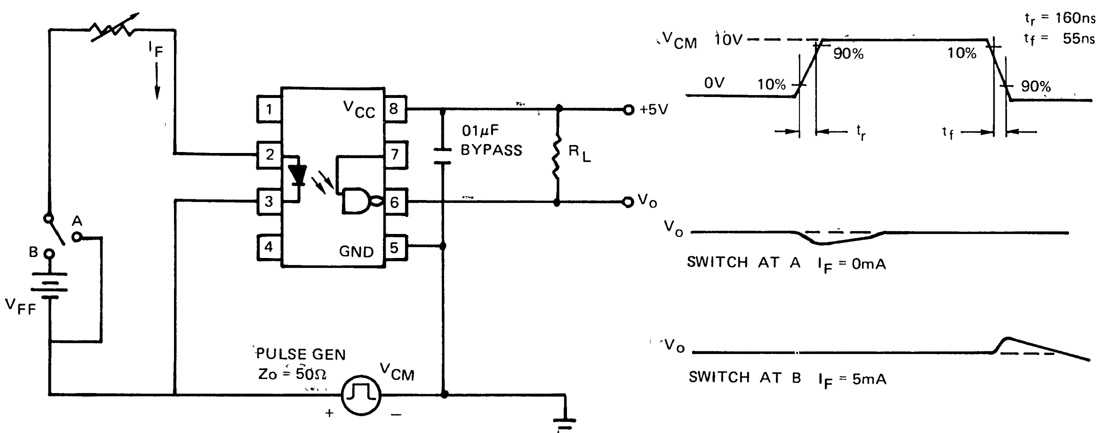
*C_L is approximately 15pF, which includes probe and stray wiring capacitance.

Fig. 2 Test circuit for t_{ELH} and t_{EHL}



*C_L is approximately 15pF, which includes probe and stray wiring capacitance

Fig. 3 Test circuit for transiet immunity and typical waveforms

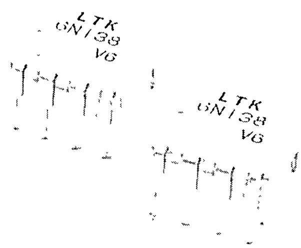


LITEON

High Sensitivity High Speed OPIC Photocoupler LTK6N138

■ FEATURES

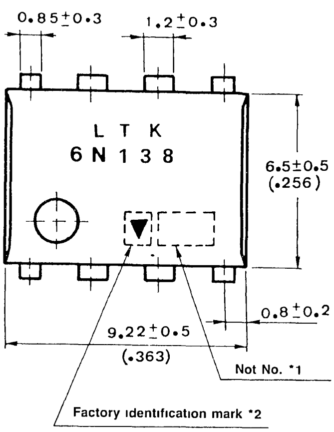
1. High current transfer ratio
   (CTR: MIN, 500% at I_F = 1.6 mA)
2. High speed response
   (t_{PHL}:TYP. 0.2μs at R_L = 270Ω)
3. Instantaneous common mode rejection voltage
   (CM_H: TYP. 500V/μs)
4. Directly interfaces to TTL
5. Overseas standard model
6. UL approved (No. E113898(s))

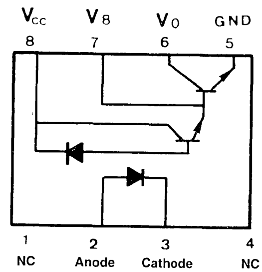


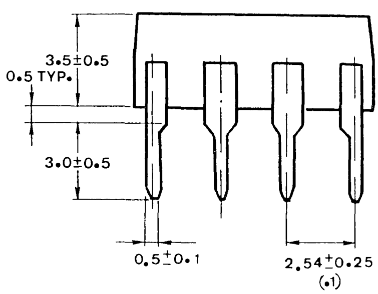
■ APPLICATIONS

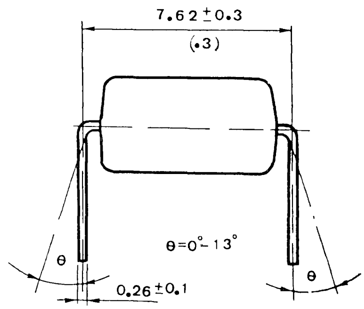
1. Interfaces for computer peripherals
2. Computers measuring instruments, control equipment
3. Telephone sets
4. Signal transmission between circuits of different potentials and impedances

■ OUTLINE DIMENSIONS (UNIT: mm)









*1 2-digit number marked according to DIN standard.
*2 Factory identification mark shall be or shall not be marked

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Emitting side	*1 Forward current	I_F	20	mA
	*2 Peak forward current	I_F	40	mA
	*3 Peak transient forward current	I_{FM}	1	A
	Reverse voltage	V_R	5	V
	*4 Input power dissipation	P	35	mW
Detecting side	*5 Average output current	I_O	60	mA
	Emitter-base reverse withstand voltage (5 ~ 7 pin)	V_{EBO}	0.5	V
	Supply voltage	V_{CC}	−0.5 ~ +7	V
	Output voltage	V_O	−0.5 ~ +7	V
	*6 Output power dissipation	P_O	100	mW
Operating temperature		T_{opr}	0 ~ +70	°C
Storage temperature		T_{stg}	−55 ~ +125	°C
* 7 Isolation voltage		V_{iso}	2500	Vrms
*8 Soldering temperature		T_{sol}	260	°C

*1 Decreases at the rate of 0.4mA/°C if the atmospheric temperature is higher than 50°C
*2 Duty cycle = 50%, pulse width = 1ms
*3 Pulse width ≤ 1μs, 300pps
*4 Decreases at the rate of 0.7mW/°C if the atmospheric temperature is higher than 50°C
*5 Decreases at the rate of 0.7mA/°C if the atmospheric temperature is higher than 25°C
*6 Decreases at the rate of 2.0mW/°C if the atmospheric temperature is higher than 25°C
*7 AC for 1 minute, 40 ~ 60% R.H.
*8 For 10 seconds.

• Electro-optical characteristics (Unless otherwise specified Ta=0~70°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
*1 Current transfer ratio	CTR	300	1500	—	%	I_F=1.6mA V_O=0.4V, V_{CC}=4.5V
Logic (0). output voltage	V_{OL}	—	0.1	0.4	V	I_F=1.6mA Io =4.8mA V_{CC}=4.5V
Logic (1) output current	I_{OH}	—	0.1	250	μA	I_F=0mA, V_{CC}=V_O=7V
Logic (0) supply current	I_{CCL}	—	0.2	—	mA	I_F=1.6mA, V_O=open V_{CC}=5V
Logic (1) supply current	I_{CCH}	—	10	—	nA	I_F=0mA, V_O=open V_{CC}=5V
Input forward current	V_F	—	1.5	1.7	V	Ta=25°C, I_F=1.6mA
Input forward voltage temperature coefficient	$\frac{\Delta VF}{\Delta Ta}$	—	−1.9	—	mV/°C	I_F=1.6mA
Input reverse voltage	BVR	5.0	—	—	V	Ta=25°C, I_R=10μA
Input capacitance	C_{IN}	—	60	—	pF	V_F=0, f=1MHz
*2 Leak current (Input-Output)	$I_{I\text{-}O}$	—	—	1.0	μA	Ta=25°C, 45%R.H. t=5s, $V_{I\text{-}O}$=3kV dc
*2 Isolation resistance (Input-Output)	$R_{I\text{-}O}$	—	10^{12}	—	Ω	$V_{I\text{-}O}$=500V dc
*2 Capacitance (Input-Output)	$C_{I\text{-}O}$	—	0.6	—	pF	f=1MHz

Note: All typical value shall be at Ta=25°C, Vcc=5V
*1 Current transfer ratio is defined as the ratio of input current to output current expressed in %.
*2 Device considered a 2 terminal device: pins 1, 2, 3 and 4 shorted together, and pins 5, 6, 7 and 8 shorted together.

• Switching characteristics

($Ta = 25°C$, $V_{CC} = 5V$)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Propagation delay time Output (1)→(0)	t_{PHL}	$I_F = 1.6mA$, $R_L = 2.2k\Omega$	—	2	10	μs
Propagation delay time Output (0)→(1)	t_{PLH}	$I_F = 1.6mA$, $R_L = 2.2k\Omega$	—	7	35	μs
*1 Common mode transient immunity at logic (1) output	CM_H	$I_F = 0mA$, $V_{CM} = 10Vp\text{-}p$ $R_L = 2.2k\Omega$	—	500	—	$V/\mu s$
*1 Common mode transient immunity at logic (0) output	CM_L	$V_{CM} = 10Vp\text{-}p$ $I_F = 1.6mA$ $R_L = 2.2k\Omega$	—	-500	—	$V/\mu s$

*1 Common mode transient immunity in logic (1) is defined as a common mode voltage fluctuation that can hold the output at level (1) ($V_O > 2.0V$).
Common mode transient immunity in logic (0) is defined as a common mode voltage fluctuation that can hold the output at level (0) ($V_O < 0.8V$)

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method.

(1) Short between pin 1 and 4 on the primary side and between pin 5 and 8 on the secondary side.
(2) The isolation voltage tester with a zero-cross circuit shall be used.
(3) The waveform of applied voltage shall be a sine wave.

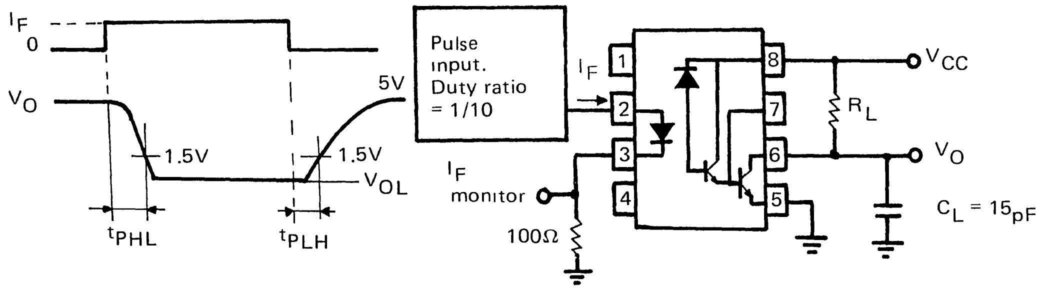
• Inspection Standard

Outgoing inspection standard for LITON products are shown below.

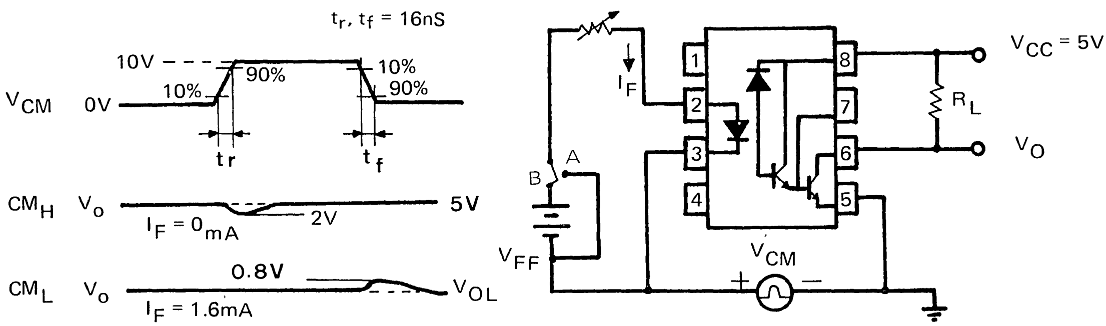
(1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL(%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

•1 Test circuit for propagation delay time



•2 Test circuit for CM_H and CM_L

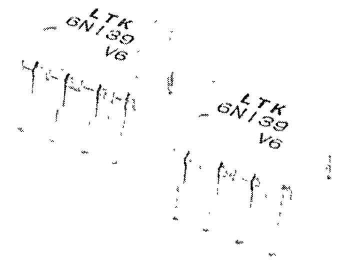


LITEON

High Sensitivity, High Speed OPIC Photocoupler LTK6N139

■ FEATURES

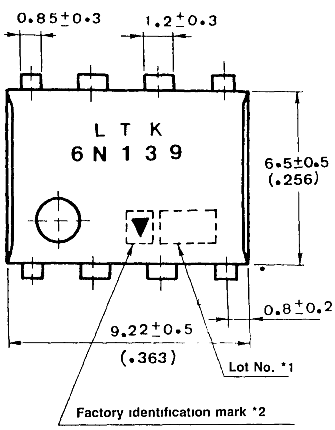
1. High current transfer ratio
   (CTR: MIN, 500% at I_F = 1.6 mA)
2. High speed response
   (t_{PHL}:TYP. 0.2μs at R_L = 270Ω)
3. Instantaneous common mode rejection voltage
   (CM_H: TYP. 500V/μs)
4. Directly interfaces to TTL
5. Overseas standard model
6. UL approved (No. E113898(s))



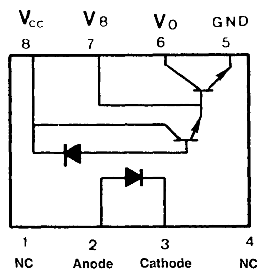
■ APPLICATIONS

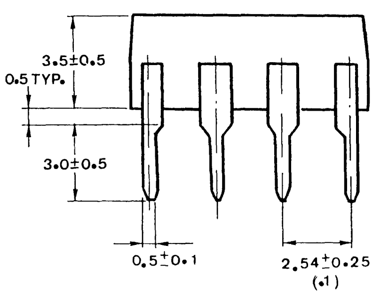
1. Interfaces for computer peripherals
2. Computers, measuring instruments, control equipment
3. Telephone sets
4. Signal transmission between circuits of different potentials and impedances

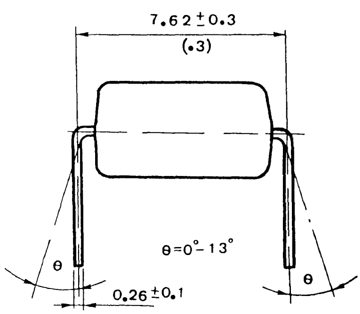
■ OUTLINE DIMENSIONS (UNIT: mm)



Pin No. and internal connection diagram







*1 2-digit number marked according to DIN standard.
*2 Factory identification mark shall be or shall not be marked

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta=25°C)

Parameter		Symbol	Rating	Unit
Emitting side	*1 Forward current	I_F	20	mA
	*2 Peak forward current	I_F	40	mA
	*3 Peak transient forward current	I_{FM}	1	A
	Reverse voltage	V_R	5	V
	*4 Input power dissipation	P	35	mW
Detecting side	*5 Average output current	I_O	60	mA
	Emitter-base reverse withstand voltage (5~7 pin)	V_{EBO}	0.5	V
	Supply voltage	V_{CC}	−0.5~+18	V
	Output voltage	V_O	−0.5~+18	V
	*6 Output power dissipation	P_O	100	mW
Operating temperature		T_{opr}	0~+70	°C
Storage temperature		T_{stg}	−55~+125	°C
* 7 Isolation voltage		V_{iso}	2500	Vrms
*8 Soldering temperature		T_{sol}	260	°C

*1 Decreases at the rate of 0.4mA/°C if the atmospheric temperature is higher than 50°C.
*2 Duty cycle=50%, pulse width=1ms.
*3 Pulse width≤1μs, 300pps
*4 Decreases at the rate of 0.7mW/°C if the atmospheric temperature is higher than 50°C
*5 Decreases at the rate of 0.7mA/°C if the atmospheric temperature is higher than 25°C
*6 Decreases at the rate of 2.0mW/°C if the atmospheric temperature is higher than 25°C
*7 AC for 1 minute, 40~60% R.H.
*8 For 10 seconds.

• Electro-optical characteristics

(Unless otherwise specified $Ta = 0 \sim 70°C$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
*1 Current transfer ratio	CTR (1)	$I_F = 0.5mA$ $V_O = 0.4V$, $V_{CC} = 4.5V$	400	1200	—	%
	CTR (2)	$I_F = 1.6mA$ $V_O = 0.4V$, $V_{CC} = 4.5V$	500	1500	—	%
Logic (0)·output voltage	V_{OL} (1)	$I_O = 6.4mA$ $I_F = 1.6mA$, $V_{CC} = 4.5V$	—	0.1	0.4	V
	V_{OL} (2)	$I_O = 15mA$ $I_F = 5mA$, $V_{CC} = 4.5V$	—	0.1	0.4	V
	V_{OL} (3)	$I_O = 24mA$ $I_F = 12mA$, $V_{CC} = 4.5V$	—	0.2	0.4	V
Logic (1) output current	I_{OH}	$I_F = 0mA$ $V_{CC} = V_O = 18V$	—	0.05	100	μA
Logic (0) supply current	I_{CCL}	$I_F = 1.6mA$ V_O = open, $V_{CC} = 5V$	—	0.2	—	mA
Logic (1) supply current	I_{CCH}	$I_F = 0mA$ V_O = open, $V_{CC} = 5V$	—	10	—	nA
Input forward voltage	V_F	$Ta = 25°C$, $I_F = 1.6mA$	—	1.5	1.7	V
Input forward voltage temperature coefficient	$\frac{\Delta VF}{\Delta Ta}$	$I_F = 1.6mA$	—	−1.9	—	mV/°C
Input reverse voltage	BVR	$Ta = 25°C$, $I_R = 10\mu A$	5.0	—	—	V
Input capacitance	C_{IN}	$V_F = 0$, $f = 1MHz$	—	60	—	pF
*2 Leak current (input-output)	$I_{I\text{-}O}$	$Ta = 25°C$, 45% R.H. $t = 5s$ $V_{I\text{-}O} = 3kV$, dc.	—	—	1.0	μA
*2 Isolation resistance (input-output)	$R_{I\text{-}O}$	$V_{I\text{-}O} = 500V$, dc.	—	10^{12}	—	Ω
*2 Capacitance (input-output)	$C_{I\text{-}O}$	$f = 1MHz$	—	0.6	—	pF

Note: Typical value: $Ta = 25°C$, $V_{CC} = 5V$

*1 Current transfer ratio is defined as the ratio of input current to output current expressed in %.
*2 Measured as a 2-pin element (Short 1, 2, 3, and 4, short 5, 6, 7 and 8).

• Switching characteristics

($Ta=25°C$, $V_{CC}=5V$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Propagation delay time Output (1)→(0)	t_{PHL}	$I_F=0.5mA$, $R_L=4.7k\Omega$	—	5	25	μs
		$I_F=12mA$, $R_L=270\Omega$	—	0.2	1	
Propagation delay time Output (0)→(1)	t_{PLH}	$I_F=0.5mA$, $R_L=4.7k\Omega$	—	5	60	μs
		$I_F=12mA$, $R_L=270\Omega$	—	1	7	
*1 Common mode transient immunity at logic (1) output	CM_H	$I_F=0mA$, $V_{CM}=10V_{p\text{-}p}$ $R_L=2\ 2k\Omega$	—	500	—	V/μs
*1 Common mode transient immunity at logic (0) output	CM_L	$I_F=1.6mA$, $V_{CM}=10V_{p\text{-}p}$ $R_L=2.2k\Omega$	—	-500	—	V/μs

*1 Common mode transient immunity in logic (1) is defined as a common mode voltage fluctuation that can hold the output at level (1) ($V_O>2.0V$)
common mode transient immunity in logic (0) is defined as a common mode voltage fluctuation that can hold the output at level (0) ($V_O<0.8V$)

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method.

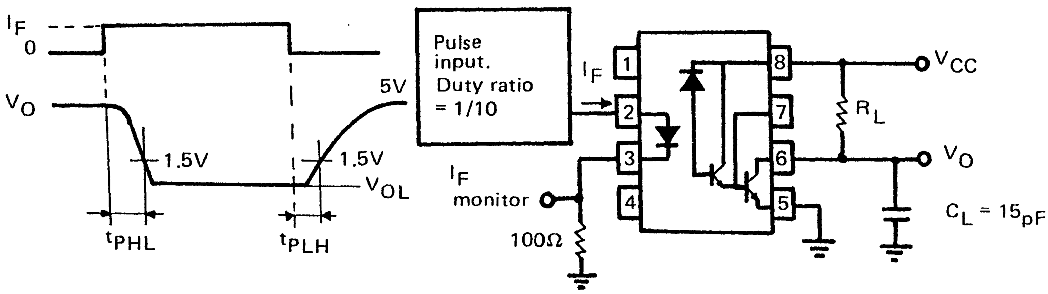
(1) Short between pin 1 and 4 on the primary side and between pin 5 and 8 on the secondary side.
(2) The isolation voltage tester with a zero -cross circuit shall be used.
(3) The waveform of applied voltage shall be a sine wave.

• Inspection standard

Outgoing inspection standard for LITON products are shown below.
(1) A single sampling plan, normal, inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL (%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

•1 Test circuit for propagation delay time



•2 Test circuit for CM_H and CM_L

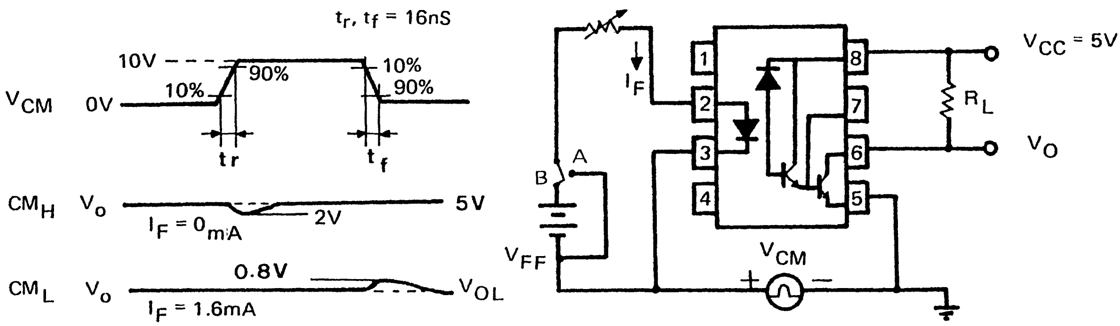


Fig. 1 Forward Current vs. Ambient Temperature

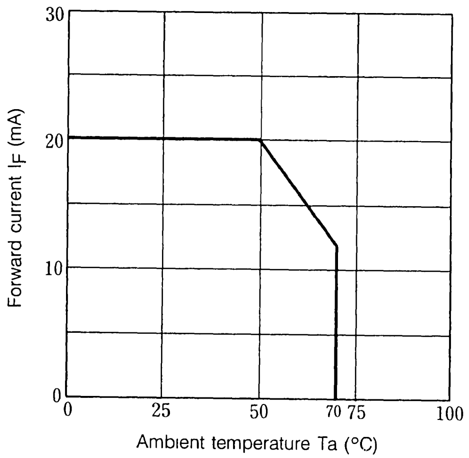


Fig. 2 Power Dissipation vs. Ambient Temperature

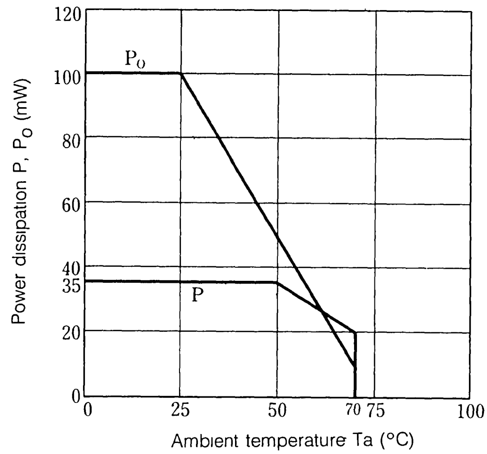


Fig. 3 Forward Current vs. Forward Voltage

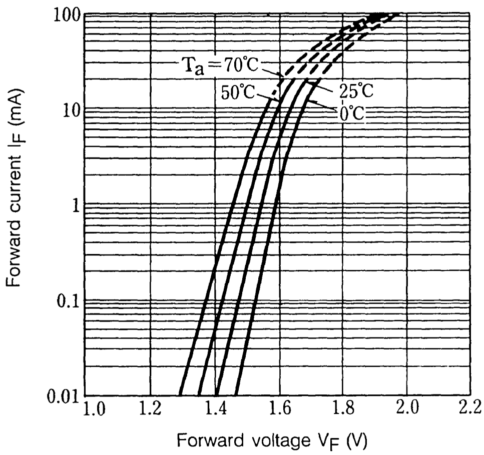


Fig. 4 Output Current vs. Output Voltage

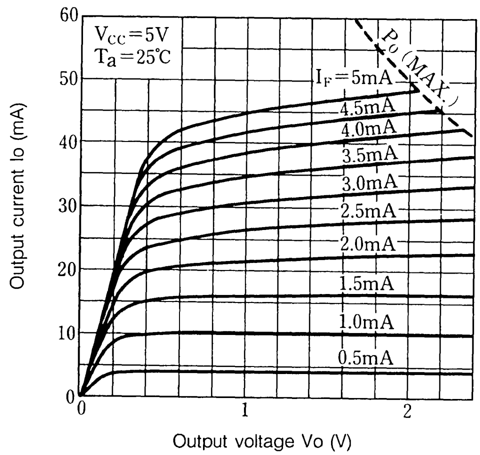


Fig. 5 Current Transfer Ratio vs. Forward Current

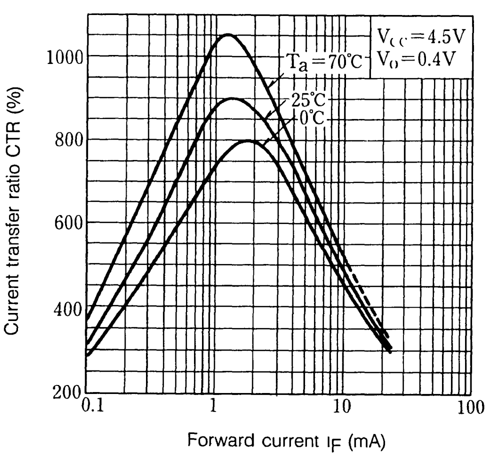


Fig. 6 Output Current vs. Forward current

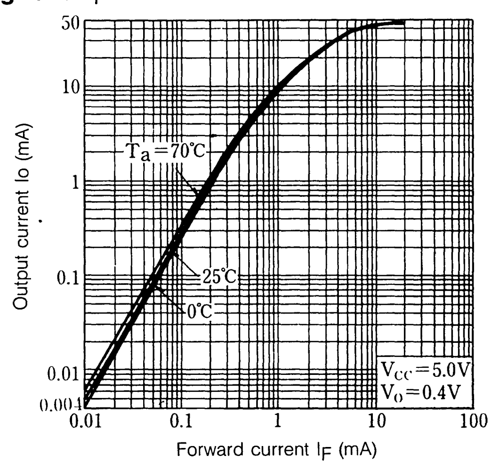


Fig. 7 Propagation Delay Time vs. Ambient Temperature (1)

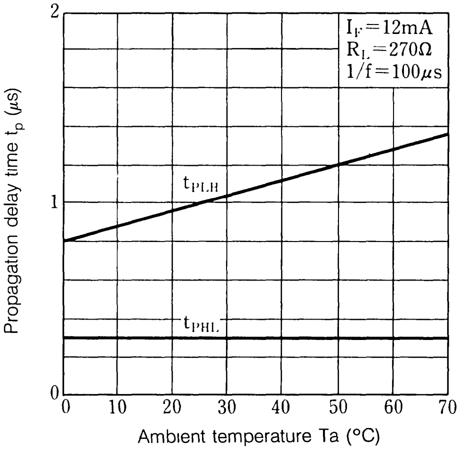


Fig. 8 Propagation Delay Time vs. Ambient Temperature (2)

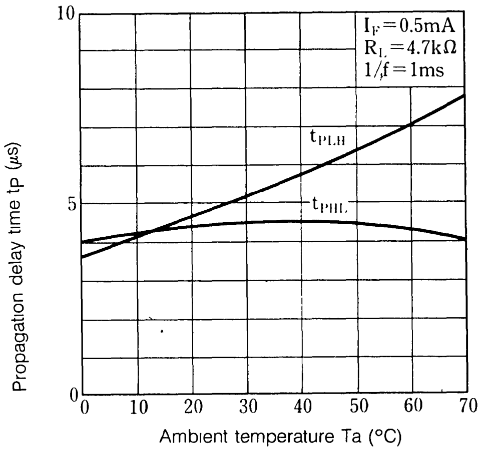


Fig. 9 Rise Time, Fall Time vs. Load Resistance

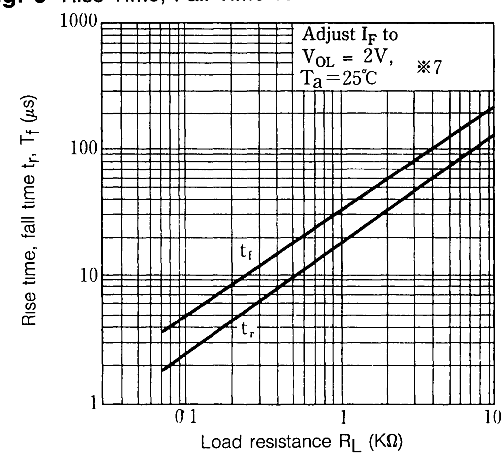
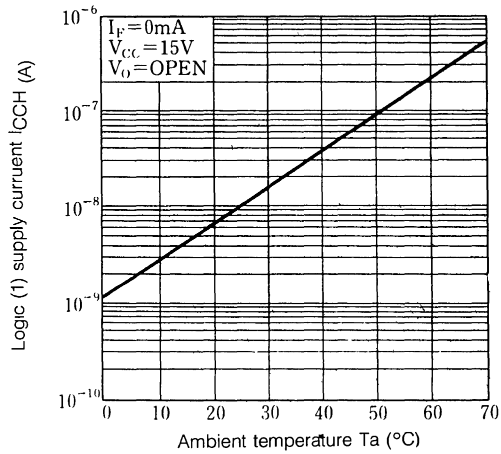
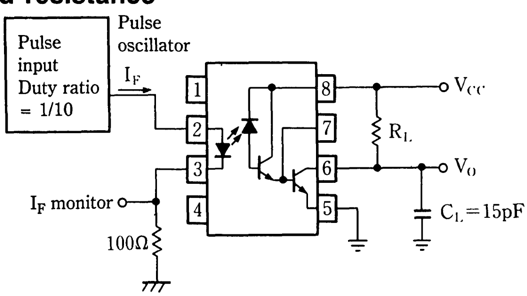
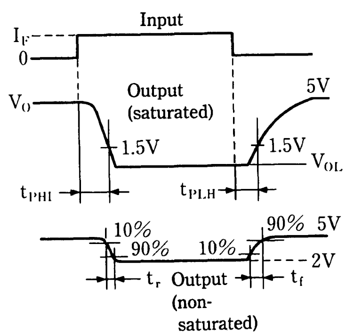


Fig. 10 Logic (1) Supply Current vs. Ambient Temperature



- **Test Circuit for Rise Time, Fall Time vs. Load resistance**





■ PRECAUTION FOR USE

The minute design makes the transistor on the bipolar structured detector vulnerable to static electricity.
To prevent damages and degradation in characteristics due to static electricity, take general measures against static electricity.

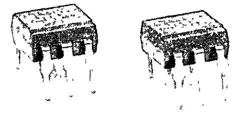
High Collector-emitter Voltage Type LTV702V

FEATURES

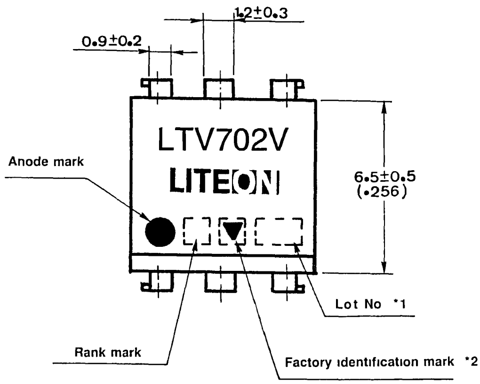
1. High collector-emitter voltage (V_{CEO}:70V)
2. High input-output isolation voltage (V_{iso}:5,000Vrms)
3. Directly connectable to TTL
4. UL approved (No. E113898(S))

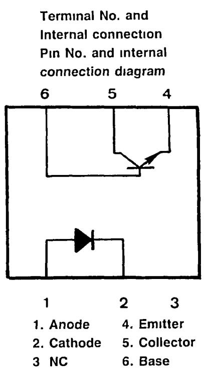
APPLICATIONS

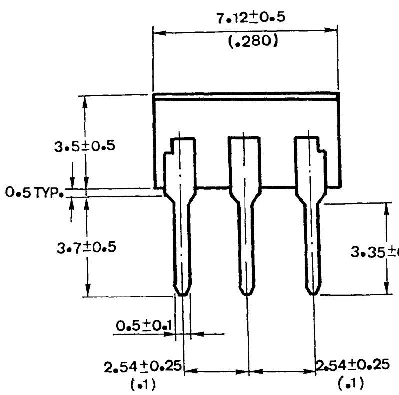
1. Telephone sets, telephone exchangers
2. System appliances, measuring instruments
3. Signal transmission between circuits of different potentials and impedances

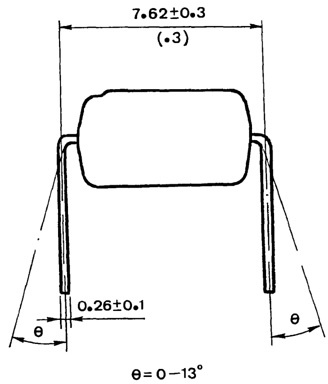


OUTLINE DIMENSIONS (UNIT: mm)









Note *1 2-digit number shall be marked according to DIN standard
*2 Two version available, one with factory identification mark and the other without

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	60	mA
	*1 Peak forward current	I_{FM}	1.5	A
	Reverse Voltage	V_R	6	V
	Power dissipation	P	105	mW
Output	Collector-emitter voltage	V_{CEO}	70	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	160	mW
	Collector-base voltage	V_{CBO}	70	V
	Emitter-base voltage	V_{EBO}	6	V
Total power dissipation		P_{tot}	200	mW
Operating temperature		T_{opr}	−55～+100	°C
Storage temperature		T_{stg}	−55～+150	°C
*2 Isolation voltage		V_{iso}	5	kVrms
*3 Soldering temperature		T_{sol}	260	°C

*1 Pulse width ≤ 10μs, Duty ratio: 0.0004
*2 AC for 1 minute, R.H.=40～60%
*3 For 10 seconds

• Electro-optical characteristics

($Ta=25°C$)

Parmeter		Symbol	Min.	Typ.	Max.	Unit	Conditions
input	Forward voltage	V_F	—	1.4	1.7	V	$I_F=60mA$
	Reverse current	I_R	—	—	10	μA	$V_R=6V$
	Terminal capacitance	C_t	—	30	250	pF	V=0, f=1kHz
Output	Collector dark current	I_{CEO}	—	—	50	nA	$V_{CE}=10V$, $I_F=0$
	Collector-emmitter breakdown voltage	BV_{CEO}	70	—	—	V	$I_C=0.1mA$, $I_F=0$
	Emitter collector breakdown voltage	BV_{ECO}	6	—	—	V	$I_E=10\mu A$, $I_F=0$
	Collector-base breakdown voltage	BV_{CBO}	70	—	—	V	$I_C=0.1mA$, $I_F=0$
Transfer characteristics	* Collector current	I_C	4	—	32	mA	$I_F=10mA$, $V_{CE}=5V$
	Collector-emitter saturation voltage	V_{CE} (sat)	—	0.25	0.4	V	$I_F=10mA$, $I_C=2.5mA$
	Isolation resistance	R_{ISO}	5×10^{10}	1×10^{11}	—	Ω	DC500V, 40～60%R.H
	Floating capacitance	C_f	—	0.6	1.0	pF	V=0, f=1MHz
	Cut-off frequency	f_C	—	150	—	KHz	$V_{CC}=5V$, $I_F=10mA$ $R_L=75\Omega$, −3dB
	Response time (Rise)	t_r	—	2	7	μs	$V_{CC}=5V$, $I_F=10mA$ $R_L=75\Omega$
	Response time (Fall)	t_f	—	2	8	μs	

$*CTR = \frac{IC}{IF} \times 100\%$

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method

(1) Anode and cathode on input side, collector and emitter on output side shall be shortened individually.
(2) Isolation voltage tester with a zero-cross circuit shall be used.
(3) Waveform of applied voltage shall be a sine wave.
(It is recommended that the isolation voltage shall be measured in insulation oil.)

• Collector current I_C is classified as follows.

Model No.	Rank mark	I_C (mA)
LTV 702V A	A	4.0 ~ 8.0
LTV 702V B	B	6.3 ~ 12.5
LTV 702V C	C	10 ~ 20
LTV 702V D	D	16 ~ 32
LTV 702V	A or B or C or D	4.0 ~ 32

Conditions	I_F = 10mA V_{CE} = 5V Ta = 25°C

• Inspection standard

Outgoing inspection standard for LITON products are shown below.
(1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL(%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

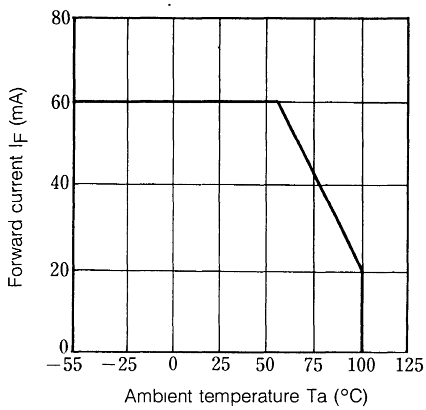


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

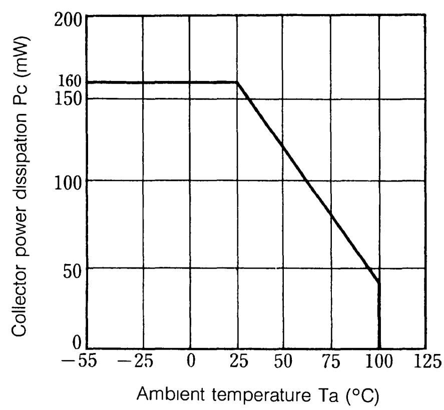


Fig. 3 Peak Forward Current vs. Duty Ratio

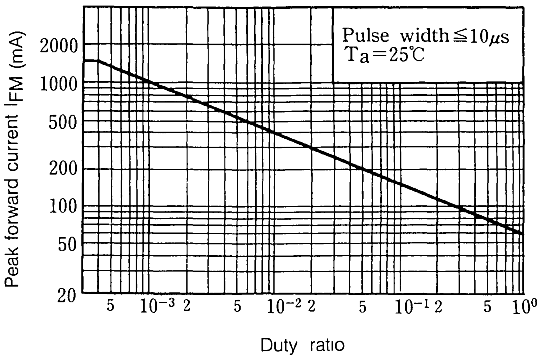


Fig. 4 Forward Current vs. Forward Voltage

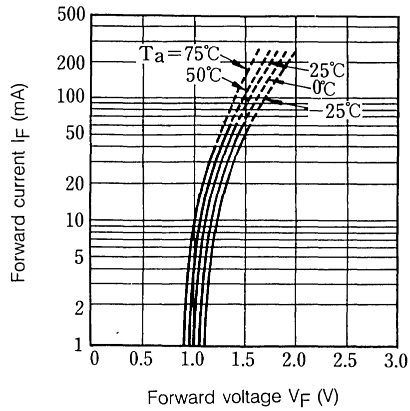


Fig. 5 Current Transfer Ratio vs. Forward Current

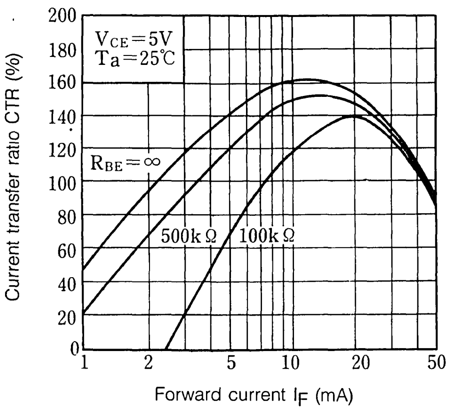


Fig. 6 Collector Current vs. Collector-emitter Voltage

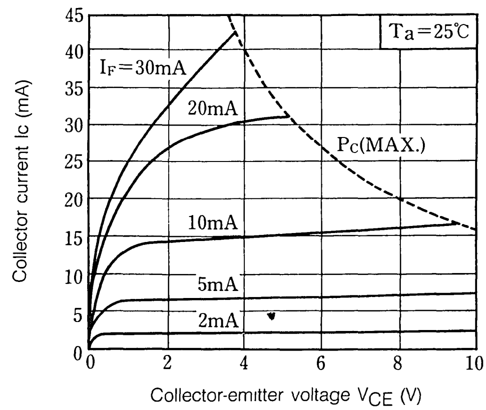


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

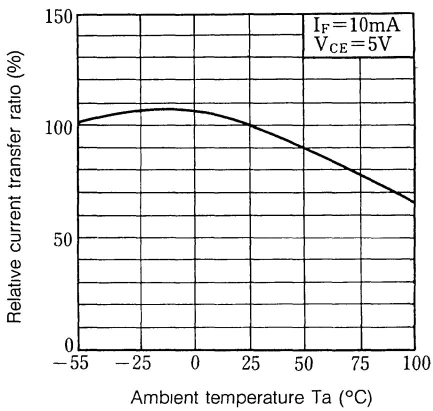


Fig. 8. Collector-emitter Saturation Voltage vs. Ambient Temperature

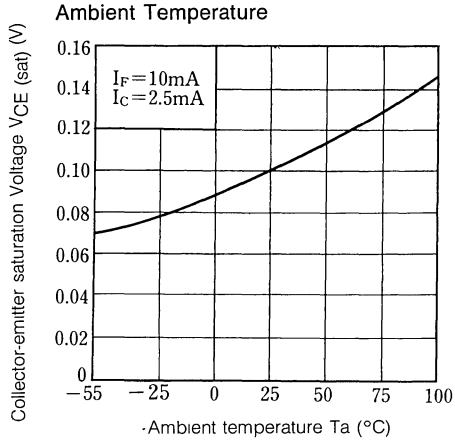


Fig. 9 Collector Dark Current vs. Ambient Temperature

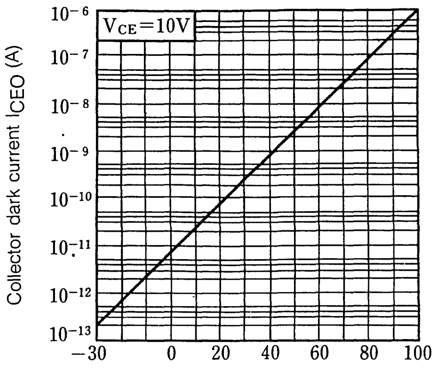


Fig. 10 Collector-emitter Saturation Voltage vs. Forward Current

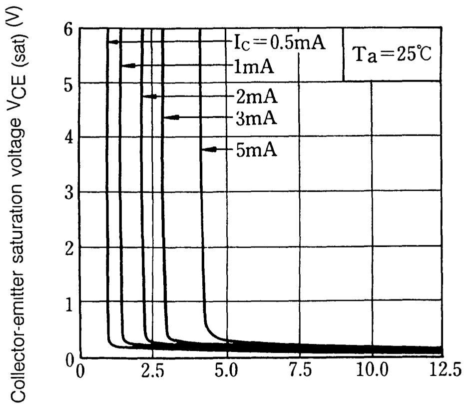


Fig. 11 Response Time vs. Load Resistance

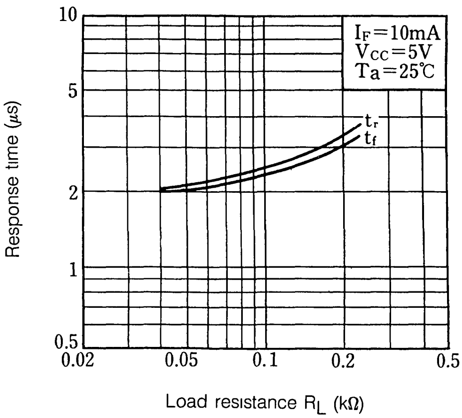
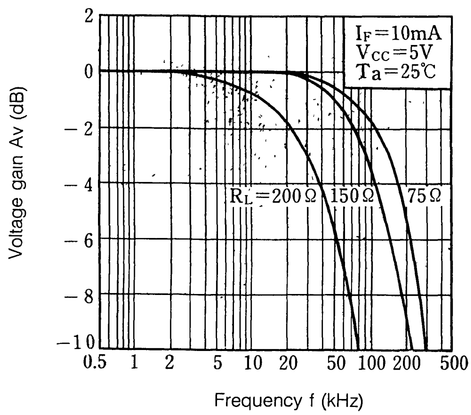
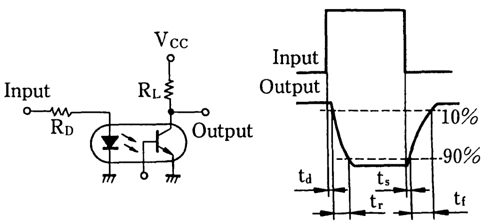


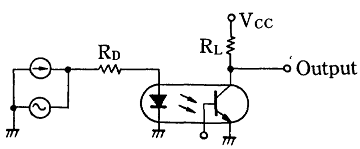
Fig. 12. Frequency Response



Test Circuit for Response Time



Test Circuit for Frequency Response



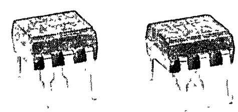
High Collector-emitter Voltage Type Photocoupler LTV703V

■ FEATURES

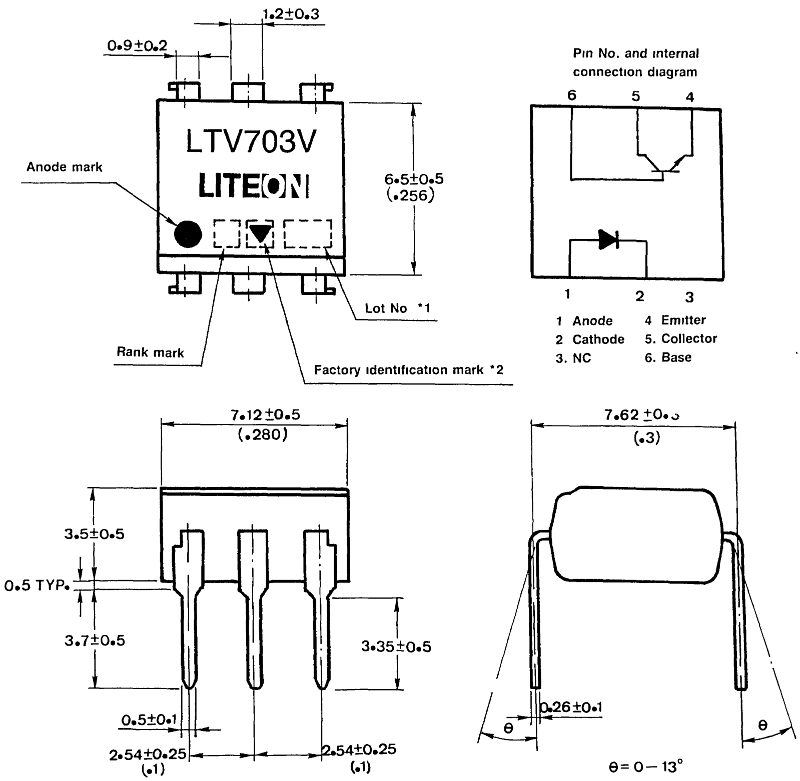
1. High collector-emitter voltage (V_{CEO}: 70V)
2. High input-output isolation voltage (V_{ISO}: 5,000 Vrms)
3. Directly connectable to TTL
4. UL approved (No. E113898 (s))

■ APPLICATIONS

1. Telephone sets, telephone exchanges
2. System appliances, measuring instruments
3. Signal transmission between circuits of different potentials and impedances



■ OUTLINE DIMENSIONS (UNIT: mm)



*1 2-digit number marked according to DIN standard
*2 Factory identification mark shall be or shall not be marked

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	*1 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	70	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	160	mW
	Collector-base voltage	V_{CBO}	70	V
	Emitter-base voltage	V_{EBO}	6	V
Total power dissipation		P_{tot}	200	mW
Operating temperature		T_{opr}	−30 ~ +100	°C
Storage temperature		T_{stg}	−55 ~ +125	°C
*2 Isolation voltage		V_{iso}	5	kVrms
*3 Soldering temperature		T_{sol}	260	°C

*1 Pulse width ≤ 100μs, Duty ratio: 0.001
*2 AC for 1 minute, 40 ~ 60% R.H.
*3 For 10 seconds

• Electro-optical characteristics

(Ta = 25°C)

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input	Forward voltage	V_F	—	1.2	1.4	V	$I_F = 20mA$
	Peak forward voltage	V_{FM}	—	—	3.0	V	$I_{FM} = 0.5A$
	Reverse current	I_R	—	—	10	μA	$V_R = 4V$
	Terminal capacitance	C_t	—	30	250	pF	V = 0, f = 1kHz
Output	Collector dark current	I_{CEO}	—	—	100	nA	$V_{CE} = 20V$, $I_F = 0$
	Collector-emitter breakdown voltage	BV_{CEO}	70	—	—	V	$I_C = 0.1mA$, $I_F = 0$
	Emitter-collector breakdown voltage	BV_{ECO}	6	—	—	V	$I_E = 10\mu A$, $I_F = 0$
	Collector-base breakdown voltage	BV_{CBO}	70	—	—	V	$I_C = 0.1mA$, $I_F = 0$
Transfer characteristics	* Collector current	I_C	4	—	32	mA	$I_F = 10mA$, $V_{CE} = 5V$
	Collector-emitter saturation voltage	V_{CE} (sat)	—	0.1	0.2	V	$I_F = 20mA$, $V_C = 1mA$
	Isolation resistance	R_{ISO}	5×10^{10}	10^{11}	—	Ω	DC500V, 40 ~ 60% RH
	Floating capacitance	C_f	—	0.6	1.0	pF	V = 0, f = 1 MHz
	Cut-off frequency	f_c	—	80	—	kHz	$V_{CE} = 5V$, $I_C = 2mA$, −3dB $R_L = 100\Omega$
	Response time (Rise)	t_r	—	4	15	μs	$V_{CE} = 2V$, $I_C = 2mA$, $R_L = 100\Omega$
	Response time (Fall)	t_f	—	3	15	μs	

$$^{*}CTR = \frac{IC}{IF} \times 100\%$$

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method.

(1) Short between anode and cathode on the primary side and between collector and emitter on the secondary side.
(2) The isolation voltage tester with a zero-cross circuit shall be used.
(3) The waveform of applied voltage shall be a sine wave.
(It is recommended that the isolation voltage shall be measured in insulation oil.)

• Rank table of collector current I_C

Model No.	Rank mark	I_C (mA)
LTV703VA	A	4.0～8.0
LTV703VB	B	6.3～12.5
LTV703VC	C	10～20
LTV703VD	D	16～32
LTV703V	A or B or C or D	4.0～32

Conditions	I_F=10mA V_{CE}=5V Ta=25°C

• Inspection standard

Outgoing inspection standard for LITON products are shown below.

(1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL According to the inspection items are shown below.

Defect	Inspection item	AQL (%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

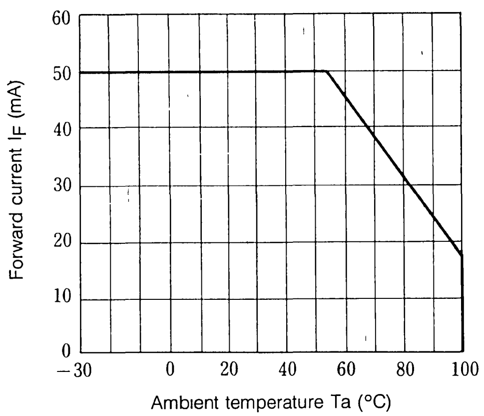


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

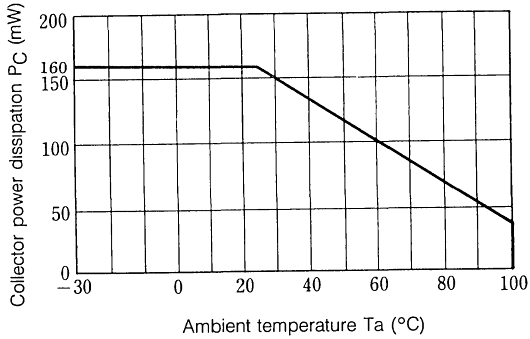


Fig. 3 Peak Forward Current vs. Duty Ratio

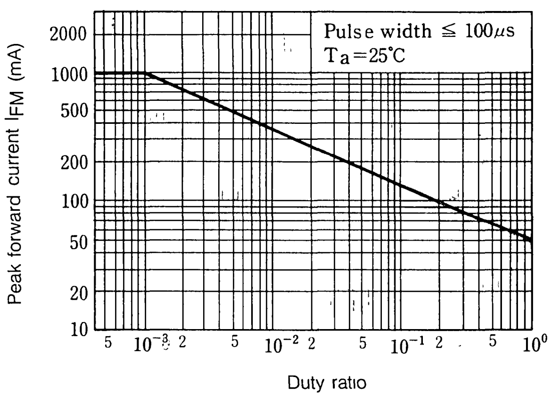


Fig. 4 Forward Current vs. Forward Voltage

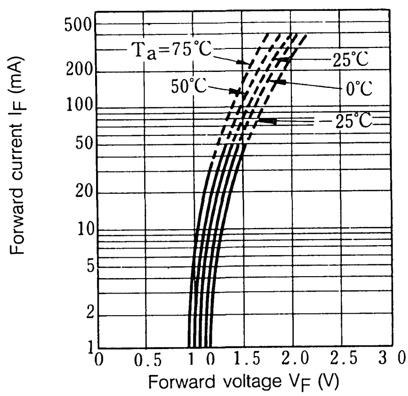


Fig. 5 Current Transfer Ratio vs. Forward Current

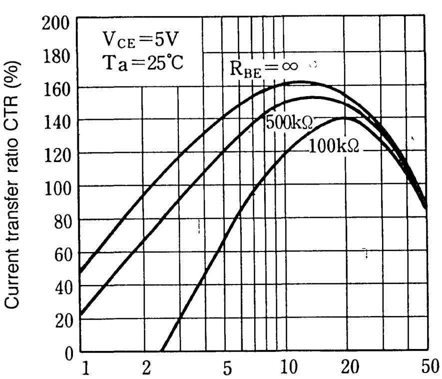


Fig. 6 Collector Current vs. Collector-emitter Voltage

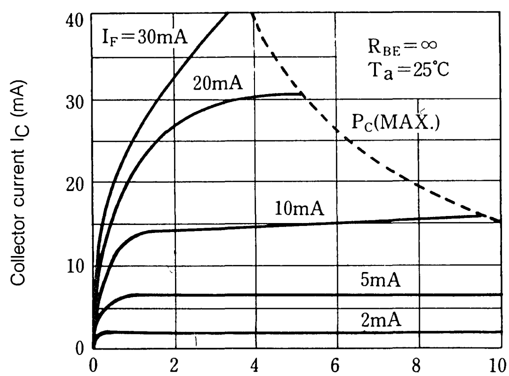


Fig. 7 Relative Current Transfer Ratio vs Ambient Temperature

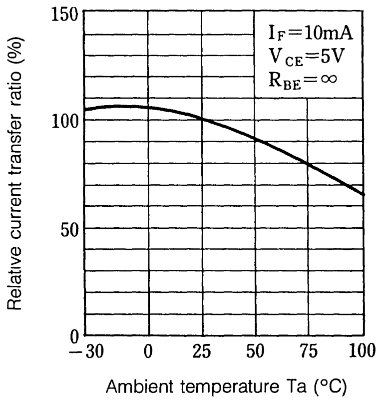


Fig. 8 Collector-emmitter Saturation Voltage vs. Ambient Temperature

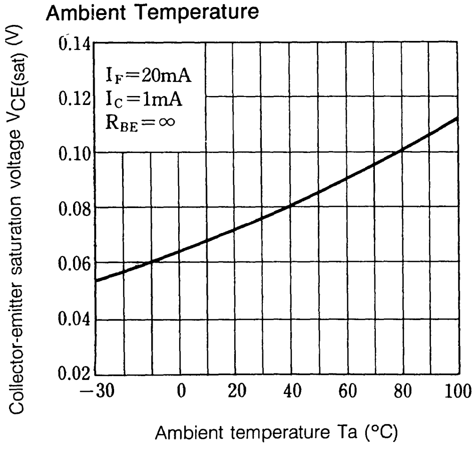


Fig. 9 Collector Dark Current vs. Ambient Temperature

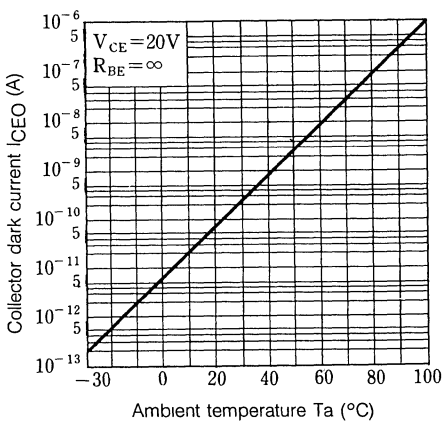


Fig. 10 Response Time vs. Load Resistance

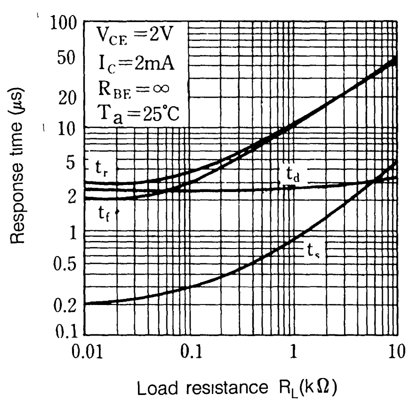


Fig. 11 Frequency Response

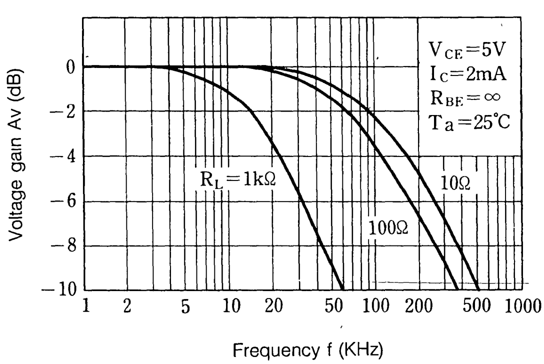
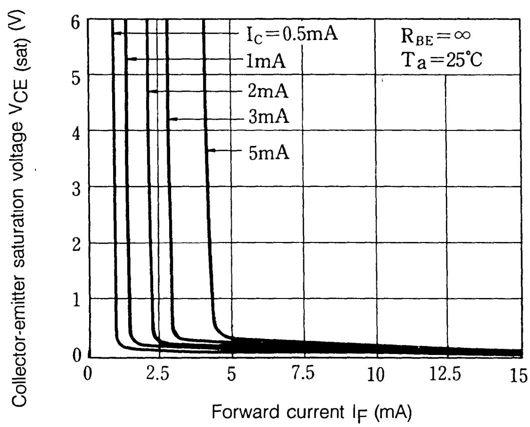
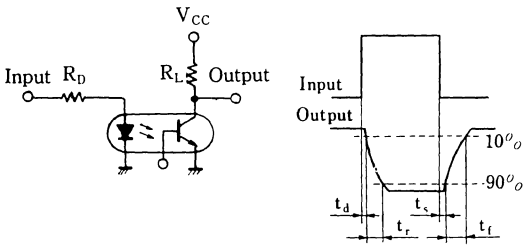


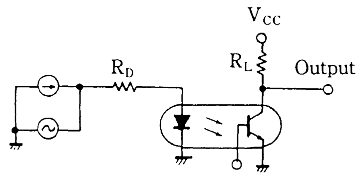
Fig. 12 Collector-emitter Saturation Voltage vs. Forward Current



Test Circuit for Response Time



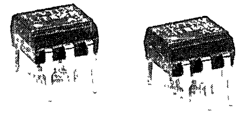
Test Circuit for Frequency Response



High Isolation Voltage Type, General Purpose Photocoupler LTV713V

■ FEATURES

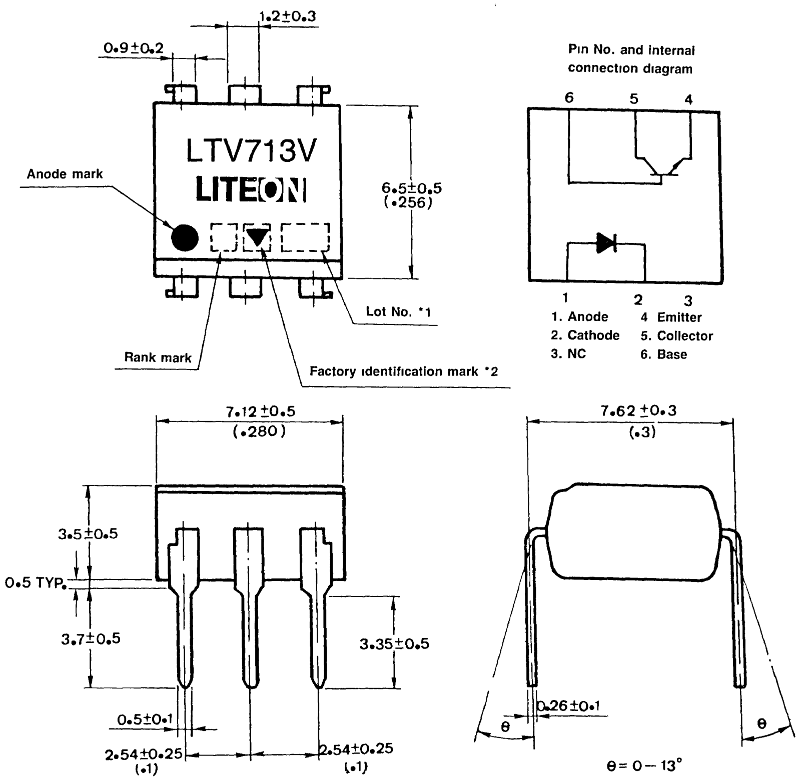
1. Directly connectable to TTL
2. Current transfer ratio
   CTR: MIN. 50% at I_F = 5mA, V_{CE} = 5V
3. Low collector dark current
   (I_{CEO}: MAX. 10^{-7}A at V_{CE} = 20V)
4. High input-output isolation voltage
   (V_{ISO}: 5,000Vrms)
5. UL approved (No. E113898 (s))



■ APPLICATIONS

1. System appliances, measuring instruments
2. Registers, copiers, automatic vending machines
3. Electric home appliances such as fan heaters
4. Medial instruments, physical and chemical equipment
5. Signal transmission between circuits of different potentials and impedances

■ OUTLINE DIMENSIONS (UNIT: mm)



*1 2-digit number marked according to DIN standard
*2 Factory identification mark shall be or shall not be marked.

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	*1 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	150	mW
	Collector-base voltage	V_{CBO}	35	V
	Emitter-base voltage	V_{EBO}	6	V
Total power dissipation		P_{tot}	170	mW
Operating temperature		T_{opr}	−25 ~ +100	°C
Storage temperature		T_{stg}	−40 ~ +125	°C
*2 Isolation voltage		V_{iso}	5	kVrms
*3 Soldering temperature		T_{sol}	260	°C

*1 Pulse width ≤ 100μs, Duty ratio: 0.001
*2 AC for 1 minute, 40 ~ 60%
*3 For 10 seconds R.H.

• Electro-optical characteristics

(Ta=25°C)

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input	Forward voltage	V_F	—	1.2	1.4	V	I_F=20mA
	Peak forward voltage	V_{FM}	—	—	3.0	V	I_{FM}=0.5A
	Reverse current	I_R	—	—	10	μA	V_R=4V
	Terminal capacitance	C_t	—	30	250	pF	V=0, f=1kHz
Output	Collector dark current	I_{CEO}	—	—	100	nA	V_{CE}=20V, I_F=0
	Collector-emitter breakdown voltage	BV_{CEO}	35	—	—	V	I_C=0.1mA, I_F=0
	Emitter-collector breakdown voltage	BV_{ECO}	6	—	—	V	I_E=10μA, I_F=0
	Collector-base breakdown voltage	BV_{CBO}	35	—	—	V	I_C=0.1mA, I_F=0
	Current transfer ratio	CTR	50	100	600	%	I_F=5mA, V_{CE}=5V, $R_{BE}=\infty$
Transfer characteristics	* Collector current	I_C	2.5	—	30	mA	I_F=5mA,V_{CE}=5V
	Collector-emitter saturation voltage	V_{CE} (sat)	—	0.1	0.2	V	I_F=20mA, I_C=1mA
	Isolation resistance	R_{ISO}	5×10^{10}	10^{11}	—	Ω	DC500V, 40~60%R.H.
	Floating capacitance	C_f	—	0.6	1.0	pF	V=0, f=1 MHz
	Cut-off frequency	f_C	—	80	—	kHz	V_{CE}=5V, I_C=2mA, −3dB R_L=100Ω $R_{BE}=\infty$
	Response time (Rise)	t_r	—	4	18	μs	V_{CE}=2V, I_C=2mA, R_L=100Ω $R_{BE}=\infty$
	Response time (Fall)	t_f	—	3	18	μs	

*CTR $=\frac{IC}{IF}\times 100\%$

■ SUPPLEMENT

• Isolation voltage shall be measured in the following method

(1) Short between anode and cathode on the primary side and between collector and emitter on the secondary side.
(2) The isolation voltage tester with a zero-cross circuit shall be used.
(3) The waveform of applied voltage shall be sine wave.
(It is recommended that the isolation voltage shall be measured in insulation oil.)

• Rank Table of Collector current I_C

Model No.	Rank mark	I_C (mA)
LTV713VA	A	4.0～8.0
LTV713VB	B	6.5～13
LTV713VC	C	10～20
LTV713V	A or B or C or No mark	2.5～30

Conditions	I_F＝5mA V_{CE}＝5V Ta＝25°C

• Inspection standard

Outgoing inspection standard for LITON products are shown below.
(1) A single sampling plan, normal insection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL (%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

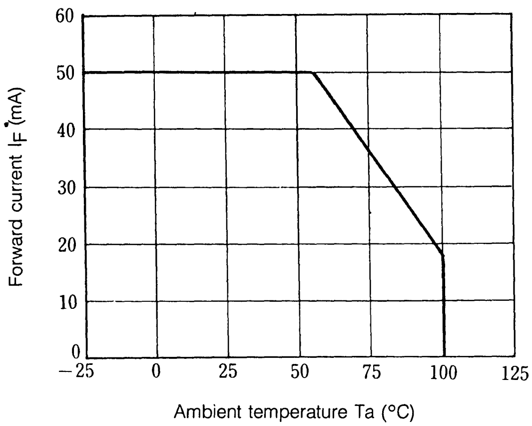


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

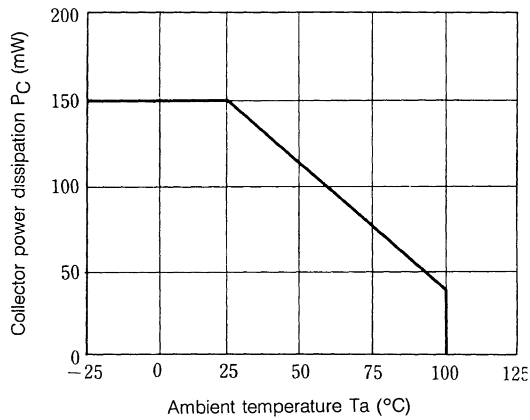


Fig. 3 Peak Forward Current vs. Duty Ratio

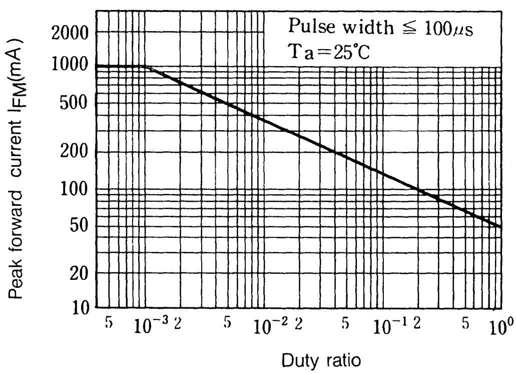


Fig. 4 Forward Current vs. Forward Voltage

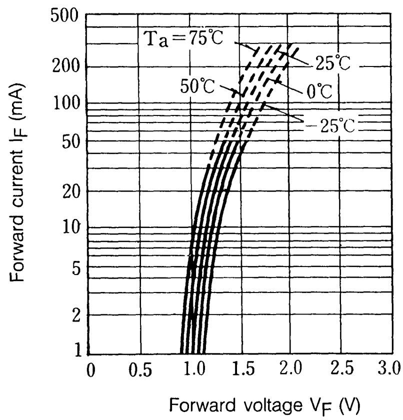


Fig. 5 Current Transfer Ratio vs. Forward Current

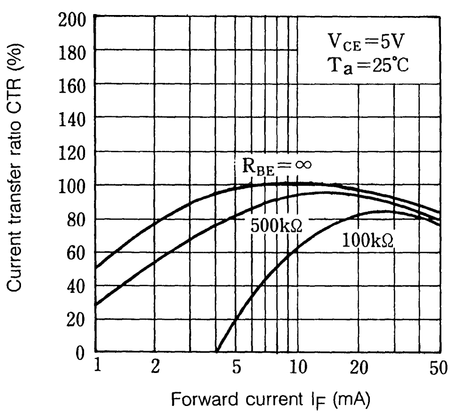


Fig. 6 Collector Current vs. Collector-emitter Voltage

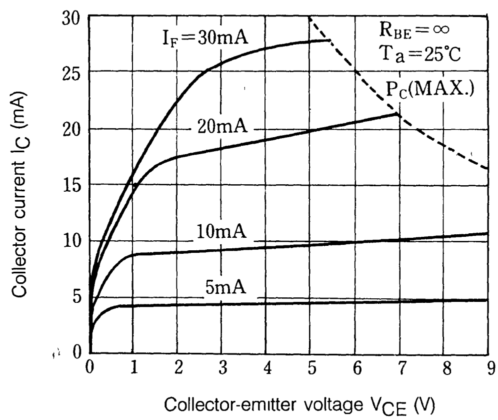


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

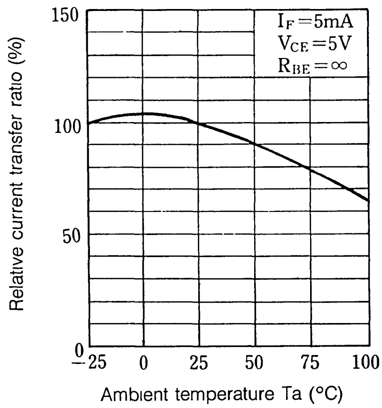


Fig. 8 Collector-emmitter Saturation Voltage vs. Ambient Temperature

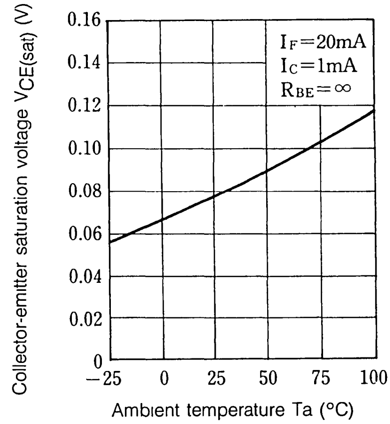


Fig. 9 Collector Dark Current vs. Ambient Temperature

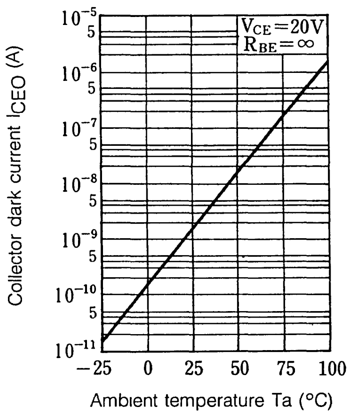


Fig. 10 Collector-base Dark Current vs. Ambient Temperature

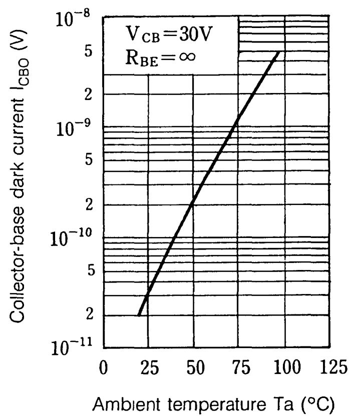


Fig. 11 Response Time vs. Load Resistance

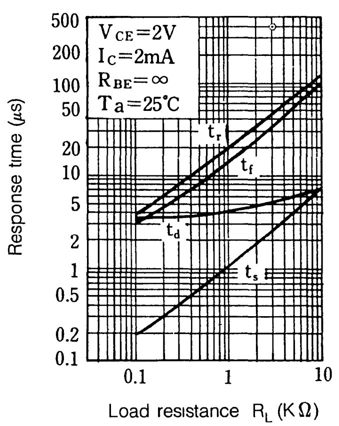
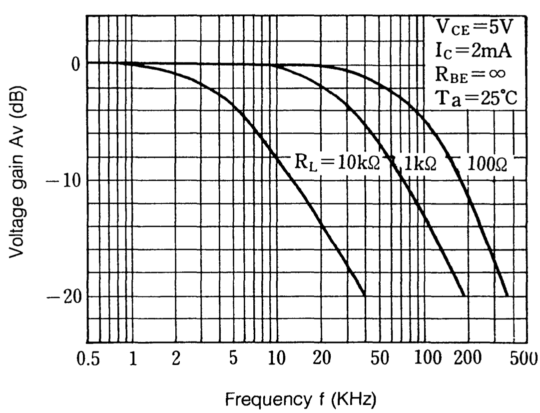
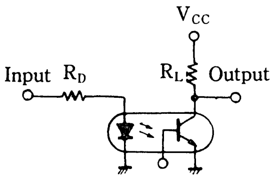
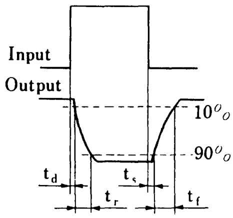


Fig. 12 Frequency Response

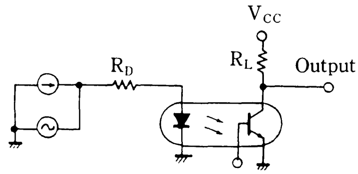


Test Circuit for Response Time





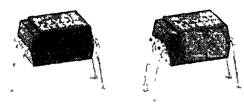
Test Circuit for Frequency Response



AC Input Type Photocoupler
LTV814

■ FEATURES

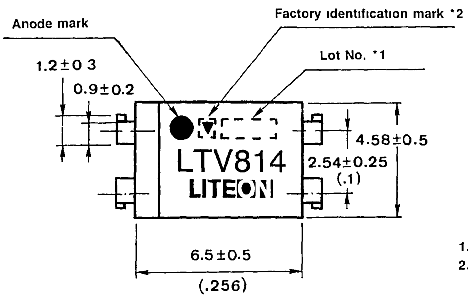
1. AC input response
2. High input-output isolation voltage (V_{ISO}: 5,000 Vrms)
3. Low collector dark current (I_{CEO}: MAX. 10^{-7}A at V_{CE} = 20V)
4. Current transfer ratio CTR: MIN. 20% at I_F = ±1mA, V_{CE} = 5V
5. Compact dual-in-line package
6. UL approved (NO. E113898(s))



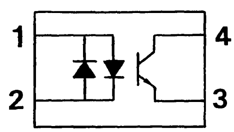
■ APPLICATIONS

1. Telephone sets, telephone exchanges
2. Sequence controllers
3. System appliances, measuring instruments
4. Signal transmission between circuits of different potentials and impedances

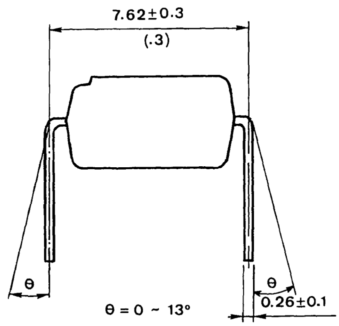
■ OUTLINE DIMENSIONS (UNIT: mm)

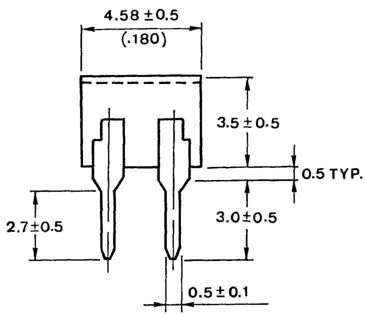


Pin No. and internal connection diagram



1. Anode, cathode
2. Anode, cathode,
3 Emitter
4. collector





*1 2-digit number marked according to DIN standard
*2 Two versions available, one with factory identification mark and the other without

ND CHARACTERISTICS

.aximum ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	±50	mA
	*1 Peak forward current	I_{FM}	±1	A
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	150	mW
Total power dissipation		P_{tot}	200	mW
Operating temperature		T_{opr}	−30 ~ +100	°C
Storage temperature		T_{stg}	−55 ~ +125	°C
*2 Isolation voltage		V_{iso}	5	kVrms
*3 Soldering temperature		T_{sol}	260	°C

*1 Pulse width ≤ 100μs, Duty ratio: 0.001
*2 AC for 1 minute, 40~60% R.H.
*3 For 10 seconds

• Electro-optical characteristics

(Ta=25°C)

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input	Forward voltage	V_F	—	1.2	1.4	V	$I_F=\pm20mA$
	Peak forward voltage	V_{FM}	—	—	3.0	V	$I_{FM}=\pm0.5A$
	Terminal capacitance	C_t	—	50	250	pF	V=0, f=1kHz
Output	Collector dark current	I_{CEO}	—	—	100	nA	$V_{CE}=20V$, $I_F=0$
	Collector-emitter breakdown voltage	BV_{CEO}	35	—	—	V	$I_C=0.1mA$, $I_F=0$
	Emitter-collector breakdown voltage	BV_{ECO}	6	—	—	V	$I_E=10\mu A$, $I_F=0$
Transfer characteristics	* Collector current	I_C	0.2	—	3	mA	$I_F=\pm1mA$, $V_{CE}=5V$
	Collector-emitter saturation voltage	V_{CE} (sat)	—	0.1	0.2	V	$I_F=\pm20mA$, $I_C=1mA$
	Isolation resistance	R_{ISO}	5×10^{10}	10^{11}	—	Ω	DC500V, 40~60%R.H.
	Floating capacitance	C_f	—	0.6	1.0	pF	V=0, f=1MHz
	Cut-off frequency	f_c	15	80	—	kHz	$V_{CE}=5V$, $I_C=2mA$ $R_L=100\Omega$, −3dB
	Response time (Rise)	t_r	—	4	18	μs	$V_{CE}=2V$, $I_C=2mA$ $R_L=100\Omega$
	Response time (Fall)	t_f	—	3	18	μs	

$$*CTR=\frac{IC}{IF}\times 100\%$$

■ SUPPLEMENT

- **Isolation voltage shall be measured in the following method**

  (1) Anode and cathode on input side, collector and emitter on output side shall be shortened individually.
  (2) The isolation voltage tester with a zero-cross circuit shall be used.
  (3) The waveform of applied voltage shall be a sine wave.
  (It is recommended that the isolation voltage shall be measured in insulation oil.)

- **Outgoing inspection standard for LITON products are shown below.**

  (1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL(%)	Judgement criterion
Major defect	• Electrical characteristics • Unreadable marking • Open, short	0.25	Depend on the specification
Minor defect	• Appearance • Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

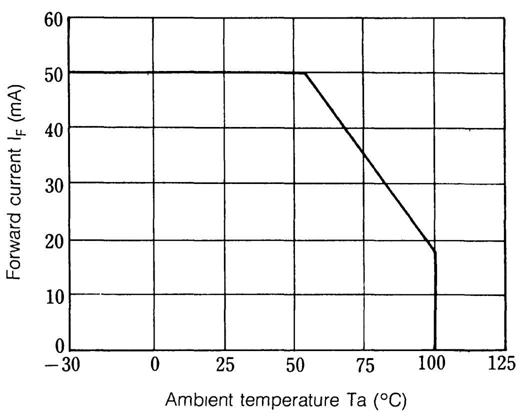


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

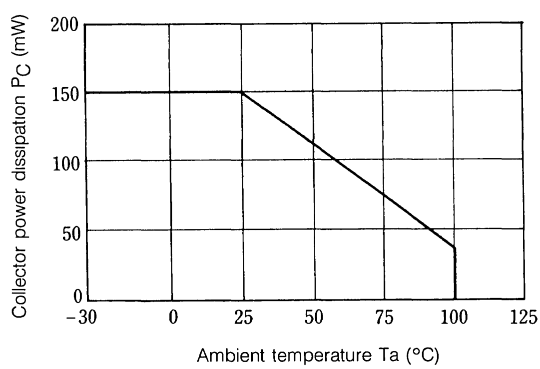


Fig. 3 Peak Forward Current vs. Duty Ratio

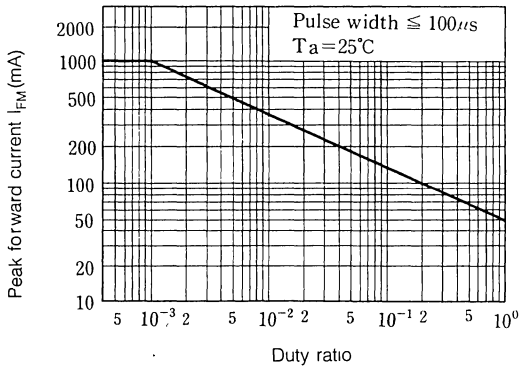


Fig. 4 Forward Current vs. Forward Voltage

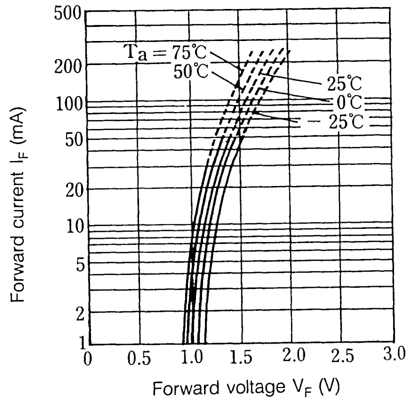


Fig. 5 Current Transfer Ratio vs. Forward Current

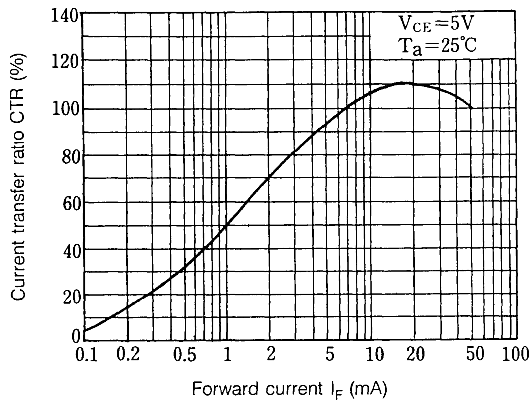


Fig. 6 Collector Current vs. Collector-emitter Voltage

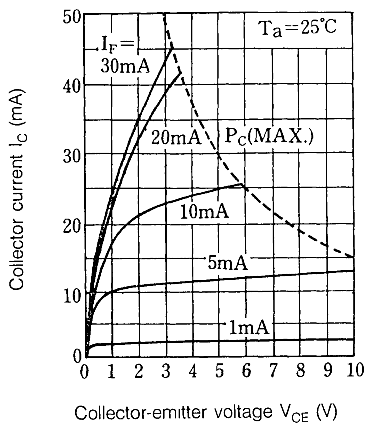


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

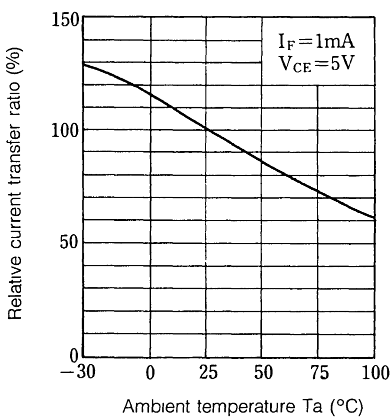


Fig. 8 Collector-emmitter Saturation Voltage vs. Ambient Temperature

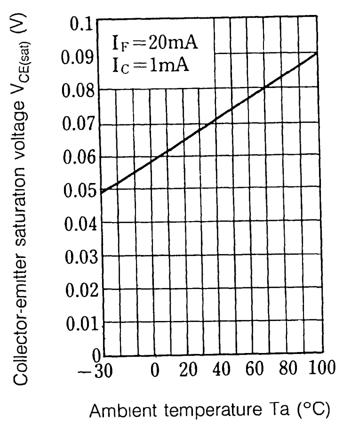


Fig. 9 Collector Dark Current vs. Ambient Temperature

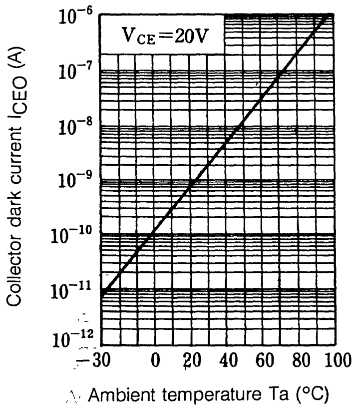


Fig. 10 Response Time vs. Load Resistance

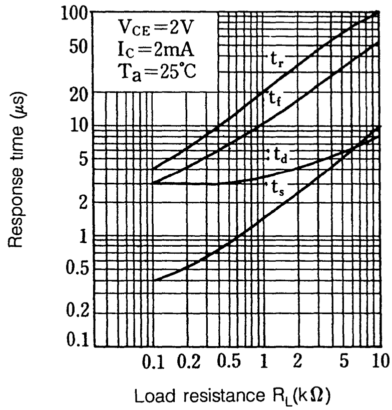


Fig. 11 Frequency Response

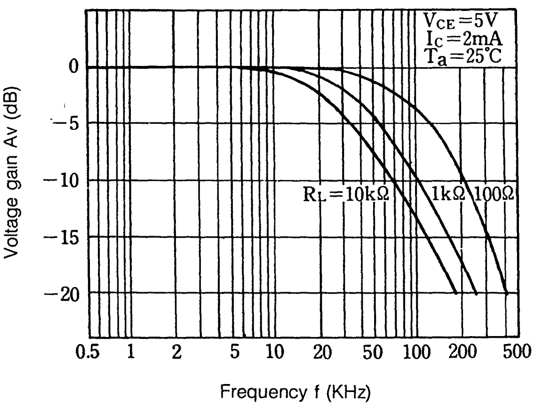
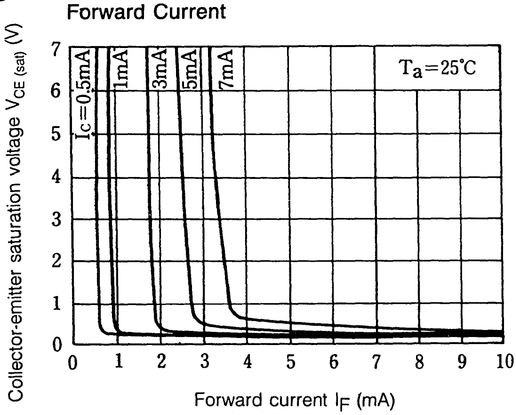
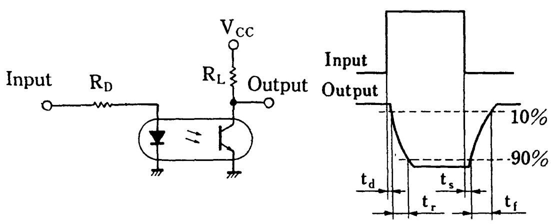


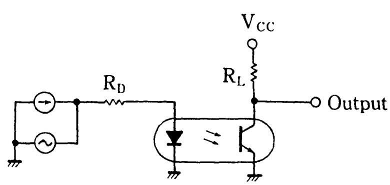
Fig. 12 Collector-emitter Saturation Voltage vs. Forward Current



Test Circuit for Response Time



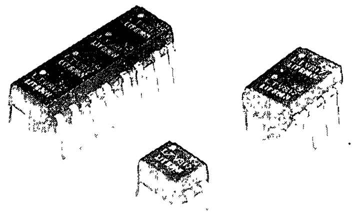
Test Circuit for Frequency Response



High Density Mounting Type Photocoupler LTV817/LTV827/LTV847

FEATURES

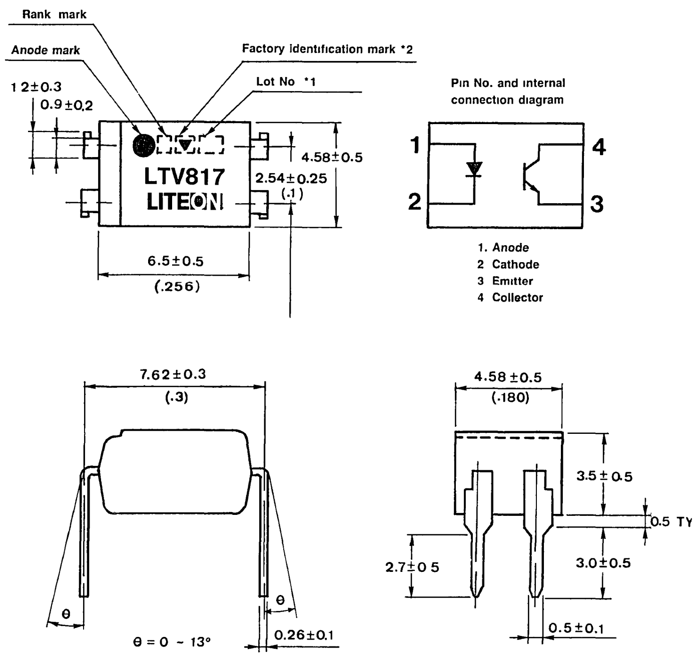
1. Current transfer ratio
   CTR: MIN. 50% at $I_F = 5mA$, $V_{CE} = 5V$
2. High input-output isolation voltage
   (V_{ISO}: 5,000 Vrms)
3. Compact dual-in-line package
   LTV817: 1-channel type, LTV827: 2-channel type
   LTV847: 4-channel type
4. UL. approved (No. E 113898(s))



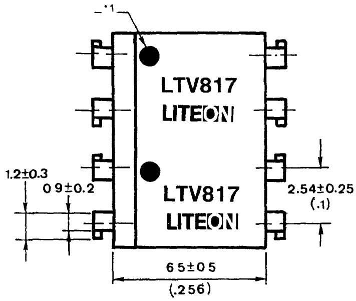
APPLICATIONS

1. Computer terminals
2. System appliances, measuring instruments
3. Registers, copiers, automatic vending machines
4. Electric home appliances such as fan heaters, etc.
5. Medical instruments, physical and chemical equipments.
6. Signal transmission between circuits of different potentials and impedances

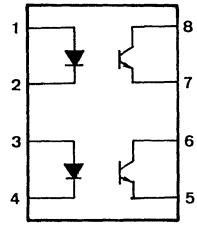
OUTLINE DIMENSIONS (UNIT: mm)



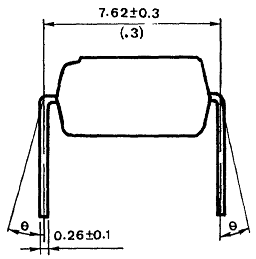
*1 2-digit number marked according to DIN standard
*2 Two versions available, one with factory identification mark and the other without

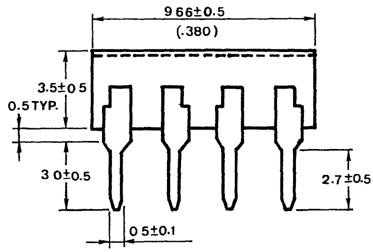


Pin No and internal connection diagram



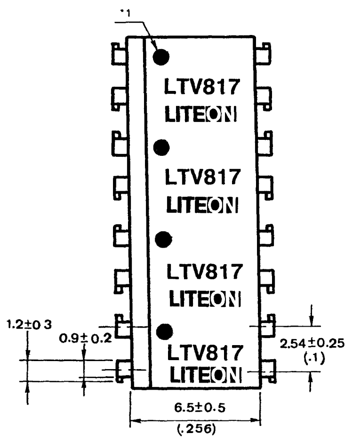
1 3 Anode   5 7 Emitter
2 4 Cathode   6 8 Collector



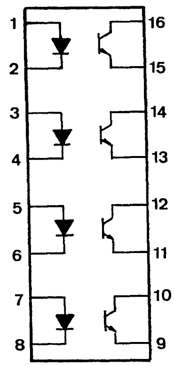


θ = 0 – 13°

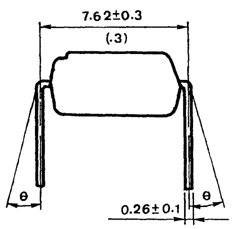
Note *1 Anode mark

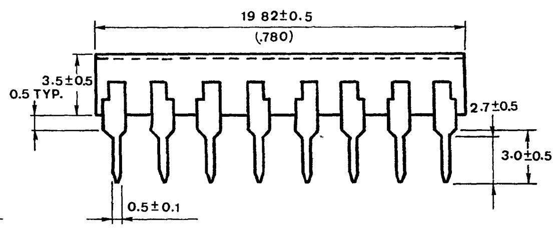


Pin No and internal connection diagram



1 3 5 7 Anode
2 4 6 8 Cathode
9 11 13 15 Emitter
10 12 14 16 Collector





θ = 0 – 13°

Note *1 Anode mark

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	*1 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	150	mW
Total power dissipation		P_{tot}	200	mW
Operating temperature		T_{opr}	−30 ~ +100	°C
Storage temperature		T_{stg}	−55 ~ +125	°C
* 2 Isolation voltage		V_{iso}	5	kVrms
*3 Soldering temperature		T_{sol}	260	°C

*1 Pulse width ≤ 100μs, Duty ratio: 0.001
*2 AC for 1 minute, 40 ~ 60% R.H.
*3 For 10 seconds

● Electro-optical characteristics

(Ta=25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Input	Forward voltage	V_F	—	1.2	1.4	V	$I_F=20mA$
	Peak forward voltage	V_{FM}	—	—	3.0	V	$I_{FM}=0.5A$
	Reverse current	I_R	—	—	10	μA	$V_R=4V$
	Terminal capacitance	C_t	—	30	250	pF	V=0, f=1kHz
Output	Collector dark current	I_{CEO}	—	—	100	nA	$V_{CE}=20V$, $I_F=0$, $R_{BE}=\infty$
	Collector-emitter breakdown voltage	BV_{CEO}	35	—	—	V	$I_C=0.1mA$, $I_F=0$
	Emitter-collector breakdown voltage	BV_{ECO}	6	—	—	V	$I_E=10\mu A$, $I_F=0$
Transfer characteristics	* Collector current	I_C	2.5	—	30	mA	$I_F=5mA$, $V_{CE}=5V$
	Collector-emitter saturation voltage	V_{CE} (sat)	—	0.1	0.2	V	$I_F=20mA$, $I_C=1mA$
	Isolation resistance	R_{ISO}	5×10^{10}	10^{11}	—	Ω	500V DC, 40~60% R.H.
	Floating capacitance	C_f	—	0.6	1.0	pF	V=0, f=1 MHz
	Cut-off frequency	f_C	—	80	—	kHz	$V_{CE}=5V$, $I_C=2mA$ $R_L=100\Omega$, −3dB
	Response time (Rise)	t_r	—	4	18	μs	$V_{CE}=2V$, $I_C=2mA$, $R_L=100\Omega$
	Response time (Fall)	t_f	—	3	18	μs	

$$*CTR = \frac{IC}{IF} \times 100\%$$

SUPPLEMENT

∘ Isolation voltage shall be measured in the following method.

(1) Anode and cathode on input side, collector and emitter on output side shall be shortened individually.
(2) The isolation voltage tester with a zero-cross circuit shall be used.
(3) The waveform of applied voltage shall be a sine wave.
(It is recommended that the isolation voltage shall be measured in insulation oil.)

∘ Rank table of collector current I_C (for LTV 817 only)

Model No.	Rank mark	I_C (mA)
LTV817A	A	4.0～8.0
LTV817B	B	6.5～13
LTV817C	C	10～20
LTV817D	D	15～30
LTV817	A, B, C, D or No mark	2.5～30

Conditions	I_F=5mA V_{CE}=5V Ta=25°C

∘ Inspection standard

Outgoing inspection standard for LITON products are shown below.

(1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL (%)	Judgement criterion
Major defect	∘ Electrical characteristics ∘ Unreadable marking ∘ Open, short	0.25	Depend on the specification
Minor defect	∘ Appearance ∘ Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

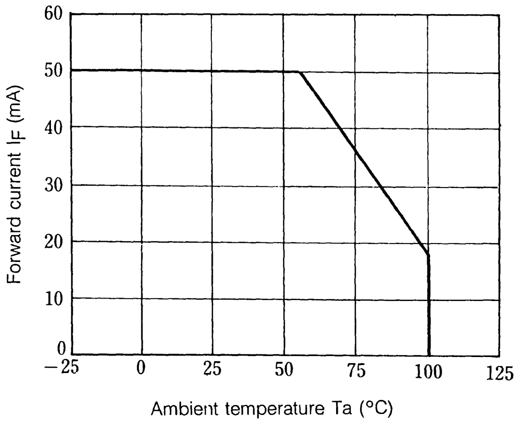


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

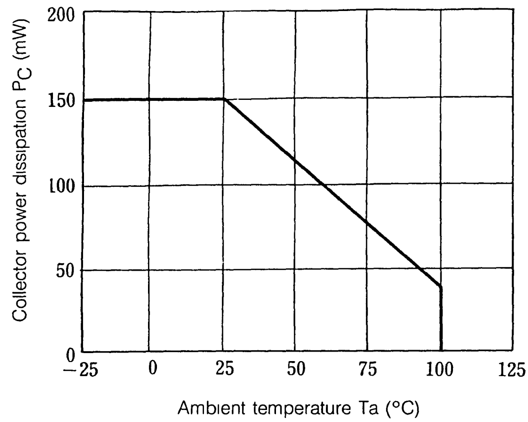


Fig. 3 Peak Forward Current vs. Duty Ratio

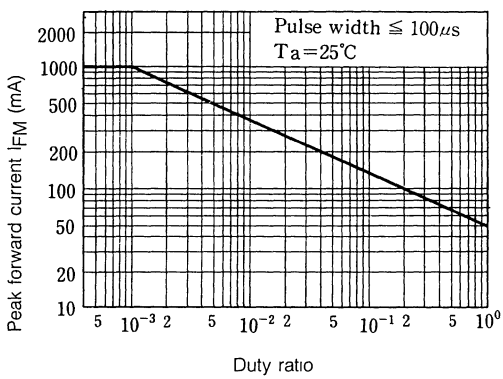


Fig. 4 Current Transfer Ratio vs. Forward Current

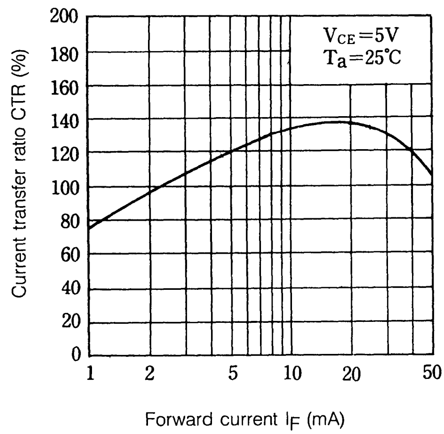


Fig. 5. Forward Current vs. Forward Voltage

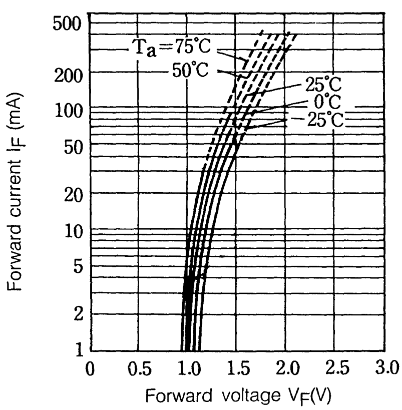


Fig. 6 Collector Current vs. Collector-emitter Voltae

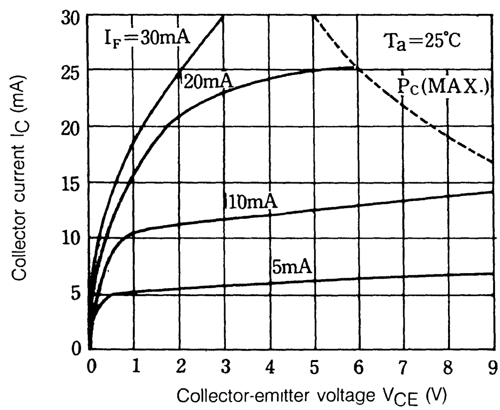


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

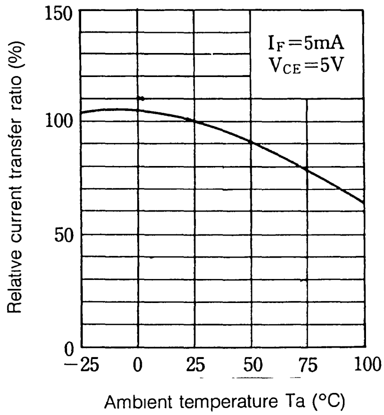


Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

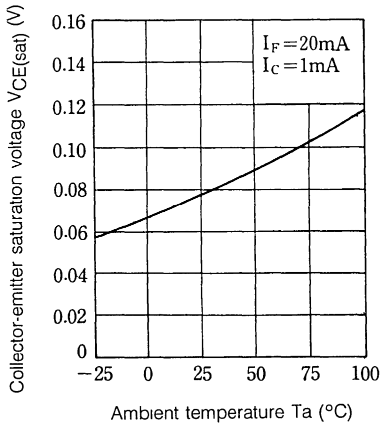


Fig. 9 Collector Dark Current vs. Ambient Temperature

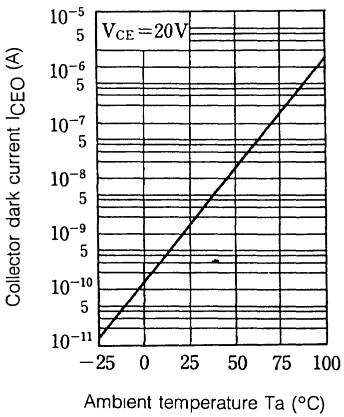


Fig. 10 Response Time vs. Load Resistance

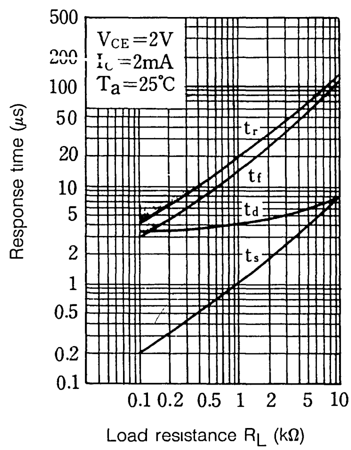


Fig. 11 Frequency Response

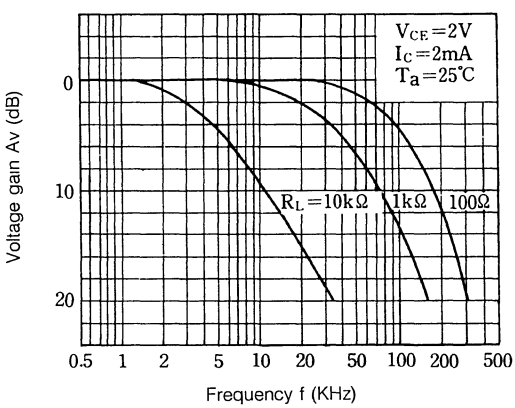
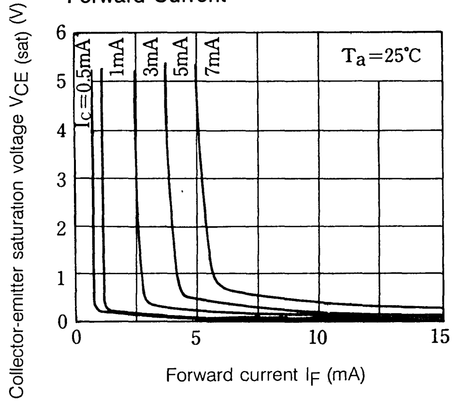
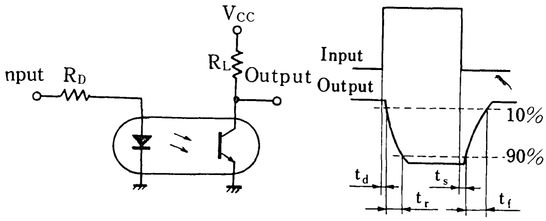


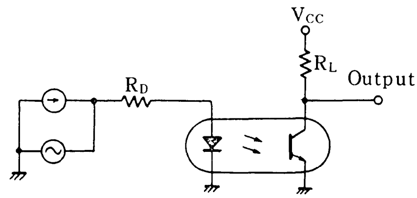
Fig. 12 Collector-emitter Saturation Voltage vs. Forward Current



Test Circuit for Response Time



Test Circuit for Frequency Response

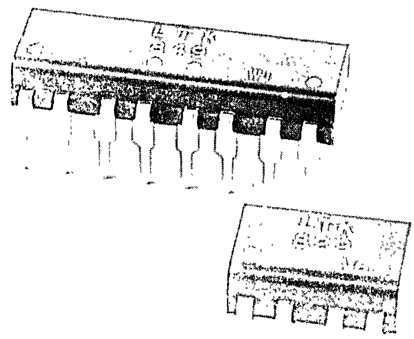


LITEON

High Density Mounting Type Photocoupler LTK829/LTK849

FEATURES

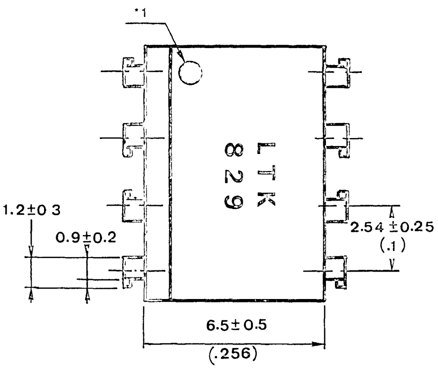
1. Symmetrical terminal configuration
   LTK829: 2-channel type
   LTK849: 4-channel type
2. High current transfer ratio
   (CTR: MIN. 50% at $I_F = 5mA$, $V_{CE} = 5V$)
3. High input-output isolation voltage
   (V_{iso}: 5,000 Vrms)
4. UL approved (No. E113898(s))



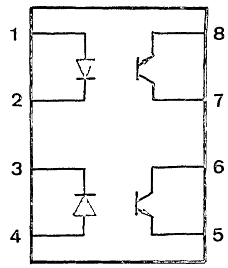
APPLICATIONS

1. Telephone exchanges
2. Computer terminal
3. System appliances, measuring instruments
4. Signal transmission between circuits of different potentials and impedances

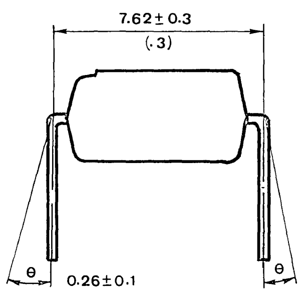
OUTLINE DIMENSIONS (UNIT: mm)

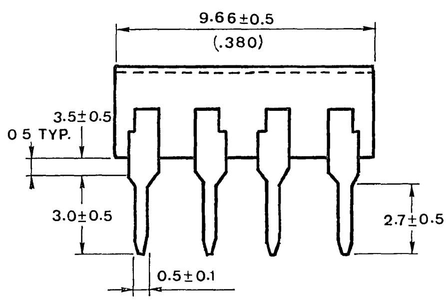


Pin No and internal connection diagram



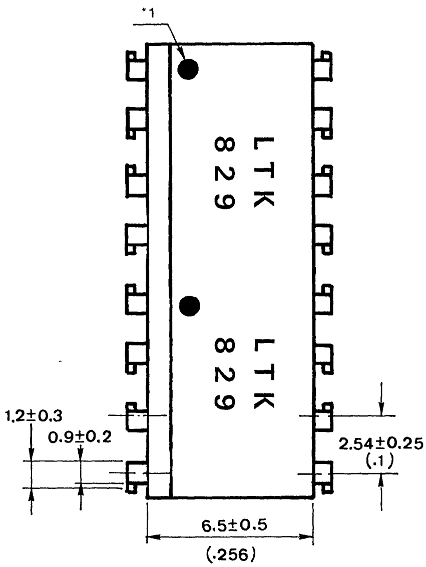
1 3 Anode 5 7 Emitter
2 4 Cathode 6 8 Collector



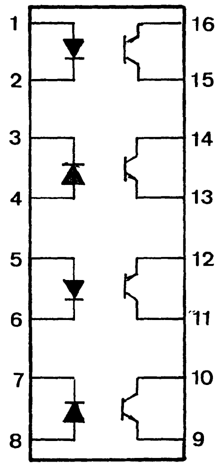


θ = 0 – 13°

Note *1 Anode mark



Pin No and internal connection diagram

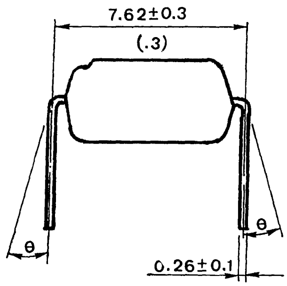


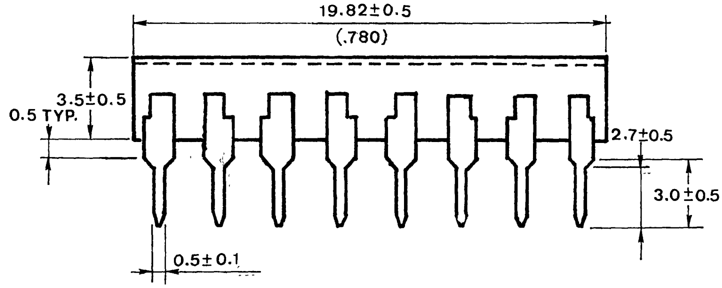
1 4 5 8 Anode

2 3 6 7 Cathode

9 12 13 16 Emitter

10 11 14 15 Collector





θ = 0 -13°

Note *1 Anode mark

■ RATINGS AND CHARACTERISTICS

• Absolute maximum ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	*1 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	150	mW
Total power dissipation		P_{tot}	170	mW
Operating temperature		T_{opr}	−25 ~ +100	°C
Storage temperature		T_{stg}	−40 ~ +125	°C
*2 Isolation voltage		V_{iso}	5	kVrms
*3 Soldering temperature		T_{sol}	260	°C

*1 Pulse width ≤ 100μs, Duty ratio: 0.001
*2 AC for 1 minute, 40 ~ 60% R.H.
*3 For 10 seconds

• Electro-optical characteristics

(Ta = 25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Input	Forward voltage	V_F	—	1.2	1.4	V	$I_F = 20mA$
	Peak forward voltage	V_{FM}	—	—	3.0	V	$I_{FM} = 0.5A$
	Reverse current	I_R	—	—	10	μA	$V_R = 4V$
	Terminal capacitance	C_t	—	30	250	pF	V = 0, f = 1 kHz
Output	Collector dark current	I_{CEO}	—	—	100	nA	$V_{CE} = 20V$, $I_F = 0$
	Collector-emitter breakdown voltage	BV_{CEO}	35	—	—	V	$I_C = 0.1mA$, $I_F = 0$
	Emitter-collector breakdown voltage	BV_{ECO}	6	—	—	V	$I_E = 10\mu A$, $I_F = 0$
Transfer characteristics	Collector current	I_C	2.5	—	20	mA	$I_F = 5mA$, $V_{CE} = 5V$
	Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.1	0.2	V	$I_F = 20mA$, $I_C = 1mA$
	Isolation resistance	R_{ISO}	5×10^{10}	10^{11}	—	Ω	DC500V, 40~60% R.H.
	Floating capacitiance	C_f	—	0.6	1.0	pF	V = 0, f = 1MHz
	Cut off frequency	f_C	—	80	—	kHz	$V_{CE} = 5V$, $I_C = 2mA$ $R_L = 100\Omega$, −3dB
	Response time (Rise)	t_r	—	4	—	μs	$V_{CE} = 2V$, $I_C = 2mA$ $R_L = 100\Omega$
	Response time (Fall)	t_f	—	3	—	μs	

$*CTR = \frac{I_C}{I_F} \times 100\%$

■ SUPPLEMENT

- **Isolation voltage shall be measured in the following method.**
  (1) Anode and cathode on input side, collector and emitter on output side shall be shortened individually.
  (2) The isolation voltage tester with a zero-cross circuit shall be used.
  (3) The waveform of applied voltage shall be a sine wave.
  (It is recommended that the isolation voltage shall be measured in insulation oil.)
- **Outgoing inspection standard for LITON products are shown below.**
  (1) A single sampling plan, normal inspection level II based on MIL-STD-105D is applied. The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL (%)	Judgement criterion
Major defect	∘ Electrical characteristics ∘ Unreadable marking ∘ Open, short	0 25	Depend on the specification
Minor defect	∘ Appearance ∘ Dimension	0.4	

Fig. 1 Forward Current vs. Ambient Temperature

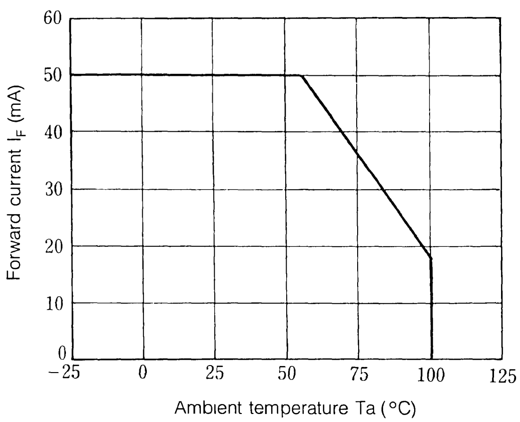


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

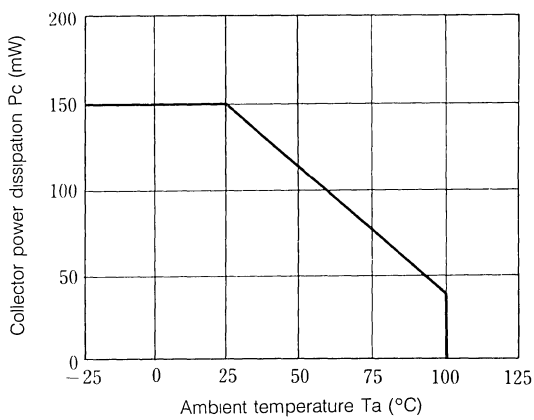


Fig. 3 Peak Forward Current vs. Duty Ratio

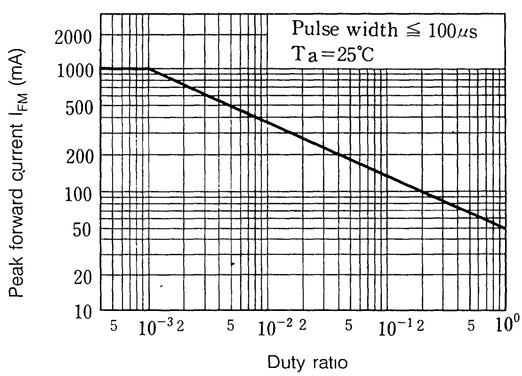


Fig. 4 Forward Current vs. Forward Voltage

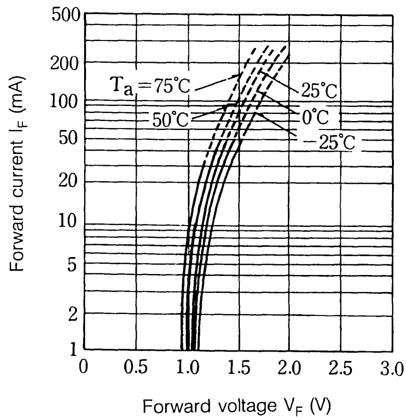


Fig. 5 Current Transfer Ratio vs. Forward Current

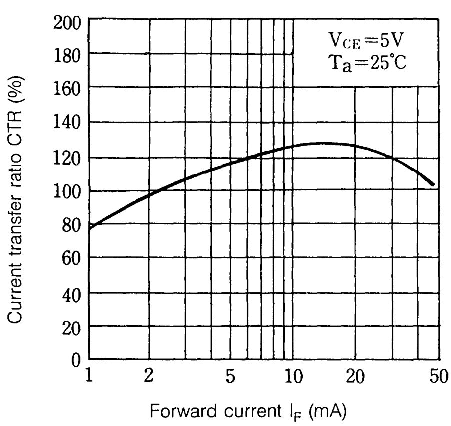


Fig. 6 Collector Current vs. Collector-emitter Voltage

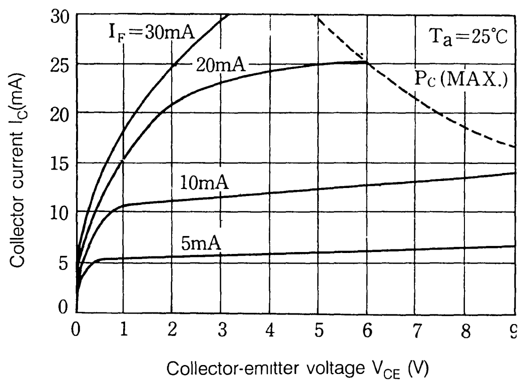


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

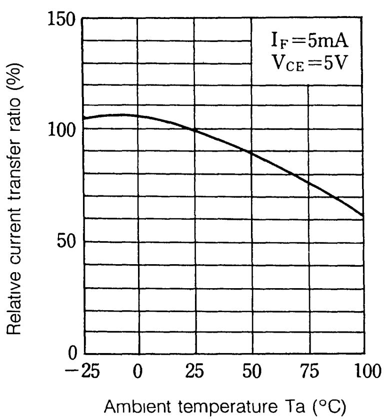


Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

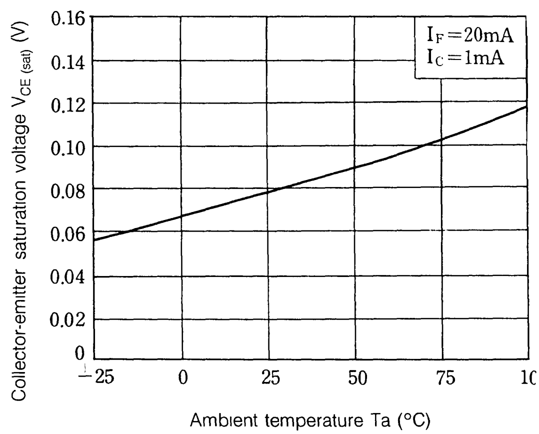


Fig. 9 Collector Dark Current vs. Ambient Temperature

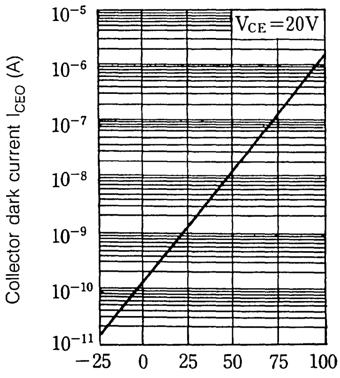


Fig. 10 Response Time vs. Load Resistance

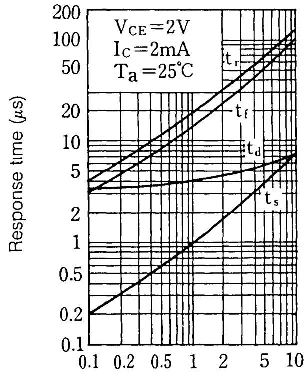


Fig. 11 Frequency Response

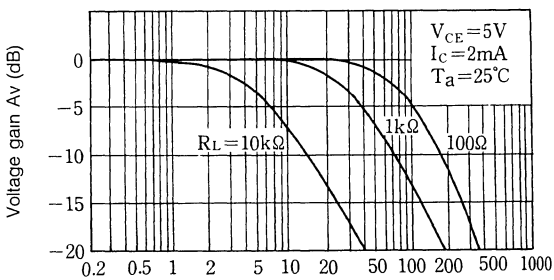
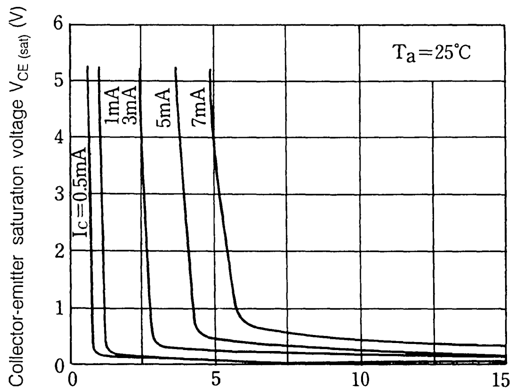
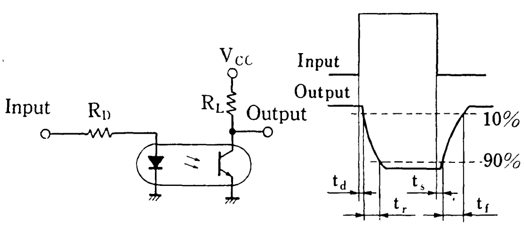


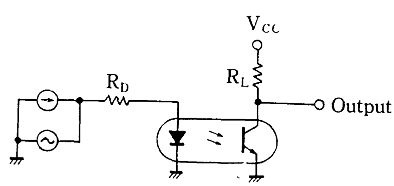
Fig. 12 Collector-emitter Saturation Voltage vs. Forward Current



Test Circuit for Response Time

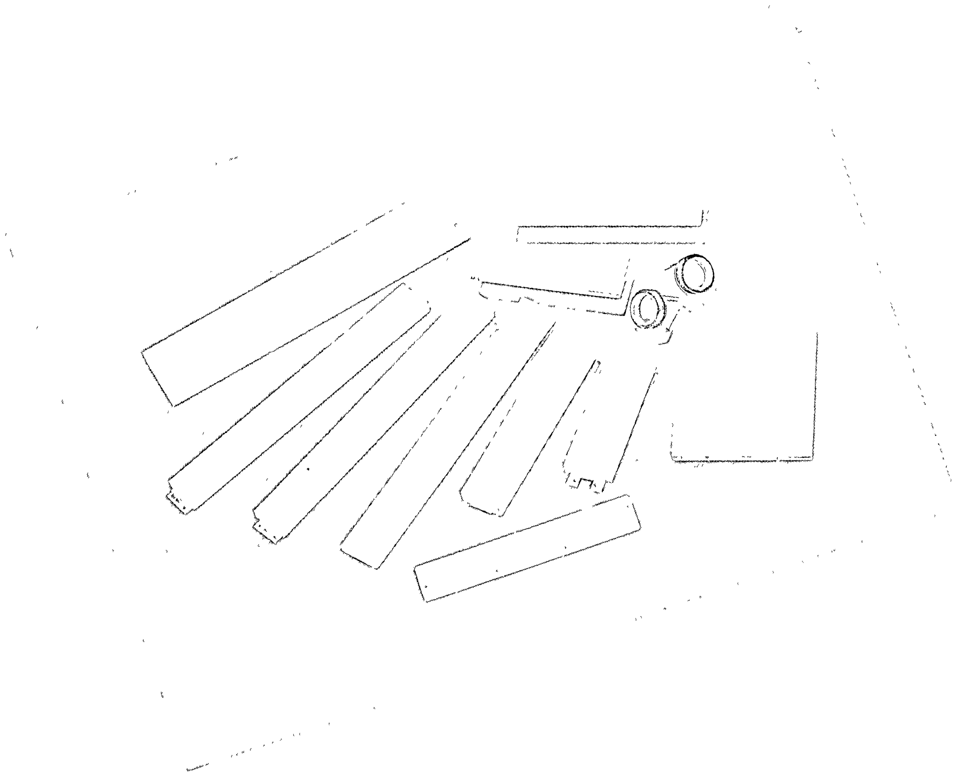


Test Circuit for Frequency Response



B. LCD Back Light

• LCD BACK LIGHT QUICK REFERENCE GUIDE



LCD BACK LIGHT

LCD BACK LIGHT QUICK REFERENCE GUIDE

DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP.	SUPPLY VOLTAGE	PACKAGE DIMENSION	PAGE NO.
PACKAGE	PART NO.	COLOR	TYPE				
77.5mm L 24.0mm W 6.0mm H	LTM-88X18	Yellow (585 nm)	Encap	250 cd/m²	4.3 V	FIG. 1-1	B-2
169.0mm L 19.5mm W 5.5mm H	LTM-88X20	Green (565 nm)	Encap	50 cd/m²	4.1 V	FIG. 1-2	B-5
109.0mm L 18.0mm W 3.0mm H	LTM-88X21	Green (565 nm)	Side Look	20 cd/m²	4.1 V	FIG. 1-3	B-8
169.0mm L 19.5mm W 5.5mm H	LTM-88X30	Yellow (585 nm)	Encap	50 cd/m²	4.1 V	FIG. 1-4	B-11
165.0mm L 21.5mm W 3.2mm H	LTM-88X32	Green (565 nm)	Coating	45 cd/m²	4.1 V	FIG. 1-5	B-14
ϕ20.2mm L 6.8mm H	LTM-88X38	Green (565 nm)	Air	30 cd/m²	4.2 V	FIG. 1-6	B-17
80.0mm L 24.0mm W 3.2mm H	LTM-89X03	Green (565 nm)	Side Look Coating	26 cd/m²	4.2 V	FIG. 1-7	B-20
100.0mm L 24.0mm W 3.2mm H	LTM-89X04	Green (565 nm)	Side Look Coating	23 cd/m²	4.2 V	FIG. 1-8	B-23
178.5mm L 35.5mm W 5.5mm H	LTM-89X06	Green (565 nm)	Coating	100 cd/m²	4.1 V	FIG. 1-9	B-26
80.0mm L 67.0mm W 3.0mm H	LTM-89X10	Orange (635 nm)	Side Look Coating	4 cd/m²	8.2 V	FIG. 1-10	B-29
107.65mm L 22.0mm W 7.0mm H	LTM-89X18	Yellow (585 nm)	Encap	30 cd/m²	4.0 V	FIG. 1-11	B-32

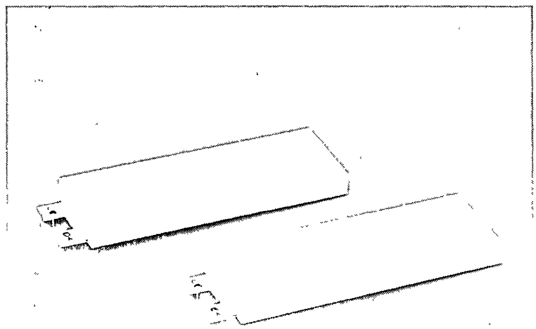
LCD BACK LIGHT

LTM-88X18

LCD BACK LIGHT

FEATURES

- FREE DESIGN ACCORDING TO INSTALL IN "LCD" FIXTURE AND FURNISHED EASILY.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE "LCD" EQUIPMENT.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CONCENTRATE CONFIGURATION DESIGNED TO REDUCED THICKNESS.
- RELIABLE PERFORMANCE CHARACTERISTICS AND GUARDED EQUIPMENT.



PACKAGE DIMENSIONS

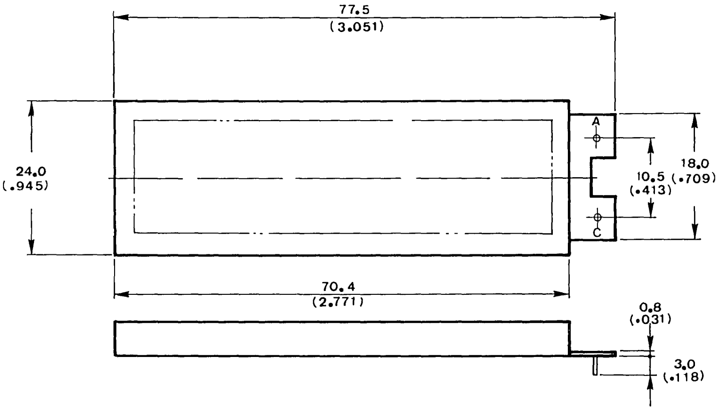
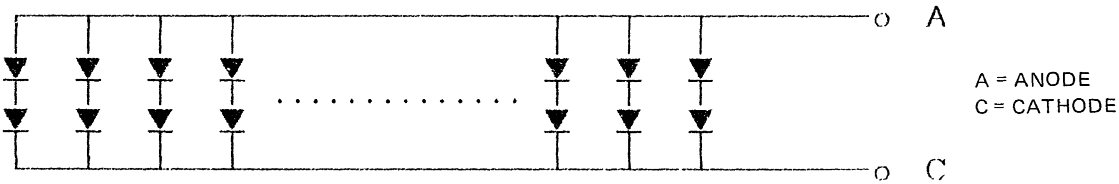


FIG. 1-1

NOTES:

1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

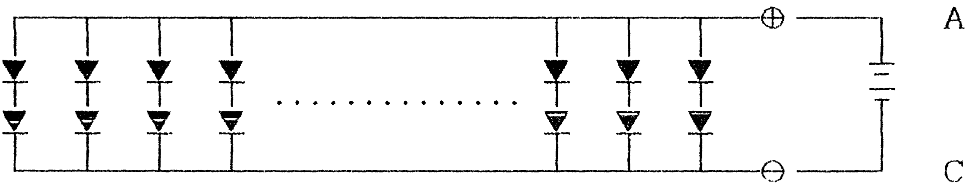


2 x 15 = 30 (LED NUMBERS)

2. OPTICAL CHARACTERISTICS.

(Luminous Intensity and Luminous Tolerance.)

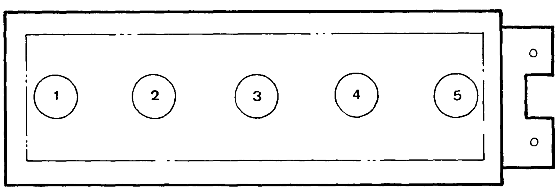
2-1 TESTING CIRCUIT



Current: IF = 200mA
Ambient Temperature: TA = 25°C

2-2 MEASURED METHOD

"HOLE" DIAMETER 3ϕ



*(Effective Spatial Destribution)
* 1 to 5 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	160	250	–	cd/m^2	
Luminous Tolerance	–	–	50	%	index(1)

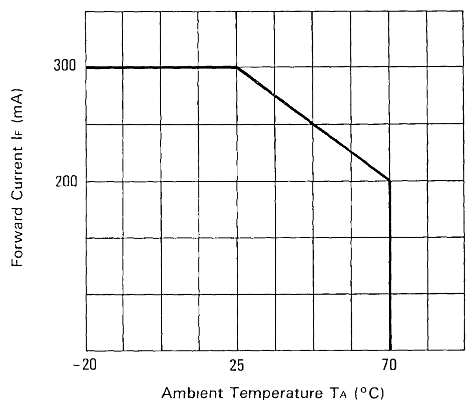
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)}$ x 100%

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	300 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	1.4 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	4.1 V	4.3 V	4.5 V	IF = 200 mA	TA = 25°C
Peak Emission Wavelength	λp	–	585	–	IF = 200 mA	Index (3)
Reverse Current	IR	–	–	0.2 mA	VR = 20 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–	–	

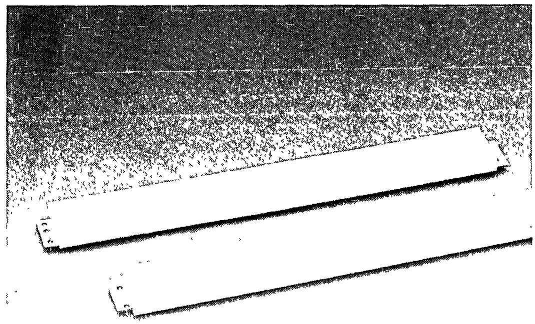
* Index (3) Source Color (Yellow DICE)

LCD BACK LIGHT

LTM-88X20

FEATURES

- FREE DESIGN ACCORDING TO INSTALL IN "LCD" FIXTURE AND FURNISHED EASILY.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE "LCD" EQUIPMENT.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CONCENTRATE CONFIGURATION DESIGNED TO REDUCED THICKNESS.
- RELIABLE PERFORMANCE CHARACTERISTICS AND GUARDED EQUIPMENT.



PACKAGE DIMENSIONS

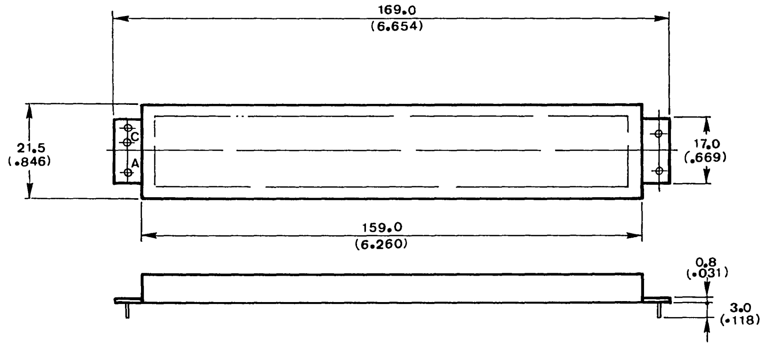
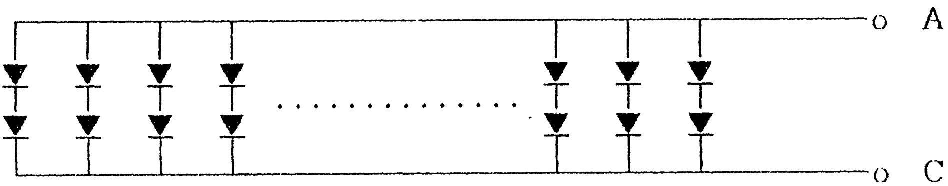


FIG. 1-2

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012") unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM



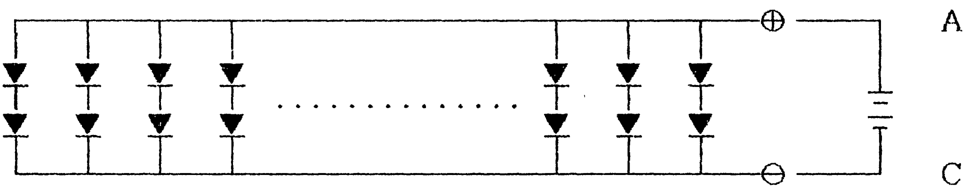
A = ANODE
C = CATHODE

LCD BACK LIGHT

2 x 26 = 52 (LED NUMBERS)

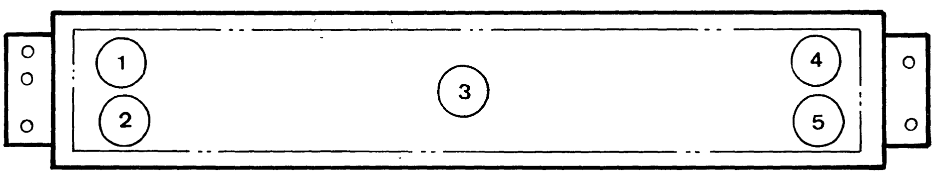
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: I_F = 180mA
Ambient Temperature: T_A = 25°C

2-2 MEASURED METHOD
"HOLE" DIAMETER 3ϕ



*(Effective Spatial Destribution)
* 1 to 5 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	30	50	–	cd/m²	
Luminous Tolerance	–	–	50	%	index(1)

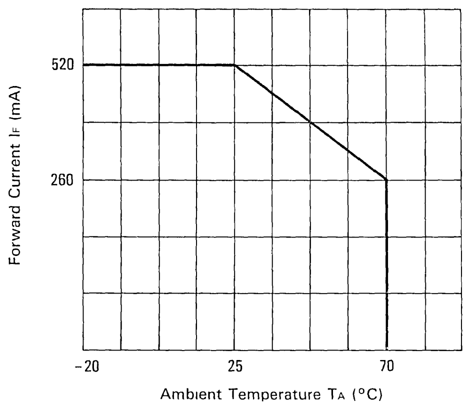
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)}$ x 100%

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	520 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	2.3 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	3.8 V	4.1 V	4.4 V	IF = 260 mA	TA = 25°C
Peak Emission Wavelength	λp	–	565	–	IF = 260 mA	Index (3)
Reverse Current	IR	–	–	2.6 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–	IF = 260 mA	

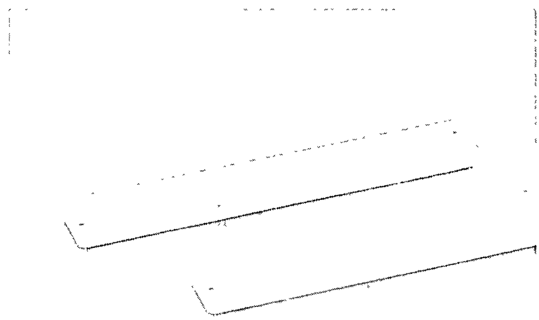
* Index (3): Source Color (Yellow Green DICE)

LCD BACK LIGHT

LTM-88X21

FEATURES

- o FREE DESIGN ACCORDING TO INSTALL IN "LCD" FIXTURE AND FURNISHED EASILY.
- o LOW POWER REQUIREMENT.
- o SOLID STATE RELIABILITY.
- o EXCELLENT CHARACTERS APPEARANCE.



PACKAGE DIMENSIONS

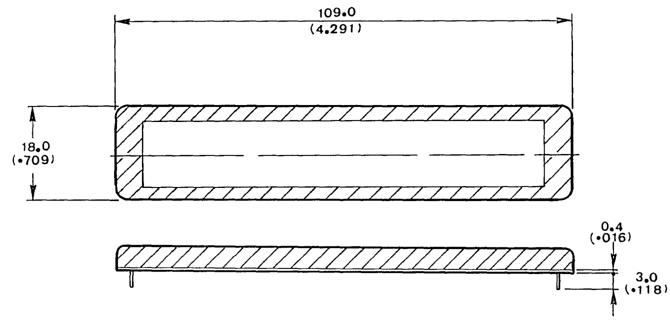
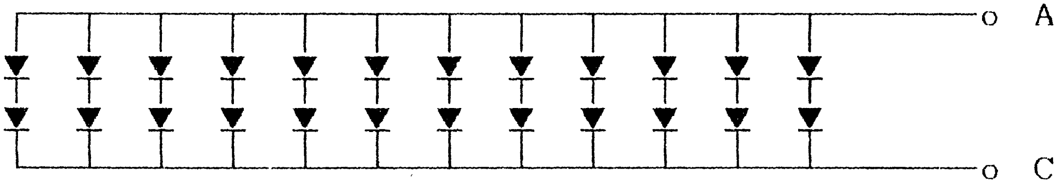


FIG. 1-3

NOTES:

1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012″) unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

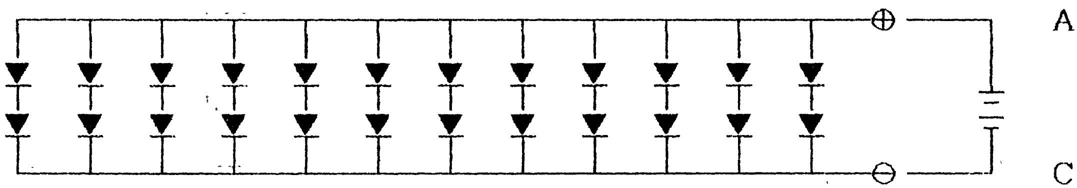


2 x 12 = 24 (LED NUMBERS)

A = ANODE
C = CATHODE

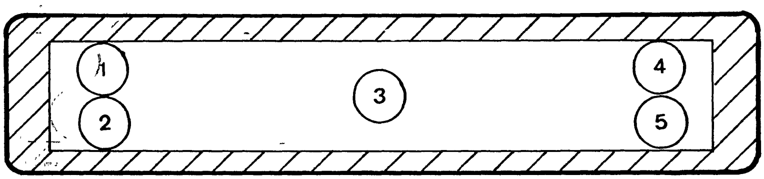
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: I_F = 120mA
Ambient Temperature: T_A = 25°C

2-2 MEASURED METHOD
"HOLE" DIAMETER 3ϕ



*(Effective Spatial Destribution)
* 1 to 5 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	15	20	50	cd/m²	
Luminous Tolerance	–	–	50	%	index(1)

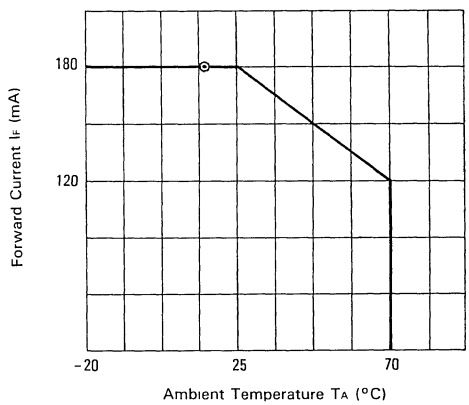
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)}$ x 100%

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	180 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	0.8 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	3.8 V	4.1 V	4.4 V	IF = 120 mA	TA = 25°C
Peak Emission Wavelength	λp	–	565	–	IF = 120 mA	Index (3)
Reverse Current	IR	–	–	2.6 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–	IF = 120 mA	

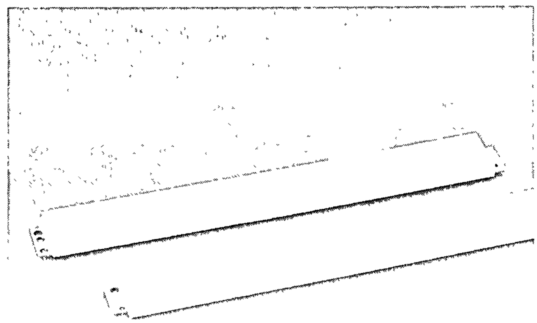
* Index (3): Source Color (Green DICE)

LCD BACK LIGHT

LTM-88X30

FEATURES

- FREE DESIGN ACCORDING TO INSTALL IN "LCD" FIXTURE AND FURNISHED EASILY.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE "LCD" EQUIPMENT.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CONCENTRATE CONFIGURATION DESIGNED TO REDUCED THICKNESS.
- RELIABLE PERFORMANCE CHARACTERISTICS AND GUARDED EQUIPMENT.



PACKAGE DIMENSIONS

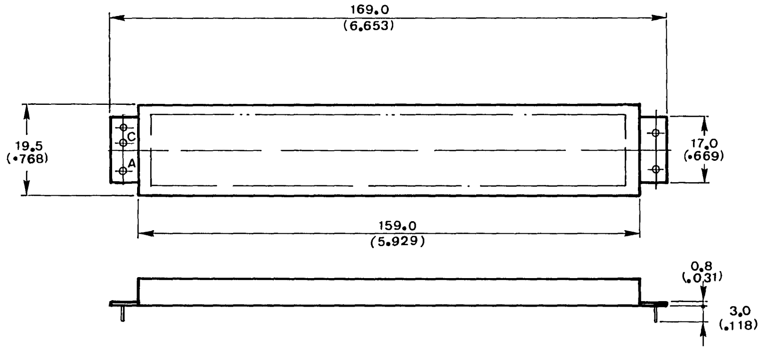
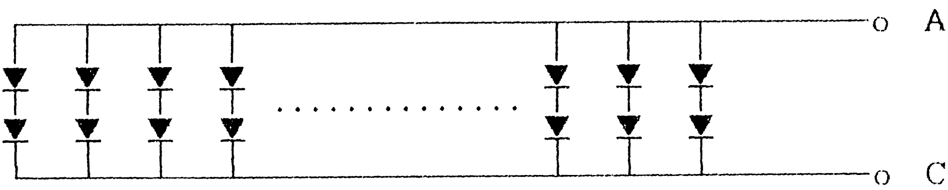


FIG. 1-4

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012") unless otherwise noted.

LCD BACK LIGHT

1. SCHEMATIC CIRCUIT DIAGRAM

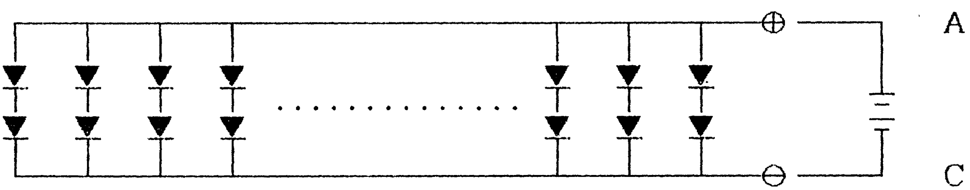


A = ANODE
C = CATHODE

2 x 24 = 48 (LED NUMBERS)

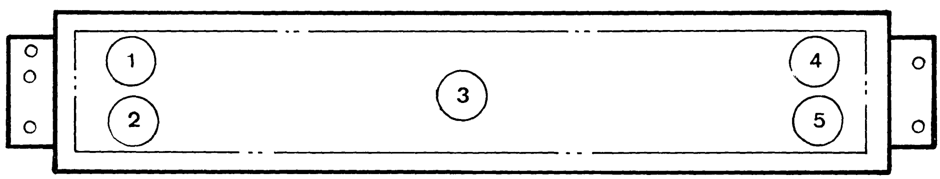
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: I_F = 180mA
Ambient Temperature: T_A = 25°C

2-2 MEASURED METHOD
"HOLE" DIAMETER 3ϕ



*(Effective Spatial Destribution)
* 1 to 5 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	30	50	—	cd/m^2	
Luminous Tolerance	—	—	50	%	index(1)

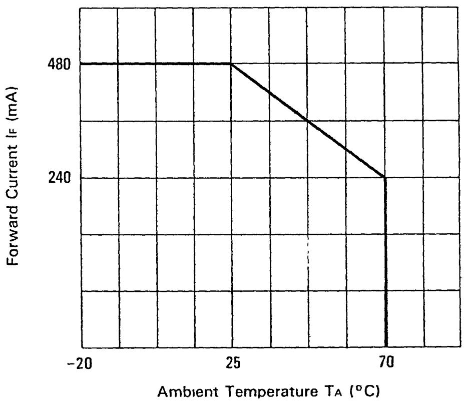
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)}$ x 100%

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	480 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	2.3 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	3.8 V	4.1 V	4.4 V	IF = 240 mA	TA = 25°C
Peak Emission Wavelength	λp	–	585	–	IF = 240 mA	Index (3)
Reverse Current	IR	–	–	2.6 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–	IF = 240 mA	

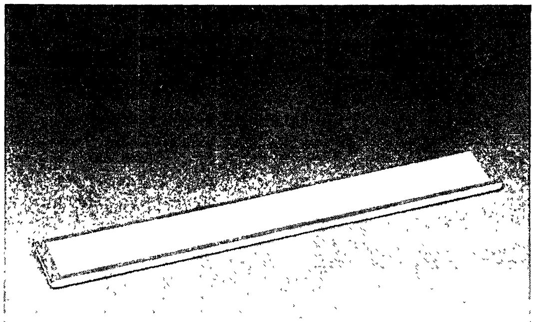
* Index (3): Source Color (Yellow DICE)

LCD BACK LIGHT
LTM-88X32

LCD BACK LIGHT

FEATURES

- THE SOLID LIGHT SOURCE BE ABLE TO REDUCE MECHANICAL STRUCTURE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- LONG LIFE-SOLID STATE RELIABILITY.



PACKAGE DIMENSIONS

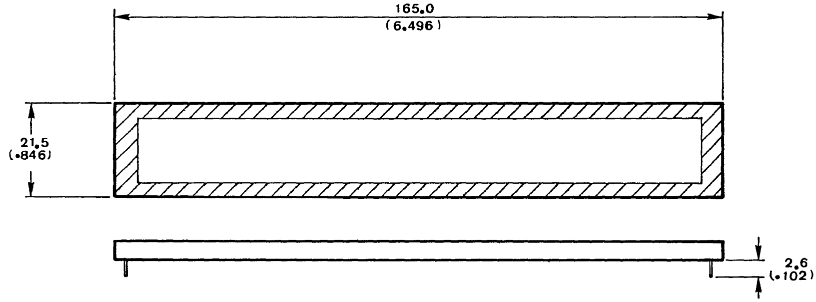
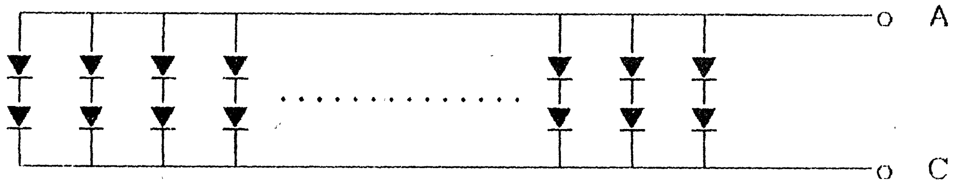


FIG. 1-5

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012") unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

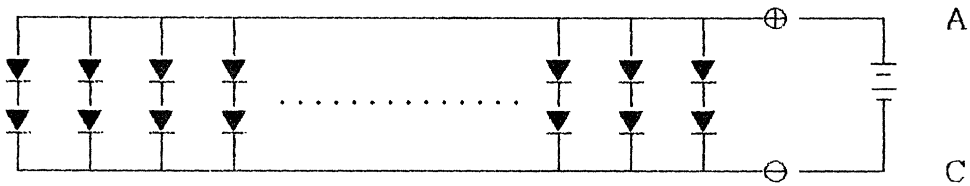


A = ANODE
C = CATHODE

2 x 17 = 34 (LED NUMBERS)

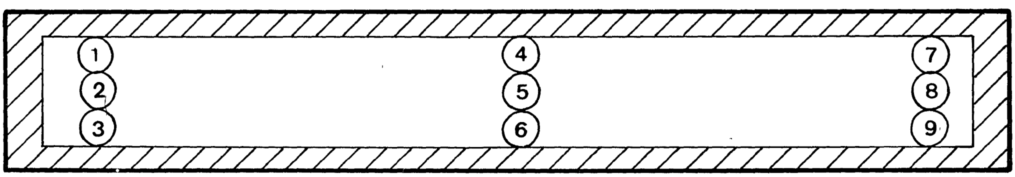
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: I_F = 200mA
Ambient Temperature: T_A = 25°C

2-2 MEASURED METHOD
"HOLE" DIAMETER 3ϕ



*(Effective Spatial Destribution)
* 1 to 9 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	35	45	—	cd/m²	
Luminous Tolerance	—	—	60	%	index(1)

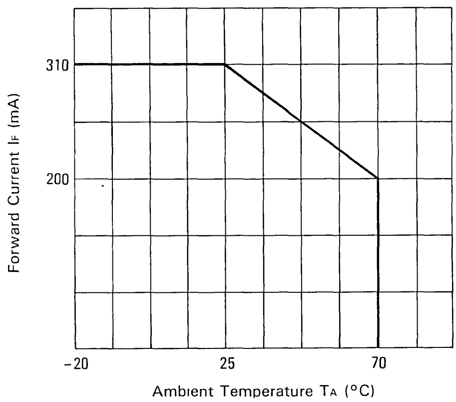
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)}$ x 100%

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	310 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	1.33 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING MIN.	RATING TYP.	RATING MAX.	TEST CONDITION	REF.
Forward Voltage	VF	–	4.1 V	4.3 V	IF = 200 mA	TA = 25°C
Peak Emission Wavelength	λp	–	565	–	IF = 200 mA	Index (3)
Reverse Current	IR	–	–	0.1 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–	IF = 200 mA	

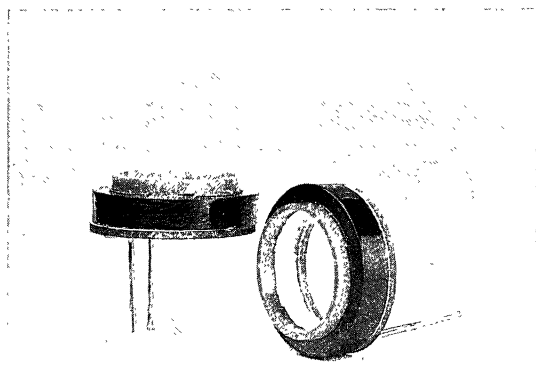
* Index (3)· Sourse Color (Green DICE)

LCD BACK LIGHT

LTM-88X38

FEATURES

- THE SOLID LIGHT SOURCE BE ABLE TO REDUCE MECHANICAL STRUCTURE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH BRIGHTNESS & LONG LIFE-SOLID STATE RELIABILITY.



PACKAGE DIMENSIONS

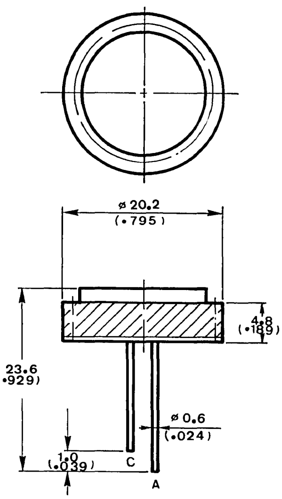
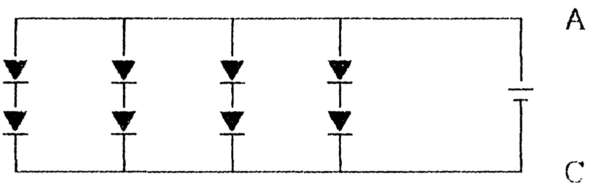


FIG. 1-6

NOTES:

1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

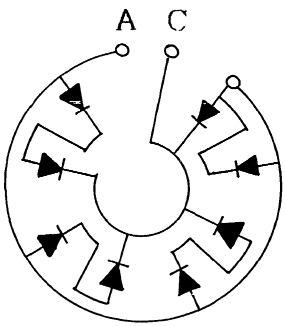


A = ANODE
C = CATHODE

2 x 4 = 8 (LED NUMBERS)

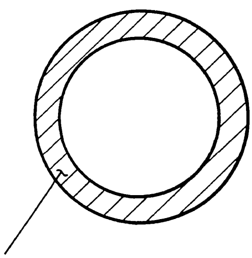
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: I_F = 24mA
Ambient Temperature: T_A = 25°C

2-2 MEASURED METHOD



*(Effective Spatial Destribution)

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	20	30	–	cd/m²	IF = 24 mA
Luminous Tolerance	–	–	60	%	index(1)

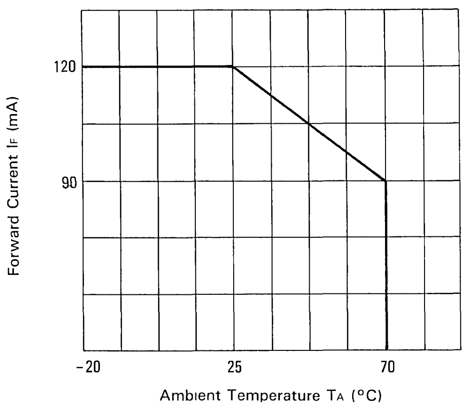
$$\text{* Index(1) Luminous Tolerance} = \frac{B(MAX) - B(MIN)}{B(MAX)} \times 100\%$$

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	120 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	0.38 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT TA = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	3.8 V	4.0 V	4.2 V	IF = 90 mA	TA = 25°C
Peak Emission Wavelength	λp	–	585	–	IF = 90 mA	Index (3)
Reverse Current	IR	–	–	0.2 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	$\Delta\lambda$	–	35	–	IF = 90 mA	

* Index (3): Source Color (Yellow DICE)

LITEON

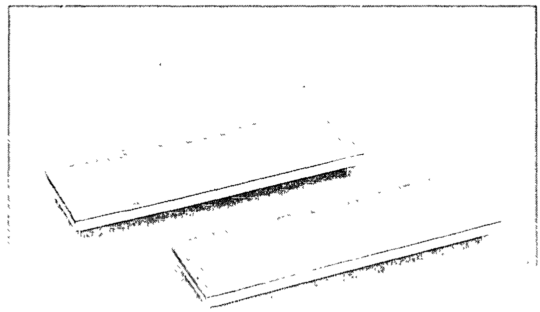
LCD BACK LIGHT

LTM-89X03

LCD BACK LIGHT

FEATURES

- THE SOLID LIGHT SOURCE BE ABLE TO REDUCE MECHANICAL STRUCTURE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- LONG LIFE-SOLID STATE RELIABILITY.



PACKAGE DIMENSIONS

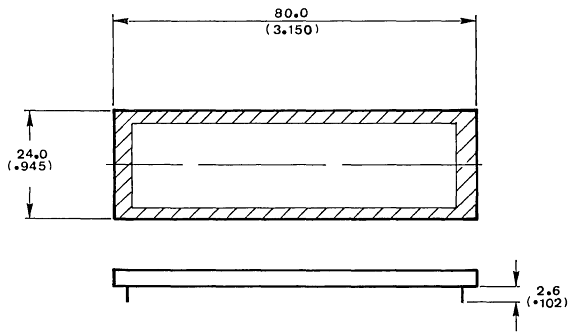
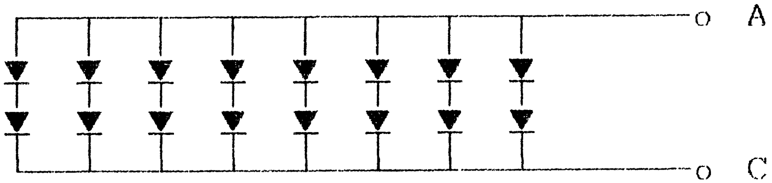


FIG. 1-7

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012") unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

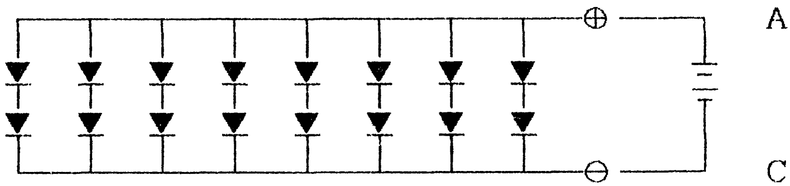


A = ANODE
C = CATHODE

2 x 8 = 16 (LED NUMBERS)

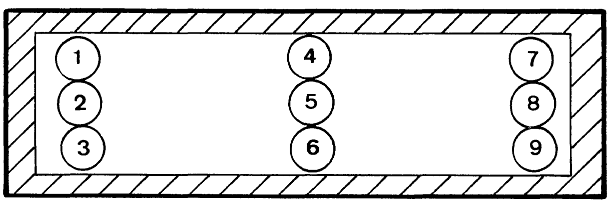
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: I_F = 80mA
Ambient Temperature: T_A = 25°C

2-2 MEASURED METHOD



*(Effective Spatial Destribution)
* 1 to 9 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	23	26	–	cd/m^2	
Luminous Tolerance	–	–	50	%	index(1)

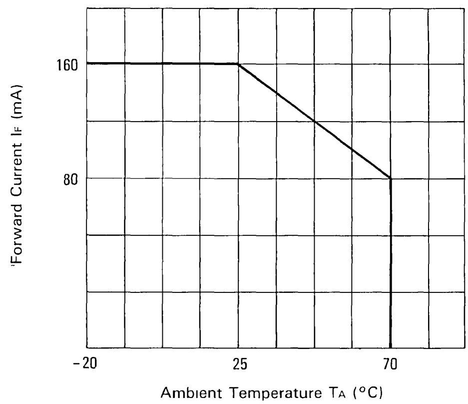
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)} \times 100\%$

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	160 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	0.7 (W)	index 2
Operating Temperature	Topr	–20 to +70 (°C)	
Storage Temperature	Tsto	–40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	4.0 V	4.2 V	4.4 V	IF = 80 mA	TA = 25°C
Peak Emission Wavelength	λp	–	565	–	IF = 80 mA	Index (3)
Reverse Current	IR	–	–	0.2 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–	IF = 80 mA	

* Index (3): Source Color (Green DICE)

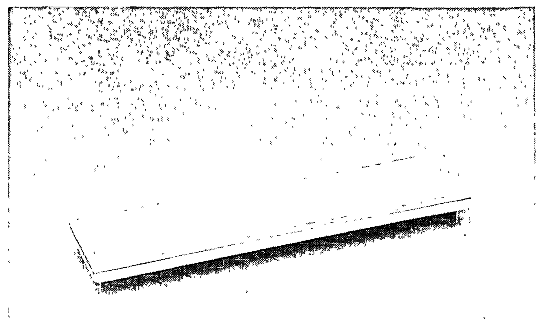
LITEON

LCD BACK LIGHT

LTM-89X04

FEATURES

- THE SOLID LIGHT SOURCE BE ABLE TO REDUCE MECHANICAL STRUCTURE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- LONG LIFE-SOLID STATE RELIABILITY.



PACKAGE DIMENSIONS

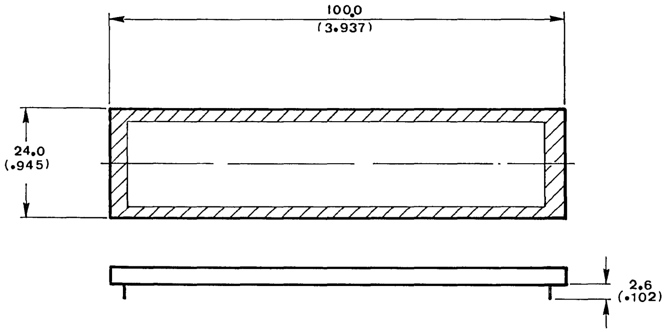
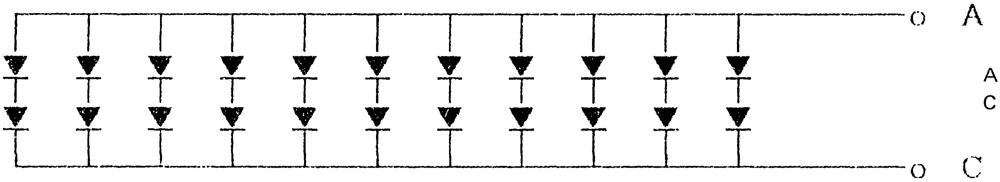


FIG. 1-8

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012") unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

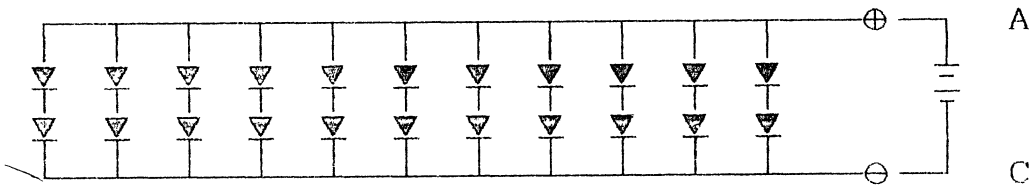


A = ANODE
C = CATHODE

2 x 11 = 22 (LED NUMBERS)

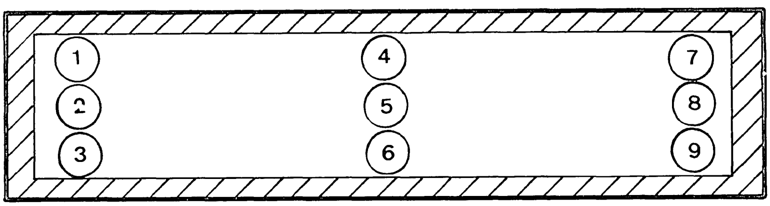
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: I = 110mA
Ambient Temperature: TA = 25°C

2-2 MEASURED METHOD



*(Effective Spatial Destribution)
* 1 to 9 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	18	23	–	cd/m^2	
Luminous Tolerance	–	–	50	%	index(1)

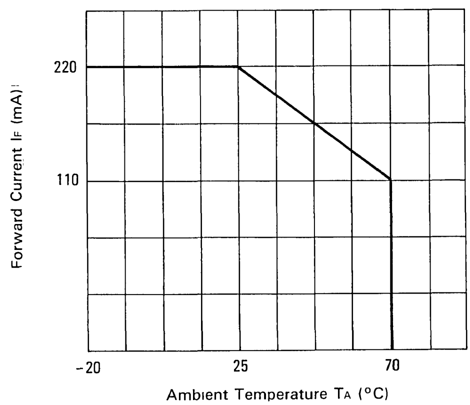
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)} \times 100\%$

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	220 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	0.968 (W)	index 2
Operating Temperature	Topr	–20 to +70 (°C)	
Storage Temperature	Tsto	–40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	4.0 V	4.2 V	4.4 V	IF = 110 mA	TA = 25°C
Peak Emission Wavelength	λp	–	565	–	IF = 110 mA	Index (3)
Reverse Current	IR	–	–	0.2 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–	IF = 110 mA	

* Index (3): Source Color (Green DICE)

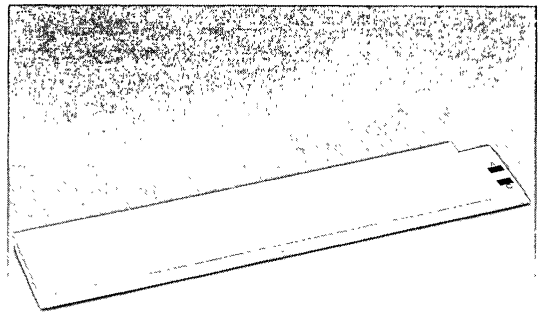
LITEON

LCD BACK LIGHT

LTM-89X06

FEATURES

- FREE DESIGN ACCORDING TO INSTALL IN "LCD" FIXTURE AND FURNISHED EASILY.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE "LCD" EQUIPMENT.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CONCENTRATE CONFIGURATION DESIGNED TO REDUCED THICKNESS.
- RELIABLE PERFORMANCE CHARACTERISTICS AND GUARDED EQUIPMENT.



PACKAGE DIMENSIONS

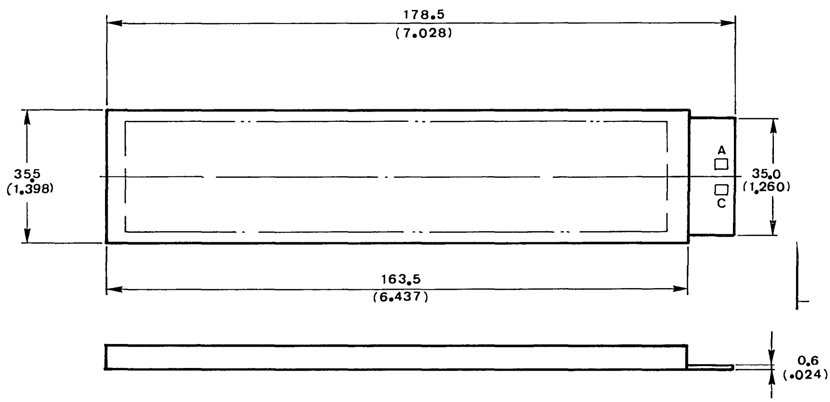
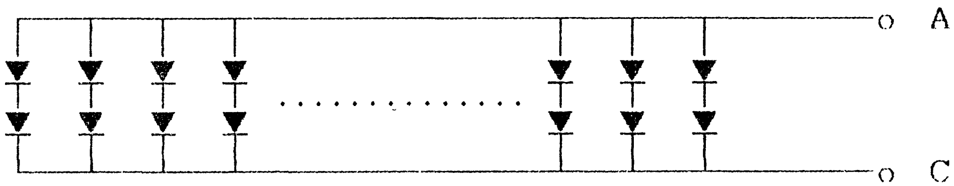


FIG. 1-9

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012") unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

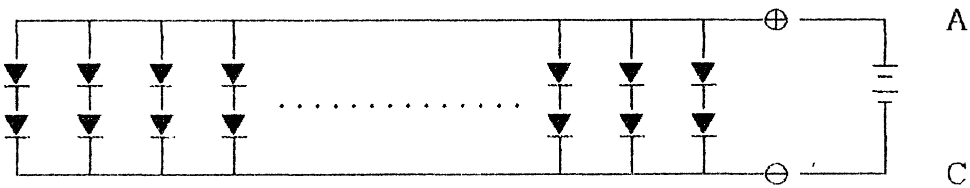


A = ANODE
C = CATHODE

$2 \times 48 = 96$ (LED NUMBERS)

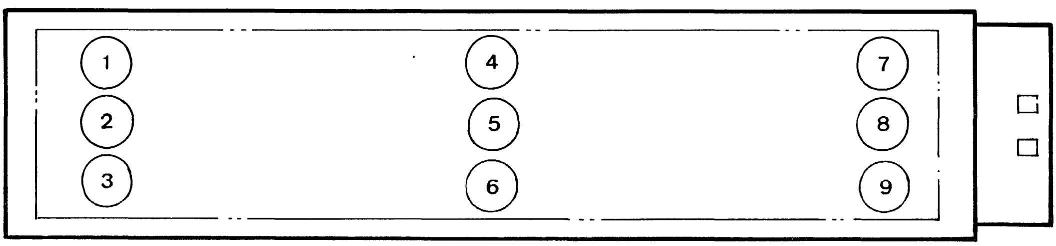
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: $I_F = 500$ mA
Ambient Temperature: $T_A = 25°C$

2-2 MEASURED METHOD
"HOLE" DIAMETER 3ϕ



*(Effective Spatial Destribution)
* 1 to 9 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	80	100	–	cd/m^2	
Luminous Tolerance	–	–	50	%	index(1)

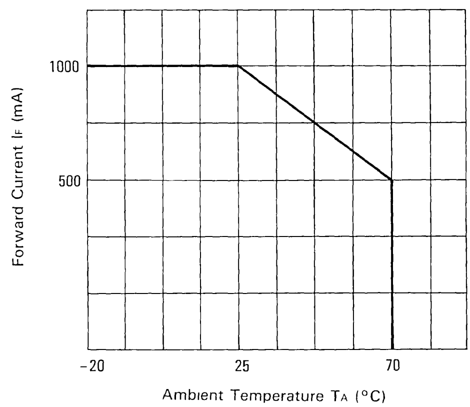
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)} \times 100\%$

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	1000 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	4.3 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT TA = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	4.0 V	4.1 V	4.3 V	IF = 500 mA	TA = 25°C
Peak Emission Wavelength	λp	–	565	–	IF = 500 mA	Index (3)
Reverse Current	IR	–	–	0.1 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–	IF = 500 mA	

* Index (3): Source Color (Green DICE)

LCD BACK LIGHT

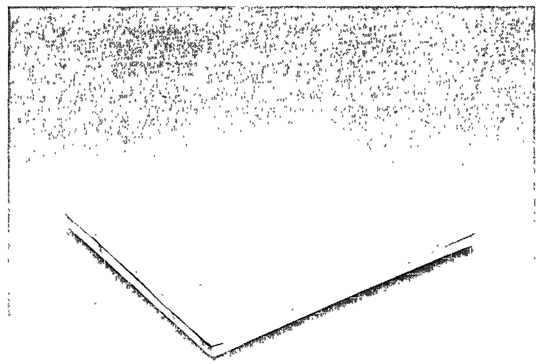
LITEON

LCD BACK LIGHT

LTM-89X10

FEATURES

- THE SOLID LIGHT SOURCE BE ABLE TO REDUCE MECHANICAL STRUCTURE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- LONG LIFE-SOLID STATE RELIABILITY.



PACKAGE DIMENSIONS

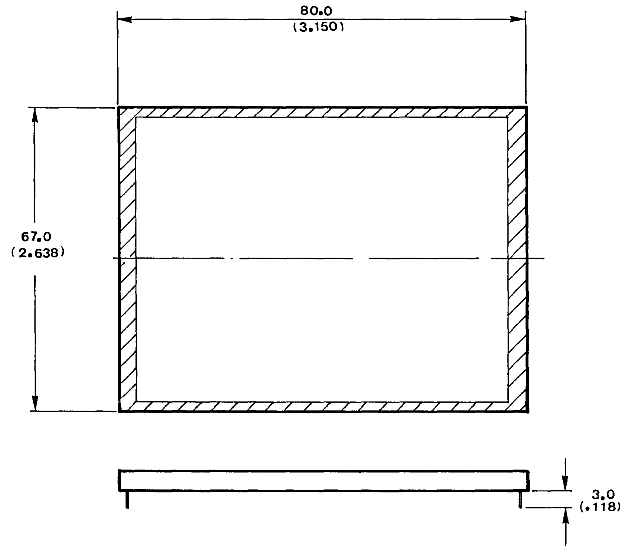
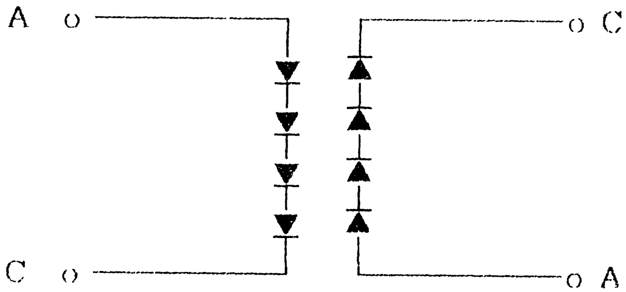


FIG. 1-10

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012″) unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

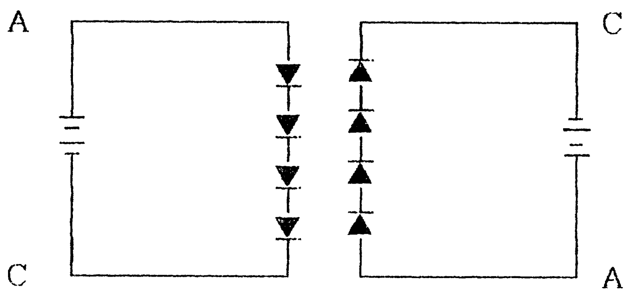


A = ANODE
C = CATHODE

2 x 4 = 8 (LED NUMBERS)

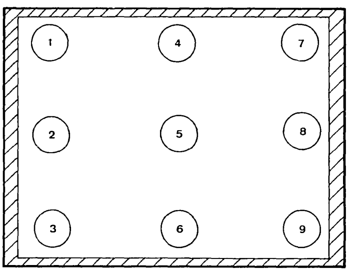
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Current: I_F = 30mA
Ambint Ambient Temperature: T_A = 25°C

2-2 MEASURED METHOD



*(Effective Spatial Destribution)
* 1 to 9 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	2	4	–	cd/m²	
Luminous Tolerance	–	–	50	%	index(1)

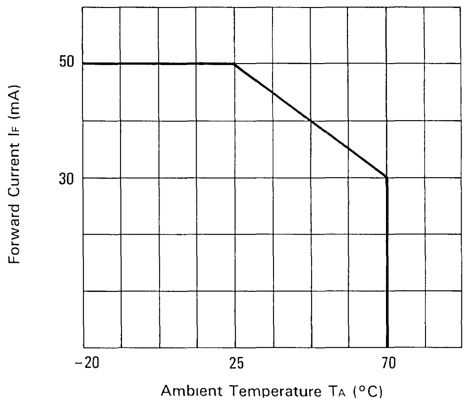
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)} \times 100\%$

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	50 (mA)	index 2
Reverse Voltage	VR	16 (V)	index 2
Power Dissipation	Po	0.4 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	8.0 V	8.2 V	8.4 V	IF = 30 mA	TA = 25°C
Peak Emission Wavelength	λp	—	635	—	IF = 30 mA	Index (3)
Reverse Current	IR	—	—	0.2 mA	VR = 16 V	TA = 25°C
Spectral Line Half Width	Δλ	—	40	—	IF = 30 mA	

* Index (3): Source Color (Orange DICE)

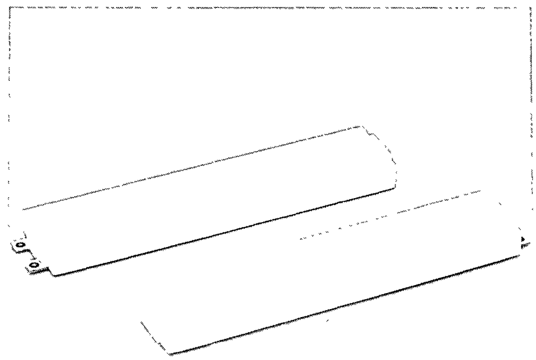
LITEON

LCD BACK LIGHT

LTM-89X18

FEATURES

- FREE DESIGN ACCORDING TO INSTALL IN "LCD" FIXTURE AND FURNISHED EASILY.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE "LCD" EQUIPMENT.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CONCENTRATE CONFIGURATION DESIGNED TO REDUCED THICKNESS.
- RELIABLE PERFORMANCE CHARACTERISTICS AND GUARDED EQUIPMENT.



PACKAGE DIMENSIONS

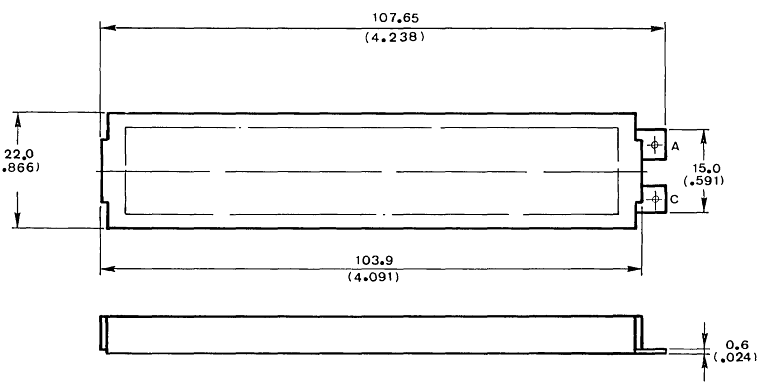
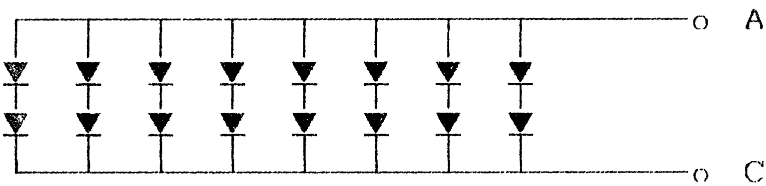


FIG. 1-11

NOTES:

1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.30mm (.012") unless otherwise noted.

1. SCHEMATIC CIRCUIT DIAGRAM

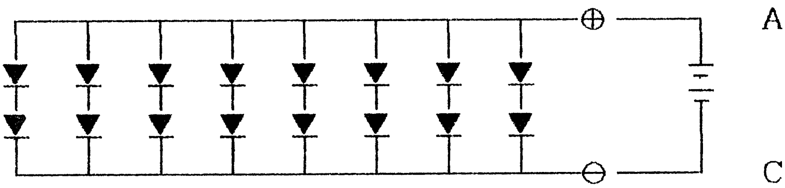


A = ANODE
C = CATHODE

2 x 8 = 16 (LED NUMBERS)

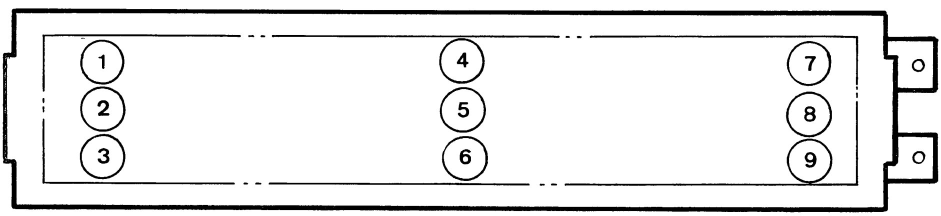
2. OPTICAL CHARACTERISTICS.
(Luminous Intensity and Luminous Tolerance.)

2-1 TESTING CIRCUIT



Curent: I_F = 90 mA
Ambient Temperature: T_A = 25°C

2-2 MEASURED METHOD
"HOLE" DIAMETER 3ϕ



*(Effective Spatial Destribution)
* 1 to 9 per-position Measured Luminous Intensity.

2-3 RATING

ITEM	RATING			UNIT	REFERANCE
	MIN.	TYP.	MAX.		
Luminous Intensity	25	30	–	cd/m²	
Luminous Tolerance	–	–	50	%	index(1)

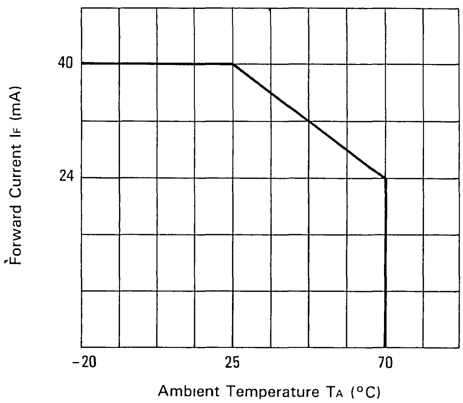
* Index(1) Luminous Tolerance = $\frac{B(MAX) - B(MIN)}{B(MAX)}$ x 100%

3. ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	TEST CONDITION
Peak Forward Current	IF	40 (mA)	index 2
Reverse Voltage	VR	8 (V)	index 2
Power Dissipation	Po	0.17 (W)	index 2
Operating Temperature	Topr	−20 to +70 (°C)	
Storage Temperature	Tsto	−40 to +80 (°C)	

* Index (2) AT T_A = 25°C

4. FORWARD CURRENT DERATING CURVE



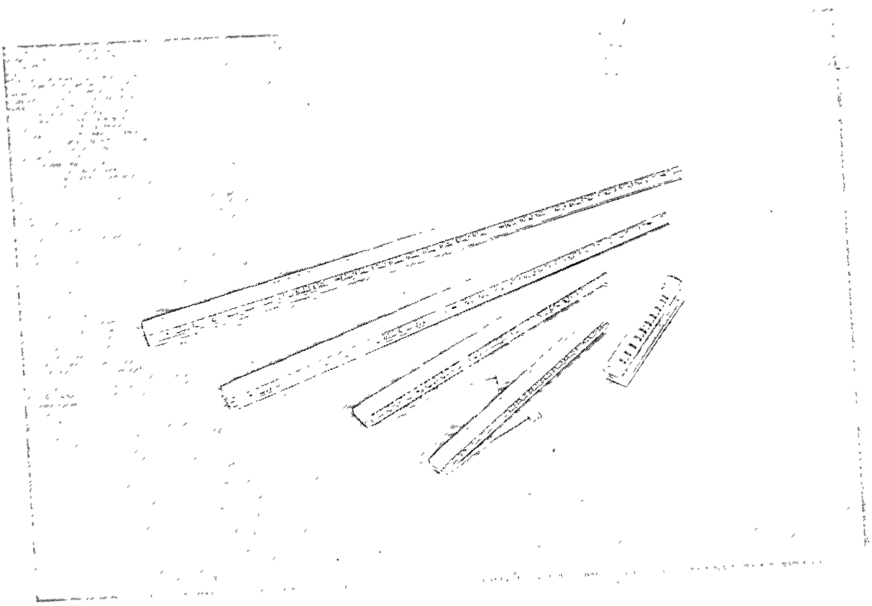
5. ELECTRICAL/OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	RATING			TEST CONDITION	REF.
		MIN.	TYP.	MAX.		
Forward Voltage	VF	4.0 V	4.2 V	4.4 V	IF = 24 mA	TA = 25°C
Peak Emission Wavelength	λp	–	565	–	IF = 24 mA	Index (3)
Reverse Current	IR	–	–	0.1 mA	VR = 8 V	TA = 25°C
Spectral Line Half Width	Δλ	–	35	–		

* Index (3): Source Color (Green DICE)

C. Light Source

- LIGHT SOURCE QUICK REFERENCE GUIDE



LIGHT SOURCE

LIGHT SOURCE QUICK REFERENCE GUIDE

DEVICE		DESCRIPTION		EFFECTIVE LENGTH	SUPPLY VOLTAGE	PACKAGE DIMENSION	PAGE NO.
PACKAGE	PART NO.	COLOR	TYPE				
243mm L	LTM-88X27	Green (565 nm)	ϕ4 Transparent	216 mm	12.0 V	FIG. 2-1	C-2
284mm L	LTM-88X28	Green (565 nm)	ϕ4 Transparent	263 mm	12.0 V	FIG. 2-2	C-6
75mm L	LTM-88X29	Ultra Bright (660 nm)	ϕ10 Transparent	35 mm	5.0 V	FIG. 2-3	C-10
148mm L	LTM-88X55	Green (565 nm)	ϕ4 Transparent	128 mm	12.0 V	FIG. 2-4	C-14
125mm L	LTM-89X12	Green (565 nm)	ϕ4 Transparent	105 mm	12.0 V	FIG. 2-5	C-18

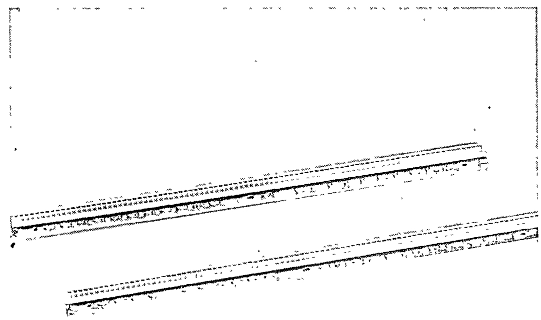
LITEON

LIGHT SOURCE

LTM-88X27

FEATURES

- EXCELLENT CHARACTERS APPEARANCES. LOW POWER REQUIREMENT.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE 92 PCS OF LED.
- HIGH RELIABILITY & LONG LIFE.
- SUITABLE AS A LIGHT SOURCE OF THE FOLLOWING APPLICATIONS FACSIMILE. IMAGE. SCANNER.



PACKAGE DIMENSIONS

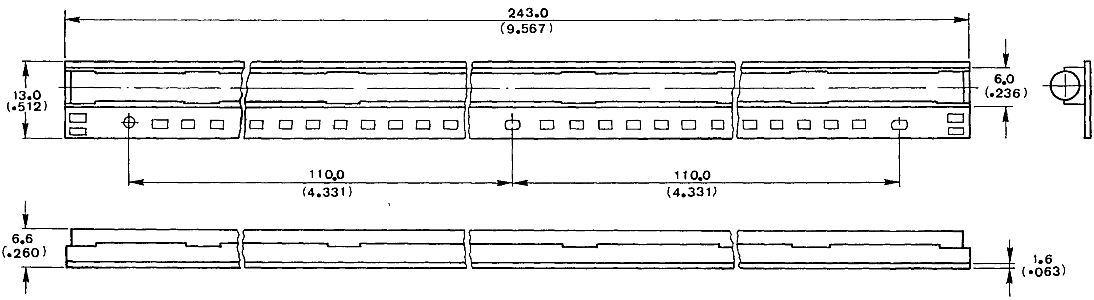
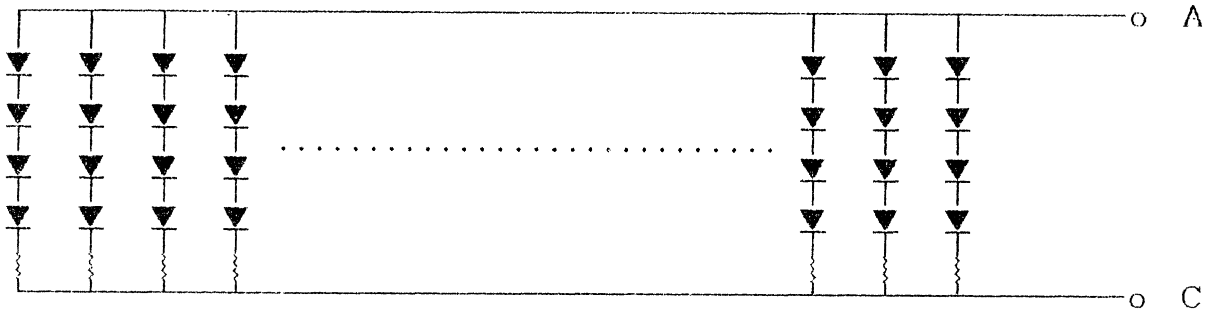


FIG. 2-1

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

LIGHT

1. SCHEMATIC CIRCUIT



4 x 23 = 92 (LED NUMBERS)

A = ANODE
C = CATHODE

2. ABSOLUTE MAXMUM RATING

PARAMETER	SYMBOL	RATING
Forward Voltage	VDD	13 (V)
Reverse Voltage	VR	16 (V)
Power Disipation	Po	5.6 (W)
Operating Temperature	Topr	−10 to +50 (°C)
Storage Temperature	Tsto	−20 to +60 (°C)

3. ELECTRICALL CHARACTERISTICS (Ta = 25°C)

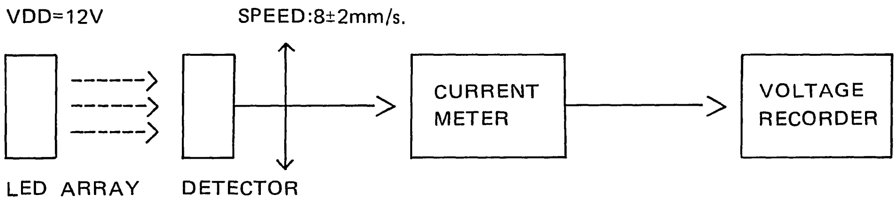
PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Forward Current	IDD	VDD = 12V	–	370	430	mA
Reverse Current	IR	VR = 16V	–	–	100	μA

LIGHT SOURCE

4. OPTICAL CHARACTERISTICS

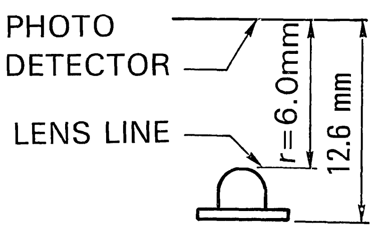
PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Peak Luminous	Lvp	VDD = 12 V NOTE 1.	1000	–	–	Lx
Condensing Light Half Width	ΔL		2.05	2.1	2.37	mm
Peak Emission Wavelength	λp	IF = 20 mA	–	565	–	nm
Spectral Line Half Width	$\Delta\lambda$	IF = 20 mA	–	25	–	nm

TEST DIAGRAM

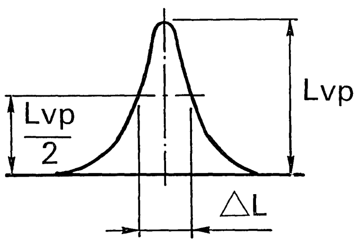


* NOTE 1. Peak Luminous (Lvp), Condensing Light Half Width (ΔHL), Condensing Irradiation Width (ΔL) Measurement:

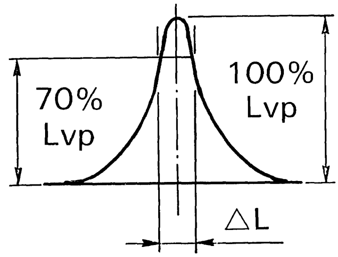
Measure Position



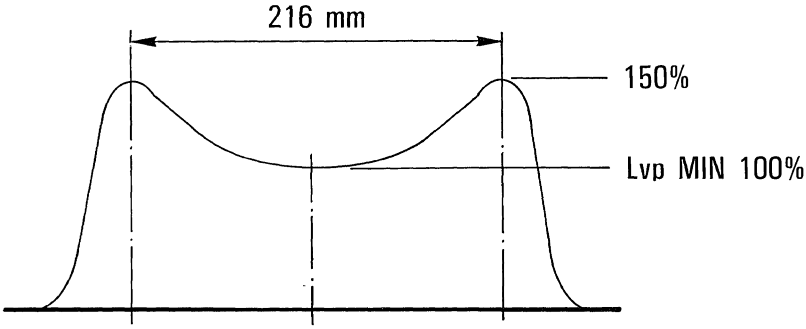
(1) Condensing Light Half

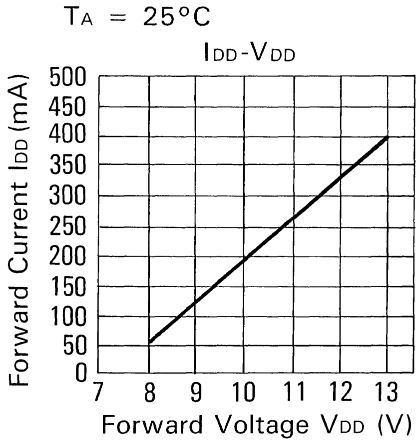


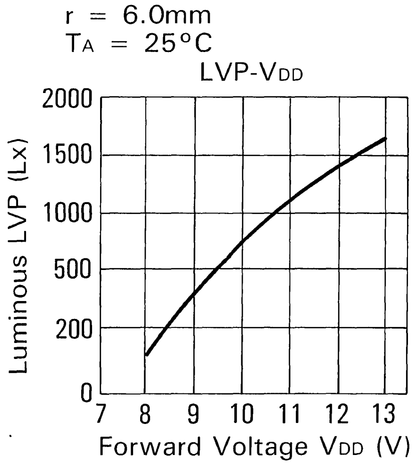
(2) Condensing Irradiation Width

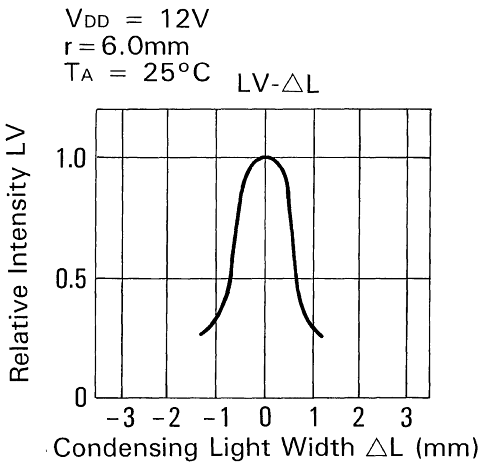


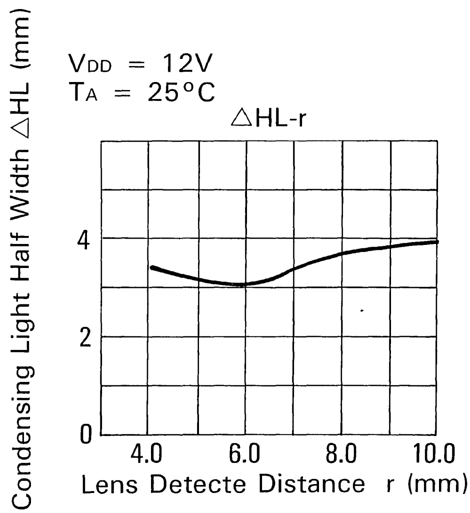
Luminous Matching

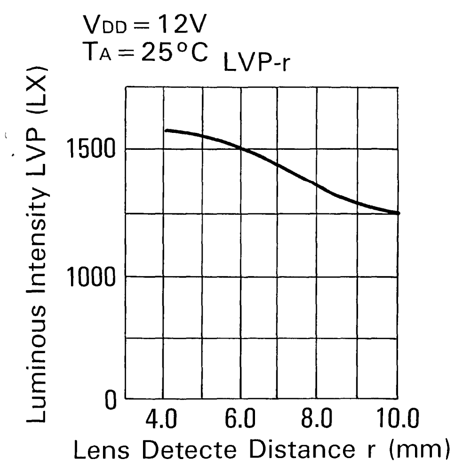


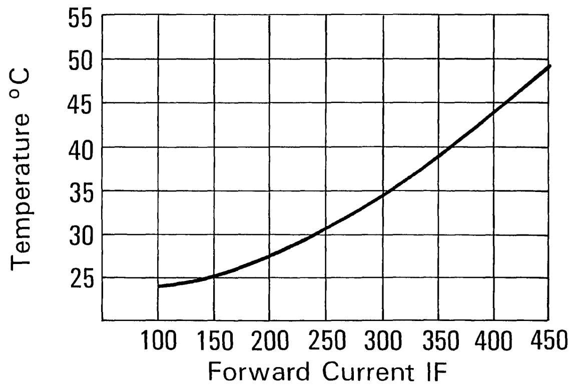

TA = 25°C
IDD-VDD
Forward Current IDD (mA)
Forward Voltage VDD (V)


r = 6.0mm
TA = 25°C
LVP-VDD
Luminous LVP (Lx)
Forward Voltage VDD (V)


VDD = 12V
r = 6.0mm
TA = 25°C
LV-△L
Relative Intensity LV
Condensing Light Width △L (mm)


VDD = 12V
TA = 25°C
△HL-r
Condensing Light Half Width △HL (mm)
Lens Detecte Distance r (mm)


VDD = 12V
TA = 25°C
LVP-r
Luminous Intensity LVP (LX)
Lens Detecte Distance r (mm)

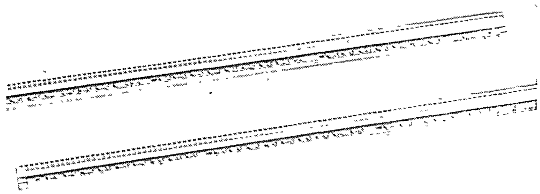

Temperature °C
Forward Current IF

LIGHT SOURCE

LTM-88X28

FEATURES

- EXCELLENT CHARACTERS APPEARANCES.
- LOW POWER REQUIREMENT.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE 92 PCS OF LED.
- HIGH RELIABILITY & LONG LIFE.
- SUITABLE AS A LIGHT SOURCE OF THE COPIER, APPLICATIONS FACSIMICE.



PACKAGE DIMENSIONS

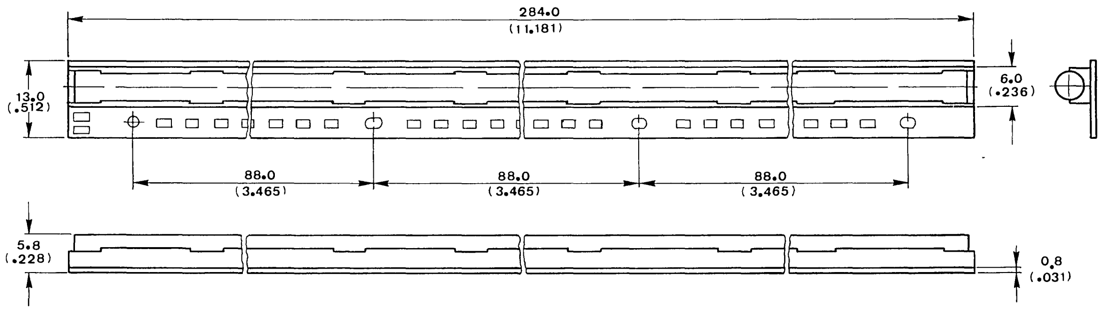
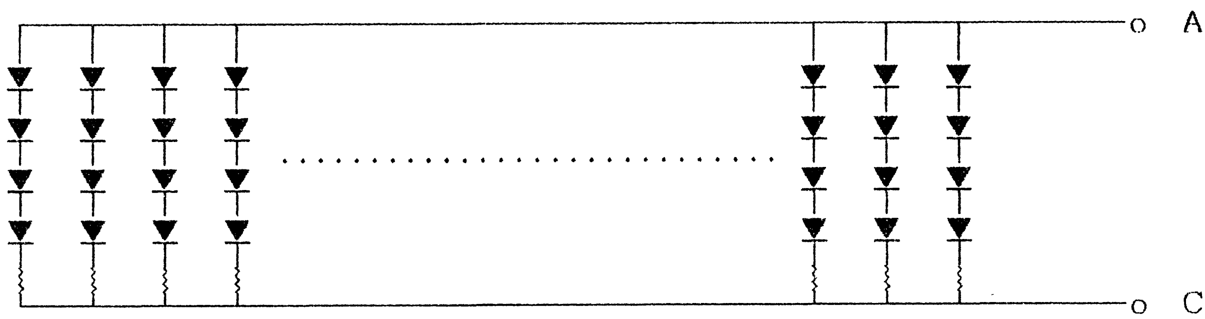


FIG. 2-2

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

1. SCHEMATIC CIRCUIT



4 x 7 4 x 27 = 108 (LED NUMBERS)

A = ANODE
C = CATHODE

2. ABSOLUTE MAXMUM RATING

PARAMETER	SYMBOL	RATING
Forward Voltage	VDD	13 (V)
Reverse Voltage	VR	16 (V)
Power Disipation	Po	5.98 (W)
Operating Temperature	Topr	–10 to +50 (°C)
Storage Temperature	Tsto	–20 to +60 (°C)

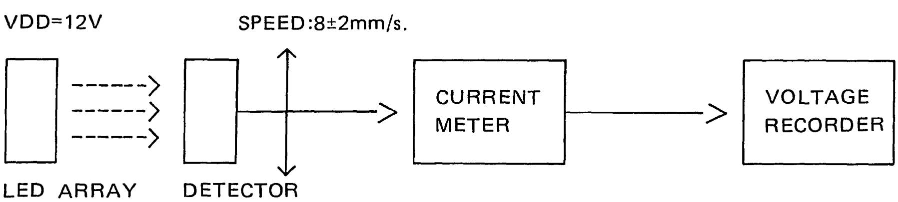
3. ELECTRICALL CHARACTERISTICS (Ta = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Forward Current	IDD	VDD = 12V	–	410	460	mA
Reverse Current	IR	VR = 16V	–	–	100	μA

4. OPTICAL CHARACTERISTICS

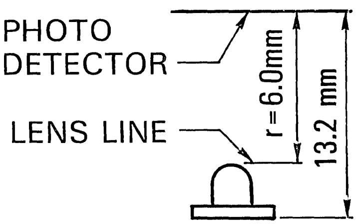
PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Peak Luminous	Lvp	VDD = 12 V NOTE 1.	1000	–	–	Lx
Condensing Light Half Width	ΔL	VDD = 12 V NOTE 1.	2.05	2.1	2.37	mm
Peak Emission Wavelength	λp	IF = 20 mA	–	565	–	nm
Spectral Line Half Width	Δλ	IF = 20 mA	–	25	–	nm

TEST DIAGRAM

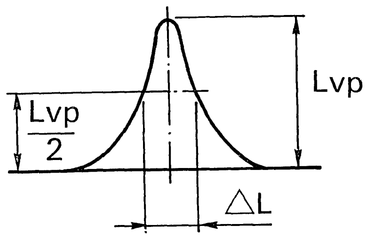


* NOTE 1. Peak Luminous (Lvp), Condensing Light Half Width (ΔHL), Measurement:

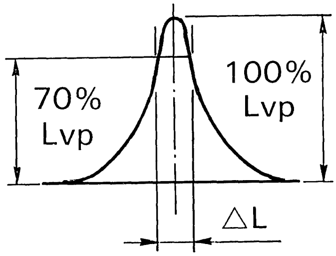
Measure Position



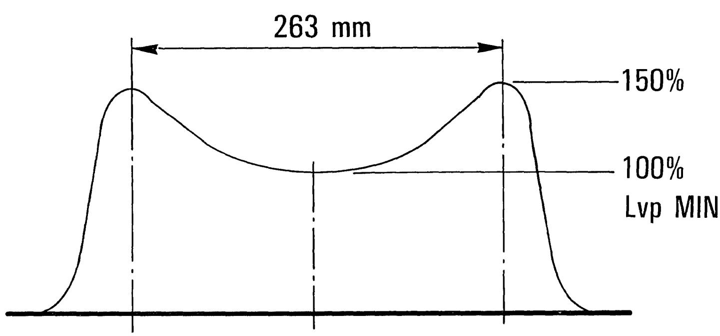
(1) Codensing Light Half

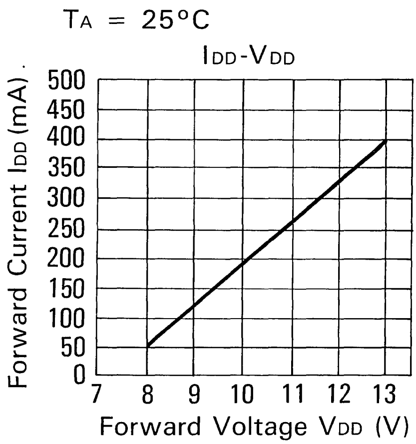


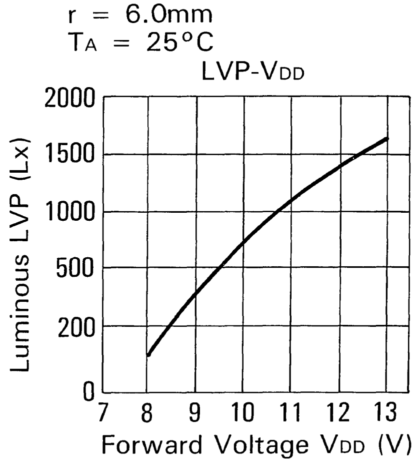
(2) Condensing Irradiation Width Width (ΔHL),

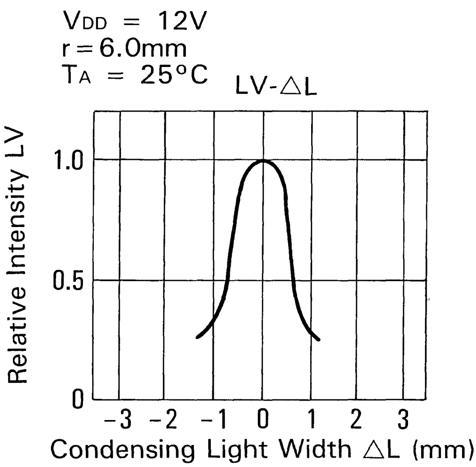


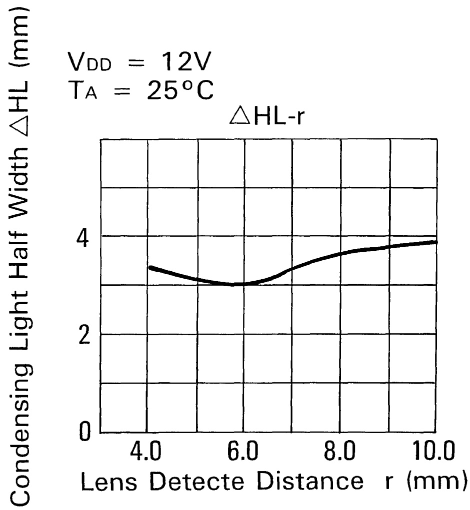
Luminous Matching

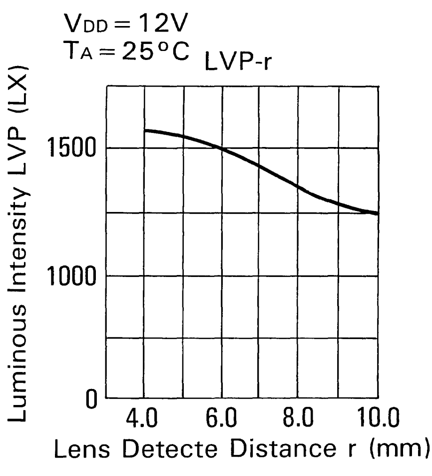


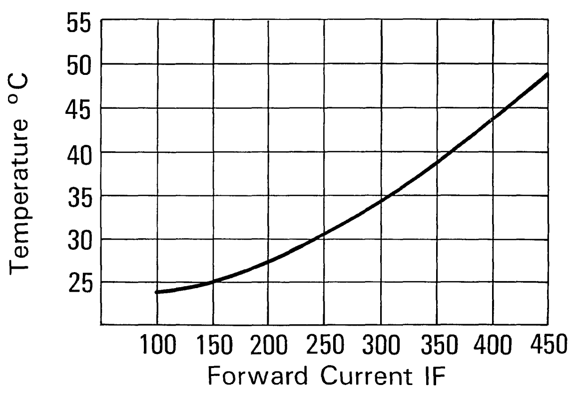

TA = 25°C
IDD-VDD
Forward Current IDD (mA)
500
450
400
350
300
250
200
150
100
50
0
7 8 9 10 11 12 13
Forward Voltage VDD (V)


r = 6.0mm
TA = 25°C
LVP-VDD
Luminous LVP (Lx)
2000
1500
1000
500
200
0
7 8 9 10 11 12 13
Forward Voltage VDD (V)


VDD = 12V
r = 6.0mm
TA = 25°C
LV-△L
Relative Intensity LV
1.0
0.5
0
−3 −2 −1 0 1 2 3
Condensing Light Width △L (mm)


VDD = 12V
TA = 25°C
△HL-r
Condensing Light Half Width △HL (mm)
4
2
0
4.0 6.0 8.0 10.0
Lens Detecte Distance r (mm)


VDD = 12V
TA = 25°C
LVP-r
Luminous Intensity LVP (LX)
1500
1000
0
4.0 6.0 8.0 10.0
Lens Detecte Distance r (mm)


Temperature °C
55
50
45
40
35
30
25
100 150 200 250 300 350 400 450
Forward Current IF

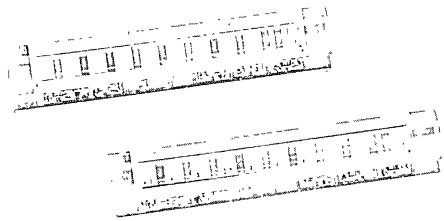
LITEON

LIGHT SOURCE

LTM-88X29

FEATURES

- EXCELLENT CHARACTERS APPEARANCES.
- LOW POWER REQIREMENTS.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE 10 PCS OF LED.
- HIGH RELIABILITY & LONG LIFE.
- SUITABLE AS A LIGHT SOURCE OF THE FOLLOWING APPLICATIONS FACSIMILE, IMAGE SCANNER.



PACKAGE DIMENSIONS

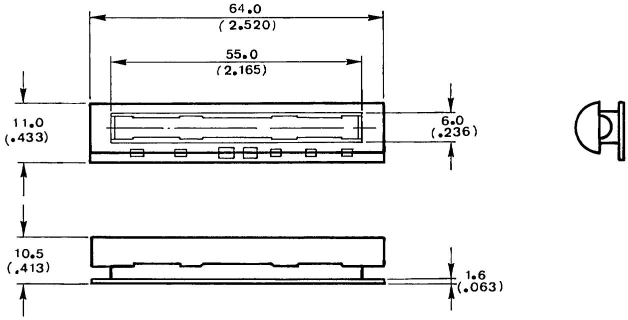
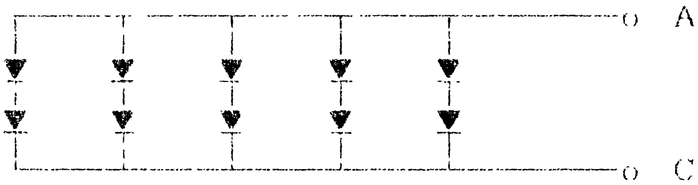


FIG. 2-3

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

1. SCHEMATIC CIRCUIT



A = ANODE
C = CATHODE

2 x 5 = 10 (LED NUMBERS)

2. ABSOLUTE MAXMUM RATING

PARAMETER	SYMBOL	RATING
Forward Voltage	VDD	5 (V)
Reverse Voltage	VR	8 (V)
Power Disipation	Po	0.4 (W)
Operating Temperature	Topr	–10 to –50 (°C)
Storage Temperature	Tsto	–20 to +60 (°C)

3. ELECTRICALL CHARACTERISTICS (Ta = 25°C)

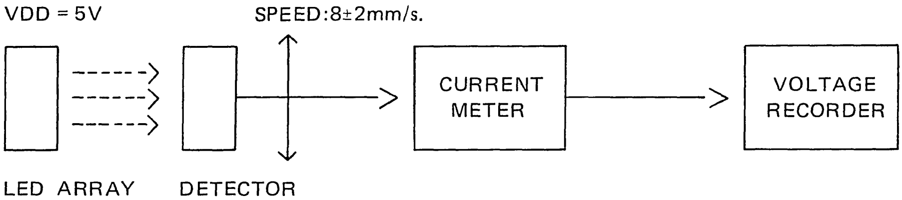
PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Forward Current	IDD	VDD = 5V	–	50	80	mA
Reverse Current	IR	VR = 8V	–	–	100	μA

4. OPTICAL CHARACTERISTICS

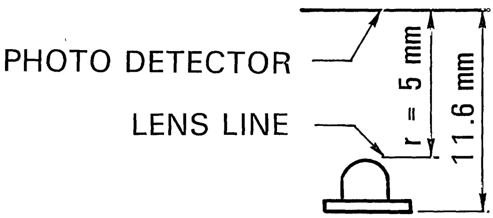
PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Peak Luminous	Lvp	VDD = 5V NOTE 1.	1000	–	–	mv
Condensing Light Half Width	ΔL		–	7.5	–	mm
Peak Emission Wavelength	λp	IF = 50mA	–	660	–	nm
Spectral Line Half Width	$\Delta\lambda$	IF = 50mA	–	20	–	nm

TEST DIAGRAM

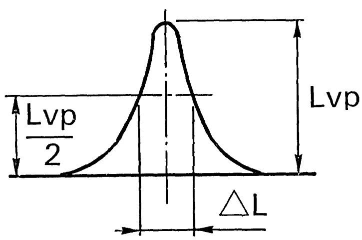
VDD = 5V



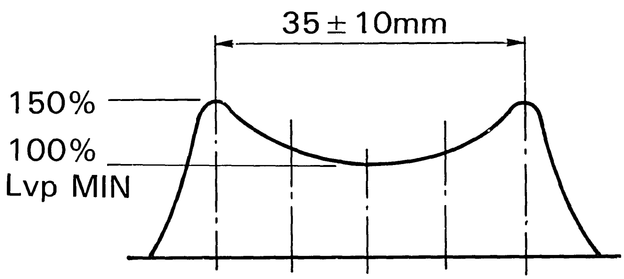
* NOTE 1. Peak Luminous (Lvp), Condensing Light Half Width (ΔL) Measurement:

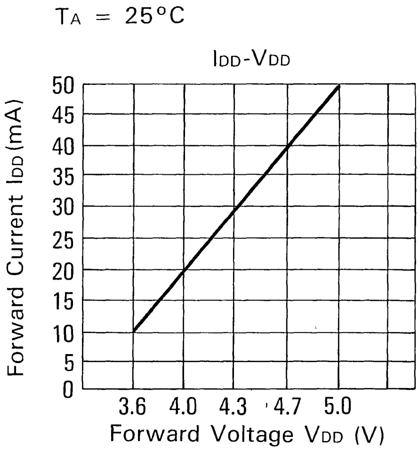


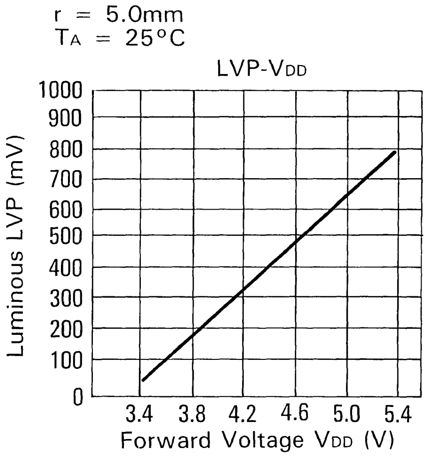
Peak Luminous, Condensing Light Half Width

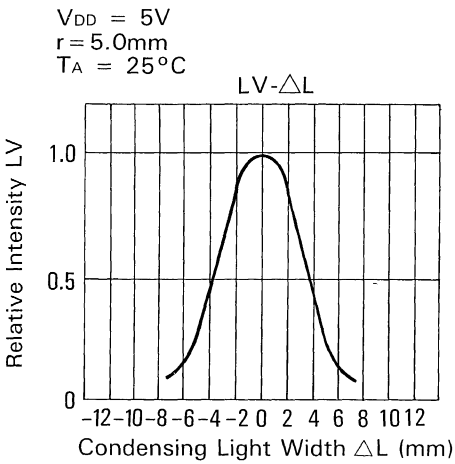


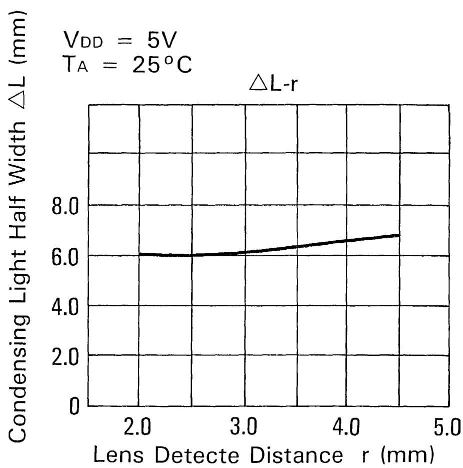
Luminous Matching

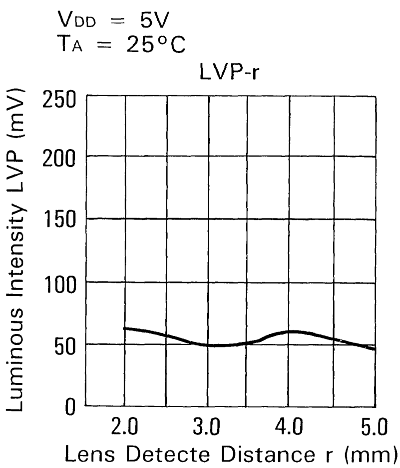



TA = 25°C
IDD-VDD
Forward Current IDD (mA)
50
45
40
35
30
25
20
15
10
5
0
3.6 4.0 4.3 4.7 5.0
Forward Voltage VDD (V)


r = 5.0mm
TA = 25°C
LVP-VDD
Luminous LVP (mV)
1000
900
800
700
600
500
400
300
200
100
0
3.4 3.8 4.2 4.6 5.0 5.4
Forward Voltage VDD (V)


VDD = 5V
r = 5.0mm
TA = 25°C
LV-△L
Relative Intensity LV
1.0
0.5
0
-12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12
Condensing Light Width △L (mm)


VDD = 5V
TA = 25°C
△L-r
Condensing Light Half Width △L (mm)
8.0
6.0
4.0
2.0
0
2.0 3.0 4.0 5.0
Lens Detecte Distance r (mm)

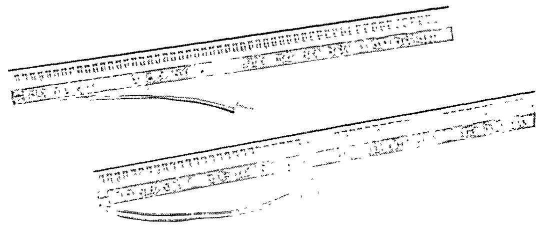

VDD = 5V
TA = 25°C
LVP-r
Luminous Intensity LVP (mV)
250
200
150
100
50
0
2.0 3.0 4.0 5.0
Lens Detecte Distance r (mm)

LIGHT SOURCE

LTM-88X55

FEATURES

- EXCELLENT CHARACTERS APPEARANCES.
- LOW POWER REQUIREMENT.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE 56 PCS OF LED.
- HIGH RELIABILITY & LONG LIFE.
- SUITABLE AS A LIGHT SOURCE OF APPLICATIONS IMAGE SCANNER.



PACKAGE DIMENSIONS

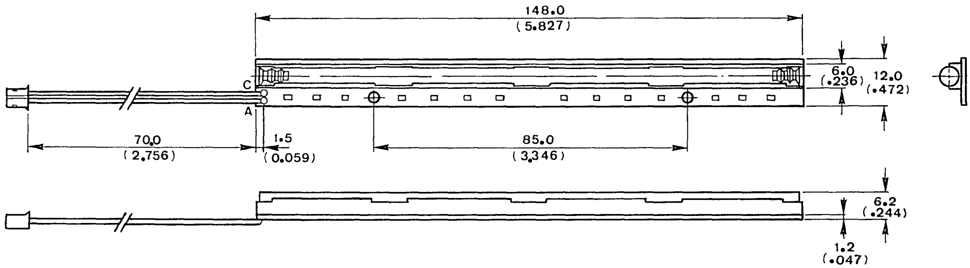
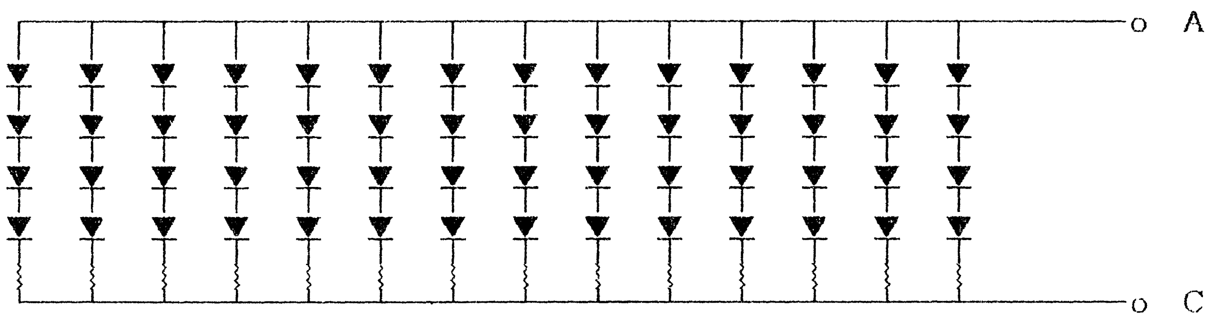


FIG. 2-4

NOTES:

1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

1. SCHEMATIC CIRCUIT



4 x 14 = 56 (LED NUMBERS)

A = ANODE
C = CATHODE

2. ABSOLUTE MAXMUM RATING

PARAMETER	SYMBOL	RATING
Forward Voltage	VDD	13 (V)
Reverse Voltage	VR	16 (V)
Power Disipation	Po	4.9 (W)
Operating Temperature	Topr	–10 to +50 (°C)
Storage Temperature	Tsto	–20 to +60 (°C)

3. ELECTRICALL CHARACTERISTICS (Ta = 25°C)

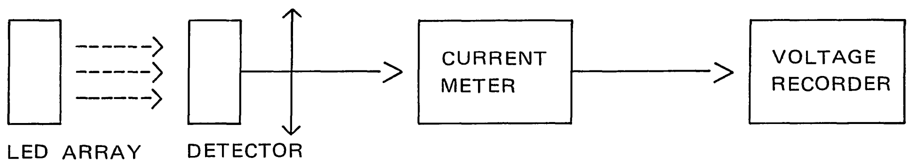
PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Forward Current	IDD	VDD = 12V	–	300	350	mA
Reverse Current	IR	VR = 16V	–	–	100	μA

4. OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Peak Luminous	Lvp	VDD = 12 V NOTE 1.	1000	–	–	Lx
Condensing Light Half Width	ΔL		–	1.7	–	mm
Peak Emission Wavelength	λp	IF = 20 mA	–	565	–	nm
Spectral Line Half Width	$\Delta\lambda$	IF = 20 mA	–	25	–	nm

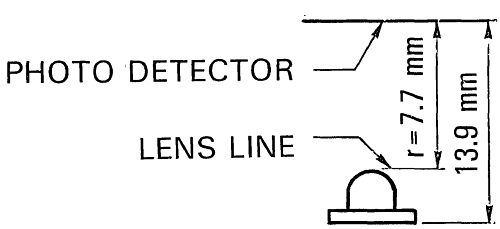
TEST DIAGRAM

VDD=12V SPEED:8±2mm/s.

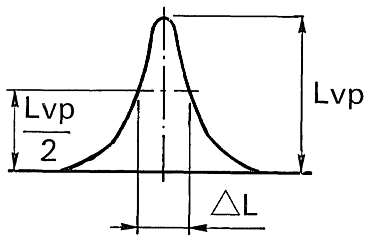


* NOTE 1. Peak Luminous (Lvp), Condensing Light Half Width (ΔL)
Measurement:

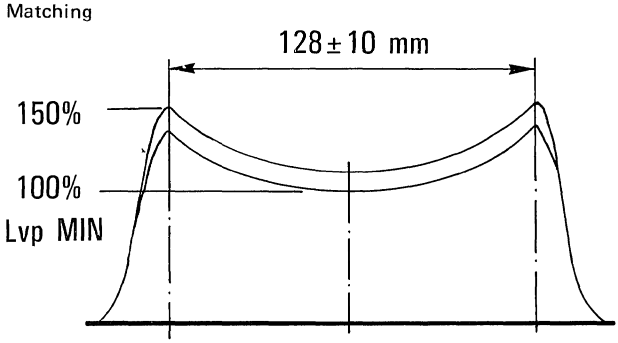
Measure Position

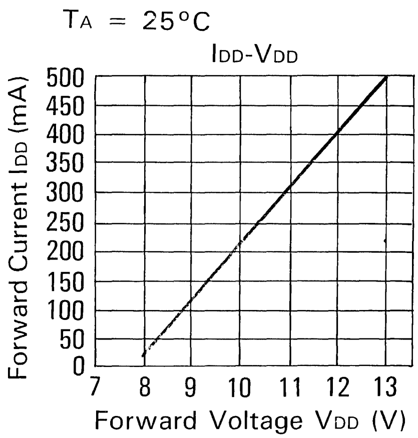


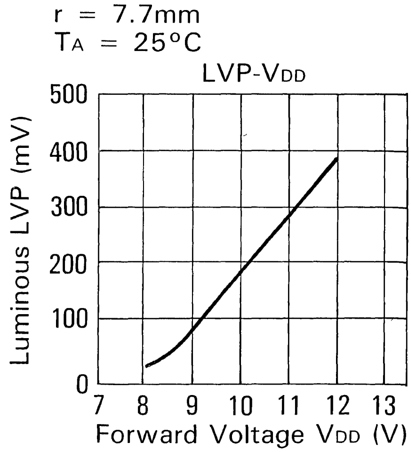
Peak Luminous, Condensing Light Half Width

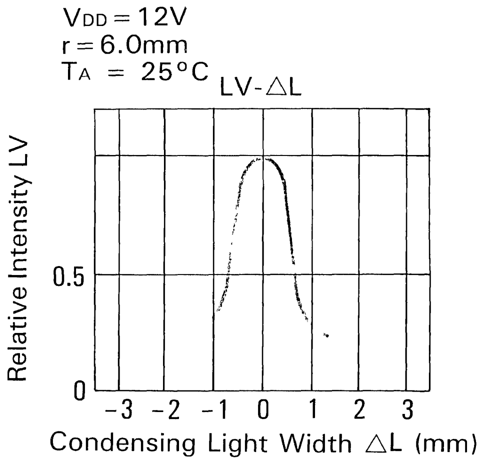


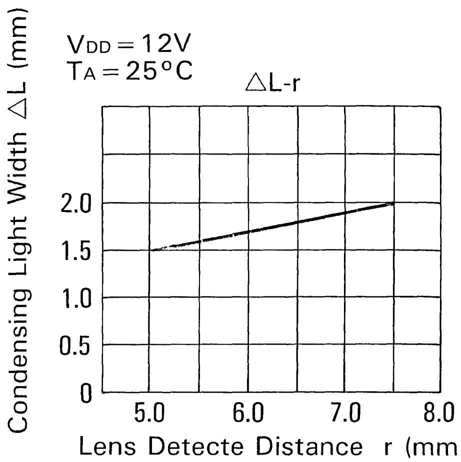
Luminous Matching

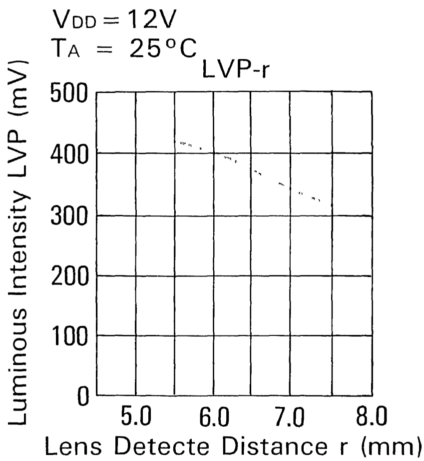



TA = 25°C
IDD-VDD
Forward Current IDD (mA)
500
450
400
350
300
250
200
150
100
50
0
7 8 9 10 11 12 13
Forward Voltage VDD (V)


r = 7.7mm
TA = 25°C
LVP-VDD
Luminous LVP (mV)
500
400
300
200
100
0
7 8 9 10 11 12 13
Forward Voltage VDD (V)


VDD = 12V
r = 6.0mm
TA = 25°C
LV-△L
Relative Intensity LV
0.5
0
−3 −2 −1 0 1 2 3
Condensing Light Width △L (mm)


VDD = 12V
TA = 25°C
△L-r
Condensing Light Width △L (mm)
2.0
1.5
1.0
0.5
0
5.0 6.0 7.0 8.0
Lens Detecte Distance r (mm)

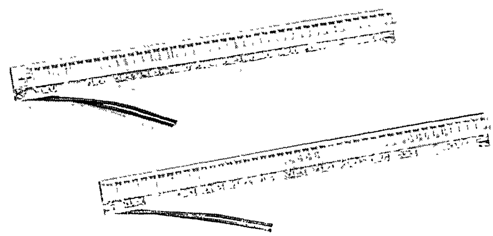

VDD = 12V
TA = 25°C
LVP-r
Luminous Intensity LVP (mV)
500
400
300
200
100
0
5.0 6.0 7.0 8.0
Lens Detecte Distance r (mm)

LIGHT SOURCE

LTM-89X12

FEATURES

- EXCELLENT CHARACTERS APPEARANCES.
- LOW POWER REQUIREMENT.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE 48 PCS OF LED.
- HIGH RELIABILITY & LONG LIFE.
- SUITABLE AS A LIGHT SOURCE OF APPLICATIONS IMAGE SCANNER.



LIGHT SOURCE

PACKAGE DIMENSIONS

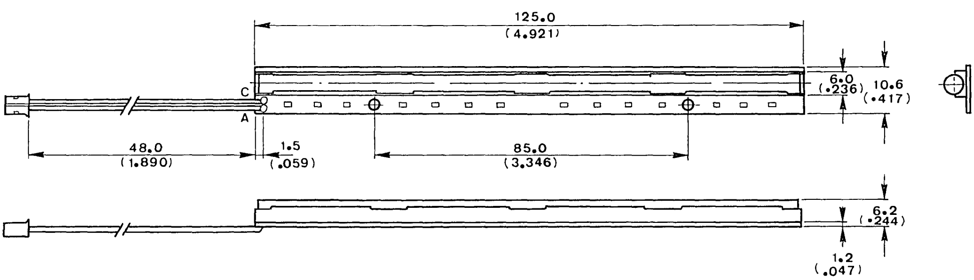
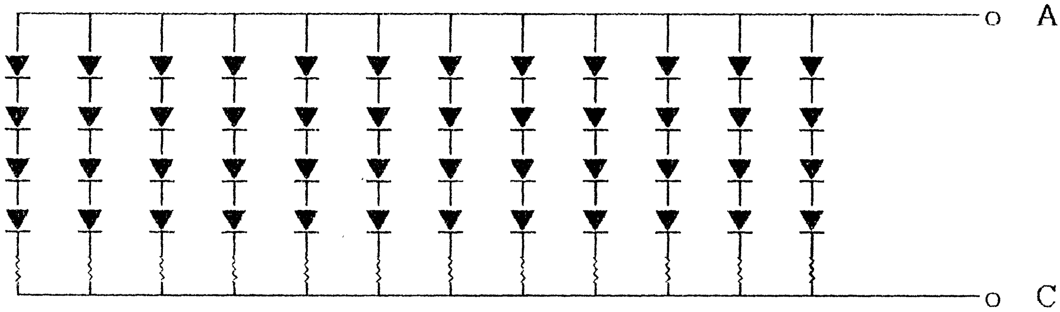


FIG. 2-5

NOTES:
1. All dimensions are in millimeters (inches.)
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

1. SCHEMATIC CIRCUIT



4 x 12 = 48 (LED NUMBERS)   A = ANODE
C = CATHODE

2. ABSOLUTE MAXMUM RATING

PARAMETER	SYMBOL	RATING
Forward Voltage	VDD	13 (V)
Reverse Voltage	VR	16 (V)
Power Disipation	Po	3.25 (W)
Operating Temperature	Topr	–10 to +50 (°C)
Storage Temperature	Tsto	–20 to +70 (°C)

3. ELECTRICALL CHARACTERISTICS (Ta = 25°C)

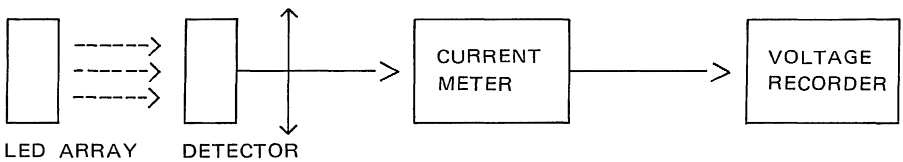
PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Forward Current	IDD	VDD = 12V	–	230	250	mA
Reverse Current	IR	VR = 16V	–	–	100	μA

4. OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Peak Luminous	Lvp	VDD = 12 V NOTE 1.	1300	–	–	Lx
Condensing Light Half Width	ΔL		–	1.6	–	mm
Peak Emission Wavelength	λp	IF = 20 mA	–	565	–	nm
Spectral Line Half Width	$\Delta\lambda$	IF = 20 mA	–	25	–	nm

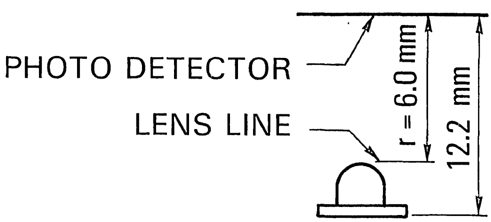
TEST DIAGRAM

VDD=12V SPEED:8±2mm/s.

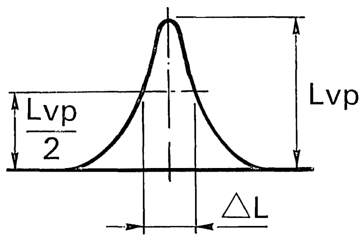


* NOTE 1 Peak Luminous (Lvp), Condensing Light Half Width (ΔL) Measurement.

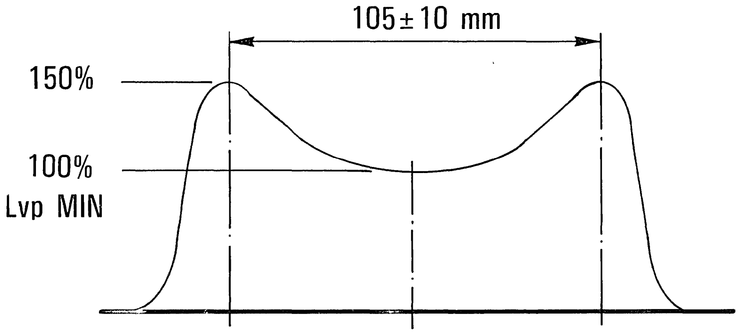
Measure Position

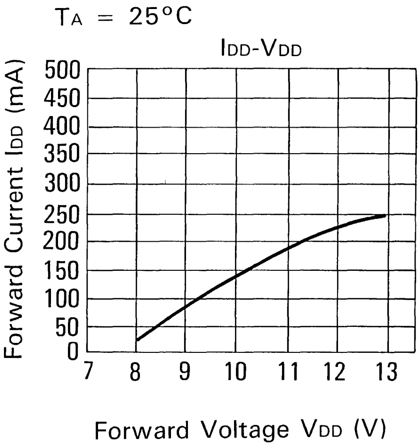


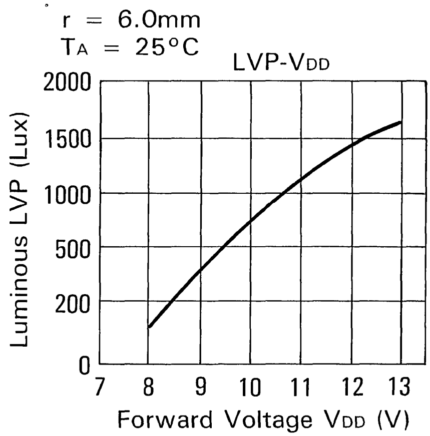
Peak Luminous, Condensing Light Half Width

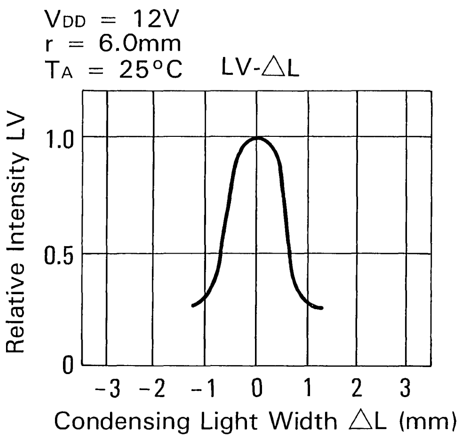


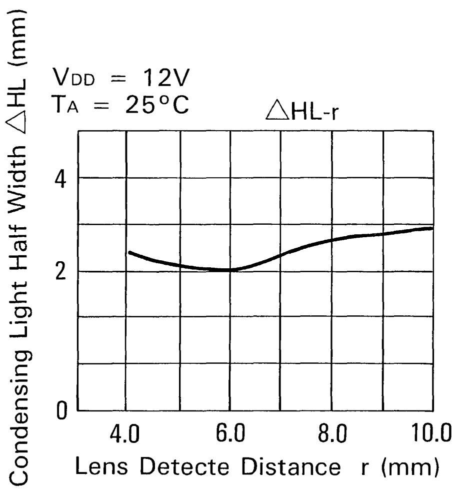
Luminous Matching

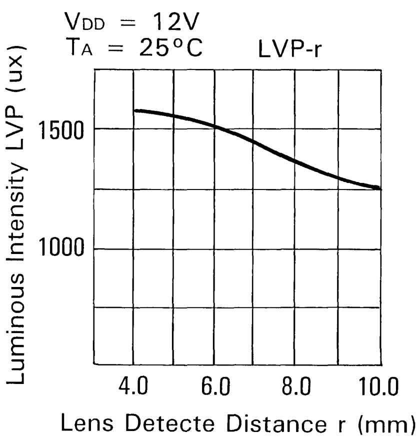


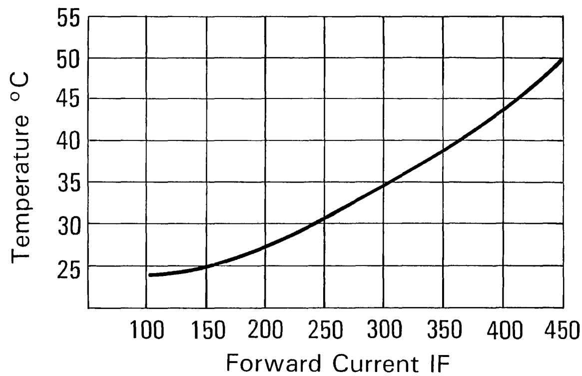

TA = 25°C
IDD-VDD
Forward Current IDD (mA)
500
450
400
350
300
250
200
150
100
50
0
7
8
9
10
11
12
13
Forward Voltage VDD (V)


r = 6.0mm
TA = 25°C
LVP-VDD
Luminous LVP (Lux)
2000
1500
1000
500
200
0
7
8
9
10
11
12
13
Forward Voltage VDD (V)


VDD = 12V
r = 6.0mm
TA = 25°C
LV-△L
Relative Intensity LV
1.0
0.5
0
-3
-2
-1
0
1
2
3
Condensing Light Width △L (mm)


VDD = 12V
TA = 25°C
△HL-r
Condensing Light Half Width △HL (mm)
4
2
0
4.0
6.0
8.0
10.0
Lens Detecte Distance r (mm)

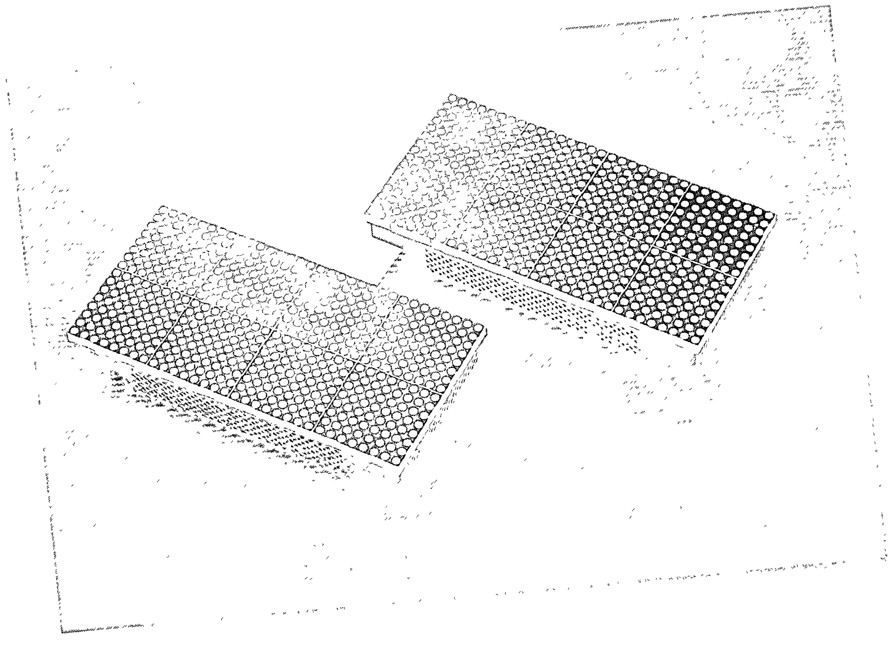

VDD = 12V
TA = 25°C
LVP-r
Luminous Intensity LVP (ux)
1500
1000
4.0
6.0
8.0
10.0
Lens Detecte Distance r (mm)


Temperature °C
55
50
45
40
35
30
25
100
150
200
250
300
350
400
450
Forward Current IF

LIGHT SOURCE

D. Multicolor LED Block Modules for Graphic Displays & Sign Board Displays

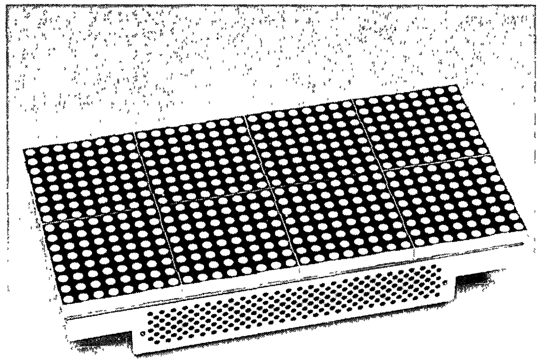
- LTM-8711-1 DISPLAY MODULE
- LTM-8843-1 LONG MOVING SIGN MODULE



LTM-8711-1 DISPLAY MODULE SPECIFICATION

1. SCOPE

The LTM-8711-1 5ϕ display module consists of CPU memory, driver, and dot matrix display. There are three colors in the module, red, green, and yellow. It is an intelligent display module that can be expanded to as large as you need.
The data is transfered by the personal computer with a particular interface card. Whatever it is character mode or graphic mode. It is colorful & changeable display.

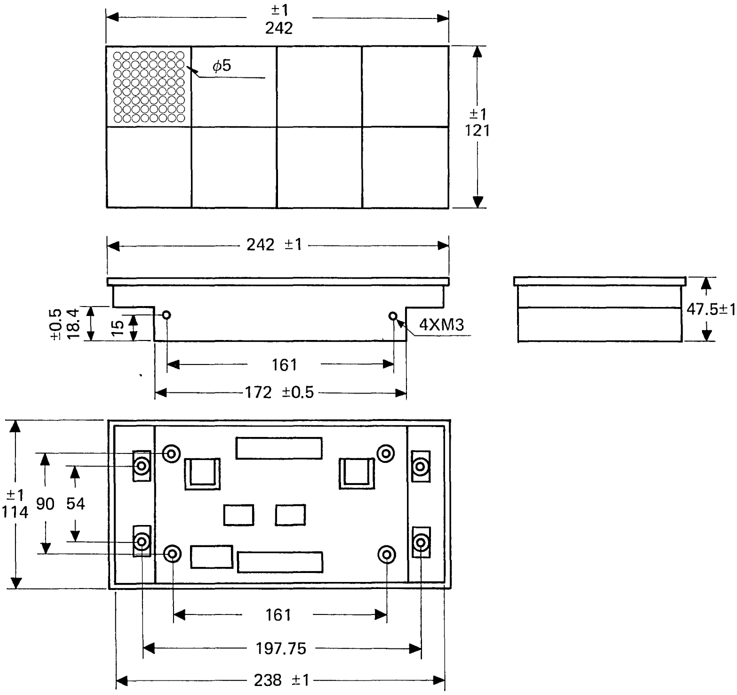


2. FEATURES

- SIZE: 16 X 32 DOTS, 24CM (WIDE) X 12CM (HIGHT).
- COLOR: RED, GREEN, YELLOW.
- WIDE VIEWING ANGLE.
- CONTENT: CONTROLER, MEMORY, DRIVER AND DOT MATRIX DISPLAY.
- INPUT, OUTPUT: TTL COMPATIBLE.

3. MECHANIC

Outline dimension (FIG.1)



4. ELECTRONIC CHARACTERISTIC

Absolute maximum rating at T = 25°C

Parameter	Symbol	Min.	Max.	Units
Supply Voltage	VDD	−0.3	9	V
Input Voltage	VI		5.5	V
Power Dissipation	PD		30	W
Operating Temperature Range (At Case)	TOP	0	45	°C
Storage Temperature Range	TSTG	−20	+60	°C

Operation condition at T = 25°C

Parameter	Symbol	Min.	Tpy.	Max.	Units
Supply Voltage	VDD	7	7.2	8	V
Supply Current	IDD		3		A
Transmission Speed (Per Module)			3		mS
I/O Connector					
Input Voltage	VIH	2.0			V
	VIL			0.8	V
Output Voltage	VOH	2.0			V
	VOL			0.8	V
Output Current	IOH		0.5		mA
	IOL			2.0	mA

MULTICOLOR LED MODULES

Optical characteristic at T = 25°C

Parameter	Symbol	Tpy.	Max.	units	Test Condition
Average Luminous Intensity	I	3000		μcd	At Vdd
Peak Emission Wave Length (Green)	λp	565		mm	= 7.2V
Peak Emission Wave Length (Red)	λp	630		mm	
Luminous Intensity Matching Ratio			2:1		

5. CONNECTOR PIN ASSIGNMENT

Input connector (Type: 3M 3428-6302 or equivalent)

Pin No.	Connection	Pin No.	Connection
1	DATA B0	11	ADDR. B0
2	DATA B1	12	ADDR B1
3	DATA B2	13	ADDR. B2
4	DATA B3	14	ADDR B3
5	DATA B4	15	ADDR B4
6	DATA B5	16	ADDR. B5
7	DATA B6	17	ADDR. B6
8	DATA B7	18	ADDR. B7
9	INPUT	19	GND
10	OUTPUT	20	GND

Output Connector (Type: 3M 3428-6302 or equivalent)

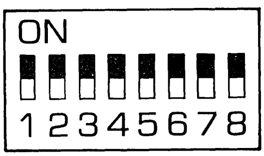
Pin No.	Connection	Pin No.	Connection
1	DATA B0	11	ADDR B0
2	DATA B1	12	ADDR. B1
3	DATA B2	13	ADDR. B2
4	DATA B3	14	ADDR. B3
5	DATA B4	15	ADDR. B4
6	DATA B5	16	ADDR. B5
7	DATA B6	17	ADDR. B6
8	DATA B7	18	ADDR. B7
9	OUTPUT	19	GND
10	INPUT	20	GND

Power connector (Type: mates with molex 70156 IDP or 8981-4p connector)

Pin No.	Connection	Pin No.	Connection
1	VDD	3	GND
2	GND	4	VDD

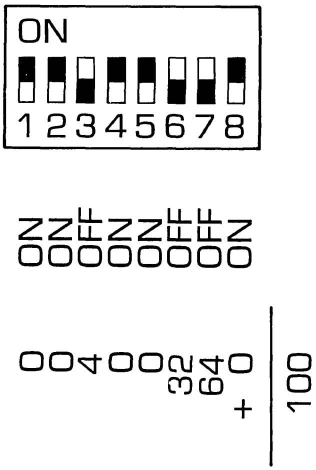
6. SETTING OF ADDRESS SWITCH

"ADDR SW1" Setting

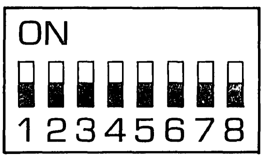


ADDR SW1	VALUE (OFF = "1")	
	OFF	ON
1	1	0
2	2	0
3	4	0
4	8	0
5	16	0
6	32	0
7	64	0
8	128	0

Example. If we want to set address no. → 100



"ADDR SW2" Setting (brightness)



	Red				Green			
	SW2-5	SW2-6	SW2-7	SW2-8	SW2-1	SW2-2	SW2-3	SW2-4
0	ON	ON	ON	X	ON	ON	ON	X
1	OFF	ON	ON	X	OFF	ON	ON	X
2	ON	OFF	ON	X	ON	OFF	ON	X
3	OFF	OFF	ON	X	OFF	OFF	ON	X
4	ON	ON	OFF	X	ON	ON	OFF	X
5	OFF	ON	OFF	X	OFF	ON	OFF	X
6	ON	OFF	OFF	X	ON	OFF	OFF	X
7	OFF	OFF	OFF	X	OFF	OFF	OFF	X

X Don't-care

7. ENVIRONMENTAL CONDITION

		Min.	Max.	Units
7-1 Operation temperature range (at case)		0	+45	°C
7-2 Storage temperature range		–20	+60	°C
7-3 Humidity	Operation	0	90	%
	Non-operation	0	95	%
7-4 Altitude	Operation		2400	m
	Non-operation		9100	m

8. APPLICATION

The big display system allow more efficient use of

A. The plate of adverising, for example

- Theater
- Introduce productions

B. Information service

- Securities
- Exchange rate
- Other money market

C. To display the information of hospital.

D. To display trains destination.

E. Information system of railroad.

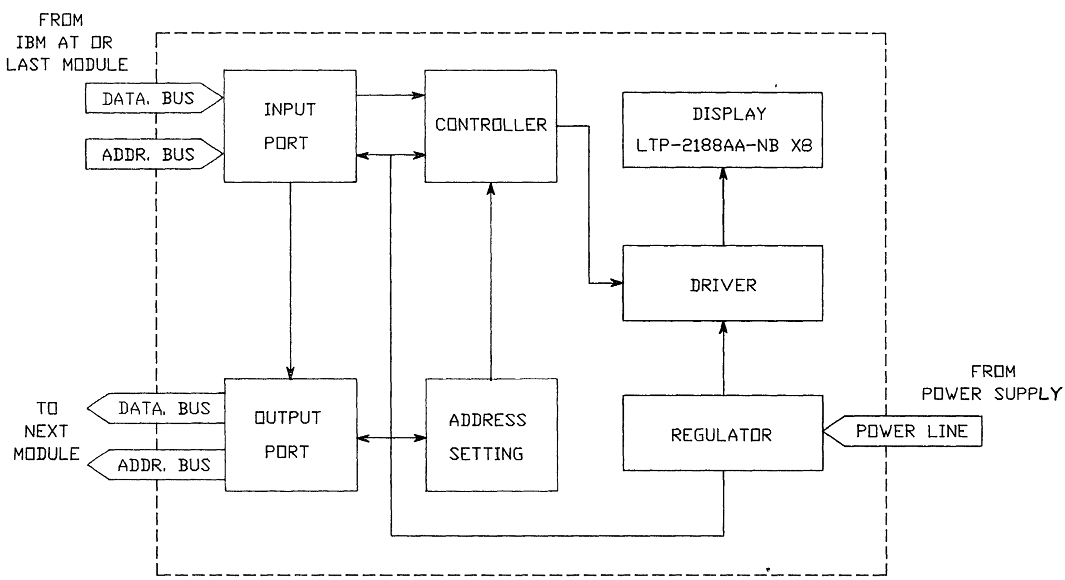


FIG. 2 MODULE BLOCK DIAGRAM

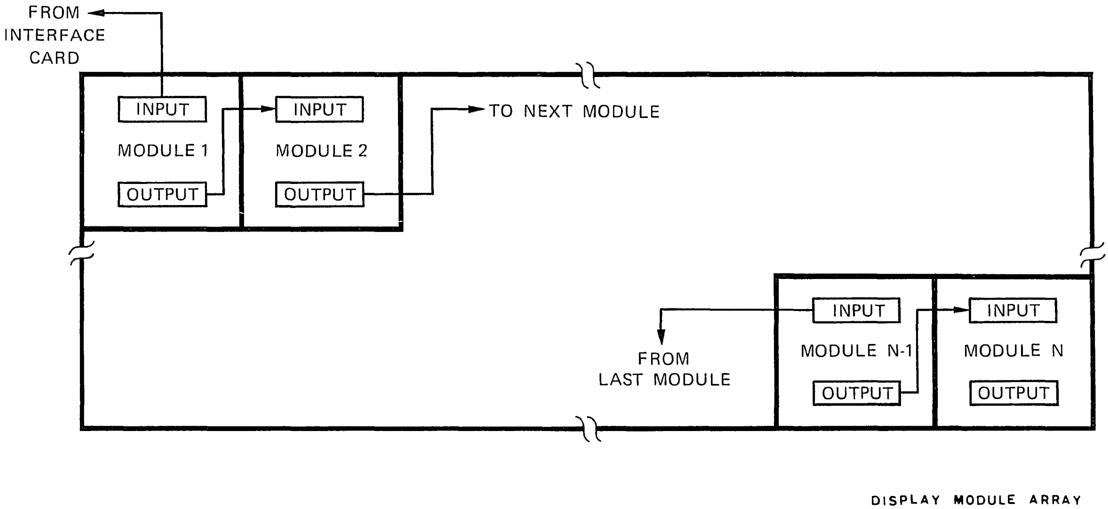


FIG. 3 DISPLAY MODULE ARRAY

MULTICOLOR LED MODULES

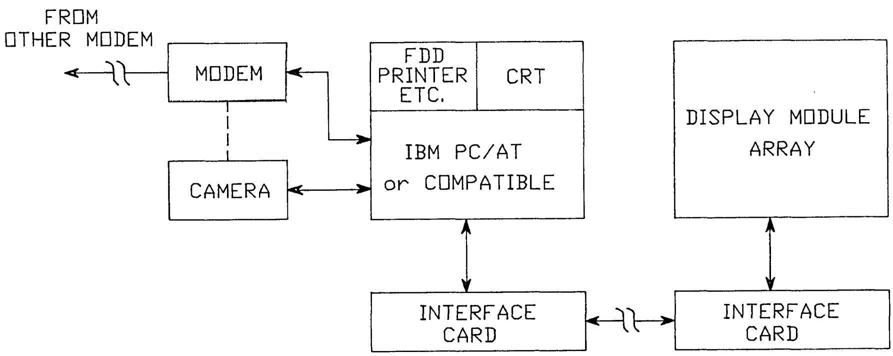


FIG. 4 SYSTEM BLOCK DIAGRAM

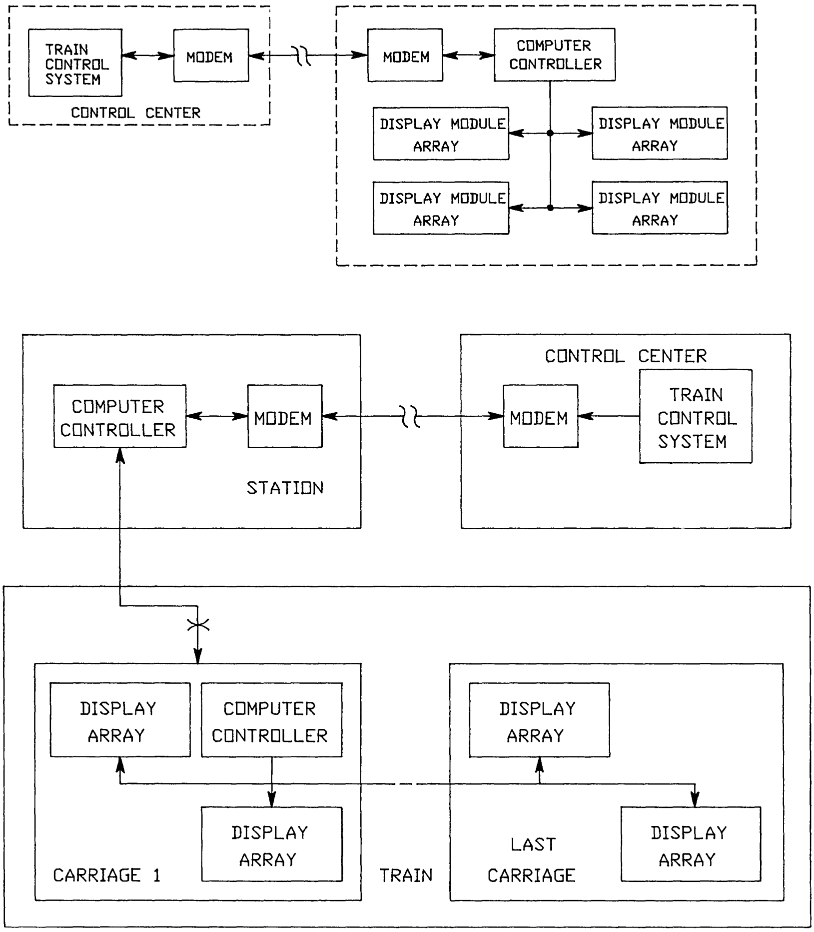
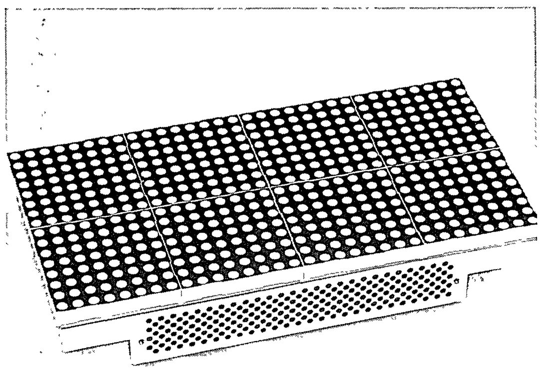


FIG. 5 APPLICATION BLOCK DIAGRAM

LTM-8843-1 LONG MOVING SIGN MODULE SPECIFICATIONS

1. SCOPE

LTM-8843-1 consists of CPU, memory, driver circuit and Dotmatrix display. There are three colors in the dotmatrix display. The display module is an intelligent module that can expand as large as you need (it connects module by module. Pls refer to FIG 1)
The data is transfered by personal computer with a particular interface card, and there are two forms of data, character or graphic, that you can choose.

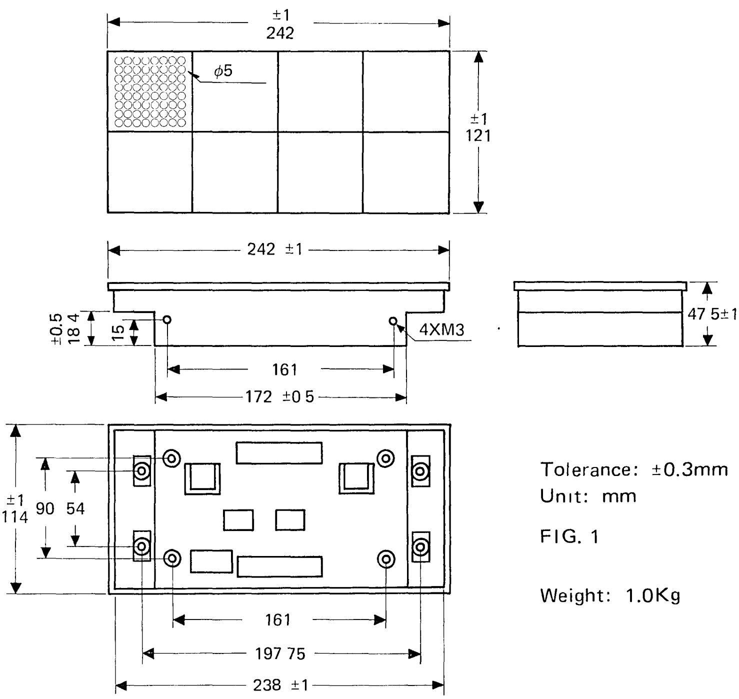


2. FEATURES

- Size: 16*32 dots, 12cm (hight) i24cm (wide) 5.5cm (deep).
- Color: Red, Green, Yellow.
- Content: Control unit, memory, driver circuit, dotmatrix display.
- Speed: High speed — 200 column/sec.
  Middle speed — 100 column/sec
  Low speed — 50 column/sec.

3. MECHANIC

Outline dimension



Tolerance: ±0.3mm
Unit: mm

FIG. 1

Weight: 1.0Kg

MULTICOLOR LED MODULES

4. CONNECTOR PIN ASSIGNMENT

Input Connector (Type: 3M 3428-6302 or equivalent)

Pin No.	Connection	Pin No.	Connection
1	NOT USE	11	DATA B0
2	NOT USE	12	DATA B1
3	NOT USE	13	DATA B2
4	NOT USE	14	DATA B3
5	NOT USE	15	DATA B4
6	NOT USE	16	DATA B5
7	NOT USE	17	DATA B6
8	NOT USE	18	DATA B7
9	ROW SCANNING IN	19	GND
10	FUNCTION IN	20	GND

Output Comector (Type: 3M 3428-6302 or equivalent)

Pin No.	Connection	Pin No.	Connection
1	NOT USE	11	DATA B0
2	NOT USE	12	DATA B1
3	NOT USE	13	DATA B2
4	NOT USE	14	DATA B3
5	NOT USE	15	DATA B4
6	NOT USE	16	DATA B5
7	NOT USE	17	DATA B6
8	NOT USE	18	DATA B7
9	ROW SCANNING OUT	19	GND
10	FUNCTION OUT	20	GND

POWER CONNECTOR (Type: mates with molex 70156 10P or 8981-4P Connector)

Pin No.	Connection	Pin No.	Connection
1	VDD	3	GND
2	GND	4	VDD

5. ABSOLUTE MAXIMUM RATING AT T = 25°C

Parameter	Symbol	Min.	Max.	Units
Supply Voltage	VDD	–0.3	9	V
Input Voltage (Singal)	VI		5.5	V
Power Dissipation	PD		30	W
Operating Temperature Range (At Case)	TOP	0	45	°C
Storage Temperature Range	TSTG	–20	+60	°C

6. OPERATION CONDITION AT T = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Units
Supply Voltage	VDD	7	7.2	8	V
Supply Current	IDD		3		A
Transmission Speed (Fast Speed)			200		COLUMN/SEC
Transmission Speed (Middle Speed)			100		COLUMN/SEC
Transmission Speed (Slow Speed)			50		COLUMN/SEC
I/O Connector					
Input Voltage	VIH	2			V
	VIL			0.8	V
Output Voltage	VOH	2			V
	VOL			0.8	V V
Output Current	IOH		0.5		mA
	IOL			2	mA

7. ELECTRICAL/OPTICAL CHARACTERISTICS AT T = 25°C

Parameter	Symbol	Min.	Typ.	Max.	units	Test Condition
Average Luminous Intensity	I		3000		μcd	at VDD = 7.2V
Peak Emission Wave Lengh (Green)	λP		565		mm	
Peak Emission Wave Lengh (Red)	λP		630		mm	
Luminous Intensity Matching Ratio				2:1		

8. APPLICATION

LTM-8843-1 moving sign system allow more efficient use of

A. The plate of advertising, for example

- Theater
- Introduce productions

B. Information service

- Securities
- Exchange rate
- Other money market

C. To display the information of hospital.

E. To display trains destination.

F. Information system of railroad.

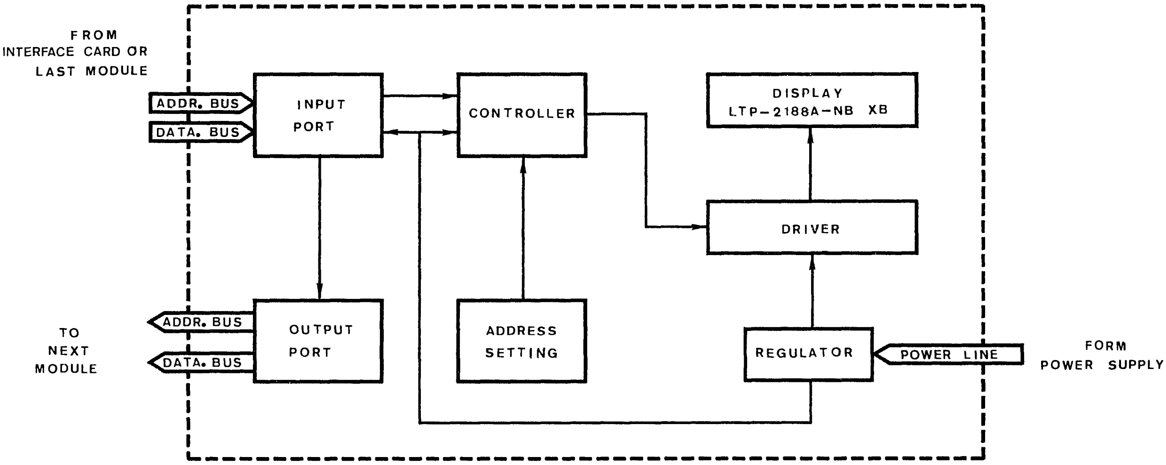
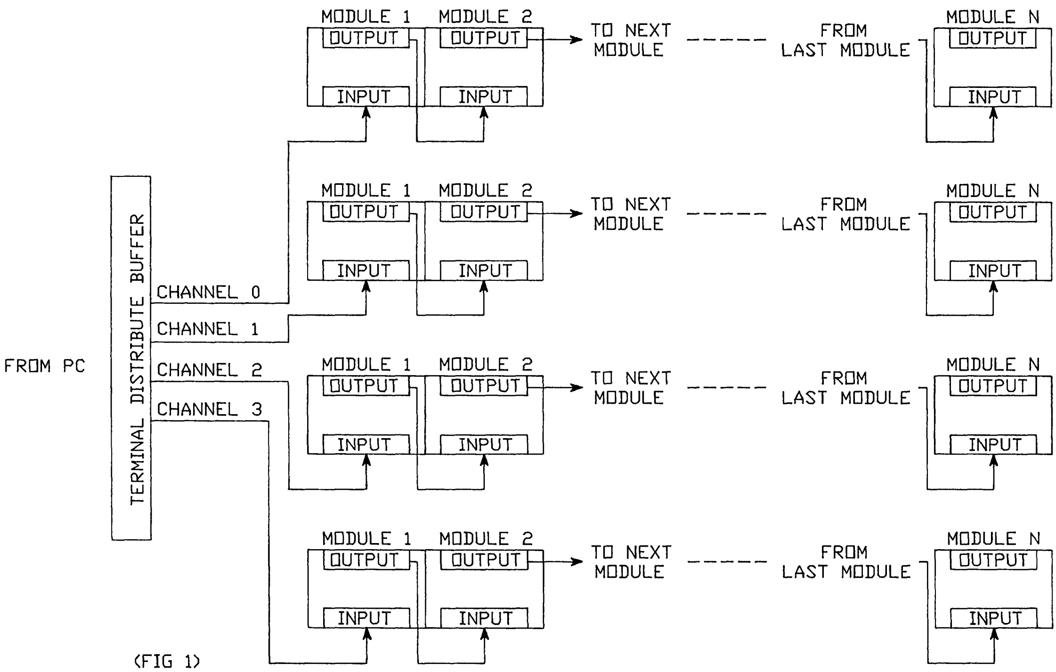


FIG. 2 MODULE BLOCK DIAGRAM



(FIG 1)

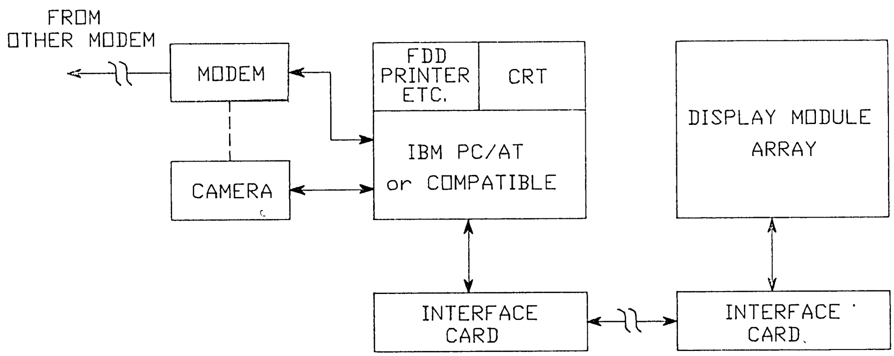


FIG. 4 SYSTEM BLOCK DIAGRAM

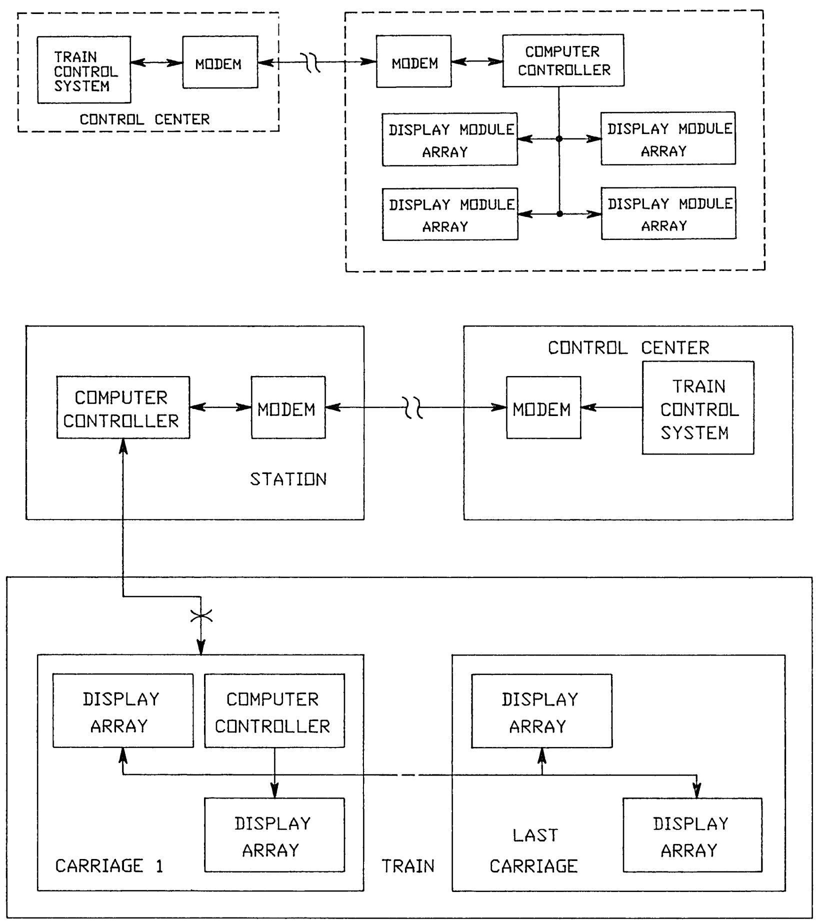
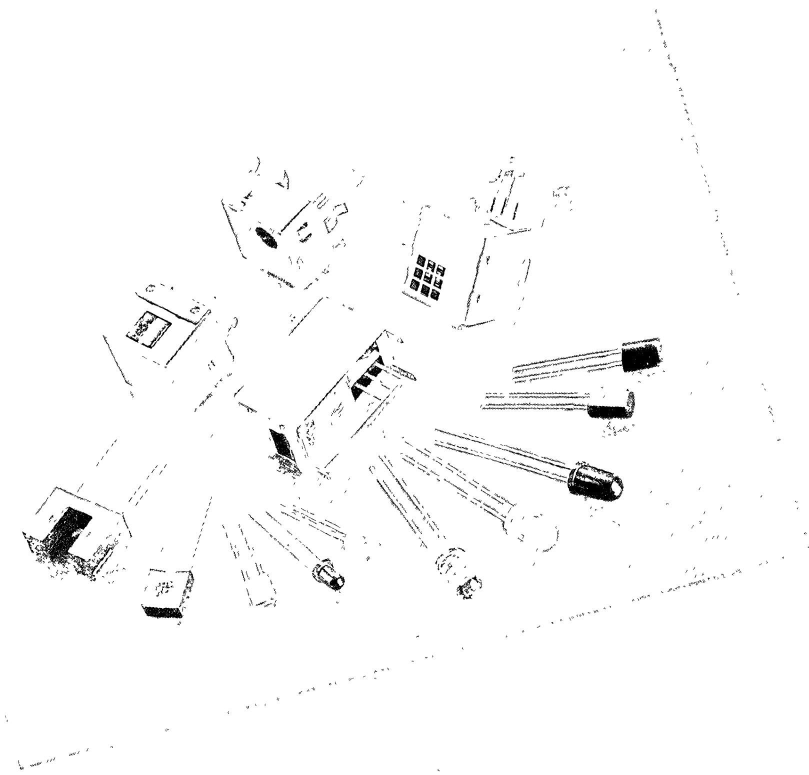


FIG. 5 APPLICATION BLOCK DIAGRAM

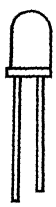
1. Infrared Products

- SELECTION GUIDE
- INFRARED EMITTING DIODES
- PHOTOTRANSISTORS
- PHOTODIODES
- TRANSMISSIVE SWITCH
- OPTIC RECEIVER MODULE



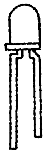
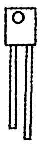
SELECTION GUIDE OF INFRARED PRODUCTS

• INFRARED EMITTING DIODES

OUTLINE	DEVICE		DESCRIPTION		APERTURE RADIANT INCIDENCE Ee TYP. @ 20mA	TYPICAL VIEWING ANGLE $2\theta½$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	WAVE-LENGTH λP	LENS				
	T-1 Modified 0.5'' Lead 0.05'' Pitch 3φ	LTE-209	940 nm	Water Clear	0 4 mw/cm²	16°	1.2 V	1-5
		LTE-209C	940 nm	Smoke	0.4 mw/cm²	16°	1.2 V	
		LTE-239	880 nm	Water Clear	0.6 mw/cm²	16°	1.3 V	1-8
		LTE-239C	880 nm	Smoke	0.6 mw/cm²	16°	1.3 V	
	T-1¾ Standard 1'' Lead 5φ	LTE-4208	940 nm	Water Clear	1.4 mw/cm²	20°	1.2 V	1-11
		LTE-4208C	940 nm	Smoke	1.4 mw/cm²	20°	1.2 V	
		LTE-4238	880 nm	Water Clear	1.4 mw/cm²	20°	1.3 V	1-14
		LTE-4238C	880 nm	Smoke	1.4 mw/cm²	20°	1.3 V	
	T-1¾ Wide Viewing Angle 5φ	LTE-5208A	940 nm	Water Clear	1.0 mw/cm²	40°	1.2 V	1-17
		LTE-5208 AC	940 nm	Smoke	1.0 mw/cm²	40°	1.2 V	
		LTE-5238A	880 nm	Water Clear	1.0 mw/cm²	40°	1.3 V	1-20
		LTE-5238AC	880 nm	Smoke	1.0 mw/cm²	40°	1.3 V	

Note: * $2\theta½$ is the off-axis angle at which the radiant intensity is half the axial radiant intensity.

• INFRARED EMITTING DIODES

OUTLINE	DEVICE		DESCRIPTION		APERTURE RADIANT INCIDANCE Ee TYP. @ 20mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	Vf TYP. @ 20mA	PAGE No.
	PACKAGE	PART NO.	WAVE-LENGTH λP	LENS				
	T-1 Standard 1" Lead 3ϕ	LTE-4206	940 nm	Water Clear	0 7 mw/cm²	20°	1 2V	1-23
		LTE-4206C	940 nm	Smoke	0 7 mw/cm²	20°	1 2V	
	T-1¾ Narrow Viewing Angle 1" Lead 5ϕ	LTE-2871	940 nm	Water Clear	1 6 mw/cm²	16°	1.2V	1-26
		LTE-2871C	940 nm	Smoke	1.6 mw/cm²	16°	1 2V	
	Side Look	LTE-302	940 nm	Water Clear	0 15 mw/cm²	40°	1 2V	1-29

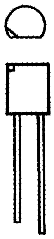
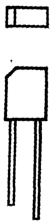
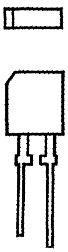
• PHOTOTRANSISTORS

OUTLINE	DEVICE		LIGHT CURRENT TYP. @ Ee = 1 mw/cm²	DARK CURRENT MAX. @ V_{CE} = 10V	V_{CE} (SAT) MAX. @ I_C = 0.5 mA	V_{CEO} MIN. @ I_C = 1 mA	PAGE No.
	PACKAGE	PART NO.					
	T-1 Modified 0.05" Pitch 0.5" Lead 3ϕ	LTR-209	2 mA	100 nA	0.4 V	30 V	1-32
	T-1¾ Standard 0.5" Lead 5ϕ	LTR-3208	4 mA	100 nA	0.4 V	30 V	1-35
		LTR-3208E	2 mA	100 nA	0.4 V	30 V	
	Side Look	LTR-301	1 mA	100 nA	0 4 V	30 V	1-38
	T-1 Standard 1" Lead 3ϕ	LTR-4206	4 mA	100 nA	0.4 V	30 V	1-41
		LTR-4206E	2 mA	100 nA	0 4 V	30 V	

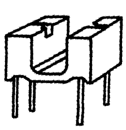
Note. * $2\theta\frac{1}{2}$ is the off-axis angle at which the radiant intensity is half the axial radiant intensity

SELECTION GUIDE

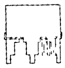
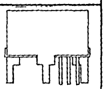
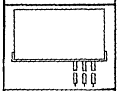
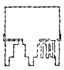
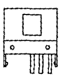
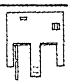
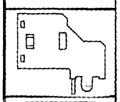
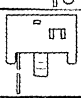
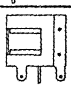
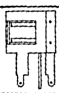
• PHOTODIODES

OUTLINE	DEVICE		Is TYP. @Ee = 0.08 mw/cm^2 @V_R = 5V	$I_{D(R)}$ MAX. @ V_R = 10V	$V_{(BR)R}$ MIN. @ I_R = 100μA	PEAK SENSITIVITY WAVELENGTH λP TYP.	PAGE No.
	PACKAGE	PART NO.					
	Black Plastic	LTR-515AD	2 μA	30 nA	30 V	950 nm	1-44
		LTR-526AD	2 μA	30 nA	30 V	950 nm	1-48
		LTR-536AD	2 μA	30 nA	30 V	950 nm	1-52
		LTR-546AD	2 μA	30 nA	30 V	950 nm	1-56

• TRANSMISSIVE SWITCH

OUTLINE	DEVICE		IRED V_F TYP. @ I_F = 20mA	SENSOR V_{CEO} MIN. @ I_C = 1mA	SENSOR V_{ECO} MIN. @ I_e = 100μA	Ic MIN. @ I_F = 20mA/ V_{CE} = 5V	PAGE No.
	PACKAGE	PART NO.					
	Housing Package	LTH-301A	1.2 V	30 V	5 V	500 μA	1-60
		LTH-301-07	1.2 V	30 V	5 V	400 μA	1-63

● OPTIC RECEIVER MODULES

OUTLINE	DEVICE			CARRIER WAVE FREQUENCY Fo (KHz)	ARRIVAL DISTANCE TYP. L (m)	SUPPLY VOLTAGE TYP. V_{CC} (V)	CURRENT CONSUMPTION MAX. I_{CC} (mA)	PAGE NO.
	PACKAGE		PART NO.					
	CUBIC TYPE MODULE	22.6x14.6 x12.7	LTM-8705A	38	10	5	2.5	1-66
			LTM-8705B					1-67
			LTM-8705C					1-68
			LTM-8705D					1-69
		14.75x14.75 x13	LTM-8834	56.8				1-73
			LTM-8834-1	38				
			LTM-8834-2	32.7				
			LTM-8834-3	36				
			LTM-8834-4	50				
			LTM-8834-5	64				
		16x14.4x9.5	LTM-8835	36	7.8			1-77
		16x14.4x11.7	LTM-8836					1-78
		14.4x14.4x9	LTM-8837		10			1-82
		24x14x13.4	LTM-8848					1-86
			LTM-8848A					1-87

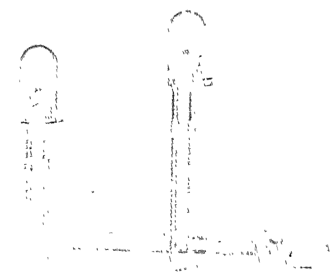
INFRARED PRODUCTS

GaAs T-1 MODIFIED 3ϕ INFRARED EMITTING DIODE

LTE-209/209C

FEATURES

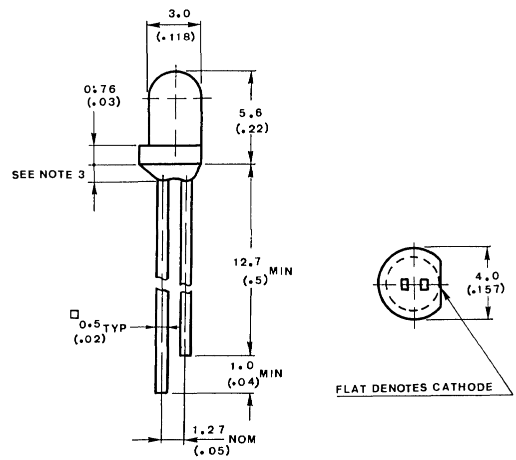
- SELECTED TO SPECIFIC ON-LINE INTENSITY AND RADIANT INTENSITY RANGES.
- LOW COST, PLASTIC END LOOKING PACKAGE.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE LTR-209 SERIES OF PHOTOTRANSISTOR.
- THE LTE-209 SERIES ARE MADE WITH GALLIUM ALUMINUM ARSENIDE WINDOW LAYER ON GALLIUM ARSENIDE INFRARED EMITTING DIODES.



DESCRIPTION

The LTE-209 series are high intensity Gallium Arsenide infrared emitting diodes mounted in clear plastic end looking packages. The LTE-209 series provides a broad range of intensity selection.
All electrical parameters are 100% tested by manufacturing. The specifications are guaranteed to a cumulative .65% AQL
C-smoke color lens.

PACKAGE DIMENSION



NOTES:
1. All Dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

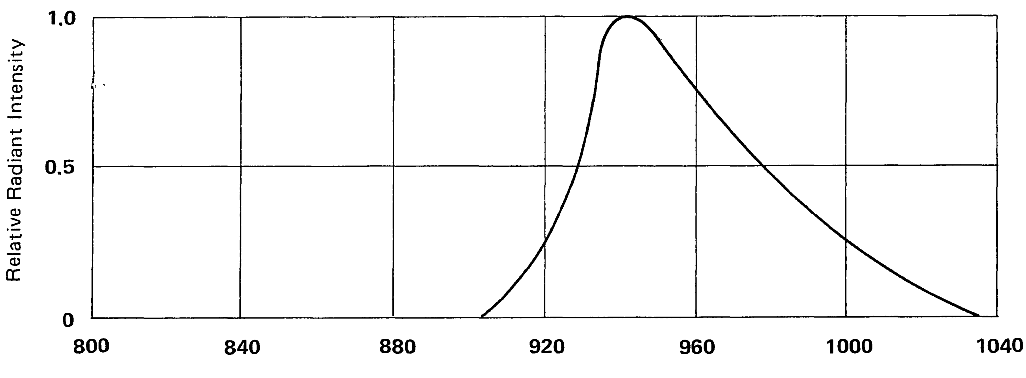


FIG. 1 SPECTRAL DISTRIBUTION

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTE—	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	209	0.2	0.4		mW/cm²	I_F = 20 mA
		209C	0.2	0.4			
Peak Emission Wavelength	λ Peak			940		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ			50		nm	I_F = 20 mA
Forward Voltage	V_F			1.2	1.6	V	I_F = 20 mA
Reverse Current	I_R			0	100	μA	V_R = 5V
Viewing Angle (See fig. 5)	$2\theta½$			16		deg.	

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

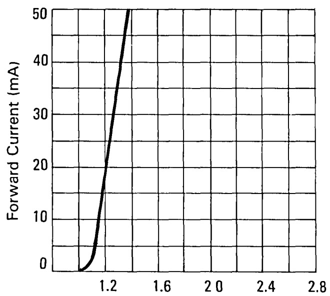


FIG 2 FORWARD CURRENT VS. FORWARD VOLTAGE

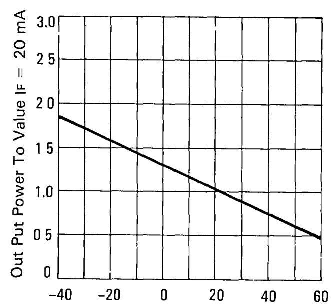


FIG. 3 RELATIVE RADIANT INTENSITY VS AMBIENT TEMPERATURE

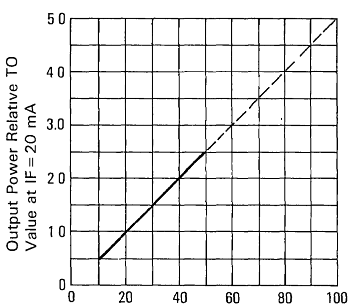


FIG. 4 RELATIVE RADIANT INTENSITY VS FORWARD CURRENT

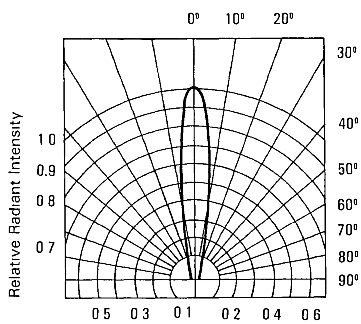


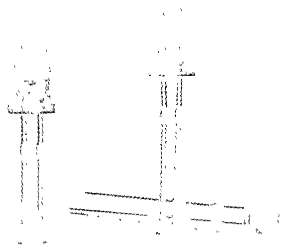
FIG 5 RADIATION DIAGRAM

GaAlAs T-1 MODIFIED 3φ INFRARED EMITTING DIODE

LTE-239/239C

FEATURES

- SELECTED TO SPECIFIC ON-LINE INTENSITY AND RADIANT INTENSITY RANGES.
- HIGH POWER OUT PUT.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE LTR-209 SERIES OF PHOTOTRANSISTOR.



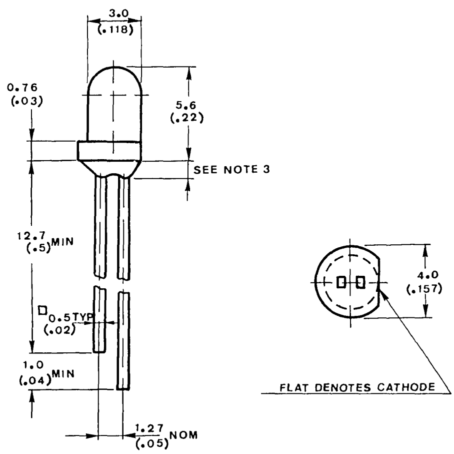
DESCRIPTION

The LTE-239 series are high intensity Gallium Aluminum Arsenide infrared emitting diodes mounted in clear plastic end looking packages, Gallium Aluminum Arsenide features a significant increase in the radiated output of Gallium Arsenide at the same forward current. Also with a wavelength centered at 880 nanometers it more closely of silcon phototransistor.

All electrical parameters are 100% tested by manufacturing. The specifications are guaranteed to a cumulative .65% AQL

C-smoke color lens

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

INFRARED PRODUCTS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	–55° C to +100° C	
Storage Temperature Range	–55° C to +100° C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260° C for 5 Seconds	

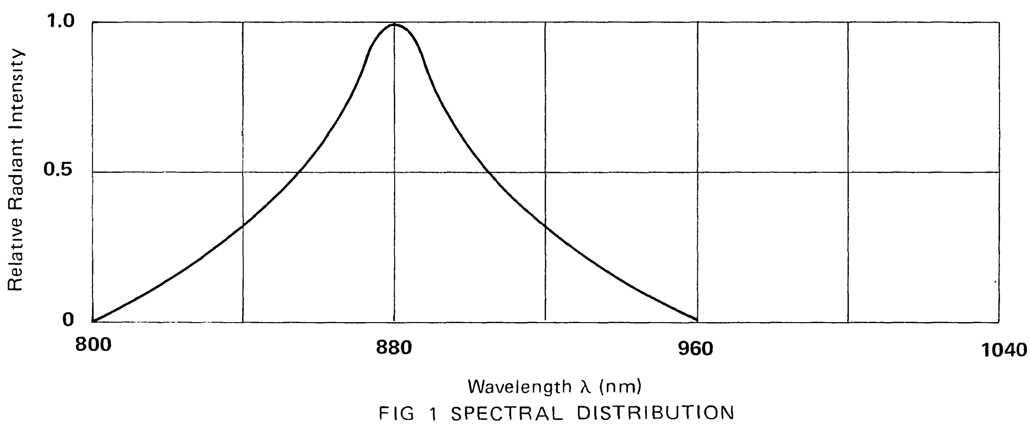


FIG 1 SPECTRAL DISTRIBUTION

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTE–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	239	0.4	0.6		mW/cm²	I_F = 20 mA
		239C	0.4	0.6			
Peak Emission Wavelength	λ Peak			880		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ			50		nm	I_F = 20 mA
Forward Voltage	V_F			1.3	1.8	V	I_F = 20 mA
Reverse Current	I_R			0	100	μA	V_R = 5V
Viewing Angle (See fig. 5)	2θ½			16		deg.	

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

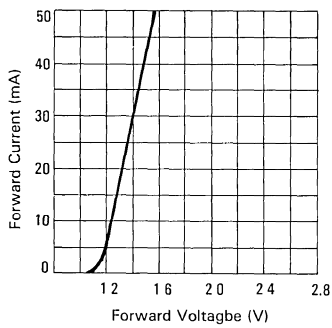


FIG. 2 FORWARD CURRENT VS VS. FORWARD VOLTAGE

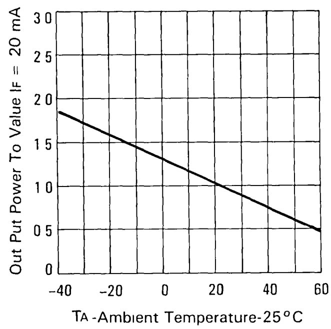


FIG 3 RELATIVE RADIANT INTENSITY VS AMBIENT TEMPERATURE

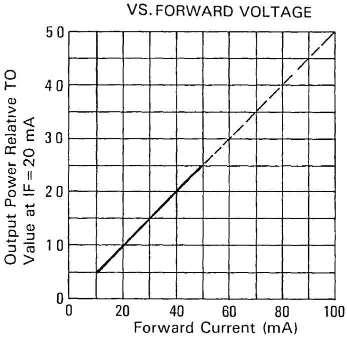


FIG 4 RELATIVE RADIANT INTENSITY VS. FORWARD CURRENT

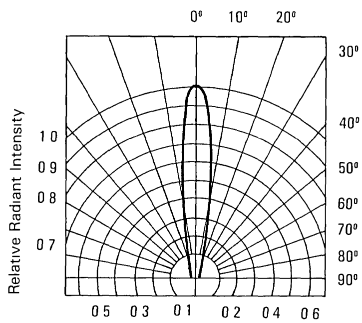


FIG 5 RADIATION DIAGRAM

INFRARED PRODUCTS

GaAs T-1¾ STANDARD 5φ INFRARED EMITTING DIODE

LTE-4208/4208C

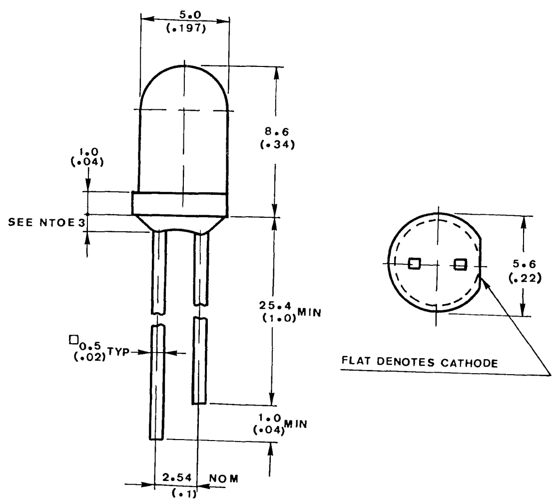
FEATURES

- SELECTED TO SPECIFIC ON-LINE INTENSITY AND RADIANT INTENSITY RANGES.
- LOW COST PLASTIC END LOOKING PACKAGE.
- MECHANICALLY AND SPECTARALLY MATCHED TO THE LTR-3208 SERIES OF PHOTOTRANSISTOR.
- THE LTE-4208 SERIES ARE MADE WITH GALLIUM ALUMINUM ARSENIDE WINDOW LAYER ON GALLIUM ARSENIDE INFRARED EMITTING DIODES.

DESCRIPTION

The LTE-4208 series are high intensity Gallium Arsenide infrared emitting diodes mounted in clear plastic end looking packages. LTE-4208 series provides a broad range of intensity selection.
All electrical parameters are 100% tested by manufacturing. The specifications are guaranteed to a cumulative .65% AQL
C-smoke color lens.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs Pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	–55°C to +100°C	
Storage Temperature Range	–55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds	

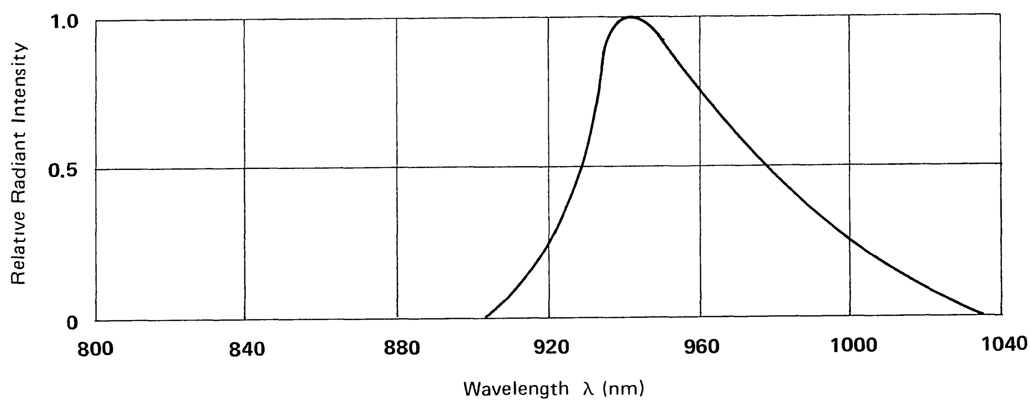


FIG. 1 SPECTRAL DISTRIBUTION

INFRARED PRODUCTS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTE-	MIN	TYP	MAX	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	4208	0.5	1.4		mW/cm^2	$I_F = 20mA$
		4208C	0.5	1.4			
Peak Emission Wavelength	λ Peak			940		nm	$I_F = 20mA$
Spectral Line Half-Width	Δλ			50		nm	$I_F = 20mA$
Forward Voltage	V_F			1.2	1.6	V	$I_F = 20mA$
Reverse Current	I_R			0	100	μA	$V_R = 5V$
Viewing Angle (See fig. 5)	$2\theta½$			20		deg.	

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

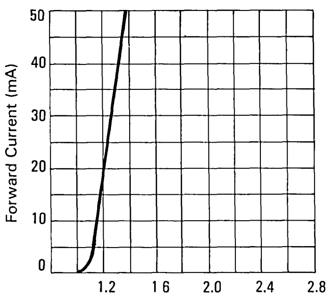


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

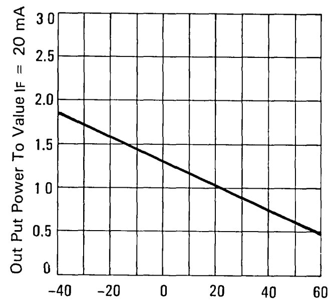


FIG. 3 RELATIVE RADIANT INTENSITY VS. AMBIENT TEMPERATURE

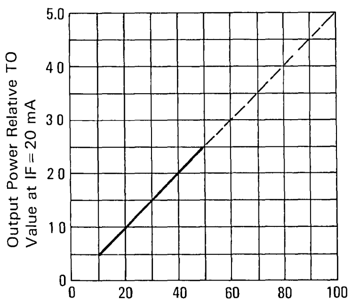


FIG 4 RELATIVE RADIANT INTENSITY VS FORWARD CURRENT

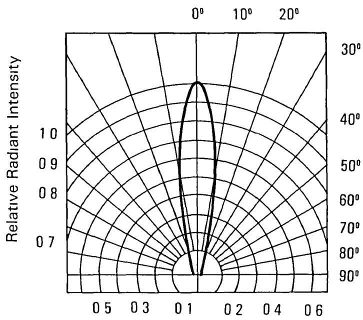


FIG. 5 RADIATION DIAGRAM

LITEON

GaAlAs T-1¾ MODIFIED 5ϕ INFRARED EMITTING DIODE

LTE-4238/4238C

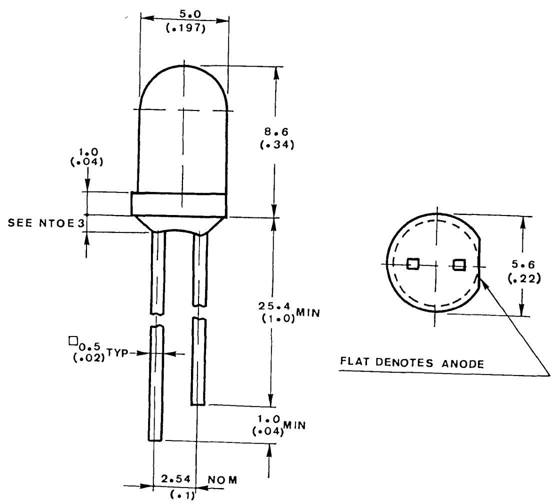
FEATURES

- SELECTED TO SPECIFIC ON-LINE INTENSITY RADIANT INTENSITY RANGES.
- HIGH POWER OUT PUT.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE LTR-3208 SERIES OF PHOTOTRANSISTOR.

DESCRIPTION

The LTE-4238 series are high intensity Gallium Aluminum Arsenide infrared emitting diodes mounted in clear plastic end looking packages. Gallium Aluminum Arsenide features a significant increase in the radiated output of Gallium Arsenide at the same forward current. Also with a wavelength centered at 880 nanometers it more closely of silcon phototransistor.
The specifications are guaianteed to a cumulative .65% AQL
C-smoke color lens

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

INFRARED PRODUCTS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

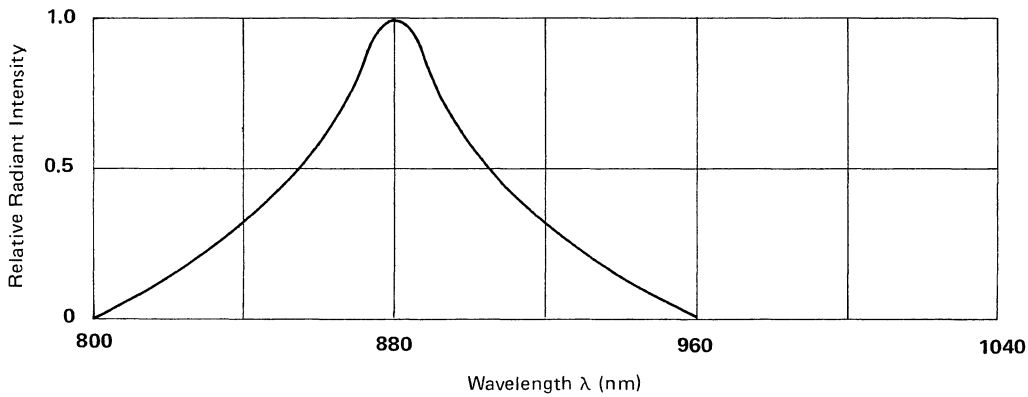


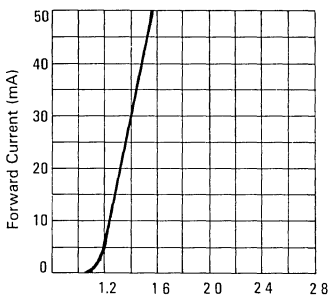
FIG. 1 SPECTRAL DISTRIBUTION

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTE–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	4238	0.8	1.4		mW/cm^2	I_F = 20 mA
		4238C	0.8	1.4			
Peak Emission Wavelength	λ Peak			880		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ			50		nm	I_F = 20 mA
Forward Voltage	V_F			1.3	1.8	V	I_F = 20 mA
Reverse Current	I_R			0	100	μA	V_R = 5V
Viewing Angle (See fig. 5)	2θ½			20		deg.	

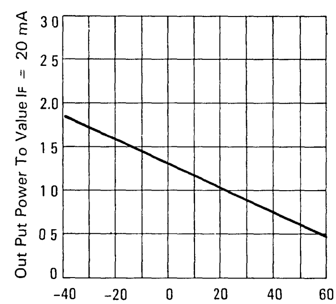
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)



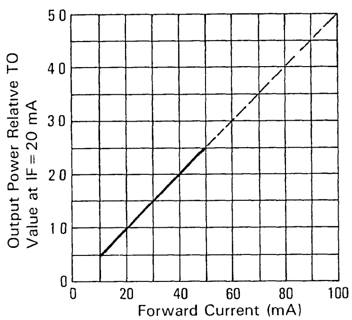
Forward Voltagbe (V)

FIG 2 FORWARD CURRENT VS VS. FORWARD VOLTAGE



TA -Ambient Temperature-25°C

FIG. 3 RELATIVE RADIANT INTENSITY VS. AMBIENT TEMPERATURE



Forward Current (mA)

FIG 4 RELATIVE RADIANT INTENSITY VS FORWARD CURRENT

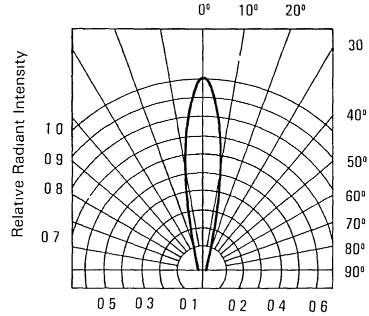


FIG 5 RADIATION DIAGRAM

INFRARED PRODUCTS

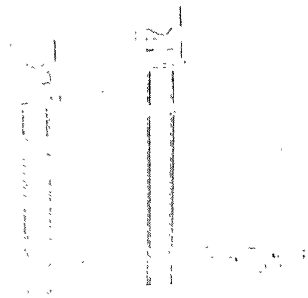
LITEON

GaAs T-1¾ STANDARD 5ϕ INFRARED EMITTING DIODE

LTE-5208A/5208AC

FEATURES

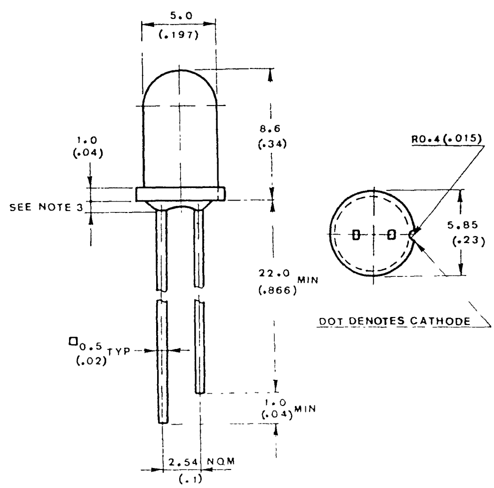
- SELECTED TO SPECIFIC ON-LINE INTENSITY AND RADIANT INTENSITY RANGES.
- LOW COST PLASTIC END LOOKING PACKAGE.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE LTR-3208 SERIES OF PHOTOTRANSISTOR.
- THE LTE-5208A SERIES ARE MADE WITH GALLIUM ALUMINUM ARSENIDE WINDOW LAYER ON GALLIUM ARSENIDE INFRARED EMITTING DIODES.



DESCRIPTION

The LTE-5208A series are high intensity Gallium Arsenide infrared emitting diodes mounted in clear pastic end looking packages. The LTE-5208A series provides a broad range of intensity selection.
All electrical parameters are 100% tested by manufacturing. The specifications are guaranteed to a cumulative .65% AQL
C-smoke color lens.

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	–55°C to +100°C	
Storage Temperature Range	–55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

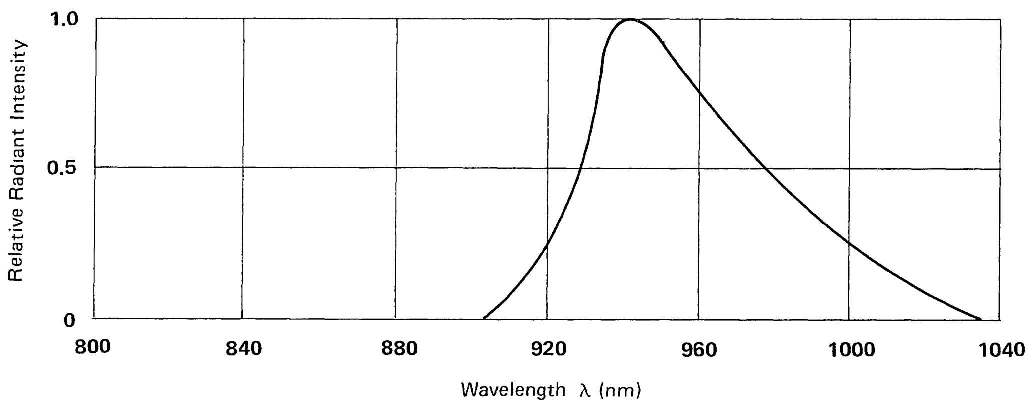


FIG. 1 SPECTRAL DISTRIBUTION

ELECTRICAL OPTICAL CHARACTERISTICS AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTE–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	5208A	0.5	1.0		mW/cm^2	I_F = 20 mA
		5208AC	0.5	1.0			
Peak Emission Wavelength	λ Peak			940		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$			50		nm	I_F = 20 mA
Forward Voltage	V_F			1.2	1.6	V	I_F = 20 mA
Reverse Current	I_R			0	100	μA	V_R = 5V
Viewing Angle (See fig. 5)	$2\theta½$			40		deg.	

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

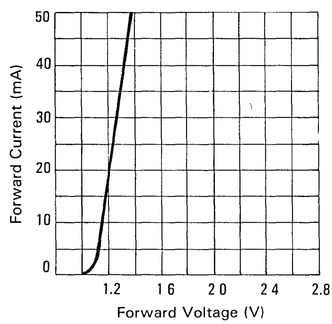


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

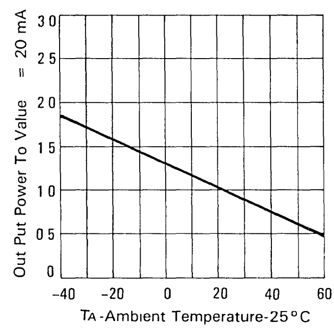


FIG 3 RELATIVE RADIANT INTENSITY VS AMBIENT TEMPERATURE

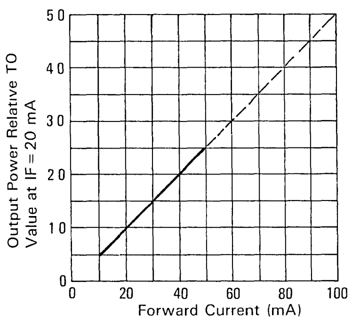


FIG 4 RELATIVE RADIANT INTENSITY VS. FORWARD CURRENT

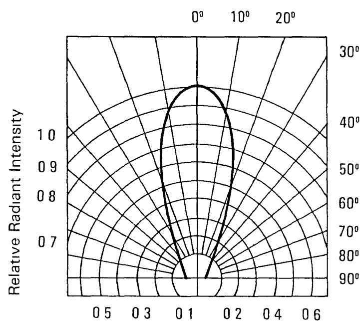


FIG 5 RADIATION DIAGRAM

GAAlAS T-1¾ STANDARD 5φ INFRARED EMITTING DIODE

LTE-5238A/5238AC

FEATURES

- SELECTED TO SPECIFIC ON-LINE INTENSITY AND RADIANT INTENSITY RANGES.
- HIGH POWER OUT PUT.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE LTR-3208 SERIES OF PHOTOTRANSISTOR.

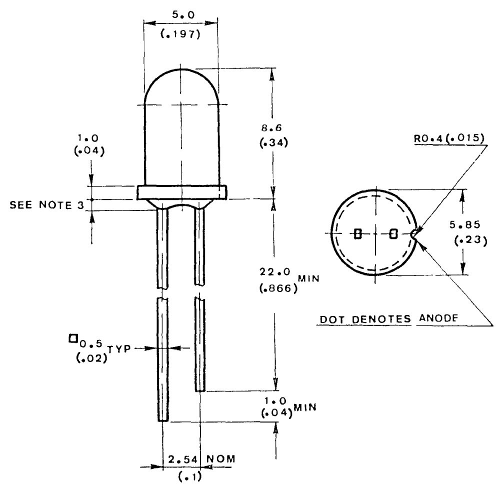
DESCRIPTION

The LTE-5238A series are high intensity Gallium Aluminum Arsenide infrared emitting diodes mounted in clear plastic end looking packages. Gallium Aluminum Arsenide features a significant increase in the radiated output of Gallium Arsenide at the same forward current. Also with a wavelength centered at 880 nanometers it more closely of silcon phototransistor.

All electrical parameters are 100% tested by manufacturing. The specifications are guaranteed to a cumulative .65% AQL

C-smoke color lens.

PACKAGE DIMENSION



NOTE:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specification are subject to change without notice.

INFRARED PRODUCTS

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs Pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

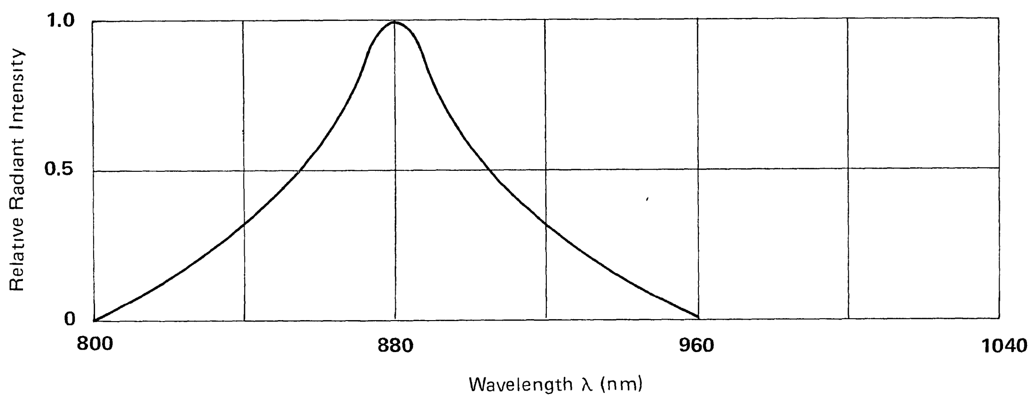


FIG. 1 SPECTRAL DISTRIBUTION

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25^\circ C$

PARAMETER	SYMBOL	PART NO. LTE–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	5238A	0.5	1.0		mW/cm²	I_F = 20mA
		5238AC	0.5	1.0			
Peak Emission Wavelength	λ Peak			880		nm	I_F = 20mA
Spectral Line Half-Width	Δλ			50		nm	I_F = 20mA
Forward Voltage	V_F			1.3	1.8	V	I_F = 20mA
Reverse Current	I_R			0	100	μA	V_R = 5V
Vewing Angle (See Fig. 5)	$2\theta½$			40		deg.	

TYPICAL ELECTRICAL/OPTICAL/CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

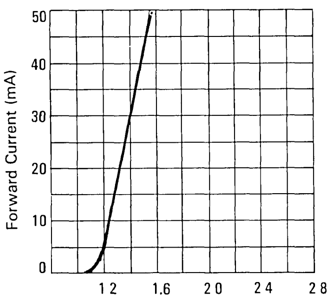


FIG. 2 FORWARD CURRENT VS. VS FORWARD VOLTAGE

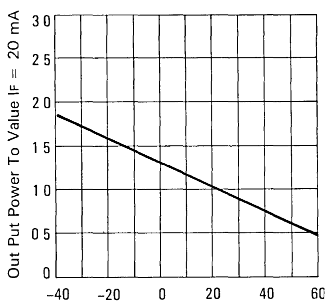


FIG 3 RELATIVE RADIANT INTENSITY VS AMBIENT TEMPERATURE

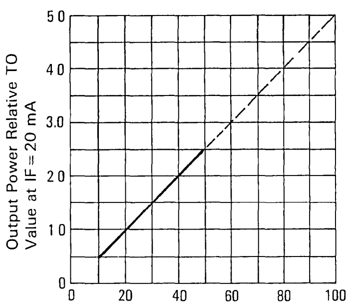


FIG 4 RELATIVE RADIANT INTENSITY VS FORWARD CURRENT

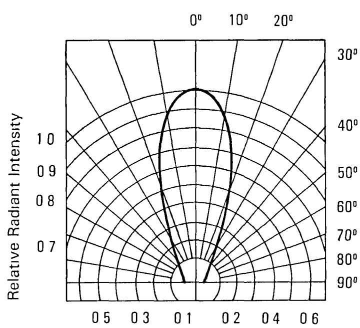


FIG 5 RADIATION DIAGRAM

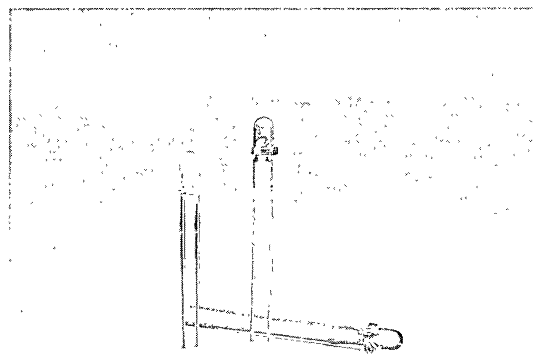
INFRARED PRODUCTS

GaAs T-1 STANDARD 3φ INFRARED EMITTING DIODE

LTE-4206/4206C

FEATURES

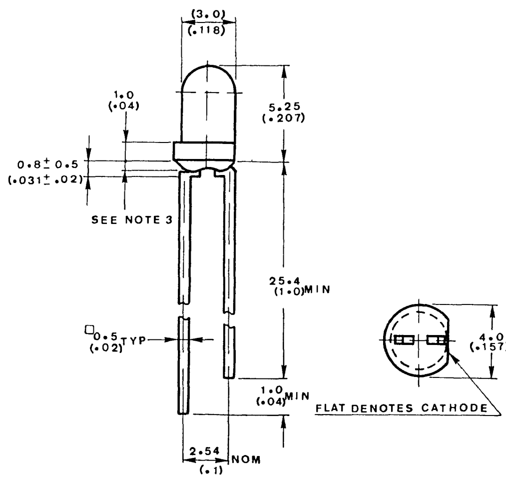
- SELECTED TO SPECIFIC ON-LINE INTENSITY AND RADIANT INTENSITY RANGES.
- LOW COST PLASTIC END LOOKING PACKAGE.
- MECHANICALLY AND SPECTARALLY MATCHED TO THE LTR-4206 SERIES OF PHOTOTRANSISTOR.
- THE LTE-4206 SERIES ARE MADE WITH GALLIUM ALUMINUM ARSENIDE WINDOW LAYER ON GALLIUM ARSENIDE INFRARED EMITTING DIODES.



DESCRIPTION

The LTE-4206 series are high intensity Gallium Arsenide infrared emitting diodes mounted in clear plastic end looking packages. LTE-4206 series provides a broad range of intensity selection.
All electrical parameters are 100% tested by manufacturing. The specifications are guaranteed to a cumulative .65%AQL
C-smoke color lens.

PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs Pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds	

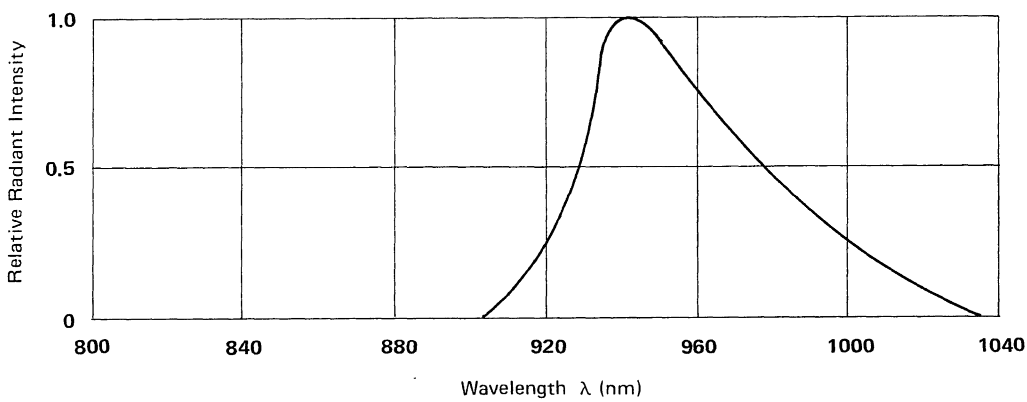


FIG. 1 SPECTRAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTE-	MIN	TYP	MAX	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	4206 4206C	0.3	0.7		mW/cm^2	I_F = 20mA
Peak Emission Wavelength	λ Peak			940		nm	I_F = 20mA
Spectral Line Half-Width	Δλ			50		nm	I_F = 20mA
Forward Voltage	V_F			1.2	1.6	V	I_F = 20mA
Reverse Current	I_R			0	100	μA	V_R = 5V
Viewing Angle (See fig. 5)	$2\theta\frac{1}{2}$			20		deg.	

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

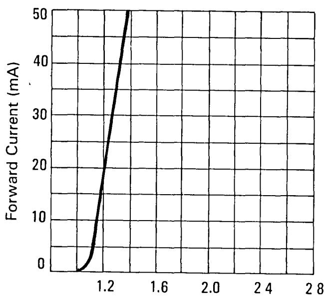


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

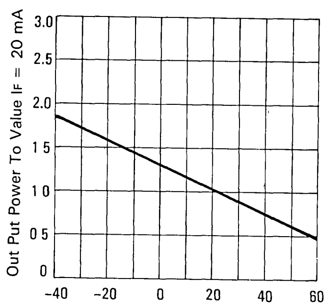


FIG 3 RELATIVE RADIANT INTENSITY VS AMBIENT TEMPERATURE

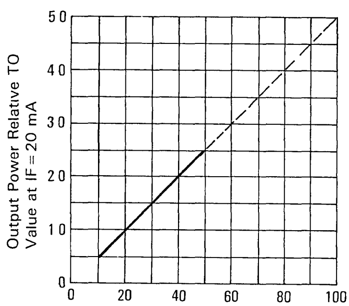


FIG 4 RELATIVE RADIANT INTENSITY VS FORWARD CURRENT

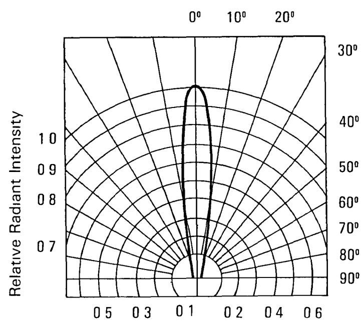


FIG 5 RADIATION DIAGRAM

GaAs T-1¾ MODIFIED 1″ LEA 5φ INFRARED EMITTING DIODE

LTE-2871/2871C

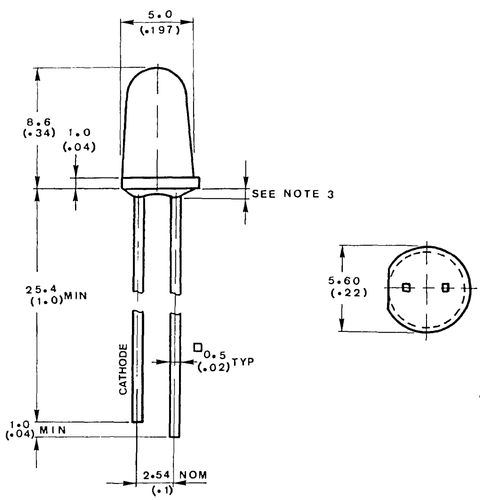
FEATURES

- SELECTED TO SPECIFIC ON-LINE INTENSITY AND RADIANT INTENSITY.
- LOW COST.
- NARROW BEAM.
- T-1¾ MODIFIED PACKAGE.
- THE LTE-2871 SERIES ARE MADE WITH GALLIUM ALUMINUM ARSENIDE WINDOW LAYER ON GALLIUM ARSENIDE INFRARED EMITTING DIODES.

DESCRIPTION

The LTE-2871 series are high intensity Gallium Arsenide infrared emitting diodes mounted in clear pastic end looking packages. The LTE-2871 series provides a broad range of intensity selection.
All electrical parameters are 100% tested by manufacturing. The specifications are guaranteed to a cumulative .65% AQL
C-smoke color lens

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs Pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

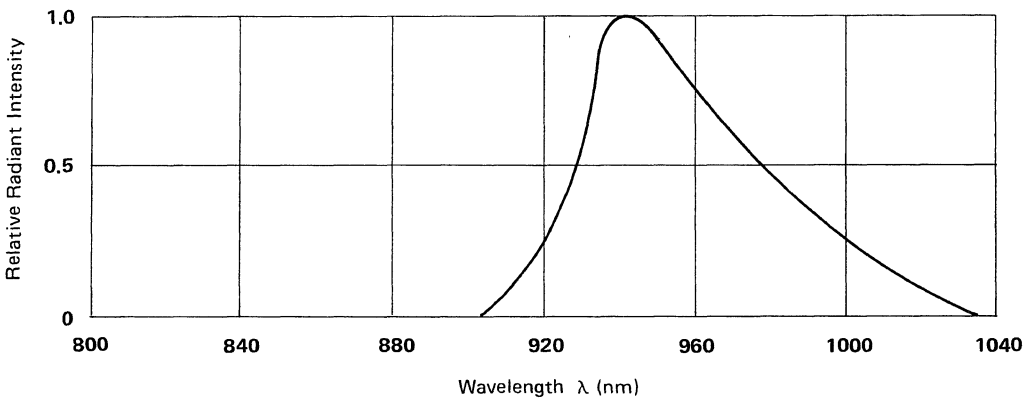


FIG. 1 SPECTRAL DISTRIBUTION

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTE–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	2871	0.7	1.6		mW/cm²	I_F = 20 mA
		2871C	0.7	1.6			
Peak Emission Wavelength	λ Peak			940		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ			50		nm	I_F = 20 mA
Forward Voltage	V_F			1.2	1.6	V	I_F = 20 mA
Reverse Current	I_R			0	100	μA	V_R = 5V
Viewing Angle (See fig. 5)	2θ½			16		deg.	

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

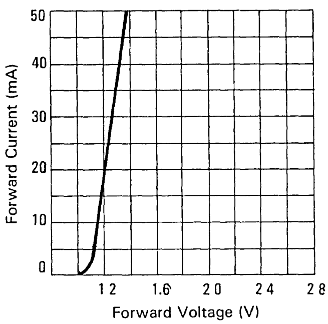


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

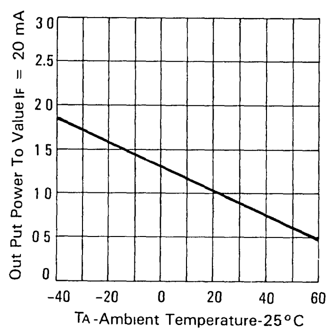


FIG. 3 RELATIVE RADIANT INTENSITY VS AMBIENT TEMPERATURE

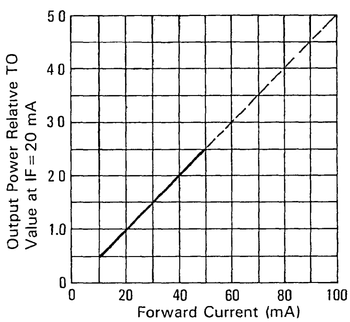


FIG 4 RELATIVE RADIANT INTENSITY VS FORWARD CURRENT

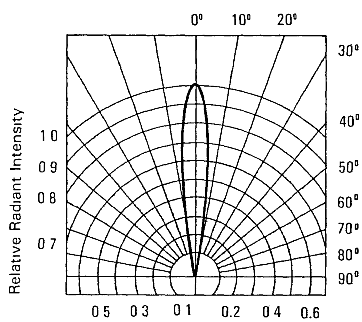


FIG 5 RADIATION PIAGRAM

INFRARED PRODUCTS

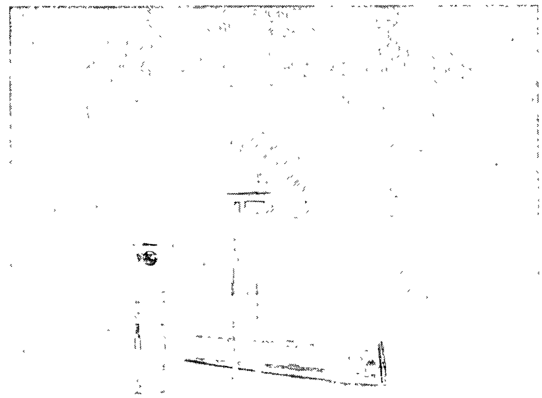
GaAs PLASTIC SIDE LOOK INFRARED EMITTING DIODE

LITEON

LTE-302

FEATURES

- SELECTED TO SPECIFIC ON-LINE INTENSITY AND RADIANT INTENSITY RANGES.
- LOW COST, PLASTIC SIDE LOOKING PACKAGE.
- MECHANICALLY AND SPECTRALLY MATCHED TO THE LTR-301 SERIES OF PHOTOTRANSISTOR.
- THE LTE-302 SERIES ARE MADE WITH GALLIUM ALUMINUM ARSENIDE WINDOW LAYER ON GALLIUM ARSENIDE INFRARED EMITTING DIODES.

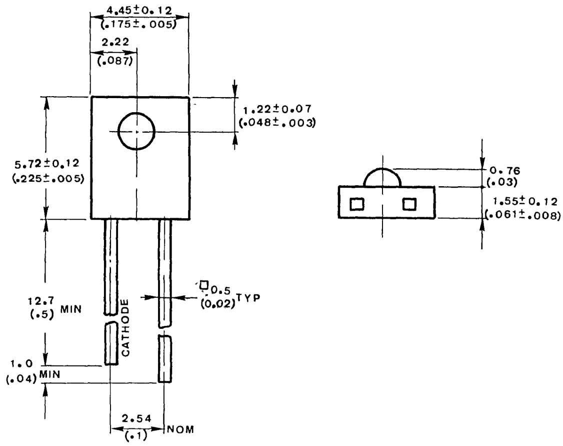


DESCRIPTION

The LTE-302 series are high intensity Gallium Arsenide infrared emitting diodes mounted in clear plastic side looking packages. The LTE-302 series provides a broad range of intensity selection.

All electrical parameters are 100% tested by manufacturing. The specifications are guaranteed to a cumulative .65%.

PACKAGE DIMENSION



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25 mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (300pps, 1μs Pulse)	3	A
Continuous Forward Current	50	mA
Reverse Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

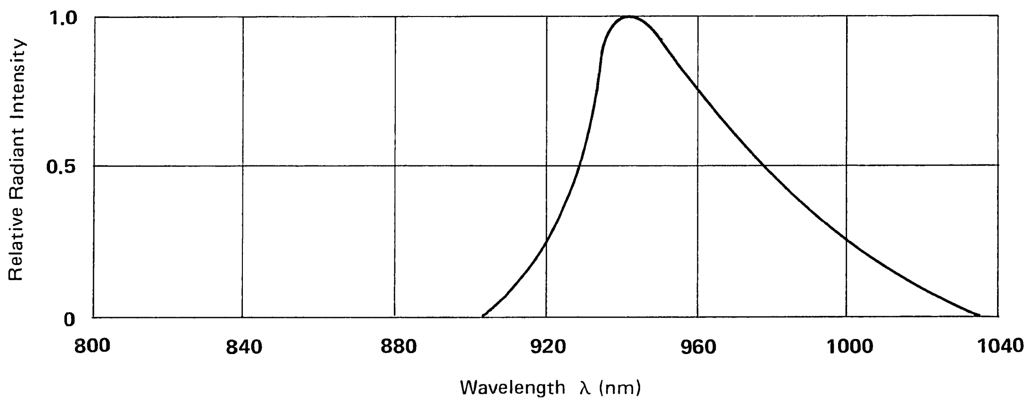


FIG. 1 SPECTRAL DISTRIBUTION

INFRARED PRODUCTS

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTE–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Aperture Radiant Incidence	Ee	302	0.07	0.15		mW/cm²	I_F = 20mA
Peak Emission Wavelength	λ PEAK			940		nm	I_F = 20mA
Spectral Line Half-Width	Δλ			50		nm	I_F = 20mA
Forward Voltage	V_F			1.2	1.6	V	I_F = 20mA
Reverse Current	I_R			0	100	μA	V_R = 5V
Vewing Angle (See Fig. 5)	$2\theta½$			40		deg.	

TYPICAL ELECTRICAL/OPTICAL/CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

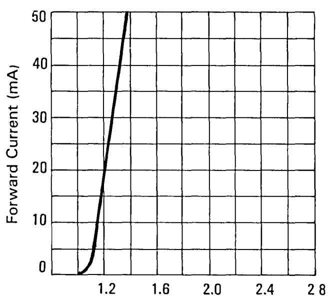


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE

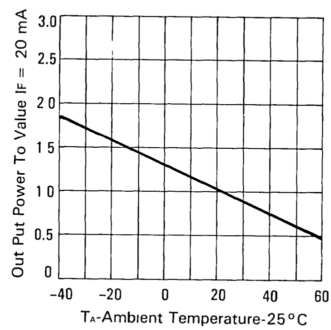


FIG. 3 RELATIVE RADIANT INTENSITY VS. AMBIENT TEMPERATURE

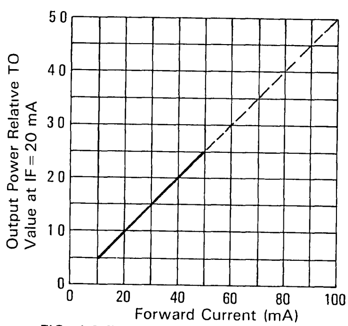


FIG. 4 RELATIVE RADIANT INTENSITY VS FORWARD CURRENT

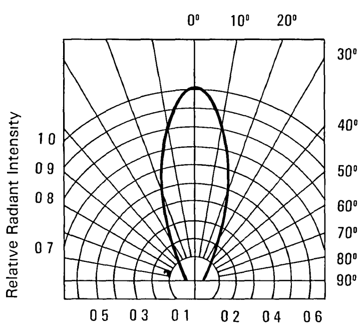


FIG 5 RADIATION DIAGRAM

NPN T-1 MODIFIED 3ϕ PHOTODETECTOR

LTR-209

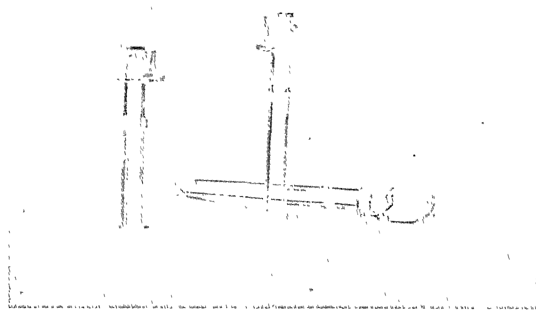
FEATURES

- WIDE RANGE OF COLLECTOR CURRENTS.
- LENSED FOR HIGH SENSITIVITY
- LOW COST PLASTIC PACKAGE.

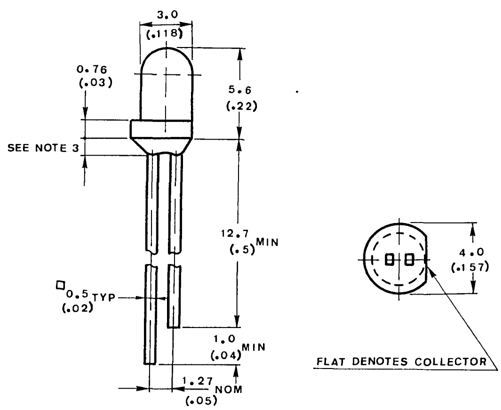
DESCRIPTION

The LTR-209 consist of an NPN silicon phototransistor mounted in a lensed, clear plastic, end looking package. The lensing effect of the package allows an acceptance half angle of 8° measured from the optical axis to the half power point. This series is mechanically and spectrally matched to the LTE-209 series of infrared emitting diodes.

All electrical parameters are 100% tested by manufacturing. Specifications are guaranteed to a cumulative .65% AQL.



PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

INFRARED PRODUCTS

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Collector-Emitter Voltage	30	V
Emitter-Collector Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

ELECTRICAL CHARACTERISTICS AT T_A = 25°C

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	REMARK
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	30			V	I_C = 1mA Ee = 0mW/cm²	
Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	5			V	I_E = 100μA Ee = 0mW/cm²	
Collector Emitter Saturation Voltage	$V_{CE(SAT)}$			0.4	V	I_C = 0.5mA Ee = 0.5mW/cm²	
Rise Time	T_r		5		μS	V_{CC} = 30V I_C = 800μA R_L = 1kΩ	
Fall Time	T_f		5		μS		
Collector Dark Current	I_{CEO}			100	nA	V_{CE} = 10V Ee = 0mW/cm²	
On State Collector Current	$I_{(ON)}$	1		2	mA	V_{CE} = 5V	BINC
		2		4	mA	Ee = 1mW/cm²	BIND
		4		8	mA	λ = 940nm	BINE
		8			mA		BINF

TYPICAL ELECTRICAL/OPTICAL/CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

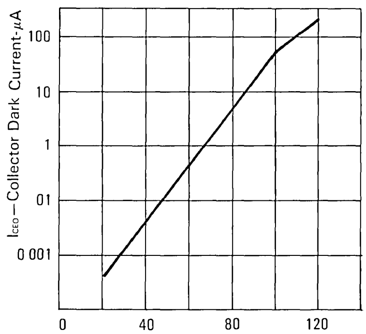


FIG 1 COLLECTOR DARK CURRENT VS AMBIENT TEMPERATURE

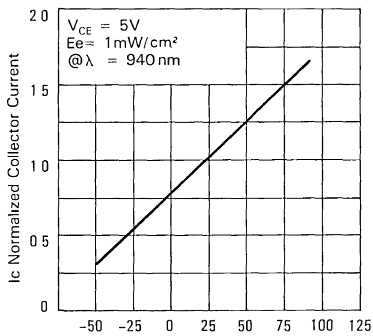


FIG 2 NORMALIZED COLLECTOR CURRENT VS AMBIENT TEMPERATURE

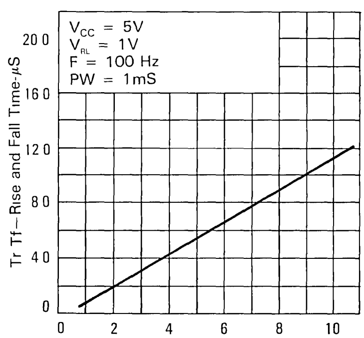


FIG 3 RISE AND FALL TIME VS LOAD RESISTANCE

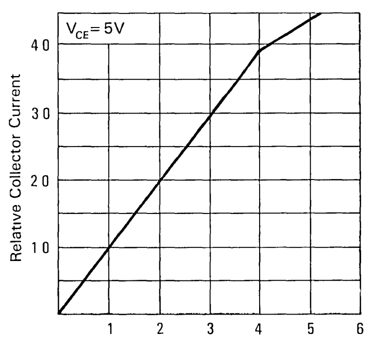


FIG 4 RELATIVE COLLECTOR CURRENT VS IRRADIANCE

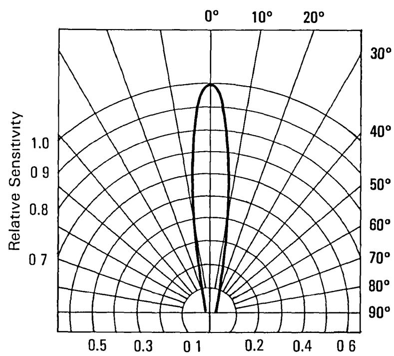


FIG 5 SENSITIVITY DIAGRAM

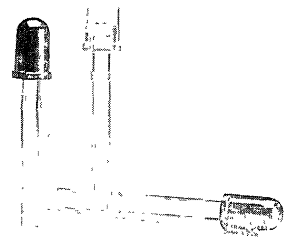
INFRARED PRODUCTS

NPN T-1¾ STANDARD 5ϕ PHOTODETECTOR

LTR-3208/3208E

FEATURES

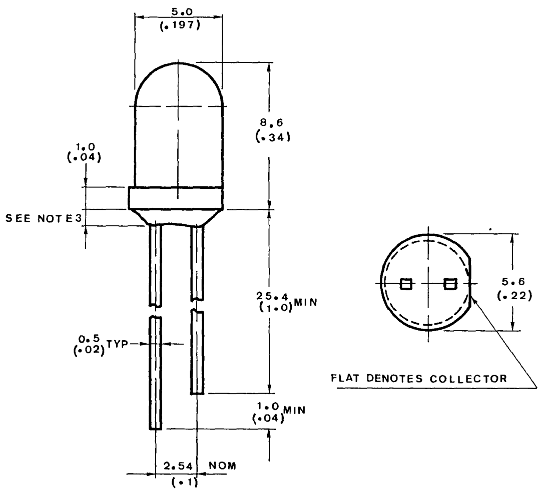
- WIDE RANGE OF COLLECTOR CURRENTS.
- LENSED FOR HIGH SENSITIVITY
- LOW COST PLASTIC PACKAGE.



DESCRIPTION

The LTR-3208 series consist of an NPN silicon phototransistor mounted in a lensed, clear plastic, end looking package. The lensing effect of the package allows an acceptance half angle of 10° measured from the optical axis to the half power point. This series is mechanically and spectrally matched to the LTE-4208 series of infrared emitting diodes.
The LTR-3208E is a special dark plastic package that cut the visible light and suitable for the detectors of infrared applications.
All electrical parameters are 100% tested by manufacturing. Specifications are guaranteed to a cumulative .65% AQL.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Collector-Emitter Voltage	30	V
Emitter-Collector Voltage	5	V
Operating Temperature Range	–55° C to +100° C	
Storage Temperature Range	–55° C to +100° C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260° C for 5 Seconds	

ELECTRICAL CHARACTERISTICS AT T = 25°C

PARAMETER	SYMBOL	PART NO. LTR-	MIN	TYP	MAX	UNIT	TEST CONDITION	REMARK
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$		30			V	I_C = 1mA, Ee = 0mW/cm²	
Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$		5			V	I_E = 100μA, Ee = 0mW/cm²	
Collector Emitter Saturation Voltage	$V_{CE(SAT)}$				0.4	V	I_C = 0.5mA, Ee = 0.5mW/cm²	
Rise Time	Tr			5		μS	Vcc = 30V, I_C = 800μA, R_L = 1kΩ	
Fall Time	Tf			5		μS		
Collector Dark Current	I_{CEO}				100	nA	V_{CE} = 10V, Ee = 0mW/cm²	
On State Collector Current	$I_{(ON)}$	3208	1	4		mA	V_{CE} = 5V, Ee = 1mW/cm², λ = 940nm	
		3208E	1	2		mA		

INFRARED PRODUCTS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

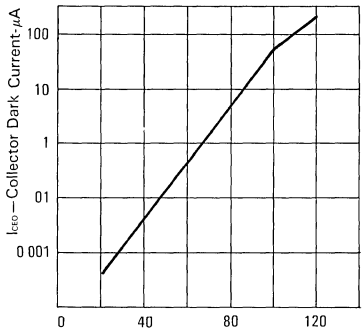


FIG 1 COLLECTOR DARK CURRENT
VS AMBIENT TEMPERATURE

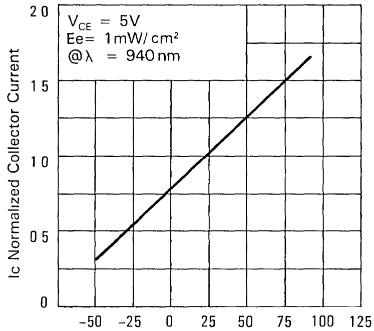


FIG 2 NORMALIZED COLLECTOR CURRENT
VS AMBIENT TEMPERATURE

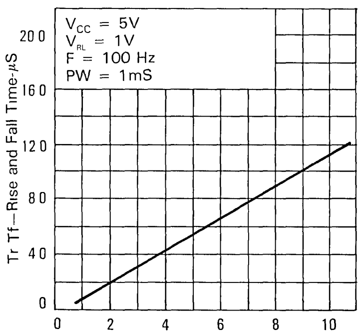


FIG 3 RISE AND FALL TIME
VS LOAD RESISTANCE

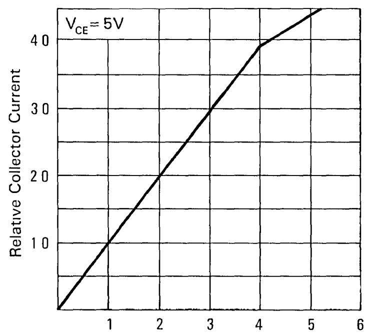


FIG. 4 RELATIVE COLLECTOR CURRENT
VS IRRADIANCE

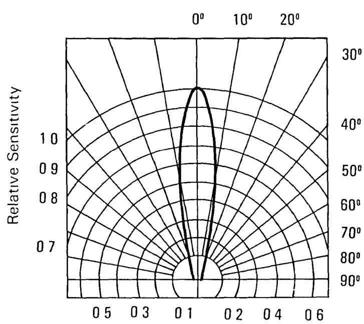


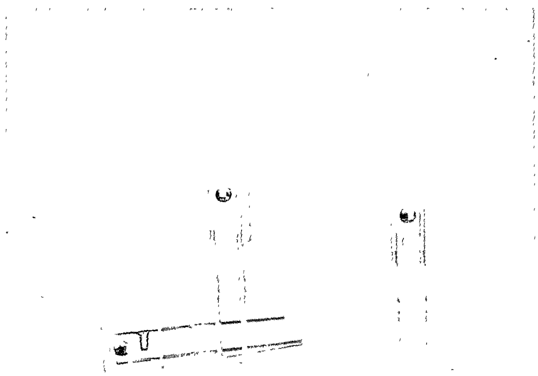
FIG. 5 SENSITIVITY DIAGRAM

NPN PLASTIC SIDE LOOK PHOTODETECTOR

LTR-301

FEATURES

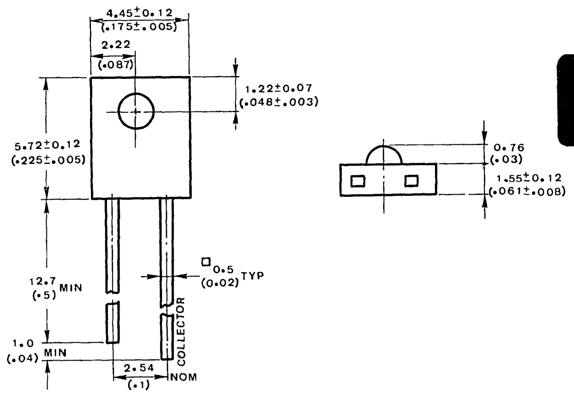
- WIDE RANGE OF COLLECTOR CURRENTS.
- LENSED FOR HIGH SENSITIVITY.
- LOW COST PLASTIC PACKAGE.



DESCRIPTION

The LTR-301 consist of an NPN silicon phototransistor mounted in a lensed, clear plastic, side looking package. The lensing effect of the package allows an acceptance half angle of 20° measured from the optical axis to the half power point. This series is mechanically and spectrally matched to the LTE-302 series of infrared emitting diodes.
All electrical parameters are 100% tested by manufacturing. Specifications are guaranteed to a cumulative .65% AQL.

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

INFRARED PRODUCTS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Collector-Emitter Voltage	30	V
Emitter-Collector Voltage	5	V
Operating Temperature Range	–55°C to +100°C	
Storage Temperature Range	–55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

ELECTRICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	REMARK
Collector-Emitter Breakdown Voltage	$V_{(BR)\,CEO}$	30			V	I_C = 1mA Ee = 0mW/cm²	
Emitter-Collector Breakdown Voltage	$V_{(BR)\,ECO}$	5			V	I_E = 100μA Ee = 0mW/cm²	
Collector Emitter Saturation Voltage	$V_{CE\,(SAT)}$			0.4	V	I_C = 0.5mA Ee = 0.5mW/cm²	
Rise Time	Tr		5		μS	V_{CC} = 30V I_C = 800μA R_L = 1kΩ	
Fall Time	T_f		5		μS		
Collector Dark Current	I_{CEO}			100	nA	V_{CE} = 10V Ee = 0mW/cm²	
On State Collector Current	$I_{(ON)}$	0.2	1		mA	V_{CE} = 5V Ee = 1mW/cm² λ = 940nm	

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

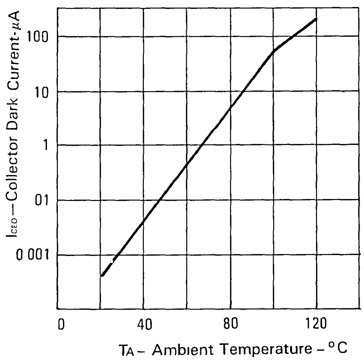


FIG 1 COLLECTOR DARK CURRENT
VS AMBIENT TEMPERATURE

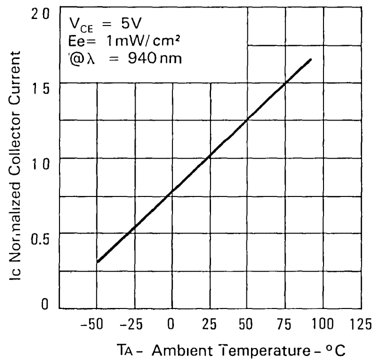


FIG. 2 NORMALIZED COLLECTOR CURRENT
VS AMBIENT TEMPERATURE

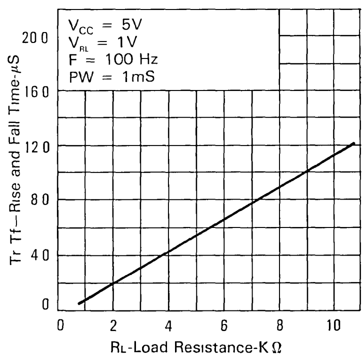


FIG 3 RISE AND FALL TIME
VS LOAD RESISTANCE

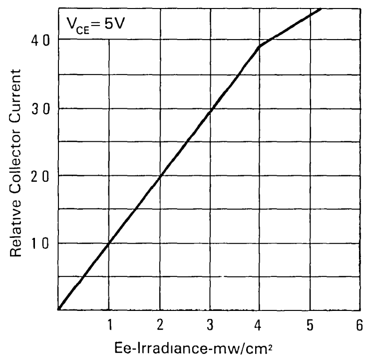


FIG 4 RELATIVE COLLECTOR CURRENT
VS IRRADIANCE

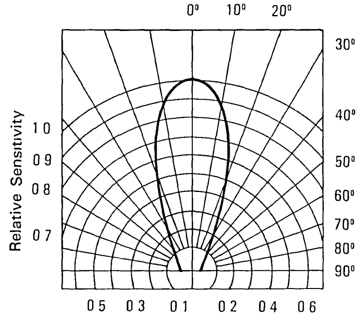


FIG 5 SENSITIVITY DIAGRAM

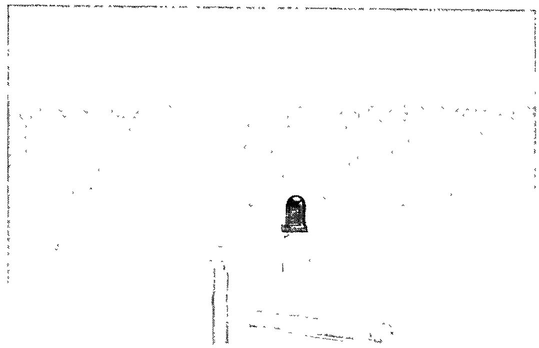
INFRARED PRODUCTS

NPN T-1 STANDARD PHOTODETECTOR

LTR-4206/4206E

FEATURES

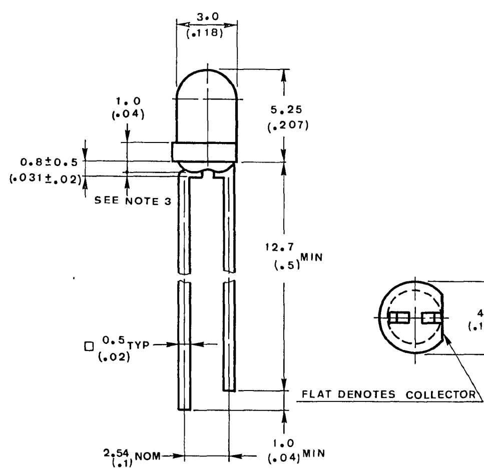
- WIDE RANGE OF COLLECTOR CURRENTS.
- LENSED FOR HIGH SENSITIVITY
- LOW COST PLASTIC PACKAGE.



DESCRIPTION

The LTR-4206 series consist of an NPN silicon phototransistor mounted in a lensed, clear plastic end looking package. The lensing effect of the package allows an acceptance half angle of 10° measured from the optical axis to the half power point. This series is mechanically and spectrally matched to the LTE-4206 series of infrared emitting diodes.
The LTR-4206E is a special dark plastic package that cut the visible light and suitable for the detectors of infrared application.
All electrical parameters are 100% tested by manufacturing. Specifications are guaranteed to a cumulative .65% AQL.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25^\circ C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Collector-Emitter Voltage	30	V
Emitter-Collector Voltage	5	V
Operating Temperature Range	$-55^\circ C$ to $+100^\circ C$	
Storage Temperature Range	$-55^\circ C$ to $+100^\circ C$	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	$260^\circ C$ for 5 Seconds	

ELECTRICAL CHARACTERISTICS AT T = $25^\circ C$

PARAMETER	SYMBOL	PART NO. LTR-	MIN	TYP	MAX	UNIT	TEST CONDITION	REMARK
Collector-Emitter Breakdown Voltage	$V_{(BR)\ CEO}$		30			V	$I_C = 1mA$ $Ee = 0mW/cm^2$	
Emitter-Collector Breakdown Voltage	$V_{(BR)\ ECO}$		5			V	$I_E = 100\mu A$ $Ee = 0mW/cm^2$	
Collector Emitter Saturation Voltage	$V_{CE\ (SAT)}$				0.4	V	$I_C = 0.5mA$ $Ee = 0.5mW/cm^2$	
Rise Time	Tr			5		μS	$V_{CC} = 30V$ $I_C = 800\mu A$ $R_L = 1k\Omega$	
Fall Time	Tf			5		μS		
Collector Dark Current	I_{CEO}				100	nA	$V_{CE} = 10V$ $Ee = 0mW/cm^2$	
On State Collector Current	$I_{(ON)}$	4206	1	4		mA	$V_{CE} = 5V$ $Ee = 1mW/cm^2$ $\lambda = 940nm$	
		4206E	1	2		mA		

INFRARED PRODUCTS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

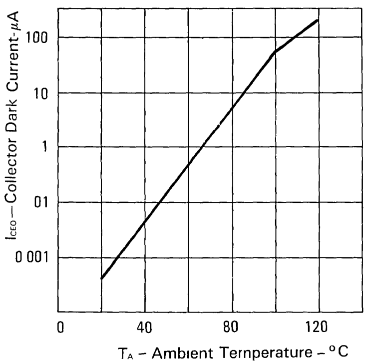


FIG. 1 COLLECTOR DARK CURRENT VS AMBIENT TEMPERATURE

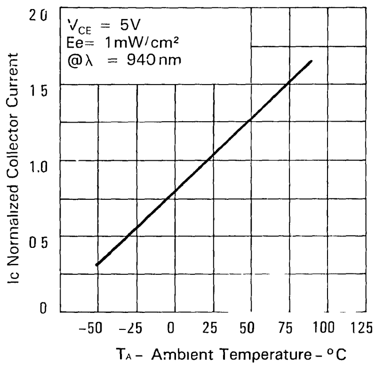


FIG 2 NORMALIZED COLLECTOR CURRENT VS AMBIENT TEMPERATURE

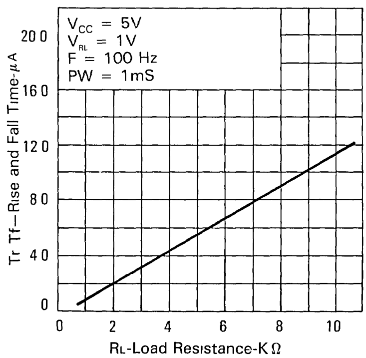


FIG 3 RISE AND FALL TIME VS LOAD RESISTANCE

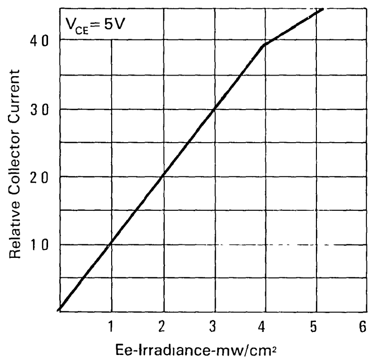


FIG 4 RELATIVE COLLECTOR CURRENT VS IRRADIANCE

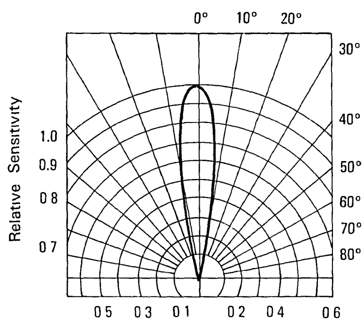
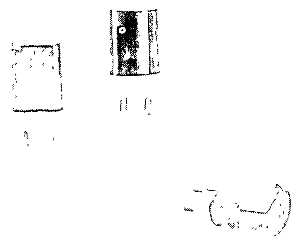


FIG. 5 SENSITIVITY DIAGRAM

LITEON

BLACK PLASTIC PHOTODIODE

LTR-516AD



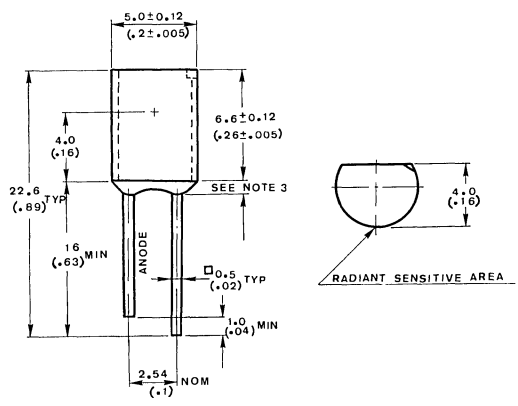
FEATURES

- HIGH PHOTO SENSITIVITY.
- SUITABLE FOR INFRARED RADIATION.
- LOW JUNCTION CAPACITANCE.
- HIGH CUT-OFF FREQUENCY.
- FAST SWITCHING TIME.

DESCRIPTION

The LTR-516AD is a special dark plastic package that cut the visible light and suitable for the detectors of infrared applications.
All electrical parameters are 100% tested by manufacturing specification are guaranteed to cumulative .65% AQL.

PACKAGE DIMENSION



NOTE:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package
5. Specification are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25^\circ C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	150	mW
Reverse Break Down Voltage	30	V
Operating Temperature Range	$-55^\circ C$ to $+100^\circ C$	
Storage Temperature Range	$-55^\circ C$ to $+100^\circ C$	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	$260^\circ C$ for 5 Seconds	

AREA – .12" x .12" = 9.3 mm²

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25^\circ C$

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Reverse Break Down Voltage	$V_{(BR)R}$	30			V	$I_R = 100\mu A$ $E_e = 0 mW/cm^2$
Reverse Dark Current	$I_{D(R)}$			30	nA	$V_R = 10V$ $E_e = 0 mW/cm^2$
Open Circuit Voltage	Voc		350		mV	$\lambda = 940nm$ $E_e = 0.5 mW/cm^2$
Rise Time	Tr		50		nsec	$V_R = 10V$ $\lambda = 940nm$ $R_L = 1K\Omega$
Fall Time	T_f		50		nsec	
Light Current	Is	1.7	2		μA	$V_R = 5V$ $\lambda = 940nm$ $E_e = 0.08 mW/cm^2$
Total Capacitance	C_T		25		pF	$V_R = 3V$ f = 1MHZ $E_e = 0 mW/cm^2$
Wavelength of the Max Sensitivity	λ_{SMAX}		950		nm	
Spectral Sensitivity	S	30	50		$\frac{\mu A\, cm^2}{mw}$	$V_R = 5V$
Noise Equivalent Power	NEP		4.4×10^{-14}		$\frac{W}{\sqrt{HZ}}$	$V_R = 10V$
Detection Limit	*D		6.3×10^{12}		$\frac{cm\sqrt{HZ}}{w}$	

*The luminance indicated refers to unfiltered radiation of a tungsten filament LAMP at a color temperature of 2856° K.

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

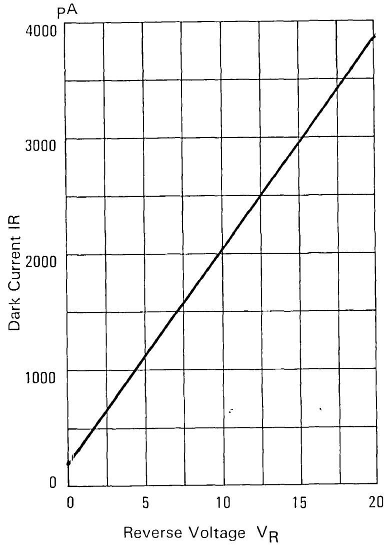


FIG 1 DARK CURRENT VS REVERSE VOLTAGE
TAMB = 25°C, Ee = 0 mW/cm²

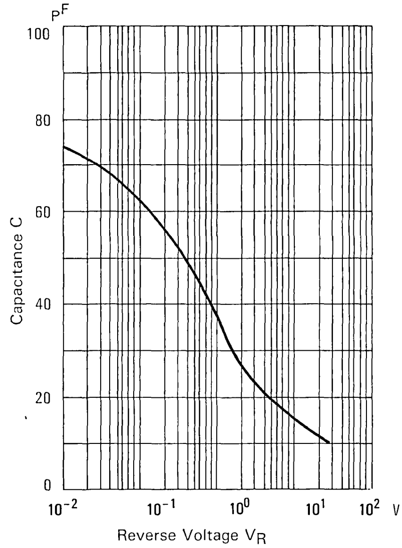


FIG 2 CAPACITANCE VS REVERSE VOLTAGE
F = 1 MHZ, Ee = 0 mW/cm²

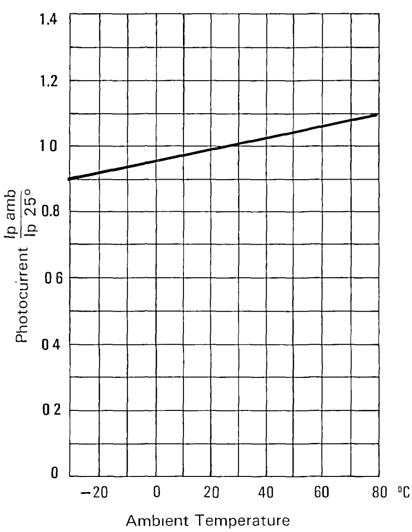


FIG 3 PHOTOCURRENT VS AMBIENT TEMPERATURE

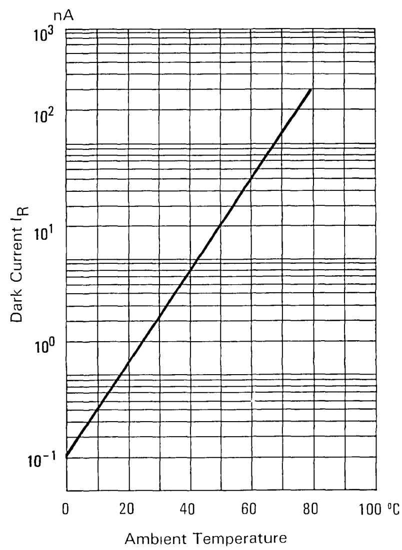


FIG 4 DARK CURRENT VS AMBIENT TEMPERATURE
V_R = 10V, Ee = 0 mW/cm²

INFRARED PRODUCTS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

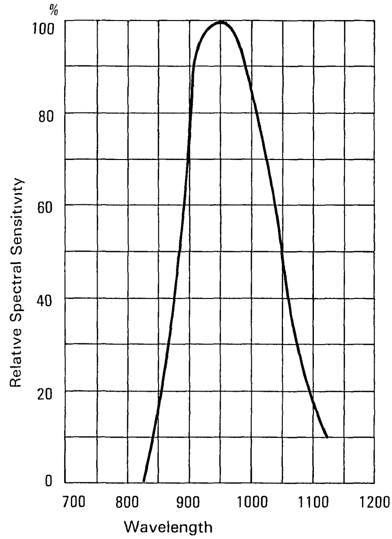


FIG 5 RELATIVE SPECTRAL SENSITIVITY VS WAVELENGTH

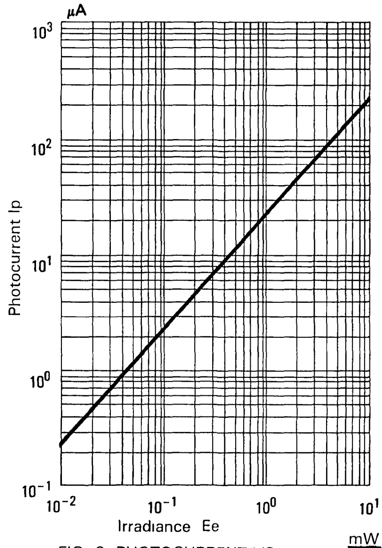


FIG 6 PHOTOCURRENT VS IRRADIANCE = 950 nm

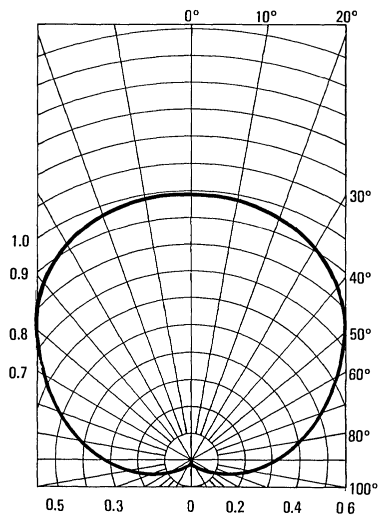


FIG 7 SENSITIVITY DIAGRAM

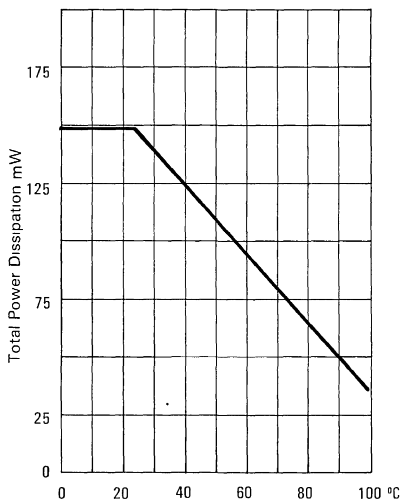


FIG 8 TOTAL POWER DISSIPATION VS AMBIENT TEMPERATURE

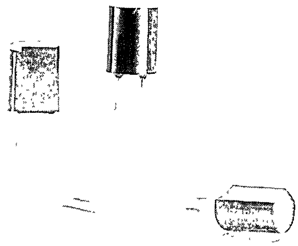
LITEON

BLACK PLASTIC PHOTODIODE

LTR-526AD

FEATURES

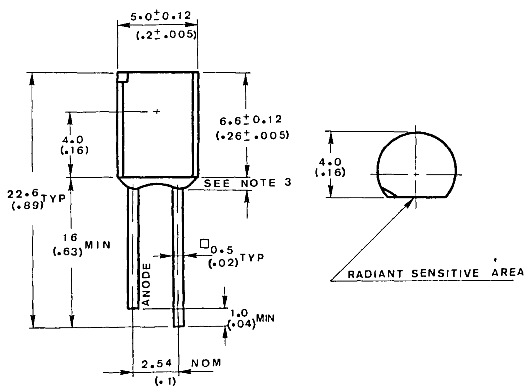
- HIGH PHOTO SENSITIVITY.
- SUITABLE FOR INFRARED RADIATION.
- LOW JUNCTION CAPACITANCE.
- HIGH CUT-OFF FREQUENCY.
- FAST SWITCHING TIME.



DESCRIPTION

The LTR-526AD is a special dark plastic package that cut the visible light and suitable for the detectors of infrared applications.
All electrical parameters are 100% tested by manufacturing specification are guaranteed to cumulative .65% AQL.

PACKAGE DIMENSION



NOTE:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specification are subject to change without notice.

INFRARED PRODUCTS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	150	mW
Reverse Break Down Voltage	30	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

AREA – .12" x .12" = 9.3 mm²

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Reverse Break Down Voltage	$V_{(BR)R}$	30			V	$I_R = 100\mu A$ $Ee = 0 mW/cm^2$
Reverse Dark Current	$I_{D(R)}$			30	nA	$V_R = 10V$ $Ee = 0 mW/cm^2$
Open Circuit Voltage	Voc		350		mV	$\lambda = 940nm$ $Ee = 0.5 mW/cm^2$
Rise Time	Tr		50		nsec	$V_R = 10V$ $\lambda = 940nm$ $R_L = 1K\Omega$
Fall Time	T_f		50		nsec	
Light Current	Is	1.7	2		μA	$V_R = 5V$ $\lambda = 940nm$ $Ee = 0.08 mW/cm^2$
Total Capacitance	C_T		25		pF	$V_R = 3V$ f = 1MHZ $Ee = 0 mW/cm^2$
Wavelength of the Max Sensitvity	λ_{SMAX}		950		nm	
Spectral Sensitivity	S	30	50		$\frac{\mu A\ cm^2}{mw}$	$V_R = 5V$
Noise Equivalent Power	NEP		4.4×10^{-14}		$\frac{W}{\sqrt{HZ}}$	$V_R = 10V$
Detection Limit	*D		6.3×10^{12}		$\frac{cm\sqrt{HZ}}{w}$	

*The luminance indicated refers to unfiltered radiation of a tungsten filament LAMP at a color temperature of 2856°K.

TYPICAL ELECTRICAL/OPTICAL/CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

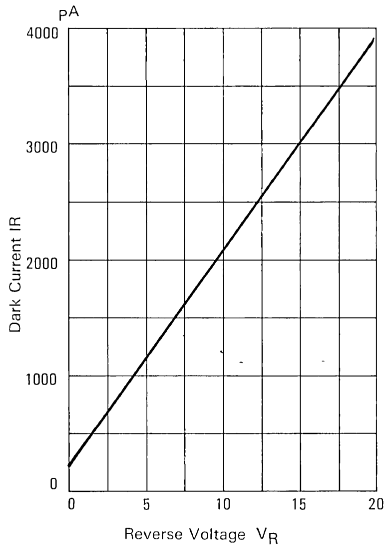


FIG 1 DARK CURRENT VS REVERSE VOLTAGE
TAMB = 25°C, Ee = 0 mW/cm²

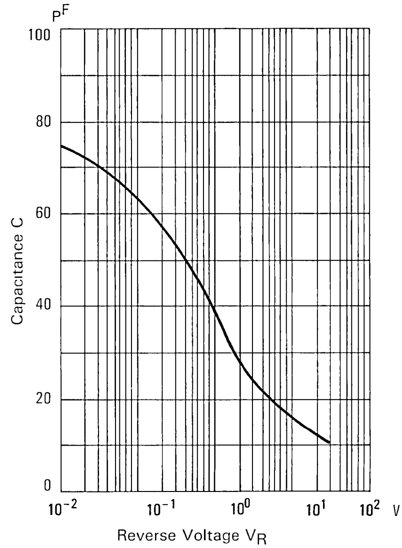


FIG 2 CAPACITANCE VS REVERSE VOLTAGE
F = 1 MHZ, Ee = 0 mW/cm²

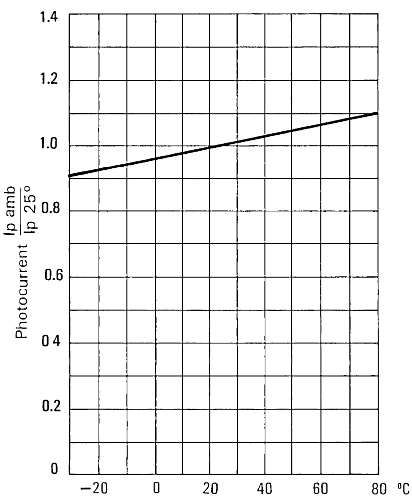


FIG 3 PHOTOCURRENT VS AMBIENT TEMPERATURE

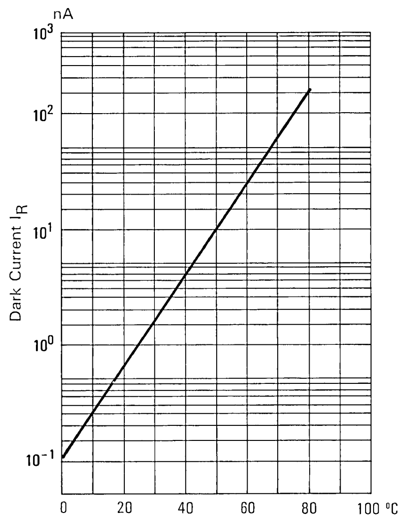


FIG 4 DARK CURRENT VS AMBIENT TEMPERATURE
V_R = 10V, Ee = 0 mW/cm²

INFRARED PRODUCTS

TYPICAL ELECTRICAL/OPTICAL/CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

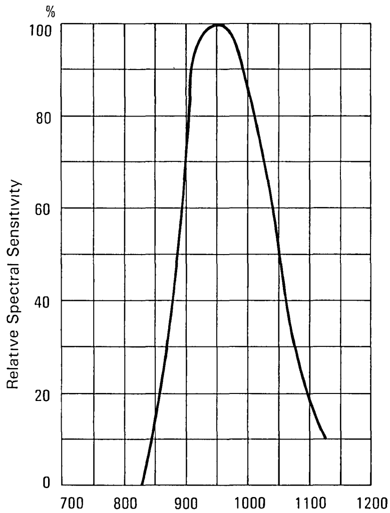


FIG 5 RELATIVE SPECTRAL SENSITIVITY VS WAVELENGTH

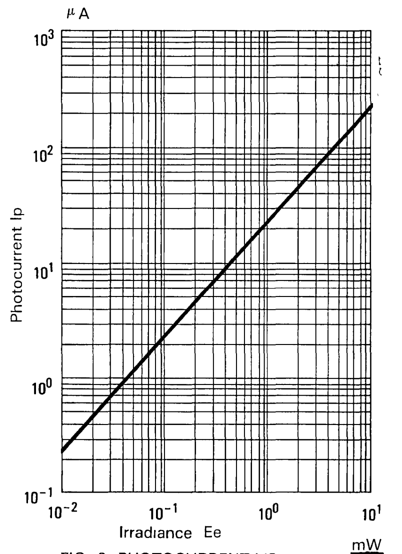


FIG. 6 PHOTOCURRENT VS IRRADIANCE = 950 nm

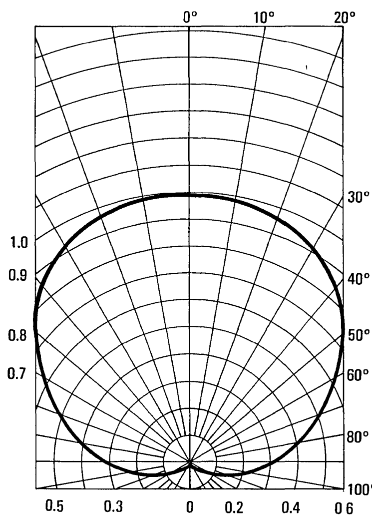


FIG 7 SENSITIVITY DIAGRAM

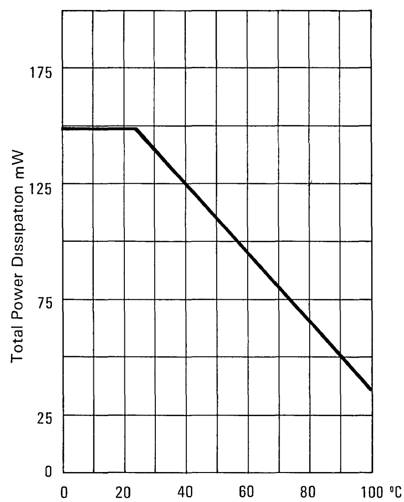


FIG. 8 TOTAL POWER DISSIPATION VS AMBIENT TEMPERATURE

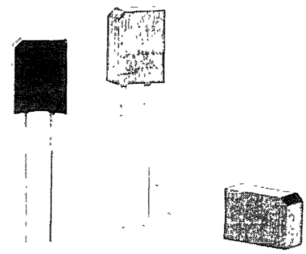
LITEON

BLACK PLASTIC PHOTODIODE

LTR-536AD

FEATURES

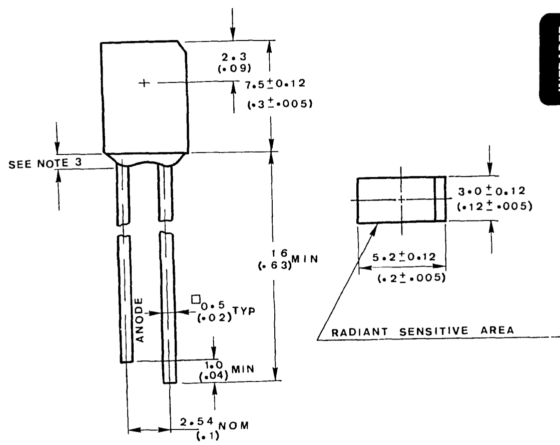
- HIGH PHOTO SENSITIVITY.
- SUITABLE FOR INFRARED RADIATION.
- LOW JUNCTION CAPACITANCE.
- HIGH CUT-OFF FREQUENCY.
- FAST SWITCHING TIME.



DESCRIPTION

The LTR-536AD is a special dark plastic package that cut the visible light and suitable for the detectors of infrared applications.
All electrical parameters are 100% tested by manufacturing specification are guaranteed to cumulative .65% AQL.

PACKAGE DIMENSION



NOTE:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specification are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	150	mW
Reverse Break Down Voltage	30	V
Operating Temperature Range	–55°C to +100°C	
Storage Temperature Range	–55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

AREA – .12" X .12" = 9.3 mm²

ELECTRICAL OPTICAL CHARACTERISTICS AT T_A = 25°C

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Reverse Break Down Voltage	$V_{(BR)R}$	30			V	I_R = 100μA, Ee = 0mW/cm²
Reverse Dark Current	$I_{D(R)}$			30	nA	V_R = 10V, Ee = 0mW/cm²
Open Circuit Voltage	Voc		350		mV	λ = 940nm, Ee = 0.5mW/cm²
Rise Time	Tr		50		nsec	V_R = 10V, λ = 940nm, R_L = 1kΩ
Fall Time	T_f		50		nsec	
Light Current	Is	1.7	2		μA	V_R =5V λ = 940nm, Ee = 0.08mW/cm²
Total Capacitance	C_T		25		pF	V_R =3V f = 1MHZ, Ee = 0mW/cm²
Wavelength of the Max Sensitivity	λ_{SMAX}		950		nm	
Spectral Sensitivity	S	30	50		$\frac{\mu A\ cm^2}{mw}$	V_R = 5V
Noise Equivalent Power	NEP		4.4×10^{-14}		$\frac{W}{\sqrt{HZ}}$	V_R = 10V
Detection Limit	*D		6.3×10^{12}		$\frac{cm\sqrt{HZ}}{w}$	

*The luminance indicated refers to unfiltered radiation of a tungsten filament LAMP at a color temperature of 2856° K.

TYPICAL ELECTRICAL/OPTICAL/CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

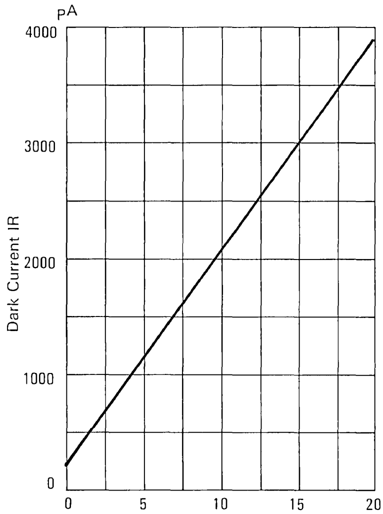


FIG 1 DARK CURRENT VS REVERSE VOLTAGE
TAMB = 25°C, Ee = 0 mW/cm²

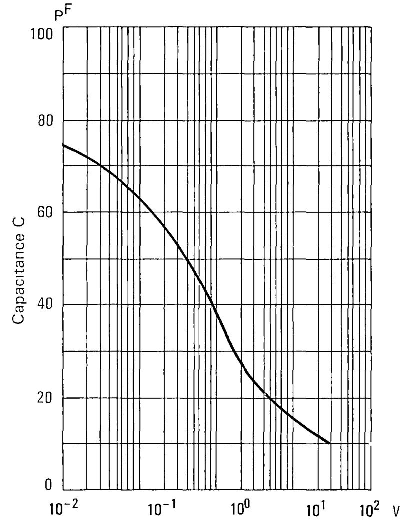


FIG 2 CAPACITANCE VS REVERSE VOLTAGE
F = 1 MHZ, Ee = 0 mW/cm²

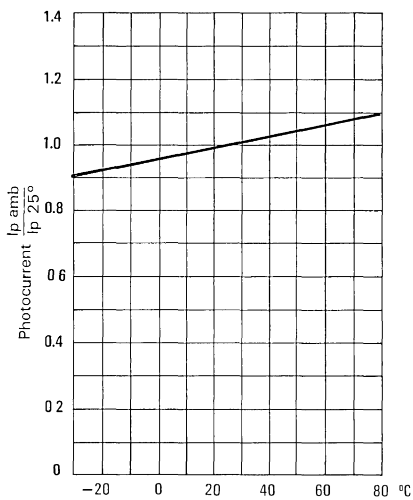


FIG 3 PHOTOCURRENT VS AMBIENT TEMPERATURE

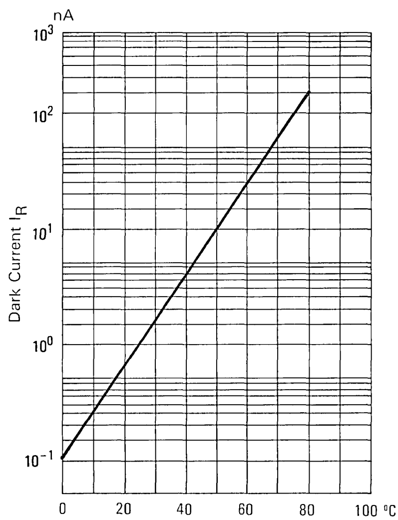


FIG 4 DARK CURRENT VS AMBIENT TEMPERATURE
V_R = 10V, Ee = 0 mW/cm²

INFRARED PRODUCTS

TYPICAL ELECTRICAL/OPTICAL/CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

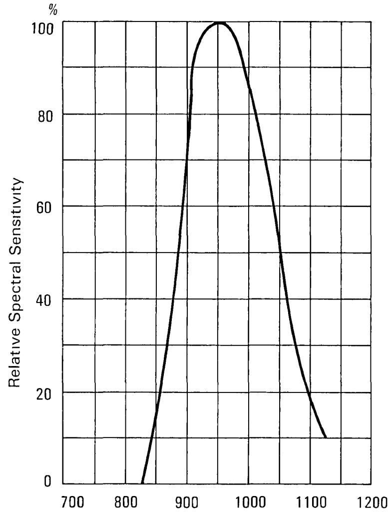


FIG 5 RELATIVE SPECTRAL SENSITIVITY VS WAVELENGTH

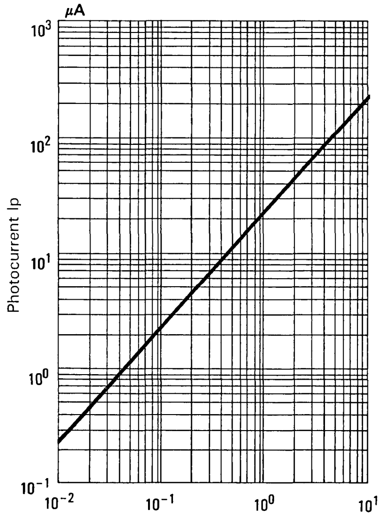


FIG 6 PHOTOCURRENT VS IRRADIANCE = 950 nm

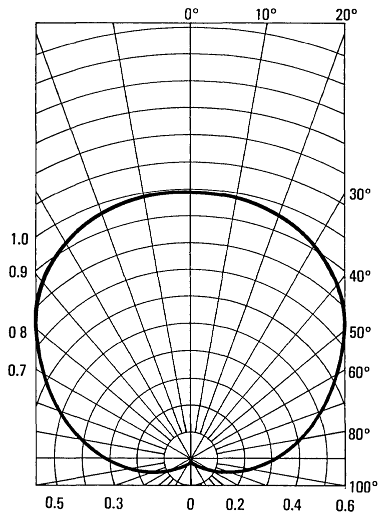


FIG 7 SENSITIVITY DIAGRAM

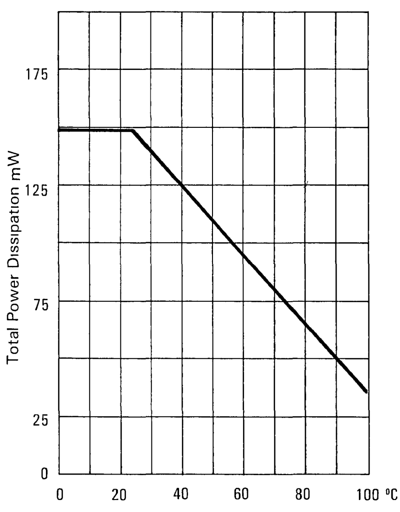


FIG. 8 TOTAL POWER DISSIPATION VS AMBIENT TEMPERATURE

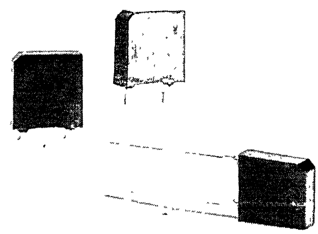
LITEON

BLACK PLASTIC PHOTODIODE

LTR-546AD

FEATURES

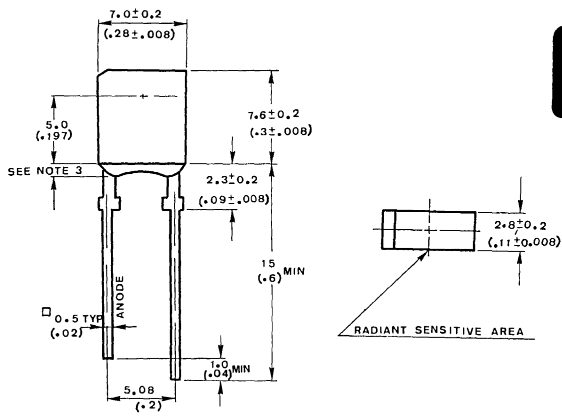
- HIGH PHOTO SENSITIVITY.
- SUITABLE FOR INFRARED RADIATION.
- LOW JUNCTION CAPACITANCE.
- HIGH CUT-OFF FREQUENCY.
- FAST SWITCHING TIME.



DESCRIPTION

The LTR-546AD is a special dark plastic package that cut the visible light and suitable for the detectors of infrared application.
All electrical parameters are 100% tested by manufacturing specification are guaranteed to cumulative .65% AQL.

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	150	mW
Reverse Break Down Voltage	30	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds	

AREA — .12" X .12" = 9.3 mm²

ELECTRICAL OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Reverse Break Down Voltage	$V_{(BR)R}$	30			V	$I_R = 100\mu A$ Ee = 0mW/cm²
Reverse Dark Current	$I_{D(R)}$			30	nA	$V_R = 10V$ Ee = 0mW/cm²
Open Circuit Voltage	Voc		350		mV	$\lambda = 940nm$ Ee = 0.5mW/cm²
Rise Time	Tr		50		nsec	$V_R = 10V$ $\lambda = 940nm$ $R_L = 1K\Omega$
Fall Time	Tf		50		nsec	
Light Current	Is	1.7	2		μA	$V_R = 5V$ $\lambda = 940nm$ Ee = 0.08mW/cm²
Total Capacitance	C_T		25		pF	$V_R = 3V$ f = 1MHZ Ee = 0mW/cm²
Wavelength of the Max Sensitvity	λ_{SMAX}		950		nm	
Spectral Sensitivity	S	30	50		$\frac{\mu A\ cm^2}{mw}$	$V_R = 5V$
Nose Equivalent Power	NEP		4.4×10^{-14}		$\frac{W}{\sqrt{HZ}}$	$V_R = 10V$
Detection Limit	*D		6.3×10^{12}		$\frac{cm\sqrt{HZ}}{w}$	

*The luminance indicated refers to unfiltered radiation of a tungsten filament LAMP at a color temperature of 2856°K.

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

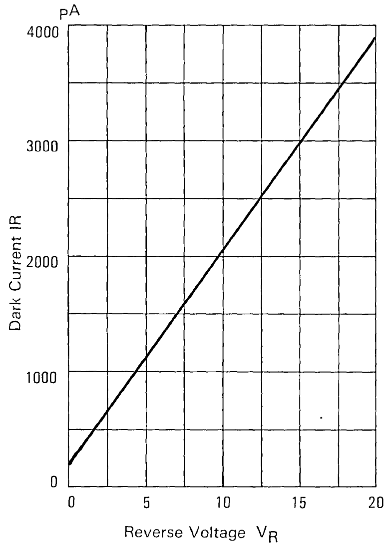


FIG 1 DARK CURRENT VS REVERSE VOLTAGE
TAMB = 25°C, Ee = 0 mW/cm²

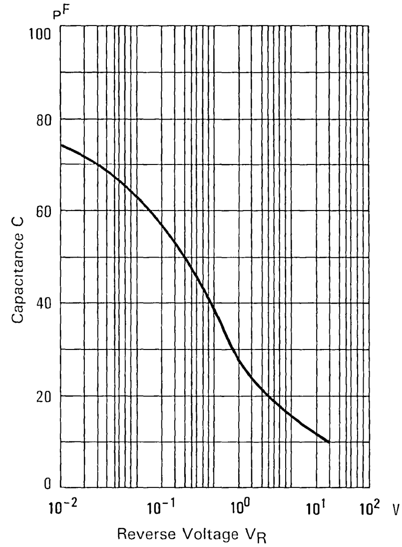


FIG 2 CAPACITANCE VS REVERSE VOLTAGE
F = 1 MHZ, Ee = 0 mW/cm²

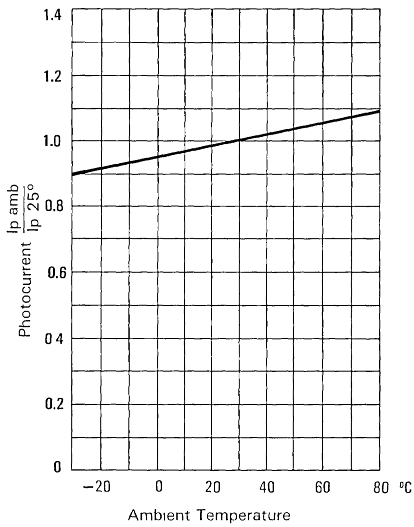


FIG 3 PHOTOCURRENT VS AMBIENT TEMPERATURE

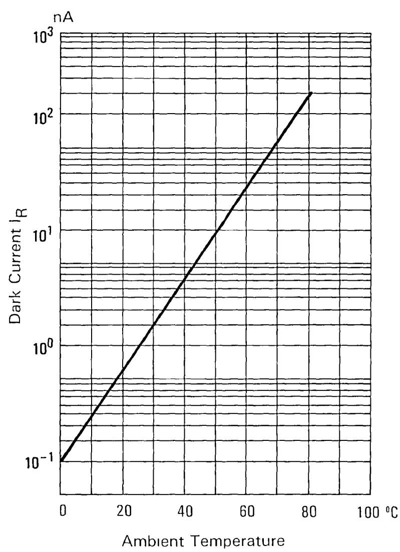


FIG 4 DARK CURRENT VS AMBIENT TEMPERATURE
V_R = 10V, Ee = 0 mW/cm²

INFRARED PRODUCTS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

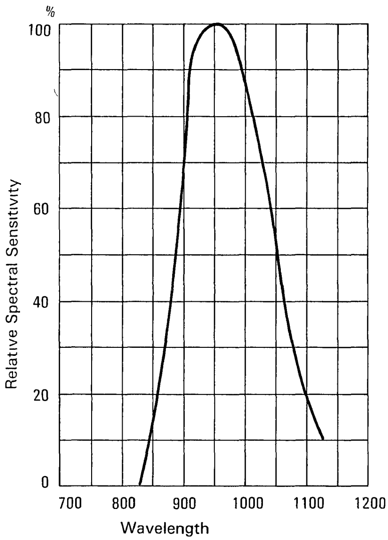


FIG. 5 RELATIVE SPECTRAL SENSITIVITY VS WAVELENGTH

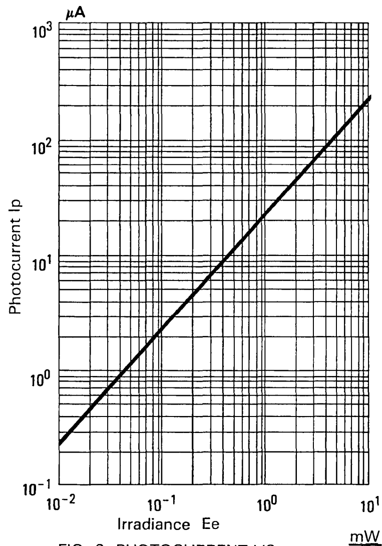


FIG 6 PHOTOCURRENT VS IRRADIANCE = 950 nm

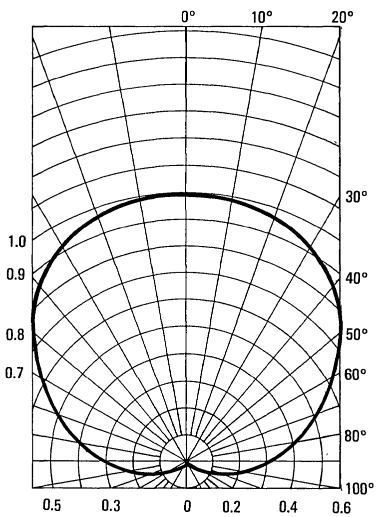


FIG 7 SENSITIVITY DIAGRAM

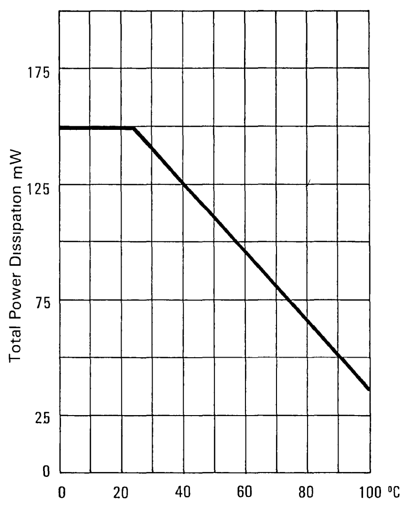


FIG 8 TOTAL POWER DISSIPATION VS AMBIENT TEMPERATURE

LITEON

PLASTIC SIDE LOOK TRANSMISSIVE SWITCHES

LTH-301A

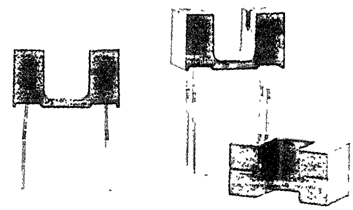
FEATURES

- NON-CONTACT SWITCHING.
- FOR DIRECT PC BOARD OR DUAL-IN-LINE SOCKET MOUNTING.
- FAST SWITCHING SPEED

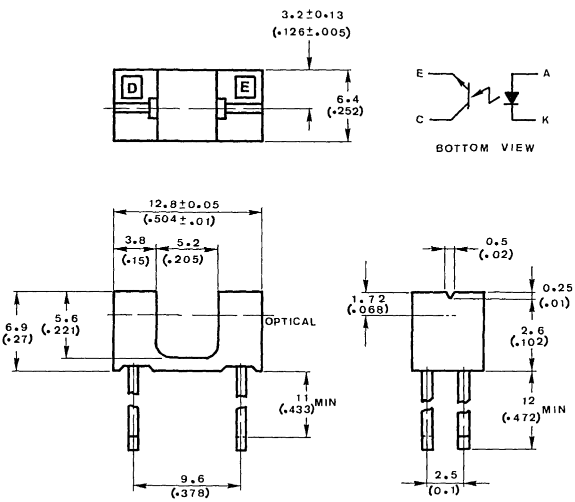
DESCRIPTION

The LTH-301A consists of a Gallium Arsenide infrared emitting diode and an NPN silicon phototransistor mounted in a low cost black plastic housing on opposite sides of a 0.061" (1.55mm) wide slot. Phototransistor switching takes place whenever an opaque object passes through the slot. The LTH-301A is designed for direct solding into PC boards of mounting in standard dual-in-line sockets.

All electrical parameters are 100% tested by manufacturing. Specifications are guaranteed to a cumulative .65% AQL.



PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Specifications are subject to change without notice.

INFRARED PRODUCTS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Diode Power Dissipation	100	mW
Phototransistor Collector-Emitter Voltage	30	V
Phototransistor Emitter-Collector Voltage	5	V
Diode Derating Linear From 25°C	1.33	mW/°C
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds	

ELECTRICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
INPUT DIODE						
Forward Voltage	V_F		1.2	1.6	V	I_F = 20 mA
Reverse Current	I_R		0	100	μA	V_R = 5V
OUTPUT PHOTOTRANSISTOR						
Collector Emitter Breakdown Voltage	$V_{(BR)\,CEO}$	30			V	I_C = 1mA
Emitter Collector Breakdown Voltage	$V_{(BR)\,ECO}$	5			V	I_E = 100μA
Collector Emitter Dark Current	I_{CEO}			100	nA	V_{ce} = 10V, I_F = 0
COUPLER						
Collector Emitter Saturation Voltage	$V_{CE\ (SAT)}$			0.4	V	I_C = 0.5mA I_F = 20mA
On State Collector Current	$I_{C\ (ON)}$	0.5	1		mA	V_{ce} = 5V I_F = 20mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

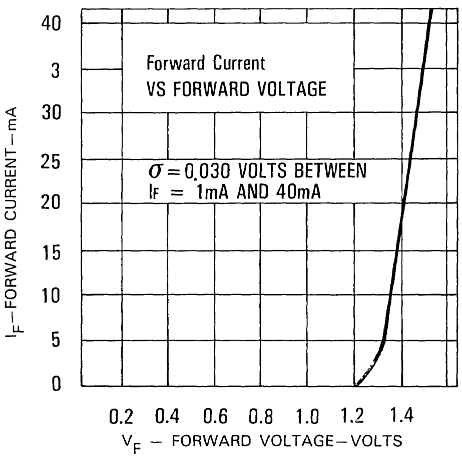


FIG. 1 FORWARD CURRENT VS FORWARD VOLTAGE

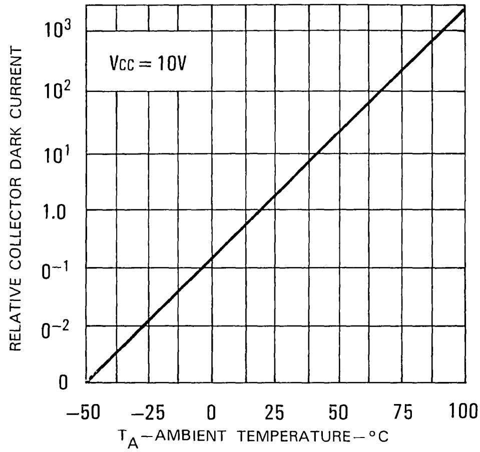


FIG 2 RELATIVE COLLECTOR DARK CURRENT VS AMBIENT TEMPERATURE

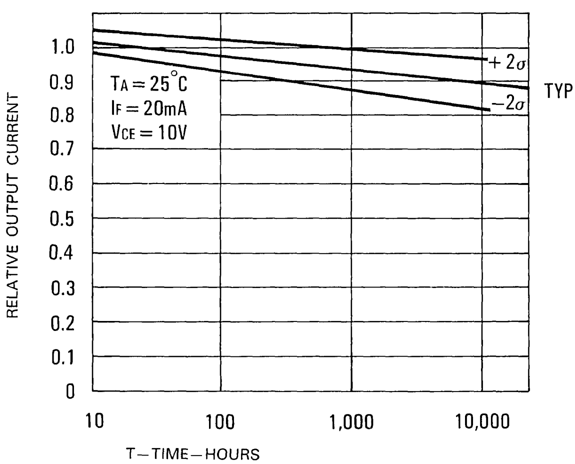


FIG 3 RELATIVE OUTPUT CURRENT VS TIME

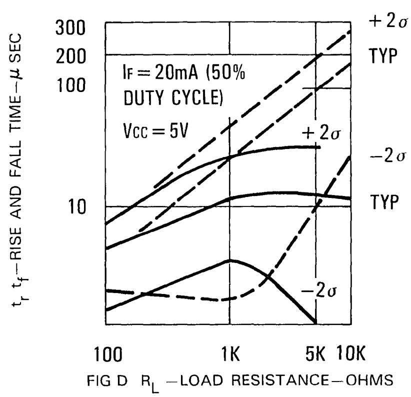


FIG. 4 RISE AND FALL TIME VS LOAD RESISTANCE

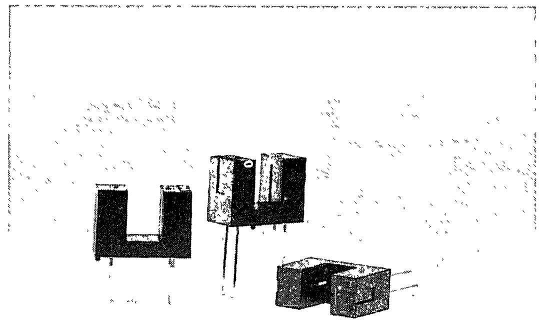
INFRARED PRODUCTS

PLASTIC SIDE LOOK TRANSMISSIVE SWITCHES

LTH-301-07

FEATURES

- NON-CONTACT SWITCHING.
- FOR DIRECT PC BOARD OR DUAL-IN-LINE SOCKET MOUNTING.
- FAST SWITCHING SPEED

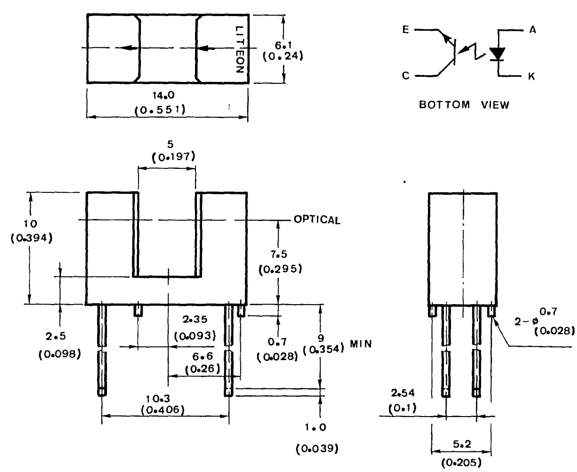


DESCRIPTION

The LTH-301-07 consists of a Gallium Arsenide infrared emitting diode and an NPN silicon phototransistor mounted in a low cost black plastic housing on opposite sides of a 0.02" (0.5mm) wide slot. Phototransistor switching takes place whenever an opaque object passes through the slot. The LTH-301-07 is designed for direct solding into PC boards of mounting in standard dual-in-line sockets.

All electrical parameters are 100% tested by manufacturing. Specifications are guaranteed to a cumulative .65% AQL.

PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Diode Power Dissipation	100	mW
Phototransistor Collector-Emitter Voltage	30	V
Phototransistor Emitter-Collector Voltage	5	V
Diode Derating Linear From 25°C	1.33	mW/°C
Operating Temperature Range	–55°C to +100°C	
Storage Temperature Range	–55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds	

ELECTRICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
INPUT DIODE						
Forward Voltage	V_F		1.2	1.6	V	$I_F = 20$ mA
Reverse Current	I_R		0	100	μA	$V_R = 5V$
OUTPUT PHOTOTRANSISTOR						
Collector Emitter Break down Voltage	$V_{(BR)\,CEO}$	30			V	$I_C = 1mA$
Emitter Collector Breakdown Voltage	$V_{(BR)\,ECO}$	5			V	$I_E = 100\mu A$
Collector Emitter Dark Current	I_{CEO}			100	nA	$V_{CE} = 10V$, $I_F = 0$
COUPLER						
Collector Emitter Saturation Voltage	$V_{CE\,(SAT)}$			0.4	V	$I_C = 0.2mA$ $I_F = 20mA$
On State Collector Current	$I_{C\,(ON)}$	0.4	0.7		mA	$V_{CE} = 5V$ $I_F = 20mA$

INFRARED PRODUCTS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

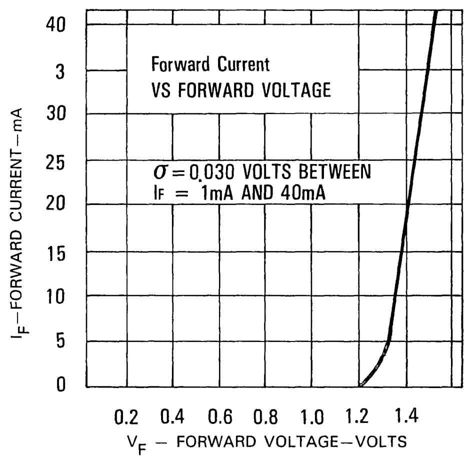


FIG. 1 FORWARD CURRENT VS FORWARD VOLTAGE

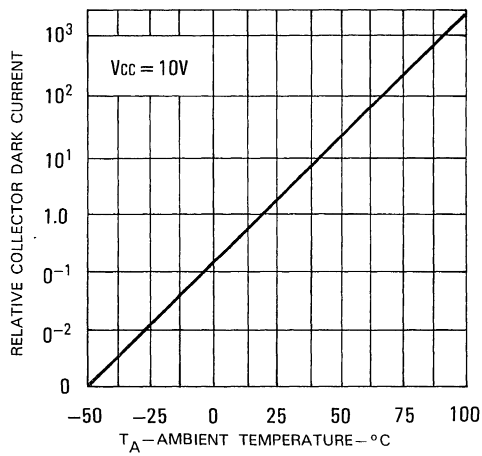


FIG. 2 RELATIVE COLLECTOR DARK CURRENT VS AMBIENT TEMPERATURE

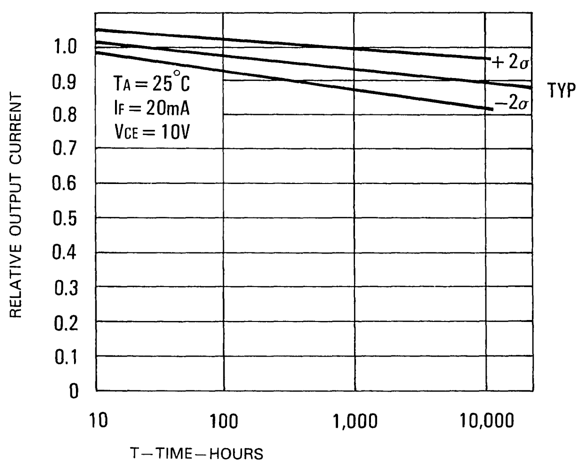


FIG. 3 RELATIVE OUTPUT CURRENT VS TIME

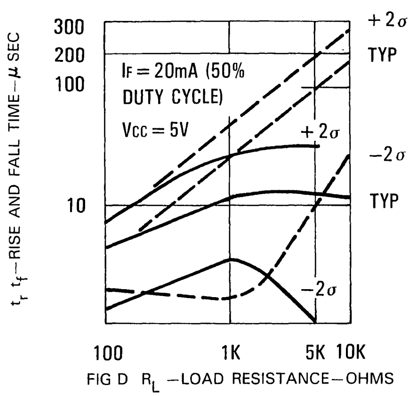


FIG 4 RISE AND FALL TIME VS LOAD RESISTANCE

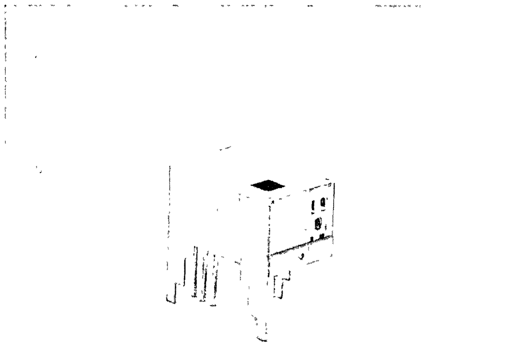
LITEON

INFRARED REMOTE CONTROL RECEIVER MODULES

LTM-8705A

FEATURES

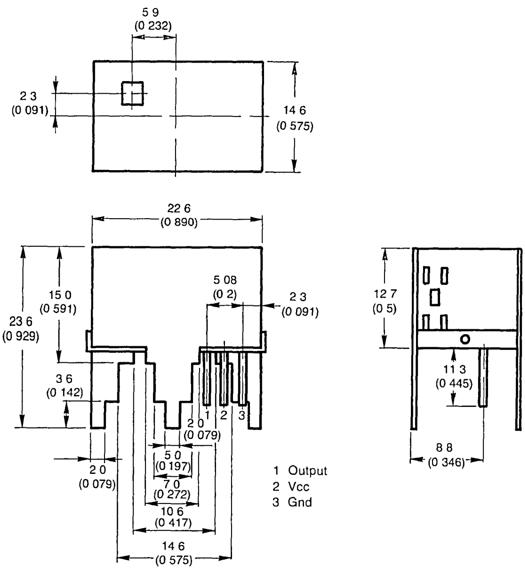
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.

INFRARED PRODUCTS

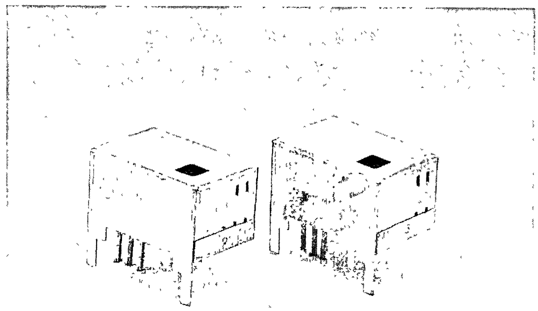
INFRARED REMOTE CONTROL RECEIVER MODULES

LITEON

LTM-8705A

FEATURES

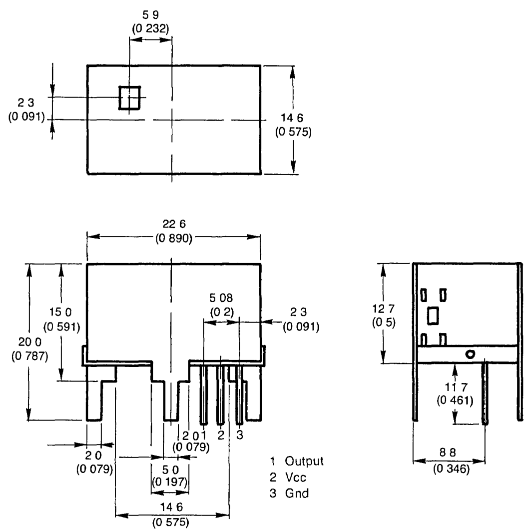
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



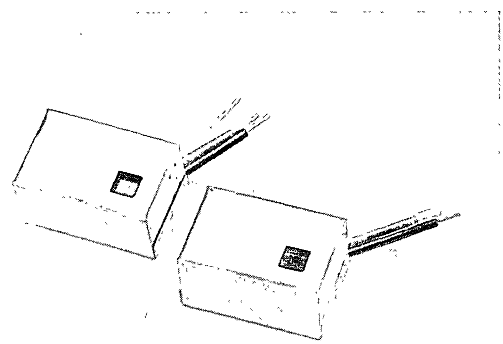
NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

INFRARED REMOTE CONTROL RECEIVER MODULES

LTM-8705C

FEATURES

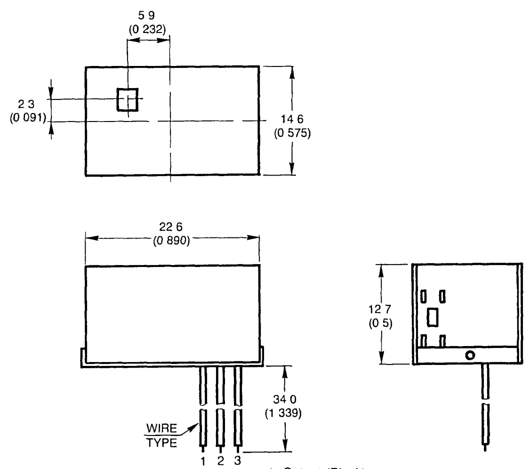
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



1 Output (Black)
2 Vcc (Red)
3 Gnd (White)

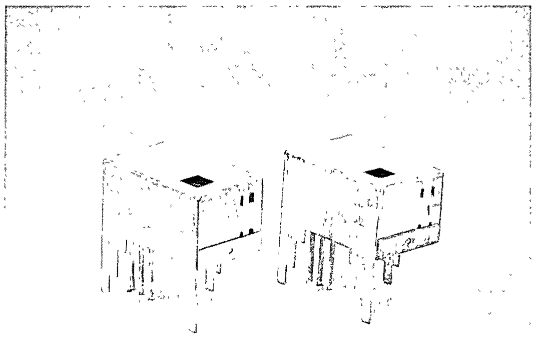
NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.

INFRARED REMOTE CONTROL RECEIVER MODULES

LTM-8705D

FEATURES

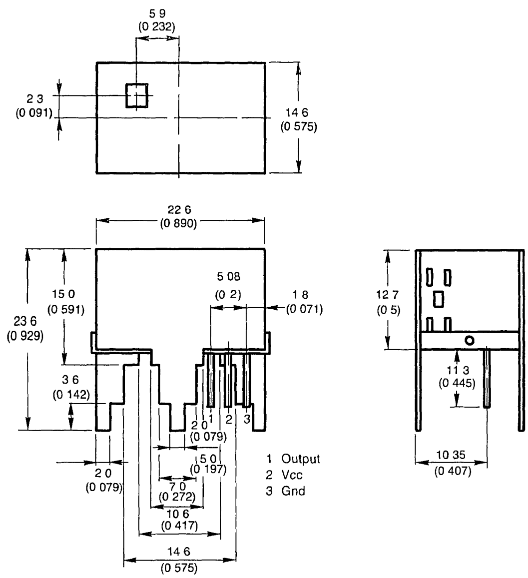
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

INFRARED REMOTE CONTROL RECEIVER

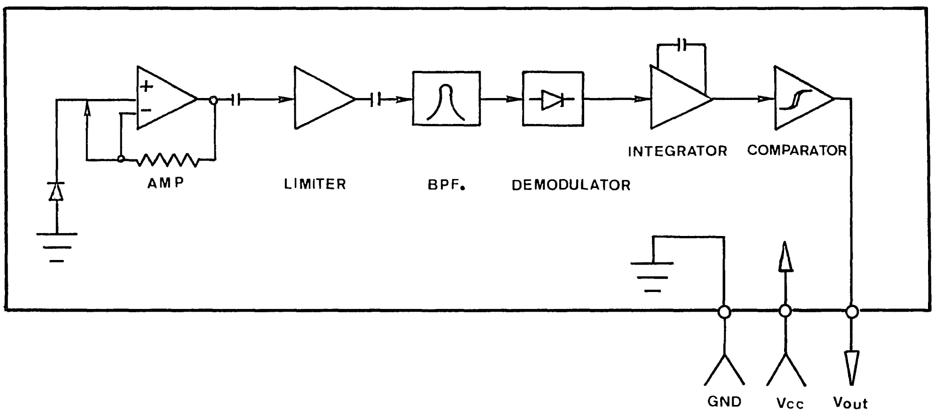
1. ABSOLUTE MAXIMUM 'RATINGS (Ta = 25°C)

* Supply voltage	Vcc	6.3	V
* Storage temperature	Tstg	−20 to +60	°C
* Operating temperature	Topr	−10 to +60	°C

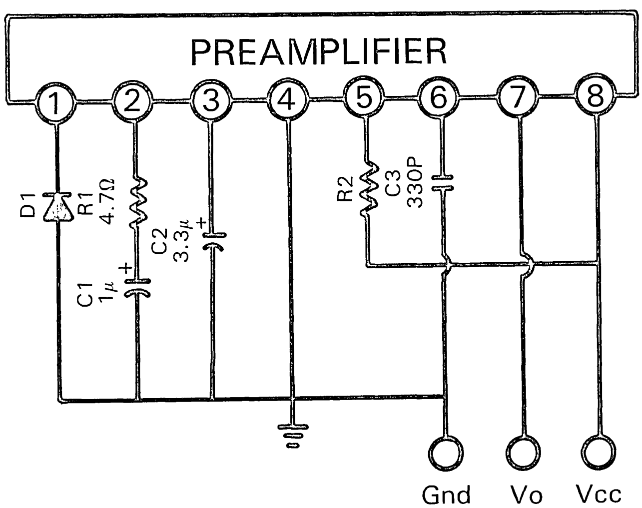
2. RECOMMENDED OPERATING CONDITION

* Supply voltage	Vcc	4.7 to 5.3	V

3. MODULE SCHEMATIC



4. RECEIVER MODULE EQUIVALENT CIRCUIT



5. MEASURE METHOD

A. Standard transmitter:

The transmitter whose output is adjusted up become Vo = 400 mVp-p by the output waveform as shown in Fig. 1 and using the measuring method as shown in Fig. 2 is specified as the standard transmitter.
However, the infrared diode to be used for the transmitter should be λpeak = 940 nm, △λ = 50 nm.

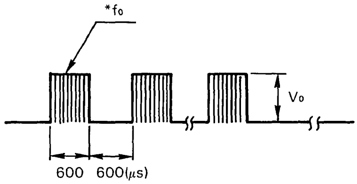


Fig. 1 Output waveform

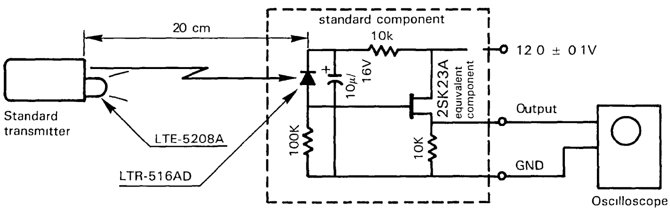
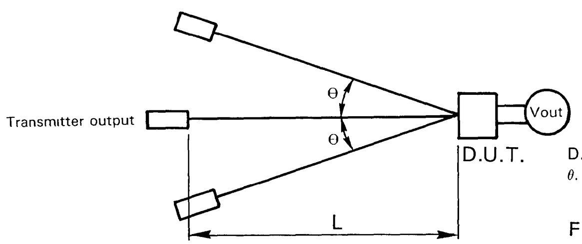


Fig. 2 Measuring method

B. Arrival distance measuring condition as shown in Fig. 3



D.U.T.: DEVICE UNDER TEST
θ. (indicates horizontal and vertical directions)

Fig. 3 Arrival distance L measuring condition

C. Pulse width measuring condition

Specifies at the TWL and the TWH period of the output pulse by using the aforementioned standard transmitter as shown in Fig. 4.

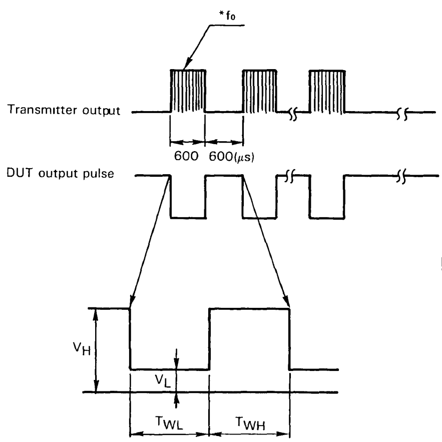


Fig. 4 Output pulse

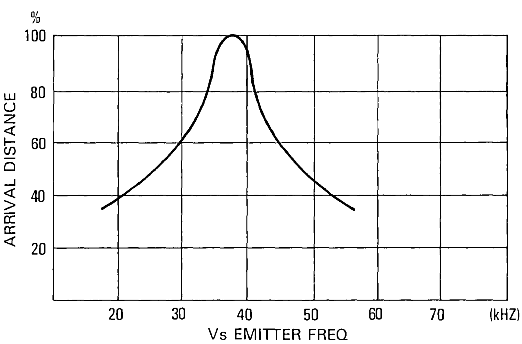
6. ELECTRICAL CHARACTERISTICS

(Ta = 25°C, Vcc = 5V)

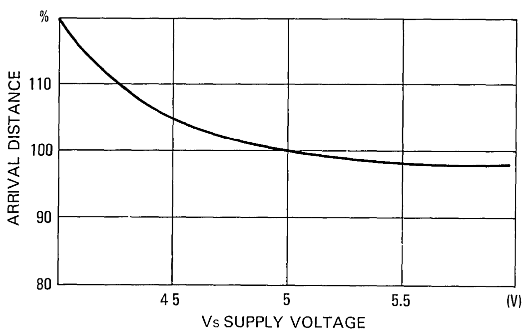
ITEM	SYMBOL	CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Current consumption	Icc	Non-signal input	1.1		2.5	mA
Arrival distance	L	At the ray axis	8.0	10.0		m
		The ray receiving surface at a vertex and in relation to the ray axis: a. In the range of 30° cone b. In the range of 45° cone	 6.0 3.0			
Low level output voltage	VL	30 cm over the ray axis			0.5	V
High level output voltage	VH	30 cm over the ray axis	4.5			V
Low level pluse width	TWL	Specified by the output TWL period within a range from 5cm to the arrival distance (Average value of 50 pulses)	410	660	910	µs
High level pluse width	TWH	Specified by the output TWH period within a range from 5cm to the arrival distance (Average value of 50 pluses)	290	540	790	µs

* CARRIER WAVE FREQUENCY F0 = 38 KHZ

7. ELECTRICAL CHARACTERISTIC CURVES



ARRIVAL DISTANCE / Vs EMITTER FREQ



ARRIVAL DISTANCE / Vs SUPPLY VOLTAGE

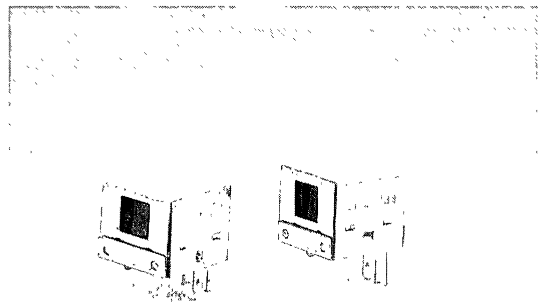
INFRARED REMOTE CONTROL RECEIVER MODULES

LTM-8834/8834-1/8834-2 8834-3/8834-4/8834-5

LITEON

FEATURES

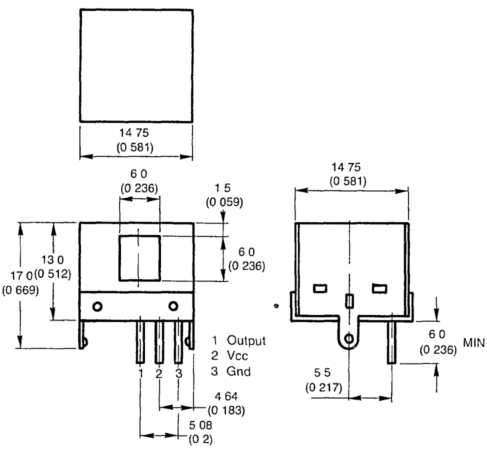
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

INFRARED REMOTE CONTROL RECEIVER

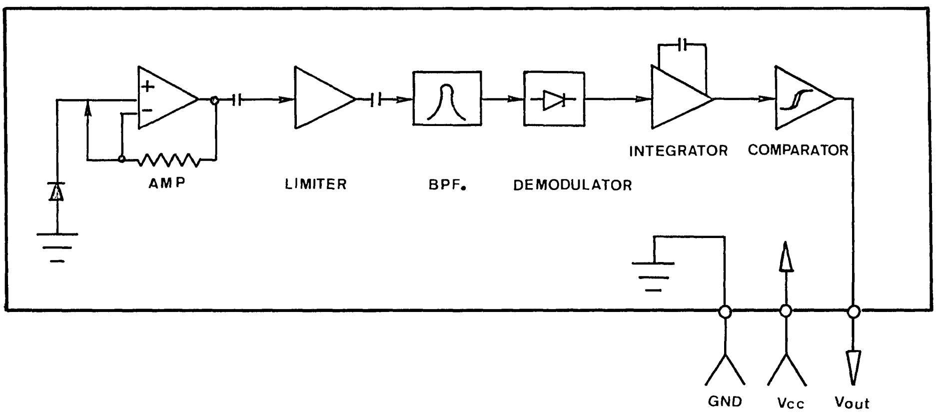
1. ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

* Supply voltage	Vcc	6.3	V
* Storage temperature	Tstg	−20 to +60	°C
* Operating temperature	Topr	−10 to +60	°C

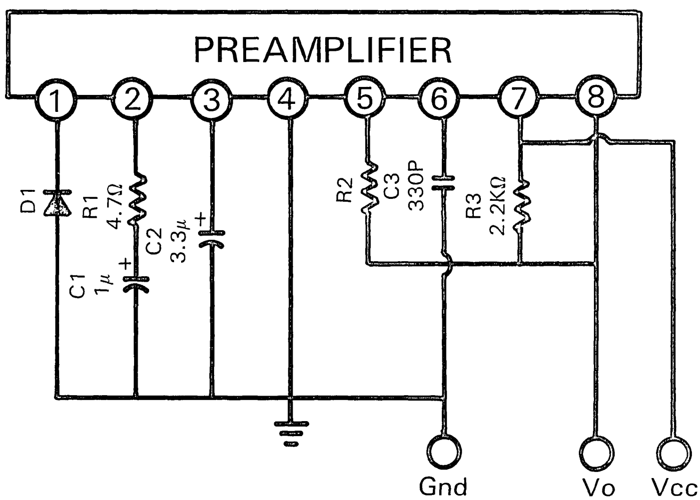
2. RECOMMENDED OPERATING CONDITION

* Supply voltage	Vcc	4.7 to 5.3	V

3. MODULE SCHEMATIC



4. RECEIVER MODULE EQUIVALENT CIRCUIT



5. MEASURE METHOD

A. Standard transmitter:

The transmitter whose output is adjusted up become Vo = 400 mVp-p by the output waveform as shown in Fig. 1 and using the measuring method as shown in Fig. 2 is specified as the standard transmitter.
However, the infrared diode to be used for the transmitter should be λpeak = 940 nm, △λ = 50 nm.

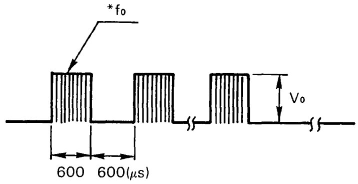


Fig. 1 Output waveform

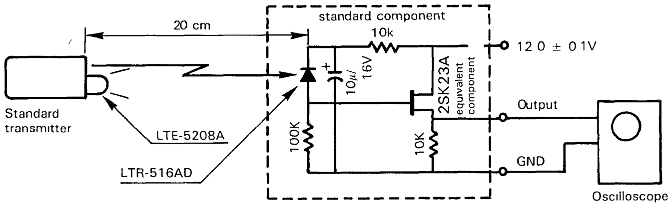
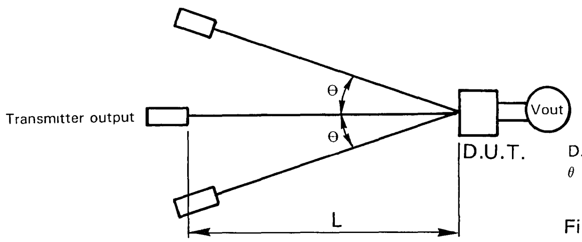


Fig. 2 Measuring method

B. Arrival distance measuring condition as shown in Fig. 3



D.U.T.: DEVICE UNDER TEST
θ (indicates horizontal) and vertical directions)

Fig. 3 Arrival distance L measuring condition

C. Pulse width measuring condition

Specifies at the TWL and the TWH period of the output pulse by using the aforementioned standard transmitter as shown in Fig. 4.

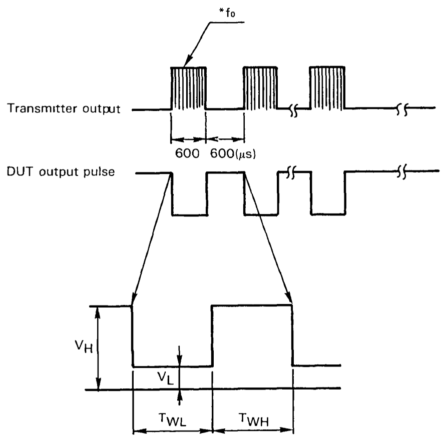


Fig. 4 Output pulse

6. ELECTRICAL CHARACTERISTICS

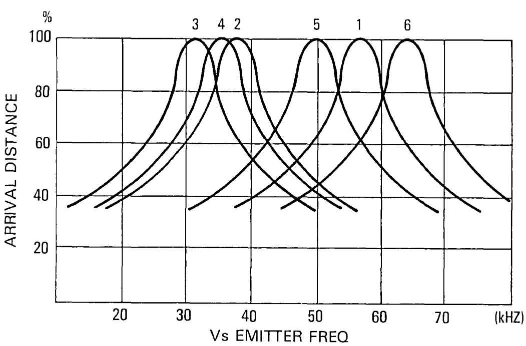
(Ta = 25°C, Vcc = 5V)

ITEM	SYMBOL	CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Current consumption	Icc	Non-signal input	1.1		2.5	mA
Arrival distance	L	At the ray axis	8.0	10.0		m
		The ray receiving surface at a vertex and in relation to the ray axis: a. In the range of 30° cone b. In the range of 45° cone	6.0 3.0			
Low level output voltage	VL	30 cm over the ray axis			0.5	V
High level output voltage	VH	30 cm over the ray axis	4 5			V
Low level pluse width	TWL	Specified by the output TWL period within a range from 5cm to the arrival distance (Average value of 50 pulses)	410	660	910	μs
High level pluse width	TWH	Specified by the output TWH period within a range from 5cm to the arrival distance (Average value of 50 pluses)	290	540	790	μs

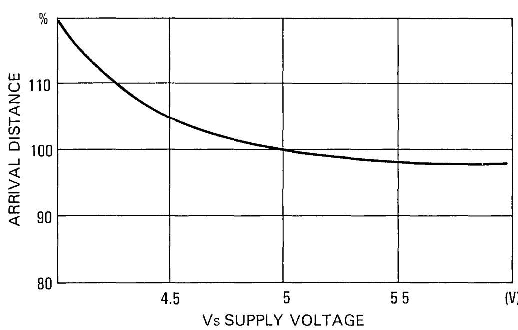
* CARRIER WAVE FREQUENCY F0 = 1. LTM-8834·56 8   4. LTM-8834-3:36
(KHZ) 2 LTM-8834-1 38   5. LTM-8834-4·50
3 LTM-8834-2 32.7   6. LTM-8834-5·64

INFRARED PRODUCTS

7. ELECTRICAL CHARACTERISTIC CURVES



ARRIVAL DISTANCE / Vs EMITTER FREQ.



ARRIVAL DISTANCE / Vs SUPPLY VOLTAGE

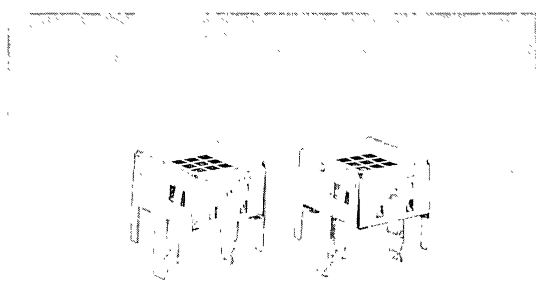
LITEON

INFRARED REMOTE CONTROL RECEIVER MODULES

LTM-8835

FEATURES

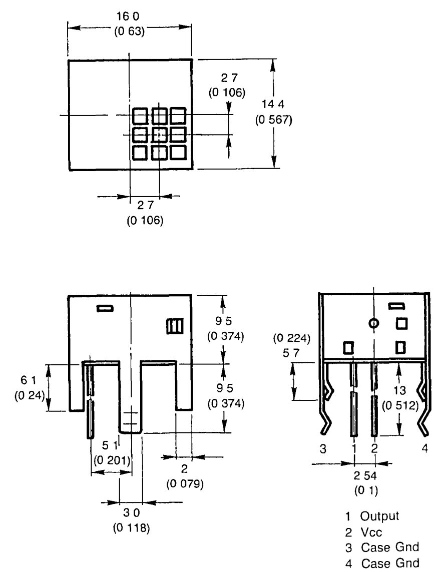
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.

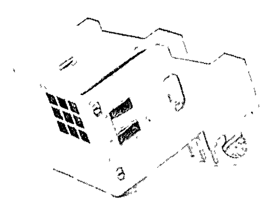
INFRARED REMOTE CONTROL RECEIVER MODULES

LITEON

LTM-8836

FEATURES

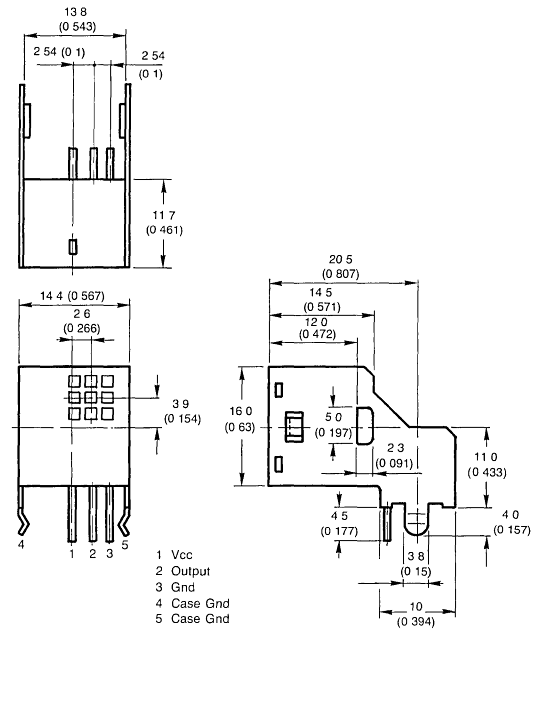
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

INFRARED REMOTE CONTROL RECEIVER

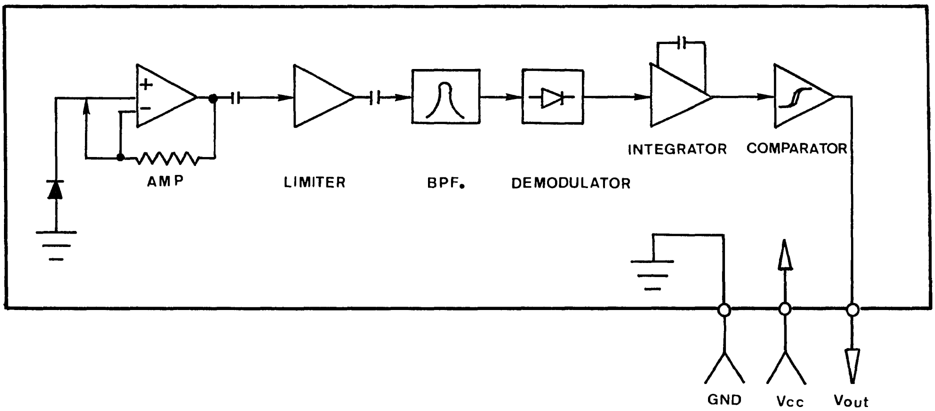
1. ABSOLUTE MAXIMUM 'RATINGS (Ta = 25°C)

* Supply voltage	Vcc	6.3	V
* Storage temperature	Tstg	−20 to +60	°C
* Operating temperature	Topr	−10 to +60	°C

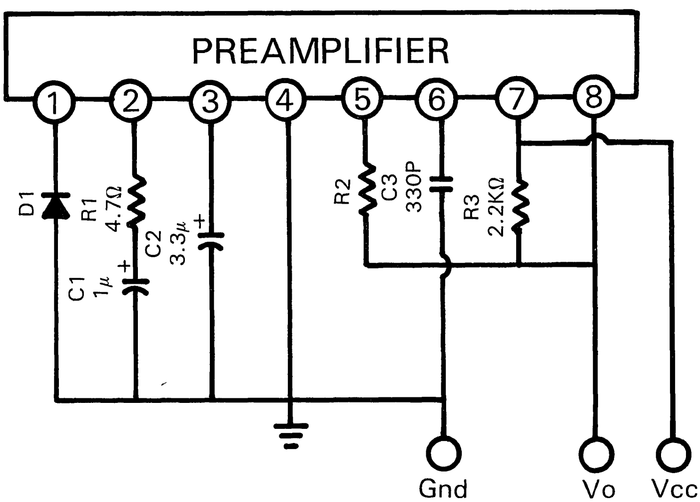
2. RECOMMENDED OPERATING CONDITION

* Supply voltage	Vcc	4.7 to 5.3	V

3. MODULE SCHEMATIC



4. RECEIVER MODULE EQUIVALENT CIRCUIT



5. MEASURE METHOD

A. Standard transmitter:

The transmitter whose output is adjusted up become Vo = 400 mVp-p by the output waveform as shown in Fig. 1 and using the measuring method as shown in Fig. 2 is specified as the standard transmitter.
However, the infrared diode to be used for the transmitter should be λpeak = 940 nm, △λ = 50 nm.

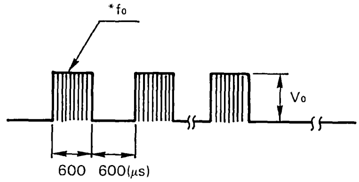


Fig. 1 Output waveform

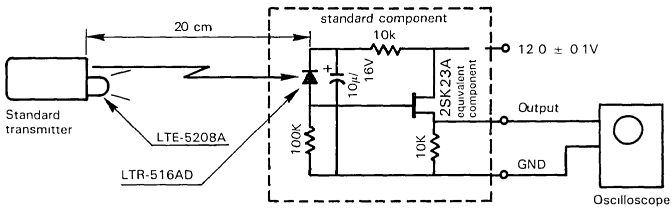
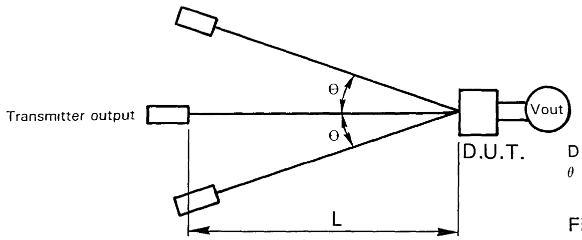


Fig. 2 Measuring method

B. Arrival distance measuring condition as shown in Fig. 3



D.U.T.. DEVICE UNDER TEST
θ (indicates horizontal) and vertical directions)

Fig. 3 Arrival distance L measuring condition

C. Pulse width measuring condition

Specifies at the TWL and the TWH period of the output pulse by using the aforementioned standard transmitter as shown in Fig. 4.

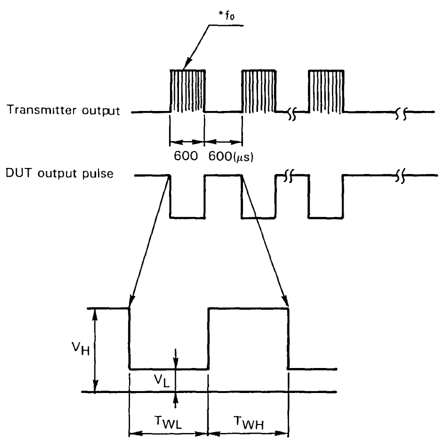


Fig. 4 Output pulse

INFRARED PRODUCTS

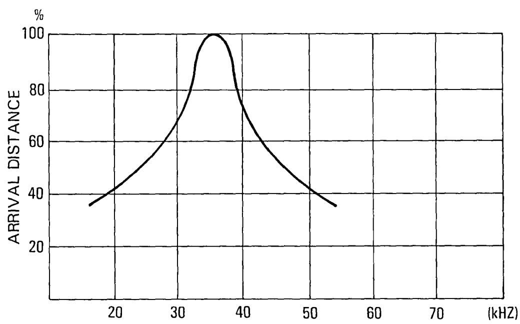
6. ELECTRICAL CHARACTERISTICS

(Ta = 25°C, Vcc = 5V)

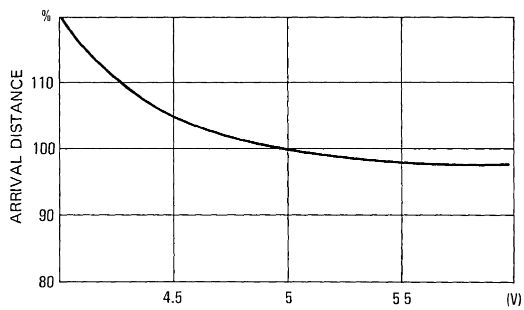
ITEM	SYMBOL	CONDITION	RATING MIN.	RATING TYP.	RATING MAX.	UNIT
Current consumption	Icc	Non-signal input	1.1		2.5	mA
Arrival distance	L	At the ray axis	6.3	7.8		m
		The ray receiving surface at a vertex and in relation to the ray axis: a. In the range of 30° cone b. In the range of 45° cone	 5.1 3.9			
Low level output voltage	VL	30 cm over the ray axis			0.5	V
High level output voltage	VH	30 cm over the ray axis	4.5			V
Low level pluse width	TWL	Specified by the output TWL period within a range from 5cm to the arrival distance (Average value of 50 pulses)	410	660	910	μs
High level pluse width	TWH	Specified by the output TWH period within a range from 5cm to the arrival distance (Average value of 50 pluses)	290	540	790	μs

* CARRIER WAVE FREQUENCY F0 = 36 KHZ

7. ELECTRICAL CHARACTERISTIC CURVES



Vs EMITTER FREQ
ARRIVAL DISTANCE / Vs EMITTER FREQ



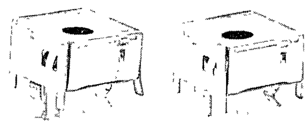
Vs SUPPLY VOLTAGE
ARRIVAL DISTANCE / Vs SUPPLY VOLTAGE

INFRARED REMOTE CONTROL RECEIVER MODULES

LTM-8837

FEATURES

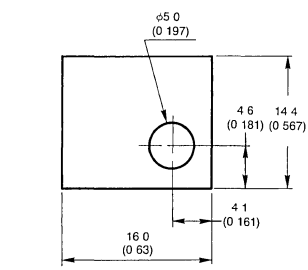
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



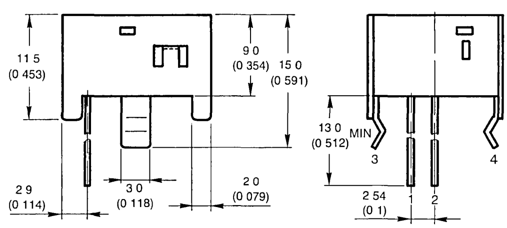
DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



1 Output
2 Vcc
3 Case Gnd
4 Case Gnd



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

INFRARED REMOTE CONTROL RECEIVER

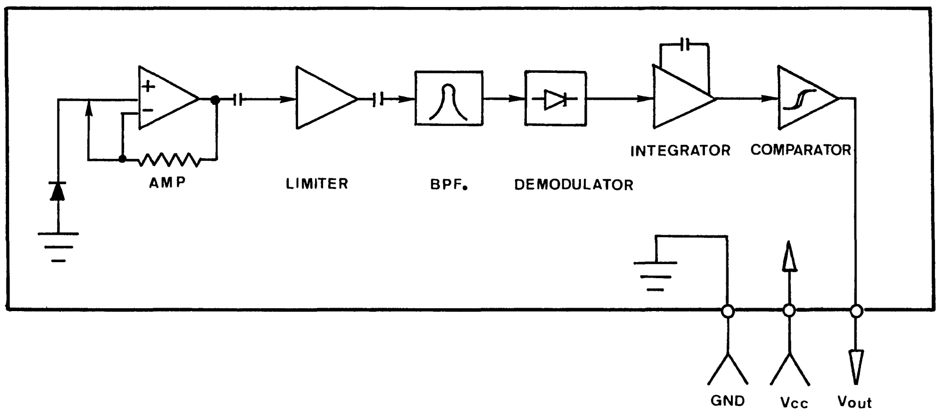
1. ABSOLUTE MAXIMUM 'RATINGS (Ta = 25°C)

* Supply voltage	Vcc	6.3	V
* Storage temperature	Tstg	−20 to +60	°C
* Operating temperature	Topr	−10 to +60	°C

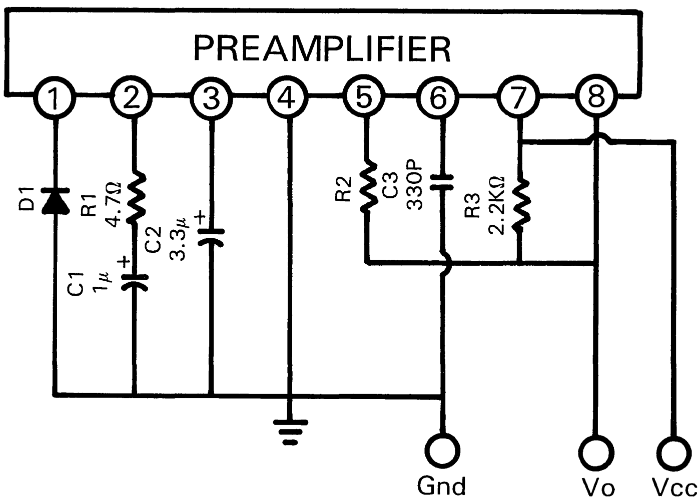
2. RECOMMENDED OPERATING CONDITION

* Supply voltage	Vcc	4.7 to 5.3	V

3. MODULE SCHEMATIC



4. RECEIVER MODULE EQUIVALENT CIRCUIT



5. MEASURE METHOD

A. Standard transmitter:

The transmitter whose output is adjusted up become Vo = 400 mVp-p by the output waveform as shown in Fig. 1 and using the measuring method as shown in Fig. 2 is specified as the standard transmitter.
However, the infrared diode to be used for the transmitter should be λpeak = 940 nm, $\Delta\lambda$ = 50 nm.

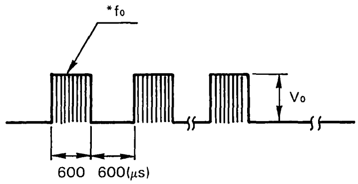


Fig. 1 Output waveform

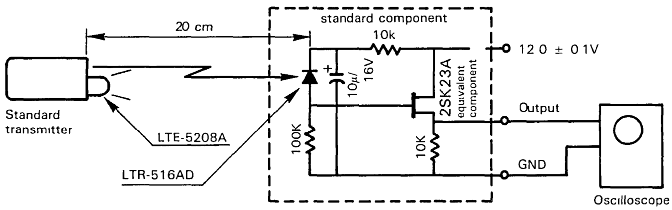
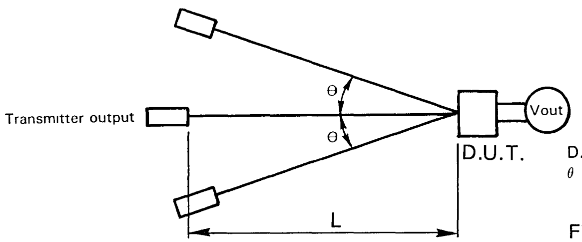


Fig. 2 Measuring method

B. Arrival distance measuring condition as shown in Fig. 3



D.U T.: DEVICE UNDER TEST
θ (indicates horizontal)
and vertical directions)

Fig. 3 Arrival distance L measuring condition

INFRARED PRODUCTS

C. Pulse width measuring condition

Specifies at the TWL and the TWH period of the output pulse by using the aforementioned standard transmitter as shown in Fig. 4.

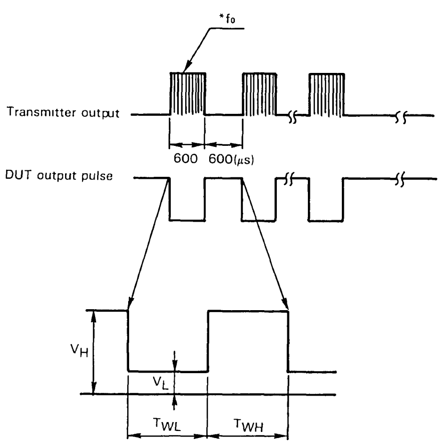


Fig. 4 Output pulse

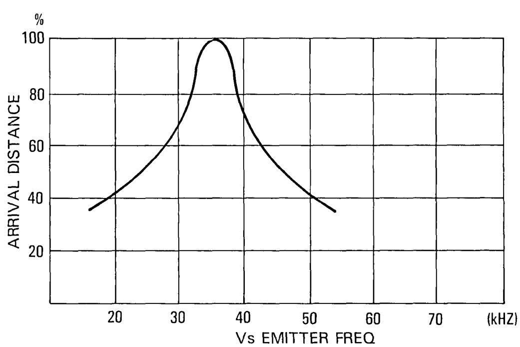
6. ELECTRICAL CHARACTERISTICS

(Ta = 25°C, Vcc = 5V)

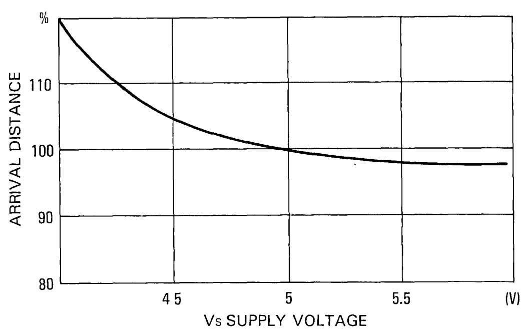
ITEM	SYMBOL	CONDITION	RATING MIN.	RATING TYP.	RATING MAX.	UNIT
Current consumption	Icc	Non-signal input	1.1		2.5	mA
Arrival distance	L	At the ray axis	8.0	10.0		m
		The ray receiving surface at a vertex and in relation to the ray axis: a. In the range of 30° cone b. In the range of 45° cone	6.0 3.0			m
Low level output voltage	VL	30 cm over the ray axis			0.5	V
High level output voltage	VH	30 cm over the ray axis	4.5			V
Low level pluse width	TWL	Specified by the output TWL period within a range from 5cm to the arrival distance (Average value of 50 pulses)	410	660	910	μs
High level pluse width	TWH	Specified by the output TWH period within a range from 5cm to the arrival distance (Average value of 50 pluses)	290	540	790	μs

* CARRIER WAVE FREQUENCY F0 = 36 KHZ

7. ELECTRICAL CHARACTERISTIC CURVES



ARRIVAL DISTANCE / Vs EMITTER FREQ.



ARRIVAL DISTANCE / Vs SUPPLY VOLTAGE

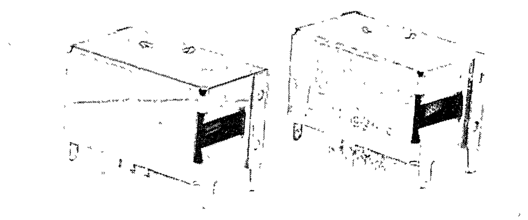
LITEON

INFRARED REMOTE CONTROL RECEIVER MODULES

LTM-8848

FEATURES

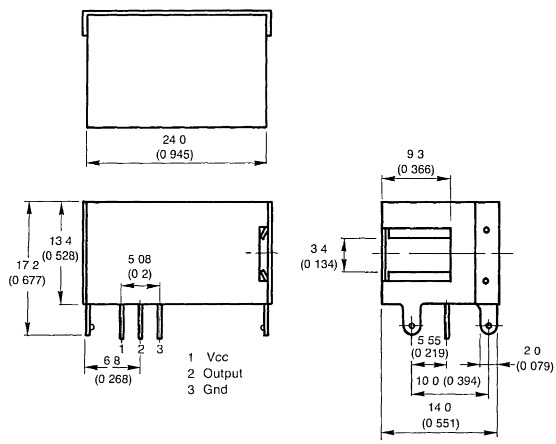
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

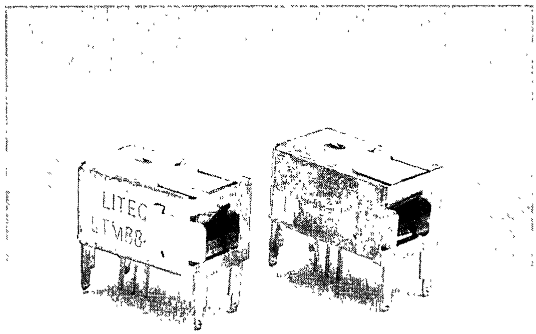
INFRARED PRODUCTS

INFRARED REMOTE CONTROL RECEIVER MODULES

LTM-8848A

FEATURES

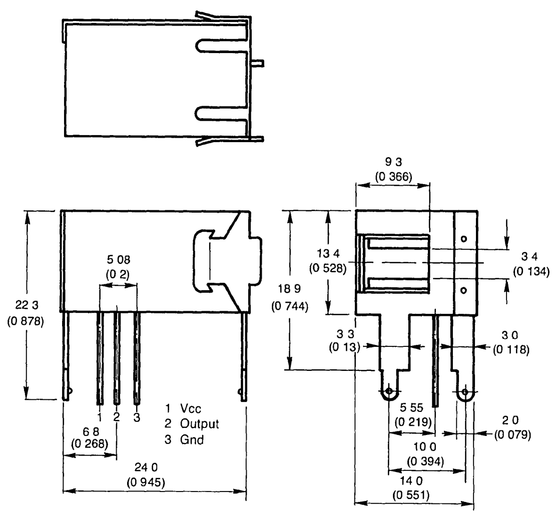
- EASY TO HANDLE SMALL TYPE MODULE.
- EXCELLENT MECHANICALLY STRENGTH AND ELECTRICAL STABILITY.
- CAN BE INSTALLED DIRECTLY TO EQUIPMENT.



DESCRIPTION

- The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
- It is a single unit type module which incorporates a PIN diode and a receiving preamplifier IC.
- It can be used for TVs, VTRs, audio equipment, air conditioners, car stereo radio, toys, home computers and all other equipments requiring remote control.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.

INFRARED REMOTE CONTROL RECEIVER

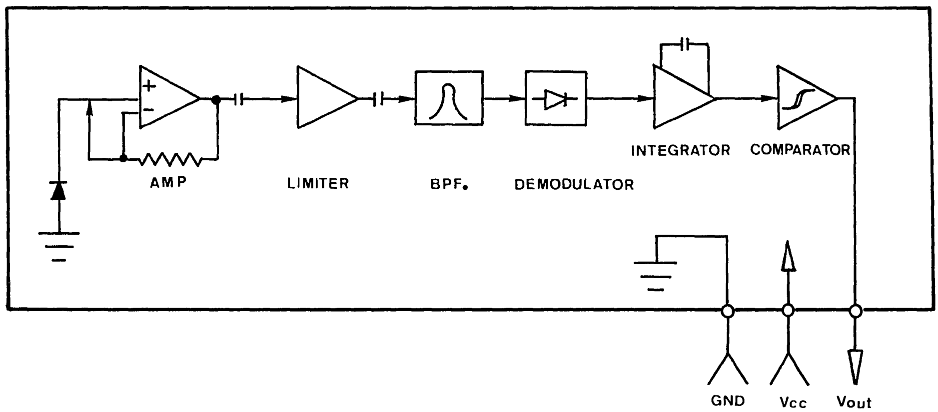
1. ABSOLUTE MAXIMUM 'RATINGS (Ta = 25°C)

* Supply voltage	Vcc	6.3	V
* Storage temperature	Tstg	−20 to +60	°C
* Operating temperature	Topr	−10 to +60	°C

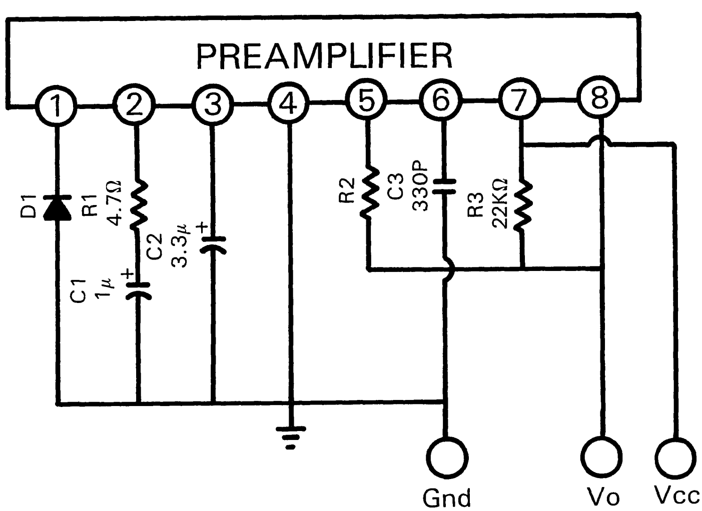
2. RECOMMENDED OPERATING CONDITION

* Supply voltage	Vcc	4.7 to 5.3	V

3. MODULE SCHEMATIC



4. RECEIVER MODULE EQUIVALENT CIRCUIT



5. MEASURE METHOD

A. Standard transmitter:

The transmitter whose output is adjusted up become Vo = 400 mVp-p by the output waveform as shown in Fig. 1 and using the measuring method as shown in Fig. 2 is specified as the standard transmitter.
However, the infrared diode to be used for the transmitter should be λpeak = 940 nm, △λ = 50 nm.

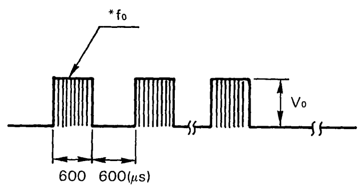


Fig. 1 Output waveform

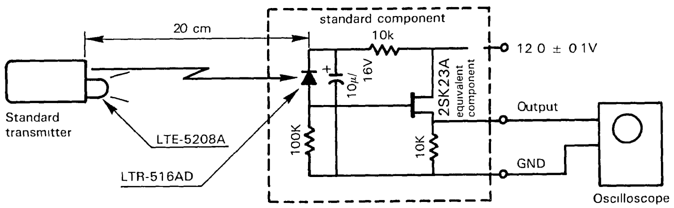
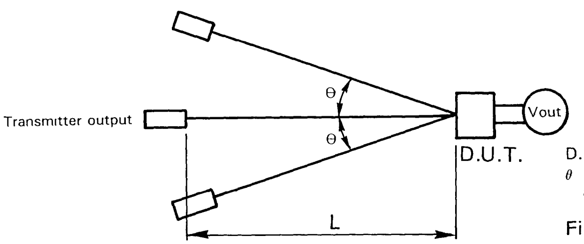


Fig. 2 Measuring method

B. Arrival distance measuring condition as shown in Fig. 3



D.U T.: DEVICE UNDER TEST
θ (indicates horizontal) and vertical directions)

Fig. 3 Arrival distance L measuring condition

C. Pulse width measuring condition

Specifies at the TWL and the TWH period of the output pulse by using the aforementioned standard transmitter as shown in Fig. 4.

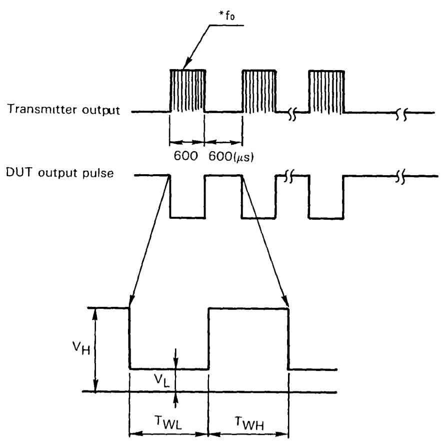


Fig. 4 Output pulse

6. ELECTRICAL CHARACTERISTICS

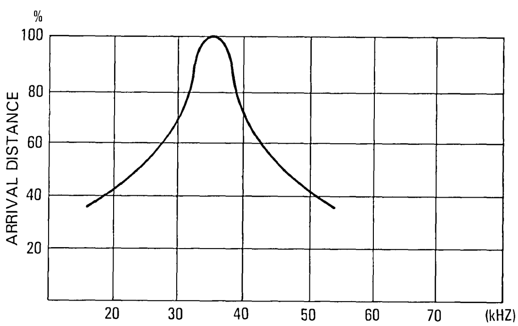
(Ta = 25°C, Vcc = 5V)

ITEM	SYMBOL	CONDITION	RATING			UNIT
			MIN.	TYP.	MAX.	
Current consumption	Icc	Non-signal input	1.1		2.5	mA
Arrival distance	L	At the ray axis	8.0	10.0		m
		The ray receiving surface at a vertex and in relation to the ray axis: a. In the range of 30° cone b. In the range of 45° cone	6.0 3.0			
Low level output voltage	VL	30 cm over the ray axis			0.5	V
High level output voltage	VH	30 cm over the ray axis	4.5			V
Low level pluse width	TWL	Specified by the output TWL period within a range from 5cm to the arrival distance (Average value of 50 pulses)	410	660	910	µs
High level pluse width	TWH	Specified by the output TWH period within a range from 5cm to the arrival distance (Average value of 50 pluses)	290	540	790	µs

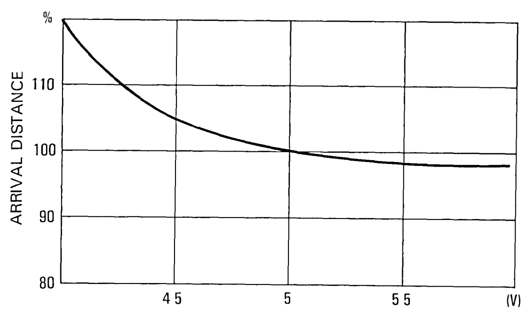
* CARRIER WAVE FREQUENCY F0 = 36 KHZ

INFRARED PRODUCTS

7. ELECTRICAL CHARACTERISTIC CURVES



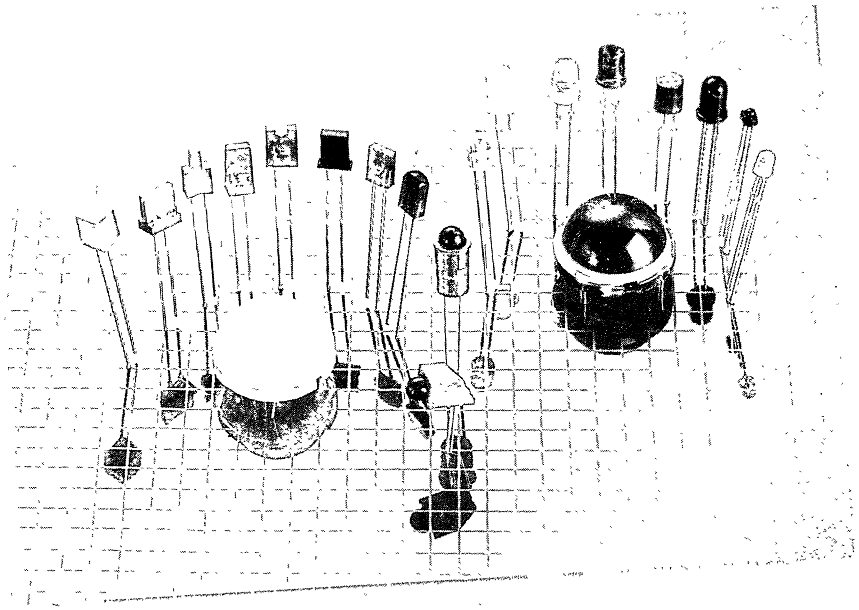
Vs EMITTER FREQ
ARRIVAL DISTANCE / Vs EMITTER FREQ



Vs SUPPLY VOLTAGE
ARRIVAL DISTANCE / Vs SUPPLY VOLTAGE

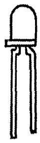
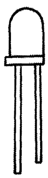
2. LED Lamps

- SELECTION GUIDE
- HOW TO USE LITON LED LAMPS
- CROSS REFERENCE GUIDE
- RESISTOR LAMPS
- FLASH LAMPS
- AXIAL LAMPS
- SURFACE MOUNT ASSEMBLY LED LAMPS
- BIG LED LAMPS
- ULTRA BRIGHT LED LAMPS
- LOW CURRENT LED LAMPS
- STANDARD LED LAMPS
- SPECIAL LED LAMPS
- DUAL COLOR LED LAMPS
- TAPE AND REEL
  - — RADIAL TAPE AND REEL
  - — SURFACE MOUNT TAPE AND REEL
- PANEL MOUNTING GROMMENTS
- LED CIRCUIT BOARD AND SNAP-IN INDICATORS

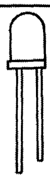


SELECTION GUIDE

RESISTOR LAMPS

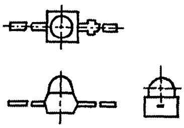
OUTLINE	DEVICE: PACKAGE	DEVICE: PART NO.	DESCRIPTION: COLOR**	DESCRIPTION: LENS	LUMINOUS INTENSITY Iv TYP.	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	OPERATING VOLTAGE	PAGE NO.
	T-1 Standard 1" LEAD 3φ	LTL-4201-R1	Red (655 nm)	Diffused	0.8 mcd	40°	5 V	2-35
		LTL-4201-R2			0.9 mcd		12 V	
		LTL-4211-R1	Bright Red (697 nm)	Diffused	1.7 mcd	40°	5 V	
		LTL-4211-R2			1.8 mcd		12 V	
		LTL-4231-R1	Green (565 nm)	Diffused	5.6 mcd	40°	5 V	
		LTL-4231-R2			5.8 mcd		12 V	
		LTL-4251-R1	Yellow (585 nm)	Diffused	5.6 mcd	40°	5 V	
		LTL-4251-R2			5.7 mcd		12 V	
		LTL-4291-R1	Orange (630 nm)	Diffused	5.6 mcd	40°	5 V	
		LTL-4291-R2			5.7 mcd		12 V	
	T-1¾ Standard 1" LEAD 5φ	LTL-4203-R1	Red (655 nm)	Diffused	0.8 mcd	36°	5 V	2-43
		LTL-4203-R2			1.0 mcd		12 V	
		LTL-4213-R1	Bright Red (697 nm)	Diffused	3.8 mcd	36°	5 V	
		LTL-4213-R2			4.0 mcd		12 V	
		LTL-4223-R1	Hi.Eff.Red (635 nm)	Diffused	8.7 mcd	36°	5 V	
		LTL-4223-R2			8.9 mcd		12 V	
		LTL-4233-R1	Green (565 nm)	Diffused	8.7 mcd	36°	5 V	
		LTL-4233-R2			8.9 mcd		12 V	
		LTL-4253-R1	Yellow (585 nm)	Diffused	8.7 mcd	36°	5 V	
		LTL-4253-R2			8.9 mcd		12 V	
		LTL-4293-R1	Orange (630 nm)	Diffused	8.7 mcd	36°	5 V	
		LTL-4293-R2			8.9 mcd		12 V	
		LTL-4238-R1	Green (565 nm)	water Clear	70 mcd	20°	5 V	
		LTL-4238-R2			85 mcd		12 V	

FLASH LAMPS

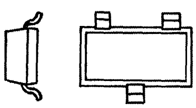
OUTLINE	DEVICE: PACKAGE	DEVICE: PART NO.	DESCRIPTION: COLOR**	DESCRIPTION: LENS	LUMINOUS INTENSITY Iv TYP.	BLINK FREQ.	PACKAGE DIMENSION
	T-1¾ Standard 1" LEAD 5φ	LTL-4263-FL	Red (660 nm)	Diffused	30 mcd	f = 2.2 HZ	2-52
		LTL-4213-FL	Bright Red (697 nm)	Diffused	1.0 mcd	f = 2.2 HZ	
		LTL-4233-FL	Green (565 nm)	Diffused	1.5 mcd		

Notes.
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm).

◎ AXIAL LAMPS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta½$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	Subminiature Lamp	LTL-93BEK1	Orange (630 nm)	Water Clear	12.5 mcd	34°	2.0 V	2-57
		LTL-93BGK1	Green (565 nm)	Water Clear	15.0 mcd	34°	2.1 V	
		LTL-93BYK1	Yellow (585 nm)	Water Clear	8.5 mcd	34°	2.1 V	
		LTL-93BHRA1	Orange (630 nm)	Diffused	3.7 mcd	90°	2.0 V	
		LTL-93BGA1	Green (565 nm)	Diffused	2.5 mcd	90°	2.1 V	
		LTL-93BYA1	Yellow (585 nm)	Diffused	5.6 mcd	90°	2.1 V	

◎ SURFACE MOUNT ASSEMBLY LED LAMPS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 20mA	TYPICAL VIEWING ANGLE $2\theta½$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	SOT-23 Surface Mount LED Lamp	LTL-907PK	Bright Red (697 nm)	Water Clear	1.7 mcd	140°	2.1 V	2-62
		LTL-907LK	Green (565 nm)	Water Clear	2.0 mcd	140°	2.1 V	
		LTL-907EK	Orange (630 nm)	Water Clear	2.0 mcd	140°	2.0 V	
		LTL-907CK	GaAlAs Red	Water Clear	3.5 mcd	140°	1.8 V	2-67
		LTL-907HK	Green	Water Clear	2.0 mcd	140°	2.1 V	2-67
			Orange				2.0 V	
		LTL-907NK	GaAlAs Red	Water Clear	3.5 mcd	140°	1.8 V	
			GaAlAs Red					
		LTL-907JK	Orange	Water Clear	2.0 mcd	140°	2.0 V	
			Orange					

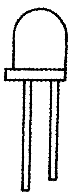
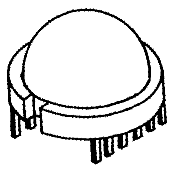
Notes:

* $2\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

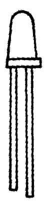
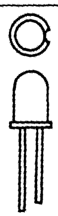
** Peak Emisson wavelength (nm).

SELECTION GUIDE

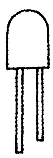
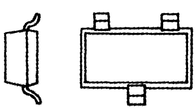
• BIG LED LAMPS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta_{1/2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	Standard 1" Lead 8ϕ	LTL-327HR	Hi. Eff. Red (635 nm)	Diffused	12.6 mcd	46°	2.0 V	2-72
		LTL-327G	Green (565 nm)	Diffused	12.6 mcd	46°	2.1 V	
		LTL-327Y	Yellow (585 nm)	Diffused	12.6 mcd	46°	2.1 V	
		LTL-327A	Amber (600 nm)	Diffused	12.6 mcd	46°	2.1 V	
		LTL-327EA	Orange (630 nm)	Diffused	12.6 mcd	46°	2.0 V	
	12 Pin DIP. 100" Centers 20ϕ	LTJ-811HR	Hi. Eff. Red (635 nm)	Diffused	25.0 mcd	180°	2.0 V	2-77
		LTJ-811G	Green (565 nm)	Diffused	25.0 mcd	180°	2.1 V	
		LTJ-811Y	Yellow (585 nm)	Diffused	25.0 mcd	180°	2.1 V	

• ULTRA BRIGHT LED LAMPS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY ***Iv TYP. @ 20mA	TYPICAL VIEWING ANGLE $2\theta_{1/2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	T-1¾ Narrow Viewing Angle 1" Lead 5ϕ	LTL-353CKL2	GaAlAs Red (660 nm)	Water Clear	300 mcd	12°	1.8 V	2-82
		LTL-353CKH3		Water Clear	500 mcd	12°		
		LTL-353CKH4		Water Clear	1000 mcd	12°		
	T-1¾ Standard 1" Lead 5ϕ	LTL-307C	GaAlAs Red (660 nm)	Diffused	60 mcd	50°	1.8 V	2-85
		LTL-307CE		Transparent	90 mcd	40°		
		LTL-307CK		Water Clear	90 mcd	40°		

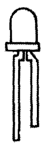
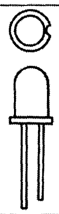
Notes:
* $2\theta_{1/2}$ is the off axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm).
*** The luminous intensity of LTL-353 serial are not include 15% Tolerance.

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 20mA	TYPICAL VIEWING ANGLE $2\theta_{1/2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	T-1¾ Standard 1" Lead 5ϕ	LTL-4263	GaAlAs Red (660 nm)	Diffused	90 mcd	40°	1.8 V	2-88
		LTL-4264H4	GaAlAs Red (660 nm)	Transparent	270 mcd	16°	1.8 V	
		LTL-4264H3		Transparent	220 mcd	16°		
		LTL-4264L2		Transparent	150 mcd	16°		
		LTL-4264L1		Transparent	100 mcd	16°		
		LTL-4268H4	GaAlAs Red (660 nm)	Water Clear	270 mcd	16°	1.8 V	
		LTL-4268H3		Water Clear	220 mcd	16°		
		LTL-4268L2		Water Clear	150 mcd	16°		
		LTL-4268L1		Water Clear	100 mcd	16°		
	T-1 Standard 1" Lead 3ϕ	LTL-4261N	GaAlAs Red (660 nm)	Diffused	48 mcd	60°	1.8 V	2-91
		LTL-4262N		Transparent	80 mcd	45°		
		LTL-4266N		Water Clear	80 mcd	45°		
	Medium Profile 4.6ϕ Flangeless	LTL-10263W	GaAlAs Red (660 nm)	Diffused	40 mcd	60°	1.8 V	2-94
	SOT-23 Surface Mount LED Lamp	LTL-907CK	GaAlAs Red (660 nm)	Water Clear	3.5 mcd	140°	1.9 V	2-97

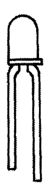
Notes.
* $2\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm)

SELECTION GUIDE

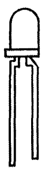
• LOW CURRENT LED LAMPS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 2mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	V_f TYP. @ 2mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	T-1 Standard 1" Led 3ϕ	LTL-4221NLC	Hi.Eff.Red (635 nm)	Diffused	1.8 mcd	45°	1.8 V	2-100
	T-1¾ Standard 1" Lead 5ϕ	LTL-307ELC	Hi.Eff.Red (635 nm)	Diffused	3.0 mcd	50°	1.8 V	2-103

• STANDARD LED LAMPS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	T-1 Standard 0.5" Lead 3ϕ	LTL-201	Red (655 nm)	Diffused	0.8 mcd	76°	1.7 V	2-106
		LTL-202		Transparent	2.0 mcd	30°		
		LTL-205		White Diffused	0.8 mcd	76°		
		LTL-211	Bright Red (697 nm)	Diffused	1.1 mcd	76°	2.1 V	
		LTL-221	Hi. Eff. Red (635 nm)	Diffused	3.8 mcd	76°	2.0 V	
		LTL-231	Green (565 nm)	Diffused	3.8 mcd	76°	2.1 V	
		LTL-232		Transparent	8.0 mcd	30°		
		LTL-251	Yellow (585 nm)	Diffused	3.8 mcd	76°	2.1 V	
		LTL-252		Transparent	8.0 mcd	30°		
		LTL-291	Orange (630 nm)	Diffused	3.8 mcd	76°	2.0 V	

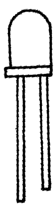
Notes:
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity
** Peak Emission wavelength (nm).

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta½$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	T-1 Standard High Perfor-mance 3ϕ	LTL-4201	Red (655 nm)	Diffused	0.8 mcd	40°	1.7 V	2-112
		LTL-4202		Transparent	4.0 mcd	20°		
		LTL-4211	Bright Red (697 nm)	Diffused	1.7 mcd	40°	2.1 V	
		LTL-4221	Hi. Eff. Red (635 nm)	Diffused	3.8 mcd	40°	2.0 V	
		LTL-4222		Transparent	12.6 mcd	20°		
		LTL-4231	Green (565 nm)	Diffused	5.6 mcd	40°	2.1 V	
		LTL-4232		Transparent	12.6 mcd	20°		
		LTL-4251	Yellow (585 nm)	Diffused	5.6 mcd	40°	2.1 V	
		LTL-4252		Transparent	12.6 mcd	20°		
		LTL-4291	Orange (630 nm)	Diffused	5.6 mcd	40°	2.0 V	
		LTL-4292		Transparent	12.6 mcd	20°		
		LTL-4296		Water Clear	12.6 mcd	20°		
	T-1 Standard 1" Lead, 3ϕ	LTL-4201N	Red (655 nm)	Diffused	0.8 mcd	60°	1.7 V	2-112
		LTL-4202N		Transparent	2.5 mcd	45°		
		LTL-4211N	Bright Red (697 nm)	Diffused	2.5 mcd	60°	2.1 V	
		LTL-4221N	Hi. Eff. Red (635 nm)	Diffused	5.6 mcd	60°	2.0 V	
		LTL-4222N		Transparent	12.6 mcd	45°		
		LTL-4231N	Green (565 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-4232N		Transparent	12.6 mcd	45°		
		LTL-4236N		Water Clear	12.6 mcd	45°		
		LTL-4251N	Yellow (585 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-4252N		Transparent	12.6 mcd	45°		
		LTL-4256N		Water Clear	12.6 mcd	45°		
		LTL-4291N	Orange (630 nm)	Diffused	5.6 mcd	60°	2.0 V	
		LTL-4292N		Transparent	12.6 mcd	45°		
		LTL-4296N		Water Clear	12.6 mcd	45°		

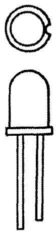
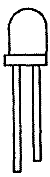
Notes.
* $2\theta½$ is the off-axis angle at which the luminous intensity is half axial luminous intensity.
** Peak Emission wavelength (nm).

LED LAMPS

SELECTION GUIDE

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE 2θ½*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	T-1 0.05" Pitch 0.5" Lead 3φ	LTL-209	Red (655 nm)	Diffused	0.8 mcd	72°	1.7 V	2-123
		LTL-219	Bright Red (697 nm)	Diffused	1.1 mcd	72°	2.1 V	
		LTL-229	Hi. Eff. Red (635 nm)	Diffused	3.8 mcd	72°	2.0 V	
		LTL-239	Green (565 nm)	Diffused	3.8 mcd	72°	2.1 V	
		LTL-259	Yellow (585 nm)	Diffused	3.8 mcd	72°	2.1 V	
		LTL-299	Orange (630 nm)	Diffused	3.8 mcd	72°	2.0 V	
	T-1¾ Standard 0.5" Lead 5φ	LTL-203	Red (655 nm)	Diffused	0.6 mcd	54°	1.7 V	2-128
		LTL-204		Transparent	2.0 mcd	32°		
		LTL-213	Bright Red (697 nm)	Diffused	1.1 mcd	54°	2.1 V	
		LTL-223	Hi. Eff. Red (635 nm)	Diffused	2.5 mcd	54°	2.0 V	
		LTL-224		Transparent	3.5 mcd	32°		
		LTL-233	Green (565 nm)	Diffused	3.0 mcd	54°	2.1 V	
		LTL-234		Transparent	3.5 mcd	32°		
		LTL-253	Yellow (585 nm)	Diffused	2.5 mcd	54°	2.1 V	
		LTL-254		Transparent	3.5 mcd	32°		
		LTL-293	Orange (630 nm)	Diffused	3.0 mcd	54°	2.0 V	
		LTL-294		Transparent	3.5 mcd	32°		
	T-1¾ Standard 1" Lead, High Perfor-mance 5φ	LTL-4203	Red (655 nm)	Diffused	0.8 mcd	36°	1.7 V	2-134
		LTL-4204		Transparent	5.5 mcd	16°		
		LTL-4208		Water Clear	5.5 mcd	16°		
		LTL-4213	Bright Red (697 nm)	Diffused	3.8 mcd	36°	2.1 V	
		LTL-4214		Transparent	12.6 mcd	16°		
		LTL-4223	Hi. Eff. Red (635 nm)	Diffused	8.7 mcd	36°	2.0 V	
		LTL-4224		Transparent	40.0 mcd	16°		
		LTL-4233	Green (565 nm)	Diffused	8.7 mcd	36°	2.1 V	
		LTL-4234		Transparent	40.0 mcd	16°		
		LTL-4238		Water Clear	60.0 mcd	16°		
		LTL-4253	Yellow (585 nm)	Diffused	8.7 mcd	36°	2.1 V	
		LTL-4254		Transparent	40.0 mcd	16°		
		LTL-4258		Water Clear	40.0 mcd	16°		
		LTL-4293	Orange (630 nm)	Diffused	8.7 mcd	36°	2.0 V	
		LTL-4294		Transparent	40.0 mcd	16°		
		LTL-4298		Water Clear	40.0 mcd	16°		

Notes:
* 2θ½ is the off-axis angle at which the luminous intensity is half axial luminous intensity.
** Peak Emission wavelength (nm).

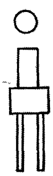
OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	Vf TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	T-1¾ Standard 1" Lead 5ϕ	LTL-307P	Bright Red (697 nm)	Diffused	5.6 mcd	50°	2.1 V	2-134
		LTL-307PE		Transparent	9.0 mcd	40°		
		LTL-307E	Hi. Eff. Red (635 nm)	Diffused	19.0 mcd	50°	2.0 V	
		LTL-307EE		Transparent	30.3 mcd	40°		
		LTL-307G	Green (565 nm)	Diffused	12.6 mcd	50°	2.1 V	
		LTL-307GE		Transparent	29.0 mcd	40°		
		LTL-307Y	Yellow (585 nm)	Diffused	12.6 mcd	50°	2.1 V	
		LTL-307EA	Orange (630 nm)	Diffused	19.0 mcd	50°	2.0 V	
	Medium Profile 4.6ϕ	LTL-10203	Red (655 nm)	Diffused	0.8 mcd	60°	1.7 V	2-144
		LTL-10213	Bright Red (697 nm)	Diffused	2.5 mcd	60°	2.1 V	
		LTL-10223	Hi. Eff. Red (635 nm)	Diffused	5.6 mcd	60°	2.0 V	
		LTL-10233	Green (565 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-10253	Yellow (585 nm)	Diffused	5.6 mcd	60°	2.1 V	
	Medium Profile 4.6ϕ Flangeless	LTL-10203W	Red (655 nm)	Diffused	0.8 mcd	60°	1.7 V	
		LTL-10223W	Hi. Eff. Red (635 nm)	Diffused	5.6 mcd	60°	2.0 V	
		LTL-10233W	Green (565 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-10253W	Yellow (585 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-10293W	Orange (630 nm)	Diffused	5.6 mcd	60°	2.0 V	

Notes.
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm).

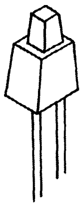
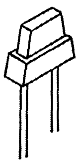
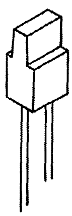
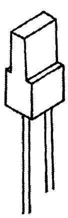
SELECTION GUIDE

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta½$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	T-1¾ Low Profile 5φ	LTL-5203	Red (655 nm)	Diffused	0.5 mcd	64°	1.7 V	2-150
		LTL-5223	Hi. Eff. Red (635 nm)	Diffused	4.0 mcd	64°	2.0 V	
		LTL-5233	Green (565 nm)	Diffused	4.0 mcd	64°	2.1 V	
		LTL-5253	Yellow (585 nm)	Diffused	4.0 mcd	64°	2.1 V	
	Dot point 1.8φ	LTL-709R	Red (655 nm)	Diffused	0.7 mcd	25°	1.7 V	2-154
		LTL-709E	Hi. Eff. Red (635 nm)	Diffused	3.0 mcd	38°	2.0 V	
		LTL-709L	Green (565 nm)	Diffused	1.5 mcd	38°	2.1 V	
		LTL-709Y	Yellow (585 nm)	Diffused	3.5 mcd	38°	2.1 V	
		LTL-709EA	Orange (630 nm)	Diffused	3.5 mcd	38°	2.0 V	

● SPECIAL LED LAMPS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta½$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	Panel Dot Indicators	LTL-1204A	Red (655 nm)	Diffused	0.1 mcd	120°	1.7 V	2-159
		LTL-1214A	Bright Red (697 nm)	Diffused	0.6 mcd	120°	2.1 V	
		LTL-1224A	Hi. Eff. Red (635 nm)	Diffused	1.3 mcd	120°	2.0 V	
		LTL-1234A	Green (565 nm)	Diffused	1.3 mcd	120°	2.1 V	
		LTL-1254A	Yellow (585 nm)	Diffused	1.0 mcd	120°	2.1 V	
		LTL-1274A	Amber (600 nm)	Diffused	1.0 mcd	120°	2.1 V	
		LTL-1294A	Orange (630 nm)	Diffussed	1.3 mcd	120°	2.0 V	

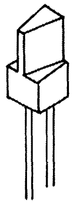
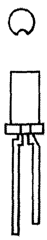
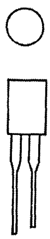
Notes:
* $2\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm).

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	2.0mm Square Top	LTL-717R	Red (655 nm)	Diffused	0.1 mcd	110°	1.7 V	2-159
		LTL-717P	Bright Red (697 nm)	Diffused	0.6 mcd	110°	2.1 V	
		LTL-717HR	Hi. Eff. Red (635 nm)	Diffused	1.3 mcd	110°	2.0 V	
		LTL-717G	Green (565 nm)	Diffused	1.7 mcd	110°	2.1 V	
		LTL-717Y	Yellow (585 nm)	Diffused	2.5 mcd	110°	2.1 V	
		LTL-717A	Amber (600 nm)	Diffused	1.5 mcd	110°	2.1 V	
	1.5mm x 5.0mm Rectangular Bars	LTL-723R	Red (655 nm)	Diffused	0.3 mcd	88°	1.7 V	2-165
		LTL-723P	Bright Red (697 nm)	Diffused	0.75 mcd	88°	2.1 V	
		LTL-723HR	Hi. Eff. Red (635 nm)	Diffused	1.7 mcd	88°	2.0 V	
		LTL-723G	Green (565 nm)	Diffused	2.5 mcd	88°	2.1 V	
		LTL-723Y	Yellow (585 nm)	Diffused	2.5 mcd	88°	2.1 V	
		LTL-723A	Amber (600 nm)	Diffused	2.5 mcd	88°	2.1 V	
	2.0mm x 5.0mm Rectangular Bars	LTL-757P	Bright Red (697 nm)	Diffused	0.4 mcd	130°	2.1 V	2-170
		LTL-757E	Hi. Eff. Red (635 nm)	Diffused	1.1 mcd	130°	2.0 V	
		LTL-757G	Green (565 nm)	Diffused	1.7 mcd	130°	2.1 V	
		LTL-757Y	Yellow (585 nm)	Diffused	2.5 mcd	130°	2.1 V	
	2.0mm x 5.0mm Rectangular Bars	LTL-767P	Bright Red (697 nm)	Diffused	0.4 mcd	140°	2.1 V	2-174
		LTL-767E	Hi. Eff. Red (635 nm)	Diffused	1.7 mcd	140°	2.0 V	
		LTL-767G	Green (565 nm)	Diffused	0.7 mcd	140°	2.1 V	
		LTL-767Y	Yellow (585 nm)	Diffused	1.1 mcd	140°	2.1 V	

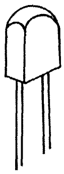
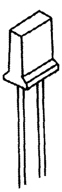
LED LAMPS

Notes.
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half axial luminous intensity.
** Peak Emission wavelength (nm).

SELECTION GUIDE

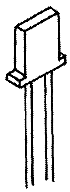
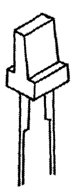
OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	Arrow Head Pointers	LTL-8212A	Bright Red (697 nm)	Diffused	0.6 mcd	100°	2.1 V	2-178
		LTL-8222A	Hi. Eff. Red (635 nm)	Diffused	1.1 mcd	100°	2.0 V	
		LTL-8232A	Green (565 nm)	Diffused	1.1 mcd	100°	2.1 V	
		LTL-8252A	Yellow (585 nm)	Diffused	1.1 mcd	100°	2.1 V	
		LTL-8292A	Orange (630 nm)	Diffused	1.1 mcd	100°	2.0 V	
	Cylindri-cal 1" Lead 3ϕ	LTL-2201AL	Red (655 nm)	Diffused	0.2 mcd	180°	1.7 V	2-183
		LTL-2211AL	Bright Red (697 nm)	Diffused	1.1 mcd	180°	2.1 V	
		LTL-2221AL	Hi. Eff. Red (635 nm)	Diffused	1.7 mcd	180°	2.0 V	
		LTL-2231AL	Green (565 nm)	Diffused	1.7 mcd	180°	2.1 V	
		LTL-2251AL	Yellow (585 nm)	Diffused	2.5 mcd	180°	2.1 V	
		LTL-2271AL	Amber (600 nm)	Diffused	2.5 mcd	180°	2.1 V	
		LTL-2291AL	Orange (630 nm)	Diffused	1.7 mcd	180°	2.0 V	
	Cylindri-cal 5ϕ	LTL-2203A	Red (655 nm)	Diffused	0.2 mcd	200°	1.7 V	2-189
		LTL-2213A	Bright Red (697 nm)	Diffused	0.3 mcd	200°	2.1 V	
		LTL-2223A	Hi. Eff.Red (635 nm)	Diffused	1.1 mcd	200°	2.0 V	
		LTL-2233A	Green (565 nm)	Diffused	1.1 mcd	200°	2.1 V	
		LTL-2253A	Yellow (585 nm)	Diffused	1.1 mcd	200°	2.1 V	
		LTL-2293A	Orange (630 nm)	Diffused	1.1 mcd	200°	2.0 V	
	Cylindrical Wide Viewing Angle Back Lighting 5ϕ	LTL-2214RT	Bright Red (697 nm)	Transparent	0.4 mcd	150°	2.1 V	2-194
		LTL-2214WC		Water Clear	0.4 mcd	150°		
		LTL-2224RT	Hi. Eff. Red (635 nm)	Transparent	1.7 mcd	150°	2.0 V	
		LTL-2234GT	Green (565 nm)	Transparent	1.7 mcd	150°	2.1 V	
		LTL-2234WC		Water Clear	1.7 mcd	150°		
		LTL-2254YT	Yellow (585 nm)	Transparent	1.7 mcd	150°	2.1 V	
		LTL-2254WC		Water Clear	1.7 mcd	150°		
		LTL-2294WC	Orange (630 nm)	Water Clear	1.7 mcd	150°	2.0 V	

Notes
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half axial luminous intensity.
** Peak Emission wavelength (nm).

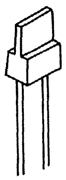
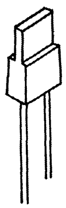
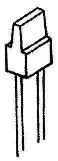
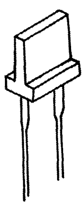
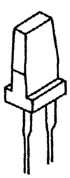
OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	Rounded Rectangular	LTL-6203LN	Red (655 nm)	Diffused	0.2 mcd	70°	1.7 V	2-199
		LTL-6213LN	Bright Red (697 nm)	Diffused	1.5 mcd	70°	2.1 V	
		LTL-6223LN	Hi. Eff. Red (635 nm)	Diffused	5.6 mcd	70°	2.0 V	
		LTL-6233LN	Green (565 nm)	Diffused	5.6 mcd	70°	2.1 V	
		LTL-6253LN	Yellow (585 nm)	Diffused	5.6 mcd	70°	2.1 V	
		LTL-6293LN	Orange (630 nm)	Diffused	5.6 mcd	70°	2.0 V	
	2.0mmx 4.0mm Rectangular Bars	LTL-403P	Bright Red (697 nm)	Diffused	0.4 mcd	104°	2.1 V	2-204
		LTL-403G	Green (565 nm)	Diffused	2.5 mcd	104°	2.1 V	
		LTL-403Y	Yellow (585 nm)	Diffused	2.5 mcd	104°	2.1 V	
		LTL-403A	Amber (600 nm)	Diffused	2.5 mcd	104°	2.1 V	
	2.0mmx 5.0mm Rectangular Bars	LTL-3201A	Red (655 nm)	Diffused	0.2 mcd	140°	1.7 V	2-209
		LTL-3211A	Bright Red (697 nm)	Diffused	0.6 mcd	140°	2.1 V	
		LTL-3221A	Hi. Eff. Red (635 nm)	Diffused	1.7 mcd	140°	2.0 V	
		LTL-3231A	Green (565 nm)	Diffused	1.7 mcd	140°	2.1 V	
		LTL-3251A	Yellow (585 nm)	Diffused	2.5 mcd	140°	2.1 V	
		LTL-3271A	Amber (600 nm)	Diffused	1.7 mcd	140°	2.1 V	
		LTL-3291A	Orange (630 nm)	Diffused	1.7 mcd	140°	2.0 V	

Notes
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm)

SELECTION GUIDE

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	2.0mmx 5.0mm Rectan-gular Bars	LTL-23203A	Red (655 nm)	Diffused	0.2 mcd	140°	1.7 V	2-209
		LTL-23213A	Bright Red (697 nm)	Diffused	0.6 mcd	140°	2.1 V	
		LTL-23223A	Hi. Eff. Red (635 nm)	Diffused	2.5 mcd	140°	2.0 V	
		LTL-23233A	Green (565 nm)	Diffused	3.8 mcd	140°	2.1 V	
		LTL-23253A	Yellow (585 nm)	Diffused	3.8 mcd	140°	2.1 V	
		LTL-23273A	Amber (600 nm)	Diffused	3.8 mcd	140°	2.1 V	
		LTL-23293A	Orange (630 nm)	Diffused	2.5 mcd	140°	2.0 V	
	2.0mmx 5.0mm Rectan-gular Bars Flangeless	LTL-433R	Red (655 nm)	Diffused	0.2 mcd	140°	1.7 V	2-215
		LTL-433P	Bright Red (697 nm)	Diffused	0.6 mcd	140°	2.1 V	
		LTL-433HR	Hi. Eff. Red (635 nm)	Diffused	1.7 mcd	140°	2.0 V	
		LTL-433G	Green (565 nm)	Diffused	1.7 mcd	140°	2.1 V	
		LTL-433Y	Yellow (585 nm)	Diffused	1.7 mcd	140°	2.1 V	
		LTL-433A	Amber (600 nm)	Diffused	2.5 mcd	140°	2.1 V	
		LTL-433EA	Orange (630 nm)	Diffused	1.7 mcd	140°	2.0 V	
	1.8mmx 5.5mm Rectan-gular Bars	LTL-3215S	Bright Red (697 nm)	Diffused	0.4 mcd	150°	2.1 V	2-220
		LTL-3235S	Green (565 nm)	Diffused	0.8 mcd	150°	2.1 V	
		LTL-3255S	Yellow (585 nm)	Diffused	1.1 mcd	150°	2.1 V	
		LTL-3295S	Orange (630 nm)	Diffused	0.8 mcd	150°	2.0 V	

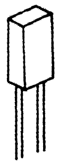
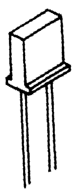
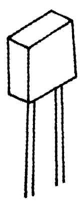
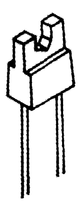
Notes
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm).

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta_{1/2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	1.0mmx 5.0mm Rectangular Bars	LTL-3217A	Bright Red (697 nm)	Diffused	0.8 mcd	120°	2.1 V	2-225
		LTL-3237A	Green (565 nm)	Diffused	1.7 mcd	120°	2.1 V	
		LTL-3257A	Yellow (585 nm)	Diffused	0.8 mcd	120°	2.1 V	
		LTL-3277A	Amber (600 nm)	Diffused	1.7 mcd	120°	2.1 V	
		LTL-3297A	Orange (630 nm)	Diffused	1.7 mcd	120°	2.0 V	
	1.0mmx 5.0mm Rectangular Bars	LTL-3218A	Bright Red (697 nm)	Diffused	0.6 mcd	106°	2.1 V	2-225
		LTL-3238A	Green (565 nm)	Diffused	1.7 mcd	106°	2.1 V	
		LTL-3258A	Yellow (585 nm)	Diffused	1.7 mcd	106°	2.1 V	
		LTL-3278A	Amber (600 nm)	Diffused	1.7 mcd	106°	2.1 V	
	1.5mmx 3.8mm Rectangular Bars	LTL-13218A	Bright Red (697 nm)	Diffused	0.3 mcd	180°	2.1 V	2-230
		LTL-13238A	Green (565 nm)	Diffused	1.1 mcd	180°	2.1 V	
		LTL-13258A	Yellow (585 nm)	Diffused	1.1 mcd	180°	2.1 V	
		LTL-13278A	Amber (600 nm)	Diffused	1.1 mcd	180°	2.1 V	
	1.5mmx 7.0mm Rectangular Bars	LTL-13215A	Bright Red (697 nm)	Diffused	0.4 mcd	150°	2.1 V	2-235
		LTL-13225A	Hi.Eff.Red (635 nm)	Diffused	0.8 mcd	150°	2.0 V	
		LTL-13235A	Green (565 nm)	Diffused	0.8 mcd	150°	2.1 V	
		LTL-13255A	Yellow (585 nm)	Diffused	0.8 mcd	150°	2.1 V	
		LTL-13295A	Orange (630 nm)	Diffused	0.8 mcd	150°	2.0 V	
	2.2mmx 4.5mm Rectangular Bars	LTL-13219B	Bright Red (697 nm)	Diffused	0.26 mcd	170°	2.1 V	2-240
		LTL-13239B	Green (565 nm)	Diffused	0.75 mcd	170°	2.1 V	
		LTL-13259B	Yellow (585 nm)	Diffused	1.1 mcd	170°	2.1 V	
		LTL-13279B	Amber (600 nm)	Diffused	1.1 mcd	170°	2.1 V	

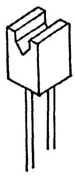
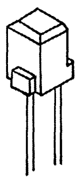
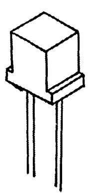
Notes:
* $2\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity
** Peak Emission wavelength (nm).

LED LAMPS

SELECTION GUIDE

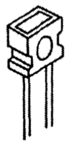
OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	2.4mmx 5.0mm Rectangular Bars	LTL-23201AL	Red (655 nm)	Diffused	0.2 mcd	130°	1.7 V	2-245
		LTL-23211AL	Bright Red (697 nm)	Diffused	0.4 mcd	130°	2.1 V	
		LTL-23221AL	Hi. Eff. Red (635 nm)	Diffused	1.3 mcd	130°	2.0 V	
		LTL-23231AL	Green (565 nm)	Diffused	1.3 mcd	130°	2.1 V	
		LTL-23251AL	Yellow (585 nm)	Diffused	1.3 mcd	130°	2.1 V	
		LTL-23291AL	Orange (630 nm)	Diffused	1.3 mcd	130°	2.0 V	
	2.0mmx 6.0mm Rectangular Bars	LTL-23214A	Bright Red (697 nm)	Diffused	0.6 mcd	125°	2.1 V	2-250
		LTL-23234A	Green (565 nm)	Diffused	0.75 mcd	125°	2.1 V	
		LTL-23254A	Yellow (585 nm)	Diffused	1.7 mcd	125°	2.1 V	
		LTL-23274A	Amber (600 nm)	Diffused	1.7 mcd	125°	2.1 V	
	2.5mmx 7.1mm Rectangular Bars	LTL-3213A	Bright Red (697 nm)	Diffused	0.4 mcd	130°	2.1 V	2-255
		LTL-3223A	Hi. Eff. Red (635 nm)	Diffused	2.5 mcd	130°	2.0 V	
		LTL-3233A	Green (565 nm)	Diffused	1.9 mcd	130°	2.1 V	
		LTL-3253A	Yellow (585 nm)	Diffused	1.7 mcd	130°	2.1 V	
		LTL-3293A	Orange (630 nm)	Diffused	2.5 mcd	130°	2.0 V	
	Double 2.0mm Square Top	LTL-23216A	Bright Red (697 nm)	Diffused	0.57 mcd	120°	2.1 V	2-260
		LTL-23236A	Green (565 nm)	Diffused	1.2 mcd	120°	2.1 V	
		LTL-23256A	Yellow (585 nm)	Diffused	1.2 mcd	120°	2.1 V	
		LTL-23276A	Amber (600 nm)	Diffused	1.2 mcd	120°	2.1 V	
		LTL-23296A	Orange (630 nm)	Diffused	1.2 mcd	120°	2.0 V	

Notes:
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm).

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta½$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	Double 1.5mm x 5mm Rectangular Top	LTL-472P	Bright Red (697 nm)	Diffused	0.2 mcd	200°	2.1 V	2-265
		LTL-472G	Green (565 nm)	Diffused	1.1 mcd	200°	2.1 V	
		LTL-472Y	Yellow (585 nm)	Diffused	0.7 mcd	200°	2.1 V	
	3.0mm Square Top	LTL-9212A	Bright Red (697 nm)	Diffused	0.8 mcd	100°	2.1 V	2-269
		LTL-9222A	Hi. Eff. Red (635 nm)	Diffused	1.7 mcd	100°	2.0 V	
		LTL-9232A	Green (565 nm)	Diffused	1.7 mcd	100°	2.1 V	
		LTL-9252A	Yellow (585 nm)	Diffused	1.7 mcd	100°	2.1 V	
		LTL-9272A	Amber (600 nm)	Diffused	1.7 mcd	100°	2.1 V	
		LTL-9292A	Orange (630 nm)	Diffused	1.7 mcd	100°	2.0 V	
	5.0mm Square Top	LTL-9213A	Bright Red (697 nm)	Diffused	0.6 mcd	150°	2.1 V	2-269
		LTL-9223A	Hi. Eff. Red (635 nm)	Diffused	1.7 mcd	150°	2.0 V	
		LTL-9233A	Green (565 nm)	Diffused	1.7 mcd	150°	2.1 V	
		LTL-9253A	Yellow (585 nm)	Diffused	1.7 mcd	150°	2.1 V	
		LTL-9273A	Amber (600 nm)	Diffused	1.7 mcd	150°	2.1 V	
		LTL-9293A	Orange (630 nm)	Diffused	1.7 mcd	150°	2.0 V	

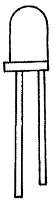
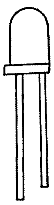
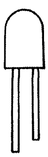
Notes.
* $2\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm).

SELECTION GUIDE

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 20mA	TYPICAL VIEWING ANGLE $2\theta½$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	3.2mmx 5.6mm Reflector Cap Rectangular Bars	LTL-33221AA	Hi. Eff. Red (635 nm)	Diffused	3.8 mcd	100°	2.0 V	2-274
		LTL-33231AA	Green (565 nm)	Diffused	5.6 mcd	100°	2.1 V	
		LTL-33251AA	Yellow (585 nm)	Diffused	5.6 mcd	100°	2.1 V	

Notes.
* $2\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm).

⊙ DUAL COLOR LED LAMPS

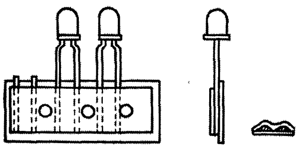
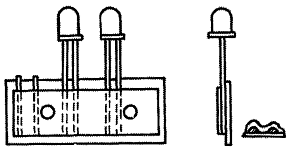
OUTLINE	DEVICE PACKAGE	DEVICE PART NO.	DESCRIPTION COLOR**	DESCRIPTION LENS	LUMINOUS INTENSITY Iv TYP. @ 20mA	TYPICAL VIEWING ANGLE 2θ½*	Vf TYP. @ 20mA	PAGE NO.
	BiPolar T-1¾ Red	LTL-298E	Hi. Eff. Red (635 nm) 2pcs	Diffused	5.0 mcd	50°	2.0V	2-278
	Bi-Color T-1¾ Standard Lamp	LTL-298VJ	Green	White Diffused	8.7 mcd	50°	2.1 V	2-281
			Red		1.2 mcd		1.7 V	
		LTL-298WJ	Green	White Diffused	8.7 mcd	50°	2.1 V	2-284
			Orange		5.5 mcd		2.0 V	
		LTL-293SJ	Green	White Diffused	12.0 mcd	80°	2.1 V	2-287
			GaAlAs Red		19.0 mcd		1.8 V	
	Bi-Color 4.6φ Flangeless	LTL-313SJ	Green	White Diffused	13.0 mcd	60°	2.1 V	2-290
			GaAlAs Red		38.0 mcd		1.8 V	
	T-1¾ Dual Color Indicator	LTL-52EG	Green	White Diffused	5.0 mcd	54°	2.1 V	2-293
			Orange		5.0 mcd		2.0 V	
	T-1¾ Dual Color Indicator	LTL-52RG	Green	White Diffused	5.0 mcd	54°	2.1 V	2-296
			Bright Red		1.1 mcd		2.1 V	
		LTL-52DG	Green (565 nm) 2pcs	Green Diffused	8.7 mcd	54°	2.1 V	2-299

Notes:
* 2θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity
** Peak Emission wavelength (nm).

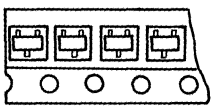
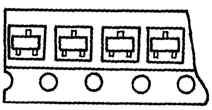
SELECTION GUIDE

● TAPE AND REEL

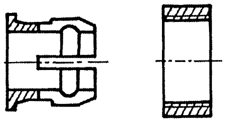
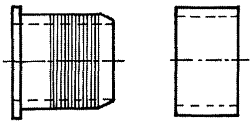
RADIAL TAPE AND REEL

OUTLINE	OPTION CODE	DESCRIPTION	PAGE NO.
	.001 .011 .021	5mm (0.197") Preformed Leads With – 001: 2.5mm (0.1") and – 011: 4.0mm (0.157") and – 021: 7.5mm (0.295") from Seating plane to Lamp Bottom.	2-302
	.002 .012 .022	2.54mm (0.1") Straight Leads With –002: 18mm (0.709"), and –012 : 22mm (0.866"), and –022 : 26mm (1.024") from Feed Hole to Lamp Bottom.	

SURFACE MOUNT TAPE AND REEL

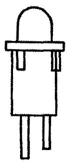
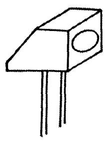
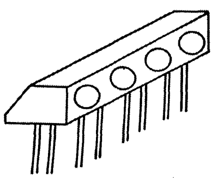
OUTLINE	OPTION CODE	DESCRIPTION	PAGE NO.
	LTL-907TA	Available with choice of orientation	2-306
	LTL-907TB	Available with choice of orientation.	

• PANEL MOUNTING GROMMENTS

PACKAGE	PART NO. LTL–	DESCRIPTION		PAGE NO.
	001B	Black	Mounting Clip Ring for T-1¾ Lamps	2-309
	001C	Clear		
	004B	Black Mounting Grommets for LTL-332 × 1AA Series Lamps		2-311

SECTION GUIDE

◎ LED CIRCUIT BOARD AND SNAP-IN INDICATORS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10mA	TYPICAL VIEWING ANGLE $2\theta\frac{1}{2}$*	V_f TYP. @ 20mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	Snap-in Indicators Holder with LTL-10200W Lamp Series	LTL-603-1	Red (655 nm)	Diffused	0.8 mcd	60°	1.7 V	2-312
		LTL-633-1	Green (565 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-653-1	Yellow (585 nm)	Diffused	5.6 mcd	60°	2.1 V	
	Logic-status Indicators Holder with LTL 10200W Lamp Series	LTL-503-11	Red (655 nm)	Diffused	0.8 mcd	60°	1.7 V	2-316
		LTL-533-11	Green (565 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-553-11	Yellow (585 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-503-14	Red (655 nm)	Diffused	0.8 mcd	60°	1.7 V	
		LTL-533-14	Green (565 nm)	Diffused	5.6 mcd	60°	2.1 V	
		LTL-553-14	Yellow (585 nm)	Diffused	5.6 mcd	60°	2.1 V	

Notes:
* $2\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
** Peak Emission wavelength (nm)

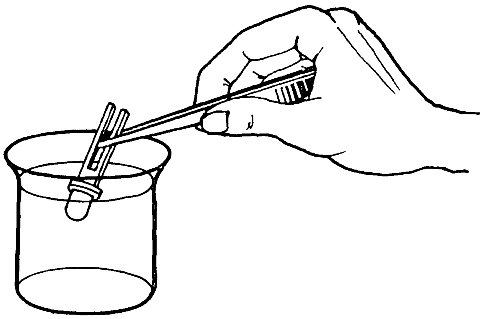
HOW TO USE LITON LED LAMPS

Generally, LITON LED Lamps can be used the same way as other general purpose semiconductors, however the following precautions must be taken to protect the LED.

1. CLEANING

Do not use unspecified chemical liquid to clean LED, they could harm the resin of the LED. If cleaning is necessary, immerse the LED in alcohol, Freon TE or chlorosen at normal temperature for less than 1 minute. When other chemical solutions not specified are used, if may cause cracks or haze on the surface of the lens.

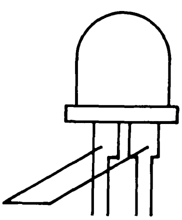
FIG. 1



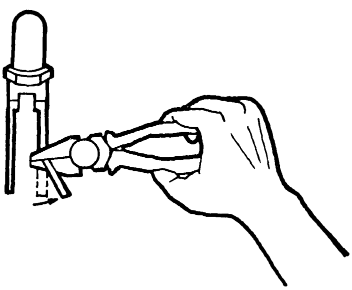
2. FORMING

2.1 Do not form during or after soldering. If forming is required, it must be done before soldering.
2.2 Please keep in mind, any stress applied to resin can break gold wire in LED.
2.3 Form leads pin by securing under the tie bar cut (Fig. 2) and bending with radio pliers or the equivalent to avoid pressure on resin (Fig. 3).

FIG. 2

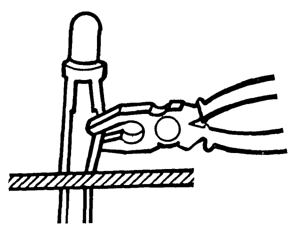


Tie bar cut



Secure lead pin

FIG. 3



Form before soldering

3. SOLDERING

3.1 Solder under tie-bar cut as show in Fig. 4. Hold pin leads, with tweezers during soldering, especially for smaller LED.

FIG. 4

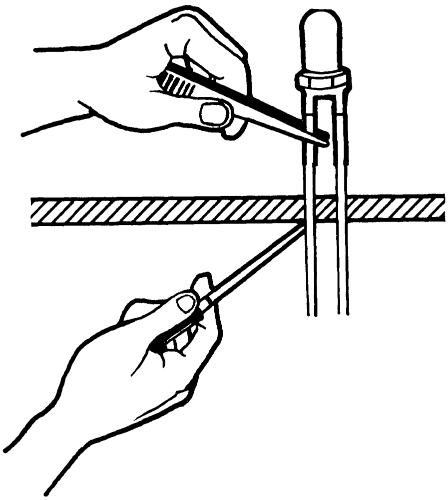
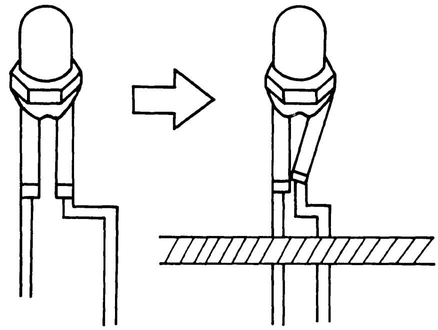


FIG. 5



If pitch of mounting holes is incorrect formed.
Pins will become distorted during insertion.

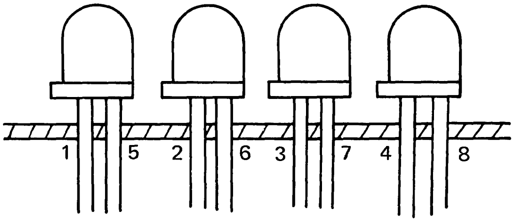
3.2 If stress is applied to LED while it is being on P.C. board, disconnection may, occur during soldering or after mounting due to creep. Lead pin mounting holes must coincide with original or formed lead pin pitch to prevent stress.

3.3 Lead forming should be not add any stress to the LED body, to do so can fracture the device epoxy and possibly break bond wires, which will cause failure.

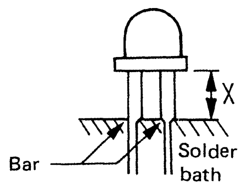
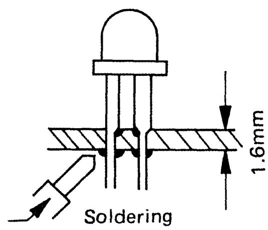
3.4 When an LED is mounted into a P.C. board, pitch spacing should be carefully aligned so as not to cause any stress to the lead wires. Otherwise the stress will cause problems in high temperature operation. Three minutes are necessary for the LED to return to normal temperature after solder operation.

3.5 If soldering one line of LED on a P.C. board by using a soldering iron, don't solder both the leads of the LED at same time. (see Fig. 6).

FIG. 6



3.6 The soldering iron should be operated at under 30w power consumption.
3.7 The LITON LED soldering specification is shown as below:

METHOD	CONDITIONS	TEMP	TIME
Soldering bath method	Dip LED up to Xmm from resin 	230°C ± 5	Within 5 Seconds
Soldering method	Soldering iron: 30W Tip: 4.5ϕ x 32mm Through hole P.C.B. 1.6mm thick 	Tip Temp. 295°C ± 5°C	Within 3 Seconds

4. PREVENTING OVERCURRENT

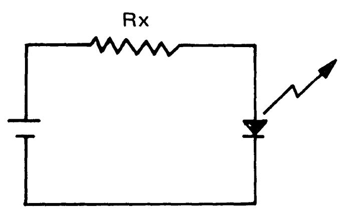
4.1 Do not overcurrent.
4.2 In order to operate LITON LED under stable conditions, put protective resistors in series. Resistor Values can be determined by supply voltage or current for the LED. Recommended current for use is in the range of IF 10mA to 20mA. (Fig. 7).
4.3 Circuit must be designed so that overvoltage (overcurrent) is not applied to the LED during ON/OFF switching. Transients or pulse current can damage the junction of the LED die.

5. BRIGHTNESS AND COLOR

5.1 For obtain even brightness multiple LED should be kept at the same current.
5.2 To increase brightness, increase current.
5.3 It checked at a distance of 30cm from the LED to the eye detects.

LED LAMPS

FIG. 7



6. RELIABILITY TESTS AND CONDITIONS

TEST	CONDITIONS	DESCRIPTION
Operating Life Test	@20mA or @10mA Duty = $\frac{1}{8}$ Ta = 25° ± 5°C 1500^{+72}_{-24} Hours	This test is conducted for the purpose of determining the resistance of a part in electrical and thermal stresses.
High Temperature Storage Test	Ta = 105°C 1000^{+72}_{-24} Hours	The purpose of this test is to determine the resistance of the device which is laid under condition of high temperature for hours.
Low Temperature Storage Test	Ta = –55°C 1000^{+72}_{-24} Hours	The purpose of this test is to determine the resistance of the device which is laid under condition of low temperature for hours.
High Temperature High Humidity Test	T = 65° ± 3°C RH = 90 ~ 95% 240 Hours	The purpose of this test is to determine the resistance of the device under tropical condition for hours.
Thermal Shock Test	–55°C ~ +105°C (Air to air) (10 Min) (10 Min) x 10 cycles Transfer time: 5 Sec.	The purpose of this test is to determine the resistance of the device to sudden extreme changes in high and low temperature.
Solder Resistance Test	Ta = 260° ± 5°C Dwell solder 10±1 sec. Cooling 5 seconds x 1 cycle. More than 1.6mm away from resin of LED	This test is intended to determine the thermal characteristic resistance of the device to sudden exposures at extreme changes in temperature when soldering the lead wire.
Solderability Test	Ta = 230° ± 5°C Dwell Flux 5 ± 1 sec. Dwell solder 5 ± ½ sec.	This test is intended to see soldering well performed or not.
Drop Test	0 ~ 9Kg H = 760mm 9.1 ~ 22Kg H = 610mm 22.1 ~ 45.5Kg H=530mm One angle, three corners three surface	This test is intended to see the certain height drop to effect the device.
Vibration Test	F = 900-3600-900 RPM (sweep cycle/min) Amplitude = 1.5mm Test Time: 15 min for 3 faces each. Acceleration: 1.5-21.8-1.5G (1G = 9.8m/sec^2)	This vibration test is intended to determine the suitability of the device.

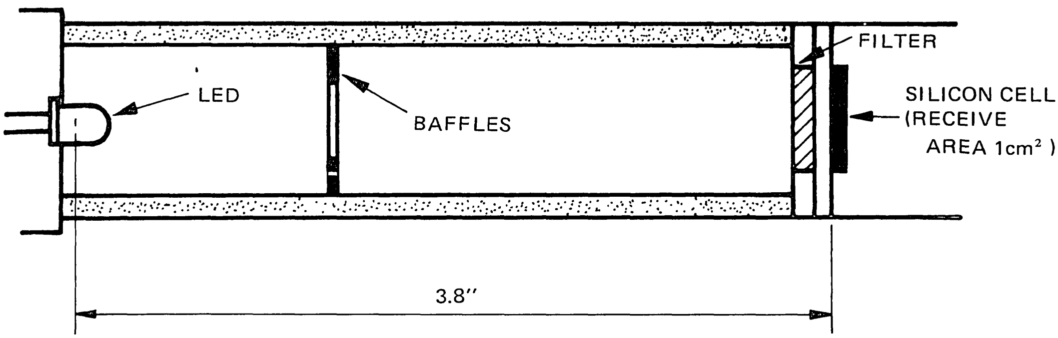
HOW TO USE LITON LED LAMPS

7. HOW TO TEST LUMINOUS INTENSITY OF LITON LED LAMPS

7.1 Standard luminous intensity tester:
EG & G MODEL 550-1 RADIOMETER/PHOTOMETER

7.2 Reference luminous intensity tester:
A. TEXTRONIX J16 PHOTOMETER
B. VIM MODEL 200 PHOTOMETER

7.3 Measurement hints



7.4 LED adapter
At one foot, one footcandle is equivalent to one candela.
At 3.8 inches, one footcandle is equivalent to 100 millicandelas.

LED LAMPS

CROSS REFERENCE GUIDE FOR:

H.P./TELEFUNKEN/SIEMENS/MATSUSHITA/ROHM/SHARP LED LAMPS

In order to designate the similarity between the other manufacturers' device and the nearest LITON equivalent. This guide has been included a letter code system to cover this.

Code Definitions:

A — LITON device is electrically and mechanically equivalent.
B — Minor electrical differences exist.
C — Minor mechanical differences exist.
D — Significant electrical differences exist.
E — Significant mechanical differences exist.

Since Optoelectronics is a relatively young industry, it is possible that different devices offered by two or more manufacturers will satisfy the requirements of one application. Therefore, slight mechanical of electrical variations should not disqualify the nearest equivalent.

The data contained in this guide is believed to be accurated. However, no responsibility is assumed by TAIWAN LITON ELECTRONIC CO., LTD. for the use of this data in actual circuit design.

CROSS REFERENCE GUIDE FOR:

H.P. (Hewlett Packard) Equivalent LED Lamps

H.P. PART NO.	LITON PART NO.	CODE
HLMP-0300/0301	LTL-3223A	A
HLMP-0400/0401	LTL-3253A	A
HLMP-0503/0504	LTL-3233A	A
HLMP-1000/1002	LTL-4201N	A
HLMP-1300/1301/1302	LTL-4221N	A
HLMP-1321	LTL-4222N	A
HLMP-1400/1401/1402	LTL-4251N	A
HLMP-1421	LTL-4252N	A
HLMP-1503/1523	LTL-4231N	A
HLMP-1521	LTL-4232N	A
HLMP-1700	LTL-4221NLC	A
HLMP-3002/3003	LTL-307R	A
HLMP-3300/3301/3762	LTL-307E	A

H.P. PART NO.	LITON PART NO.	CODE
HLMP-3315/3316	LTL-307EE	A
HLMP-3350/3351	LTL-5233	A
HLMP-3400/3401/3862	LTL-307Y	A
HLMP-3450/3451	LTL-5253	A
HLMP-3502/3507/3962	LTL-307G	A
HLMP-3517/3519	LTL-307GE	A
HLMP-3553/3554	LTL-5233	A
HLMP-4700	LTL-307ELC	A
HLMP-5000	LTL-503-11	E
HLMP-5030	LTL-523-11	E
HLMP-5040	LTL-553-11	E
HLMP-5050	LTL-533-11	E
HLMP-D400/D401	LTL-307EA	A

CROSS REFERENCE GUIDE

TELEFUNKEN Equvialent LED Lamps

TELEFUNKEN PART NO.	LITON PART NO.	CODE
TLUR-2400/2401	LTL-709R	A
TLUO-2400/2401	LTL-709EA	A
TLUY-2400/2401	LTL-709Y	A
TLUG-2400/2401	LTL-709G	A
TLSR-3200/3201	LTL-2201AL	E
TLSO-3200/3201	LTL-2291AL	E
TLSY-3200/3201	LTL-2251AL	E
TLSG-3200/3201	LTL-2231AL	E
TLSR-3300/3301	LTL-9202A	E
TLSO-3300/3301	LTL-9292A	E
TLSY-3300/3301	LTL-9252A	E
TLSG-3300/3301	LTL-9232A	E
TLHR-4200/4201/4202/ 4203/4205	LTL-4202N	A
TLHY-4200/4201/4203	LTL-4252N	A
TLHG-4200/4201/4202/ 4203/4205	LTL-4232N	A
TLHR-4400/4401/4402/ 4403/4405	LTL-4201N	A
TLHY-4400/4401/4402/ 4403/4405	LTL-4251N	A
TLHG-4400/4401/4402/ 4403/4405	LTL-4231N	A
TLSR-5100/5101	LTL-23201AL	C
TLSO-5100/5101	LTL-23291AL	C
TLSY-5100/5101	LTL-23251AL	C

TELEFUNKEN PART NO.	LITON PART NO.	CODE
TLSG-5100/5101	LTL-23231AL	C
TLSR-5300/5301	LTL-9204A	A
TLSO-5300/5301	LTL-9294A	A
TLSY-5300/5301	LTL-9254A	A
TLSG-5300/5301	LTL-9234A	A
TLAR-5400/5401	LTL-6203LN	A
TLAO-5400/5401	LTL-6293LN	A
TLAY-5400/5401	LTL-6253LN	A
TLAG-5400/5401	LTL-6233LN	A
TLUR-6400/6401	LTL-307R	A
TLUO-6400/6401	LTL-307EA	A
TLUY-6400/6401	LTL-307Y	A
TLUG-6400/6401	LTL-307G	A
TLHR-6200/6201/6202/ 6203/6205	LTL-4224	A
TLHY-6200/6201/6202/ 6203/6205	LTL-4254	A
TLHG-6200/6201/6202/ 6203/6205	LTL-4234	A
TLHR-6400/6401/6402 6403/6405	LTL-307E	A
TLHY-6400/6401/6402 6403/6405	LTL-307Y	A
TLEG-6400/6401/6402/ 6403/6405	LTL-307G	A

CROSS REFERENCE GUIDE

SIEMENS Equivalent LED Lamps

SIEMENS PART NO.	LITON PART NO.	CODE
LDR-1101/1102/1103	LTL-4201N	A
LDH-1111/1112/1113	LTL-4221N	A
LDY-1131/1132/1133	LTL-4251N	A
LDG-1151/1152/1153	LTL-4231N	A
LDR-1201	LTL-10203N	C
LDG-1231	LTL-10233N	C
LDY-1251	LTL-10253N	C
LDH-2310	LTL-907EK	A
LDY-2320	LTL-907YK	A
LDG-2330	LTL-907LK	A
LDH-3601/3602/3603	LTL-23201AL	A

SIEMENS PART NO.	LITON PART NO.	CODE
LDR-3701/3702/3703	LTL-23221AL	A
LDY-3801/3802/3803	LTL-23251AL	A
LDG-3901/3902/3903	LTL-23231AL	A
LDR-5091/5092/5093	LTL-4204	A
LDR-5101/5102/5103	LTL-307R	A
LDH-5121/5122/5123	LTL-307E	A
LDY-5161/5162/5163	LTL-307Y	A
LDG-5171/5172/5173	LTL-307G	A
LDH-5191/5192/5193	LTL-4224	A
LDY-5391/5392/5393	LTL-4254	A
LDG-5591/5592/5593	LTL-4238	A

MATSUSHITA (PANASONIC) Equivalent LED Lamps

MATSUSHITA PART NO.	LITON PART NO.	CODE
LN2TRPHL/21RPH	LTL-307P	A
LN21RCPH/21RCPHL	LTL-307PE	A
LN21CAL (U)	LTL-4268H3	A
LN217RP	LTL-3215S	C
LN222RP	LTL-1214A	A
LN224RP	LTL-3218A	C
LN226RP	LTL-8212A	C
LN242RP	LTL-433P	A
LN245RP	LTL-23216A	B/E
LN28RP	LTL-4211	C
LN28RCP	LTL-4212	C
LN31GPHL/31GPH	LTL-307G	A
LN31CPHL/31GCPH	LTL-307GE	A
LN31GCPHL(U)/ 31GCPH (U)	LTL-4234	B
LN317GP	LTL-3235S	C

MATSUSHITA PART NO.	LITON PART NO.	CODE
LN322GP	LTL-1234A	A
LN324GP	LTL-3238A	C
LN326GP	LTL-8232A	C
LN342GP	LTL-433G	A
LN345GP	LTL-23236A	B/E
LN38GP	LTL-4231	B/C
LN38GCP	LTL-4232	B/C
LN41YPH/41YPHL	LTL-307Y	A
LN417YP	LTL-3255S	C
LN422YP	LTL-1254A	A
LN424YP	LTL-3278A	C
LN442YP	LTL-433Y	A
LN445YP	LTL-23276A	B/E
LN48YP	LTL-4271	B/C
LN81RPHL/81RPH	LTL-307E	A
LN81RCPHL/81RCPH	LTL-307EE	A

CROSS REFERENCE GUIDE

ROHM Equivalent LED Lamps

ROHM PART NO.	LITON PART NO.	CODE
SLR-34VR/SLH-34VR	LTL-4221	A
SLR-34VC	LTL-4222	A
SLR-34VT	LTL-4296	A
SLR-34DU/SLH-34DU	LTL-4291	A
SLR-34DC	LTL-4292	A
SLR-34DT	LTL-4296	A
SLR-34YY/SLH-34YY	LTL-4251	A
SLR-34YC	LTL-4252	A
SLR-34YT	LTL-4256	A
SLR-34MG/SLH-34MG	LTL-4231	A
SLR-34MC	LTL-4232	A
SLR-34MT	LTL-4236	A
SLR-56VR/SLH-56VR	LTL-307E	B
SLR-56VC	LTL-307EE	B
SLR-56DU/SLH-56DC	LTL-307EA	A
SLR-56YY/SLH-56YY	LTL-307Y	A
SLR-56MG/SLH-56MG	LTL-307G	A
SLR-56MC	LTL-307GE	A

ROHM PART NO.	LITON PART NO.	CODE
SPR-56MVW	LTL-52EA	A
SLV-56VC	LTL-2224RT	A
SLV-56VT	LTL-2294WC	A
SLV-56DC	LTL-2224RT	A
SLV-56DT	LTL-2294WC	A
SLV-56YC	LTL-2254YT	A
SLV-56YT	LTL-2254WC	A
SLV-56MC	LTL-2234GT	A
SLV-56MT	LTL-2234WC	A
SLR-80VR	LTL-327HR	A
SLR-80MG	LTL-327G	A
SLR-80YY	LTL-327Y	A
LSR-80DU	LTL-327EA	A
SLB-25VR	LTL-3221A	C
SLB-25DU	LTL-3291A	C
SLB-25YY	LTL-3251A	C
SLB-25MG	LTL-3231A	C

SHARP Equivalent LED Lamps

SHARP PART NO.	LITON PART NO.	CODE
GL3AR2	LTL-4201	E
GL3PR7	LTL-4211	B/E
GL3HD7	LTL-4221	B/E
GL3EG7	LTL-4231	B/E
GL3HY7	LTL-4251	B/E
GL5AR1	LTL-203	A
GL5PR1	LTL-213	A
GL5PR5	LTL-307P	A
GL5PR6	LTL-307PE	A
GL5PR27	LTL-2214RT	A
GL5HD5	LTL-307E	A
GL5HD27	LTL-2224PT	A
GL5EG5	LTL-307G	A
GL5HY1	LTL-253	A
GL5HY5	LTL-307Y	A
GL5HY27	LTL-2254YT	A
GL5PR21	LTL-4214	B
GL5PR24	LTL-4218	B
GL5HD21	LTL-4224	B
GL5EG21	LTL-4234	B
GL5EG24	LTL-4238	B
GL5HY21	LTL-4254	B
GL9PR2	LTL-3211A	A
GL9PR26	LTL-433P	C
GL9HD2	LTL-3221A	A
GL9HD26	LTL-433HR	C
GL9EG2	LTL-3231A	A

SHARP PART NO.	LITON PART NO.	CODE
GL9HY2	LTL-3251A	A
GL9HY26	LTL-433Y	C
GL9PR10	LTL-13218A	A
GL9HD10	LTL-13228A	A
GL9H10	LTL-13258A	A
GL9PR23	LTL-13219B	B/C
GL9HD23	LTL-13229B	B/C
GL9EG23	LTL-13239B	B/C
GL9HY23	LTL-13259B	B/C
GL9PR24	LTL-3218A	C
GL9HD24	LTL-3228A	C
GL9EG24	LTL-3238A	C
GL9HY24	LTL-3258A	C
GL9PR25	LTL-3217A	A
GL9EG25	LTL-3237A	A
GL9HY25	LTL-3257A	A
GL9PR40	LTL-23216A	E
GL9HY40	LTL-23256A	E
GL9PR4	LTL-9213A	A
GL9HD4	LTL-9223A	A
GL9EG4	LTL-9233A	A
GL9HY4	LTL-9253A	A
GL9PR6	LTL-8212A	A
GL9HD6	LTL-8222A	A
GL9HG6	LTL-8232A	A
GL9HY6	LTL-8252A	A

CROSS REFERENCE FOR IR/PTR/PTD

INFRARED EMITTING DIODES

LITON	HONEWELL	TRW	T.I.	SIEMENS	TOSHIBA	KODENSHI
LTE-209/209C	SPE8505/8525	OP160	TIL32	–	–	–
LTE-239/239C	–	OP260	TIL902	–	–	–
LTE-4208/4208C	–	–	TIL39	LD274	TLN110	EL-ILI
LTE-4238/4238C	SEP8703-00X	OP295	TIL906	LD484	–	–
LTE-5208A/5208AC	–	–	TIL38	LD271	TLN105A	–
LTE-5238A/5238AC	SEP8703-30X	OP290	TIL905	SFH485	TLN205	–
LTE-302	SEP8506/8526	OP140	–	IRL80	–	–
LTE-4206	–	OP161	–	SFH409	–	–

PHOTO TRANSISTORS

LITON	TOSHIBA	HONEWELL	TRW	SIEMENS	T.I.
LTR-209	–	SDP8425	OP500	–	TIL78
LTR-4208	TPS610	SDP8403	–	BP103B	TIL414
LTR-301	–	SDP8406	OP550	LRT-80	–

PHOTODIODES

LITON	SIEMENS	KODENSHI	TOSHIBA
LTR-516AD	SFH205	–	–
LTR-526AD	SFH206	–	–
LTR-536AD	–	HP-3FR2	–
LTR-546AE	–	HP-5FR3	TPS703
LTR-546AD	–	–	TPS703A

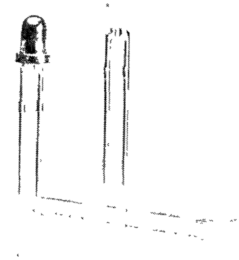
LED LAMPS

T-1 (3mm) RESISTOR LAMPS

LTL-4201-R1/R2 RED
LTL-4211-R1/R2 BRIGHT RED
LTL-4231-R1/R2 GREEN
LTL-4251-R1/R2 YELLOW
LTL-4291-R1/R2 ORANGE

FEATURES

- INTEGRAL CURRENT LIMITING RESISTOR.
- COST EFFECTIVE.
  Saves Spaces and Resistor Cost.
- EXTERNAL RESISTOR REQUIRED WITH 5 VOLT/12 VOLT SUPPLY.
- AVAILABLE IN ALL COLORS.
  Red, High Efficiency Red, Yellow and Green in T-1 Packages.



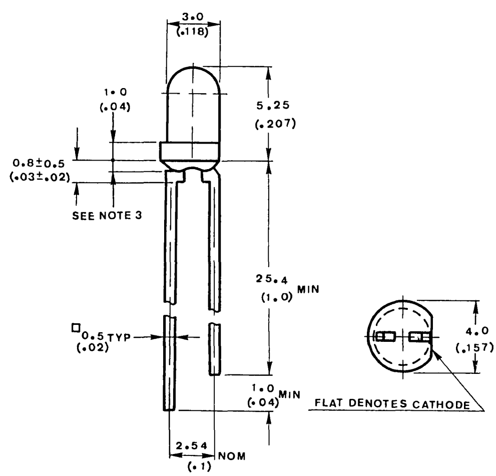
DESCRIPTION

The RESISTOR LAMP contains an integral current limiting resistor in series with the LED. This allows the lamp to be driven from a high volt source without an external current limiter. The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red Light Emitting Diode. The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode. The Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
4201-R1/R2	Red	Diffused	Red
4211-R1/R2	Red	Diffused	Bright Red
4231-R1/R2	Green	Diffused	Green
4251-R1/R2	Yellow	Diffused	Yellow
4291-R1/R2	Orange	Diffused	Orange

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protrued resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED/BRIGHT RED/ GREEN/YELLOW/ORANGE 5V LAMPS	RED/BRIGHT RED/ GREEN/YELLOW/ORANGE 12V LAMPS	UNIT
DC Forward Voltage (T_A =25°C)	7.5	15	volts
Reverse Voltage	5	5	volts
Operating Temperature Range	−40°C to +85°C		
Storage Temperature Range	−55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		

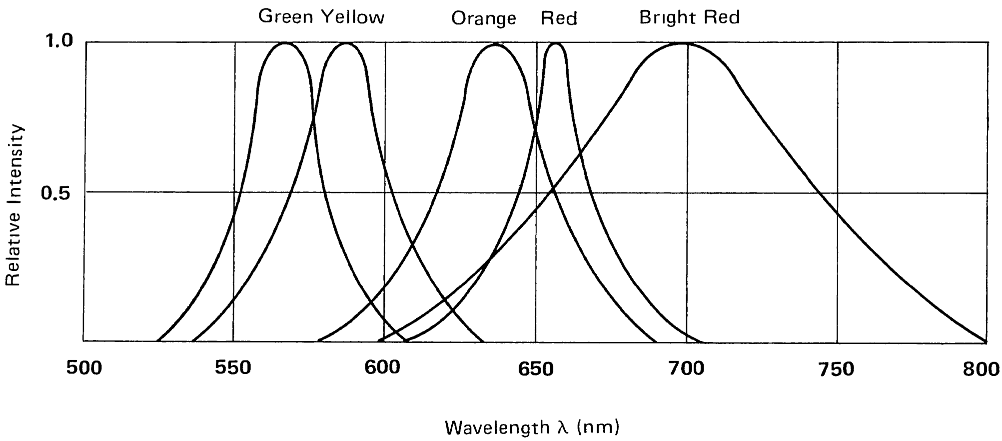
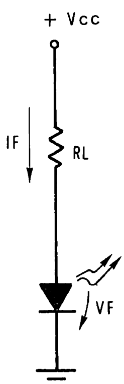


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

EQUIVALENT CIRCUIT:



V_{CC} = 5 volts
(RL = 250 ohms ± 20%)

V_{CC} = 12 volts
(RL = 800 ohms ± 20%)

$$IF = \frac{V_{CC} - VF}{RL}$$

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4201-R1	0.3	0.8		mcd	VF=5V	NOTE.1
		4201-R2	0.3	0.9			VF=12V	
Viewing Angle	2θ1/2	4201-R1/R2		40		deg	Note 2 (Fig. 6)	
Peak Emission Wavelength	λ PEAK	4201-R1/R2		655		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half — Width	Δλ	4201-R1/R2		24		nm		
Forward Current 5V Devices	IF	4201-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4201-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4201-R1/R2			100	μA	VR = 5V	

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. θ 1/2 is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

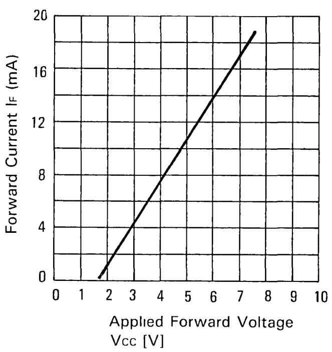


FIG 2 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE. 5 VOLT DEVICES

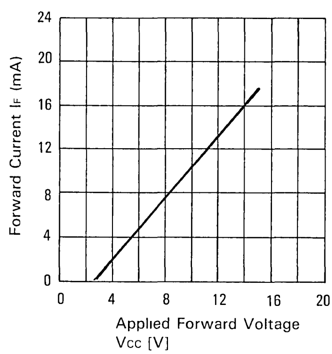


FIG 3 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE. 12 VOLT DEVICES

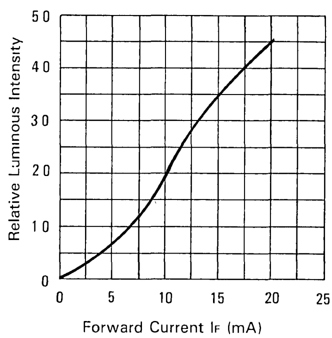


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

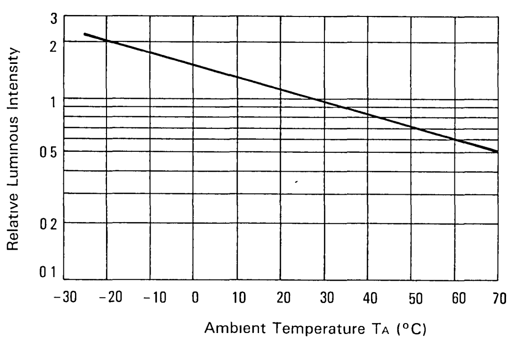


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

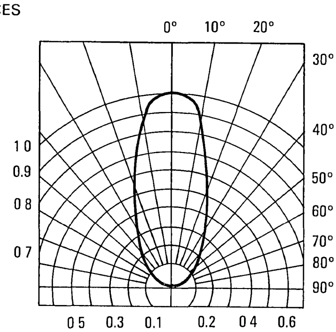


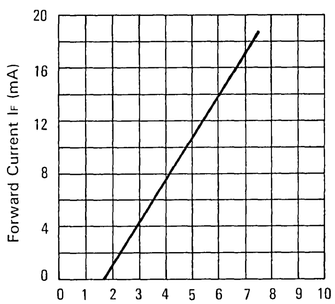
FIG 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

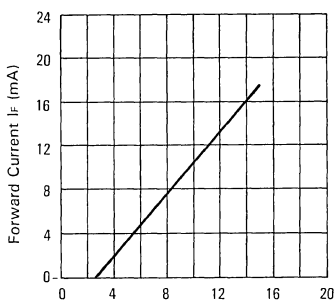
PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4211-R1	1.1	3.8		mcd	VF=5V	NOTE.1
		4211-R2	1.1	4.0			VF=12V	
Viewing Angle	$2\theta\frac{1}{2}$	4211-R1/R2		40		deg	Note 2 (Fig. 11)	
Peak Emission Wavelength	λ PEAK	4211-R1/R2		697		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4211-R1/R2		90		nm		
Forward Current 5V Devices	IF	4211-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4211-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4211-R1/R2			100	μA	VR = 5V	

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L Eclairage) eye-response curve

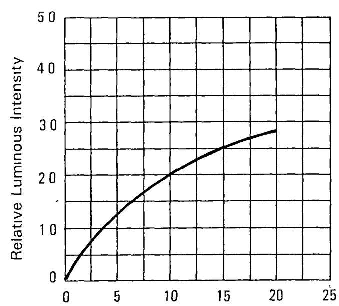
2 $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.



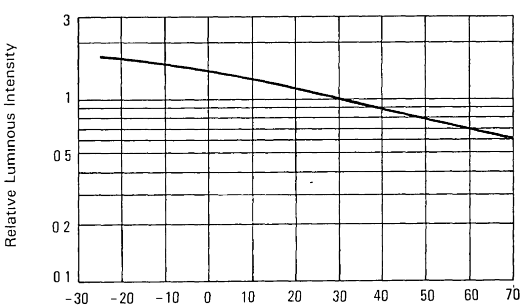
Applied Forward Voltage
Vcc [V]
FIG. 7 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 5 VOLT DEVICES



Applied Forward Voltage
Vcc [V]
FIG 8 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 12 VOLT DEVICES



Forward Current IF (mA)
FIG 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT



Ambient Temperature TA (°C)
FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

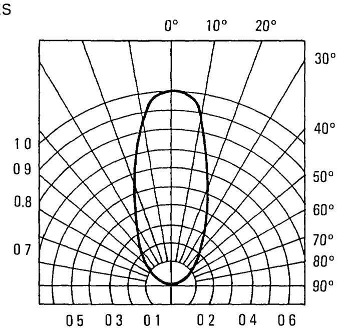


FIG. 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4231-R1	2.5	5.6		mcd	VF=5V	NOTE.1
		4231-R2	2.5	5.8			VF=12V	
Viewing Angle	$2\theta½$	4231-R1/R2		40		deg	Note 2 (Fig. 16)	
Peak Emission Wavelength	λ PEAK	4231-R1/R2		565		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4231-R1/R2		30		nm		
Forward Current 5V Devices	IF	4231-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4231-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4231-R1/R2			100	μA	VR = 5V	

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

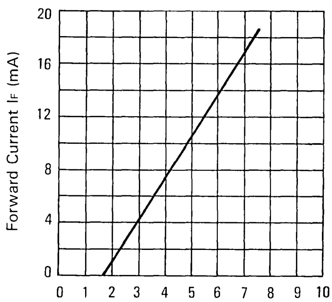


FIG 12 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 5 VOLT DEVICES

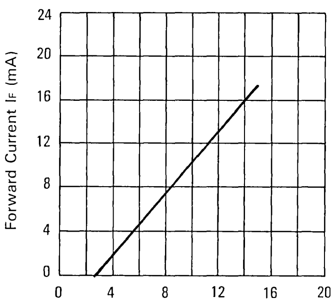


FIG 13 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 12 VOLT DEVICES

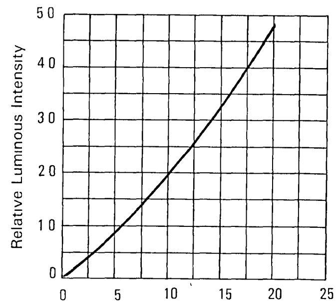


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

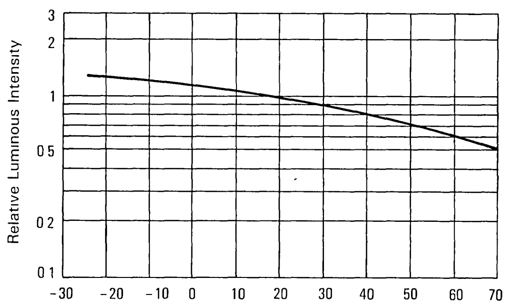


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

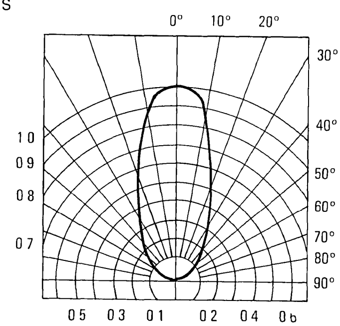


FIG 16 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4251-R1	2.5	5 6		mcd	VF=5V NOTE 1
		4251-R2	2.5	5 7			VF=12V
Viewing Angle	2θ½	4251-R1/R2		40		deg	Note 2 (Fig 21)
Peak Emission Wavelength	λ PEAK	4251-R1/R2		585		nm	Measurement @Peak (Fig. 1)
Spectral Line Half – Width	Δλ	4251-R1/R2		35		nm	
Forward Current 5V Devices	IF	4251-R1		10	20	mA	VF = 5V
Forward Current 12V Devices	IF	4251-R2		12	20	mA	VF = 12V
Reverse Current	IR	4251-R1/R2			100	μA	VR = 5V

NOTES. 1 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve
2 θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

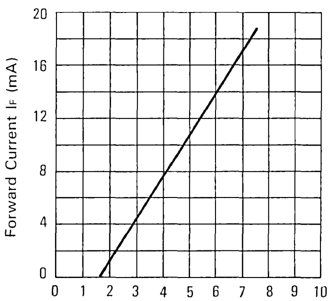


FIG 17 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 5 VOLT DEVICES

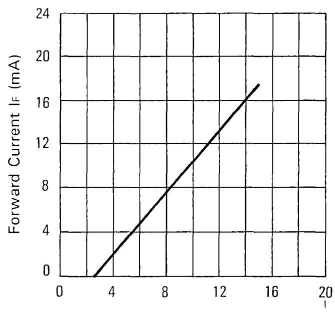


FIG. 18 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 12 VOLT DEVICES

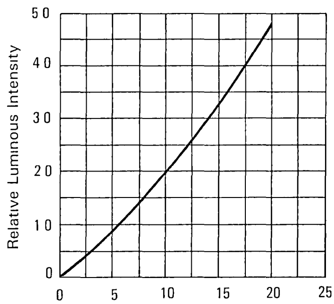


FIG 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

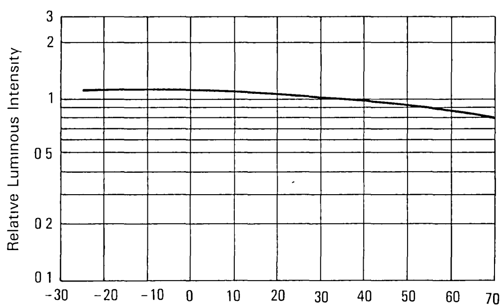


FIG 20 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

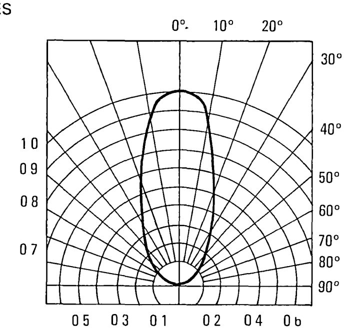


FIG 21 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4291-R1	2.5	5.6		mcd	VF=5V	NOTE.1
		4291-R2	2.5	5.7			VF=12V	
Viewing Angle	$2\theta\frac{1}{2}$	4291-R1/R2		40		deg	Note 2 (Fig. 26)	
Peak Emission Wavelength	λ PEAK	4291-R1/R2		630		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4291-R1/R2		40		nm		
Forward Current 5V Devices	IF	4291-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4291-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4291-R1/R2			100	μA	VR = 5V	

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

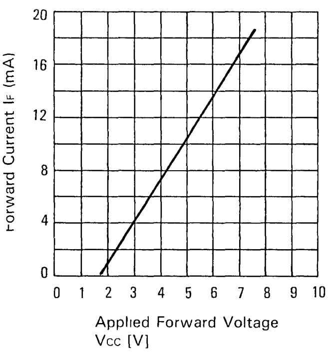


FIG 22 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 5 VOLT DEVICES

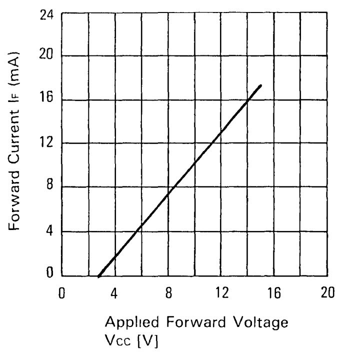


FIG. 23 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 12 VOLT DEVICES

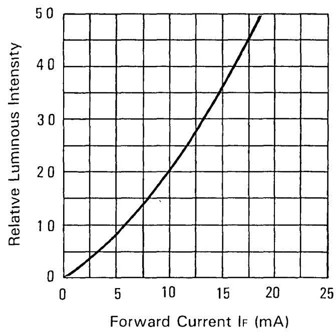


FIG 24 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

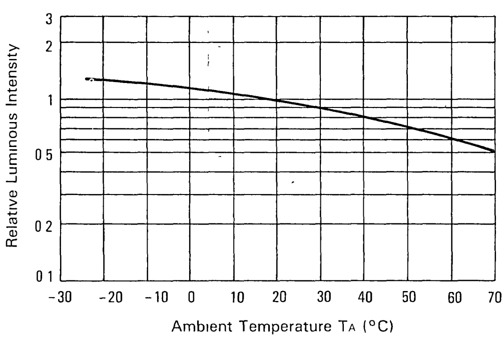


FIG 25 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

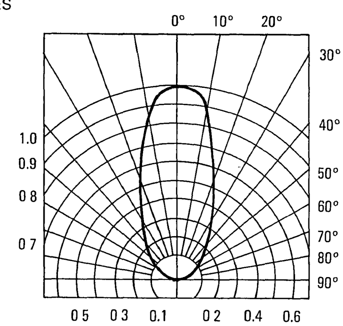


FIG. 26 SPATIAL DISTRIBUTION

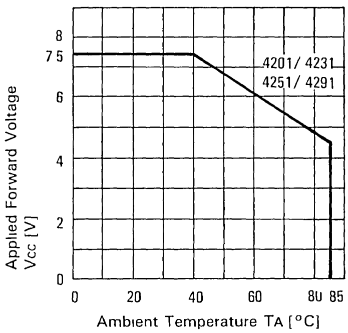


FIG 27 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [5 VOLT DEVICES]

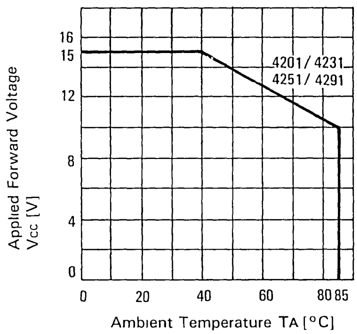


FIG 28 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [12 VOLT DEVICES]

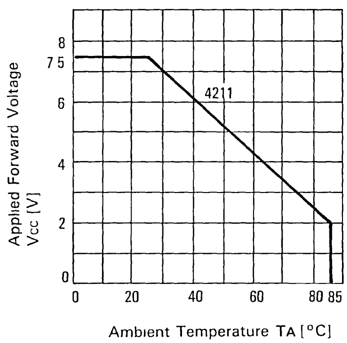


FIG 29 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [5 VOLT DEVICES]

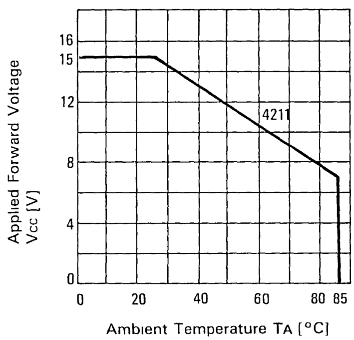


FIG 30 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [12 VOLT DEVICES]

LED LAMPS

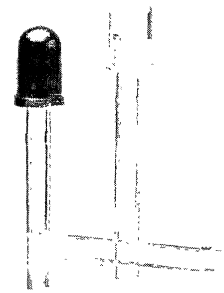
LITEON

T-1 3/4 (5mm) RESISTOR LAMPS

LTL-4203-R1/R2 RED
LTL-4213-R1/R2 BRIGHT RED
LTL-4223-R1/R2 HI.EFF.RED
LTL-4233-R1/R2 GREEN
LTL-4238-R1/R2 GREEN
LTL-4253-R1/R2 YELLOW
LTL-4293-R1/R2 ORANGE

FEATURES

- INTEGRAL CURRENT LIMITING RESISTOR.
- COST EFFECTIVE.
  Saves Spaces and Resistor Cost.
- EXTERNAL RESISTOR REQUIRED WITH 5 VOLT/12 VOLT SUPPLY.
- AVAILABLE IN ALL COLORS.
  Red, High Efficiency Red, Yellow and Green in T-1 3/4 Packages.



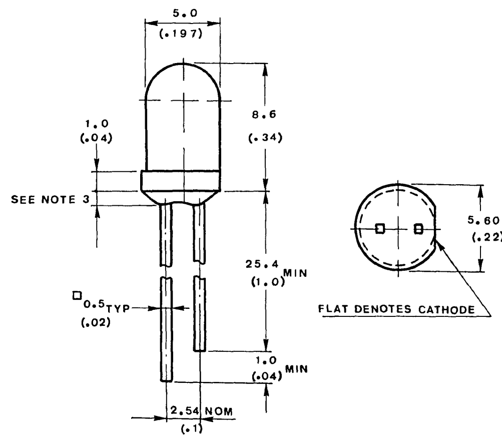
DESCRIPTION

The RESISTOR LAMP contains an integral current limiting resistor in series with the LED. This allows the lamp to be driven from a high volt source without an external current limiter. The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red Light Emitting Diode. The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode. The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
4203-R1/R2	Red	Diffused	Red
4213-R1/R2	Red	Diffused	Bright Red
4223-R1/R2	Red	Diffused	Hi.Eff.Red
4233-R1/R2	Green	Diffused	Green
4238-R1/R2	Water Clear	Non-Diffused	Green
4253-R1/R2	Yellow	Diffused	Yellow
4293-R1/R2	Orange	Diffused	Orange

PACKAGE DIMENSION

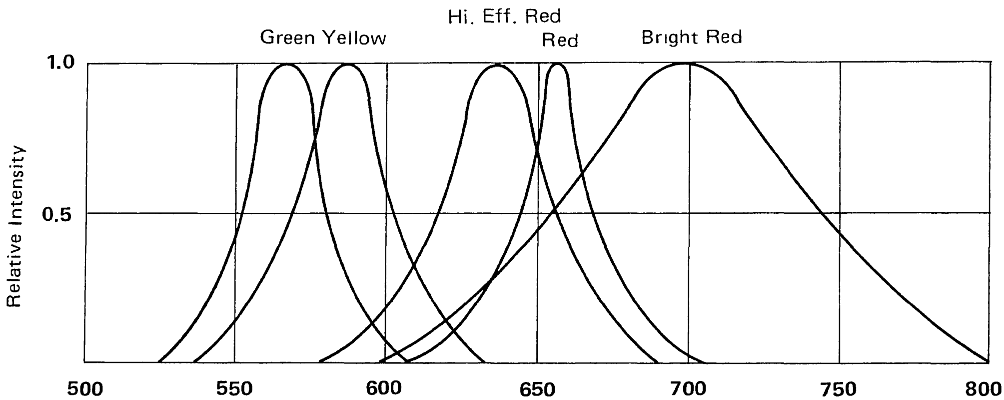


NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (0.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

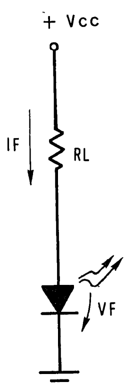
PARAMETER	RED/BRIGHT RED/HI.EFF.RED GREEN/YELLOW/ORANGE 5V LAMPS	RED/BRIGHT RED/HI.EFF.RED GREEN/YELLOW/ORANGE 12V LAMPS	UNIT
DC Forward Voltage (T_A =25°C)	7.5	15	volts
Reverse Voltage	5	5	volts
Operating Temperature Range	−40°C to +85°C		
Storage Temperature Range	−55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		



Wavelength λ (nm)

FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

EQUIVALENT CIRCUIT:



V_{CC} = 5 volts
(R_L = 250 ohms ± 20%)

V_{CC} = 12 volts
(R_L = 800 ohms ± 20%)

$$I_F = \frac{V_{CC} - V_F}{R_L}$$

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4203-R1	0.3	0.8		mcd	VF=5V	NOTE.1
		4203-R2	0.3	1.0			VF=12V	
Viewing Angle	2θ½	4203-R1/R2		36		deg	Note 2 (Fig. 6)	
Peak Emission Wavelength	λ PEAK	4203-R1/R2		655		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4203-R1/R2		24		nm		
Forward Current 5V Devices	IF	4203-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4203-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4203-R1/R2			100	μA	VR = 5V	

NOTES. 1 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve

2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

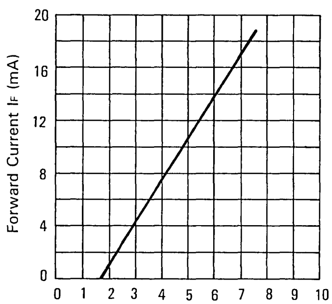


FIG 2 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 5 VOLT DEVICES

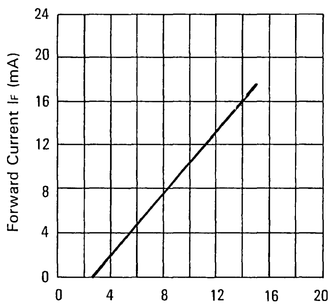


FIG 3 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE. 12 VOLT DEVICES

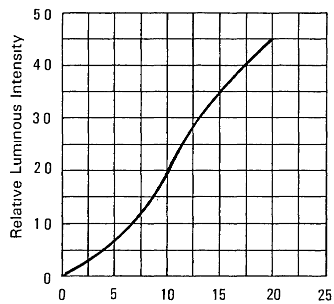


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

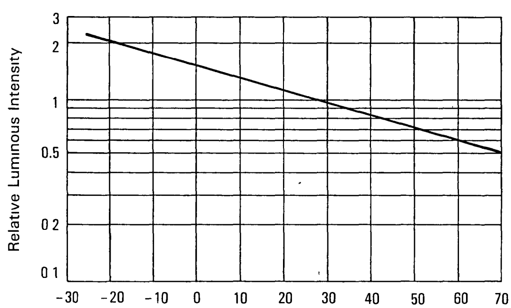


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

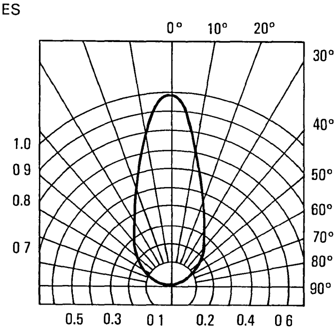


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4213-R1	1.1	3.8		mcd	VF=5V	NOTE 1
		4213-R2	1 1	4.0			VF=12V	
Viewing Angle	$2\theta\frac{1}{2}$	4213-R1/R2		36		deg	Note 2 (Fig. 11)	
Peak Emission Wavelength	λ PEAK	4213-R1/R2		697		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4213-R1/R2		90		nm		
Forward Current 5V Devices	IF	4213-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4213-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4213-R1/R2			100	μA	VR = 5V	

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve

2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

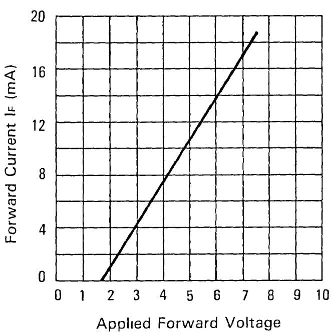


FIG 7 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE 5 VOLT DEVICES

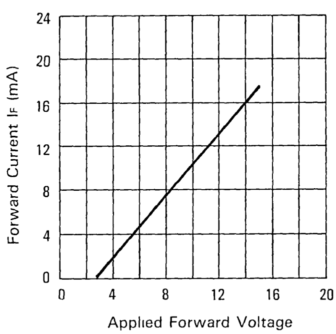


FIG 8 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 12 VOLT DEVICES

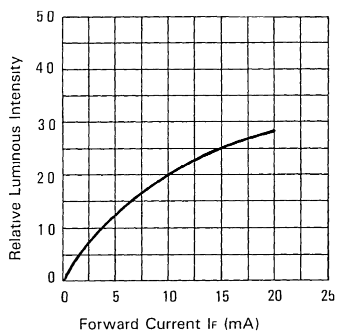


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

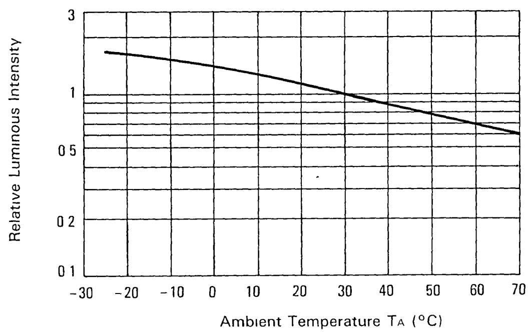


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

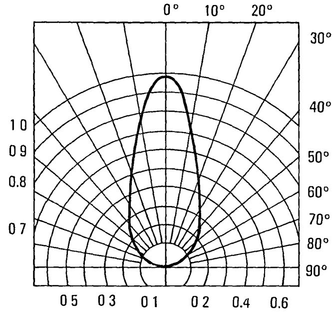


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4223-R1	2.5	8.7		mcd	VF=5V	NOTE.1
		4223-R2	2.5	8.9			VF=12V	
Viewing Angle	$2\theta\frac{1}{2}$	4223-R1/R2		36		deg	Note 2 (Fig. 16)	
Peak Emission Wavelength	λ PEAK	4223-R1/R2		635		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4223-R1/R2		40		nm		
Forward Current 5V Devices	IF	4223-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4223-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4223-R1/R2			100	μA	VR = 5V	

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

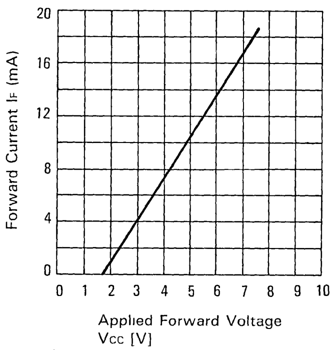


FIG 12 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 5 VOLT DEVICES

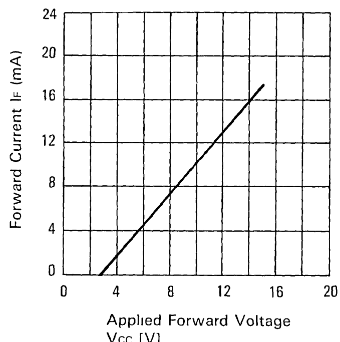


FIG 13 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 12 VOLT DEVICES

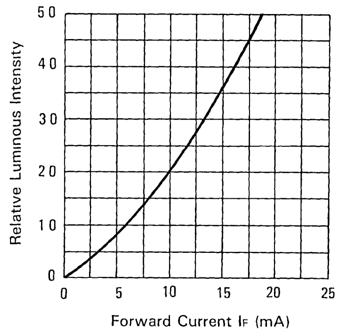


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

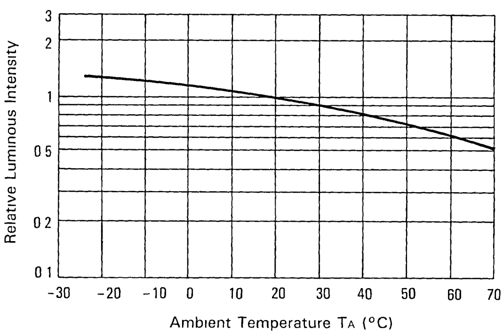


FIG 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

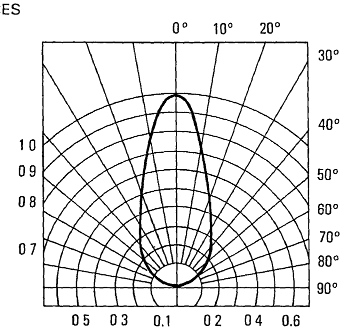


FIG 16 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4233-R1 4238-R1	2.5 35	8.7 70		mcd	VF=5V	NOTE.1
		4233-R2 4238-R2	2.5 40	8.9 85			VF=12V	
Viewing Angle	2θ½	4233-R1/R2 4238-R1/R2		36 16		deg	Note 2 (Fig. 21)	
Peak Emission Wavelength	λ PEAK	4233-R1/R2 4238-R1/R2		565		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4233-R1/R2 4238-R1/R2		30		nm		
Forward Current 5V Devices	IF	4233-R1 4238-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4233-R2 4238-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4233-R1/R2 4238-R1/R2			100	μA	VR = 5V	

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

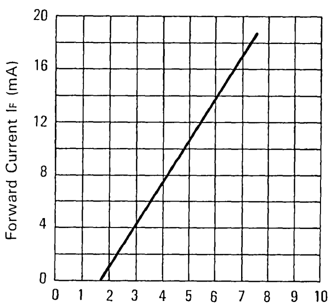


FIG 17 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE. 5 VOLT DEVICES

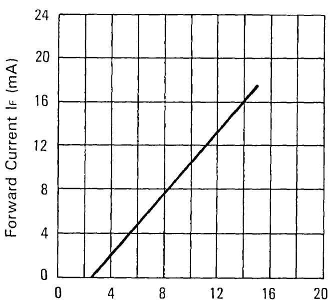


FIG 18 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 12 VOLT DEVICES

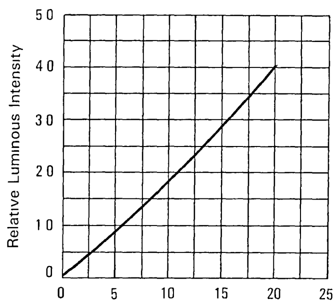


FIG 19 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

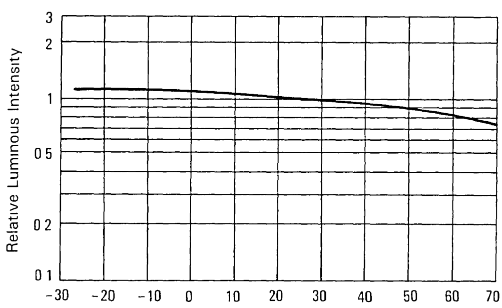


FIG 20 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

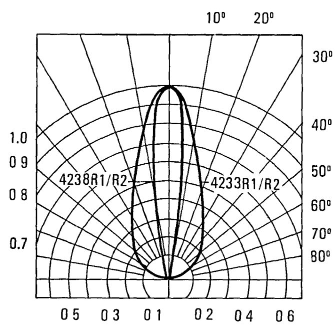


FIG 21 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4253-R1	2.5	8.7		mcd	VF=5V	NOTE.1
		4253-R2	2.5	8.9			VF=12V	
Viewing Angle	$2\theta½$	4253-R1/R2		36		deg	Note 2 (Fig. 26)	
Peak Emission Wavelength	λ PEAK	4253-R1/R2		585		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4253-R1/R2		35		nm		
Forward Current 5V Devices	IF	4253-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4253-R2		12	20	mA	VF = 12V	
Reverse Current	IR	4253-R1/R2			100	μA	VR = 5V	

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

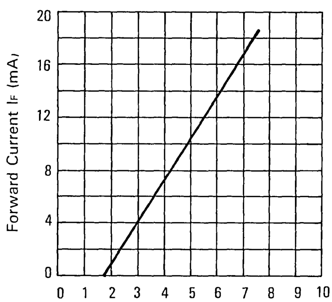


FIG 22 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 5 VOLT DEVICES

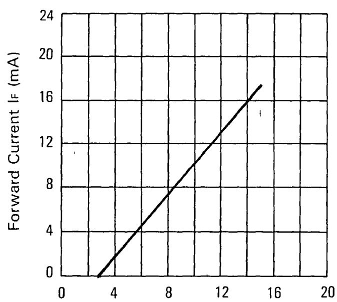


FIG 23 FORWARD CURRENT VS APPLIED FORWARD VOLTAGE 12 VOLT DEVICES

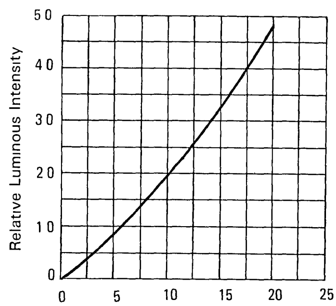


FIG 24 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

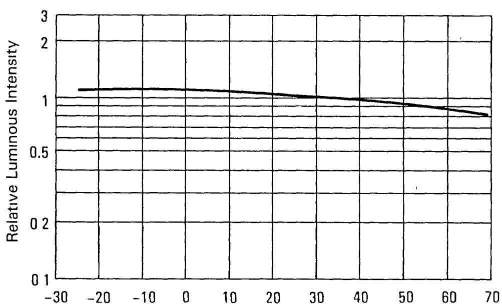


FIG. 25 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

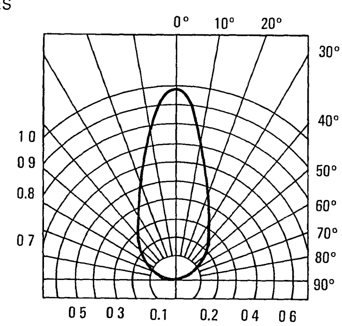


FIG. 26 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	
Luminous Intensity	Iv	4293-R1	2.5	8.7		mcd	VF=5V	NOTE.1
		4293-R2	2.5	8.9			VF=12V	
Viewing Angle	$2\theta½$	4293-R1/R2		36		deg	Note 2 (Fig 31)	
Peak Emission Wavelength	λ PEAK	4293-R1/R2		630		nm	Measurement @Peak (Fig. 1)	
Spectral Line Half – Width	Δλ	4293-R1/R2		40		nm		
Forward Current 5V Devices	IF	4293-R1		10	20	mA	VF = 5V	
Forward Current 12V Devices	IF	4293-R2		12	20	mA	VF 12V	
Reverse Current	IR	4293-R1/R2			100	μA	VR = 5V	

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

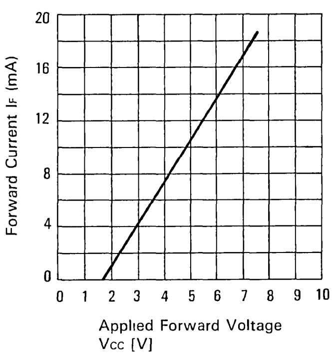


FIG. 22 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 5 VOLT DEVICES

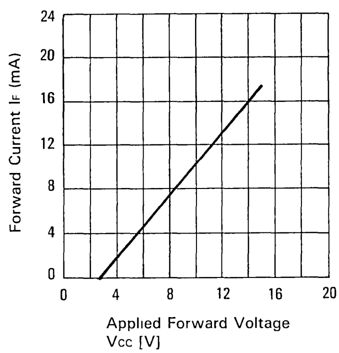


FIG. 23 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 12 VOLT DEVICES

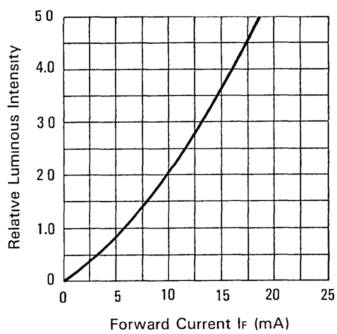


FIG. 24 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

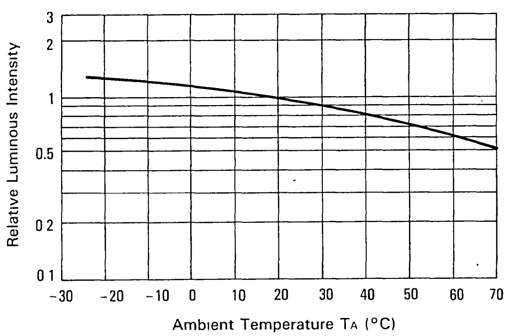


FIG 25 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

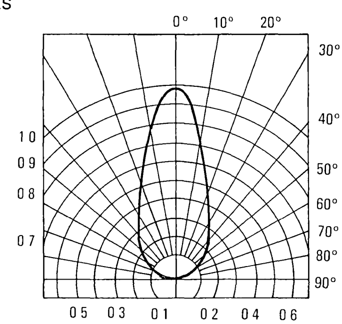


FIG. 31 SPATIAL DISTRIBUTION

LED LAMPS

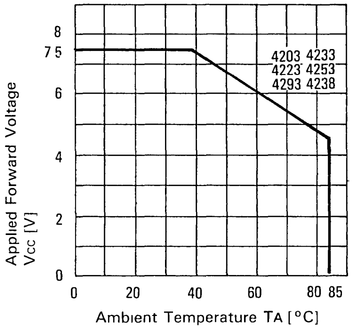


FIG 32 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS AMBIENT TEMPERATURE [5 VOLT DEVICES]

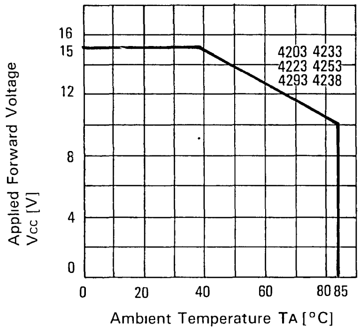


FIG 33 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [12 VOLT DEVICES]

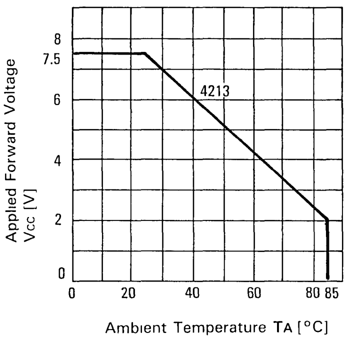


FIG 34 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS AMBIENT TEMPERATURE [5 VOLT DEVICES]

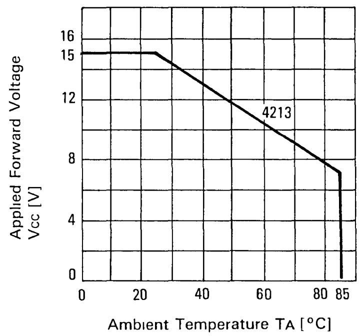


FIG 35 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [12 VOLT DEVICES]

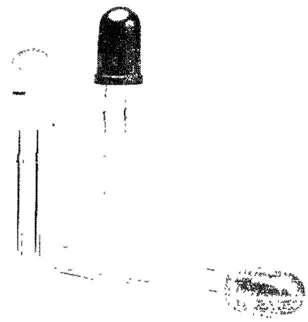
LITEON

T-1¾ (5mm) FLASH LAMPS

LTL-4213-FL BRIGHT RED
LTL-4233-FL GREEN
LTL-4263-FL ULTRA BRIGHT RED

FEATURES

- OPERATION VOLTAGE RANGE: 3V – 10V.
- ±2.4HZ FLASHING RATE AT V_{DD} : 3.0V.
- 1/4 DUTY-CYCLE.
- ADJUSTABLE FLASHING RATE.



DESCRIPTION

The flash lamp contains an integral circuit oscillator series with the LED. This allows the lamp to be driven from a high voltage source without any external component. (The FLASH LAMP is a high voltage blinking LEDS).

The Ultra Bright Red source color are made with Gallium Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.

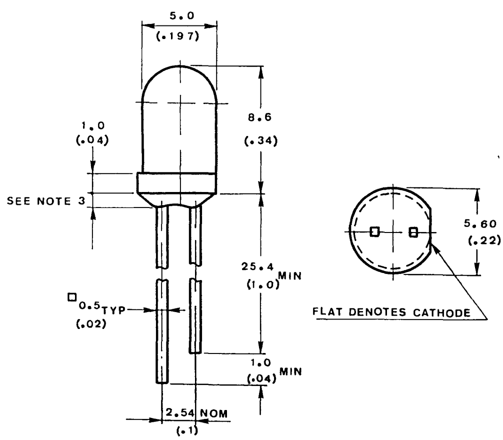
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.

The Ultra Bright Red source color are made with Gallium Aluminum Arsenide Red Light Emitting Diode.

DEVICES

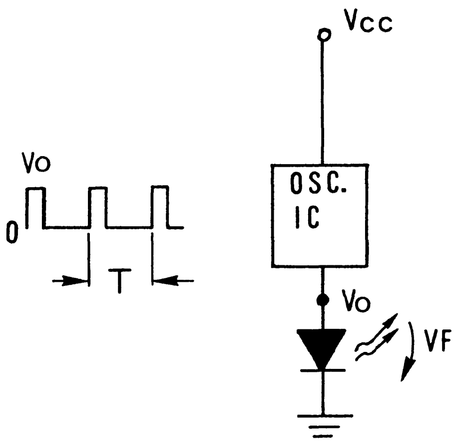
PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
4213-FL	Red	Diffused	Bright Red
4233-FL	Green	Diffused	Green
4263-FL	Red	Diffused	GaAlAs Red

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

EQUIVALENT CIRCUIT:



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	MAXIMUM RATING
Operating Temperature Range	0°C to + 70°C
Storage Temperature Range	–50°C to + 85°C
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds

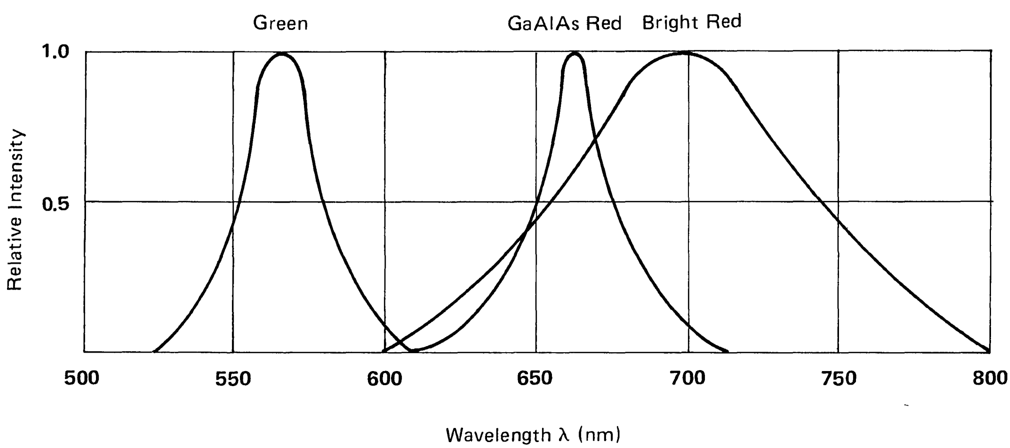


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4213-FL	0.6	1.1		mcd	VDD :3.0 V (NOTE.1)
			1.8	4.0			VDD .10.0V
Viewing Angle	$2\theta½$	4213-FL		36		deg	Note 2 (Fig. 4)
Peak Emission Wavelength	λ PEAK	4213-FL		697		nm	Measurement @Peak (Fig. 1)
Operating Voltage	VDD	4213-FL	3.0		10.0	volt	(Fig.2)
Blinking Freq.	f	4213-FL	2.0		2.4	HZ	VDD :3.0 . . . 10.0V (Fig.3)

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

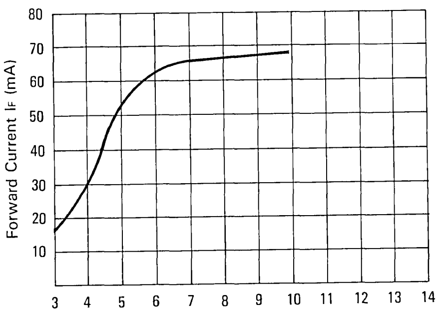


FIG 2 APPLIED VOLTAGE VDD (VOLT)

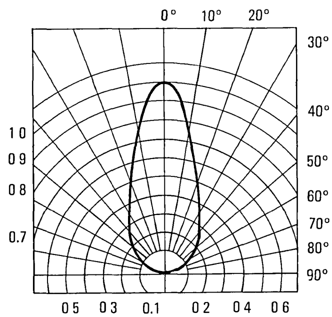


FIG. 4 SPATIAL DISTRIBUTION

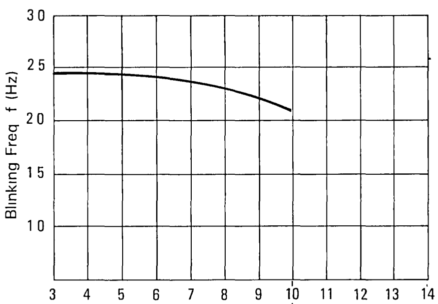


FIG 3 APPLIED VOLTAGE VDD (VOLT)

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4233-FL	1.5	3.5		mcd	V_{DD} :3.0 V (NOTE.1)
			4.5	10 0			V_{DD} :10.0V
Viewing Angle	$2\theta^{1/2}$	4233-FL		36		deg	Note 2 (Fig. 7)
Peak Emission Wavelength	λ PEAK	4233-FL		565		nm	Measurement @Peak (Fig. 1)
Operating Voltage	V_{DD}	4233-FL	3.0		10.0	volt	(Fig.5)
Blinking Freq.	f	4233-FL	2.0		2.4	HZ	V_{DD} :3.0 . . . 10.0V (Fig.6)

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta^{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

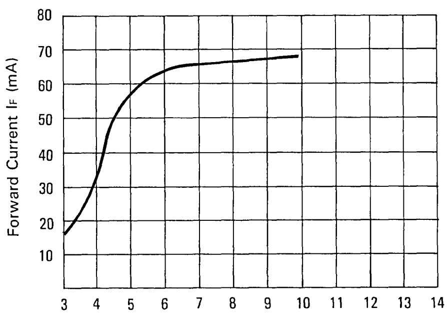


FIG 5 APPLIED VOLTAGE VDD (VOLT)

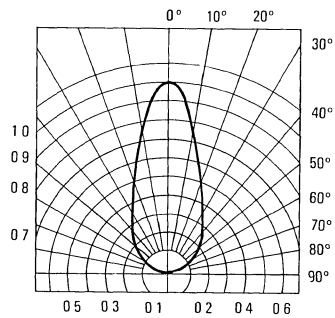


FIG 7 SPATIAL DISTRIBUTION

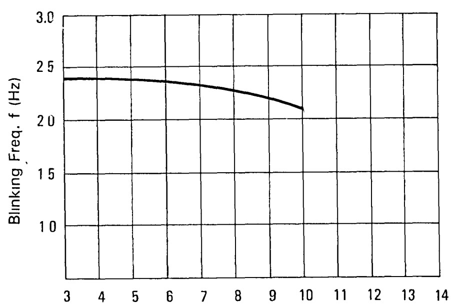


FIG 3 APPLIED VOLTAGE VDD (VOLT)

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. (LTL-)	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4263-FL	9	17		mcd	VDD .3.0 V (NOTE.1)
			19	36			VDD .10.0V
Viewing Angle	2θ½	4263-FL		40		deg	Note 2 (Fig. 10)
Peak Emission Wavelength	λ PEAK	4263-FL		660		nm	Measurement @Peak (Fig. 1)
Operating Voltage	VDD	4263-FL	3 0		10.0	volt	(Fig.8)
Blinking Freq.	f	4263-FL	2.0		2.4	HZ	VDD .3.0 . . . 10.0V (Fig.9)

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

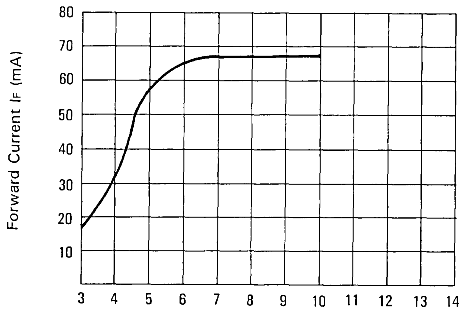


FIG. 8 APPLIED VOLTAGE VDD (VOLT)

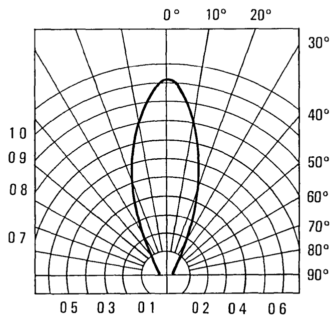


FIG 10 SPATIAL DISTRIBUTION

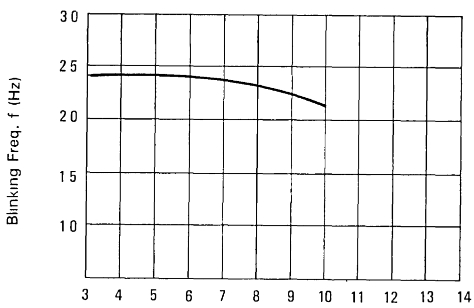


FIG. 9 APPLIED VOLTAGE VDD (VOLT)

LED LAMPS

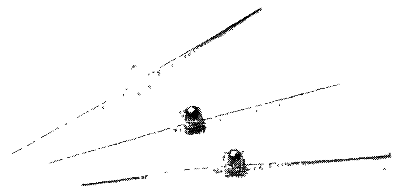
LITEON

SUBMINIATURE SOLID STATE LAMPS

LTL-93BEK1/HRA1 ORANGE
LTL-93BGK1/GA1 GREEN
LTL-93BYK1/YA1 YELLOW

FEATURES

- SUBMINIATURE PACKAGE STYLE.
- LOW PACKAGE PROFILE.
- AXIAL LEADS
- WIDE VIEWING ANGLE.
- LONG LIFE SOLID STATE RELIABILITY.



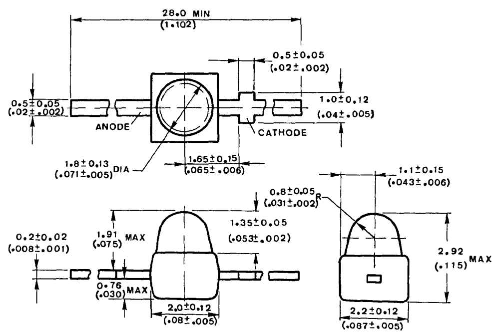
DESCRIPTION

The Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.
Lamps in this series of solid state indicators are molded in an axial lead subminiature package of molded epoxy. Size makes these lamp suitable for PC board mountinq in space sensitive application.

DEVICES

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
93BEK1	Water Clear	Non-Diffused	Orange
93BHRA1	Red	Diffused	
93BGK1	Water Clear	Non-Diffused	Green
93BGA1	Green	Diffused	
93BYK1	Water Clear	Non-Diffused	Yellow
93BYA1	Yellow	Diffused	

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	ORANGE	GREEN	YELLOW	UNIT
Power Dissipation	100	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	120	80	mA
Continuous Forward Current	30	30	20	mA
Derating Linear From 25°C	0.4	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	–55°C to +100°C			
Storage Temperature Range	–55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 3 Seconds			

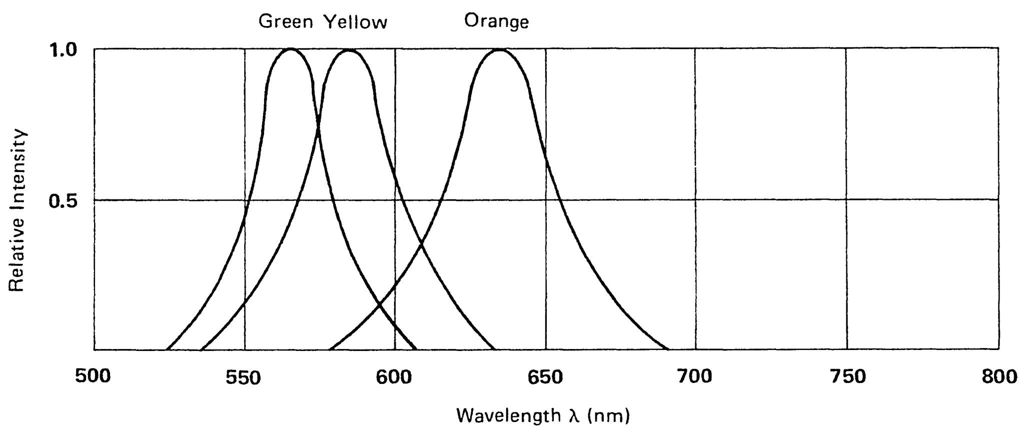


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	93BEK1 93BHRA1	3.7 1.1	12.5 3.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	93BEK1 93BHRA1		34 90		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

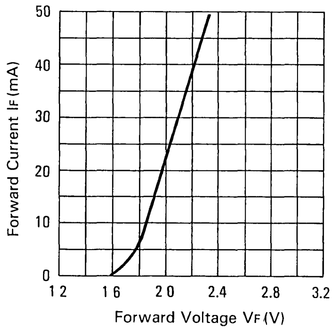


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

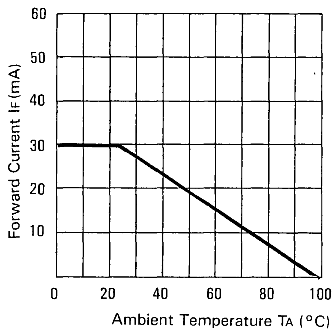


FIG. 3 FORWARD CURRENT DERATING CURVE

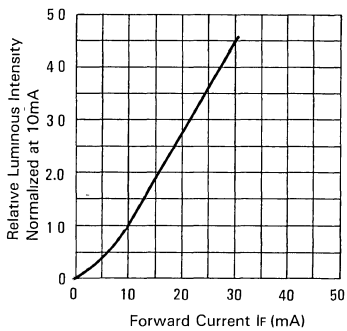


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

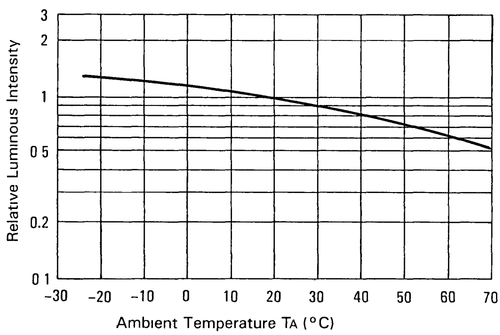


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

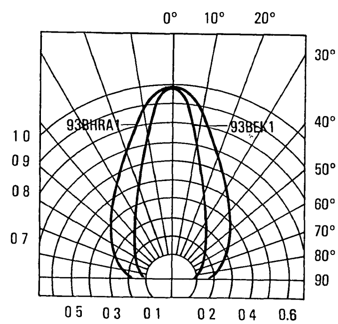


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	93BGA1 93BGK1	0.7 4.0	2.5 15.0		mcd	I = 10 mA Note 1
Viewing Angle	$2\theta_{1/2}$	93BGA1 93BGK1		90 34		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	93BGA1 93BGK1		565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	93BGA1 93BGK1		30		nm	
Forward Voltage	V	93BGA1 93BGK1		2.1	2.8	V	I = 20 mA
Reverse Current	I	93BGA1 93BGK1			100	μA	V = 5V
Capacitance	C	93BGA1 93BGK1		35		PF	V = 0 f = 1 MHZ

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

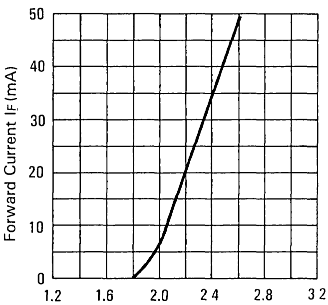


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE.

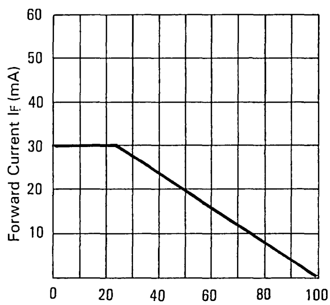


FIG 8 FORWARD CURRENT DERATING CURVE.

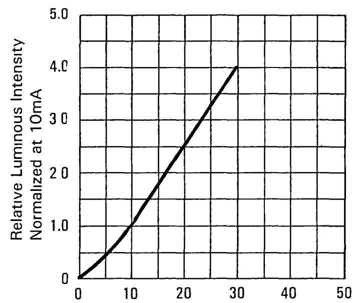


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

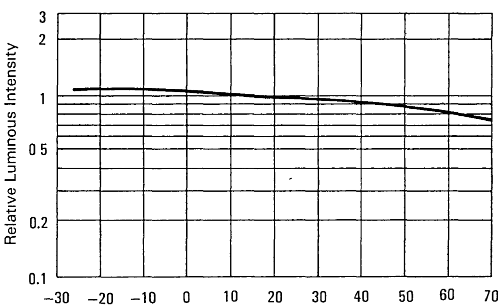


FIG. 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

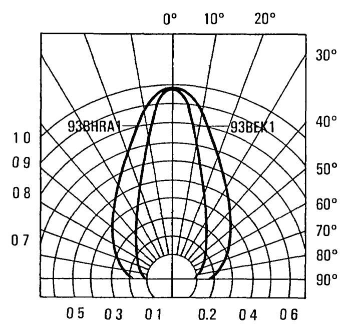


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	93BYA1 93BYK1	1.7 2.5	5.6 8.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	93BYA1 93BYK1		90 34		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ PEAK	93BYA1 93BYK1		585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	93BYA1 93BYK1		35		nm	
Forward Voltage	V_F	93BYA1 93BYK1		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	93BYA1 93BYK1			100	μA	V_R = 5V
Capacitance	C	93BYA1 93BYK1		15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

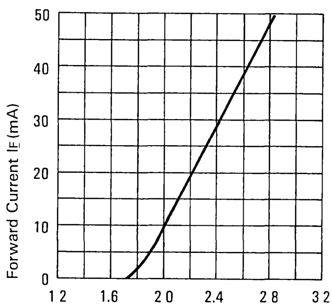


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

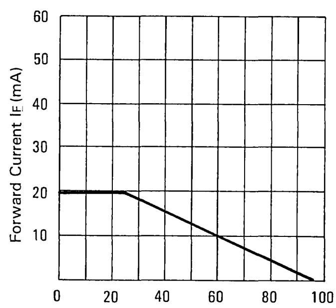


FIG. 13 FORWARD CURRENT DERATING CURVE

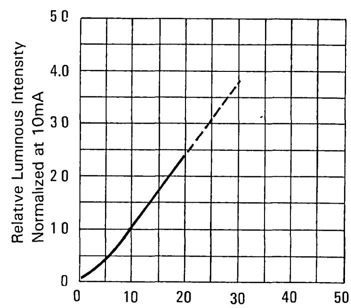


FIG. 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

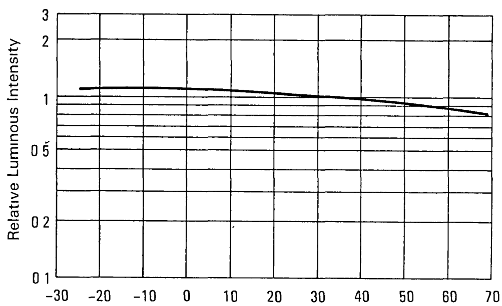


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

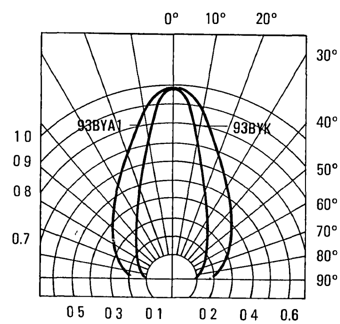


FIG.16 SPATIAL DISTRIBUTION

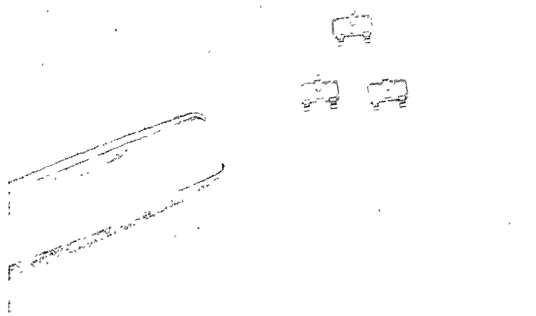
LITEON

SOT-23 SURFACE MOUNT ASSEMBLY LED LAMP

LTL-907PK/907LK/907EK

FEATURES

- MICROMINIATURE PACKAGE LED LAMP.
- SURFACE MOUNT ASSEMBLY LAMP.
- SINGLE CHIP.
- HIGH EFFCIENCY/LOWER POWER CONSUMPTION.
- LONG LIFE SOLID STATE RELIABILITY.



DESCRIPTION

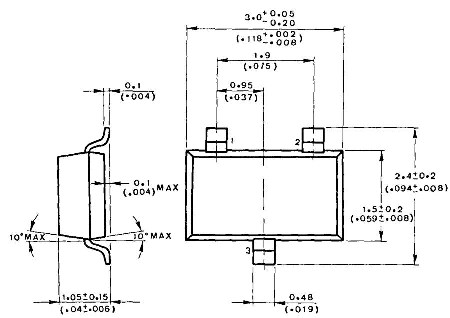
The LTL-907 series are clear non-diffused epoxy microminiature package for surface mount assembly.
LTL-907PK is Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
LTL-907LK is Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
LTL-907FK is Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.

DEVICES

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
907PK	Water Clear	Non-diffused	Bright Red
907LK	Water Clear	Non-diffused	Green
907EK	Water Clear	Non-diffused	Orange

PIN NO.	LTL-907PK LTL-907LK LTL-907EK
1	N.C.
2	Anode
3	Cathode

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Lead spacing is measured where the leads emerge from the package.
4. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	BRIGHT RED	GREEN	ORANGE	UNIT
Power Dissipation	40	100	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	120	mA
Continuous Forward Current	15	30	30	mA
Derating Linear From 25°C	0.2	0.4	0.4	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	−55°C to +100°C			
Storage Temperature Range	−55°C to +100°C			
Lead Soldering Temperature	240°C for 5 Seconds			

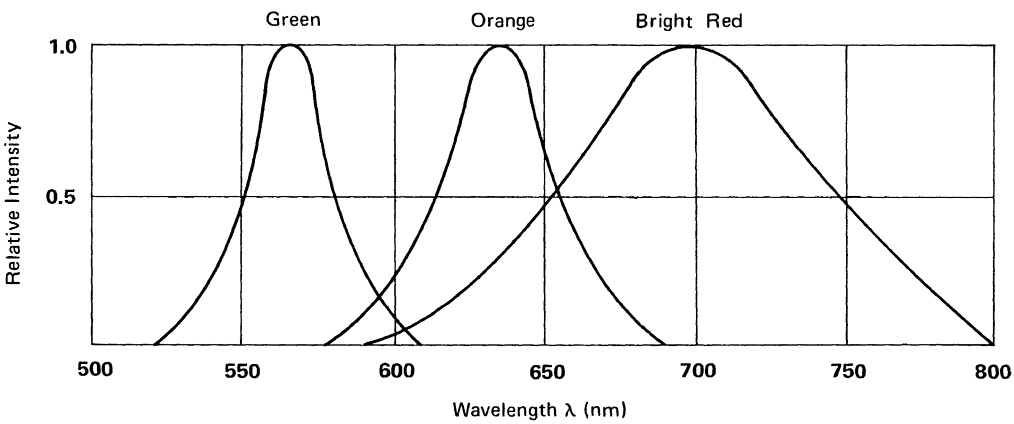


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	907PK	0.5	1.7		mcd	$I_F = 20mA$ Note 1
Viewing Angle	$2\theta½$	907PK		140		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK			697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			90		nm	
Forward Voltage	V_F			2.1	2.8	V	$I_F = 20mA$
Reverse Current	I_R				100	μA	$V_R = 5V$
Capacitance	C			55		PF	$V_F = 0$ f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

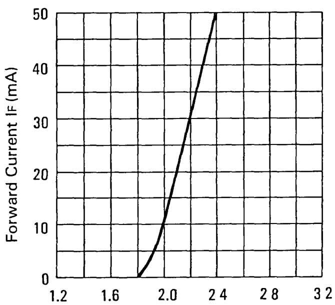


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

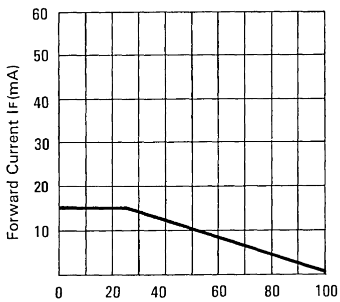


FIG 3 FORWARD CURRENT DERATING CURVE.

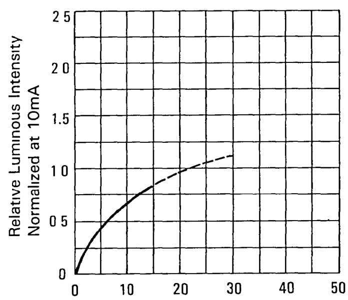


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

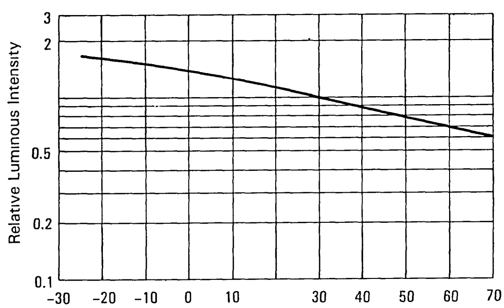


FIG.5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

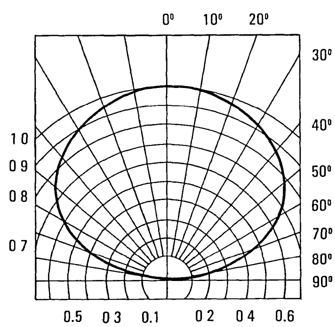


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	907LK	0.6	2.0		mcd	I_F = 20mA Note 1
Viewing Angle	$2\theta½$	907LK		140		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}			565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			30		nm	
Forward Voltage	V_F			2.1	2.8	V	I_F = 20mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			35		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

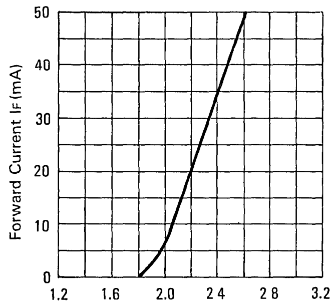


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE.

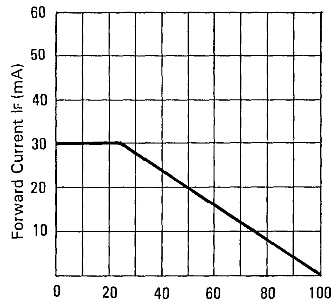


FIG. 8 FORWARD CURRENT DERATING CURVE.

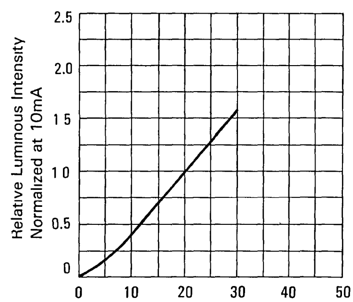


FIG. 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

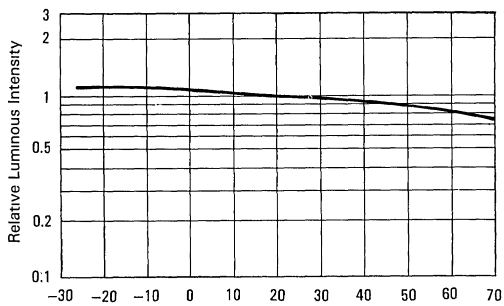


FIG. 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

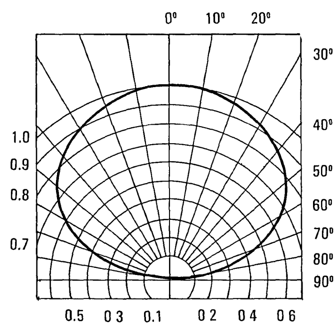


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	I_V	907EK	0.6	2.0		mcd	I_F = 20mA Note 1
Viewing Angle	$2\theta½$	907EK		140		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

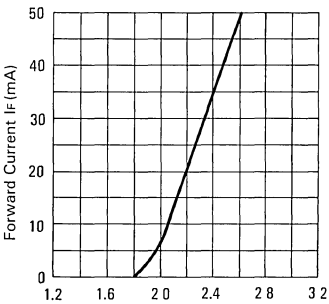


FIG 12 FORWARD CURRENT VS. FORWARD VOLTAGE.

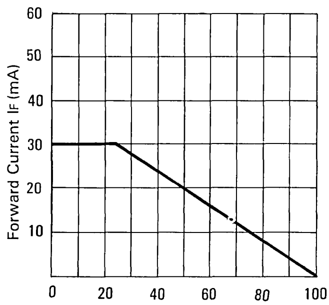


FIG. 13 FORWARD CURRENT DERATING CURVE.

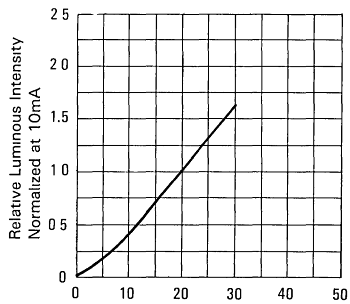


FIG 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

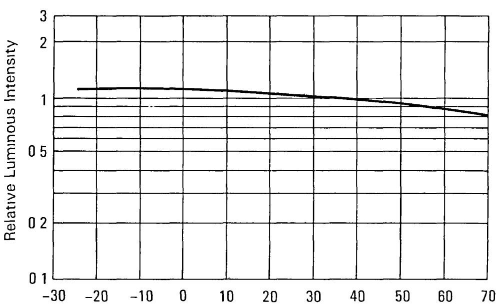


FIG 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

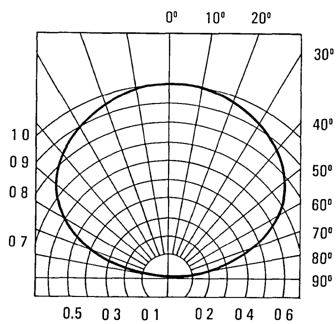


FIG. 16 SPATIAL DISTRIBUTION

LED LAMPS

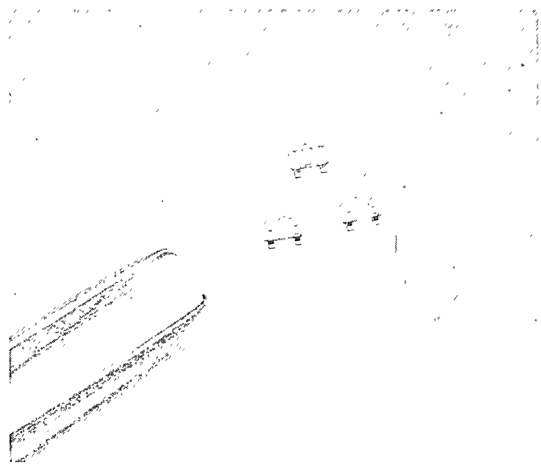
LITEON

SOT-23 SURFACE MOUNT ASSEMBLY LED LAMPS

LTL-907HK/907JK/907NK

FEATURES

- MICROMINIATURE PACKAGE LED LAMP.
- SURFACE MOUNT ASSEMBLY LAMP.
- DOUBLE CHIP.
- HIGH EFFCIENCY/LOWER POWER CONSUMPTION.
- LONG LIFE SOLID STATE RELIABILITY.



DESCRIPTION

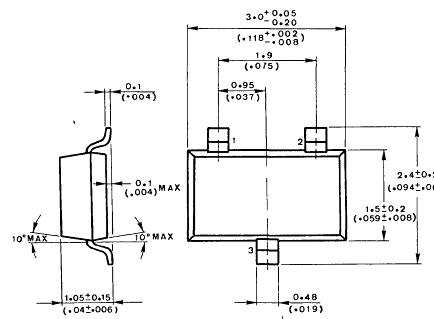
The LTL-907HK are bicolor LED contains two integral chip one orange Gallium Arsenide Phosphide on Gallium Phosphide and one green Gallium Phosphide, operation independently of each other with a common anode.
The LTL-907JK is clear non-diffused epoxy microminiature package for surface mount assembly double orange Gallium Arsenide Phosphide on Gallium Phosphide Light Emitting Diode.
The LTL-907NK utilizing double Gallium Aluminum Arsenide Ultra-brightness red.

DEVICES

PART NO. LTL-	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
907HK	Water Clear	Non-diffused	Orange
			Green
907JK	Water Clear	Non-diffused	Orange
			Orange
907NK	Water Clear	Non-diffused	GaAlAs Red
			GaAlAs Red

PIN NO.	LTL-907HK	LTL-907JK	LTL-907NK
1	Cathode (Orange)	Cathode	Anode
2	Cathode (Green)	Cathode	Anode
3	Anode	Anode	Cathode

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Lead spacing is measured where the leads emerge from the package.
4. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	GaAlAs RED	GREEN	ORANGE	UNIT
Power Dissipation	100	100	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	120	120	mA
Continuous Forward Current	40	30	30	mA
Derating Linear From 25°C	0.5	0.4	0.4	mA/°C
Reverse Voltage	4	5	5	V
Operating Temperature Range	–55°C to +100°C			
Storage Temperature Range	–55°C to +100°C			
Lead Soldering Temperature	240°C for 5 Seconds			

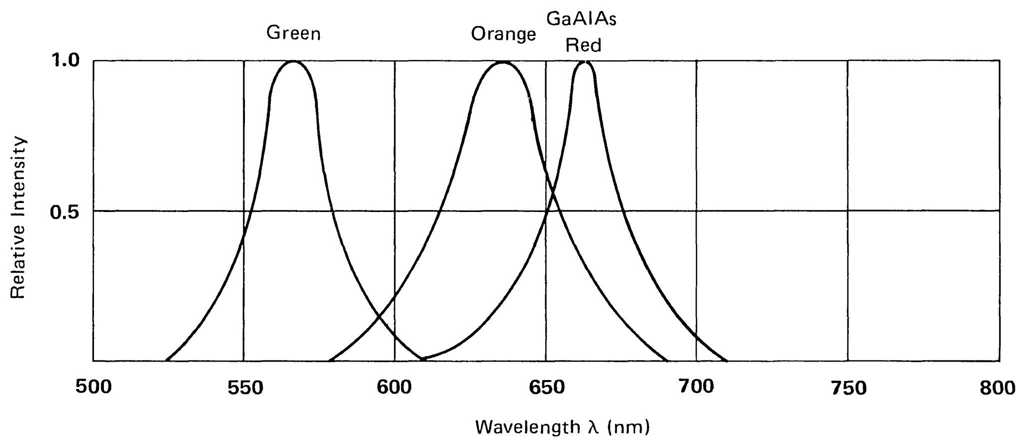


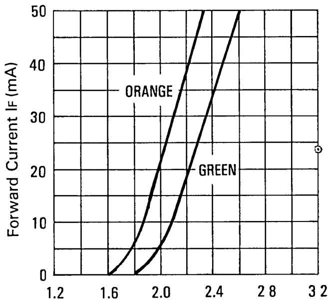
FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

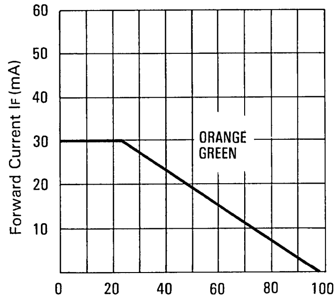
ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL-907HK	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	Orange Green	0.6 0.6	2.0 2.0		mcd	I_F = 20mA Note 1
Viewing Angle	$2\theta½$	Orange Green		140		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK	Orange Green		630 565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	Orange Green		40 30		nm	
Forward Voltage	V_F	Orange Green		2.0 2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	Orange Green			100	μA	V_R = 5V
Capacitance	C	Orange Green		20 35		PF	V_F = 0 f = 1MHz

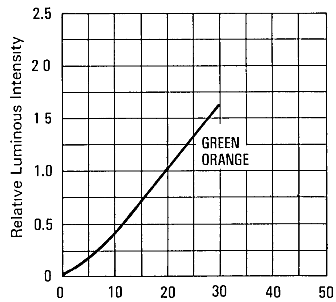
NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.



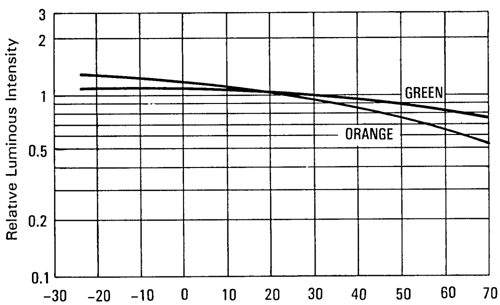
Forward Voltage VF (V)
FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE



Ambient Temperature TA (°C)
FIG. 3 FORWARD CURRENT DERATING CURVE



Forward Current IF (mA)
FIG. 4 RELATIVE LUMINOUS INTENSITY VS.



Ambient Temperature TA (°C)
FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

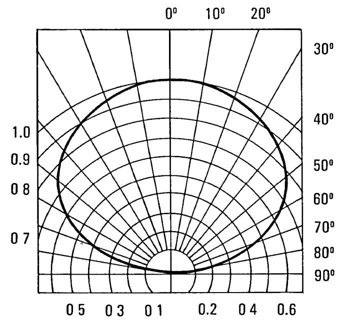


FIG SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	I_V	907NK	1.1	3.5		mcd	I_F = 20mA Note 1
Viewing Angle	$2\theta_{1/2}$	907NK		140		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}			660		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			20		nm	
Forward Voltage	V_F			1.8	2.4	V	I_F = 20mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			30		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

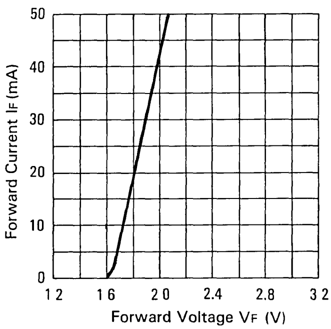


FIG 7 FORWARD CURRENT VS. FORWARD VOLTAGE

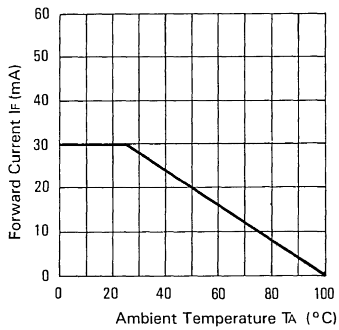


FIG 8 FORWARD CURRENT VS DERATING CURVE

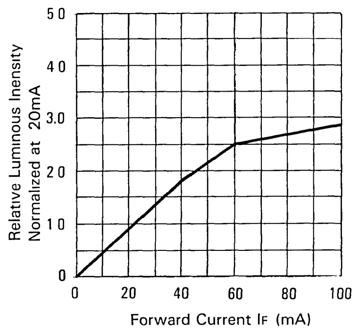


FIG 9 Relative LUMINOUS INTENSITY VS FORWARD CURRENT.

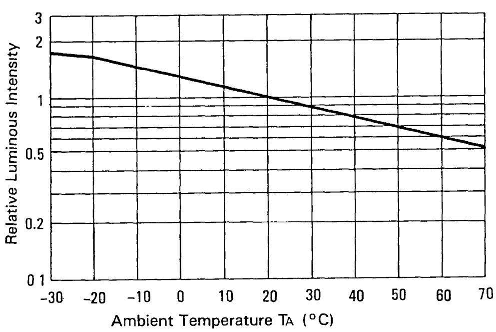


FIG. 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE CHARACTERISTICS

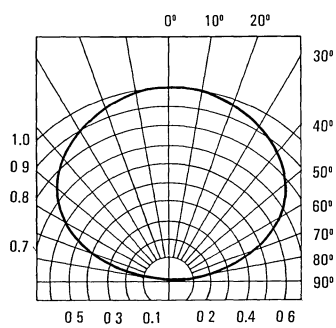


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	I_V	907JK	0.6	2.0		mcd	$I_F = 20mA$ Note 1
Viewing Angle	$2\theta½$	907JK		140		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			40		nm	
Forward Voltage	V_F			2.0	2.8	V	$I_F = 20mA$
Reverse Current	I_R				100	μA	$V_R = 5V$
Capacitance	C			20		PF	$V_F = 0$ f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

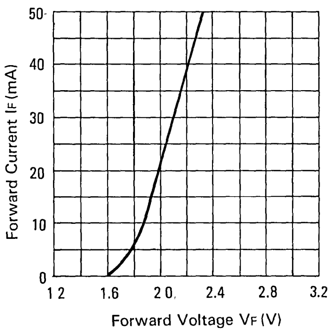


FIG. 12 FORWARD CURRENT VS FORWARD VOLTAGE.

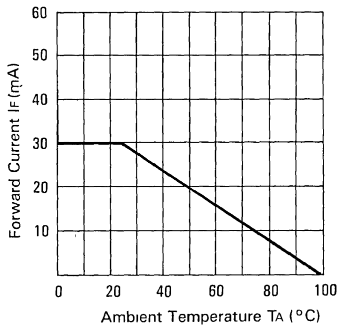


FIG. 13 FORWARD CURRENT DERATING CURVE.

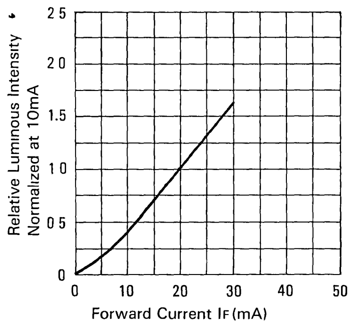


FIG. 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

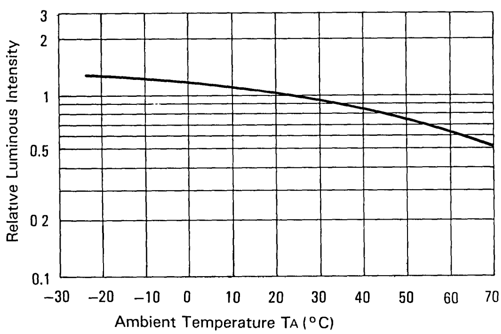


FIG. 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

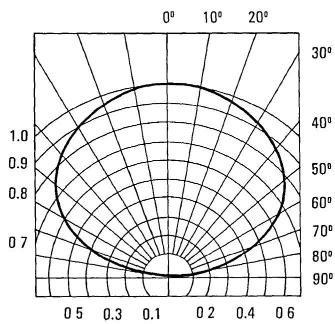


FIG 16 SPATIAL DISTRIBUTION

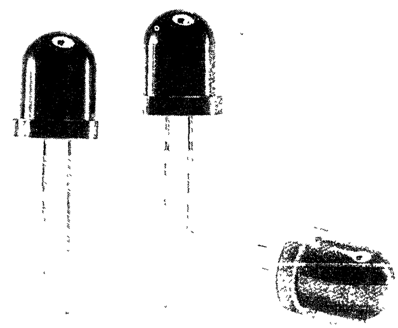
LITEON

BIG(8mm) SOLID STATE LAMPS

LTL-327HR HIGH EFFICIENCY RED LTL-327A AMBER
LTL-327G GREEN LTL-327EA ORANGE
LTL-327Y YELLOW

FEATURES

- 8mm DIAMETER BIG LAMP.
- WIDE VIEWING ANGLE.
- LOW POWER CONSUMPTION.
- I. C. COMPATIBLE/LOW CURRENT REQUIREMENTS.
- RELIABLE AND RUGGED.



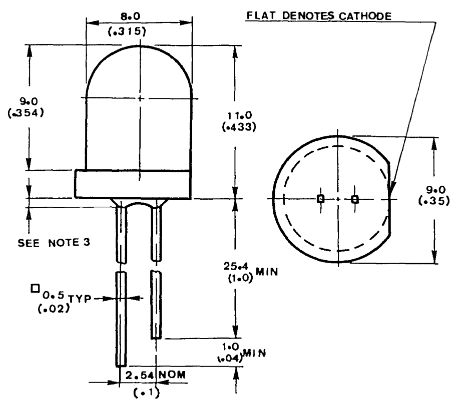
DESCRIPTION

The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
327HR	Red	Diffused	Hi. Eff. Red
327G	Green	Diffused	Green
327Y	Yellow	Diffused	Yellow
327A	Amber	Diffused	Amber
327EA	Orange	Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	GREEN	AMBER YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	80	120	mA
Continuous Forward Current	30	20	30	mA
Derating Linear From 25°C	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	−55°C to +100°C			
Storage Temperature Range	−55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds			

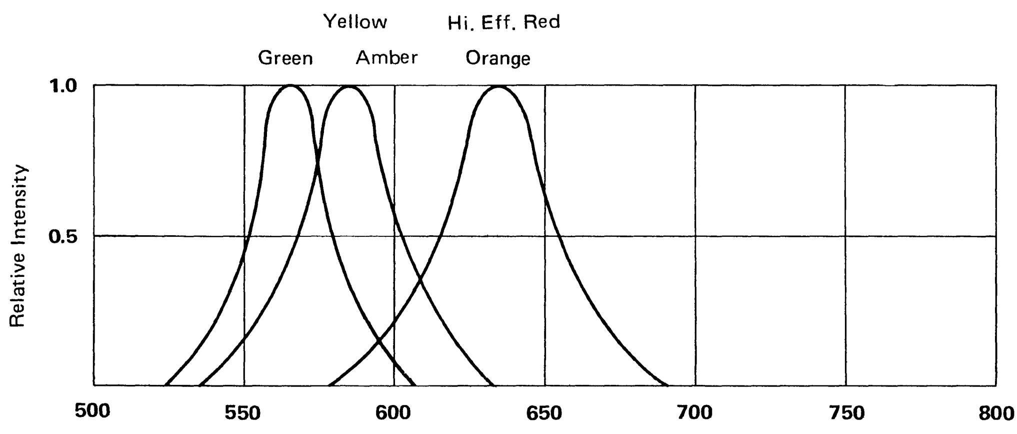


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	327HR	3.7	12.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	327HR		46		deg.	Note 2 (Fig 6)
Peak Emission Wavelength	λ PEAK	327HR		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	327HR		40		nm	
Forward Voltage	V_F	327HR		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	327HR			100	μA	V_R = 5V
Capacitance	C	327HR		20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

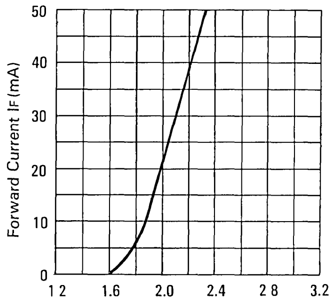


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

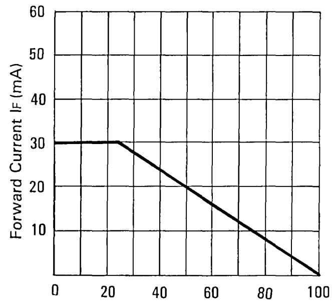


FIG 3 FORWARD CURRENT DERATING CURVE

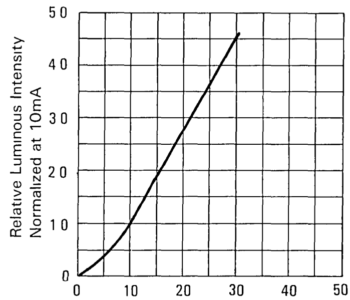


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

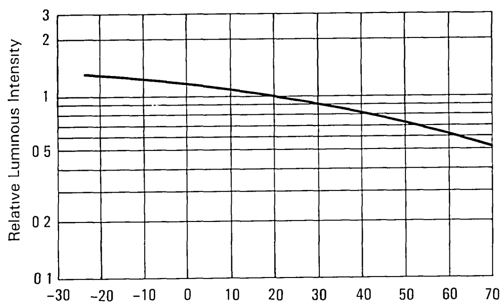


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

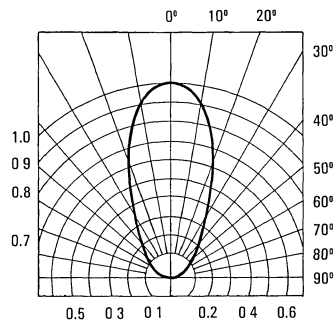


FIG. 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	327G 327Y	3.7 3.7	12.6 12.6		mcd	$I_F = 10$ mA Note 1
Viewing Angle	$2\theta½$	327G 327Y		46		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}	327G 327Y		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	327G 327Y		30 35		nm	
Forward Voltage	V_F	327G 327Y		2.1	2.8	V	$I_F = 20$ mA
Reverse Current	I_R	327G 327Y			100	μA	$V_R = 5V$
Capacitance	C	327G 327Y		35 15		PF	$V_F = 0$ f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

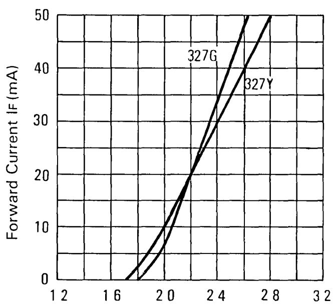


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

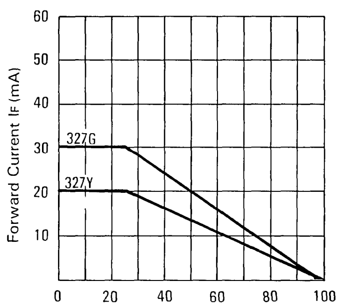


FIG 8 FORWARD CURRENT DERATING CURVE

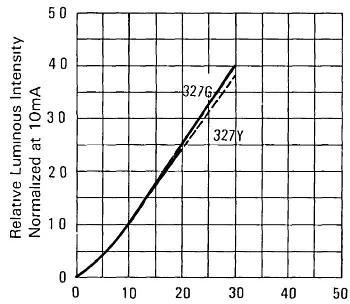


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

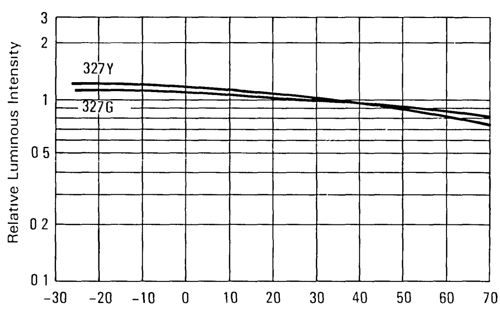


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

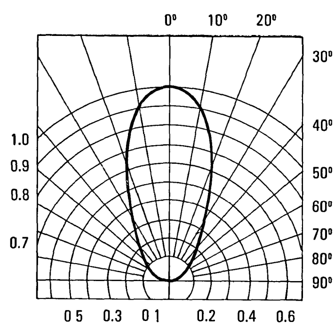


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	327A 327EA	3.7 3.7	12.6 12.6		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	327A 327EA		46		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ PEAK	327A 327EA		600 630		nm	Measurement @Peak (Fig. 1)
Spectral Line Hall Width	Δλ	327A 327EA		35 40		nm	
Forward Voltage	V_F	327A 327EA		2.1 2.0	2.8	V	I_F = 20mA
Reverse Current	I_R	327A 327EA			100	μA	V_R = 5V
Capacitance	C	327A 327EA		15 20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

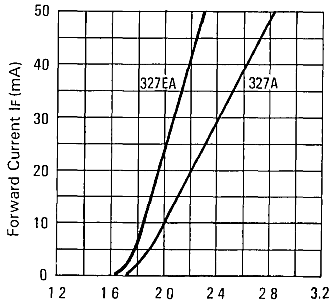


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

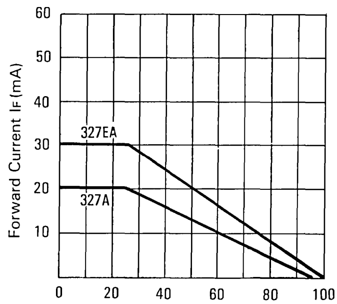


FIG 13 FORWARD CURRENT DERATING CURVE

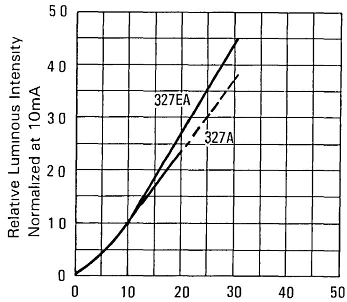


FIG.14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

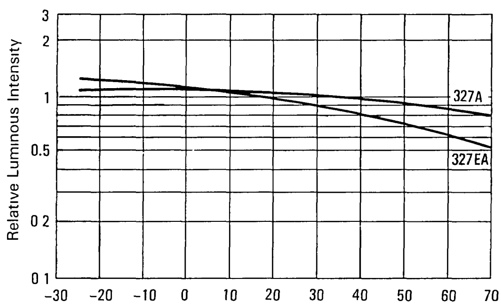


FIG.15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

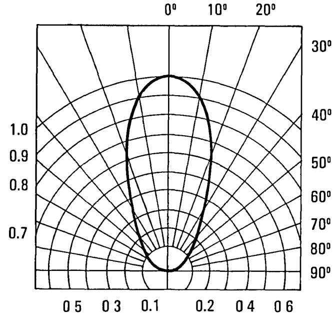


FIG 16 SPATIAL DISTRIBUTION

LED LAMPS

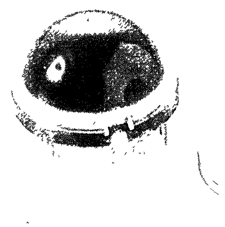
LITEON

0.8″ (20mm) BIG LAMP

LTJ-811 HR/811G/811Y

FEATURES

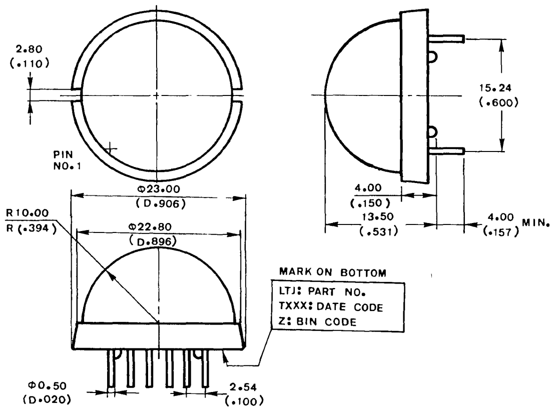
- 0.8 INCH (20.0mm) DIAMETER BIG LAMP.
- CHOICE OF THREE BRIGHT COLORS-GREEN/ YELLOW/HIGH EFFICIENCY RED.
- WIDE VIEWING ANGLE.
- GRAPHIC STACKING ALLOWABLE.
- HIGH LUMINOUS INTENSITY.
- LOW POWER REQUIREMENT.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- EXCELLENT ON-OFF CONTRAST.
- SUITABLE FOR MULTIPLEX OPERATION.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

The LTJ-811 series big lamp are sphere light sources designed for a variety of application where a large, bright source of light is required. The green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. The green devices have green diffused lens color. The yellow devices have yelllow diffused lens color. The high efficiency red devices have red diffused lens color.

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

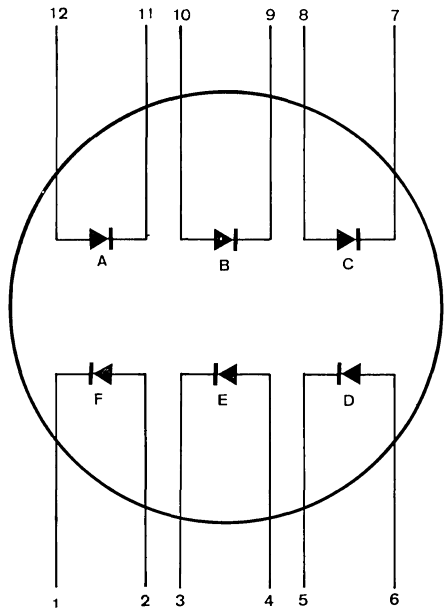
DEVICES

PART NO. LTJ–			DESCRIPTION
GREEN	YELLOW	HI.-EFF. RED	
811G	811Y	811HR	Universal, Sphere Lens

PIN CONNECTION

PIN NO.	CONNECTION
1	Cathode F
2	Anode F
3	Cathode E
4	Anode E
5	Cathode D
6	Anode D
7	Cathode C
8	Anode C
9	Cathode B
10	Anode B
11	Cathode A
12	Anode A

INTERNAL CIRCUIT DIAGRAM



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	GREEN	YELLOW	HI.-EFF. RED	UNIT
Power Dissipation Per Chip	75	60	75	mW
Peak Forward Current Per Chip (1/10 Duty Cycle, 0.1ms Pulse Width)	100	80	100	mA
Continuous Forward Current Per Chip	25	20	25	mA
Derating Linear From 25°C Per Chip	0.3	0.24	0.3	mA/°C
Reverse Voltage Per Chip	5	5	5	V
Operating Temperature Range	–25°C to +85°C			
Storage Temperature Range	–25°C to +85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTJ-811Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Lamp	I_V	11	25		mcd	I_F = 60 mA
Peak Emission Wavelength Per Lamp	λP		585		nm	I_F = 120 mA
Spectral Line Half-Width Per Lamp	$\Delta\lambda$		35		nm	I_F = 120 mA
Forward Voltage any Chip	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Chip	I_R			100	μA	V_R = 5V

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

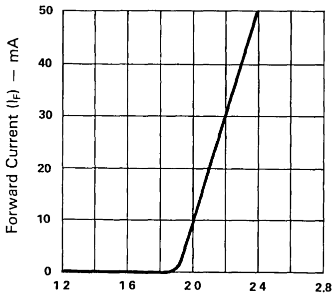


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE

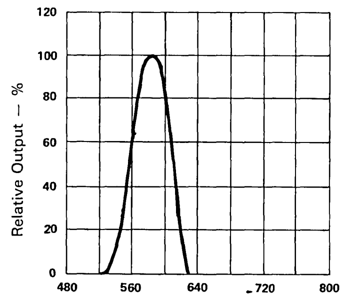


Fig. 2 SPECTRAL RESPONSE.

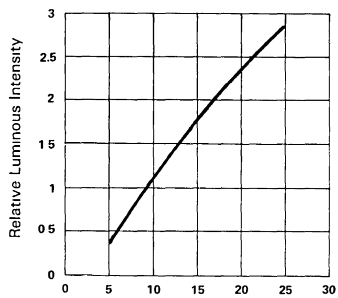


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

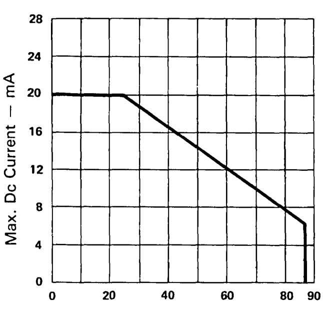


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

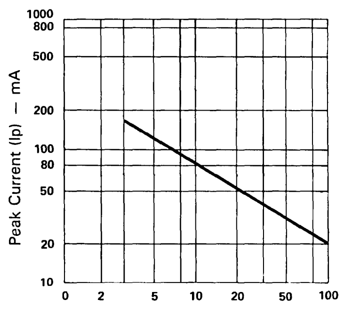


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

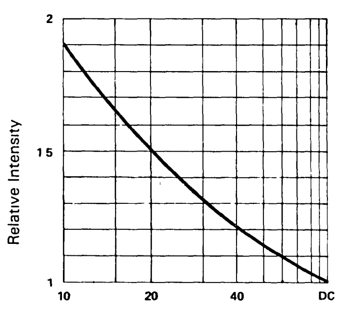


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTJ-811G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Lamp	Iv	11	25		mcd	I_F = 60 mA
Peak Emission Wavelength Per Lamp	λP		565		nm	I_F = 120 mA
Spectral Line Half-Width Per Lamp	$\Delta\lambda$		30		nm	I_F = 120 mA
Forward Voltage any Chip	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Chip	I_R			100	μA	V_R = 5V

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

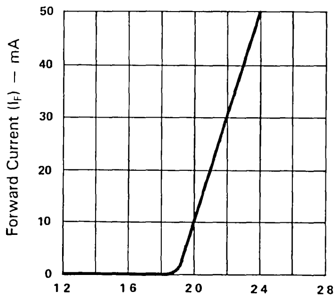


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

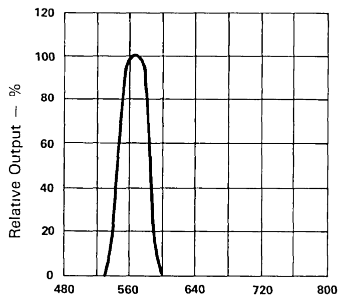


Fig. 2 SPECTRAL RESPONSE.

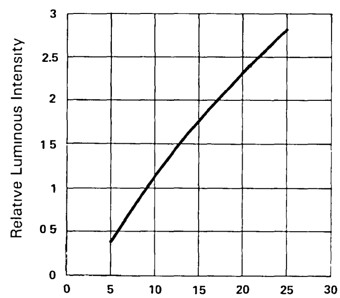


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

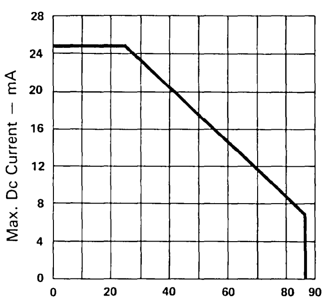


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

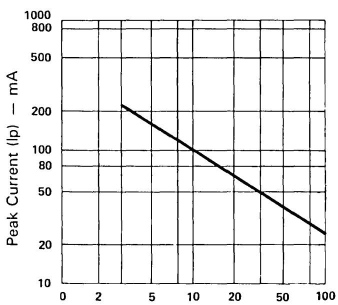


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

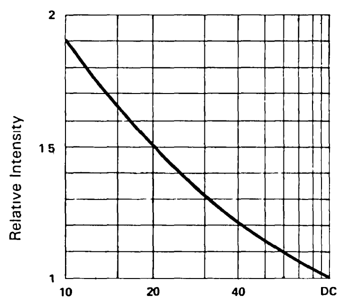


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTJ-811HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Lamp	Iv	11	25		mcd	I_F = 60 mA
Peak Emission Wavelength Per Lamp	λP		585		nm	I_F = 120 mA
Spectral Line Half-Width Per Lamp	$\Delta\lambda$		35		nm	I_F = 120 mA
Forward Voltage any Chip	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Chip	I_R			100	μA	V_R = 5V

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

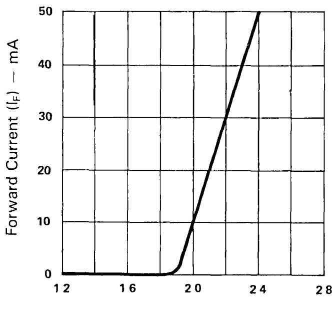


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

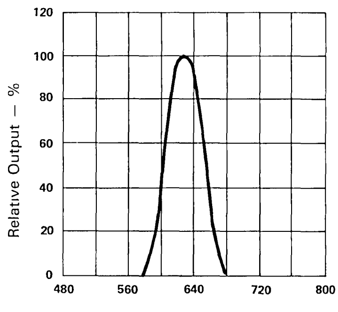


Fig 2 SPECTRAL RESPONSE

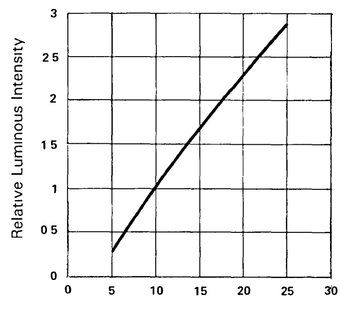


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

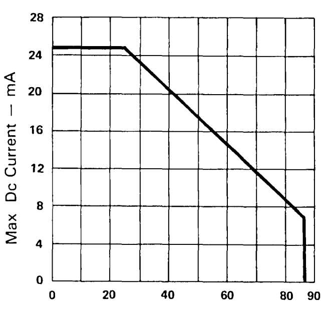


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

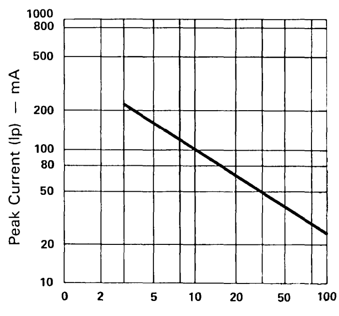


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

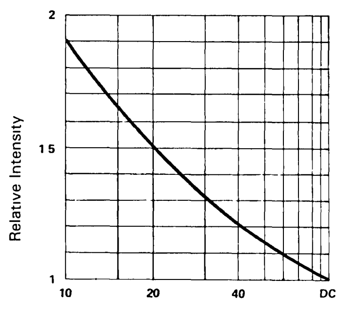


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

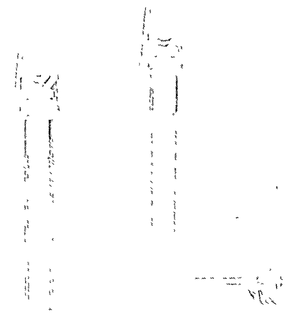
ULTRA BRIGHT RED SOLID STATE LAMPS T-1¾ MODIFIED 1" LEAD

LITEON

LTL-353CK (NEW IMPROVED PART TO REPLACE LTL-283CK SERIES)

FEATURES

- ULTRA-BRIGHTNESS.
- NEW STURDY LEADS.
- IC COMPATIBLE/LOW CURRENT CAPABILITY.
- RELIABLE AND RUGGED



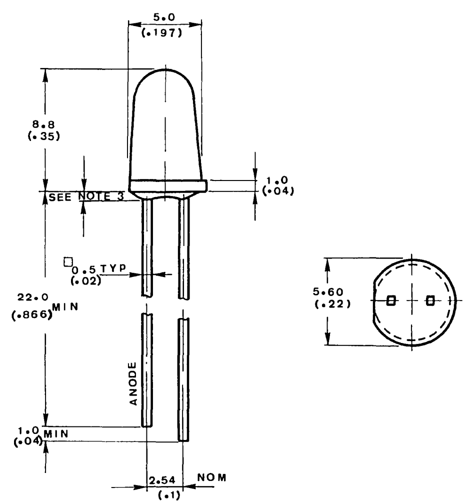
DESCRIPTION

The LTL-353CK is Gallium Aluminum Arsenide red light emitting diodes.
These clear, non-diffused Ultra Bright lamps but perform conventional LED lamps, by utilizing new ultra intensity material. We achieve superior product performance.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
353CK	Water Clear	Non-diffused	GaAIAs Red

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	mA
Continuous Forward Current	40	mA
Derating Linear From 25°C	0.5	mA/°C
Reverse Voltage	4	V
Operating Temperature Range	– 55°C to + 100°C	
Storage Temperature Range	– 55°C to + 100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

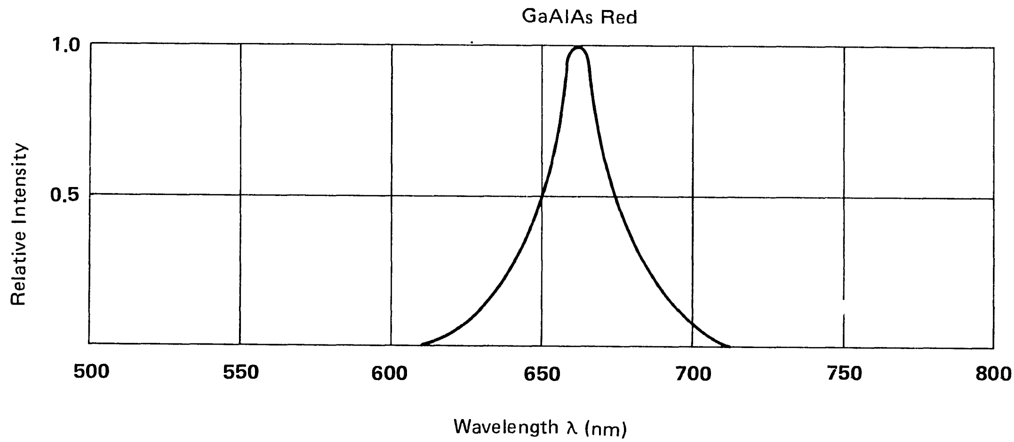


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25^\circ C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	353CK L2 353CK H3 353CK H4	150 400 700	300 500 1000		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$			12		deg	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK			660		nm	Measurement @ peak (Fig. 1)
Spectral Line Half-Width	Δλ			20		nm	
Forward Voltage	V_F			1.8	2.4	V	I_F = 20 MA
Reverse Current	I_R				100	μA	V_R = 4V
Capactance	C			30		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

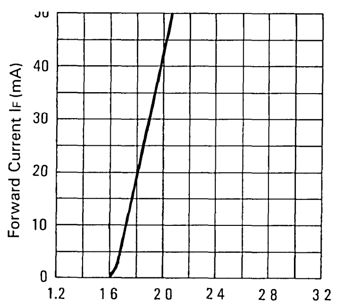


FIG 2 FORWARD CURRENT VS. FORWARD VOLTAGE

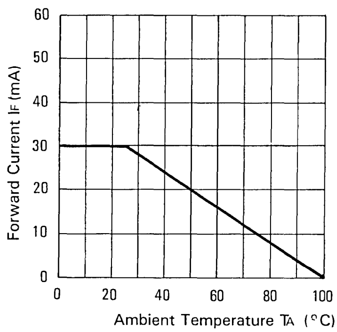


FIG 3 FORWARD CURRENT VS. DERATING CURVE

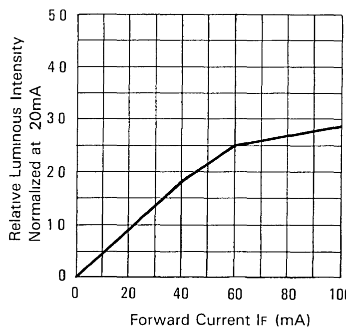


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

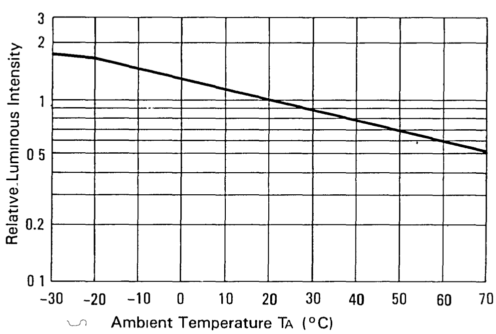


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE CHARACTERISTICS

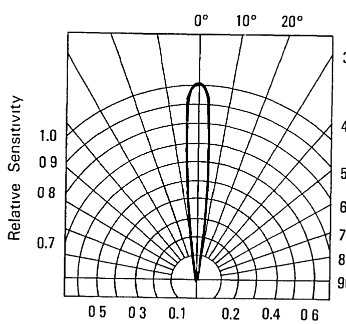


FIG. 6 SPATIAL DISTRIBUTION

LED LAMPS

ULTRA BRIGHT RED SOLID STATE LAMPS T-1¾ STANDARD 5φ LED

LTL-307C/307CE/307CK

FEATURES

- ULTRA-BRIGHTNESS.
- NEW STURDY LEADS.
- IC COMPATIBLE/LOW CURRENT CAPABILITY.
- RELIABLE AND RUGGED.

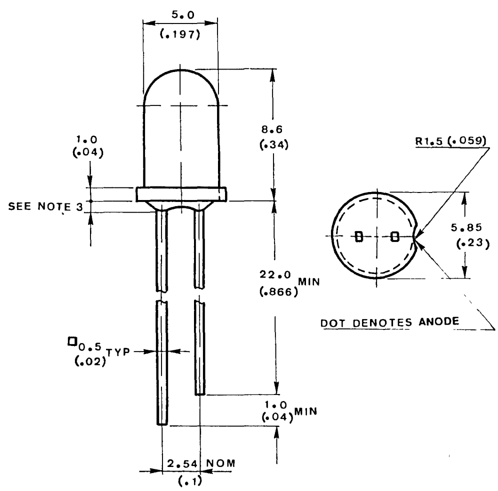
DESCRIPTION

The LTL-307C, 307CE, 307CK series are Gallium Aluminum Arsenide superbrightness red light emitting diodes.
LTL-307C; Red, diffused.
LTL-307CE, Red, Transparent.
LTL-307CK, water clear.
These LED Lamps perform conventional, and we achieve supperior product performance by utilizing new higher intensity material.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
307C	Red	Diffused	GaAlAs Red
307CE	Red	Transparent	GaAlAs Red
307CK	Water Clear	Non-diffused	GaAlAs Red

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (1/10 Duty Cycle, 0 1ms Pulse Width)	200	mA
Continuous Forward Current	40	mA
Derating Linear From 25°C	0.5	mA/°C
Reverse Voltage	4	V
Operating Temperature Range	– 55°C to + 100°C	
Storage Temperature Range	– 55°C to + 100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

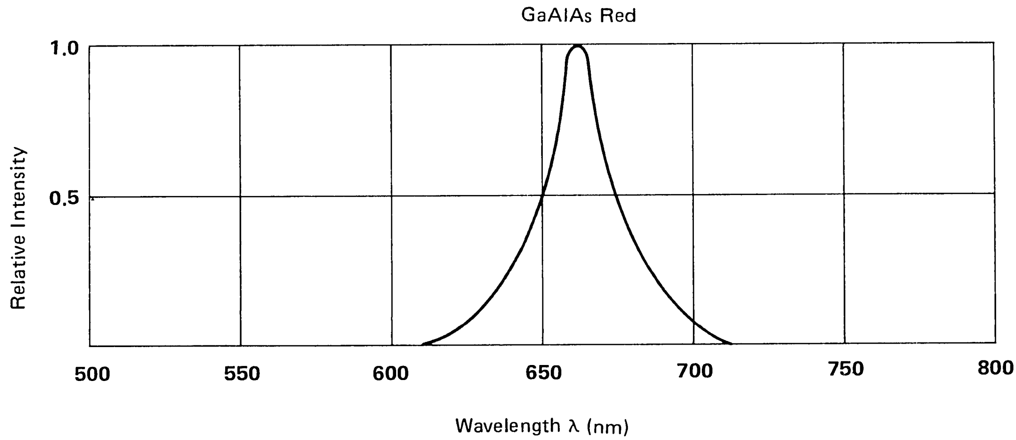


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	307C 307CE 307CK	19 29 29	60 90 90		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta_{1/2}$	307C 307CE 307CK		50 40 40		deg	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK			660		nm	Measurement @ peak (Fig. 1)
Spectral Line Half-Width	Δλ			20		nm	
Forward Voltage	V_F			1.8	2.4	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 4V
Capacitance	C			30		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

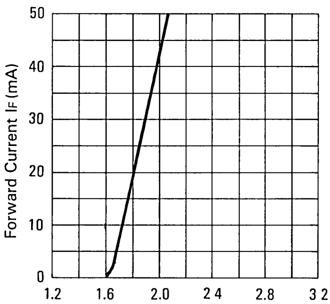


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

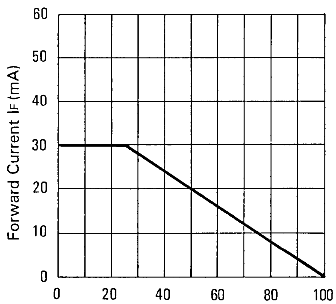


FIG 3 FORWARD CURRENT VS. DERATING CURVE

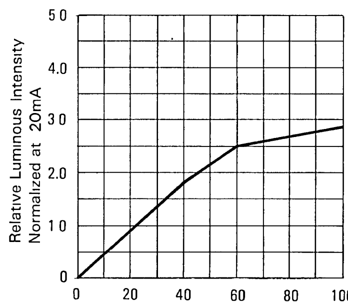


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

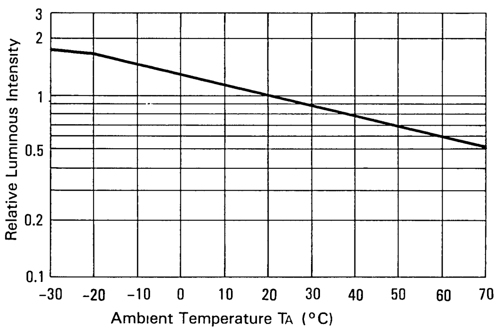


FIG. 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE CHARACTERISTICS

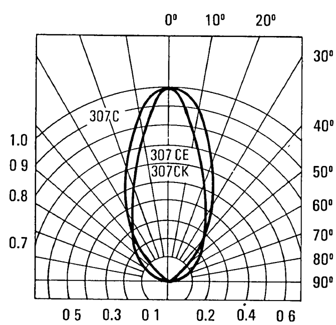


FIG 6 SPATIAL DISTRIBUTION

ULTRA BRIGHT RED SOLID STATE LAMPS T-1¾ STANDARD 5ϕ LED

LITEON

LTL-4263 / 4264 / 4268

FEATURES

- ULTRA-BRIGHTNESS.
- NEW STURDY LEADS.
- IC COMPATIBLE/LOW CURRENT CAPABILITY.
- RELIABLE AND RUGGED.

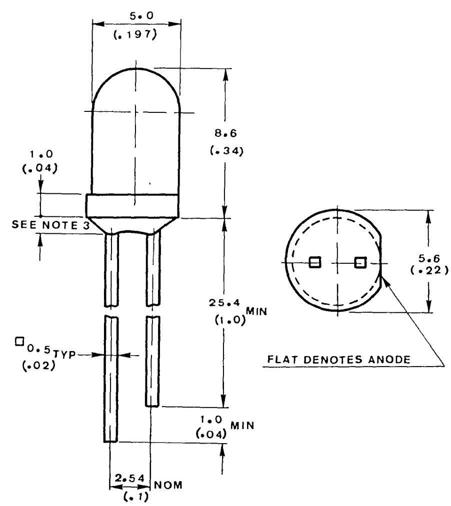
DESCRIPTION

The semiconductor material is Gallium Aluminum Arsenid Ultra-brightness red Light emitting diodes. The LTL-4263, have Red diffused lens. The LTL-4264 have red, non-diffused lenses where as the LTL-4268, has a untinted. non-diffused lenses lamp out perform conventional LED lamps. By utilizing new higher intensity material, we achieve superior product performance.

DEVICES

PART NO. PTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
4263	Red	Diffused	GaAlAs Red
4264H4	Red	Transparent	GaAlAs Red
4264H3			
4264L2			
4264L1			
4268H4	Water Clear	Non-diffused	GaAlAs Red
4268H3			
4268L2			
4268L1			

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1 ms Pulse Width)	200	mA
Continuous Forward Current	40	mA
Derating Linear From 25°C	0.5	mA/°C
Reverse Voltage	4	V
Operating Temperature Range	– 55°C to + 100°C	
Storage Temperature Range	– 55°C to + 100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

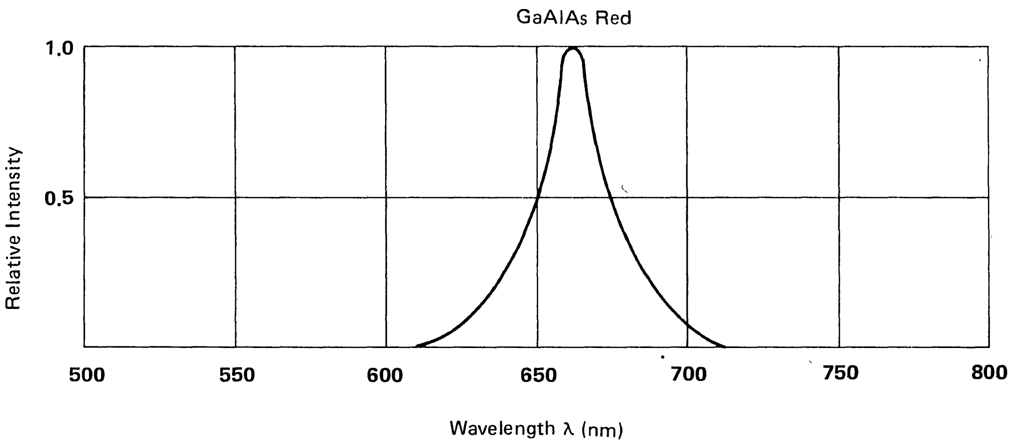


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4263 4264H4 4264H3 4264L2 4264L1 4268H4 4268H3 4268L2 4268L1	29 230 160 90 80 230 160 90 80	90 270 220 150 100 270 220 150 100		mcd	I_F = 20 mA Note 1
Viewing Angle	2θ½	4263 4264 4268		40 16 16		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK			660		nm	Measurement @Peak (Fig. 1)
Spectral Line Half-Width	Δλ			20		nm	
Forward Voltage	V_F			1 8	2.4	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 4V
Capacitance	C			30		PF	V_F = 0 f = 1 MHZ

NOTES 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

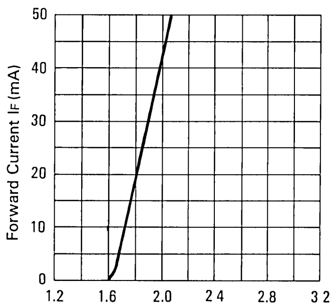


FIG 2 FORWARD CURRENT VS. FORWARD VOLTAGE

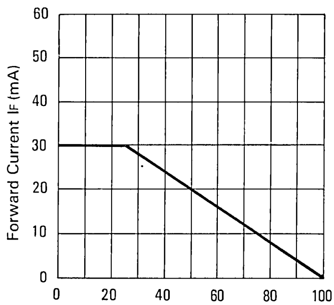


FIG 3 FORWARD CURRENT VS. DERATING CURVE

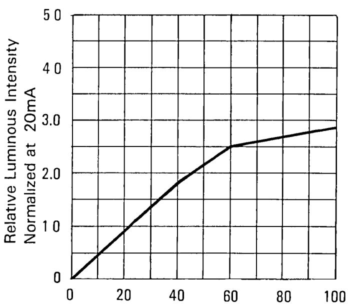


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

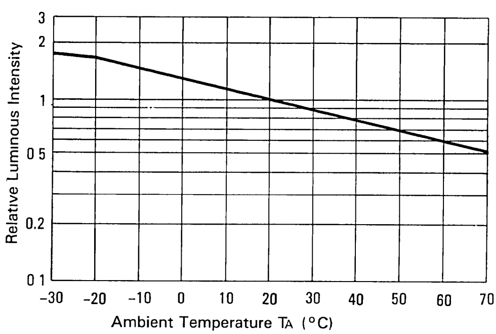


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE CHARACTERISTICS

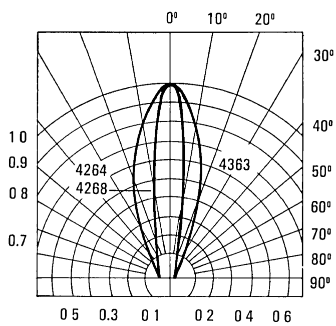


FIG. 6 SPATIAL DISTRIBUTION

LED LAMPS

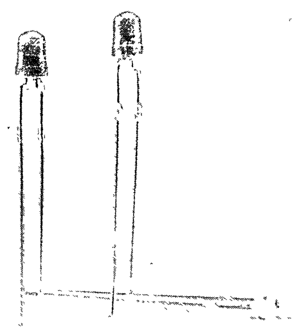
![LITEON logo]

ULTRA BRIGHT RED SOLID STATE LAMPS T-1 STANDARD 3ϕ LED

LTL- 4261N/4262N/4266N

FEATURES

- ULTRA-BRIGHTNESS.
- NEW STURDY LEADS.
- IC COMPATIBLE/LOW CURRENT CAPABILITY.
- RELIABLE AND RUGGED.
- LOW COST.



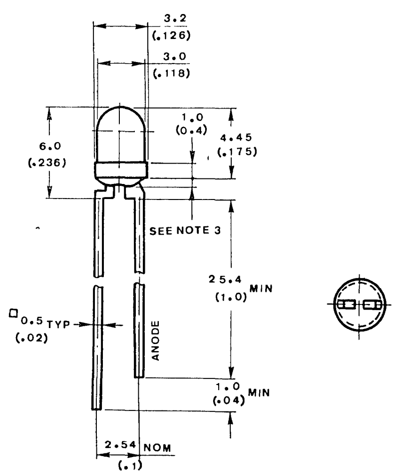
DESCRIPTION

The LTL-4261N, 4262N, 4266N series is Gallium Aluminum Arsenide superbrightness red light emitting diodes.
LTL-4261N Red, diffused.
LTL-4262N Red, transparent.
LTL-4266N water clear. These Lamp out perform conventional LED lamps. By utilizing new higher intensity material, we achieve superior product performance.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
4261N	Red	Diffused	GaAlAs Red
4262N	Red	Transparent	GaAlAs Red
4266N	Water Clear	Non-diffused	GaAlAs Red

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	mA
Continuous Forward Current	40	mA
Derating Linear From 25°C	0.5	mA/°C
Reverse Voltage	4	V
Operating Temperature Range	– 55°C to + 100°C	
Storage Temperature Range	– 55°C to + 100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

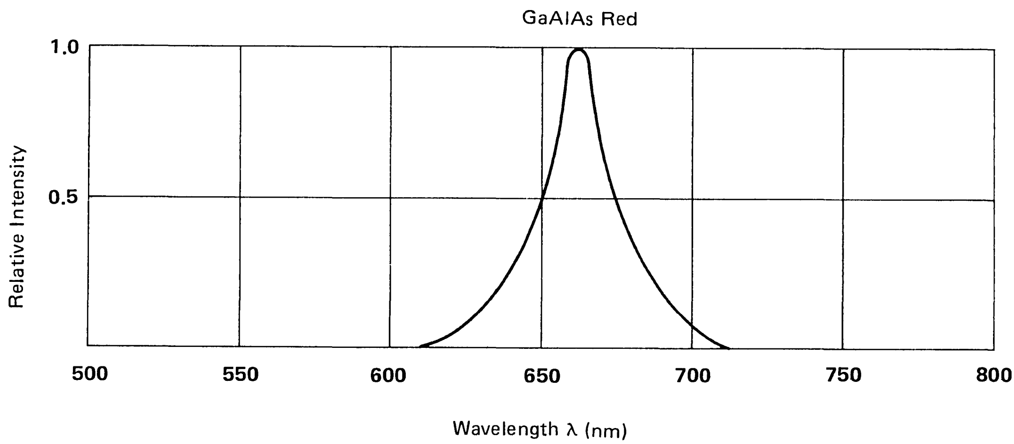


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4261N 4262N 4266N	8.7 19 19	48 80 80		mcd	I_F = 20 mA
Viewing Angle	$2\theta½$	4261N 4262N 4266N		60° 45° 45°		deg	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK			660		nm	Measurement @ peak (Fig. 1)
Spectral Line Half-Width	Δλ			20		nm	
Forward Voltage	V_F			1.8	2.4	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 4V
Capactance	C			30		PF	V_F = 0 f = 1 MHZ

NOTES 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity

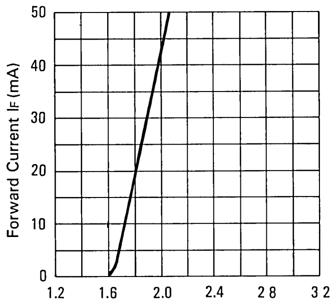


FIG 2 FORWARD CURRENT VS. FORWARD VOLTAGE

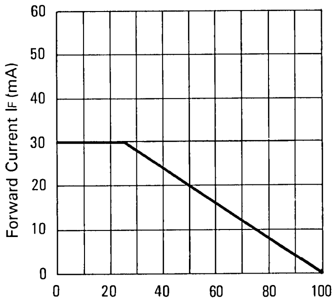


FIG 3 FORWARD CURRENT VS. DERATING CURVE

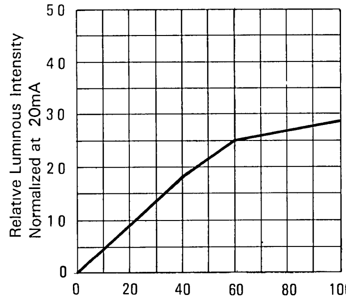


FIG. 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

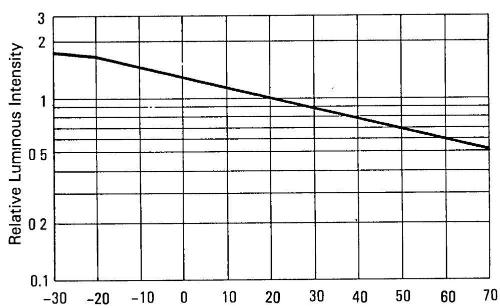


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE CHARACTERISTICS

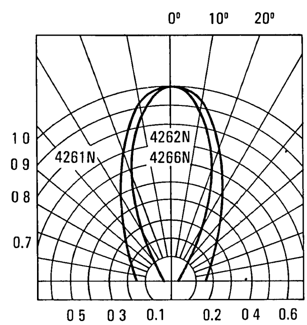


FIG 6 SPATIAL DISTRIBUTION

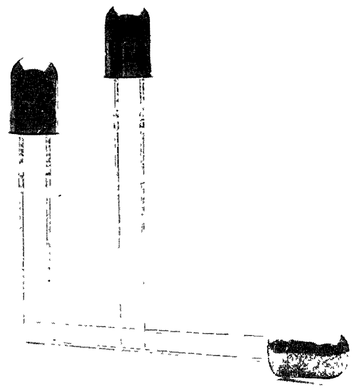
LITEON

ULTRA BRIGHT RED SOLID STATE LAMPS MEDIUM PROFILE 4.6ϕ FLANGELESS

LTL-10263W

FEATURES

- ULTRA BRIGHTNESS.
- NEW STURDY LEADS.
- IC COMPATIBLE/LOW CURRENT CAPABILITY.
- RELIABLE AND RUGGED.
- LOW COST.



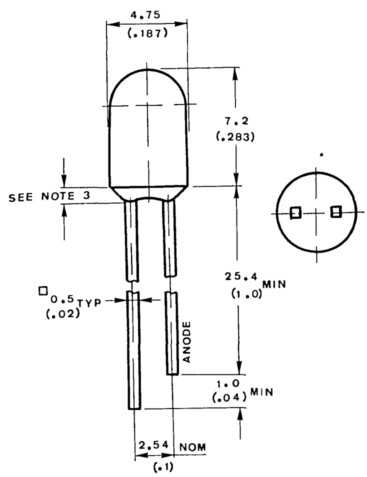
DESCRIPTION

The LTL-10263W is Gallium Aluminum Arsenide red light emitting diodes.
These red, diffused lamps out perform conventional LED lamps. By utilizing new higher intensity material, we achieve superior product performance.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
10263W	Red	Diffused	GaAlAs Red

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	mA
Continuous Forward Current	40	mA
Derating Linear From 25°C	0.5	mA/°C
Reverse Voltage	4	V
Operating Temperature Range	– 55°C to + 100°C	
Storage Temperature Range	– 55°C to + 100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

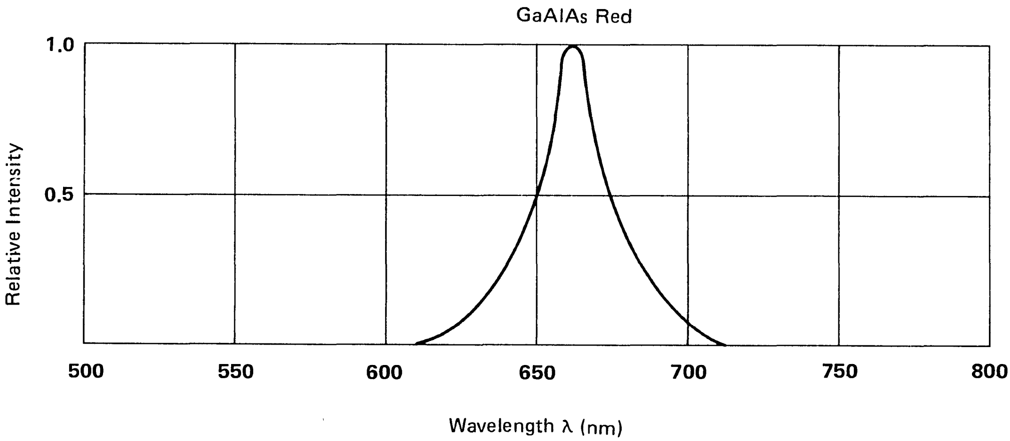


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	11	40		mcd	$I_F = 20$ mA Note 1.
Viewing Angle	$2\theta½$		60°		deg	Note 2 Fig. 6.
Peak Emission Wavelength	λPEAK		660		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half-Width	$\Delta\lambda$		20		nm	
Forward Voltage	V_F		1.8	2.4	V	$I_F = 20$ mA
Reverse Current	I_R			100	μA	$V_R = 4V$
Capacitance	C		30		PF	$V_F = 0$ f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

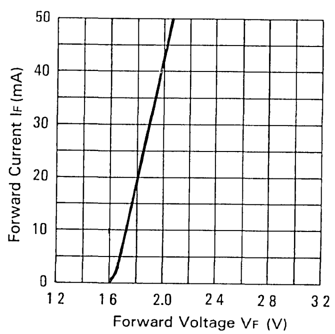


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

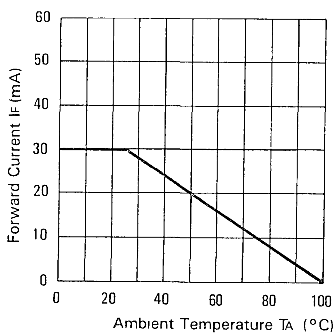


FIG 3 FORWARD CURRENT VS. DERATING CURVE

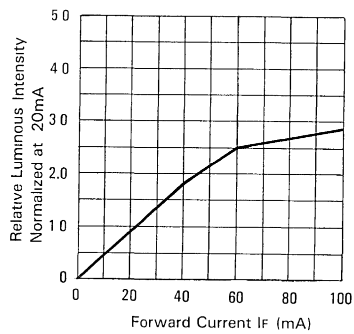


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

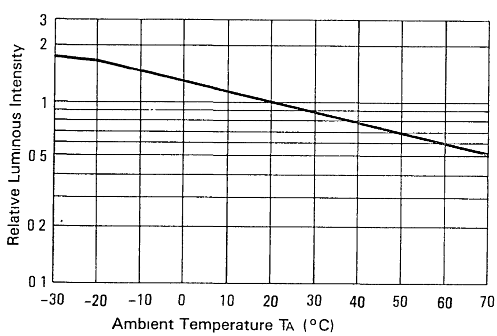


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE CHARACTERISTICS

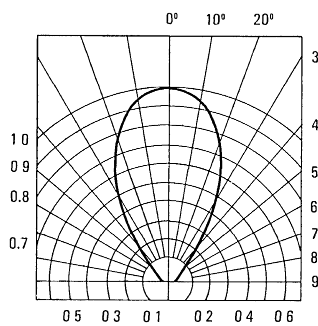


FIG. 6 SPATIAL DISTRIBUTION

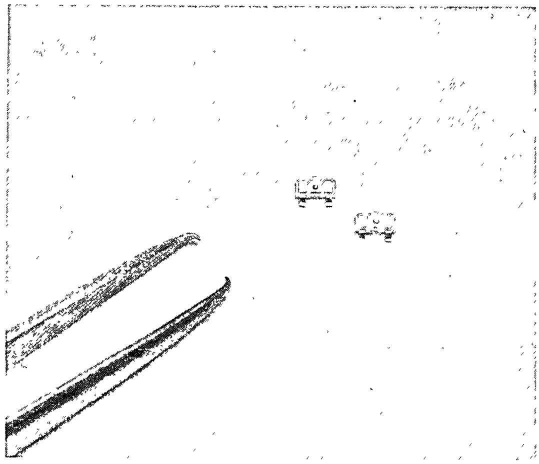
LED LAMPS

SOT-23 SURFACE MOUNT ASSEMBLY LED LAMP

LTL-907CK

FEATURES

- MICROMINATURE PACKAGE LED LAMP.
- SURFACE MOUNT ASSEMBLY LAMP.
- SINGLE CHIP.
- HIGH EFFICIENCY/LOWER POWER CONSUMPTION.
- LONG LIFE SOLID STATE RELIABILITY.



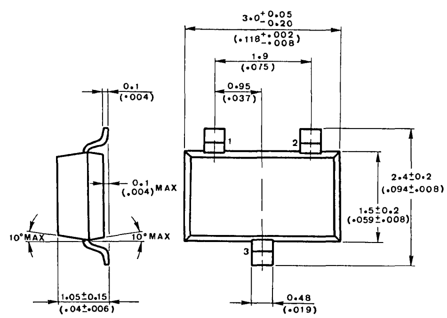
DESCRIPTION

The LTL-907CK is clear non-diffused epoxy microminiature package for surface mount assembly. LTL-907CK Red GaAIAs, Ultra-Brightness.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR	PIN NO.	
	COLOR	DIFFUSION			
907CK	Water Clear	Non-Diffused	GaAIAs Red	1	
				2	Cathode
				3	Anode

PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Lead spacing is measured where the leads emerge from the package.
4. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25^\circ C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	mA
Continuous Forward Current	40	mA
Derating Linear From 25°C	0.5	mA/°C
Reverse Voltage	4	V
Operating Temperature Range	– 55°C to + 100°C	
Storage Temperature Range	– 55°C to + 100°C	
Lead Soldering Temperature	240°C for 5 Seconds	

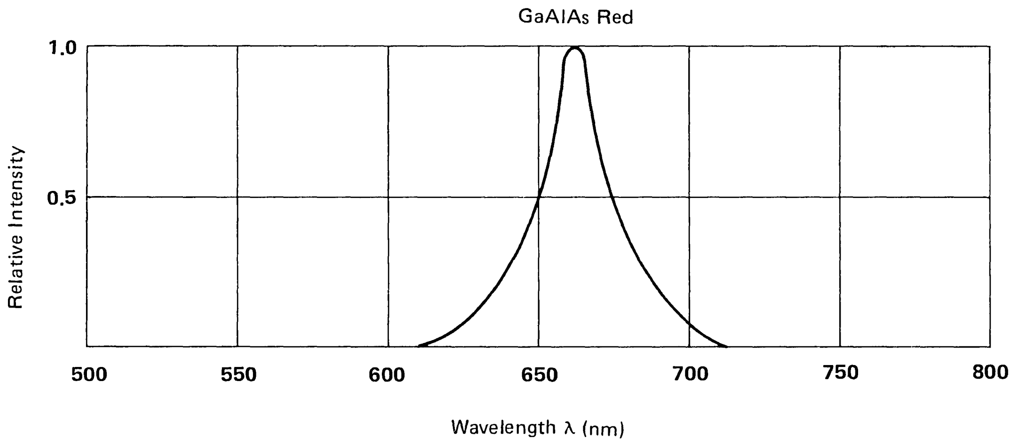


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	907CK	2.5	3.5		mcd	I_F = 20 mA, Note 1
Viewing Angle	$2\theta ½$	907CK		140		deg.	Note 2,(Fig. 6)
Peak Emission Wavelength	λ PEAK			660		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half-Width	$\Delta\lambda$			20		nm	
Forward Voltage	V_F			1.8	2.4	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 4V
Capacitance	C			30		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

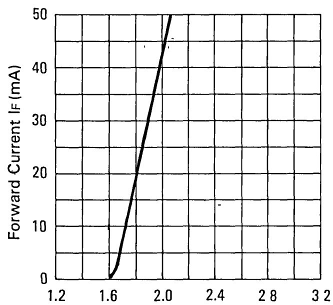


FIG 2 FORWARD CURRENT VS. FORWARD VOLTAGE

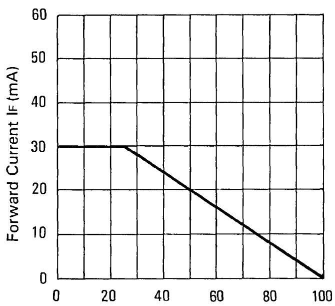


FIG 3 FORWARD CURRENT VS. DERATING CURVE

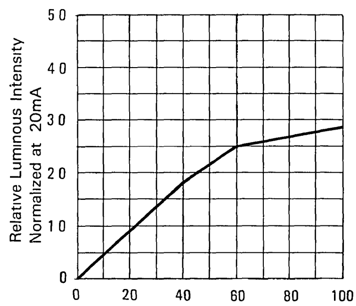


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

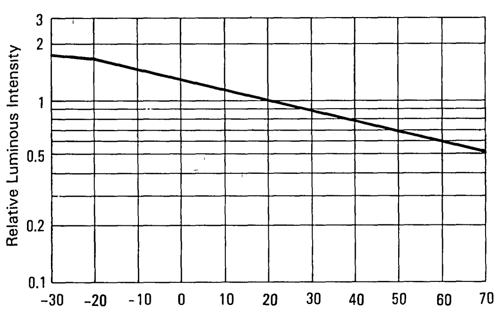


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE CHARACTERISTICS

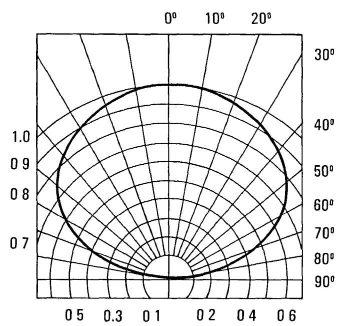


FIG 6 SPATIAL DISTRIBUTION

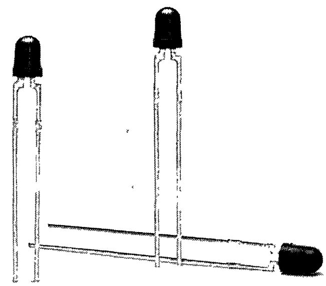
LITEON

T-1 (3mm) SOLID STATE LAMPS

LTL-422INLC LOW CURRENT HIGH EFFICIENCY RED

FEATURES

- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- VERSATILE MOUNTING ON P.C. BOARD OR PANEL.
- I.C. COMPATIABLE/LOW CURRENT REQUIREMENTS.
- POPULAR T-1 DIAMETER 25mm(1") LENGTH OF LEADS PACKAGE.
- RELIABLE AND RUGGED.



DESCRIPTION

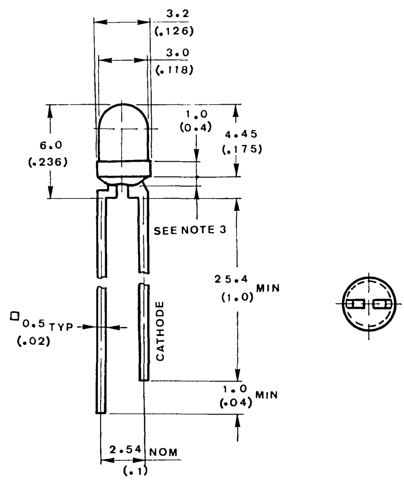
The LTL-4221NLC is made with Gallium Arsenide Phosphide on Gallium Phosphide Red Light Emitting Diode.
These lamp use low current, and it has High Efficiency Red Brightness.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
422INLC	Red	Diffused	Hi. Eff. Red

NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

PACKAGE DIMENSIONS



LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	24	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	mA
Continuous Forward Current	7	mA
Derating Linear From 25°C	0.1	mA/°C
Reverse Voltage	5	V
Operating Temperature Range	– 55°C to + 100°C	
Storage Temperature Range	– 55°C to + 100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

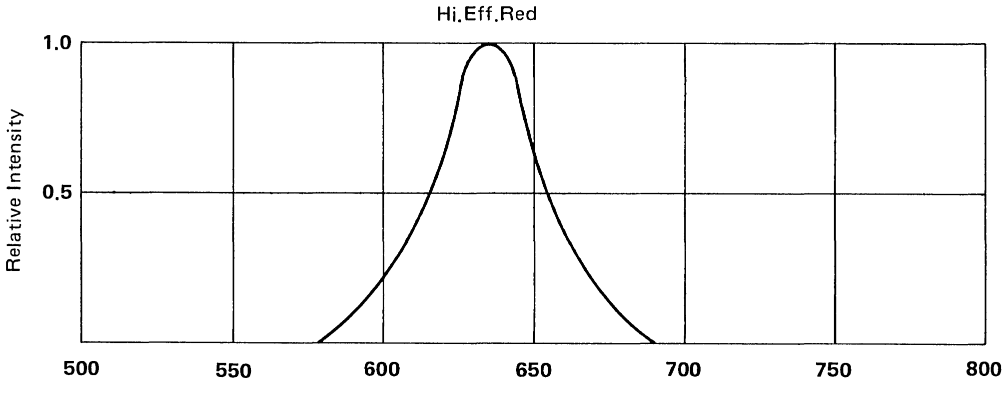


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL-	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	4221NLC	1.0	1.8		mcd	I_F = 2 mA (Note 1)
Viewing Angle	$2\theta½$	4221NLC		45		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	4221NLC		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half-Width	$\Delta\lambda$	4221NLC		40		nm	
Forward Voltage	V_F	4221NLC		1.8	2.2	V	I_F = 2 mA
Reverse Current	I_R	4221NLC			100	μA	V_R = 5V
Capacitance	C	4221NLC		4		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

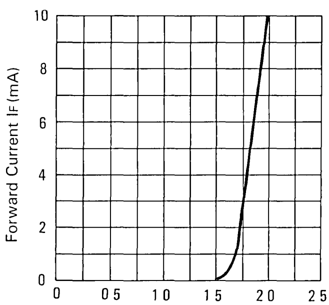


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

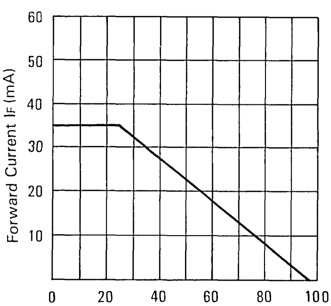


FIG 3 FORWARD CURRENT DERATING CURVE

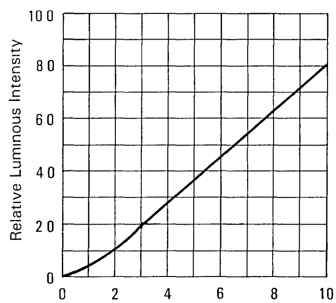


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

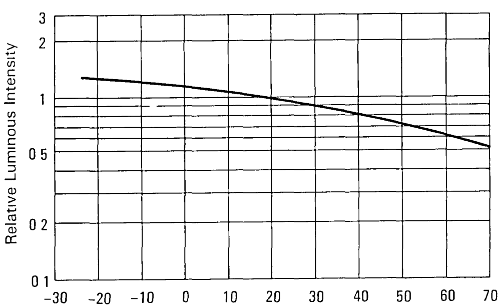


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

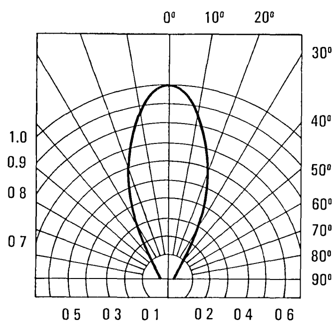


FIG. 6 SPATIAL DISTRIBUTION

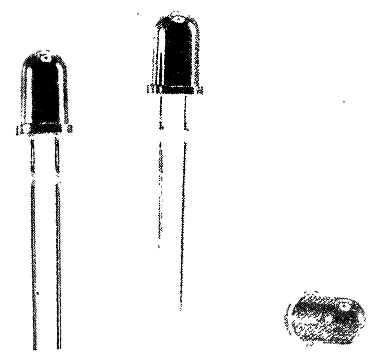
LED LAMPS

T-1 ¾ (5mm) SOLID STATE LAMPS

LTL-307ELC LOW CURRENT HIGH EFFICIENCY RED

FEATURES

- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- VERSATILE MOUNTING ON P.C. BOARD OR PANEL.
- I.C. COMPATIABLE/LOW CURRENT REQUIREMENTS.
- POPULAR T-1¾ DIAMETER, 25mm(1") LENGTH
- RELIABLE AND RUGGED.



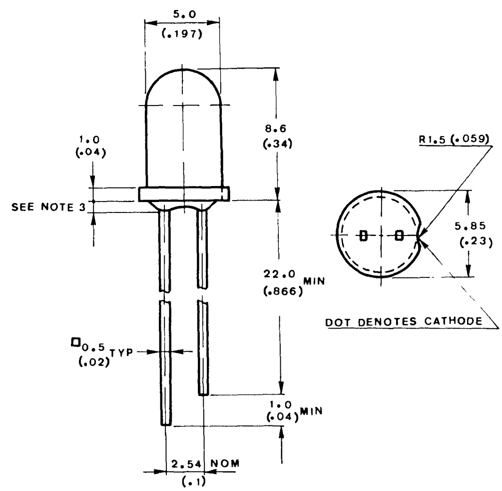
DESCRIPTION

The LTL-307ELC is made with Gallium Arsenide Phosphide on Gallium Phosphide Red Light Emitting Diode.
These lamp use low current, and it has High Efficiency Red Brightness.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
307ELC	Red	Diffused	Hi. Eff. Red

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation	24	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	mA
Continuous Forward Current	7	mA
Derating Linear From 25°C	0.1	mA/°C
Reverse Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds	

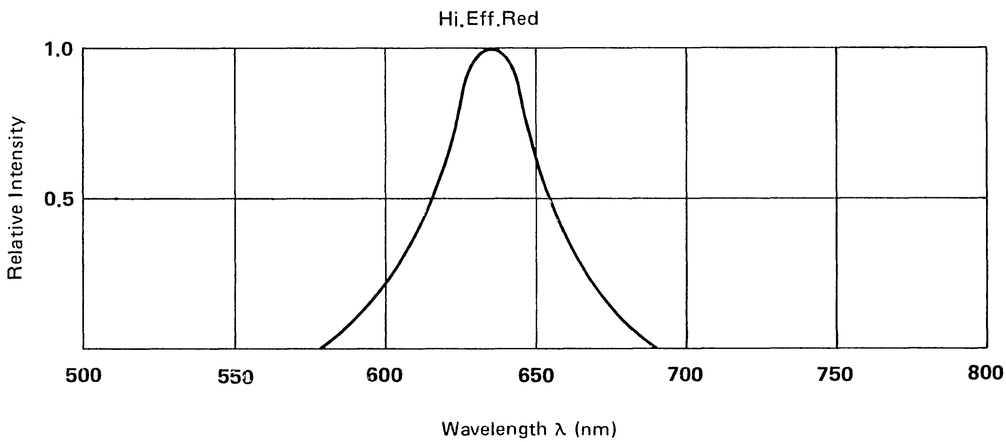


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	307ELC	1.2	3.0		mcd	I_F = 2 mA (Note 1)
Viewing Angle	$2\theta½$	307ELC		50		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	307ELC		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half-Width	Δλ	307ELC		40		nm	
Forward Voltage	V_F	307ELC		1.8	2.2	V	I_F = 2 mA
Reverse Current	I_R	307ELC			100	μA	V_R = 5V
Capacitance	C	307ELC		4		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

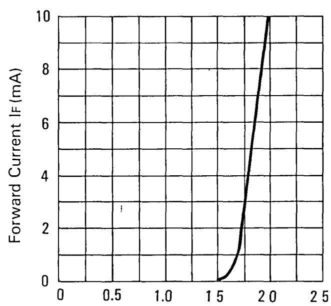


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

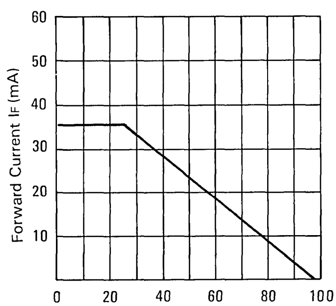


FIG 3 FORWARD CURRENT DERATING CURVE

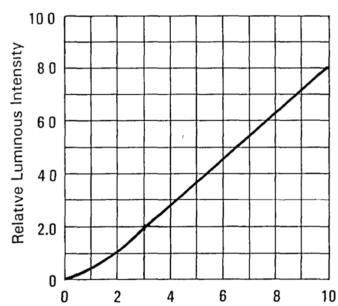


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

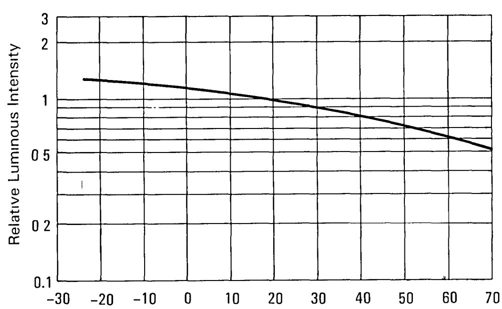


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

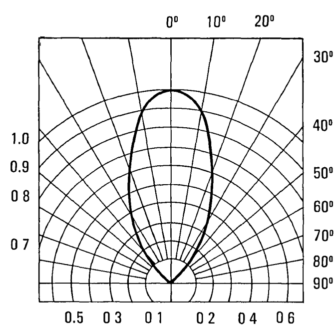


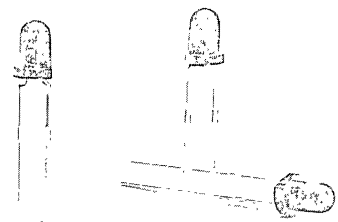
FIG. 6 SPATIAL DISTRIBUTION

T-1(3mm) SOLID STATE LAMPS

LTL-201	RED	LTL-231	GREEN
LTL-211	BRIGHT RED	LTL-251	YELLOW
LTL-221	HIGH EFFICIENCY RED	LTL-291	ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- VERSATILE MOUNTING ON P.C. BOARD OR PANEL.
- CMOS/MOS AND TTL COMPATIBLE.
- LONG LIFE-SOLID STATE RELIABILITY.
- WIDE VIEWING ANGLE.
- LOW COST.



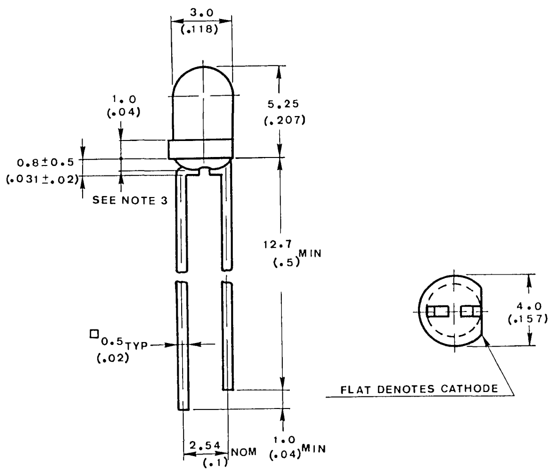
DESCRIPTION

The Red source color devices are made with Gallium Arsenide Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
201 202 205	Red Red White	Diffused Transparent Diffused	Red
211	Red	Diffused	Bright Red
221	Red	Diffused	Hi. Eff. Red
231 232	Green	Diffused Transparent	Green
251 252	Yellow	Diffused Transparent	Yellow
291	Orange	Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	– 55°C to + 100°C					
Storage Temperature Range	– 55°C to + 100°C					
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds					

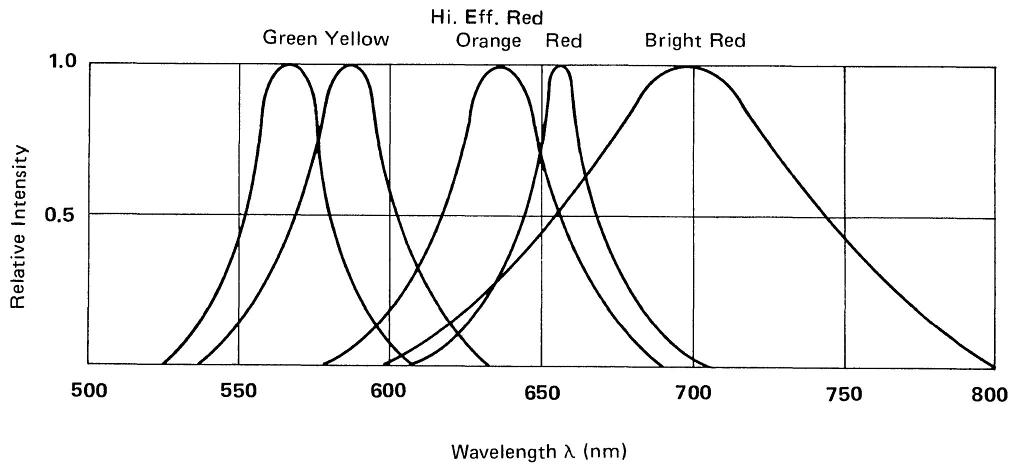


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	201 202 205	0.3 0.7 0.3	0.8 2.0 0.8		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	201 202 205		76 30 76		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK			655		nm	Measurement @Peak (Fig. 1)
Spectral Line Half Width	Δλ			24		nm	
Forward Voltage	V_F			1.7	2.0	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capactance	C			30		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

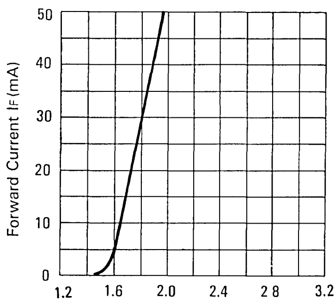


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE

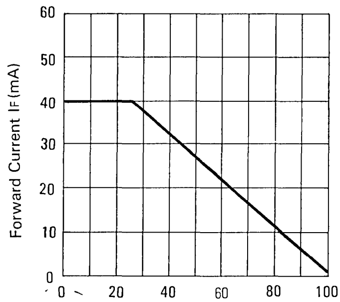


FIG 3 FORWARD CURRENT DERATING CURVE

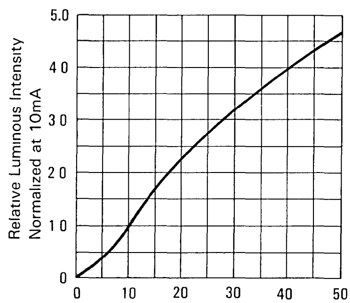


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

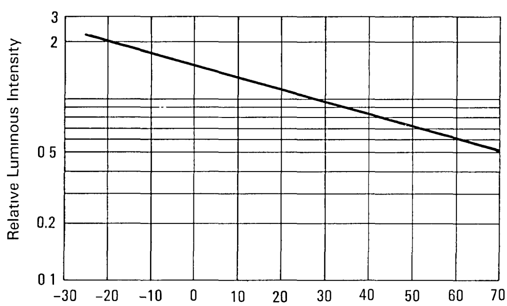


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

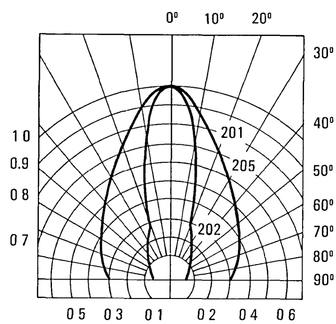


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	211 221	0.4 1.1	1.1 3.8		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	211 221		76 76		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	211 221		697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	211 221		90 40		nm	
Forward Voltage	V_F	211 221		2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	211 221			100	μA	V_R = 5V
Capacitance	C	211 221		55 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

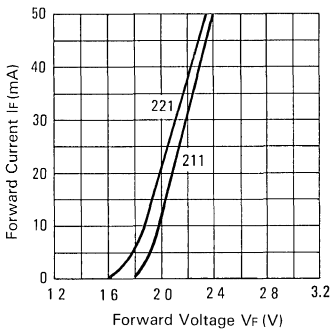


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

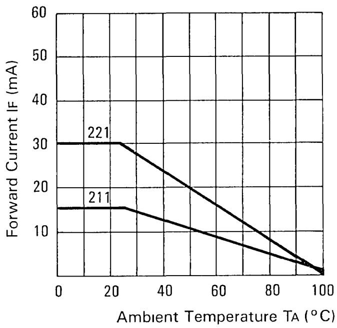


FIG 8 FORWARD CURRENT DERATING CURVE

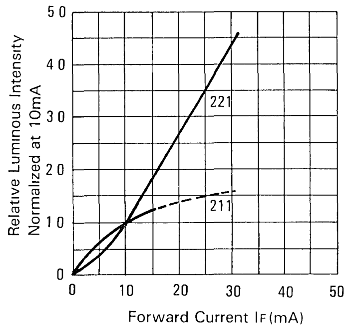


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

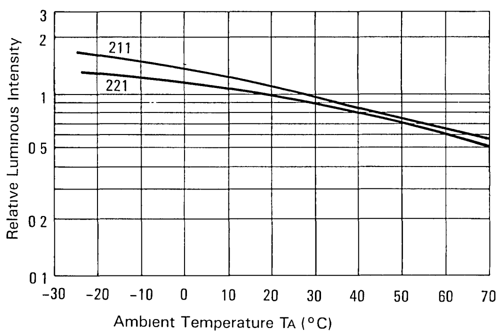


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

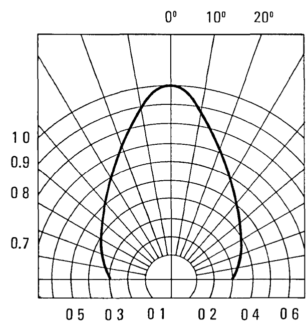


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	231 232 251 252	1.1 2.5 1.1 2.5	3.8 8.0 3.8 8.0		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	231 232 251 252		76 30 76 30		deg	Note 2 (Fig 16)
Peak Emission Wavelength	λPEAK	231 232 251 252		565 565 585 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	231 232 251 252		30 30 35 35		nm	
Forward Voltage	V_F	231 232 251 252		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	231 232 251 252			100	μA	V_R = 5V
Capacitance	C	231 232 251 252		35 35 15 15		PF	V_F = 0 f = 1MHZ

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

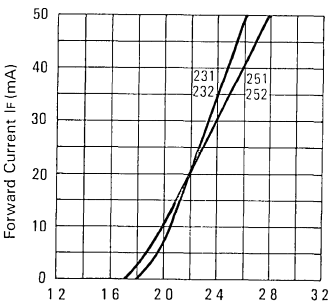


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

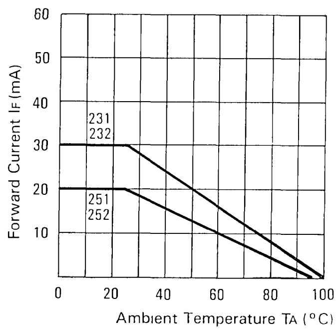


FIG 13 FORWARD CURRENT DERATING CURVE

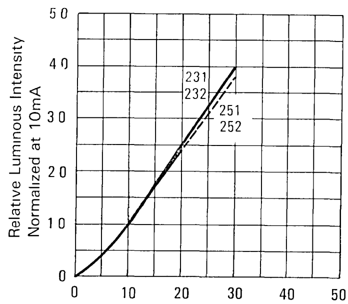


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

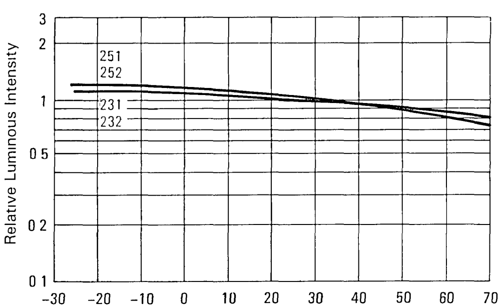


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

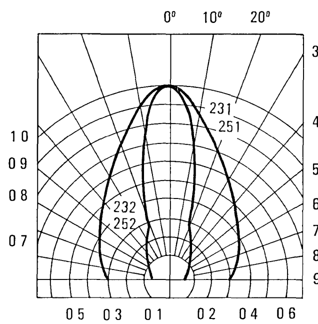


FIG 16 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	291	1.1	3.8		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	291		76		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λPEAK	291		630		nm	Measurement @Peak (Fig. 1)
Spectral Line Half Width	Δλ	291		40		nm	
Forward Voltage	V_F	291		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	291			100	μA	V_R = 5V
Capacitance	C	291		20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

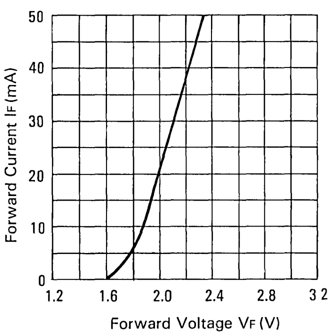


FIG. 17 FORWARD CURRENT VS. FORWARD VOLTAGE.

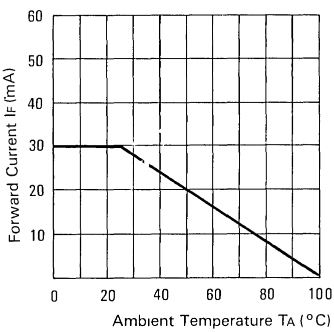


FIG 18 FORWARD CURRENT DERATING CURVE

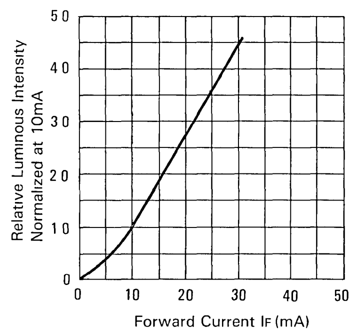


FIG 19 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

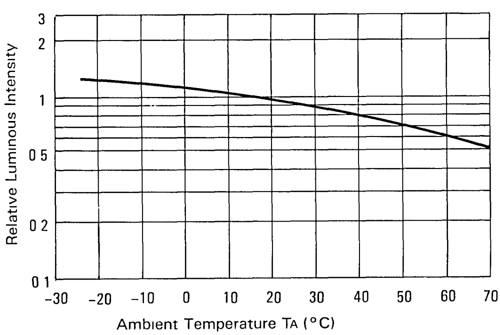


FIG 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

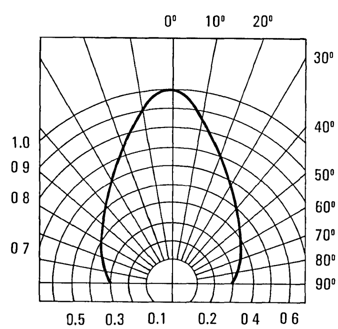


FIG 21, SPATIAL DISTRIBUTION

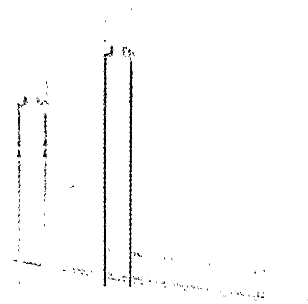
LITEON

T-1(3mm) SOLID STATE LAMPS

LTL-4201/4201N RED
LTL-4211/4211N BRIGHT RED
LTL-4221/4221N HIGH EFFICIENCY RED
LTL-4231/4231N GREEN
LTL-4251/4251N YELLOW
LTL-4291/4291N ORANGE

FEATURES

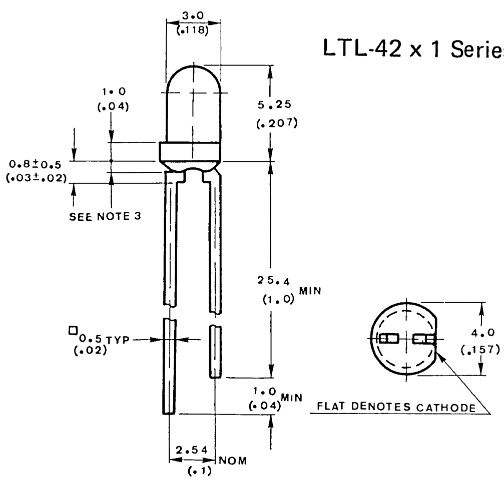
- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- VERSATILE MOUNTING ON P.C. BOARD OR PANEL.
- I.C. COMPATIBLE/LOW CURRENT REQUIREMENTS.
- POPULAR T-1 DIAMETER, 25mm (1") LENGTH OF LEADS PACKAGE.
- RELIABLE AND RUGGED.
- LOW COST.



DESCRIPTION

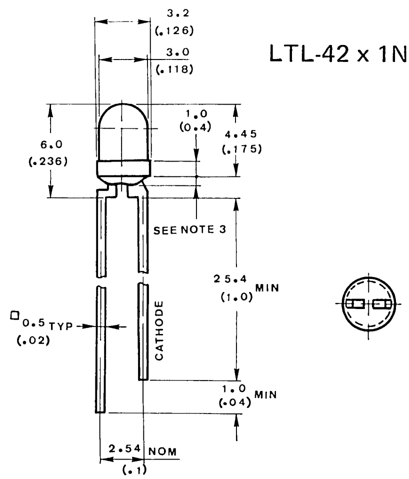
The Red source color devices are made with Gallium Arsenide Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

LTL-42 x 1 Series



PACKAGE DIMENSIONS

LTL-42 x 1N Series



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

DEVICES

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
4201 4202 4206	Red Red Water Clear	Diffused Transparent Non-diffused	Red
4211	Red	Diffused	Bright Red
4221 4222	Red Red	Diffused Transparent	Hi.Eff.Red
4231 4232	Green Green	Diffused Transparent	Green
4251 4252	Yellow Yellow	Diffused Transparent	Yellow
4291 4292 4296	Orange Orange Water Clear	Diffused Transparent Non-diffused	Orange

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
4201N 4202N	Red	Diffused Transparent	Red
4211N	Red	Diffused	Bright Red
4221N 4222N	Red	Diffused Transparent	Hi. Eff. Red
4231N 4232N 4236N	Green	Diffused Transparent Non-diffused	Green
4251N 4252N 4256N	Yellow	Diffused Transparent Non-diffused	Yellow
4291N 4292N 4296N	Orange	Diffused Transparent Non-diffused	Orange

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C					
Storage Temperature Range	–55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

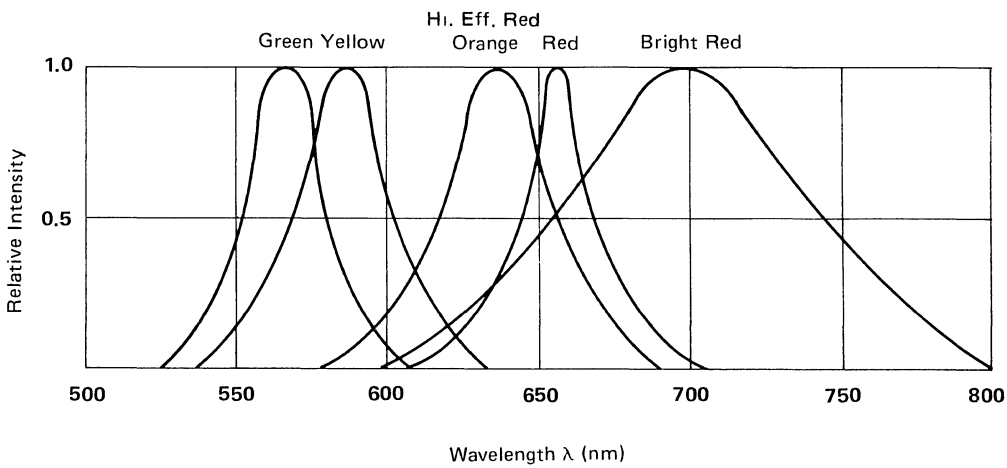


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4201 4202 4211	0.3 1.1 0.6	0.8 4.0 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	4201 4202 4211		40 20 40		deg.	Note 2 (Fig 6)
Peak Emission Wavelength	λPEAK	4201 4202 4211		655 655 697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4201 4202 4211		24 24 90		nm	
Forward Voltage	V_F	4201 4202 4211		1.7 1.7 2.1	2.0 2.0 2.8	V	I_F = 20 mA
Reverse Current	I_R	4201 4202 4211			100	μA	V_R = 5 V
Capacitance	C	4201 4202 4211		30 30 55		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

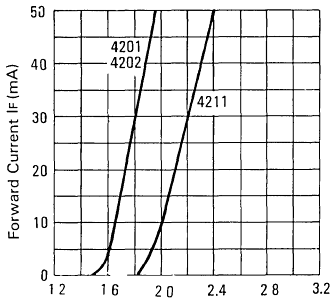


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE.

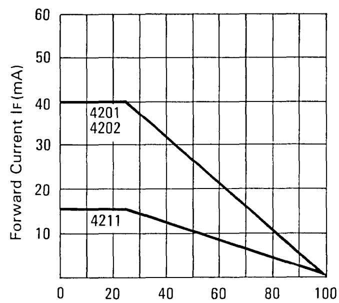


FIG 3 FORWARD CURRENT DERATING CURVE

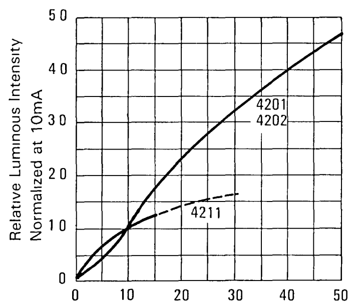


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

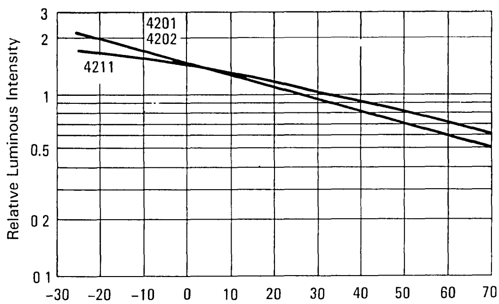


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

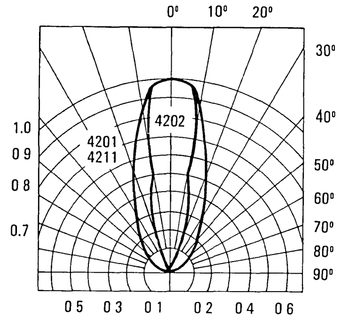


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4221 4222	1.1 4.0	3.8 12.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	4221 4222		40 20		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	4221 4222		635 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4221 4222		40 40		nm	
Forward Voltage	V_F	4221 4222		2.0 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	4221 4222			100	μA	V_R = 5V
Capactance	C	4221 4222		20 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

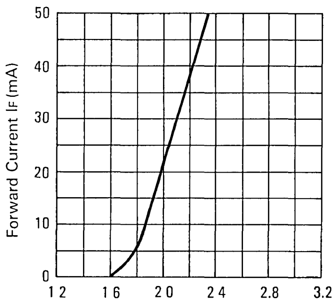


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE

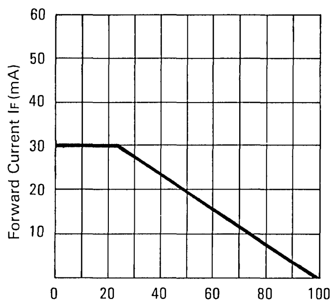


FIG 8 FORWARD CURRENT DERATING CURVE

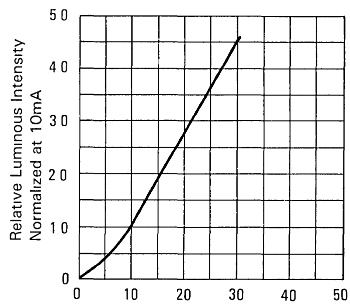


FIG. 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

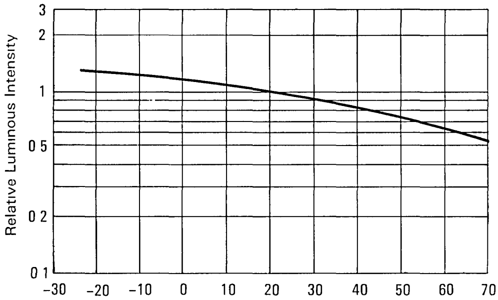


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

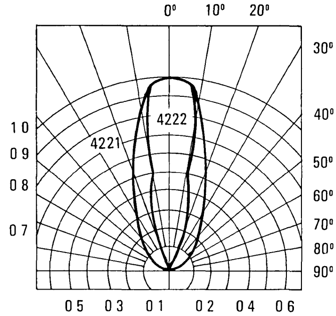


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4231 4232 4251 4252	1.7 4.0 1.7 4.0	5.6 12.6 5.6 12.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	4231 4232 4251 4252		40 20 40 20		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	4231 4232 4251 4252		565 565 585 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4231 4232 4251 4252		30 30 35 35		nm	
Forward Voltage	V_F	4231 4232 4251 4252		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	4231 4232 4251 4252			100	μA	V_R = 5 V
Capacitance	C	4231 4232 4251 4252		35 35 15 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

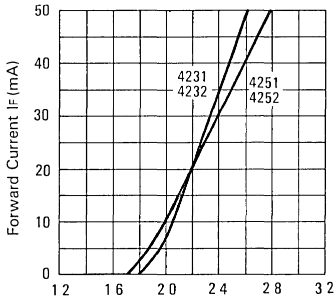


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

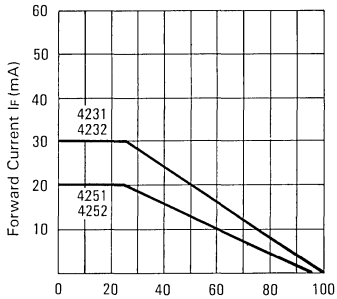


FIG 13 FORWARD CURRENT DERATING CURVE

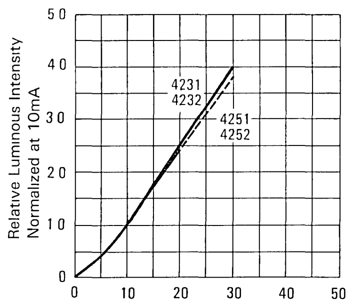


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

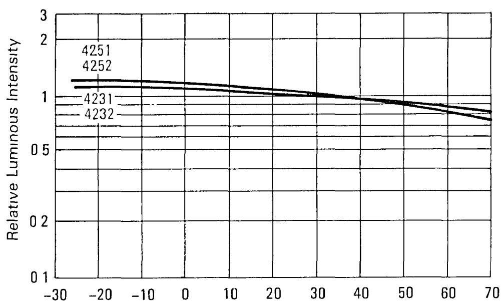


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

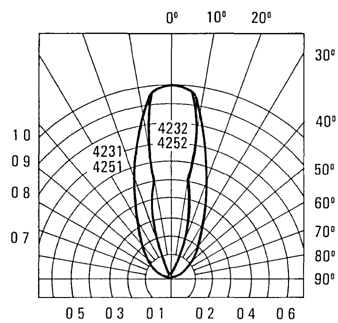


FIG 16 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25^\circ C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4291 4292 4296	1.7 4.0 4.0	5.6 12.6 12.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta_{1/2}$	4291 4292 4296		40 20 20		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

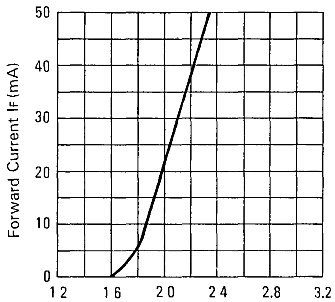


FIG. 17 FORWARD CURRENT VS FORWARD VOLTAGE

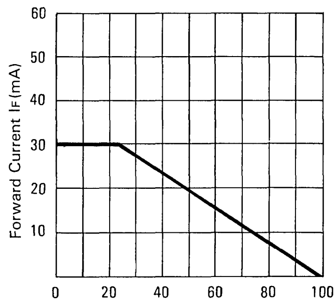


FIG 18 FORWARD CURRENT DERATING CURVE

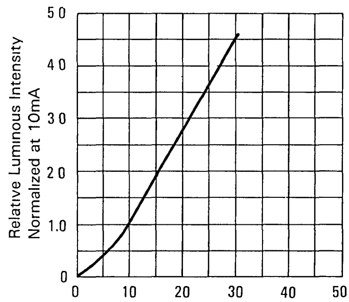


FIG 19 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

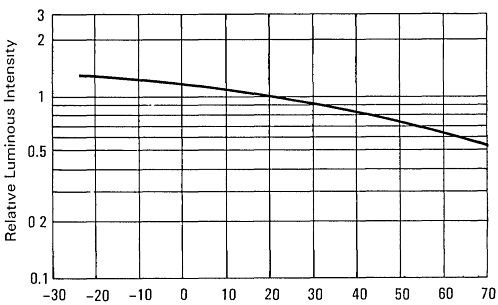


FIG 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

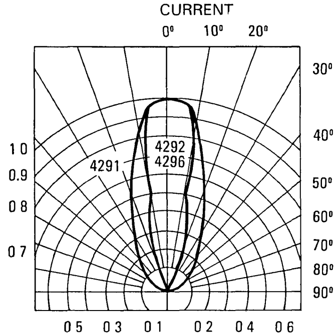


FIG. 21 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	4201N 4202N 4211N	0.3 0.8 0.8	0.8 2.5 2 5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta\frac{1}{2}$	4201N 4202N 4211N		60 45 60		deg	Note 2 (Fig 26)
Peak Emission Wavelength	λPEAK	4201N 4202N 4211N		655 655 697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4201N 4202N 4211N		24 24 90		nm	
Forward Voltage	V_F	4201N 4202N 4211N		1.7 1 7 2.0	2 0 2.0 2.8	V	I_F = 20 mA
Reverse Current	I_R	4201N 4202N 4211N			100	μA	V_R = 5 V
Capacitance	C	4201N 4202N 4211N		30 30 55		PF	V_F = 0 f = 1MHZ

NOTES. 1 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve

2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity

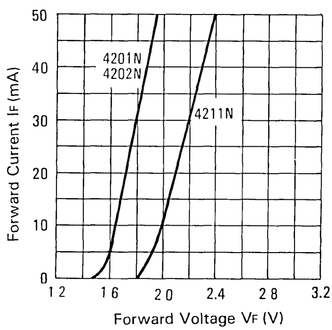


FIG 22 FORWARD CURRENT VS FORWARD VOLTAGE

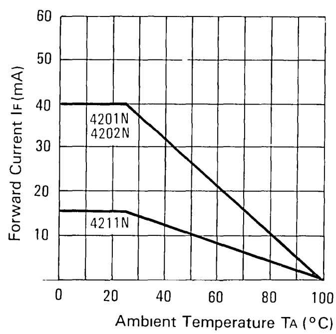


FIG 23 FORWARD CURRENT DERATING CURVE

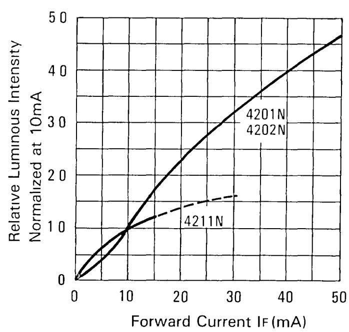


FIG 24 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

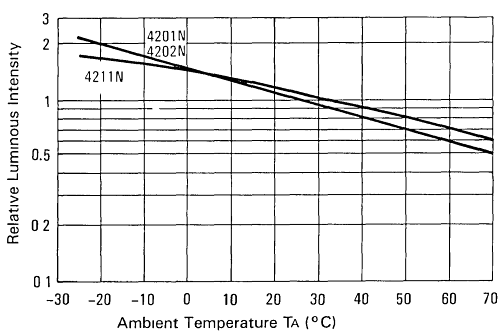


FIG 25 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

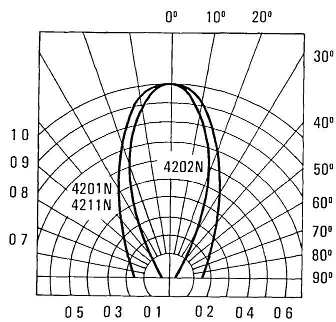


FIG 26 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4221N 4222N	1.7 4.0	5.6 12.6		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	4221N 4222N		60 45		deg.	Note 2 (Fig. 31)
Peak Emission Wavelength	λPEAK	4221N 4222N		635 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4221N 4222N		40 40		nm	
Forward Voltage	V_F	4221N 4222N		2.0 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	4221N 4222N			100	μA	V_R = 5V
Capacitance	C	4221N 4222N		20 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.

2. θ½ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

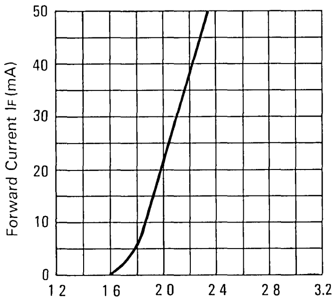


FIG 27 FORWARD CURRENT VS FORWARD VOLTAGE

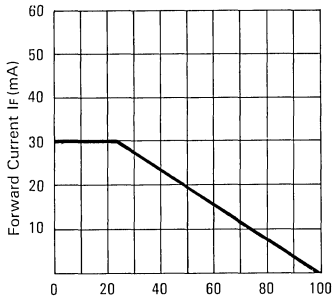


FIG. 28 FORWARD CURRENT DERATING CURVE

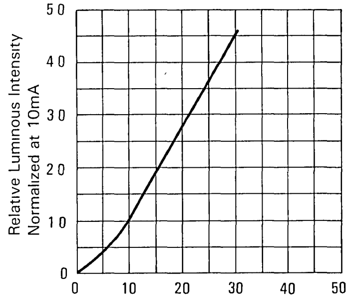


FIG 29 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

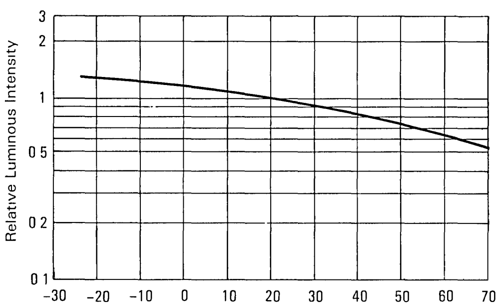


FIG 30 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

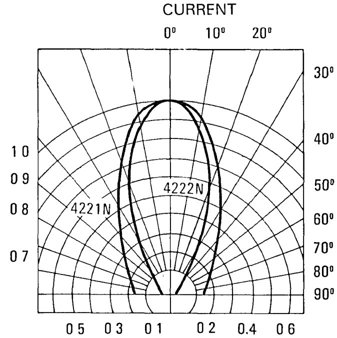


FIG 31 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4231N 4232N 4236N	1 7 4 0 4 0	5.6 12.6 12 6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta ½$	4231N 4232N 4236N		60 45 45		deg.	Note 2 (Fig 36)
Peak Emission Wavelength	λPEAK	4231N 4232N 4236N		565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4231N 4232N 4236N		30		nm	
Forward Voltage	V_F	4231N 4232N 4236N		2.1	2.8	V	I_F = 20 mA
Reverse Curren	I_R	4231N 4232N 4236N			100	μA	V_R = 5 V
Capacitance	C	4231N 4232N 4236N		35		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclatrage) eye-response curve.
2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

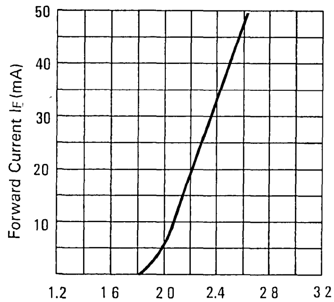


FIG 32 FORWARD CURRENT VS FORWARD VOLTAGE.

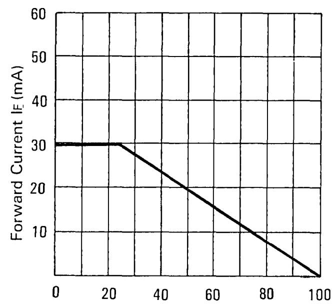


FIG 33 FORWARD CURRENT DERATING CURVE

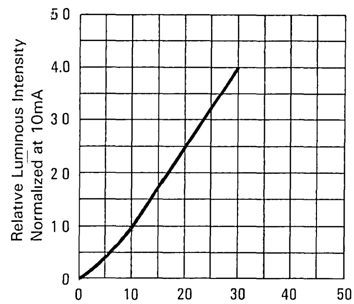


FIG 34 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

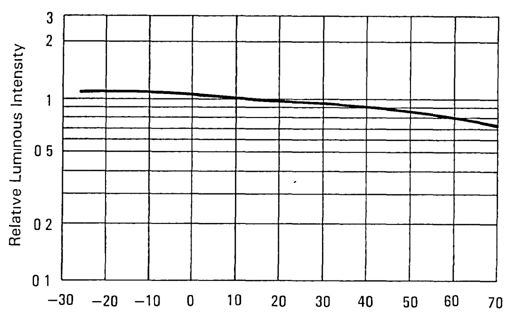


FIG 35 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

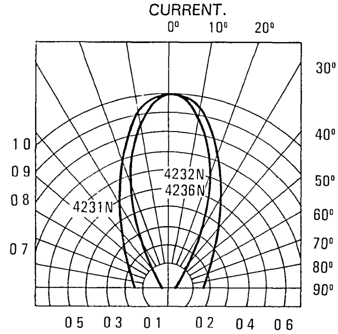


FIG 36 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4251N 4252N 4256N	1.7 4.0 4.0	5.6 12.6 12.6		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	4251N 4252N 4256N		60 45 45		deg.	Note 2 (Fig. 41)
Peak Emission Wavelength	λPEAK	4251N 4252N 4256N		585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4251N 4252N 4256N		35		nm	
Forward Voltage	V_F	4251N 4252N 4256N		2.1	2.8	V	I_F = 20 mA
Reverse Curren	I_R	4251N 4252N 4256N			100	μA	V_R = 5 V
Capacitance	C	4251N 4252N 4256N		15		PF	V_F = 0 f = 1MHZ

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclatrage) eye-response curve.

2 θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

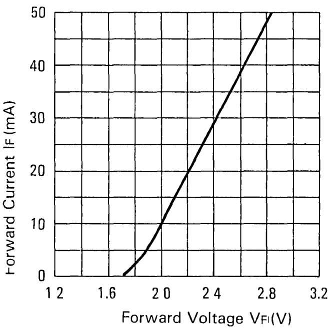


FIG 37 FORWARD CURRENT VS FORWARD VOLTAGE

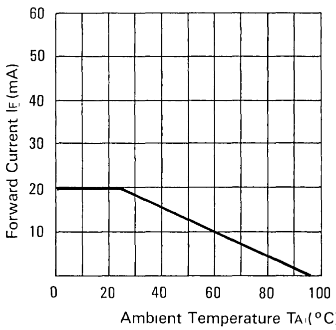


FIG. 38 FORWARD CURRENT DERATING CURVE

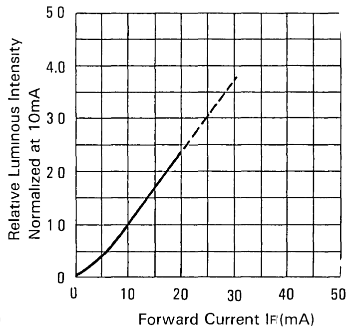


FIG 39 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

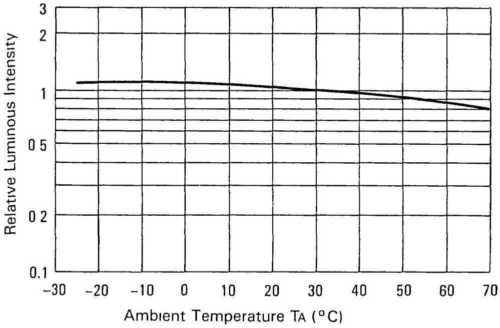


FIG 40 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

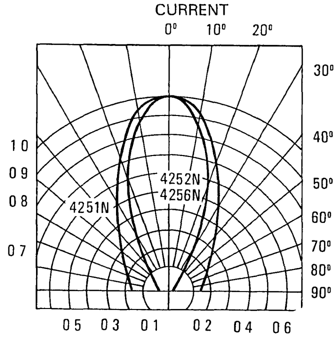


FIG 41 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4291N 4292N 4296N	1.7 4.0 4.0	5.6 12.6 12 6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta\frac{1}{2}$	4291N 4292N 4296N		60 45 45		deg	Note 2 (Fig 46)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2 0	2 8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. $\theta\frac{1}{2}$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

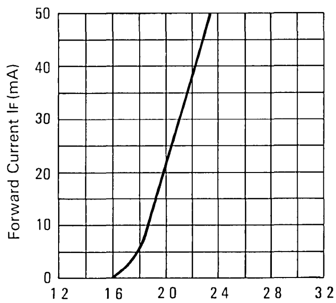


FIG 42 FORWARD CURRENT VS. FORWARD VOLTAGE

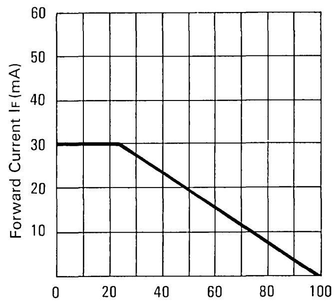


FIG 43 FORWARD CURRENT DERATING CURVE

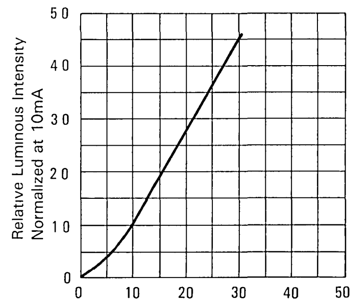


FIG 44 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

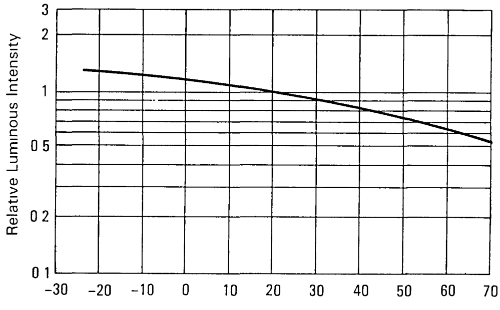


FIG 45 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

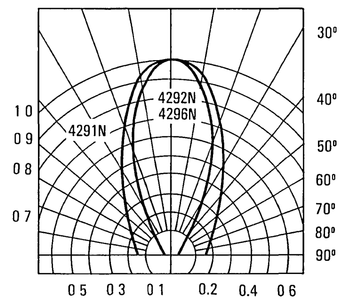


FIG. 46 SPATIAL DISTRIBUTION

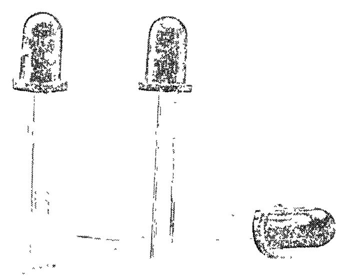
LED LAMPS

T-1(3mm) SOLID STATE LAMPS

LTL-209 RED
LTL-219 BRIGHT RED
LTL-229 HIGH EFFICIENCY RED
LTL-239 GREEN
LTL-259 YELLOW
LTL-299 ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- I.C. COMPATIBLE/LOW CURRENT REQUIREMENTS.
- 1.27mm (0.5") LEAD SPACING.
- T-1 DIAMETER.
- DIFFUSED LENS.
- WIDE VIEWING ANGLE.
- LOW COST.



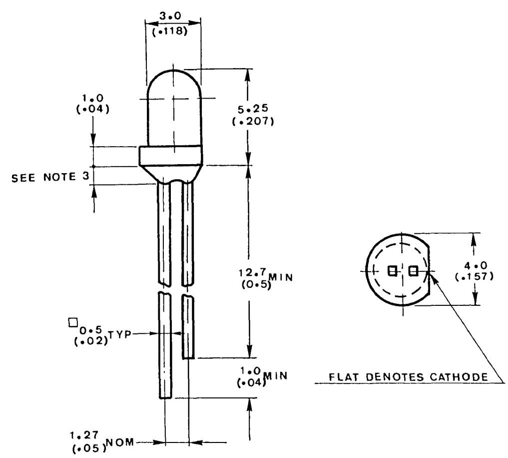
DESCRIPTION

The Red source color devices are made with Gallium Arsenide Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
209	Red	Diffused	Red
219	Red	Diffused	Bright Red
229	Red	Diffused	Hi. Eff. Red
239	Green	Diffused	Green
259	Yellow	Diffused	Yellow
299	Orange	Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	−55°C to +100°C					
Storage Temperature Range	−55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds					

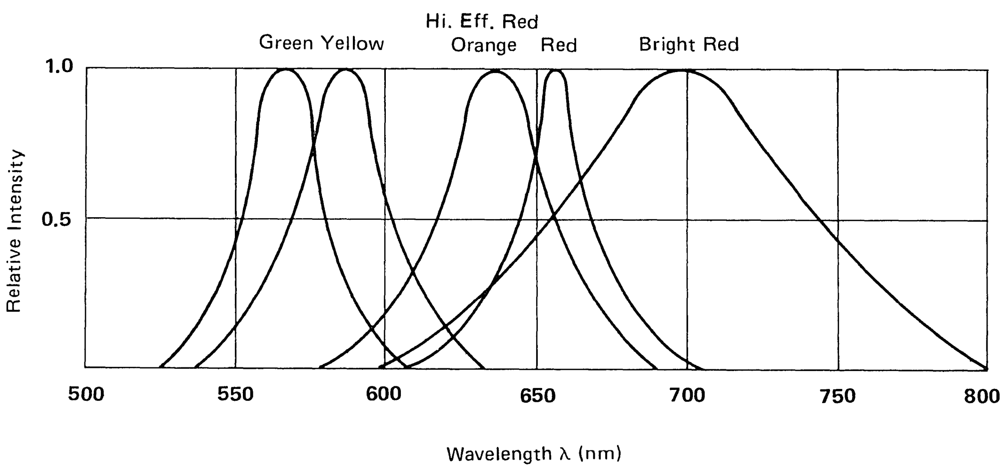


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	209 219 229	0.3 0.4 0.8	0.8 1.1 3.8		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta ½$	209 219 229		72		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	209 219 229		655 697 635		nm	Measurement @ Peak (Fig 1)
Spectral Line Half Width	Δλ	209 219 229		24 90 40		nm	
Forward Voltage	V_F	209 219 229		1.7 2.1 2.0	2.0 2.8 2.8	V	I_F = 20 mA
Reverse Current	I_R	209 219 229			100	μA	V_R = 5 V
Capacitance	C	209 219 229		30 55 20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

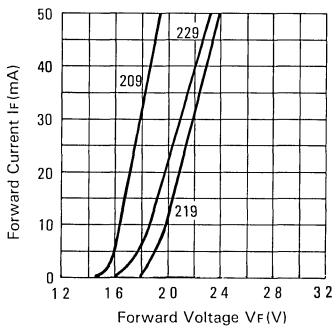


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE

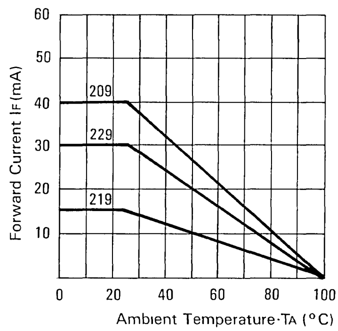


FIG 3 FORWARD CURRENT DERATING CURVE

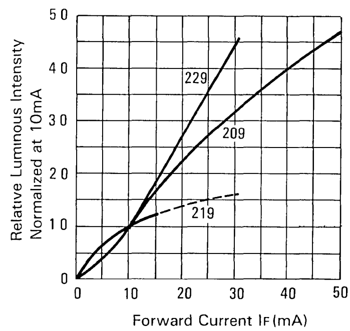


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

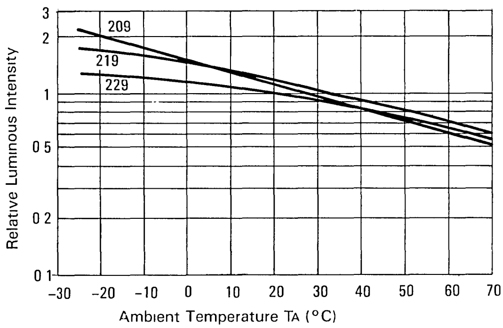


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

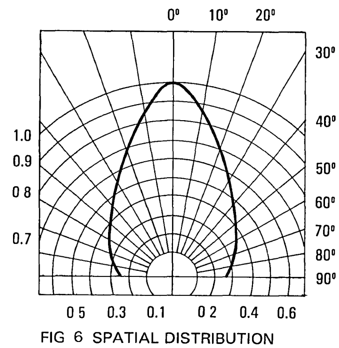


FIG 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	239 259	0.8 0.8	3.8 3.8		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	239 259		72		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	239 259		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	239 259		30 35		nm	
Forward Voltage	V_F	239 259		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	239 259			100	μA	V_R = 5V
Capacitance	C	239 259		35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

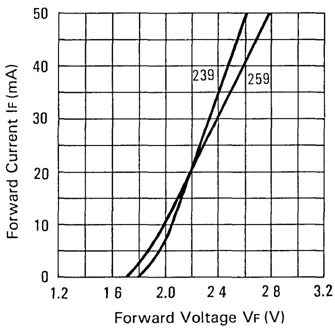


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

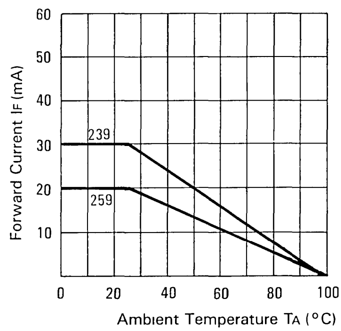


FIG. 8 FORWARD CURRENT DERATING CURVE

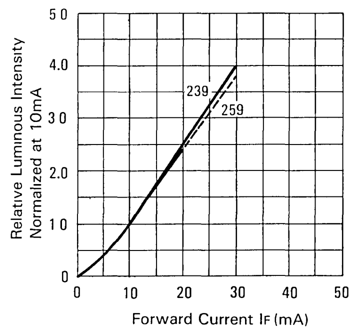


FIG 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

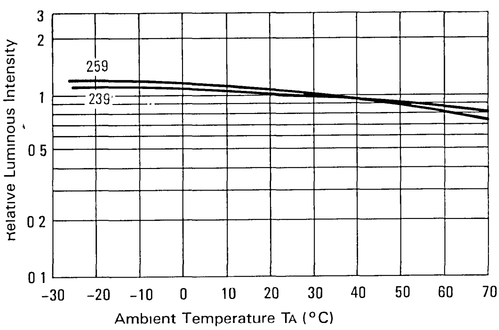


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

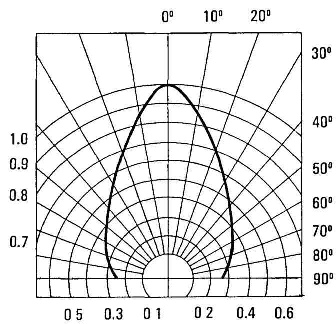


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	299	0.8	3.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta_{1/2}$	299		72		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	299		630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	299		40		nm	
Forward Voltage	V_F	299		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	299			100	μA	V_R = 5V
Capacitance	C	299		20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. $\theta_{1/2}$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

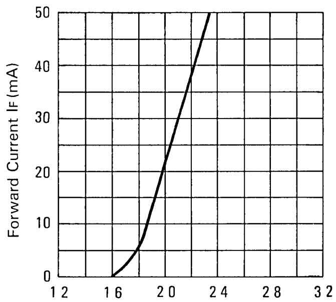


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

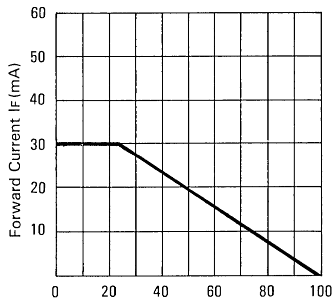


FIG 13 FORWARD CURRENT DERATING CURVE

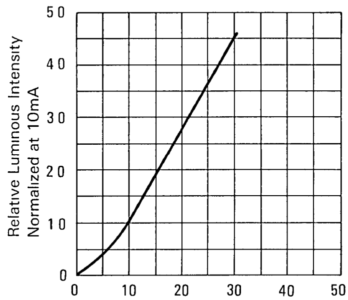


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

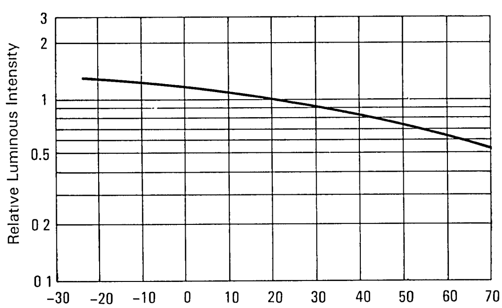


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

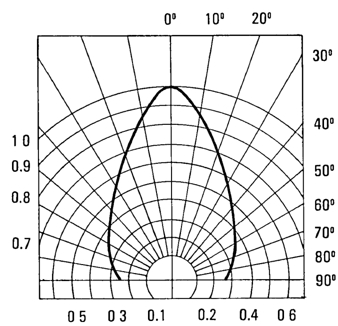


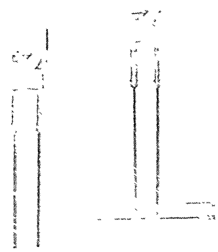
FIG 16 SPATIAL DISTRIBUTION

T-1¾(5mm)SOLID STATE LAMPS

LTL-203 RED
LTL-213 BRIGHT RED
LTL-223 HIGH EFFICIENCY RED
LTL-233 GREEN
LTL-253 YELLOW
LTL-293 ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- VERSATILE MOUNTING ON P.C. BOARD OR PANEL.
- I.C. COMPATIBLE/LOW CURRENT REQUIREMENTS.
- POPULAR T-1¾ DIAMETER PACKAGE.
- WIDE VIEWING ANGLE.
- GENERAL PURPOSE LEADS.
- RELIABLE AND RUGGED.



DESCRIPTION

The Red source color devices are made with Gallium Arsenide Phosphide Red Light Emitting Diode.

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.

The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.

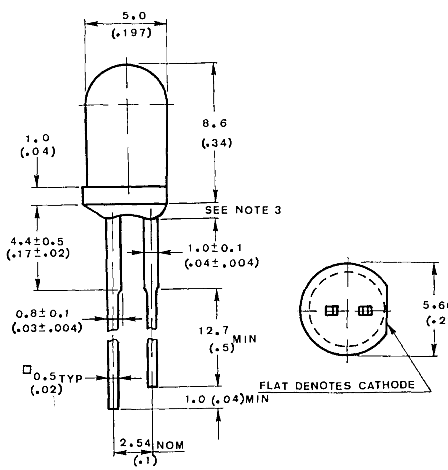
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.

The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
203 204	Red	Diffused	Red
213	Red	Diffused	Bright Red
223 224	Red	Diffused Transparent	Hi. Eff. Red
233 234	Green	Diffused Transparent	Green
253 254	Yellow	Diffused Transparent	Yellow
293 294	Orange	Diffused Transparent	Orange

PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	−55°C to +100°C					
Storage Temperature Range	−55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

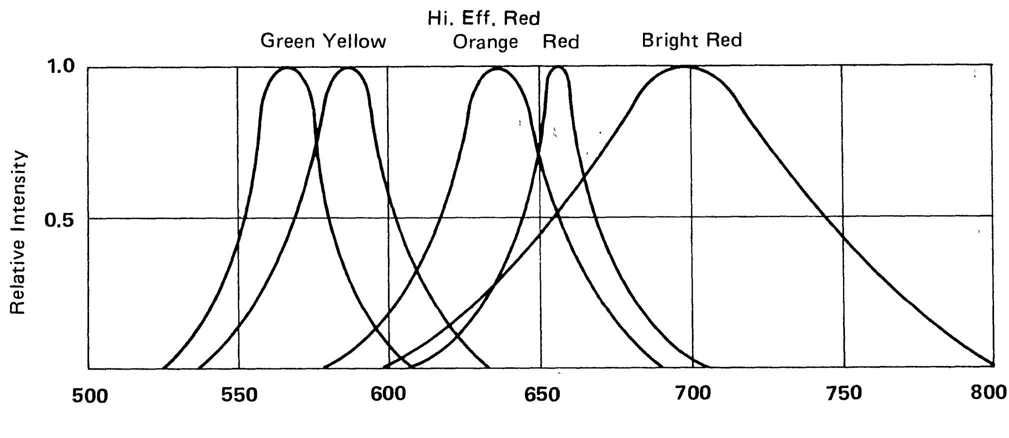


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	203 204	0.2 0.7	0.6 2.0		mcd	$I_F = 10$ mA Note 1
Viewing Angle	$2\theta½$	203 204		54 32		deg.	Note 2 (Fig 6)
Peak Emission Wavelength	λPEAK			655		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			24		nm	
Forward Voltage	V_F			1.7	2.0	V	$I_F = 20$ mA
Reverse Current	I_R				100	μA	$V_R = 5V$
Capacitance	C			30		PF	$V_F = 0$ f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

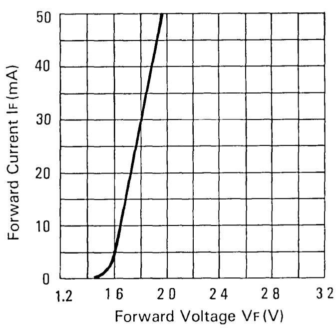


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE

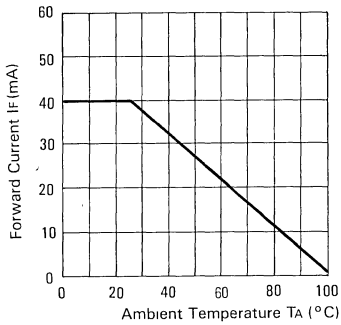


FIG 3 FORWARD CURRENT DERATING CURVE

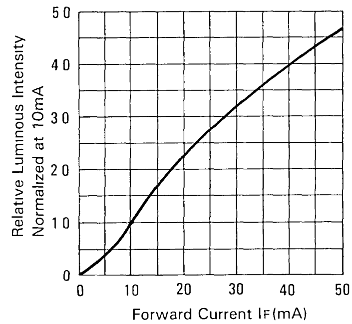


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

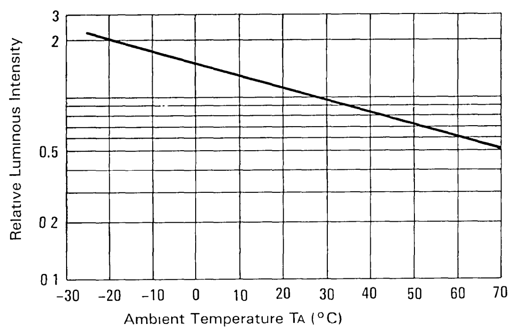


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

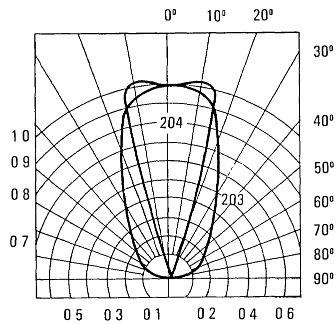


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	213 223 224	0.4 1.0 1.0	1.1 3.0 3.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	213 223 224		54 54 32		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	213 223 224		697 635 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	213 223 224		90 40 40		nm	
Forward Voltage	V_F	213 223 224		2.1 2.0 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	213 223 224			100	μA	V_R = 5 V
Capacitance	C	213 223 224		55 20 20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

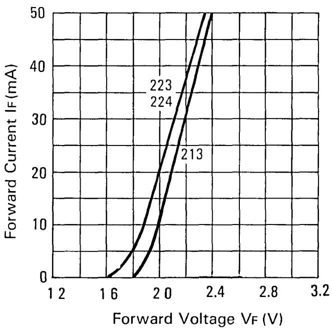


FIG. 7 FORWARD CURRENT VS FORWARD VOLTAGE

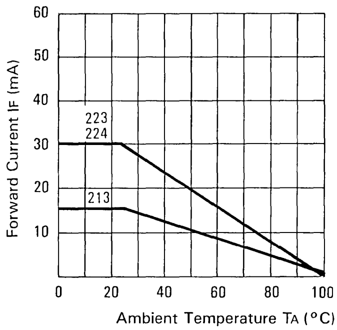


FIG 8 FORWARD CURRENT DERATING CURVE

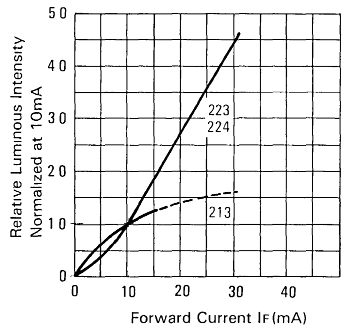


FIG. 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

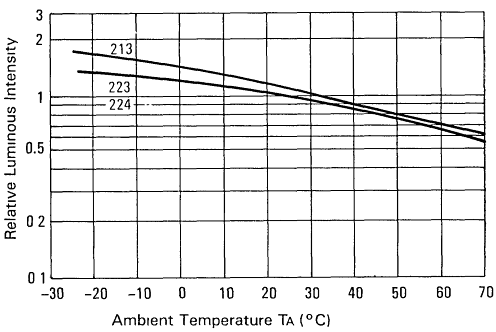


FIG 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

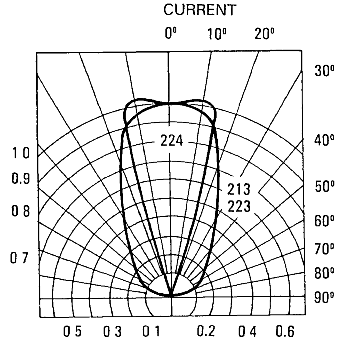


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	233 234 253 254	0.7 0.7 1.0 1.0	2.5 3.5 2.5 3.5		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	233 234 253 254		54 32 54 32		deg	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	233 234 253 254		565 565 585 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	233 234 253 254		30 30 35 35		nm	
Forward Voltage	V_F	233 234 253 254		2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	233 234 253 254			100	μA	V_R = 5 V
Capacitance	C	233 234 253 254		35 35 15 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

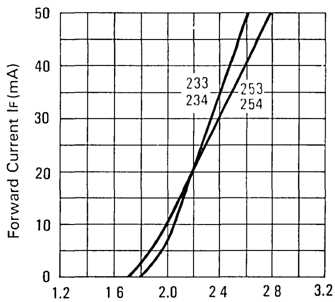


FIG 12 FORWARD CURRENT VS. FORWARD VOLTAGE

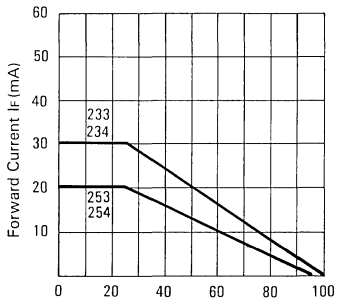


FIG 13 FORWARD CURRENT DERATING CURVE

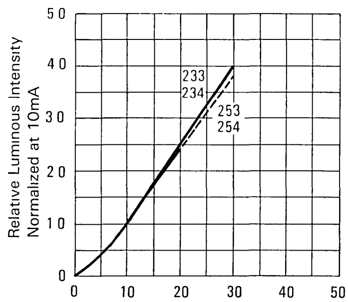


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

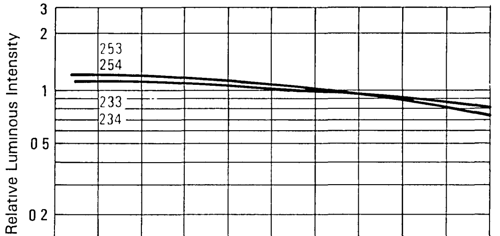


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

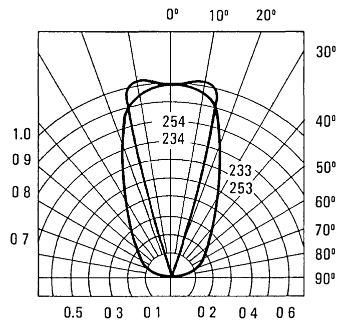


FIG 16 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	293 294	1.0 1.0	3.0 3.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta\frac{1}{2}$	293 294		54 32		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. $\theta\frac{1}{2}$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

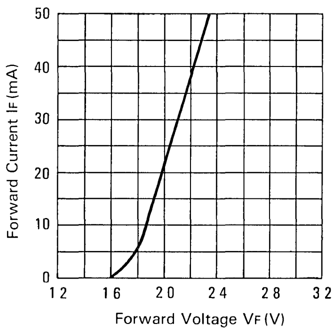


FIG.17 FORWARD CURRENT VS. FORWARD VOLTAGE

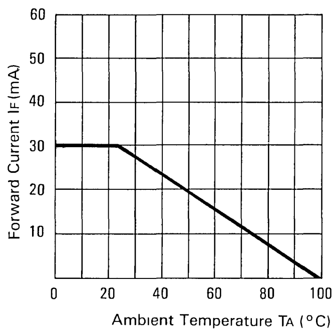


FIG 18 FORWARD CURRENT DERATING CURVE

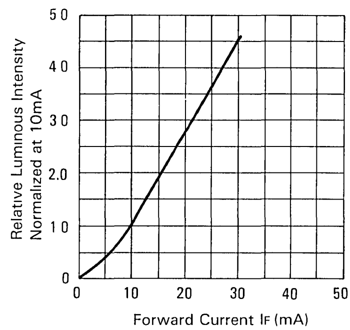


FIG 19 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

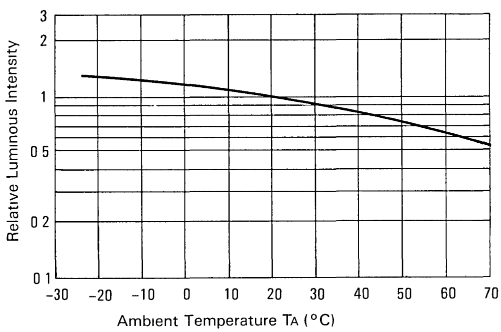


FIG 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

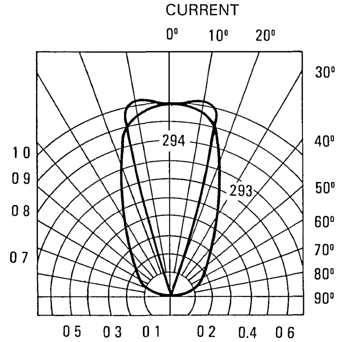


FIG 21 SPATIAL DISTRIBUTION

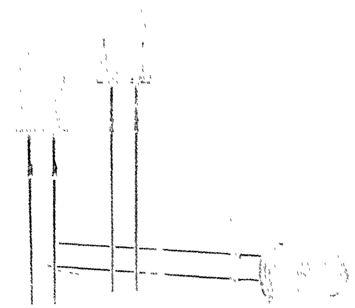
LITEON

T-1¾ (5mm) SOLID STATE LAMPS

LTL-4203	RED	LTL-4233/307G	GREEN
LTL-4213/307P	BRIGHT RED	LTL-4253/307Y	YELLOW
LTL-4223/307E	HIGH EFFICIENCY RED	LTL-4294/307EA	ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- VERSATILE MOUNTING ON P.C. BOARD OR PANEL.
- I.C. COMPATIBLE/LOW CURRENT REOUIREMENTS.
- POPULAR T-1¾ DIAMETER, 1" LEAD LENGTH.
- RELIABLE AND RUGGED.
- LOW COST.

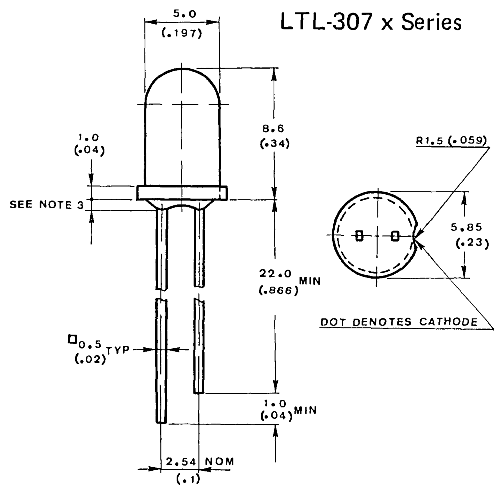


DESCRIPTION

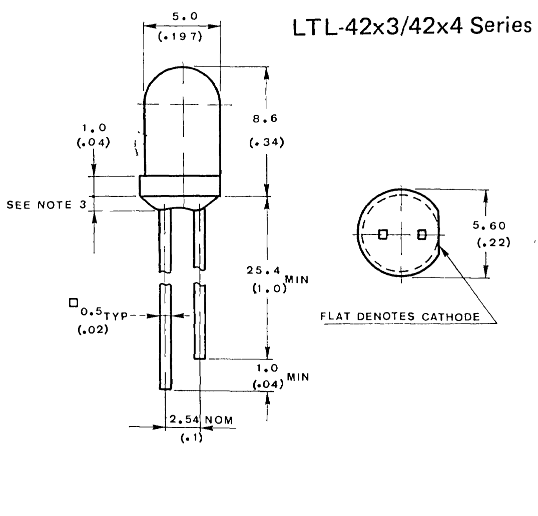
The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

PACKAGE DIMENSIONS

LTL-307 x Series



LTL-42x3/42x4 Series



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
4203 4204 4208	Red Red Water Clear	Diffused Transparent Non-Diffused	Red
4213 4214	Red	Diffused Transparent	Bright Red
4223 4224	Red	Diffused Transparent	Hi. Eff. Red
4233 4234	Green	Diffused Transparent	Green
4253 4254	Yellow	Diffused Transparent	Yellow
4293 4294	Orange	Diffused Transparent	Orange

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
307P 307PE	Red	Diffused Transparent	Bright Red
307E 307EE	Red	Diffused Transparent	Hi. Eff. Red
307G 307GE	Green	Diffused Transparent	Green
307Y	Yellow	Diffused	Yellow
307EA	Orange	Diffused	Orange

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C					
Storage Temperature Range	–55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

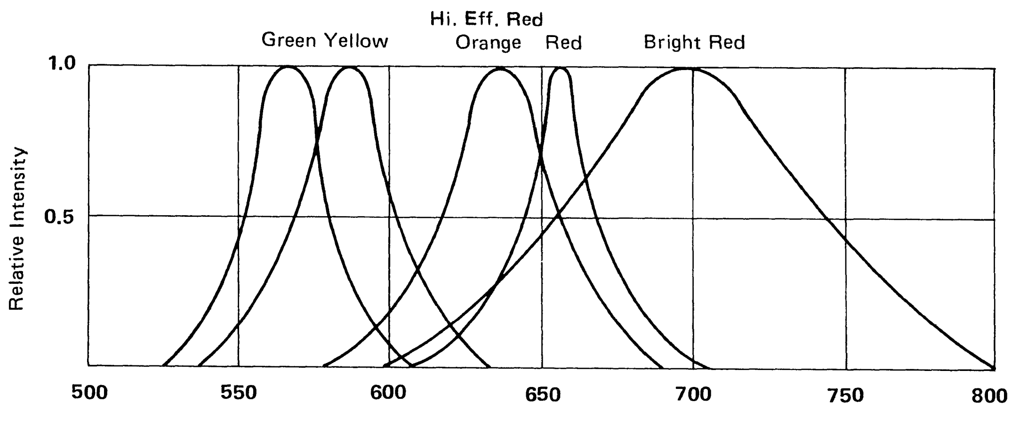


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4203 4204 4208	0.3 1.7 1.7	0.8 5.5 5.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	4203 4204 4208		36 16 16		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK			655		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			24		nm	
Forward Voltage	V_F			1.7	2.0	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			30		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

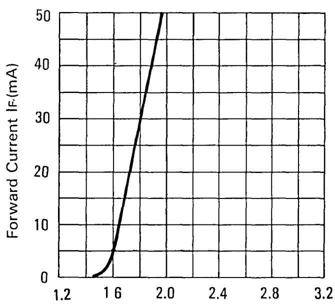


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

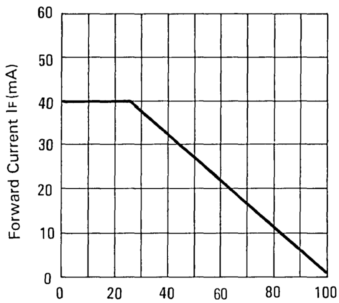


FIG. 3 FORWARD CURRENT DERATING CURVE

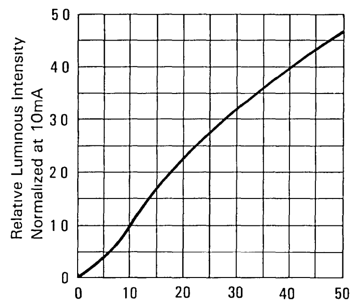


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

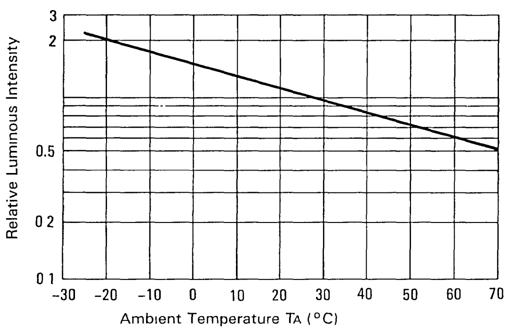


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

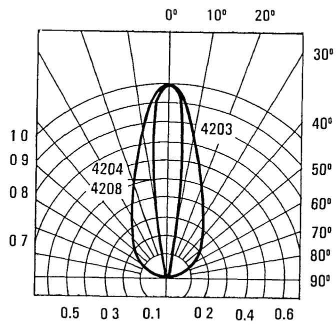


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL—	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4213 4214 4223 4224	1.1 2.5 2.5 10.0	3.8 12.6 8.7 40.0		mcd	I_F = 10mA Note 1
Viewing Angle	2θ½	4213 4214 4223 4224		36 16 36 16		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	4213 4214 4223 4224		697 697 635 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4213 4214 4223 4224		90 90 40 40		nm	
Forward Voltage	V_F	4213 4214 4223 4224		2.1 2.1 2.0 2.0	2.8	V	I_F = 20mA
Reverse Current	I_R	4213 4214 4223 4224			100	μA	V_R = 5 V
Capacitance	C	4213 4214 4223 4224		55 55 20 20		PF	V = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

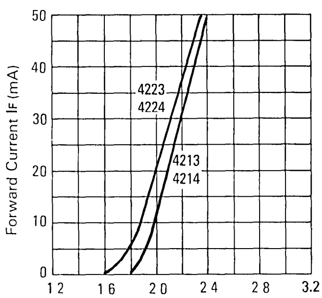


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

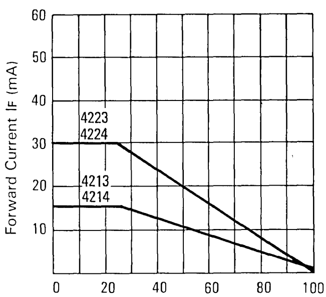


FIG 8 FORWARD CURRENT DERATING CURVE

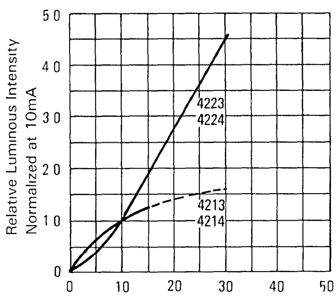


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

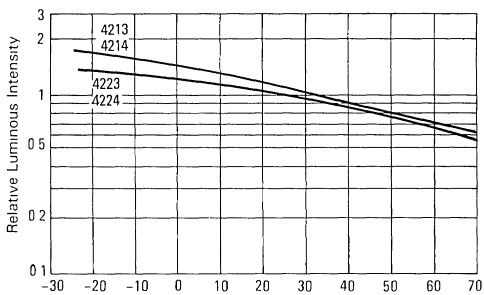


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

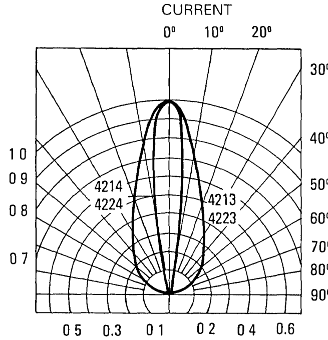


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4233 4234 4238	2.5 10.0 29.0	8.7 40.0 60.0		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	4233 4234 4238		36 16 16		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	4233 4234 4238		565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4233 4234 4238		30		nm	
Forward Voltage	V_F	4233 4234 4238		2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	4233 4234 4238			100	μA	V_R = 5 V
Capacitance	C	4233 4234 4238		35		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

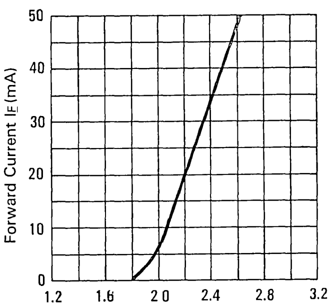


FIG. 12 FORWARD CURRENT VS. FORWARD VOLTAGE.

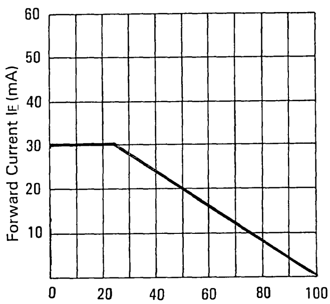


FIG. 13 FORWARD CURRENT DERATING CURVE.

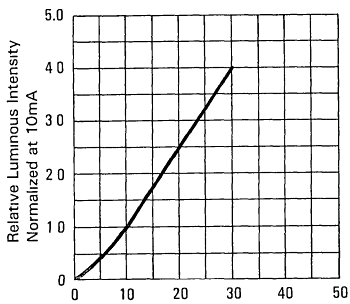


FIG 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

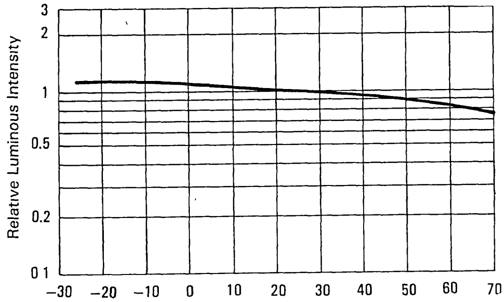


FIG. 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

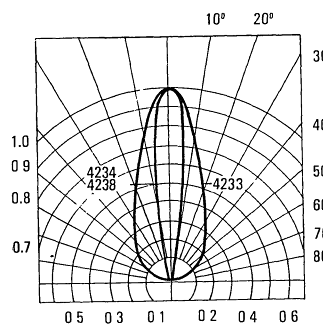


FIG 16 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4253 4254 4258	2.5 10.0 10.0	8.7 40.0 40.0		mcd	IF = 10mA Note 1
Viewing Angle	$2\theta½$	4253 4254 4258		36 16 16		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λPEAK	4253 4254 4258		585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	4253 4254 4258		35		nm	
Forward Voltage	VF	4253 4254 4258		2.1	2.8	V	IF = 20mA
Reverse Current	IR	4253 4254 4258			100	μA	VR = 5 V
Capacitance	C	4253 4254 4258		15		PF	VF = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off axis angle at which the luminous intensity is half the axial luminous intensity.

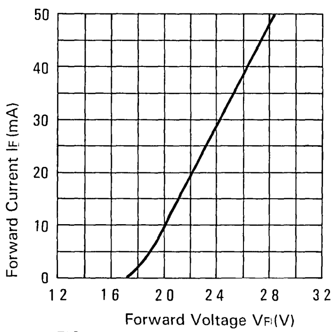


FIG. 17 FORWARD CURRENT VS FORWARD VOLTAGE

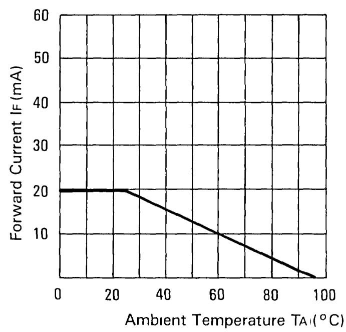


FIG. 18 FORWARD CURRENT DERATING CURVE

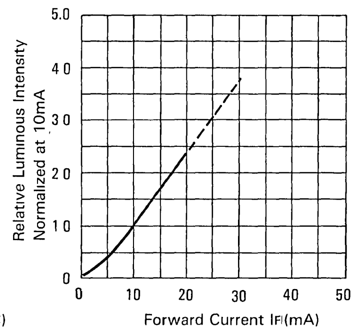


FIG. 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

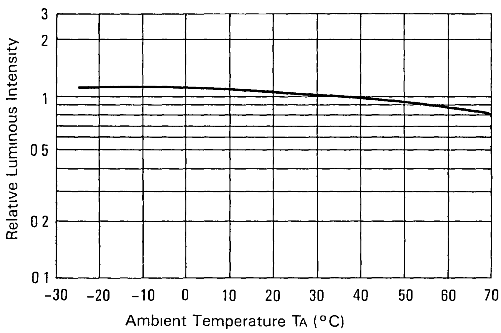


FIG. 20 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

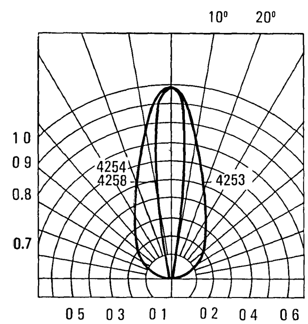


FIG 21 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	4293 4294 4298	2.5 10.0 10.0	8.7 40.0 40.0		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	4293 4294 4298		36 16 16		deg.	Note 2 (Fig 26)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

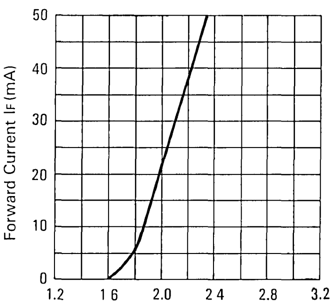


FIG. 22 FORWARD CURRENT VS. FORWARD VOLTAGE

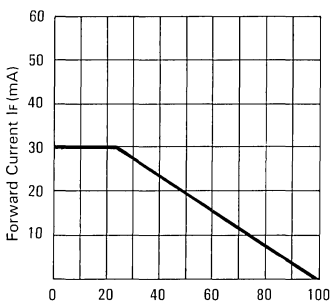


FIG. 23 FORWARD CURRENT DERATING CURVE

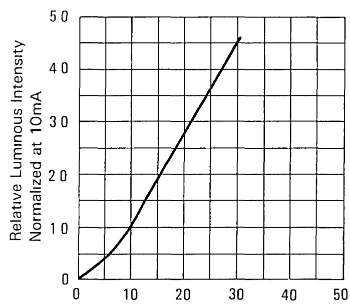


FIG. 24 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

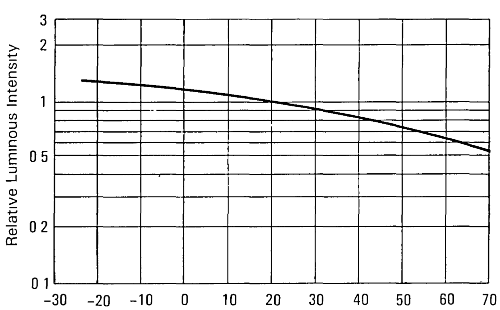


FIG 25 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

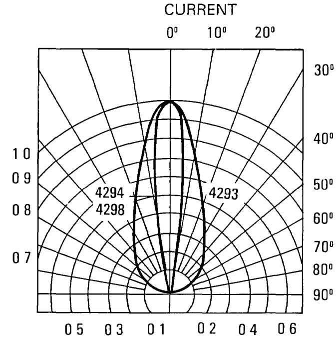


FIG. 26 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	307P 307PE 307E 307EE	1.1 2.5 5.6 9.0	5.6 9.0 19.0 30.3		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	307P 307PE 307E 307EE		50 40 50 40		deg.	Note 2 (Fig. 31)
Peak Emission Wavelength	λPEAK	307P 307PE 307E 307EE		697 697 635 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	307P 307PE 307E 307EE		90 90 40 40		nm	
Forward Voltage	V_F	307P 307PE 307E 307EE		2.1 2.1 2.0 2.0	2.8	V	I_F = 20mA
Reverse Current	I_R	307P 307PE 307E 307EE			100	μA	V_R = 5 V
Capacitance	C	307P 307PE 307E 307EE		55 55 20 20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

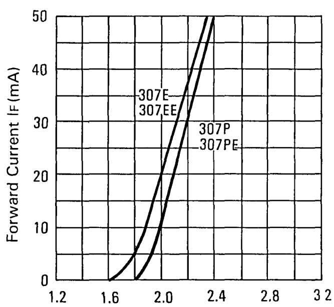


FIG. 27 FORWARD CURRENT VS FORWARD VOLTAGE

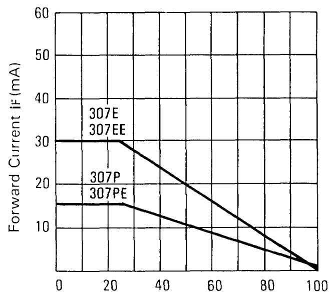


FIG. 28 FORWARD CURRENT DERATING CURVE

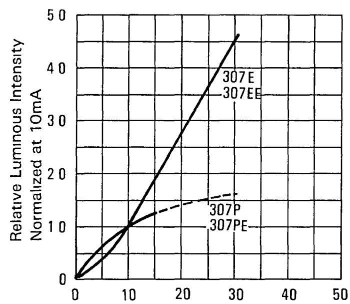


FIG. 29 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

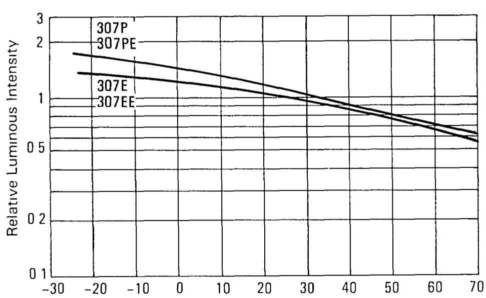


FIG. 30 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

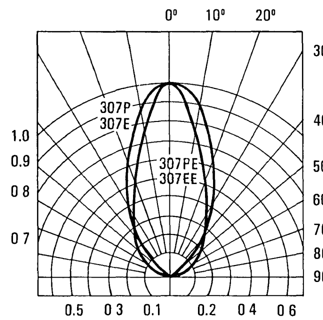


FIG 31 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	307G 307GE 307Y	4.0 8.7 4.0	12.6 29.0 12.6		mcd	$I_F = 10$ mA Note 1
Viewing Angle	$2\theta½$	307G 307GE 307Y		50 40 50		deg.	Note 2 (Fig. 36)
Peak Emission Wavelength	λPEAK	307G 307GE 307Y		565 565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	307G 307GE 307Y		30 30 35		nm	
Forward Voltage	V_F	307G 307GE 307Y		2.1	2.8	V	$I_F = 20$ mA
Reverse Current	I_R	307G 307GE 307Y			100	μA	$V_R = 5$ V
Capacitance	C	307G 307GE 307Y		35 35 15		PF	$V_F = 0$ f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

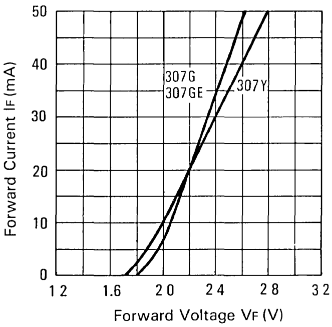


FIG 32 FORWARD CURRENT VS. FORWARD VOLTAGE

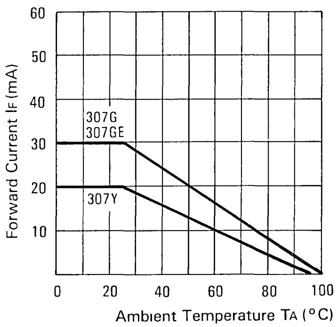


FIG. 33 FORWARD CURRENT DERATING CURVE

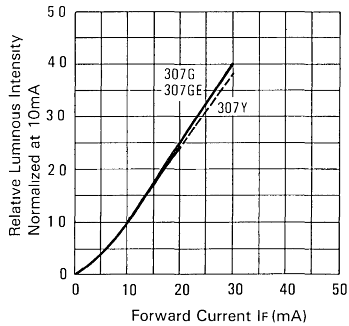


FIG. 34 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

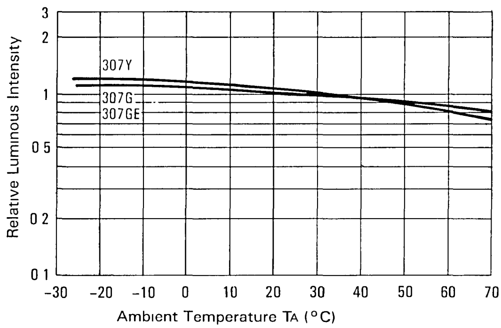


FIG 35 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

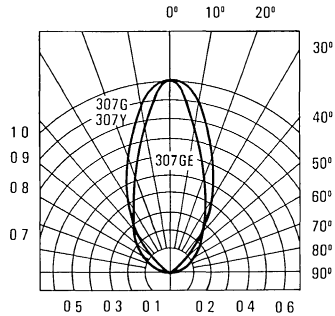


FIG 36 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	307EA	5.6	19.0		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	307EA		50		deg.	Note 2 (Fig. 41)
Peak Emission Wavelength	$\lambda PEAK$			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

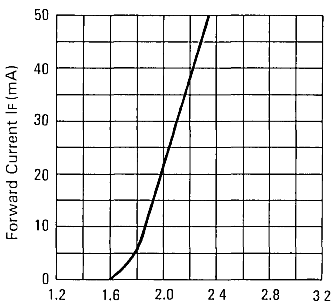


FIG. 37 FORWARD CURRENT VS FORWARD VOLTAGE

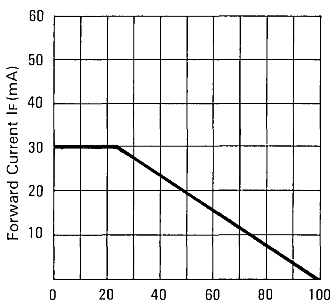


FIG 38 FORWARD CURRENT DERATING CURVE

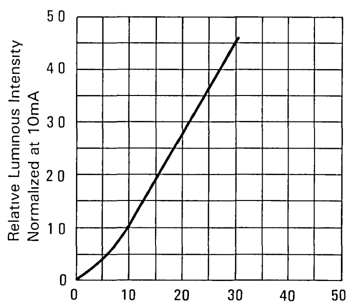


FIG. 39 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

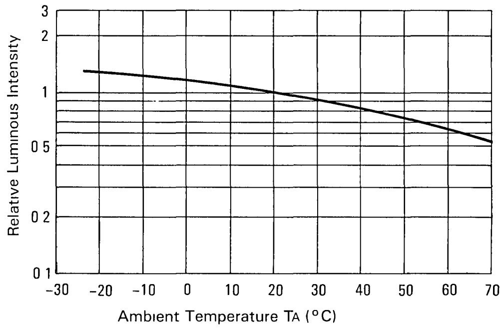


FIG. 40 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

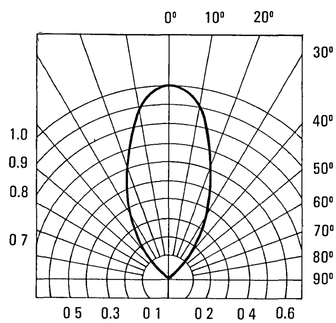


FIG. 41 SPATIAL DISTRIBUTION

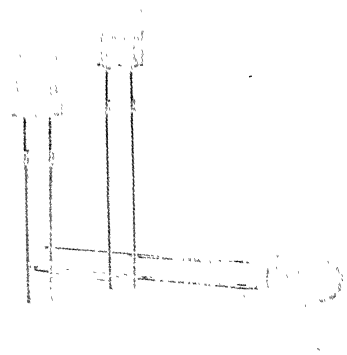
MEDIUM PROFILE T-1 ¾ LED LAMPS

LITEON

LTL-10203/10203W	RED	LTL-10233/10233W	GREEN
LTL-10213	BRIGHT RED	LTL-10253/10253W	YELLOW
LTL-10223/10223W	HIGH EFFICIENCY RED	LTL-10293W	ORANGE

FEATURES

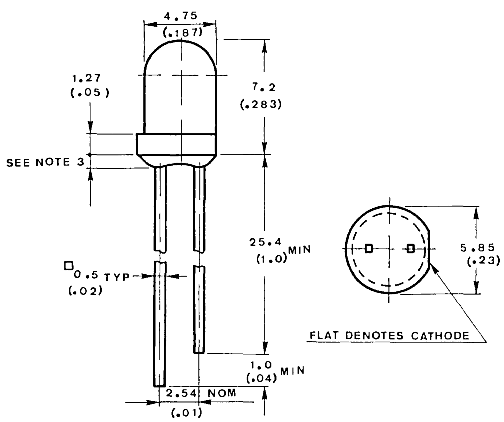
- LOW POWER CONSUMPTION.
- WIDE VIEWING ANGLE.
- MEDIUM PROFILE: 7.24mm (0.285") NOMINAL.
- GENERAL PURPOSE LEADS.
- I.C. COMPATIBLE/LOW CURRENT REQUIREMENT.
- RELIABLE AND RUGGED.



DESCRIPTION

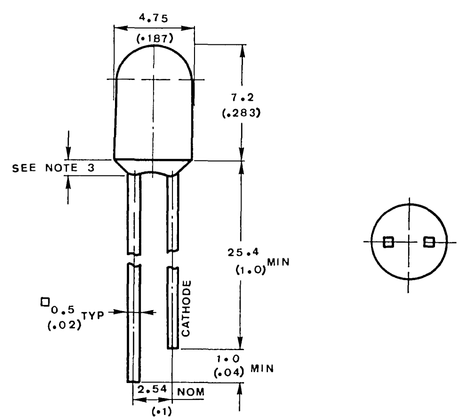
The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

LTL-102 x 3 Series



PACKAGE DIMENSIONS

LTL-102 x 3W Series



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. *Specifications are subject to change without notice.*

DEVICES

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
10203	Red	Diffused	Red
10213	Red	Diffused	Bright Red
10223	Red	Diffused	Hi. Eff. Red
10233	Green	Diffused	Green
10253	Yellow	Diffused	Yellow

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
10203W	Red	Diffused	Red
10223W	Red	Diffused	Hi. Eff. Red
10233W	Green	Diffused	Green
10253W	Yellow	Diffused	Yellow
10293W	Orange	Diffused	Orange

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	HI.EFF.RED ORANGE	YELLOW	UNIT
Power Dissipation	80	40	100	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	120	80	mA
Continuous Forward Current	40	15	30	30	20	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C					
Storage Temperature Range	–55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

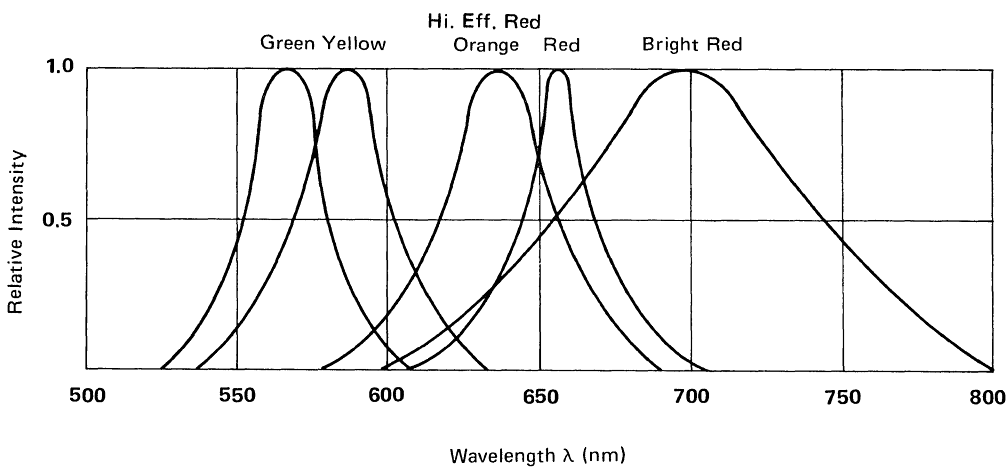


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	10203 10213 10203W	0.3 0.8 0.3	0.8 2.5 0.8		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	10203 10213 10203W		60 60 60		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	10203 10213 10203W		655 697 655		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	10203 10213 10203W		24 90 24		nm	
Forward Voltage	V_F	10203 10213 10203W		1.7 2.1 1.7	2.0 2.8 2.0	V	I_F = 20 mA
Reverse Current	I_R	10203 10213 10203W			100	μA	V_R = 5 V
Capacitance	C	10203 10213 10203W		30 55 30		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

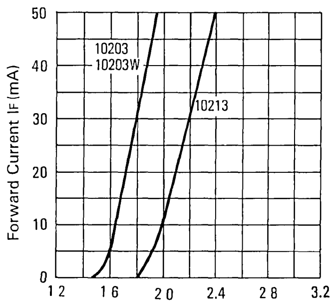


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

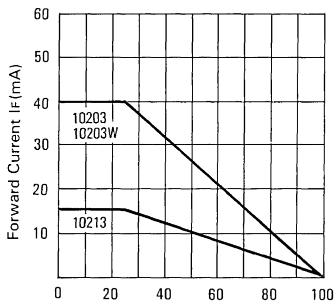


FIG 3 FORWARD CURRENT DERATING CURVE

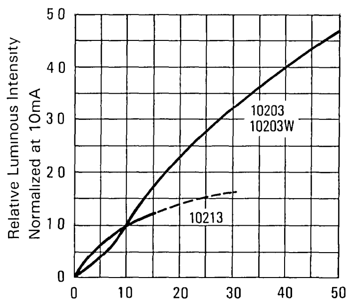


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

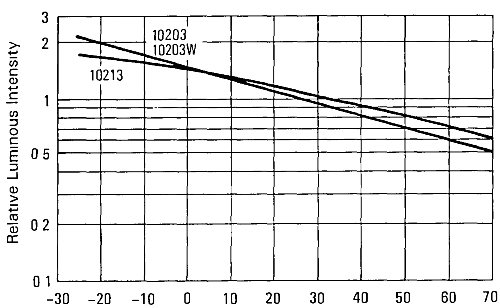


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

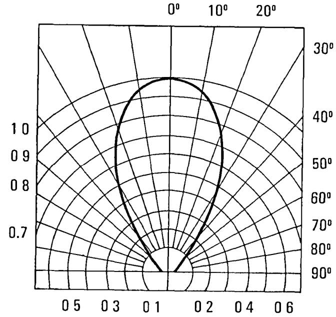


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	10223 10223W	1.7 1.7	5.6 5.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	10223 10223W		60		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	10223 10223W		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	10223 10223W		40		nm	
Forward Voltage	V_F	10223 10223W		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	10223 10223W			100	μA	V_R = 5V
Capacitance	C	10223 10223W		20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

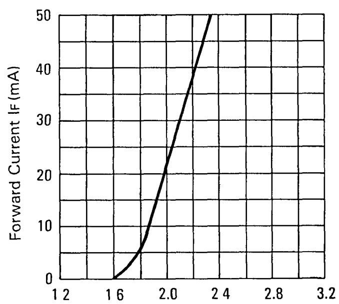


FIG 7 FORWARD CURRENT VS. FORWARD VOLTAGE

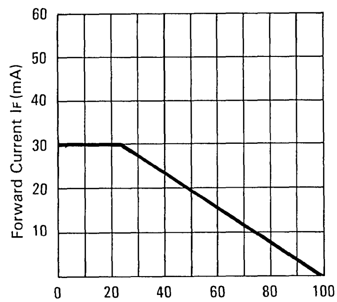


FIG 8 FORWARD CURRENT DERATING CURVE

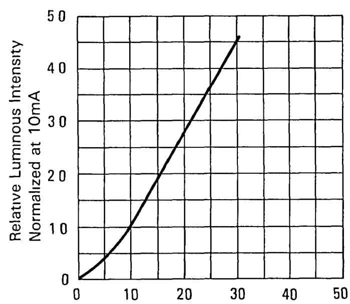


FIG. 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

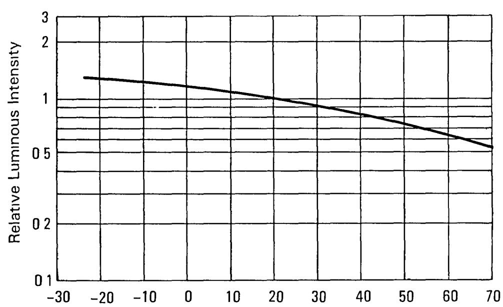


FIG 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

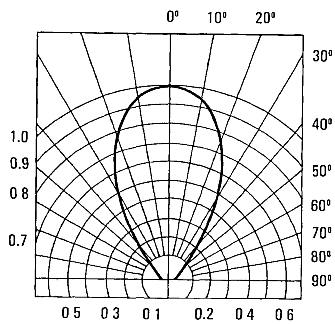


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	10233 10253 10233W 10253W	1.7 1.7 1.7 1.7	5.6 12.6 5.6 12.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	10233 10253 10233W 10253W		60 60 60 60		deg	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	10233 10253 10233W 10253W		565 585 565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	10233 10253 10233W 10253W		30 35 30 35		nm	
Forward Voltage	V_F	10233 10253 10233W 12053W		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	10233 10253 10233W 10253W			100	μA	V_R = 5V
Capacitance	C	10233 10253 10233W 10253W		35 15 35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

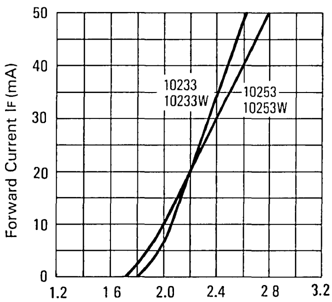


FIG 12 FORWARD CURRENT VS. FORWARD VOLTAGE

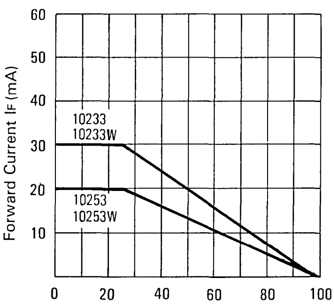


FIG 13 FORWARD CURRENT DERATING CURVE

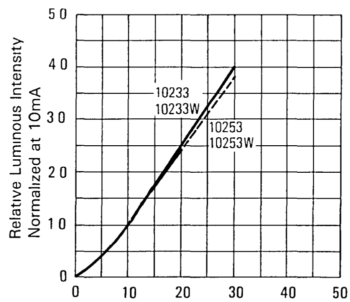


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

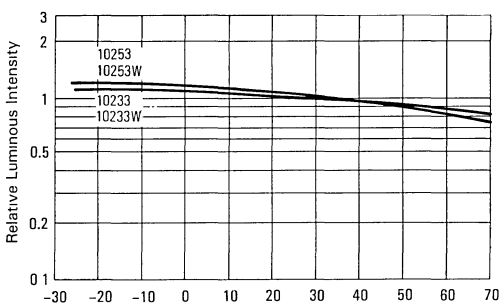


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

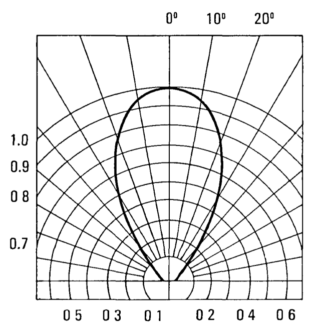
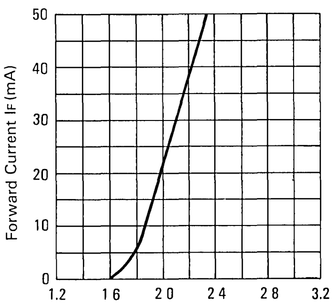


FIG 16 SPATIAL DISTRIBUTION

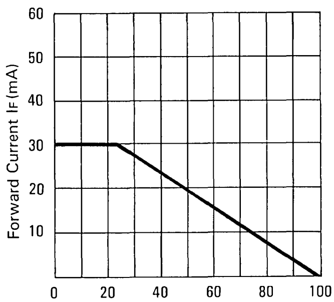
ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	10293W	1.7	5.6		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	10293W		60		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

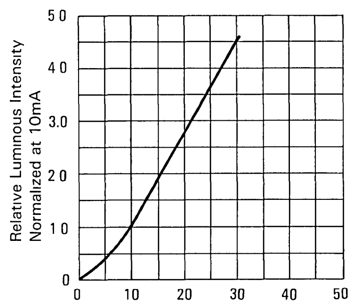
NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.



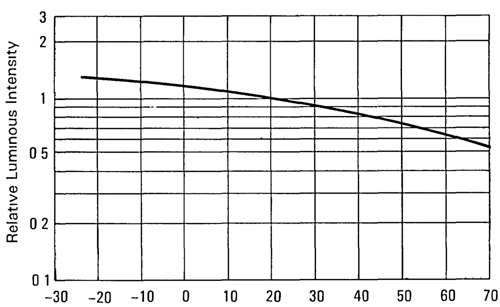
Forward Voltage V_F (V)
FIG. 17 FORWARD CURRENT VS. FORWARD VOLTAGE



Ambient Temperature T_A (°C)
FIG. 18 FORWARD CURRENT DERATING CURVE



Forward Current I_F (mA)
FIG 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT



Ambient Temperature T_A (°C)
FIG. 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

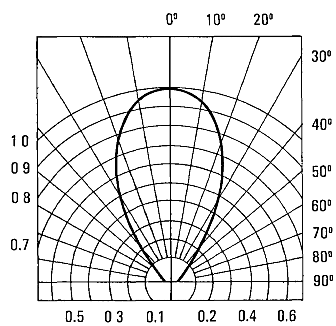


FIG. 21 SPATIAL DISTRIBUTION

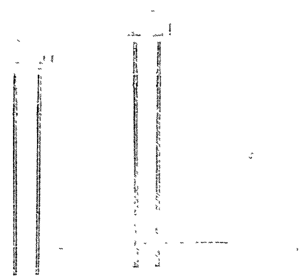
LITEON

LOW PROFILE T-1 ¾ LED LAMPS

LTL-5203 RED
LTL-5223 HIGH EFFICIENCY RED
LTL-5233 GREEN
LTL-5253 YELLOW

FEATURES

- HIGH INTENSITY LIGHT SOURCE WITH TWO LENSES EFFECTS.
- RED, GREEN AND YELLOW COLORS AVAILABLE.
- LOW PROFILE.
- LOW POWER CONSUMPTION.
- LONG LIFE-SOLID STATE RELIABILITY.
- GENERAL PURPOSE LEADS.
- I.C. COMPATIBLE/LOW CURRENT REQUIREMENTS.
- RELIABLE AND RUGGED.



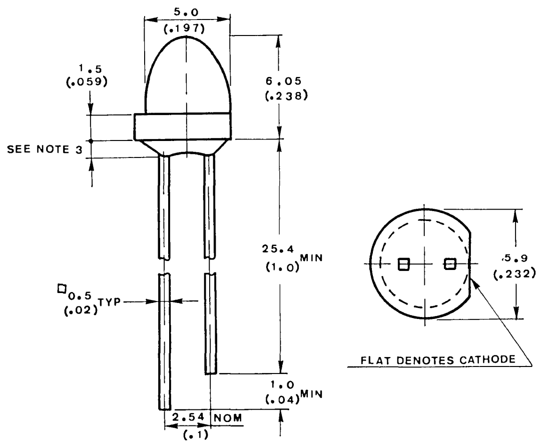
DESCRIPTION

The Red source color devices are made with Gallium Arsenide Phosphide Red Light Emitting Diode.
The High Efficiency Red source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
5203	Red	Diffused	Red
5223	Red	Diffused	Hi. Eff. Red
5233	Green	Diffused	Green
5253	Yellow	Diffused	Yellow

PACKAGE DIMENSION



LED LAMPS

NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	HI. EFF. RED	GREEN	YELLOW	UNIT
Power Dissipation	80	100	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	120	120	80	mA
Continuous Forward Current	40	30	30	20	mA
Derating Linear From 25°C	0.5	0.4	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	– 55°C to + 100°C				
Storage Temperature Range	– 55°C to + 100°C				
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds				

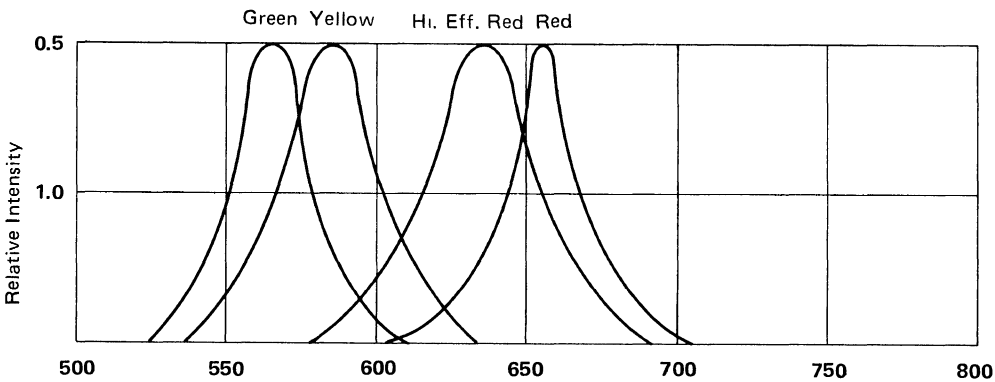


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL—	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	5203 5223	0.2 1.0	0.5 4.0		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	5203 5223		64 64		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	5203 5223		655 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	5203 5223		24 40		nm	
Forward Voltage	V_F	5203 5223		1.7 2.0	2.0 2.8	V	I_F = 20 mA
Reverse Current	I_R	5203 5223			100	μA	V_R = 5V
Capacitance	C	5203 5223		55 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

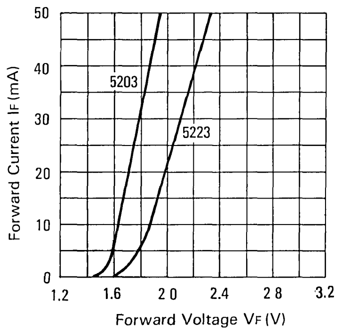


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

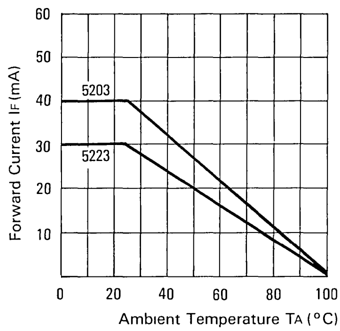


FIG. 3 FORWARD CURRENT DERATING CURVE

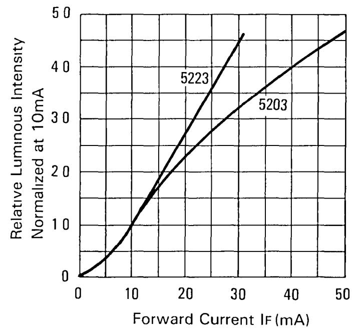


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

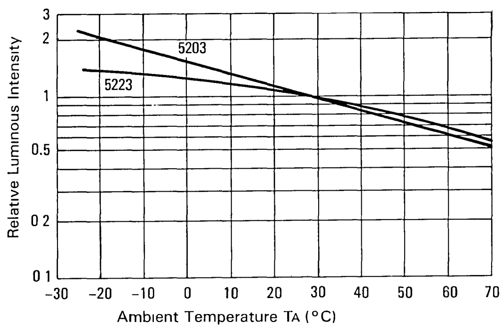


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

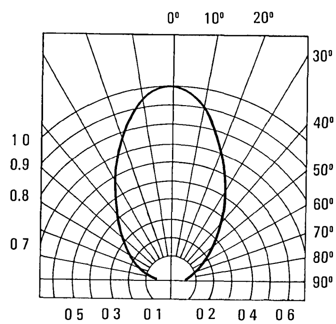


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	5233 5253	1.0 1.0	4.0 4.0		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	5233 5253		64 64		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	5233 5253		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	5233 5253		30 35		nm	
Forward Voltage	V_F	5233 5253		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	5233 5253			100	μA	V_R = 5V
Capacitance	C	5233 5253		35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclaiiage) eye-response curve.

2. θ½ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

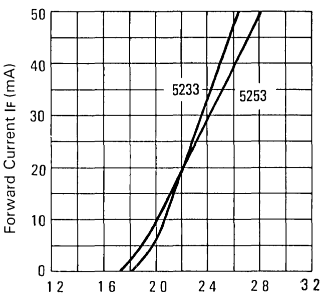


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

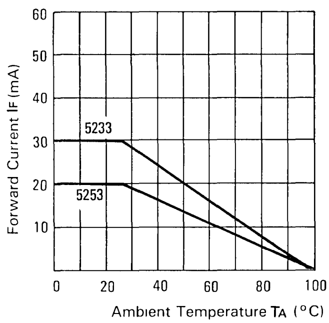


FIG 8 FORWARD CURRENT DERATING CURVE

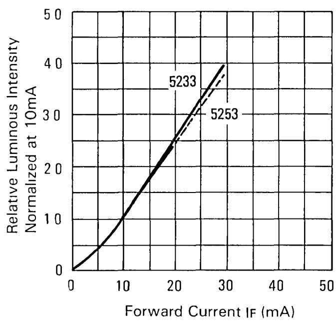


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

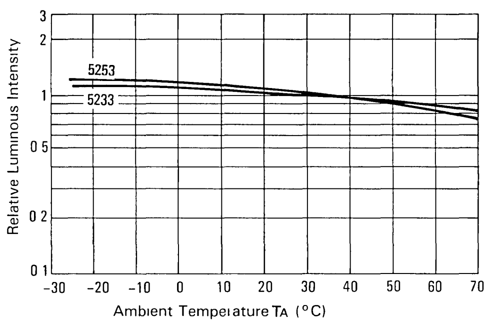


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

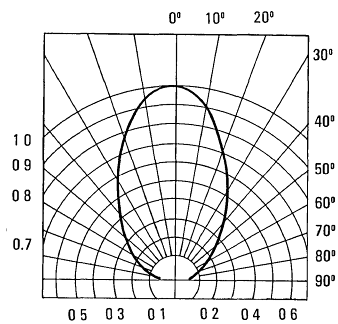


FIG. 11 SPATIAL DISTRIBUTION

LITEON

(1.8mm) DOT POINT LED LAMPS

LTL-709R RED
LTL-709E HIGH EFFICIENCY RED
LTL-709L GREEN
LTL-709Y YELLOW
LTL-709EA ORANGE

FEATURES

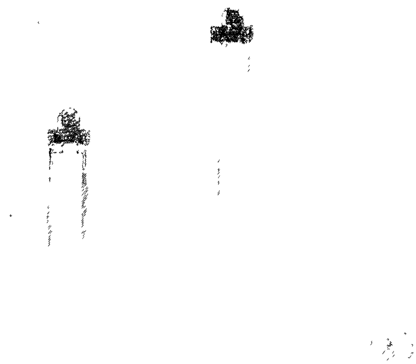
- LOW POWER CONSUMPTION.
- GENERAL PURPOSE LEADS.
- I.C. COMPATIBLE/LOW CURRENT REQUIREMENTS.
- RELIABLE AND RUGGED.

DESCRIPTION

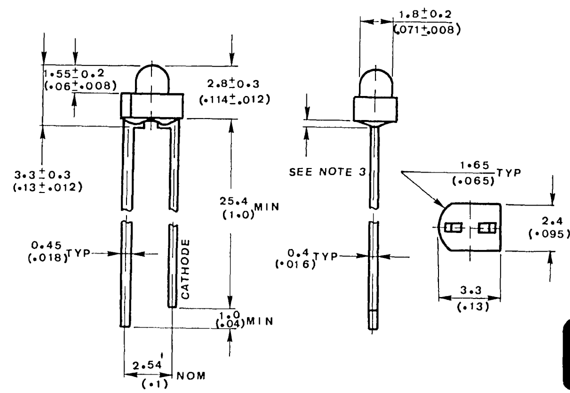
The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
709R	Red	Diffused	Red
709E	Red	Diffused	Hi. Eff. Red
709L	Green	Diffused	Green
709Y	Yellow	Diffused	Yellow
709EA	Orange	Diffused	Orange



PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	120	80	120	mA
Continuous Forward Current	40	30	20	30	mA
Derating Linear From 25°C	0.5	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	– 55°C to + 100°C				
Storage Temperature Range	– 55°C to + 100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

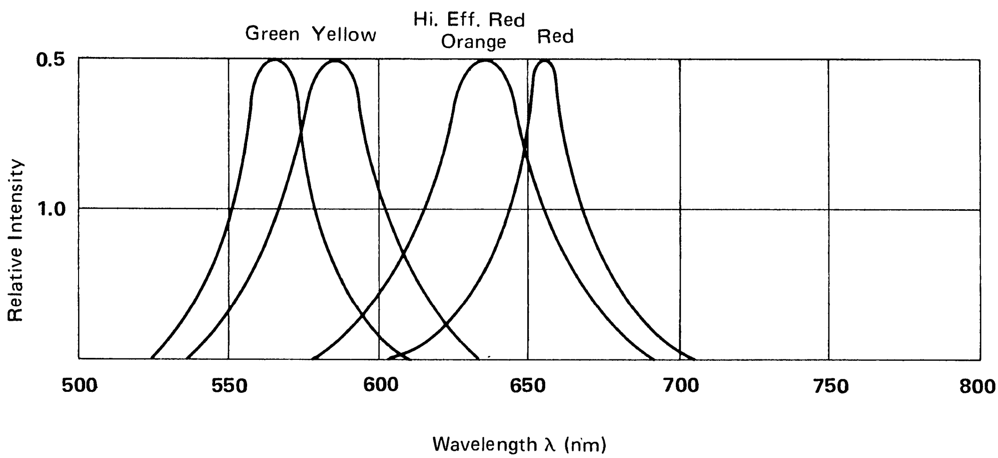


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	709R 709E	0.3 0.7	0.7 3.0		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	709R 709E		25° 38°		deg.	Note 2 (Fig. 6) (Fig.11)
Peak Emission Wavelength	λPEAK	709R 709E		655 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	709R 709E		24 40		nm	
Forward Voltage	V_F	709R 709E		1.7 2.0	2.0 2.8	V	I_F = 20 mA
Reverse Current	I_R	709R 709E			100	μA	V_R = 5V
Capacitance	C	709R 709E		30 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

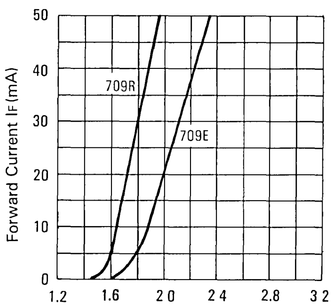


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE

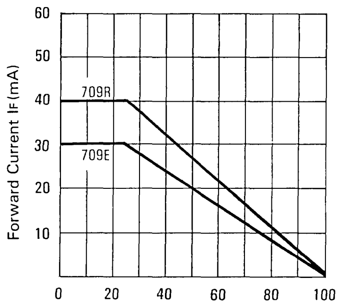


FIG 3 FORWARD CURRENT DERATING CURVE

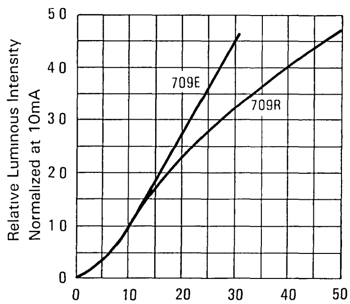


FIG. 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

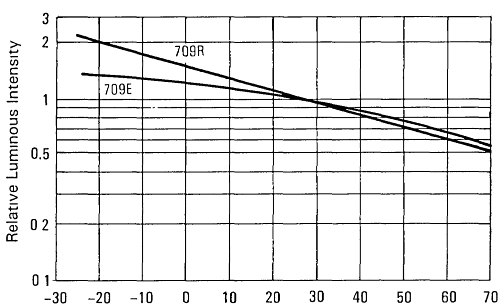


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

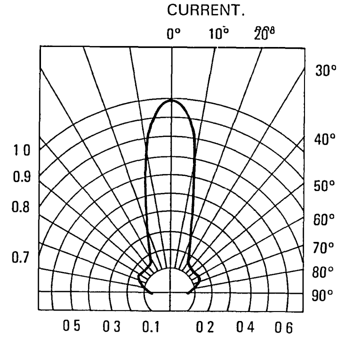


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL—	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	709L 709Y	0.5 1.1	1.5 3.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	709L 709Y		38°		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	709L 709Y		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	709L 709Y		30 35		nm	
Forward Voltage	V_F	709L 709Y		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	709L 709Y			100	μA	V_R = 5V
Capacitance	C	709L 709Y		35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

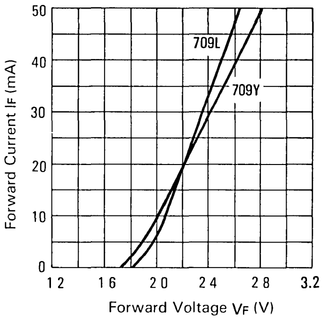


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

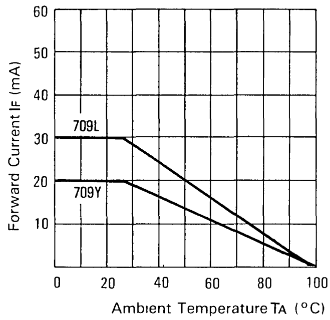


FIG 8 FORWARD CURRENT DERATING CURVE

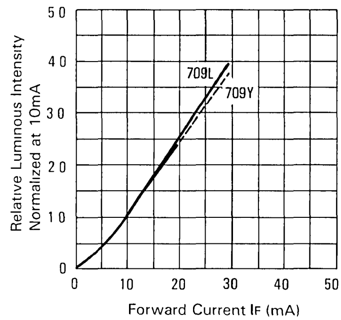


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

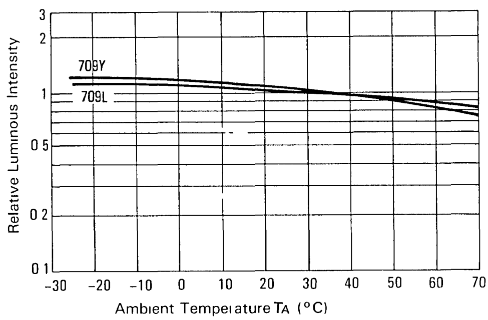


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

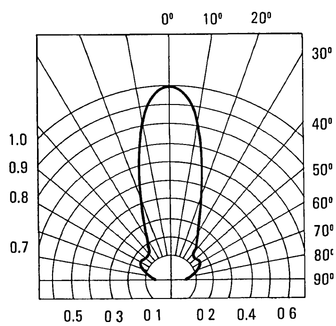


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	709EA	1.1	3.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	709EA		38°		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

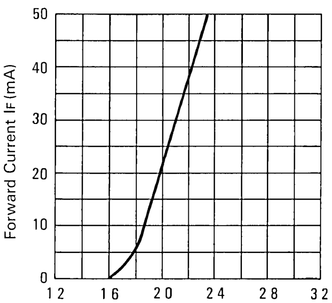


FIG 12 FORWARD CURRENT VS. FORWARD VOLTAGE

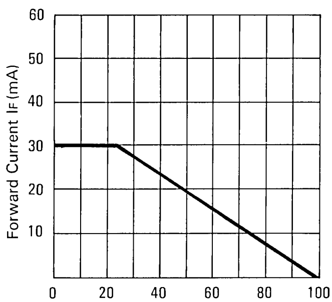


FIG 13 FORWARD CURRENT DERATING CURVE

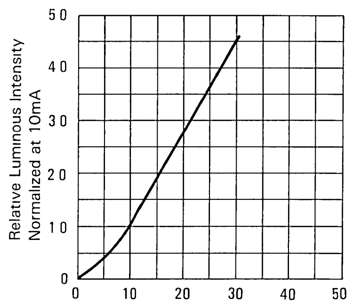


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

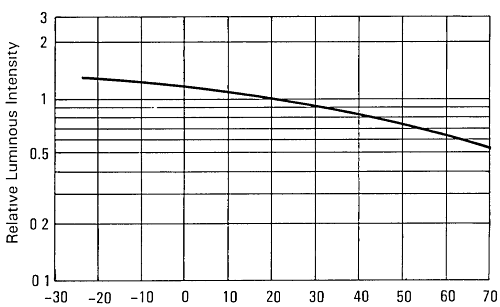


FIG. 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

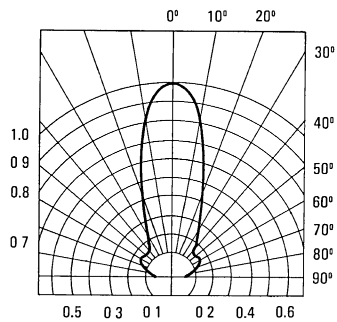


FIG. 16 SPATIAL DISTRIBUTION

LED LAMPS

LED PANEL DOT INDICATORS

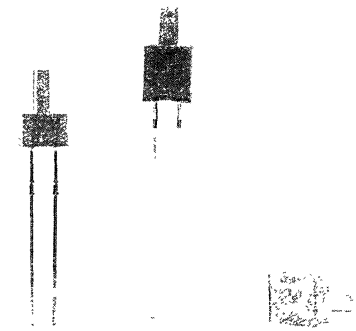
LTL-1204A/717R	RED	LTL-1254A/717Y	YELLOW
LTL-1214A/717P	BRIGHT RED	LTL-1274A/717A	AMBER
LTL-1224A/717HR	HIGH EFFICIENCY RED	LTL-1294A	ORANGE
LTL-1234A/717G	GREEN		

FEATURES

- LOW POWER CONSUMPTION.
- SUITABLE FOR PULSED OPERATION.
- MOST SUITABLE FOR USE LIKE AUDIO PANEL INDICATOR.
- FITS 2mm HOLE IN PANELS UP TO 4.5 mm (0.177") THICK.
- LONG LIFE-SOLID STATE RELIABILITY.

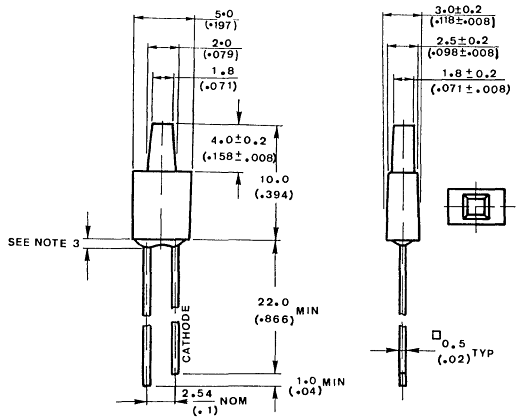
DESCRIPTION

The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

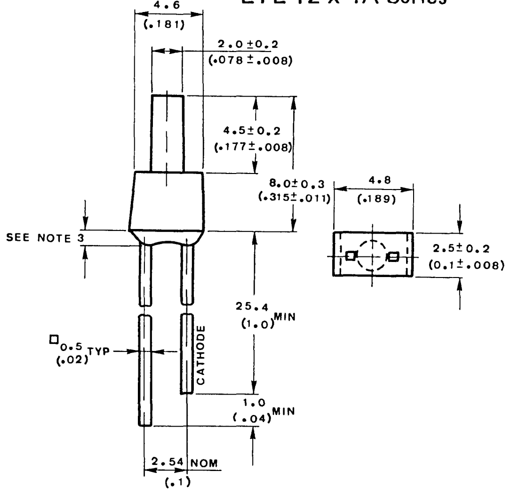


PACKAGE DIMENSIONS

LTL-717 x Series



LTL-12 x 4A Series



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
1204A	Red	Diffused	Red
1214A	Red	Diffused	Bright Red
1224A	Red	Diffused	Hi. Eff. Red
1234A	Green	Diffused	Green
1254A	Yellow	Diffused	Yellow
1274A	Amber	Diffused	Amber
1294A	Orange	Diffused	Orange

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
717R	Red	Diffused	Red
717P	Red	Diffused	Bright Red
717HR	Red	Diffused	Hi. Eff. Red
717G	Green	Diffused	Green
717Y	Yellow	Diffused	Yellow
717A	Amber	Diffused	Amber

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C					
Storage Temperature Range	–55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

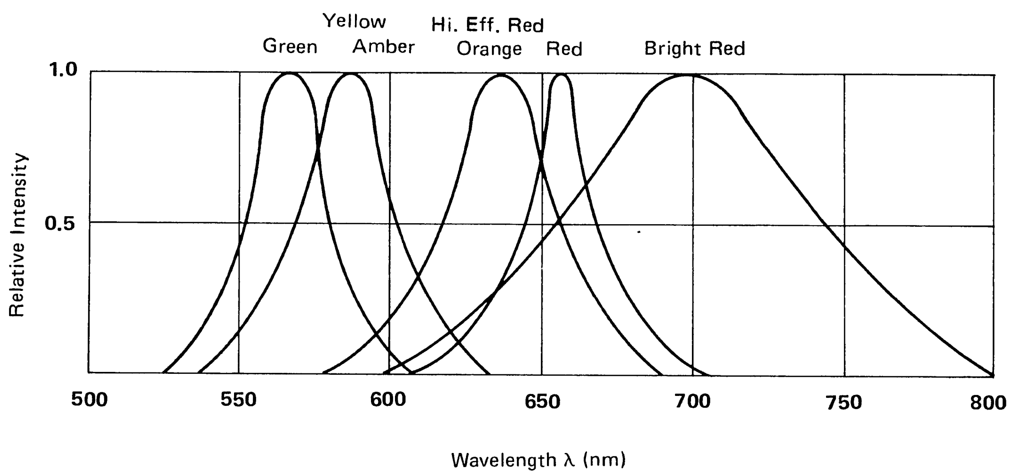


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	1204A 1214A 717R 717P	0.06 0.2 0.06 0.2	0.1 0.6 0.1 0.6		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	1204A 1214A 717R 717P		120 120 110 110		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	1204A 1214A 717R 717P		655 697 655 697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	1204A 1214A 717R 717P		24 90 24 90		nm	
Forward Voltage	V_F	1204A 1214A 717R 717P		1.7 2.1 1.7 2 1	2.0 2.8 2.0 2.8	V	I_F = 20 mA
Reverse Current	I_R	1204A 1214A 717R 717P			100	μA	V_R = 5V
Capacitance	C	1204A 1214A 717R 717P		30 55 30 55		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

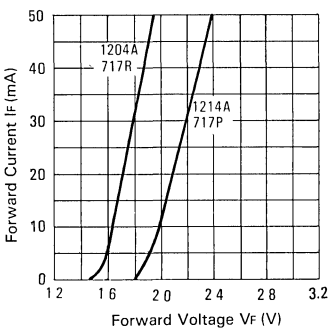


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

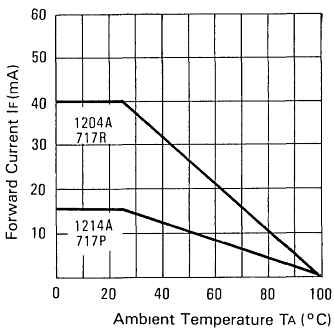


FIG 3 FORWARD CURRENT DERATING CURVE

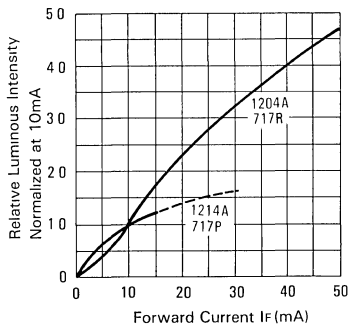


FIG. 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

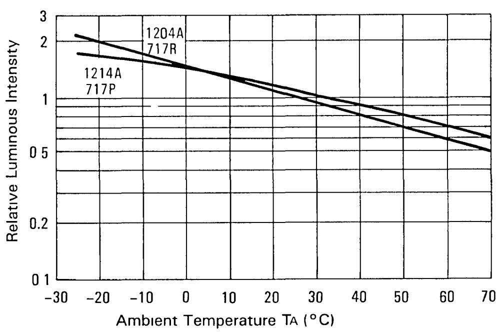


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

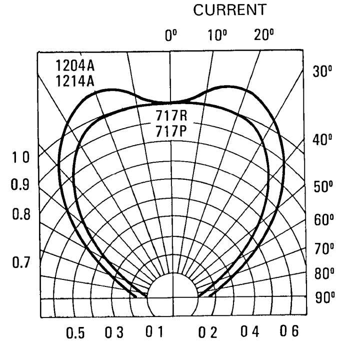


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	1224A 717HR	0.4 0.4	1.3 1.3		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	1224A 717HR		120 110		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	1224A 717HR		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	1224A 717HR		40		nm	
Forward Voltage	V_F	1224A 717HR		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	1224A 717HR			100	μA	V_R = 5V
Capacitance	C	1224A 717HR		20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

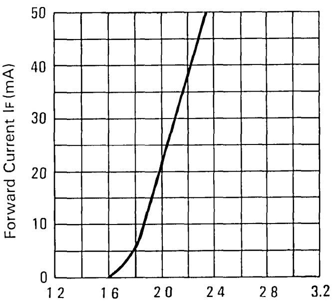


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE

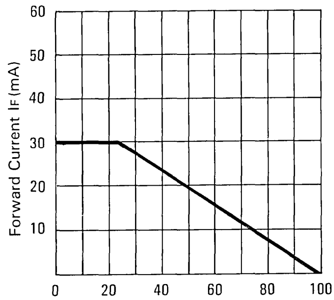


FIG. 8 FORWARD CURRENT DERATING CURVE

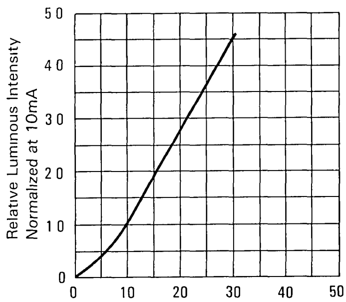


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

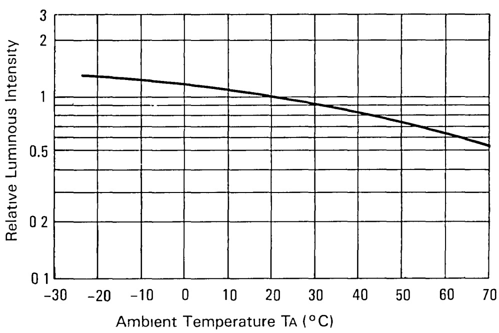


FIG 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

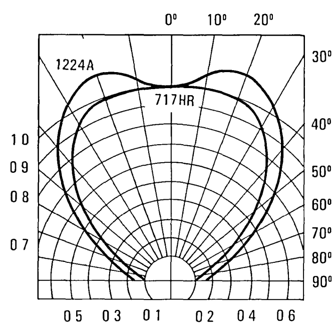


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	1234A 1254A 717G 717Y	0.4 0.3 0.5 0.7	1.3 1.0 1.7 2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	1234A 1254A 717G 717Y		120 120 110 110		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	1234A 1254A 717G 717Y		565 585 565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	1234A 1254A 717G 717Y		30 35 30 35		nm	
Forward Voltage	V_F	1234A 1254A 717G 717Y		2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	1234A 1254A 717G 717Y			100	μA	V_R = 5 V
Capacitance	C	1234A 1254A 717G 717Y		35 15 35 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

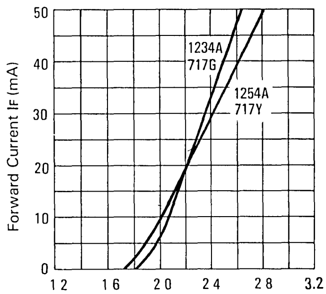


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

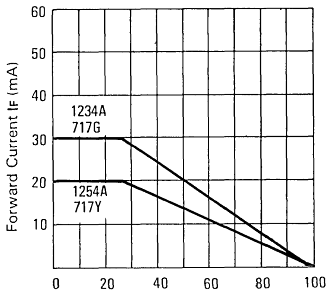


FIG 13 FORWARD CURRENT DERATING CURVE

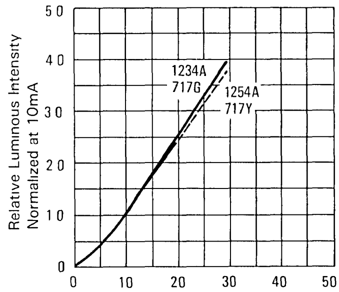


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

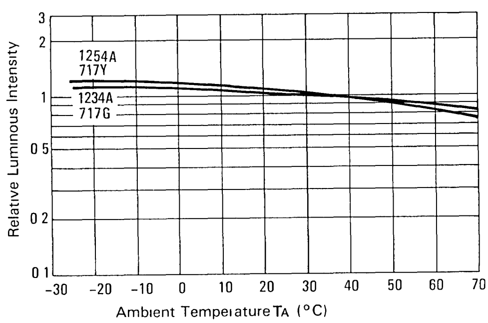


FIG 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

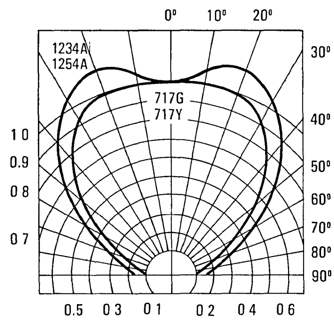


FIG 16 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	1274A 1294A 717A	0.3 0.4 0.5	1.0 1.3 1.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	1274A 1294A 717A		120 120 110		deg.	Note (Fig. 21)
Peak Emission Wavelength	λPEAK	1274A 1294A 717A		600 630 600		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	1274A 1294A 717A		35 40 35		nm	
Forward Voltage	V_F	1274A 1294A 717A		2.1 2.0 2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	1274A 1294A 717A			100	μA	V_R = 5V
Capacitance	C	1274A 1294A 717A		15 20 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

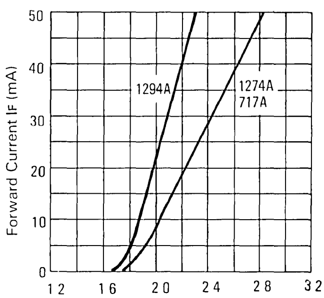


FIG 17 FORWARD CURRENT VS FORWARD VOLTAGE

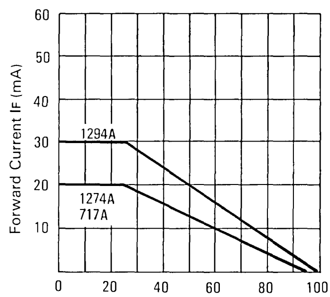


FIG 18 FORWARD CURRENT DERATING CURVE

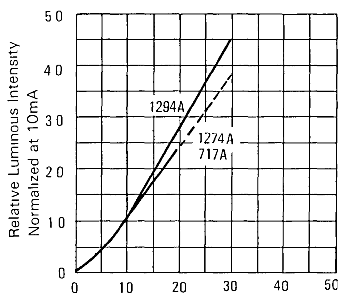


FIG 19 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

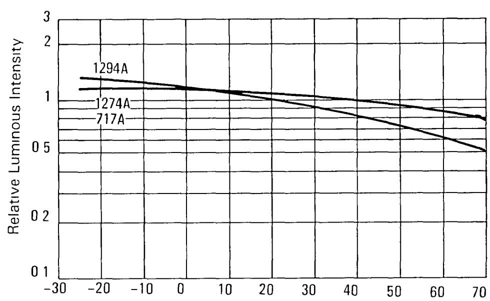


FIG 20 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

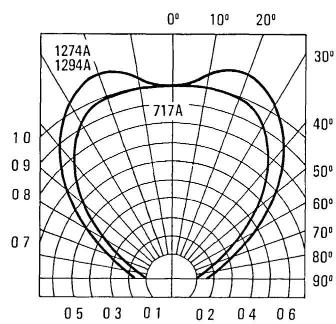


FIG 21 SPATIAL DISTRIBUTION

LED LAMPS

LITEON

1.5×5.0 RECTANGULAR BAR LED LAMPS

LTL-723R RED
LTL-723P BRIGHT RED
LTL-723HR HIGH EFFICIENCY RED
LTL-723G GREEN
LTL-723Y YELLOW
LTL-723A AMBER

FEATURES

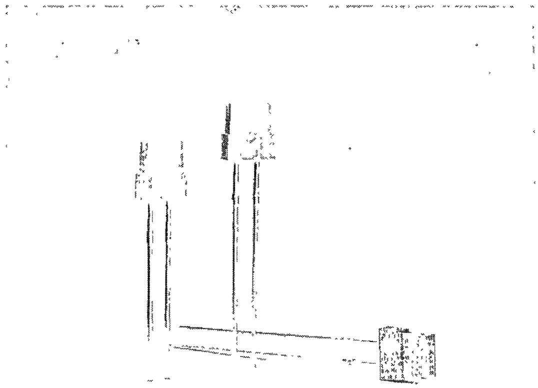
- LOW POWER CONSUMPTION.
- SUITABLE FOR PULSED OPERATION.
- MOST SUITABLE FOR USE LIKE AUDIO PANEL INDICATOR.
- FITS 1.5x5 mm HOLE IN PANELS UP TO 3.5 mm THICK.
- LONG LIFE-SOLID STATE RELIABILITY.

DESCRIPTION

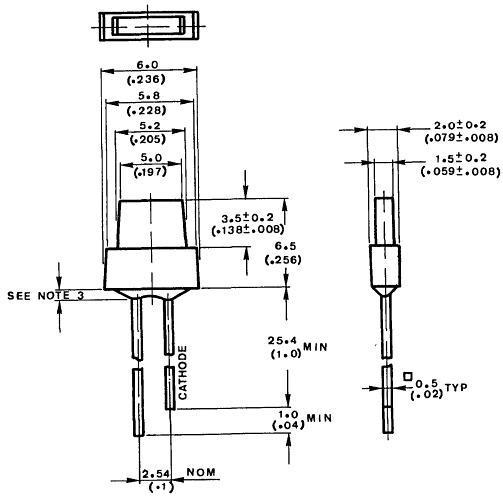
The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE
	COLOR	DIFFUSION	COLOR
723R	Red	Diffused	Red
723P	Red	Diffused	Bright Red
723HR	Red	Diffused	Hi, Eff.Red
723G	Green	Diffused	Green
723Y	Yellow	Diffused	Yellow
723A	Amber	Diffused	Amber



PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	−55°C to +100°C					
Storage Temperature Range	−55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

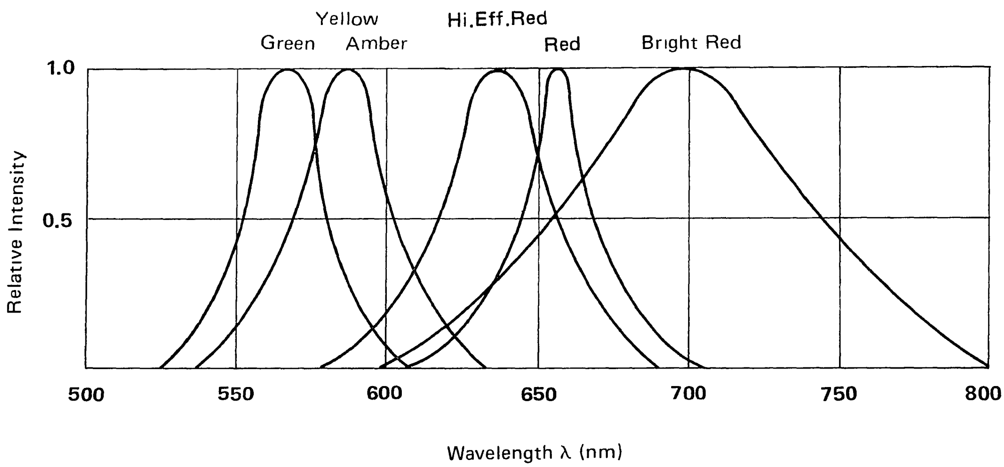


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT.	TEST CONDITION
Luminous Intensity	Iv	723R 723P 723E	0.1 0.3 0.5	0.3 0.7 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	723R 723P 723E		88°		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	723R 723P 723E		655 697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	723R 723P 723E		24 90 40		nm	
Forward Voltage	V_F	723R 723P 723E		1.7 2.1 2.0	2.0 2.8 2.8	V	I_F = 20 mA
Reverse Current	I_R	723R 723P 723E			100	μA	V_R = 5 V
Capacitance	C	723R 723P 723E		30 55 20		PF	V_F = 0 f = 1 MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

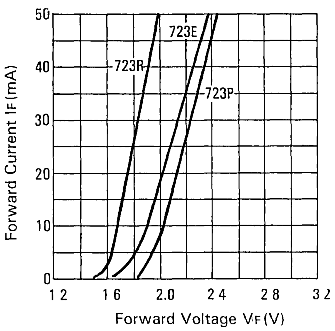


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

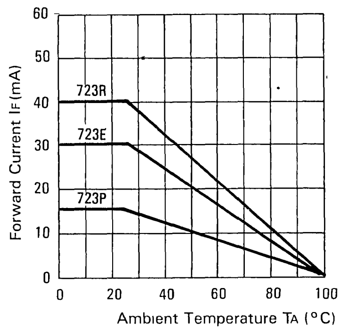


FIG. 3 FORWARD CURRENT DERATING CURVE

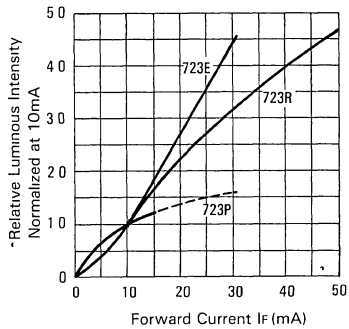


FIG. 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

FIG 11

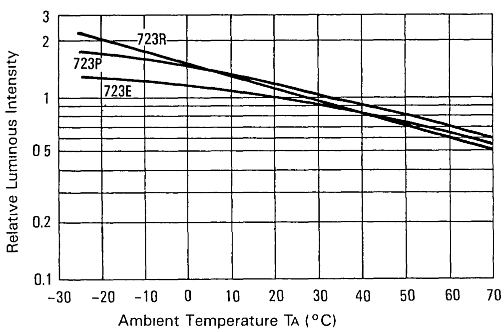


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

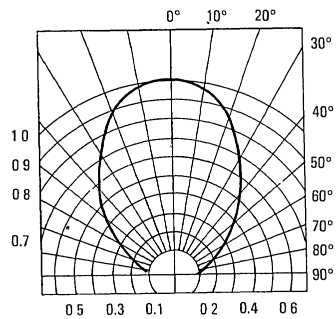


FIG 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT.	TEST CONDITION
Luminous Intensity	Iv	723G 723Y	0.7 0.7	2 5 2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	723G 723Y		88°		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	723G 723Y		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	723G 723Y		30 35		nm	
Forward Voltage	V_F	723G 723Y		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	723G 723Y			100	μA	V_R = 5 V
Capacitance	C	723G 723Y		35 15		PF	V_F = 0 f = 1 MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity

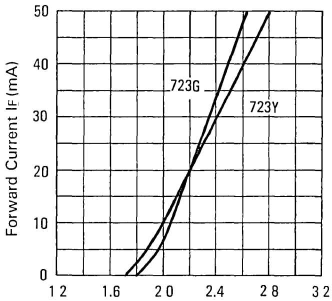


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

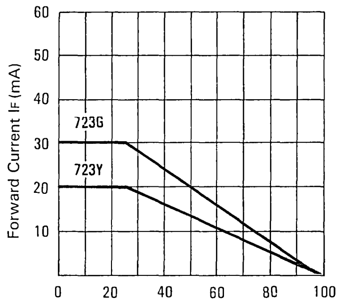


FIG 8 FORWARD CURRENT DERATING CURVE

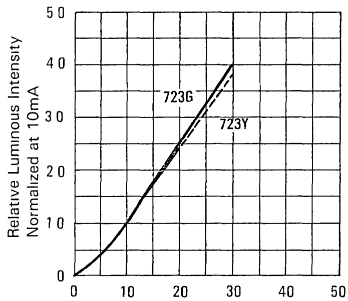


FIG. 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

FIG 6

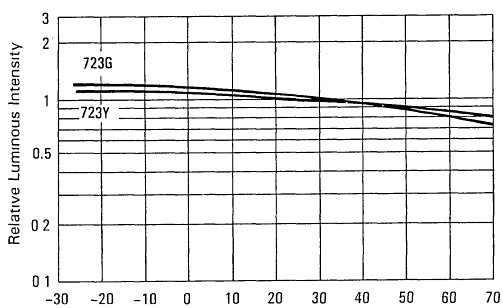


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

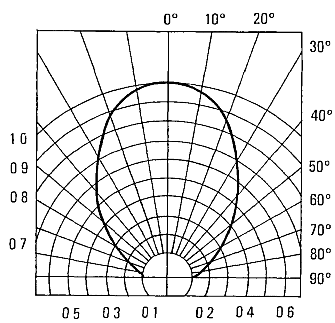


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT.	TEST CONDITION
Luminous Intensity	Iv	723A	0.7	2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	723A		88		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK			600		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			35		nm	
Forward Voltage	V_F			2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5 V
Capacitance	C			15		PF	V_F = 0 f = 1 MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

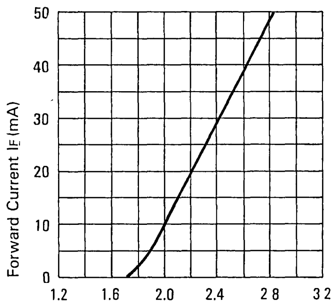


FIG. 12 FORWARD CURRENT VS FORWARD VOLTAGE

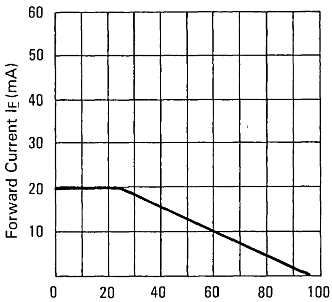


FIG. 13 FORWARD CURRENT DERATING CURVE

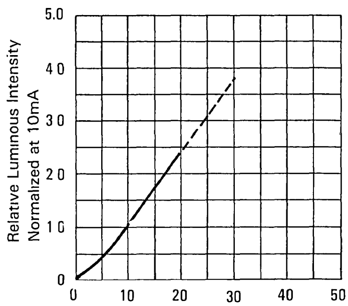


FIG. 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

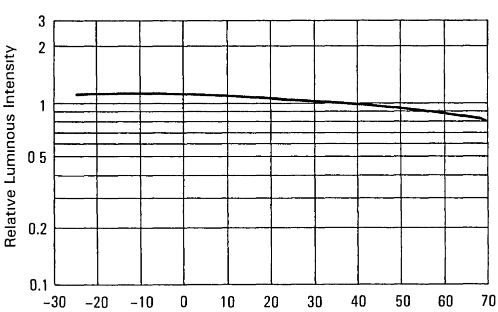


FIG. 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

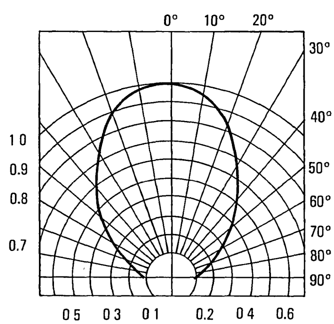


FIG. 16 SPATIAL DISTRIBUTION

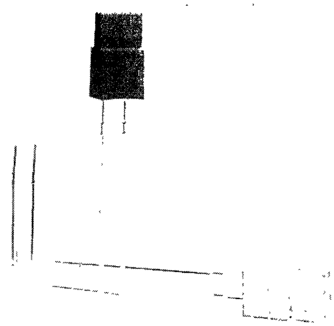
LITEON

2×5 RECTANGULAR BAR LED LAMPS

LTL-757P BRIGHT RED LTL-757G GREEN
LTL-757E HIGH EFFICIENCY RED LTL-757Y YELLOW

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.



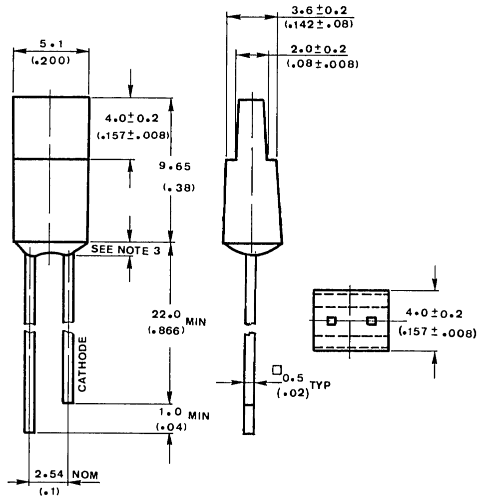
DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red source color Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
757P	Red	Diffused	Bright Red
757E	Red	Diffused	Hi. Eff. Red
757G	Green	Diffused	Green
757Y	Yellow	Diffused	Yellow

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

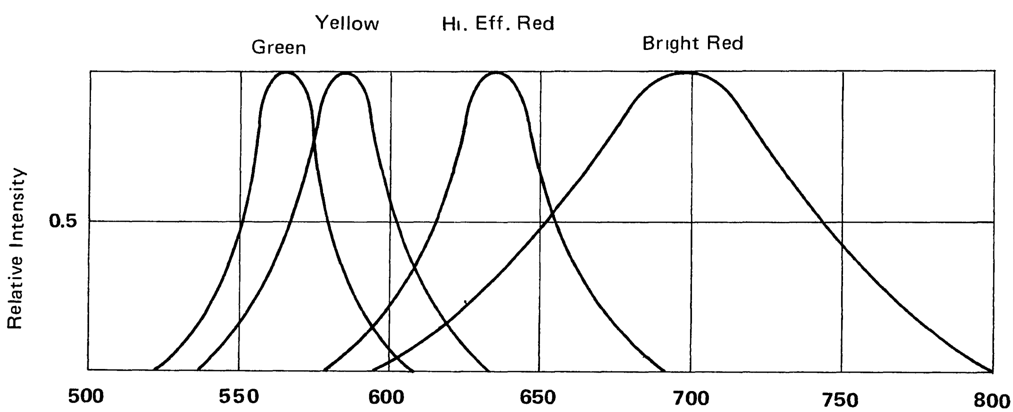


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	757P 757E	0.1 0.4	0.4 1.1		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	757P 757E		130		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	757P 757E		697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	757P 757E		90 40		nm	
Forward Voltage	V_F	757P 757E		2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	757P 757E			100	μA	V_R = 5V
Capacitance	C	757P 757E		55 20		PF	V_F = 0 f = 1 MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

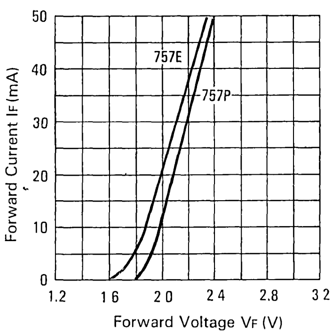


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

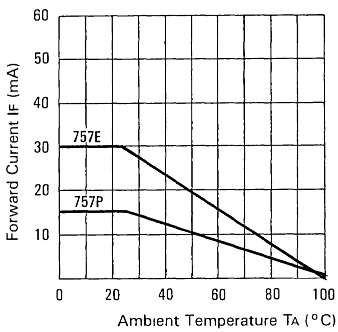


FIG. 3 FORWARD CURRENT DERATING CURVE

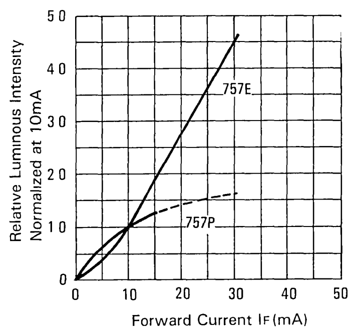


FIG. 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

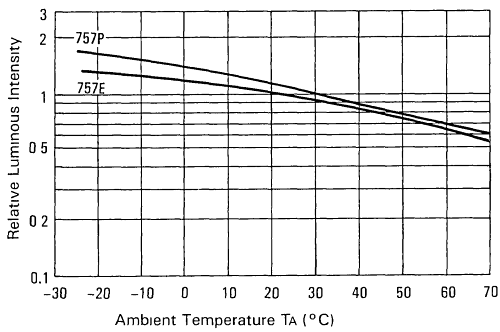


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

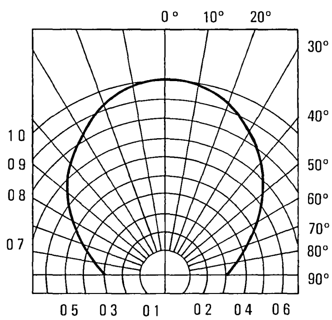


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	757G 757Y	0.6 0.7	1.7 2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	757G 757Y		130		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	757G 757Y		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	757G 757Y		30 35		nm	
Forward Voltage	V_F	757G 757Y		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	757G 757Y			100	μA	V_R = 5V
Capacitance	C	757G 757Y		35 15		PF	V_F = 0 f = 1 MHz

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

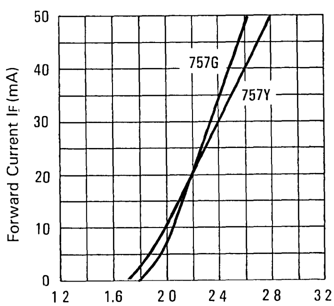


FIG 7 FORWARD CURRENT VS. FORWARD VOLTAGE

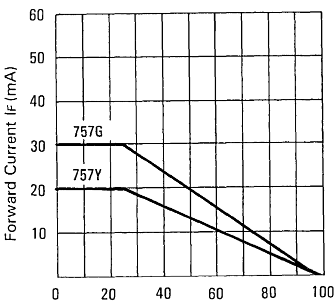


FIG 8 FORWARD CURRENT DERATING CURVE

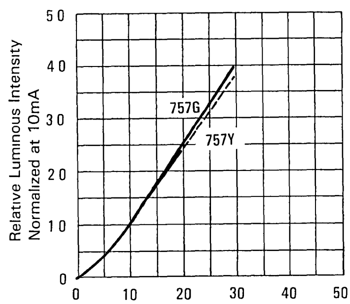


FIG. 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

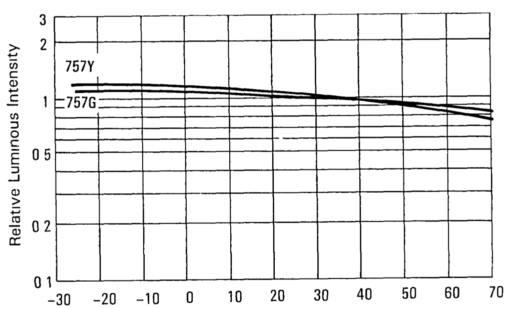


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

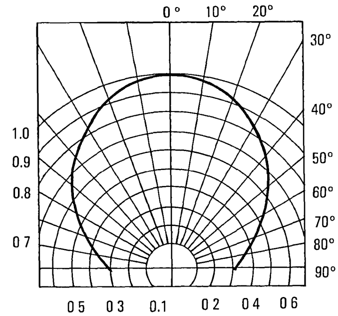


FIG 11 SPATIAL DISTRIBUTION

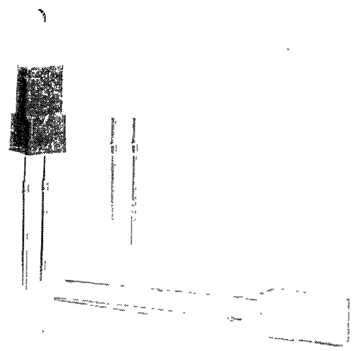
LITEON

2×5 RECTANGULAR BAR LED LAMPS

LTL-767P BRIGHT RED LTL-767G GREEN
LTL-767E HIGH EFFICIENCY RED LTL-767Y YELLOW

FEATURES

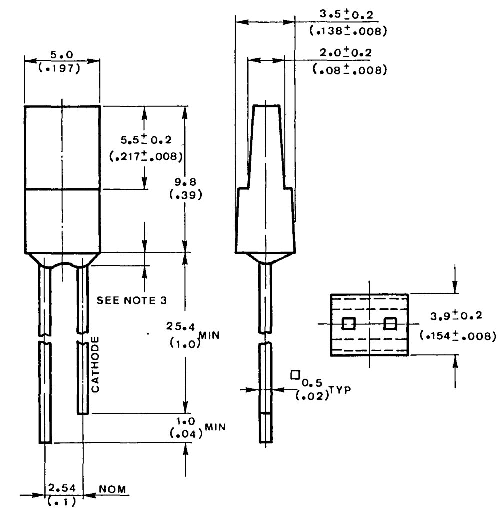
- LOW POWER CONSUMPTION
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.



DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red Source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
767P	Red	Diffused	Bright Red
767E	Red	Diffused	Hi. Eff. Red
767G	Green	Diffused	Green
767Y	Yellow	Diffused	Yellow

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW	HI.EFF.RED	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Detating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds				

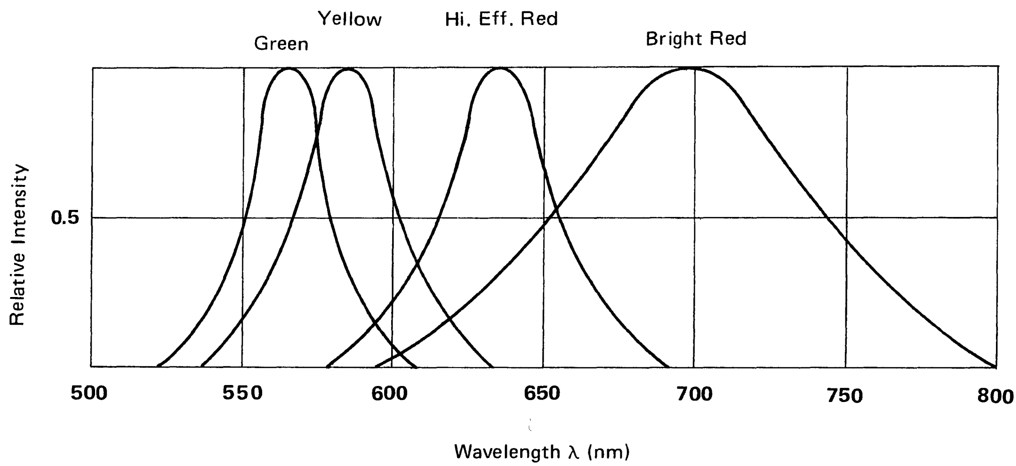


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	767P 767E	0.1 0.6	0 4 1 7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	767P 767E		140		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	767P 767E		697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	767P 767E		90 40		nm	
Forward Voltage	V_F	767P 767E		2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	767P 767E			100	μA	V_R = 5V
Capacitance	C	767P 767E		55 20		PF	V_F = 0 f = 1 MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensitv

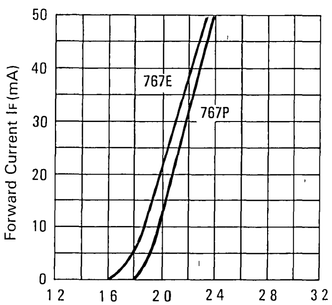


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

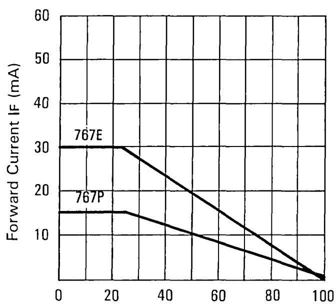


FIG. 3 FORWARD CURRENT DERATING CURVE

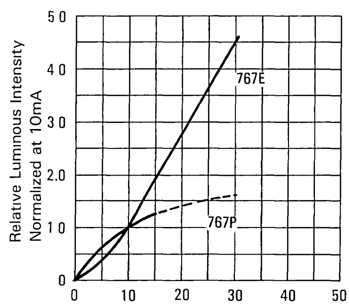


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

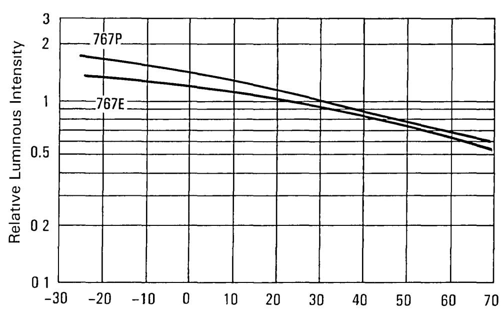


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

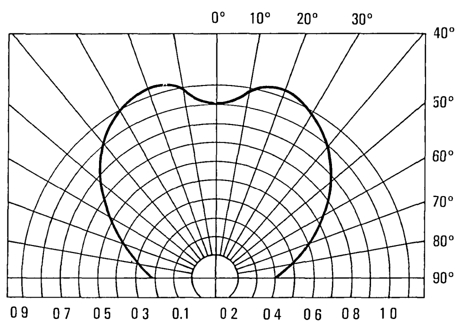


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	767G 767Y	0.4 0.5	1.0 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	767G 767Y		140		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	767G 767Y		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	767G 767Y		30 35		nm	
Forward Voltage	V_F	767G 767Y		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	767G 767Y			100	μA	V_R = 5V
Capacitance	C	767G 767Y		35 15		PF	V_F = 0 f = 1 MHz

NOTES 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

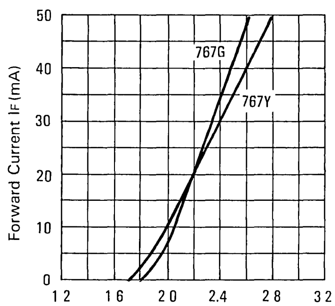


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE

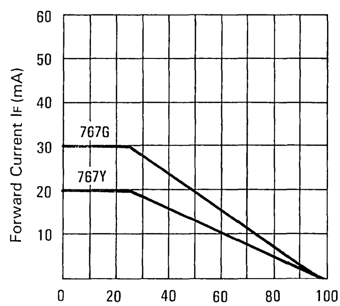


FIG. 8 FORWARD CURRENT DERATING CURVE

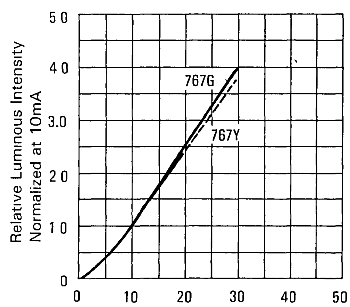


FIG. 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

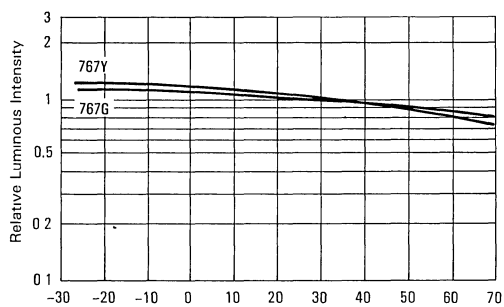


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

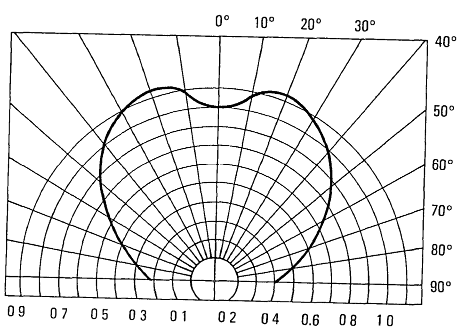


FIG 11 SPATIAL DISTRIBUTION

ARROWHEAD POINTERS LED LAMPS

LITEON

LTL-8212A BRIGHT RED
LTL-8222A HIGH EFFICIENCY RED
LTL-8232A GREEN
LTL-8252A YELLOW
LTL-8292A ORANGE

FEATURES

- HIGH VISIBILITY POINT SOURCE.
- MOST SUITABLE FOR DIRECTION INDICATOR OF TAPE RECODER.
- RELIABLE AND RUGGED.
- I.C. COMPATIBLE/LOW CURRENT REQUIREMENTS.
- LOW POWER CONSUMPTION.

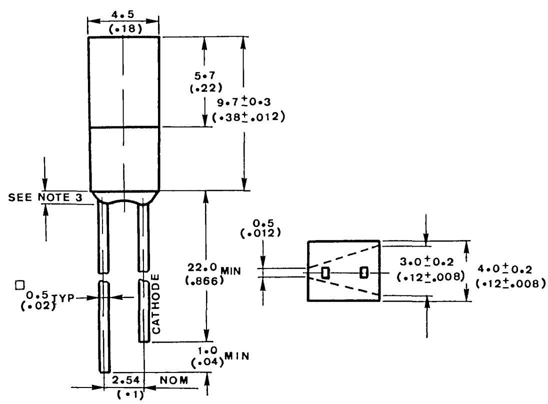
DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
8212A	Red	Diffused	Bright Red
8222A	Red	Diffused	Hi. Eff. Red
8232A	Green	Diffused	Green
8252A	Yellow	Diffused	Yellow
8292A	Orange	Diffused	Orange

PACKAGE DIMENSION



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

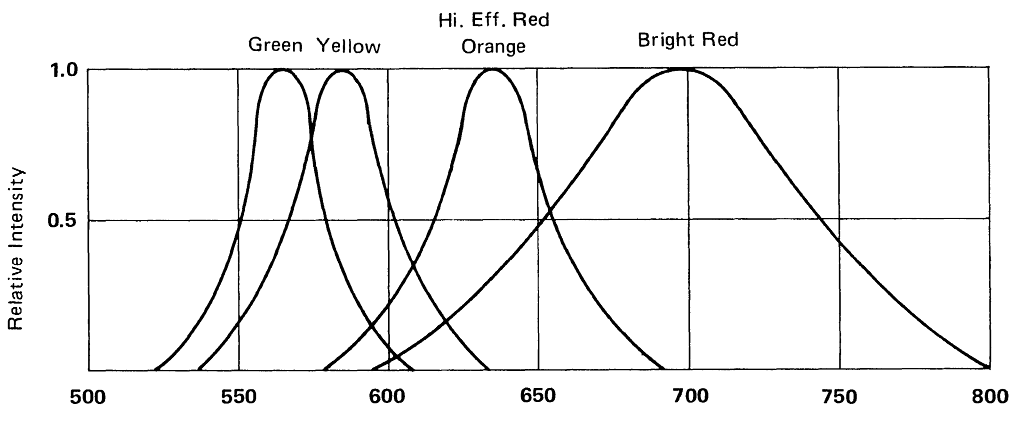
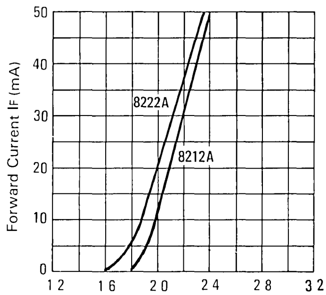


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

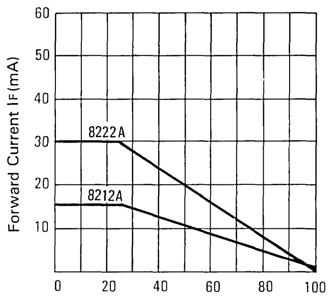
ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	8212A 8222A	0.2 0.4	0.6 1.1		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta ½$	8212A 8222A		100		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	8212A 8222A		697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	8212A 8222A		90 40		nm	
Forward Voltage	V_F	8212A 8222A		2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	8212A 8222A			100	μA	V_R = 5V
Capacitance	C	8212A 8222A		55 20		PF	V_F = 0 f = 1MHZ

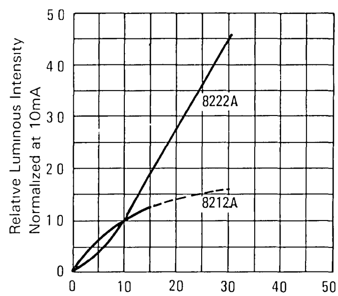
NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.



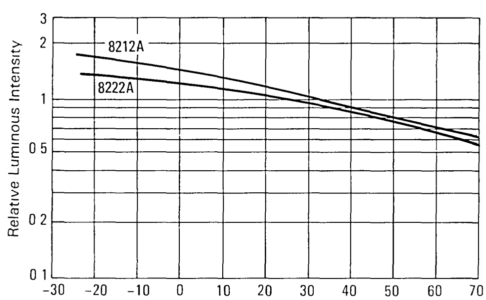
Forward Voltage VF (V)
FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE



Ambient Temperature TA (°C)
FIG 3 FORWARD CURRENT DERATING CURVE



Forward Current IF (mA)
FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT



Ambient Temperature TA (°C)
FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

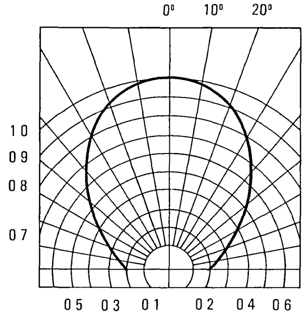


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	8232A 8252A	0.4 0.4	1.1 1.1		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	8232A 8252A		100		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	8232A 8252A		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	8232A 8252A		30 35		nm	
Forward Voltage	V_F	8232A 8252A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	8232A 8252A			100	μA	V_R = 5V
Capacitance	C	8232A 8252A		35 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

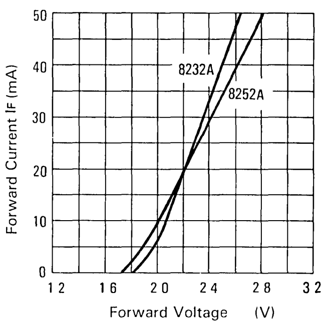


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

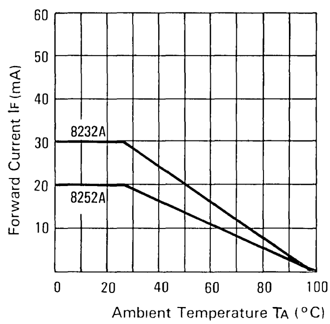


FIG 8 FORWARD CURRENT DERATING CURVE

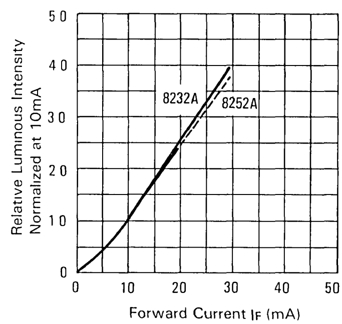


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

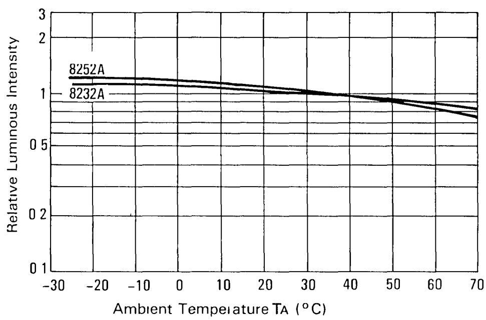


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

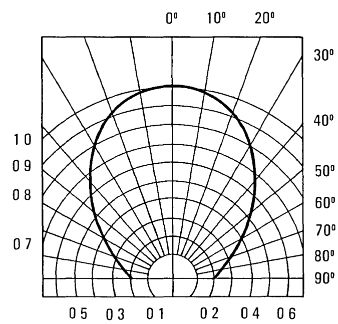


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	8292A	0.5	1.1		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	8292A		100		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

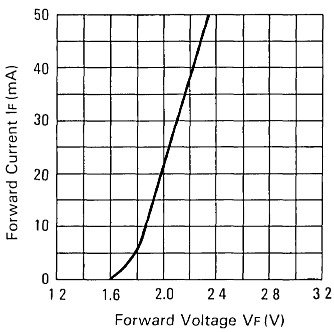


FIG 12 FORWARD CURRENT VS. FORWARD VOLTAGE

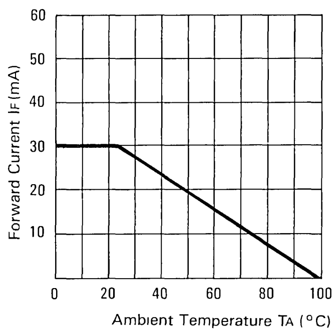


FIG 13 FORWARD CURRENT DERATING CURVE

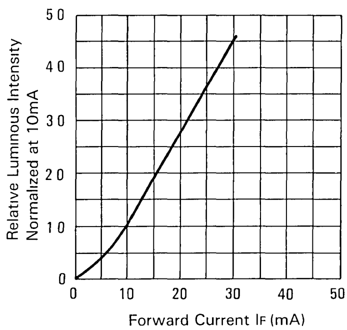


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

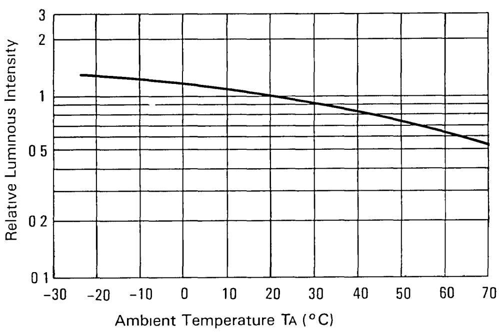


FIG 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

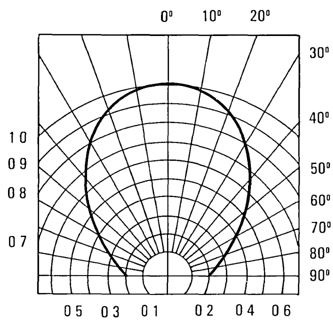


FIG 16 SPATIAL DISTRIBUTION

LED LAMPS

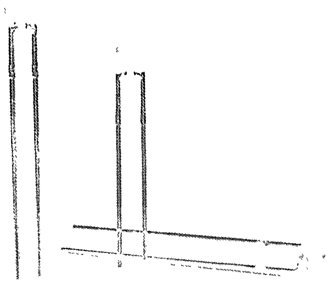
LITEON

(3mm) CYLINDRICAL LED LAMPS

LTL-2201AL RED
LTL-2211AL BRIGHT RED
LTL-2221AL HIGH EFFICIENCY RED
LTL-2231AL GREEN
LTL-2251AL YELLOW
LTL-2271AL AMBER
LTL-2291AL ORANGE

FEATURES

- CYLINDRICAL SHAPE.
- I.C. COMPATIBLE.
- LOW POWER CONSUMPTION.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW COST.



DESCRIPTION

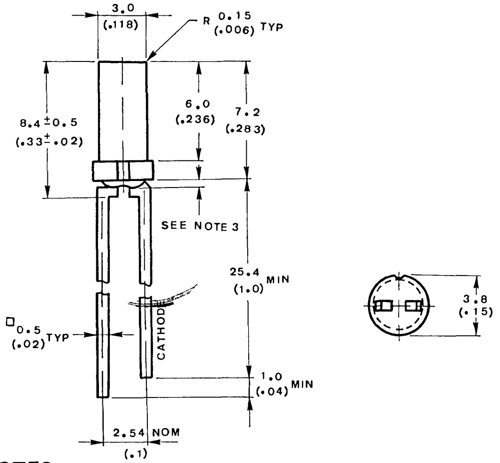
The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
2201AL	Red	Diffused	Red
2211AL	Red	Diffused	Bright Red
2221AL	Red	Diffused	Hi. Eff. Red
2231AL	Green	Diffused	Green
2251AL	Yellow	Diffused	Yellow
2271AL	Amber	Diffused	Amber
2291AL	Orange	Diffused	Orange

PACKAGE DIMENSIONS

LTL-22 x 1AL Series



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW AMBER	HI.EFF.RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	– 55°C to + 100°C					
Storage Temperature Range	– 55°C to + 100°C					
Lead Solering Temperature [1.6mm (0 063in) From Body]	260°C for 5 Seconds					

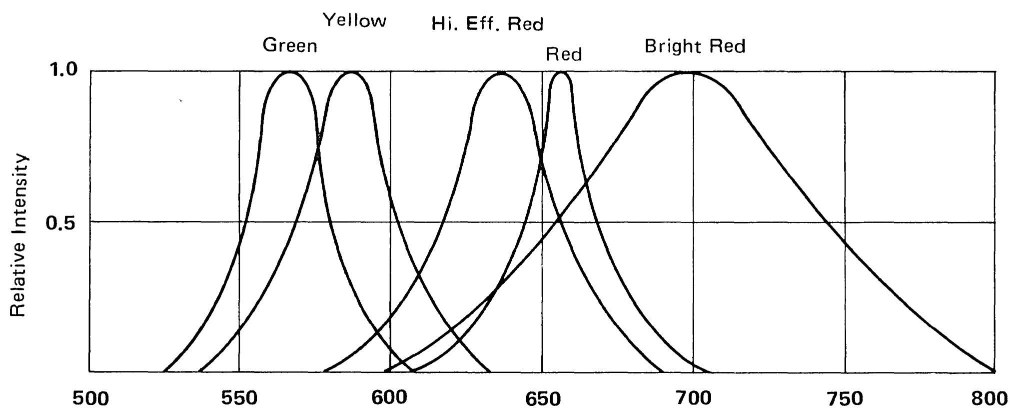


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	2201AL 2211AL	0.1 0.4	0.2 1.1		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	2201AL 2211AL		180		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	2201AL 2211AL		655 697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	2201AL 2211AL		24 90		nm	
Forward Voltage	V_F	2201AL 2211AL		1.7 2.1	2.0 2.8	V	I_F = 20mA
Reverse Current	I_R	2201AL 2211AL			100	μA	V_R = 5 V
Capacitance	C	2201AL 2211AL		30 55		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

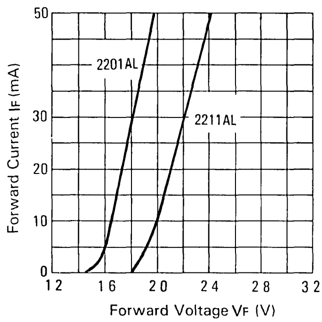


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

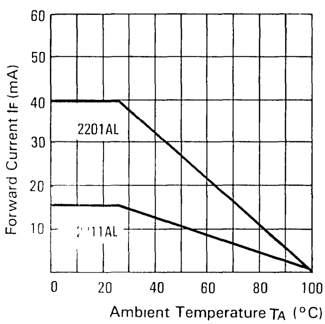


FIG 3 FORWARD CURRENT DERATING CURVE

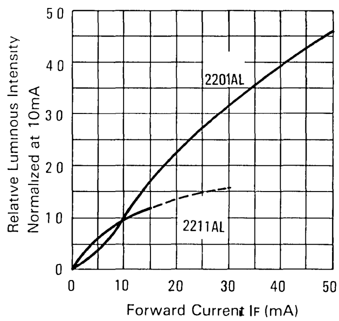


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

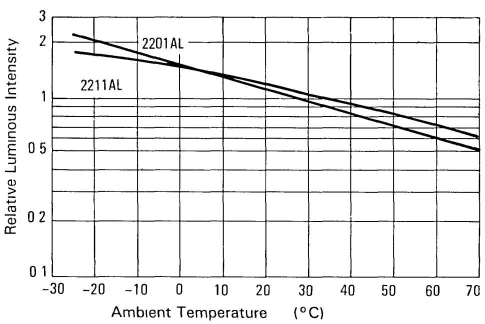


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

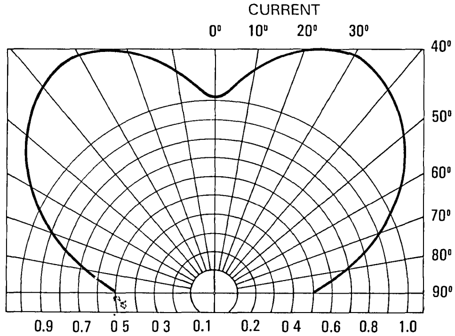


FIG 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	2221AL	0.5	1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta ½$	2221AL		180		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ PEAK	2221AL		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	2221AL		40		nm	
Forward Voltage	V_F	2221AL		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	2221AL			100	μA	V_R = 5V
Capacitance	C	2221AL		20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

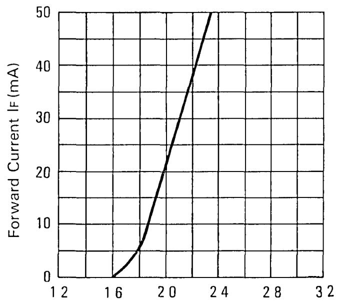


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

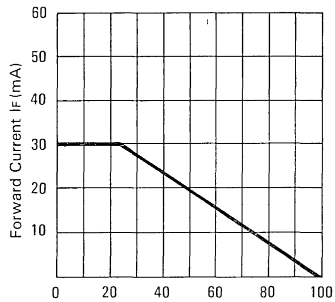


FIG 8 FORWARD CURRENT DERATING CURVE

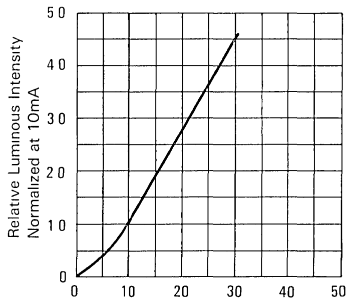


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

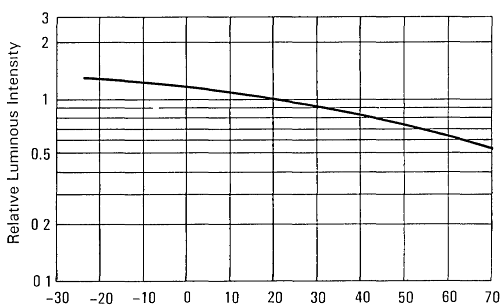


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

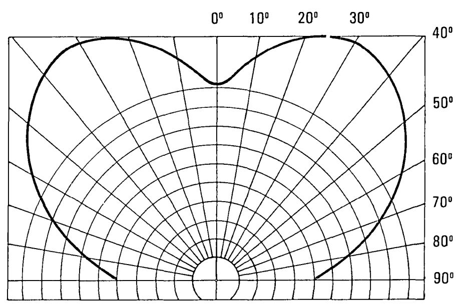


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	2231AL 2251AL	0.6 0.7	1.7 2.5		mcd	I_F = 10mA Note 1
Viewing Angle	2θ½	2231AL 2251AL		180		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	2231AL 2251AL		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	2231AL 2251AL		30 35		nm	
Forward Voltage	V_F	2231AL 2251AL		2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	2231AL 2251AL			100	μA	V_R = 5 V
Capacitance	C	2231AL 2251AL		35 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

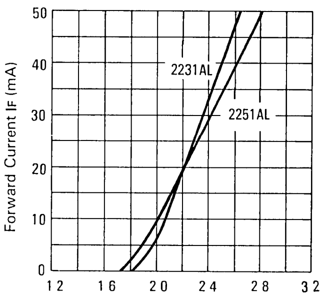


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

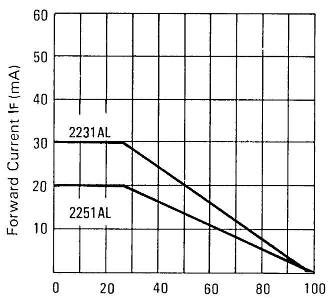


FIG 13 FORWARD CURRENT DERATING CURVE

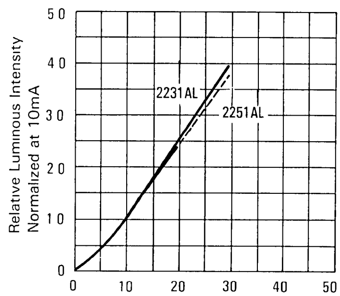


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

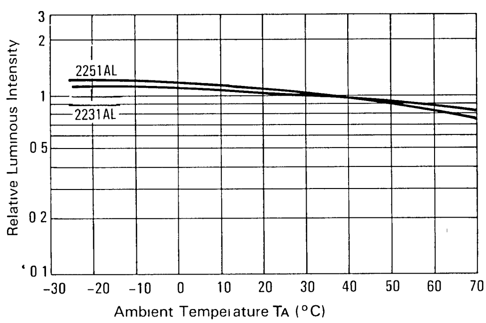


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

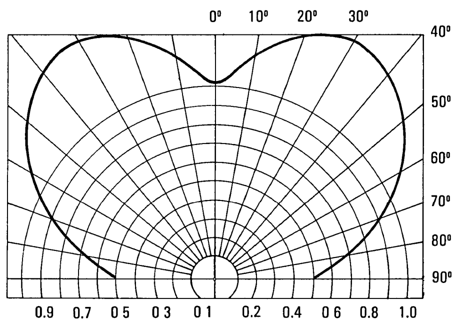


FIG 16 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	2271AL 2291AL	0.7 0.5	2.5 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta\frac{1}{2}$	2271AL 2291AL		180		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λPEAK	2271AL 2291AL		600 630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	2271AL 2291AL		35 40		nm	
Forward Voltage	V_F	2271AL 2291AL		2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	2271AL 2291AL			100	μA	V_R = 5V
Capacitance	C	2271AL 2291AL		15 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

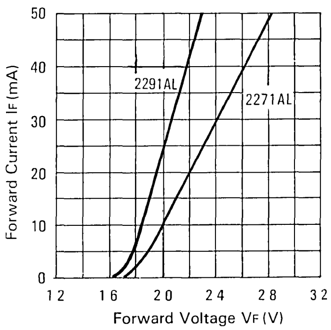


FIG 17 FORWARD CURRENT VS FORWARD VOLTAGE

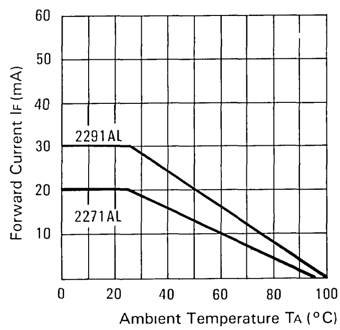


FIG 18 FORWARD CURRENT DERATING CURVE

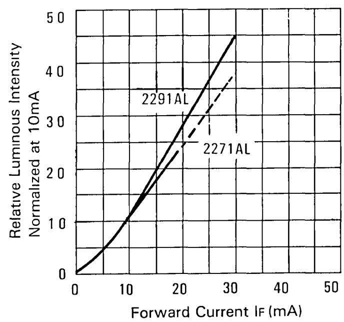


FIG 19 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

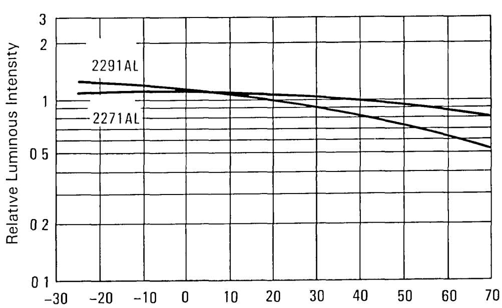


FIG 20 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

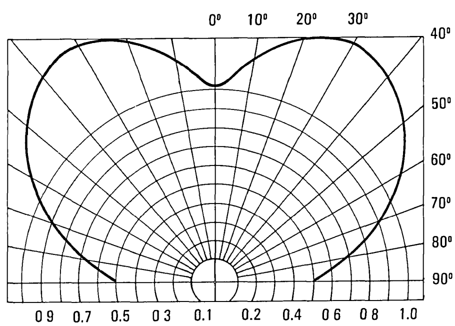


FIG 21 SPATIAL DISTRIBUTION

LED LAMPS

(5mm) CYLINDRICAL LED LAMPS

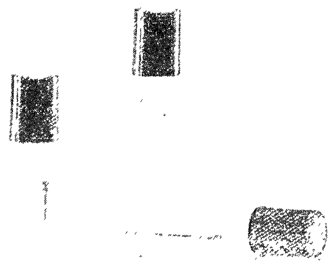
LTL-2203A RED
LTL-2213A BRIGHT RED
LTL-2223A HIGH EFFICIENCY RED
LTL-2233A GREEN
LTL-2253A YELLOW
LTL-2293A ORANGE

FEATURES

- CYLINDRICAL SHAPE.
- I.C. COMPATIBLE.
- LOW POWER CONSUMPTION.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW COST.

DESCRIPTION

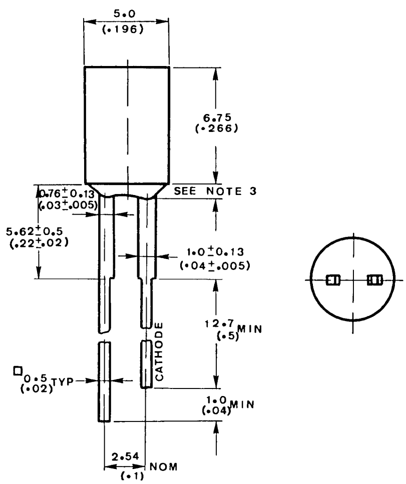
The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.



DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
2203A	Red	Diffused	Red
2213A	Red	Diffused	Bright Red
2223A	Red	Diffused	Hi.Eff. Red
2233A	Green	Diffused	Green
2253A	Yellow	Diffused	Yellow
2293A	Orange	Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25^\circ C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI.EFF.RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	– 55°C to + 100°C					
Storage Temperature Range	– 55°C to + 100°C					
Lead Solering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

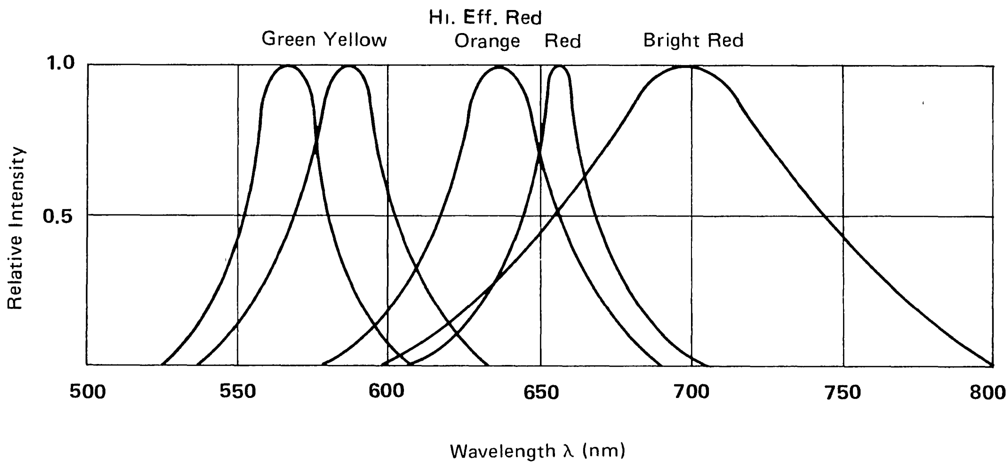


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	2203A 2213A 2223A	0.08 0.1 0.4	0.2 0.3 1.1		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	2203A 2213A 2223A		200		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK	2203A 2213A 2223A		655 697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	2203A 2213A 2223A		24 90 40		nm	
Forward Voltage	V_F	2203A 2213A 2223A		1.7 2.1 2.0	2.0 2.8 2.8	V	I_F = 20 mA
Reverse Current	I_R	2203A 2213A 2223A			100	μA	V_R = 5V
Capacitance	C	2203A 2213A 2223A		30 55 20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

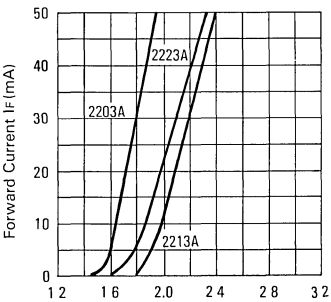


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

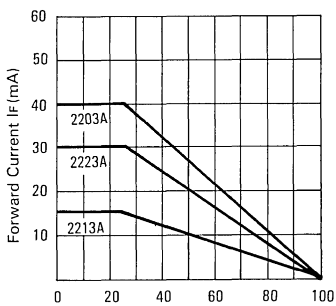


FIG 3 FORWARD CURRENT DERATING CURVE

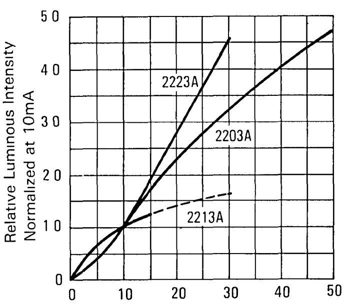


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

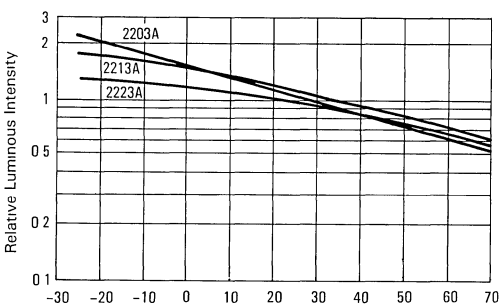


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

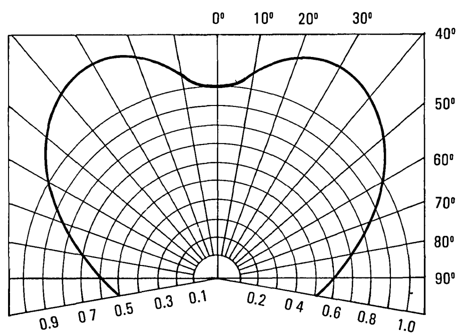


FIG 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	2233A 2253A	0.4 0.4	1.1 1.1		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	2233A 2253A		200		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ PEAK	2233A 2253A		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	2233A 2253A		30 35		nm	
Forward Voltage	V_F	2233A 2253A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	2233A 2253A			100	μA	V_R = 5V
Capacitance	C	2233A 2253A		35 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

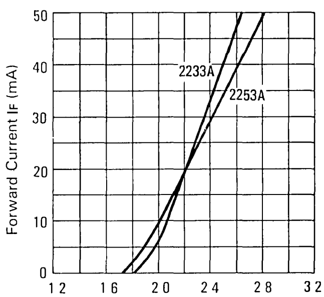


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

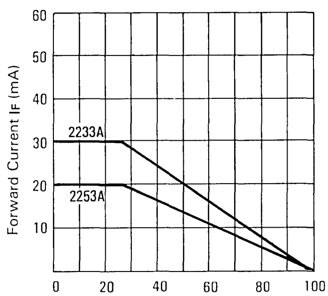


FIG 8 FORWARD CURRENT DERATING CURVE

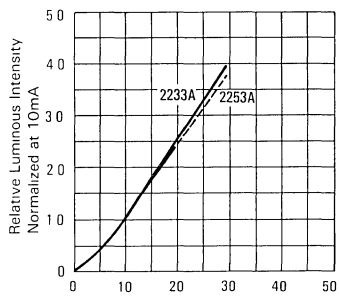


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

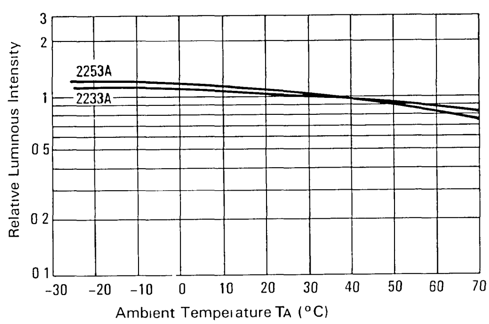


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

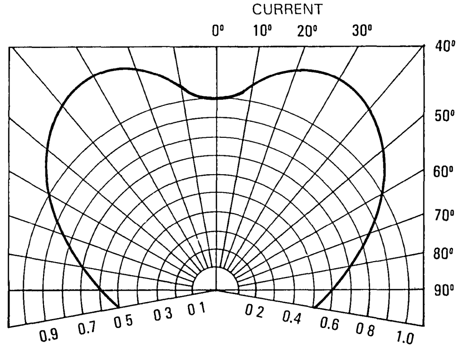


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	2293A	0.4	1.1		mcd	$I_F = 10$ mA Note 1
Viewing Angle	$2\theta_{1/2}$	2293A		200		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			40		nm	
Forward Voltage	V_F			2.0	2.8	V	$I_F = 20$ mA
Reverse Current	I_R				100	μA	$V_R = 5V$
Capacitance	C			20		PF	$V_F = 0$ f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

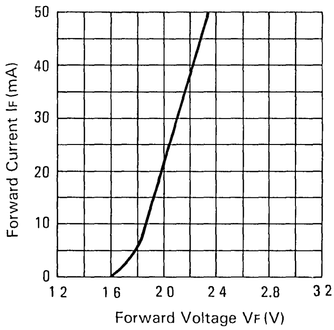


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

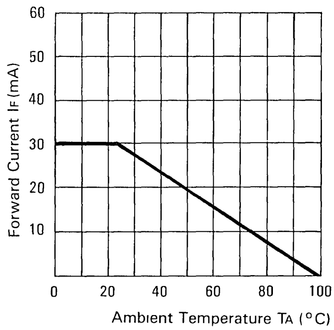


FIG 13 FORWARD CURRENT DERATING CURVE

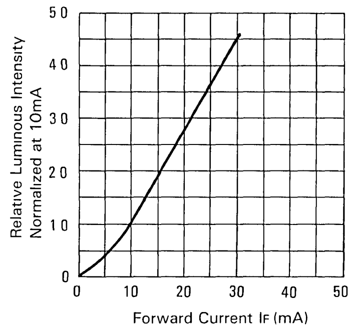


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

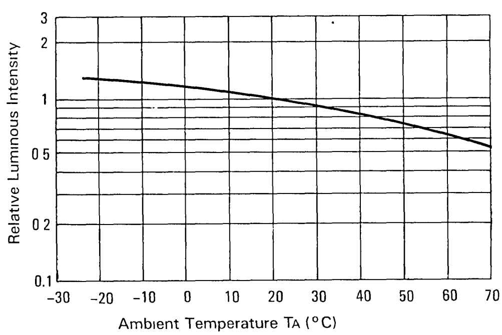


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

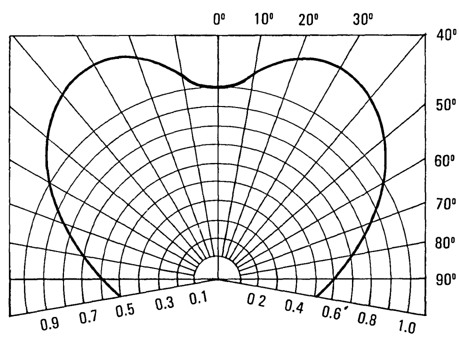


FIG 16 SPATIAL DISTRIBUTION

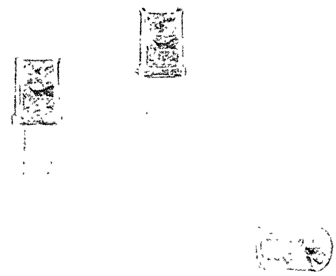
(5mm) CYLINDRICAL LED LAMPS

LITEON

LTL-2214RT/2214WC BRIGHT RED
LTL-2234GT/2234WC GREEN
LTL-2254YT/2254WC YELLOW
LTL-2224RT HIGH EFFICIENCY RED
LTL-2294WC ORANGE

FEATURES

- WIDE VIEWING ANGLE
- LOW POWER CONSUMPTION
- LONG LIFE-SOLID STATE RELIABILITY
- LOW COST.



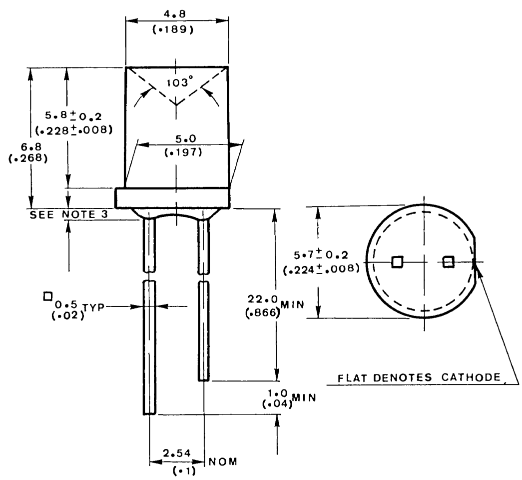
DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
2214RT 2214WC	Red Water Clear	Transparent Non-Diffused	Bright Red
2234GT 2234WC	Green Water Clear	Transparent Non-Diffused	Green
2254YT 2254WC	Yellow Water Clear	Transparent Non-Diffused	Yellow
2224RT	Red	Transparent	Hi. Eff. Red
2294WC	Water Clear	Non-Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YEELOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

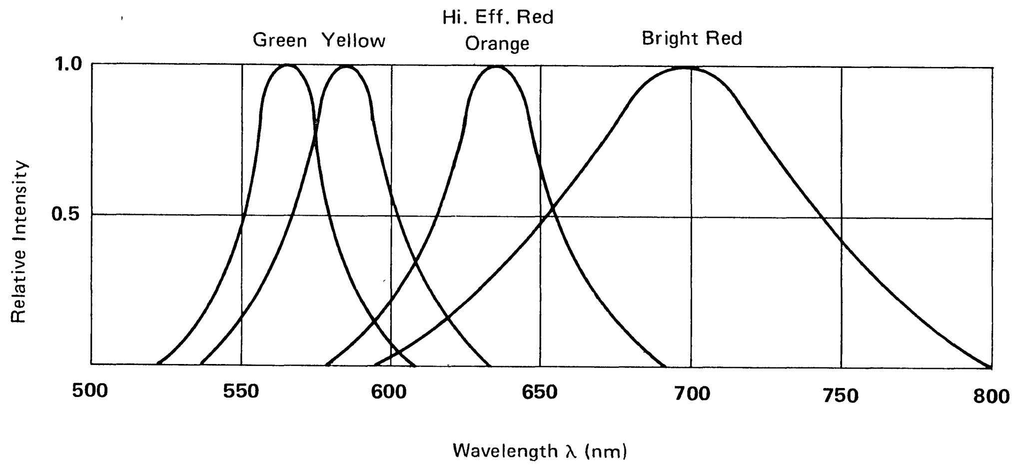


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	2214RT 2214WC	0.2 0.2	0.4 0.4		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta\frac{1}{2}$	2214RT 2214WC		150		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	2214RT 2214WC		697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	2214RT 2214WC		90		nm	
Forward Voltage	V_F	2214RT 2214WC		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	2214RT 2214WC			100	μA	V_R = 5V
Capacitance	C	2214RT 2214WC		55		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

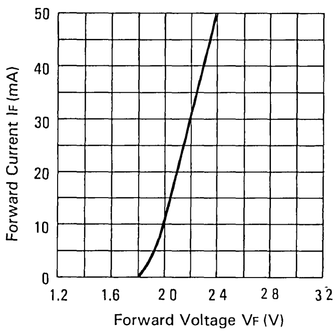


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

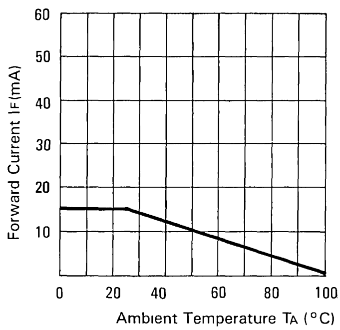


FIG. 3 FORWARD CURRENT DERATING CURVE.

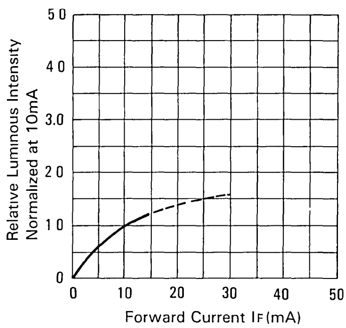


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

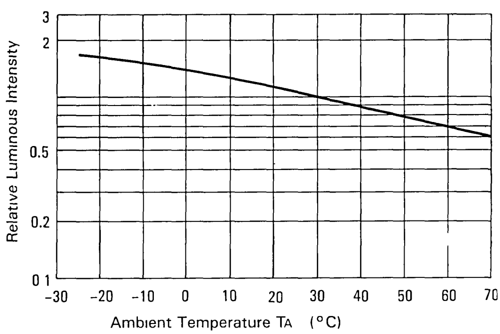


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

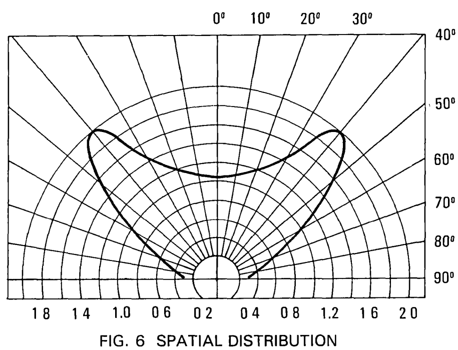


FIG. 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	2234GT 2234WC 2254YT 2254WC	0.5 0.5 0.5 0.5	1.7 1.7 1.7 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	2234GT 2234WC 2254YT 2254WC		150		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	2234GT 2234WC 2254YT 2254WC		565 565 585 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	2234GT 2234WC 2254YT 2254WC		30 30 35 35		nm	
Forward Voltage	V_F	2234GT 2234WC 2254YT 2254WC		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	2234GT 2234WC 2254YT 2254WC			100	μA	V_R = 5V
Capacitance	C	2234GT 2234WC 2254YT 2254WC		35 35 15 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

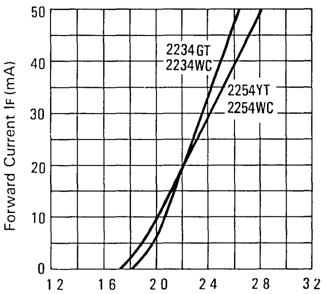


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

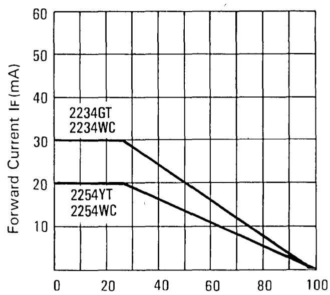


FIG 8 FORWARD CURRENT DERATING CURVE

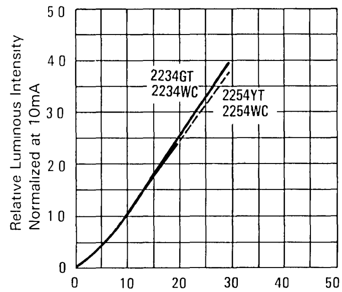


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

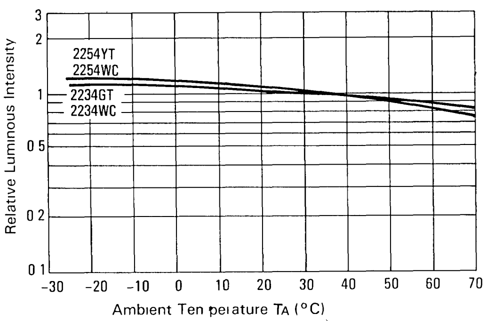


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

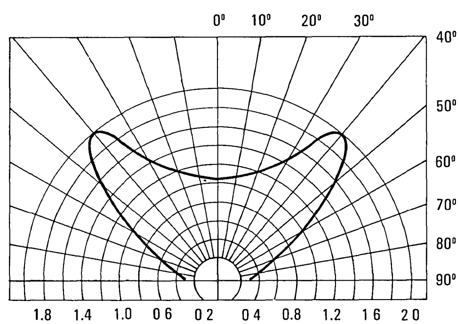


FIG. 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	2224RT 2294WC	0.5 0.5	1.7 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	2224RT 2294WC		150		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	2224RT 2294WC		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	2224RT 2294WC		40		nm	
Forward Voltage	V_F	2224RT 2294WC		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	2224RT 2294WC			100	μA	V_R = 5V
Capacitance	C	2224RT 2294WC		20		PF	V_F = 0 f = 1MHZ

NOTES: 1 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

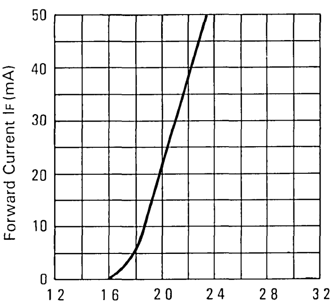


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

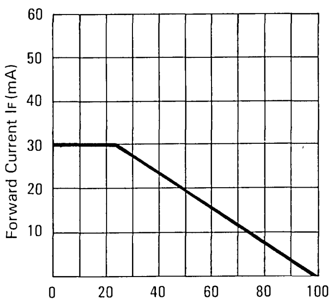


FIG 13 FORWARD CURRENT DERATING CURVE

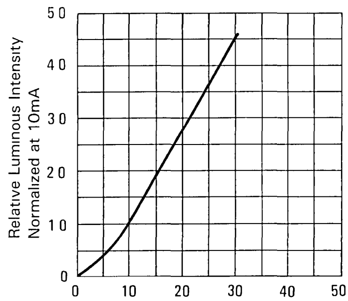


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

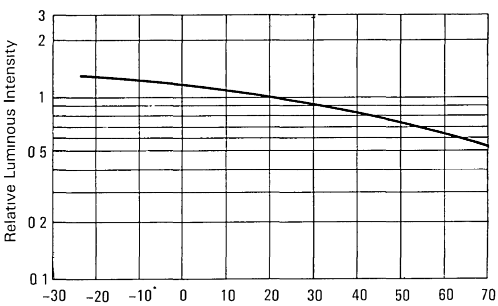


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

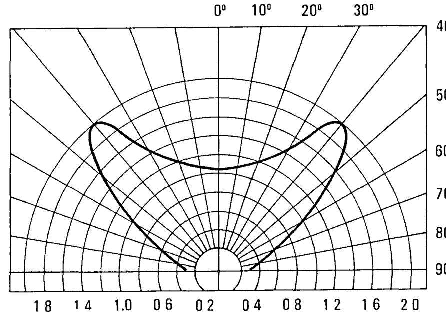


FIG. 16 SPATIAL DISTRIBUTION

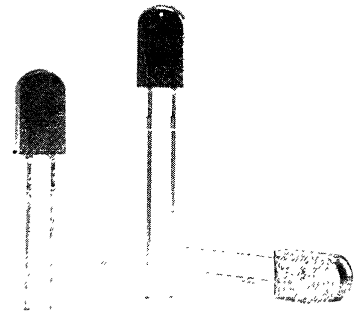
LED LAMPS

ROUND RECTANGULAR LED LAMPS

LTL-6203LN RED
LTL-6213LN BRIGHT RED
LTL-6223LN HIGH EFFICIENCY RED
LTL-6233LN GREEN
LTL-6253LN YELLOW
LTL-6293LN ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- MINIMUM LEAD LENGTH 1".
- ROUNDED END RECTANGULAR SHAPE.
- I.C. COMPATIBLE.
- LONG LIFE-SOLID STATE RELIABILITY.



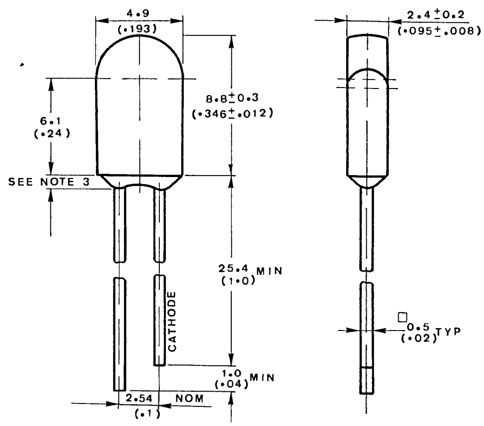
DESCRIPTION

The Red source color devices are made with Gallium Arsenide Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
6203LN	Red	Diffused	Red
6213LN	Red	Diffused	Bright Red
6223LN	Red	Diffused	Hi. Eff. Red
6233LN	Green	Diffused	Green
6253LN	Yellow	Diffused	Yellow
6293LN	Orange	Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	−55°C to +100°C					
Storage Temperature Range	−55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

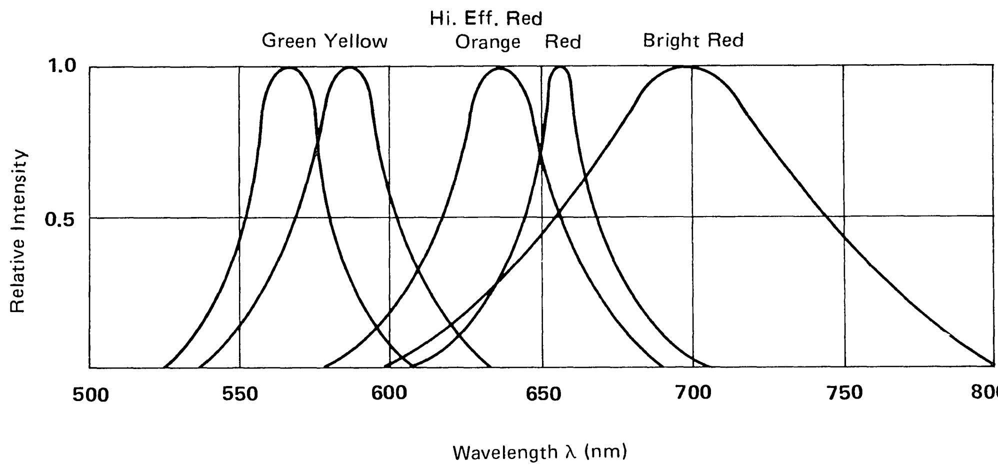


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	6203LN 6213LN 6223LN	0.09 0.4 1.7	0.2 1.5 5.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	6203LN 6213LN 6223LN		70		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	6203LN 6213LN 6223LN		655 697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	6203LN 6213LN 6223LN		24 90 40		nm	
Forward Voltage	V_F	6203LN 6213LN 6223LN		1.7 2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	6203LN 6213LN 6223LN			100	μA	V_R = 5V
Capacitance	C	6203LN 6213LN 6223LN		30 55 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

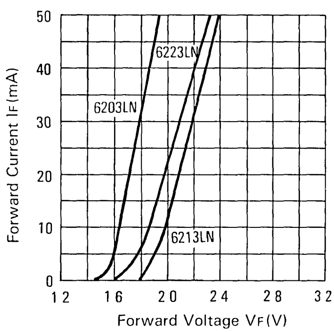


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

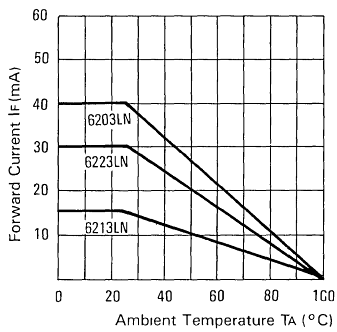


FIG 3 FORWARD CURRENT DERATING CURVE

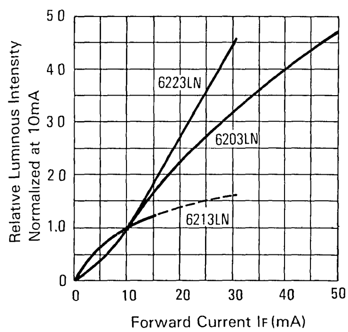


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

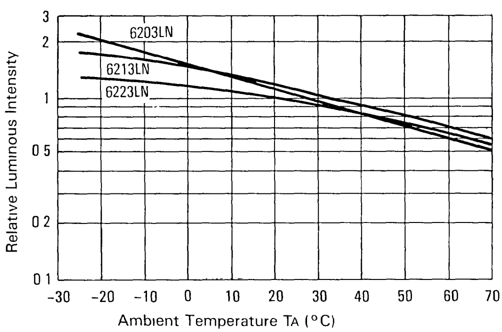


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

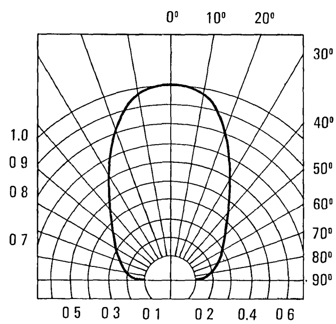


FIG 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	6233LN 6253LN	1.7 1.7	5.6 5.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	6233LN 6253LN		70		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	6233LN 6253LN		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	6233LN 6253LN		30 35		nm	
Forward Voltage	V_F	6233LN 6253LN		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	6233LN 6253LN			100	μA	V_R = 5V
Capacitance	C	6233LN 6253LN		35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

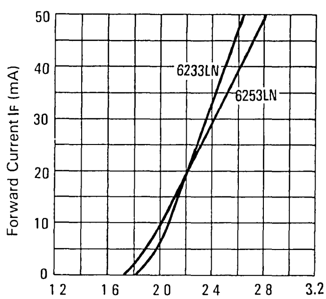


FIG 7 FORWARD CURRENT VS. FORWARD VOLTAGE

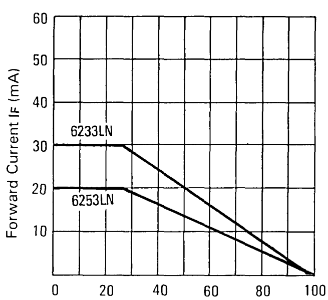


FIG 8 FORWARD CURRENT DERATING CURVE

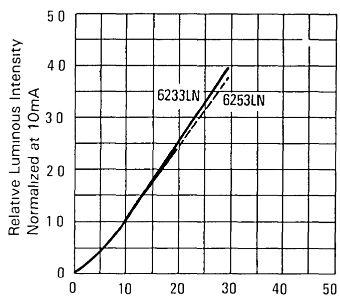


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

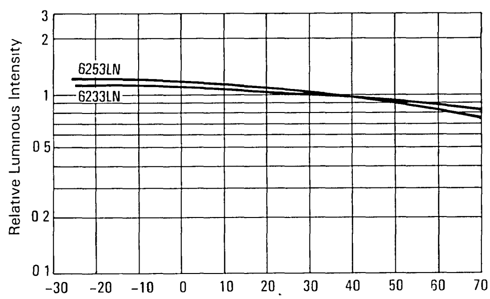


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

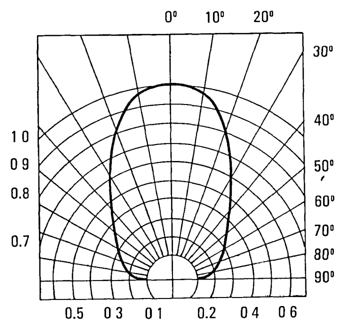


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	6293LN	1.7	5.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	6293LN		70		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	6293LN		630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	6293LN		40		nm	
Forward Voltage	V_F	6293LN		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	6293LN			100	μA	V_R = 5V
Capacitance	C	6293LN		20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

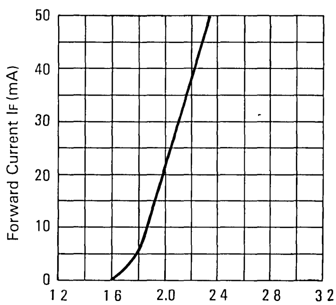


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

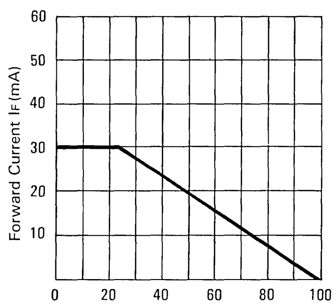


FIG 13 FORWARD CURRENT DERATING CURVE

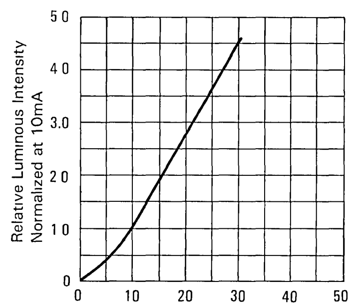


FIG. 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

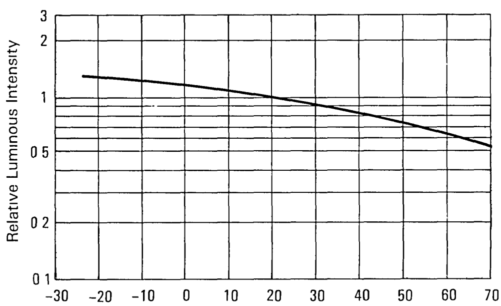


FIG. 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

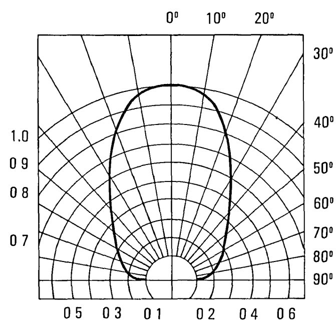


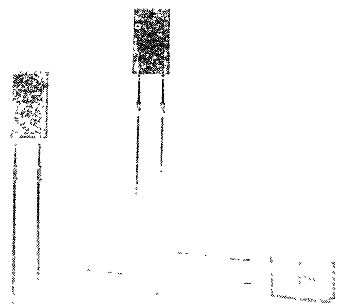
FIG.16 SPATIAL DISTRIBUTION

2x4 RECTANGULAR BAR LED LAMPS

LTL-403P BRIGHT RED LTL-403Y YELLOW
LTL-403G GREEN LTL-403A AMBER

FEATURES

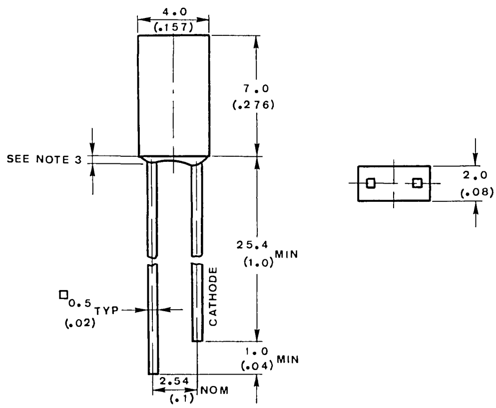
- LOW POWER CONSUMPTION
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.



DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
403P	Red	Diffused	Bright Red
403G	Green	Diffused	Green
403Y	Yellow	Diffused	Yellow
403A	Amber	Diffused	Amber

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	BRIGHT RED	GREEN	YELLOW AMBER	UNIT
Power Dissipation	40	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	mA
Continuous Forward Current	15	30	20	mA
Detating Linear From 25°C	0.2	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	–55°C to +100°C			
Storage Temperature Range	–55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds			

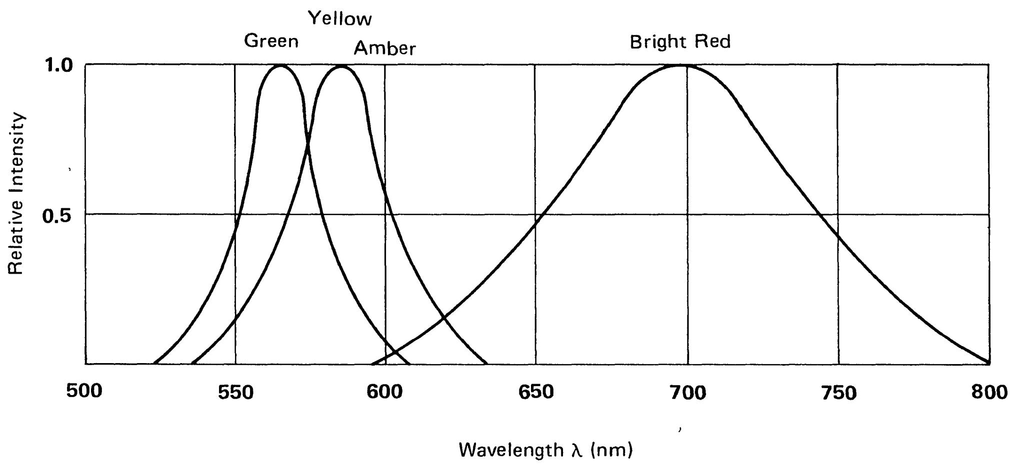


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	403P	0 1	0.4		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	403P		104		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	403P		697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	403P		90		nm	
Forward Voltage	V_F	403P		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	403P			100	μA	V_R = 5V
Capacitance	C	403P		55		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

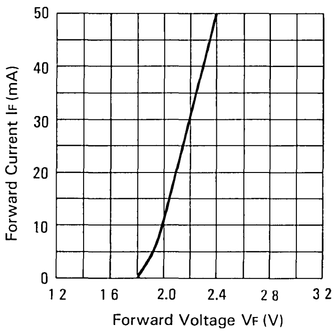


FIG 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

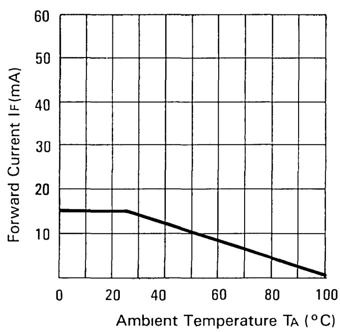


FIG. 3 FORWARD CURRENT DERATING CURVE

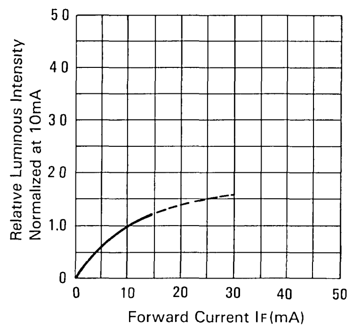


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

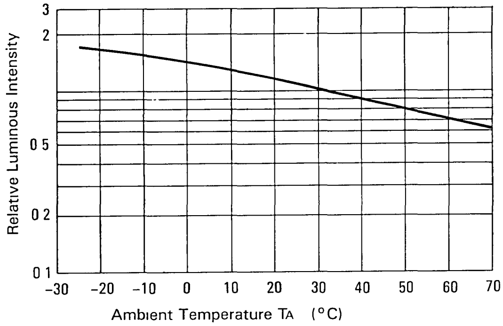


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

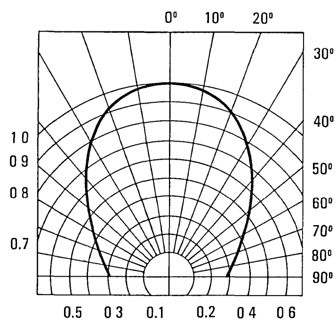


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	403G 403Y	0.7 0.7	2.5 2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	403G 403Y		104		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ PEAK	403G 403Y		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	403G 403Y		30 35		nm	
Forward Voltage	V_F	403G 403Y		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	403G 403Y			100	μA	V_R = 5V
Capacitance	C	403G 403Y		35 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

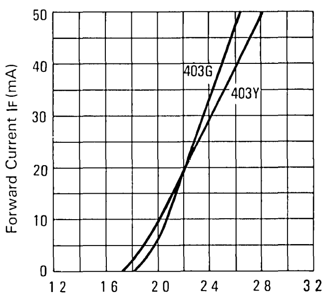


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

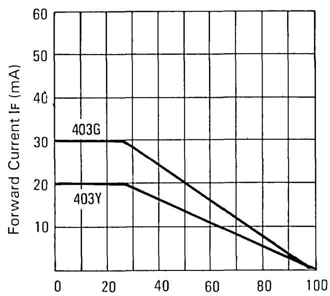


FIG 8 FORWARD CURRENT DERATING CURVE

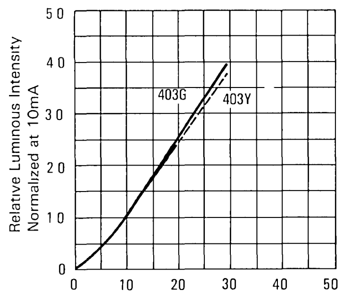


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

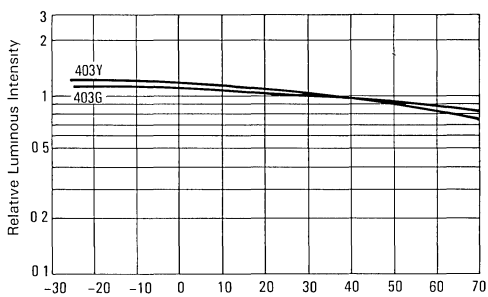


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

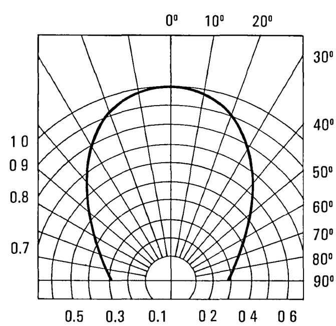


FIG. 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	403A	0.7	2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta\frac{1}{2}$	403A		104		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}			600		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			35		nm	
Forward Voltage	V_F			2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

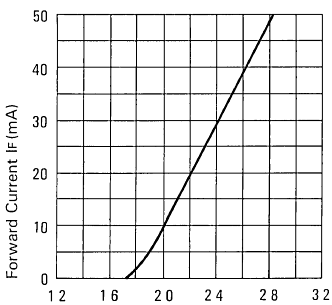


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

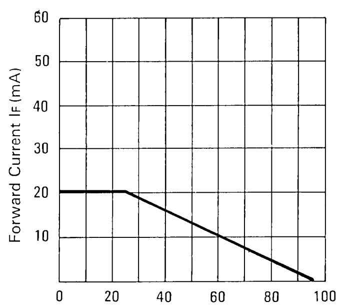


FIG 13 FORWARD CURRENT DERATING CURVE

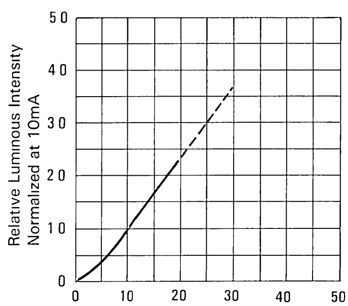


FIG 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

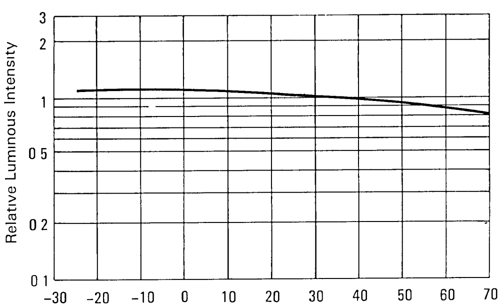


FIG. 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

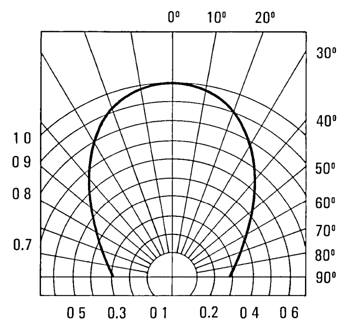


FIG. 16 SPATIAL DISTRIBUTION

LED LAMPS

LITEON

2x5 RECTANGULAR BAR LED LAMPS

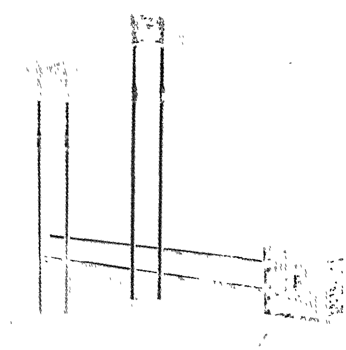
LTL-3201A / 23203A RED
LTL-3211A / 23213A BRIGHT RED
LTL-3221A / 23223A HIGH EFFICIENCY RED
LTL-3231A / 23233A GREEN
LTL-3251A / 23253A YELLOW
LTL-3271A / 23273A AMBER
LTL-3291A / 23293A ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.

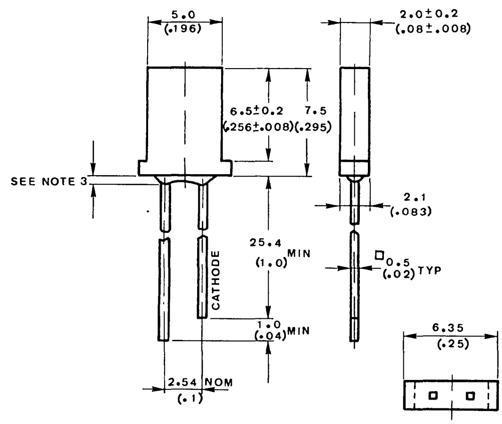
DESCRIPTION

The Red source color devices are made with Gallium Arsenide Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

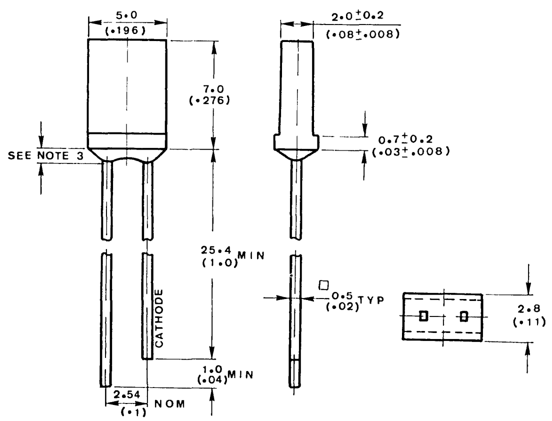


PACKAGE DIMENSIONS

LTL-232x3A Series



LTL-32x1A Series



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
3201A	Red	Diffused	Red
3211A	Red	Diffused	Bright Red
3221A	Red	Diffused	Hi. Eff. Red
3231A	Green	Diffused	Green
3251A	Yellow	Diffused	Yellow
3271A	Amber	Diffused	Amber
3291A	Orange	Diffused	Orange

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
23203A	Red	Diffused	Red
23213A	Red	Diffused	Bright Red
23223A	Red	Diffused	Hi. Eff. Red
23233A	Green	Diffused	Green
23253A	Yellow	Diffused	Yellow
23273A	Amber	Diffused	Amber
23293A	Orange	Diffused	Orange

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW AMBER	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	– 55°C to + 100°C					
Storage Temperature Range	– 55°C to + 100°C					
Lead Solering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

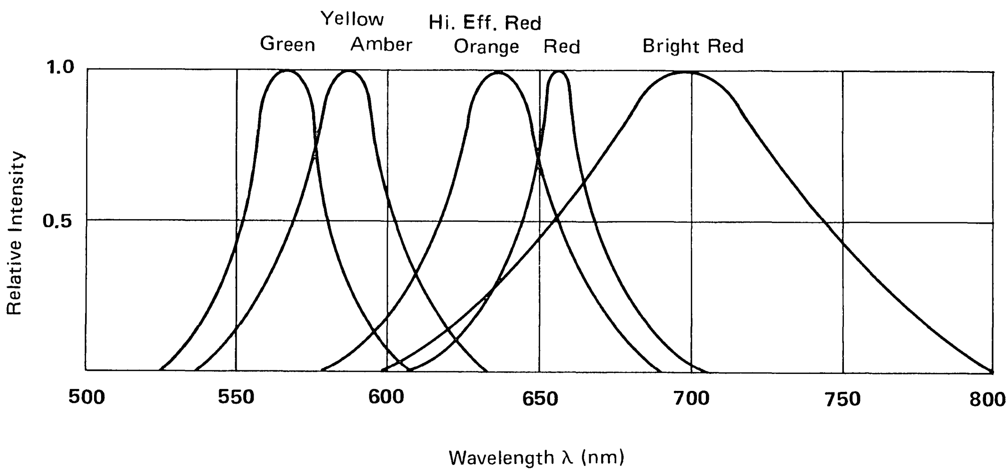


FIG 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	3201A 3211A 23203A 23213A	0.08 0.2 0.08 0.2	0.2 0.6 0.3 0.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	3201A 3211A 23203A 23213A		140 140 140 140		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	3201A 3211A 23203A 23213A		655 697 655 697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	3201A 3211A 23203A 23213A		24 90 24 90		nm	
Forward Voltage	V_F	3201A 3211A 23203A 23213A		1.7 2.1 1.7 2.1	2.0 2.8 2.0 2.8	V	I_F = 20 mA
Reverse Current	I_R	3201A 3211A 23203A 23213A			100	μA	V_R = 5V
Capacitance	C	3201A 3211A 23203A 23213A		30 55 30 55		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

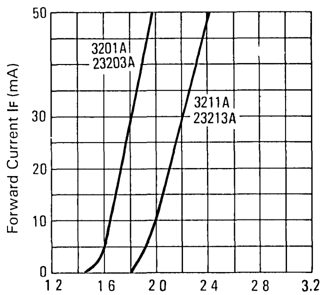


FIG 2 FORWARD CURRENT VS. FORWARD VOLTAGE

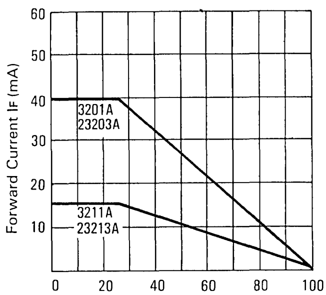


FIG. 3 FORWARD CURRENT DERATING CURVE

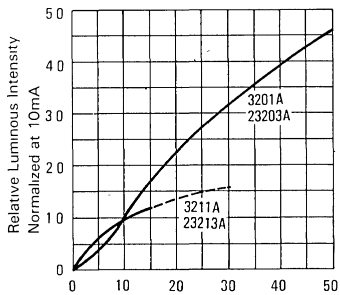


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

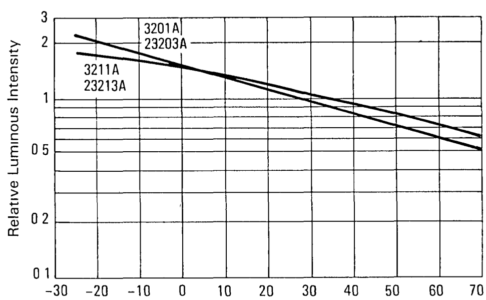


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

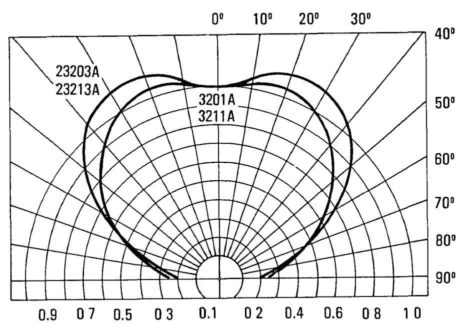


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	3221A 23223A	0.5 0.7	1.7 2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	3221A 23223A		140 140		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ PEAK	3221A 23223A		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	3221A 23223A		40		nm	
Forward Voltage	V_F	3221A 23223A		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	3221A 23223A			100	μA	V_R = 5V
Capacitance	C	3221A 23223A		20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

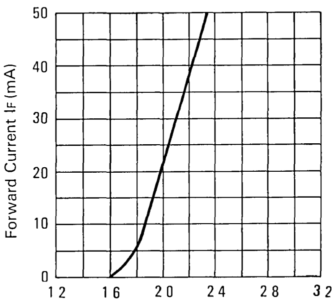


FIG. 7 FORWARD CURRENT VS FORWARD VOLTAGE

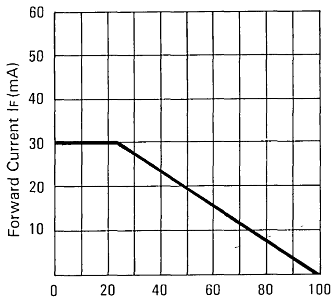


FIG 8 FORWARD CURRENT DERATING CURVE

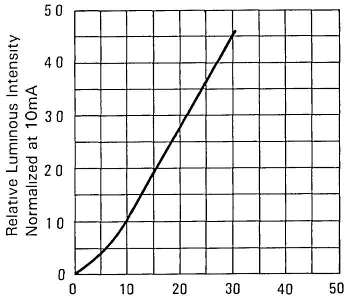


FIG. 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

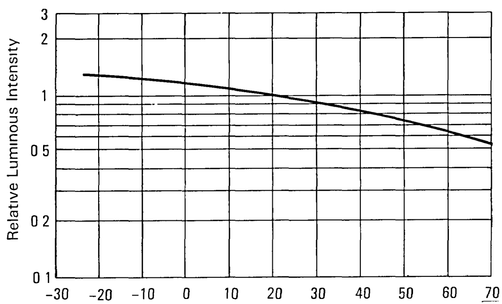


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

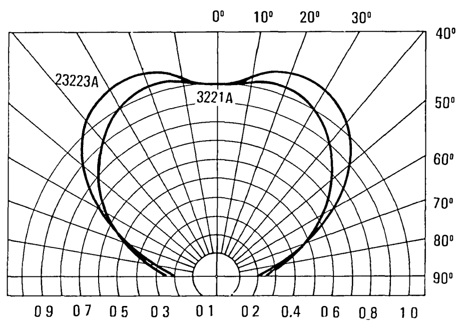


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	3231A 3251A 23233A 23253A	0.5 0.8 1.1 1.1	1.7 2.5 3.8 3.8		mcd	$I_F = 10$ mA Note 1
Viewing Angle	$2\theta\frac{1}{2}$	3231A 3251A 23233A 23253A		140 140 140 140		deg	Note 2 (Fig.16)
Peak Emission Wavelength	λPEAK	3231A 3251A 23233A 23253A		565 585 565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	3231A 3251A 23233A 23253A		30 35 30 35		nm	
Forward Voltage	V_F	3231A 3251A 23233A 23253A		2.1	2.8	V	$I_F = 20$ mA
Reverse Current	I_R	3231A 3251A 23233A 23253A			100	μA	$V_R = 5V$
Capacitance	C	3231A 3251A 23233A 23253A		35 15 35 15		PF	$V_F = 0$ f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

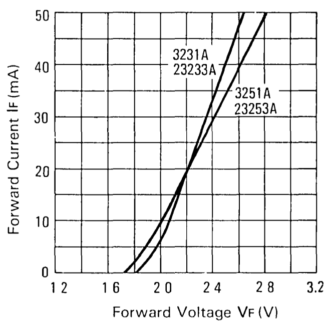


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

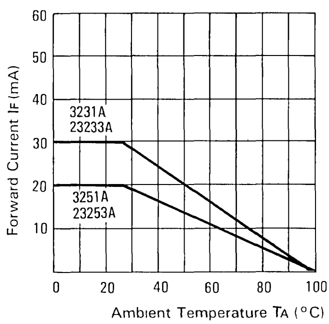


FIG 13 FORWARD CURRENT DERATING CURVE

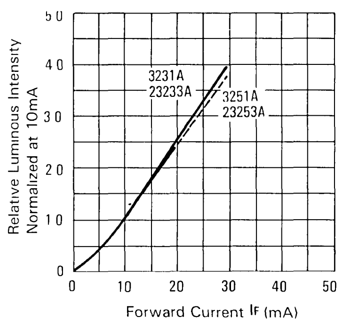


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

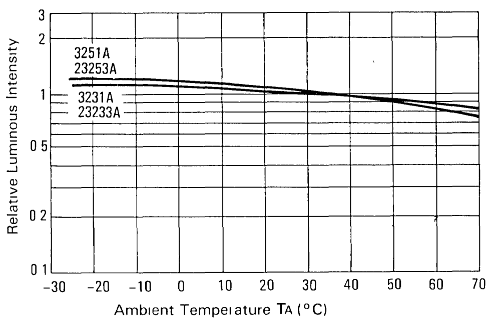


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

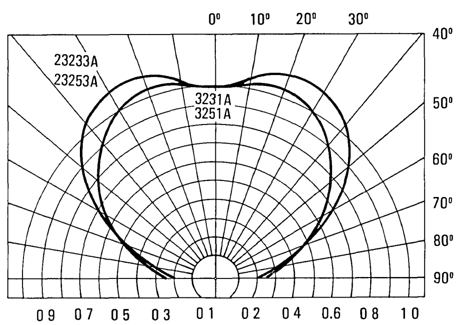


FIG. 16 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	3271A 3291A 23273A 23293A	0.5 0.5 1.1 0.7	1.7 1.7 3.8 2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	3271A 3291A 23273A 23293A		140 140 140 140		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λPEAK	3271A 3291A 23273A 23293A		600 630 600 630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	3271A 3291A 23273A 23293A		35 40 35 40		nm	
Forward Voltage	V_F	3271A 3291A 23273A 23293A		2.1 2.0 2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	3271A 3291A 23273A 23293A			100	μA	V_R = 5V
Capacitance	C	3271A 3291A 23273A 23293A		15 20 15 20		PF	V_F = 0 f = 1 MHZ

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

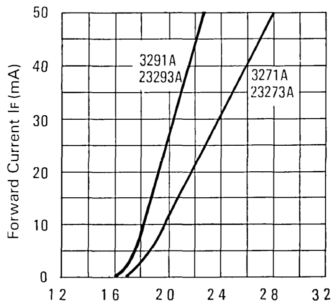


FIG 17 FORWARD CURRENT VS FORWARD VOLTAGE

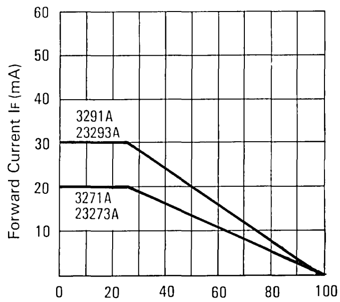


FIG 18 FORWARD CURRENT DERATING CURVE

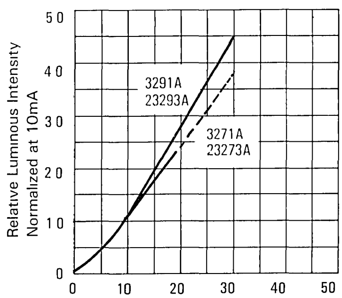


FIG 19 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

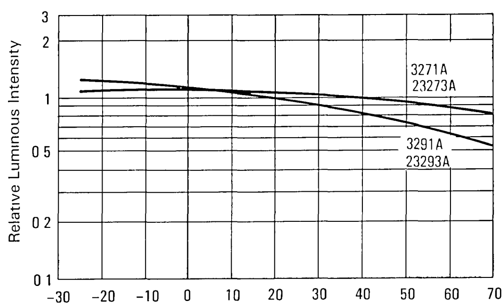


FIG 20 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

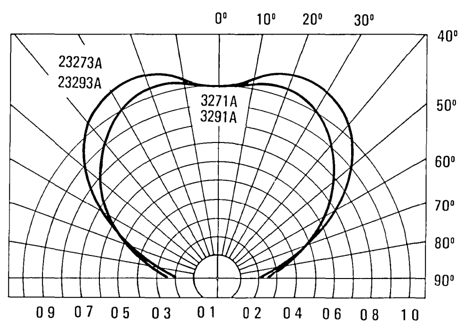


FIG 21 SPATIAL DISTRIBUTION

LED LAMPS

2x5 RECTANGULAR BAR FLANGELESS LED LAMPS

LTL-433R RED
LTL-433P BRIGHT RED
LTL-433HR HIGH EFFICIENCY RED
LTL-433G GREEN
LTL-433Y YELLOW
LTL-433A AMBER
LTL-433EA ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.

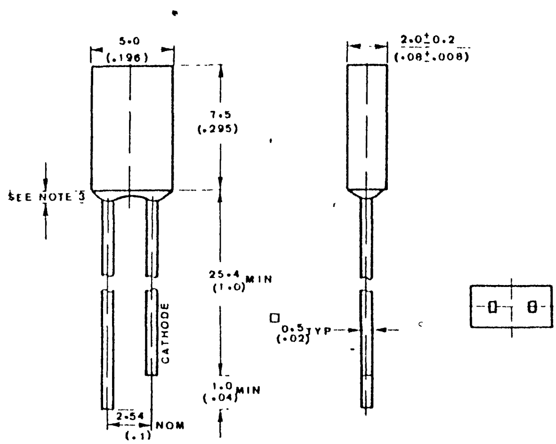
DESCRIPTION

The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
433R	Red	Diffused	Red
433P	Red	Diffused	Bright Red
433HR	Red	Diffused	Hi. Eff. Red
433G	Green	Diffused	Green
433Y	Yellow	Diffused	Yellow
433A	Amber	Diffused	Amber
433EA	Orange	Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	AMBER YELLOW	HI.EFF.RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	– 55°C to + 100°C					
Storage Temperature Range	– 55°C to + 100°C					
Lead Solering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

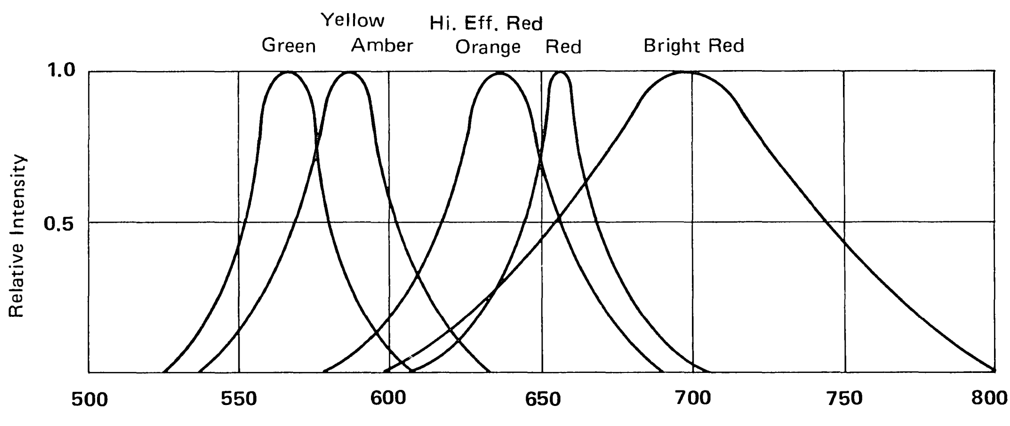


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	433R 433P 433HR	0.08 0.2 0.5	0.2 0.6 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	433R 433P 433HR		140		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	433R 433P 433HR		655 697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	433R 433P 433HR		24 90 40		nm	
Forward Voltage	V_F	433R 433P 433HR		1.7 2.1 2.0	2.0 2.8 2.8	V	I_F = 20 mA
Reverse Current	I_R	433R 433P 433HR			100	µA	V_R = 5V
Capacitance	C	433R 433P 433HR		30 55 20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

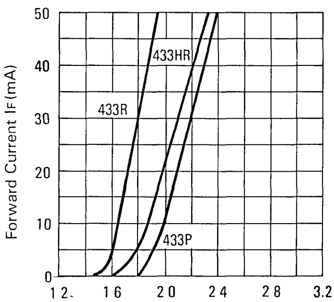


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

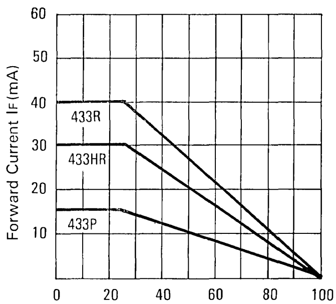


FIG 3 FORWARD CURRENT DERATING CURVE

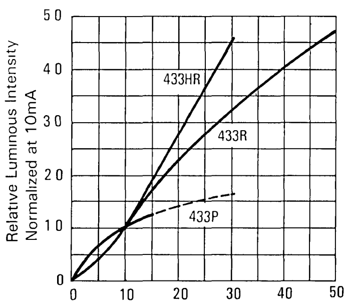


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

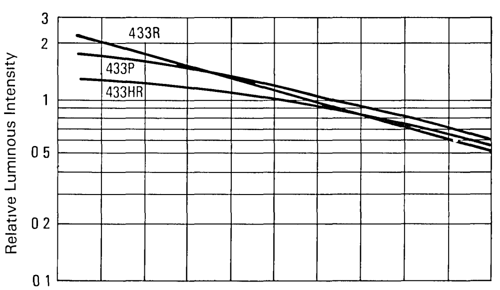


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

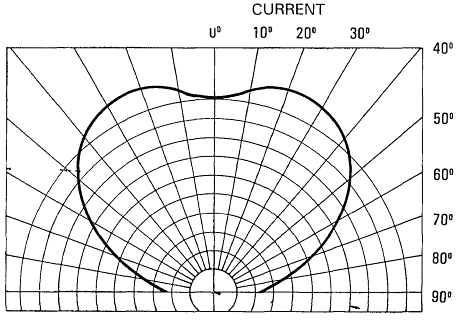


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	433G 433Y	0.6 0.6	1.7 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	433G 433Y		140		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}	433G 433Y		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	433G 433Y		30 35		nm	
Forward Voltage	V_F	433G 433Y		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	433G 433Y			100	μA	V_R = 5V
Capacitance	C	433G 433Y		35 15		PF	$V_F = 0$ f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

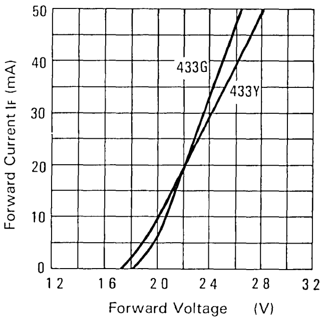


FIG. 7 FORWARD CURRENT VS FORWARD VOLTAGE

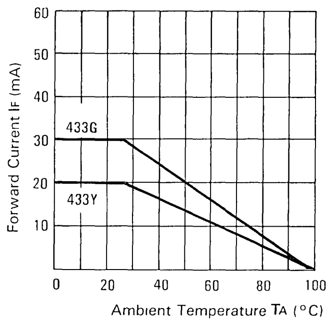


FIG. 8 FORWARD CURRENT DERATING CURVE

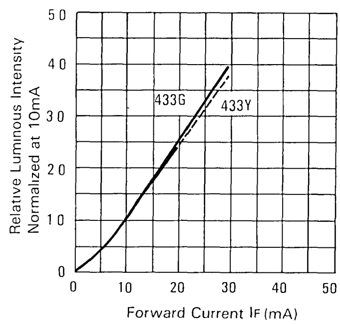


FIG. 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

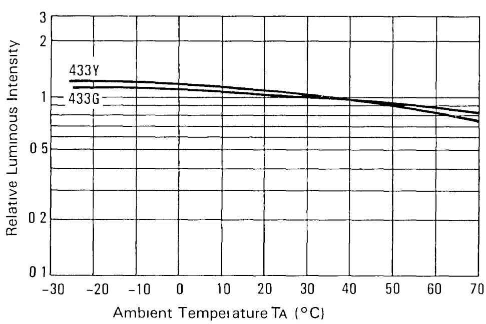


FIG. 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

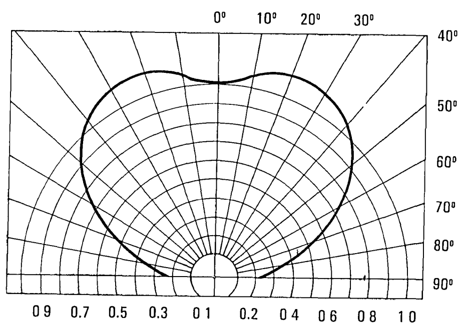


FIG. 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	433A 433EA	0.6 0.5	2.5 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	433A 433EA		140		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ PEAK	433A 433EA		600 630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	433A 433EA		35 40		nm	
Forward Voltage	V_F	433A 433EA		2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	433A 433EA			100	μA	V_R = 5V
Capacitance	C	433A 433EA		15 20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

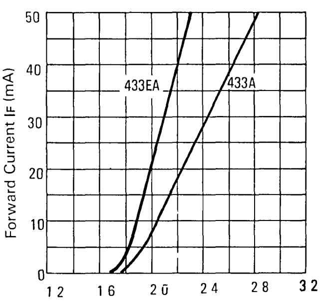


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

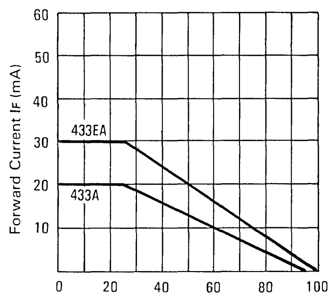


FIG 13 FORWARD CURRENT DERATING CURVE

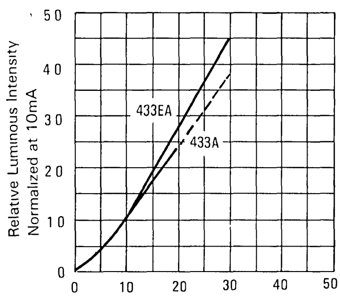


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

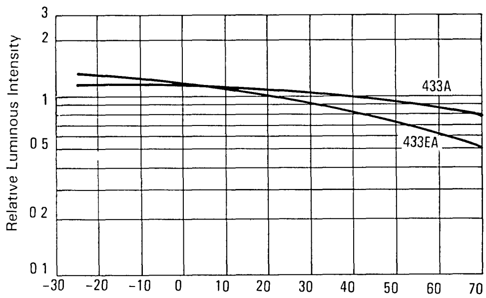


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

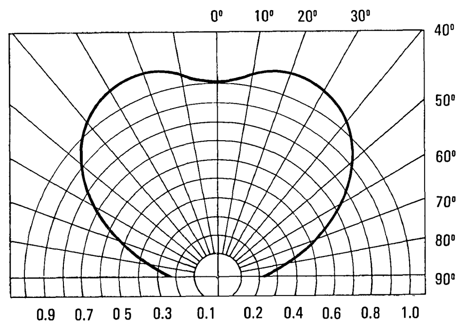


FIG. 16 SPATIAL DISTRIBUTION

LITEON

RECTANGULAR BAR LED LAMPS

LTL-3215S BRIGHT RED **LTL-3255S YELLOW**
LTL-3235S GREEN **LTL-3295S ORANGE**

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.

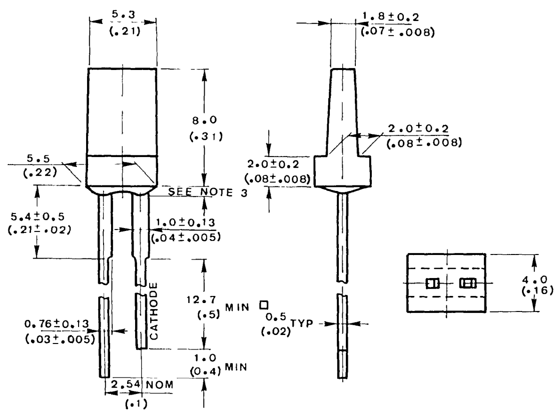
DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
3215S	Red	Diffused	Bright Red
3235S	Green	Diffused	Green
3255S	Yellow	Diffused	Yellow
3295S	Orange	Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW	ORANGE	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

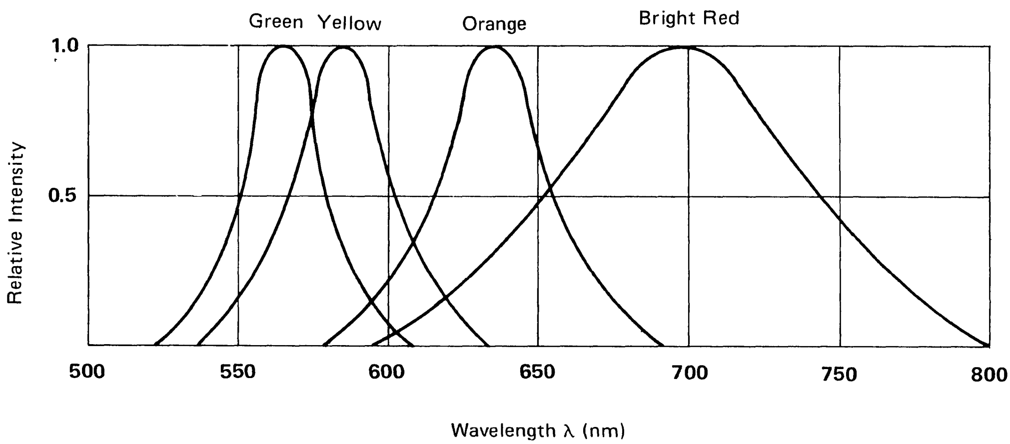


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	3215S	0.2	0.4		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta_{1/2}$	3215S		150		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	3215S		697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	3215S		90		nm	
Forward Voltage	V_F	3215S		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	3215S			100	μA	V_R = 5V
Capacitance	C	3215S		55		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

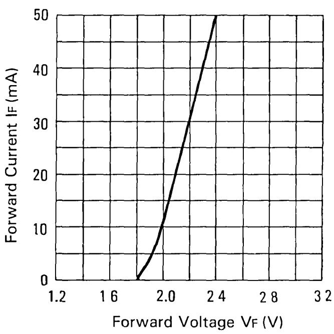


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE.

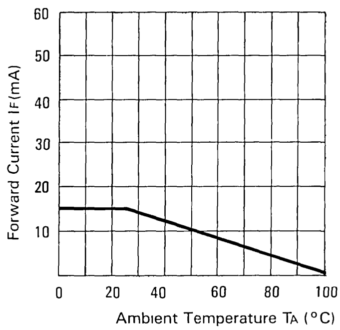


FIG. 3 FORWARD CURRENT DERATING CURVE

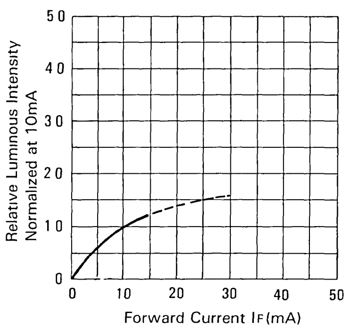


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

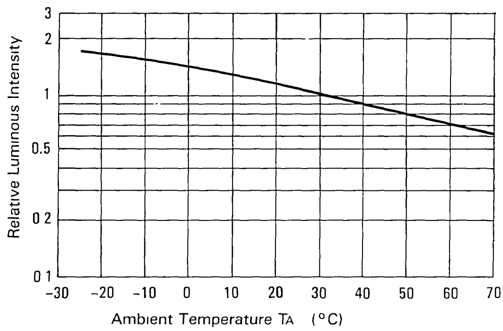


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

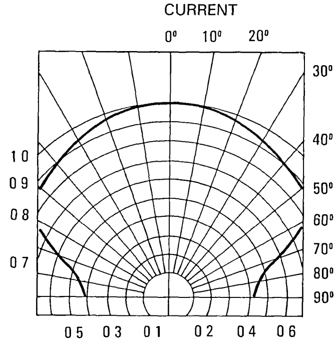


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	3235S 3255S	0.3 0.4	0.8 1.1		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	3235S 3255S		150		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	3235S 3255S		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	3235S 3255S		30 35		nm	
Forward Voltage	V_F	3235S 3255S		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	3235S 3255S			100	μA	V_R = 5V
Capacitance	C	3235S 3255S		35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

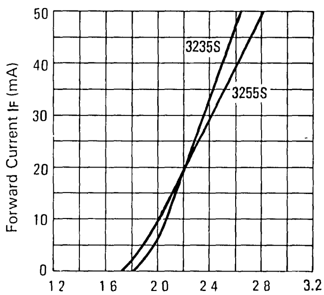


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

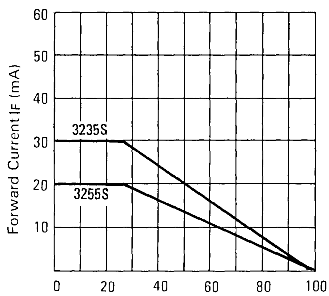


FIG 8 FORWARD CURRENT DERATING CURVE

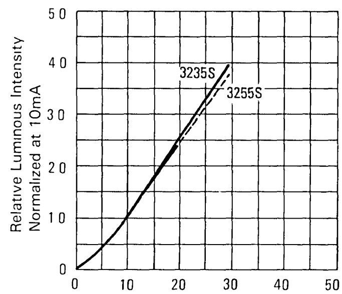


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

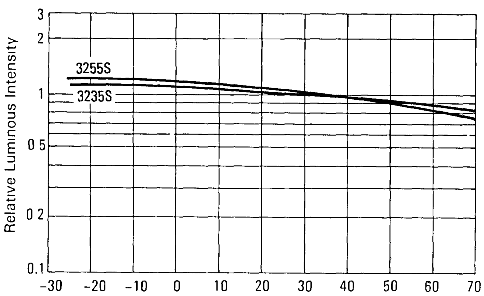


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

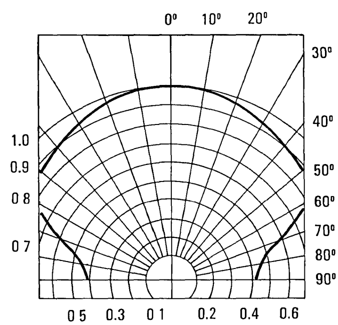


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	3295S	0.3	0.8		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta_{1/2}$	3295S		150		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	3295S		630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	3295S		40		nm	
Forward Voltage	V_F	3295S		2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	3295S			100	μA	V_R = 5V
Capacitance	C	3295S		20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

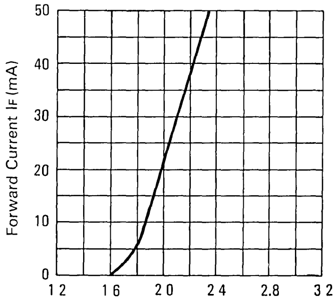


FIG. 12 FORWARD CURRENT VS. FORWARD VOLTAGE

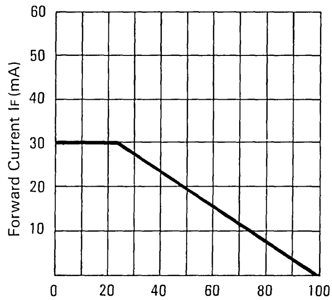


FIG. 13 FORWARD CURRENT DERATING CURVE

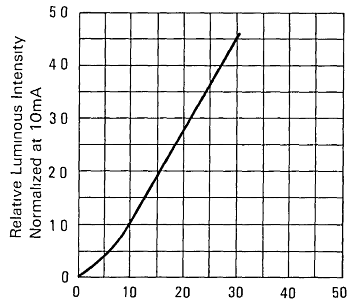


FIG. 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

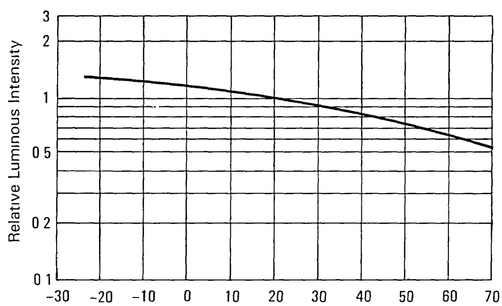


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

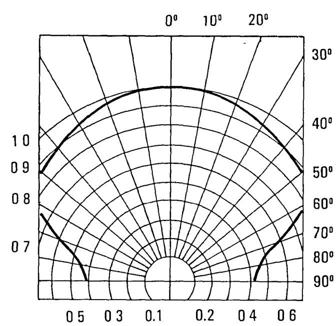


FIG. 16 SPATIAL DISTRIBUTION

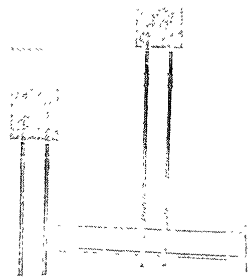
LED LAMPS

RECTANGULAR BARS LED LAMPS

LTL-3217A/3218A BRIGHT RED LTL-3277A/3278A AMBER
LTL-3237A/3238A GREEN LTL-3297A ORANGE
LTL-3257A/3258A YELLOW

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.

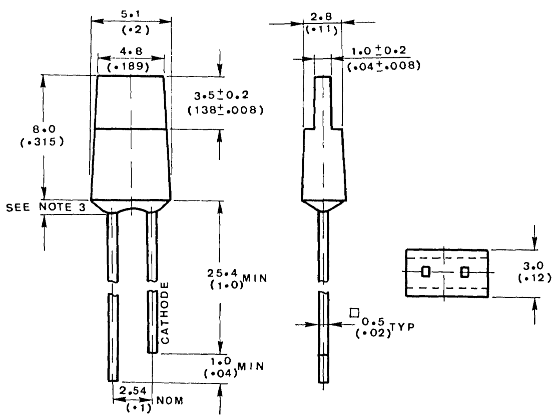


DESCRIPTION

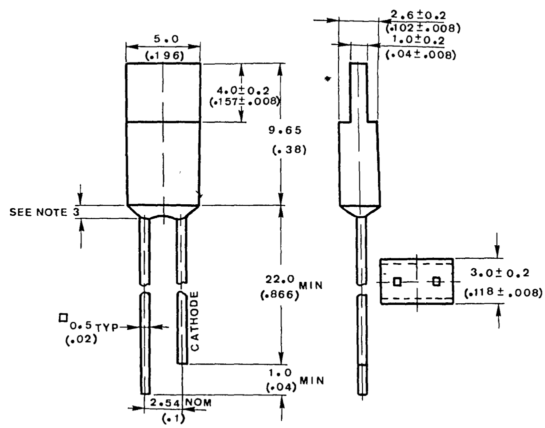
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

PACKAGE DIMENSIONS

LTL-32 x 7A Series



LTL-32 x 8A Series



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
3217A	Red	Diffused	Bright Red
3237A	Green	Diffused	Green
3257A	Yellow	Diffused	Yellow
3277A	Amber	Diffused	Amber
3297A	Orange	Diffused	Orange

PART NO. LTL–	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
3218A	Red	Diffused	Bright Red
3238A	Green	Diffused	Green
3258A	Yellow	Diffused	Yellow
3278A	Amber	Diffused	Amber

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW AMBER	ORANGE	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

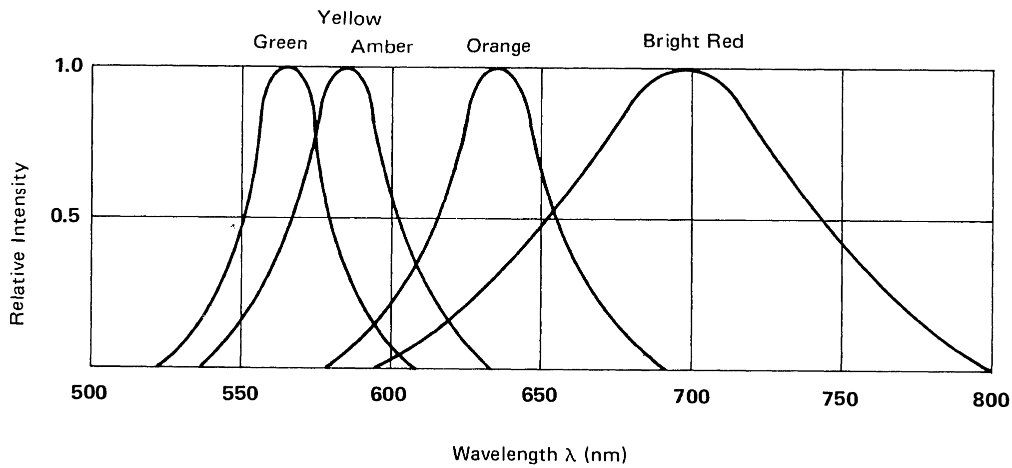


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	3217A 3218A	0.3 0.2	0.8 0.6		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	3217A 3218A		120 106		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	3217A 3218A		697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	3217A 3218A		90		nm	
Forward Voltage	V_F	3217A 3218A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	3217A 3218A			100	μA	V_R = 5V
Capacitance	C	3217A 3218A		55		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

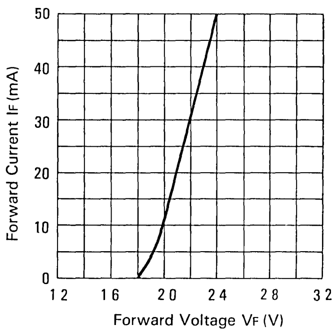


FIG 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

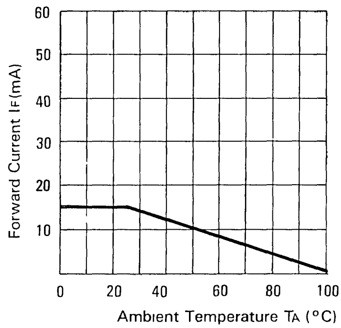


FIG 3 FORWARD CURRENT DERATING CURVE

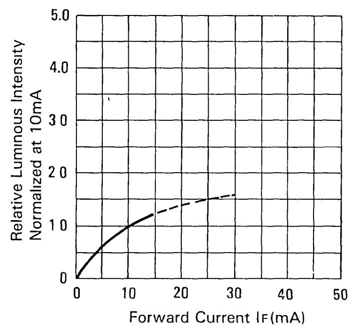


FIG. 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

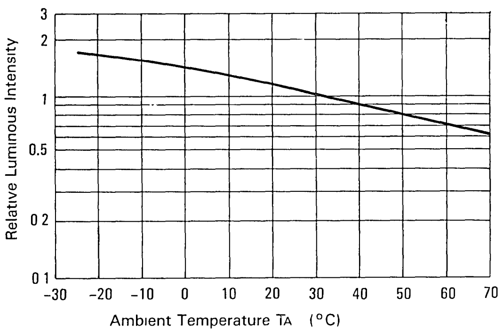


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

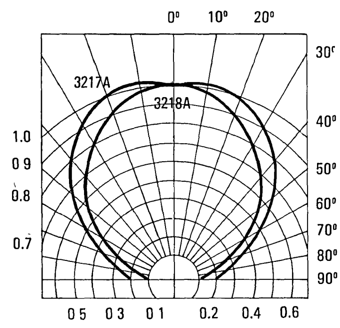


FIG 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	3237A 3257A 3238A 3258A	0.5 0.3 0.5 0.5	1.7 0.8 1.7 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	3237A 3257A 3238A 3258A		120 120 106 106		deg	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	3237A 3257A 3238A 3258A		565 585 565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	3237A 3257A 3238A 3258A		30 35 30 35		nm	
Forward Voltage	V_F	3237A 3257A 3238A 3258A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	3237A 3257A 3238A 3258A			100	µA	V_R = 5V
Capacitance	C	3237A 3257A 3238A 3258A		35 15 35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

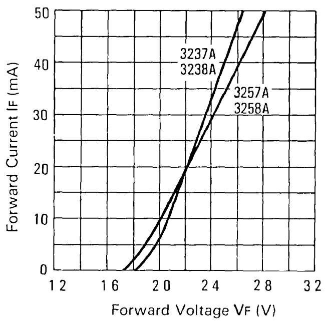


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

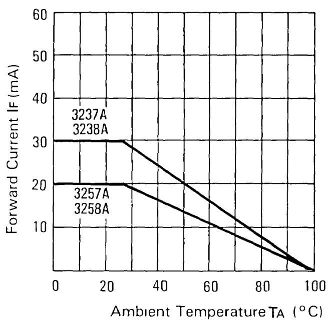


FIG 8 FORWARD CURRENT DERATING CURVE

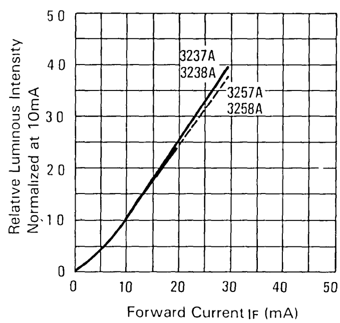


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

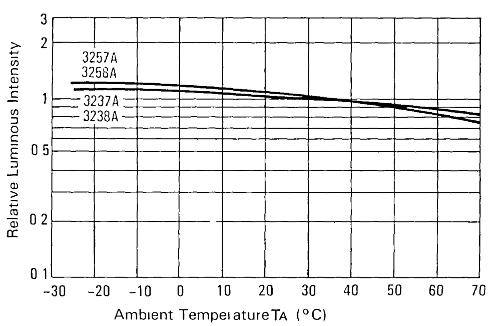


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

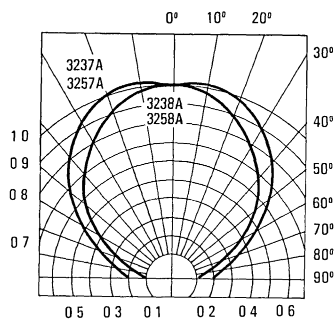


FIG. 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	3277A 3297A 3278A	0.5 0.5 0.5	1.7 1.7 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	3277A 3297A 3278A		120 120 106		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	3277A 3297A 3278A		600 630 600		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	3277A 3297A 3278A		35 40 35		nm	
Forward Voltage	V_F	3277A 3297A 3278A		2.1 2.0 2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	3277A 3297A 3278A			100	μA	V_R = 5V
Capacitance	C	3277A 3297A 3278A		15 20 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

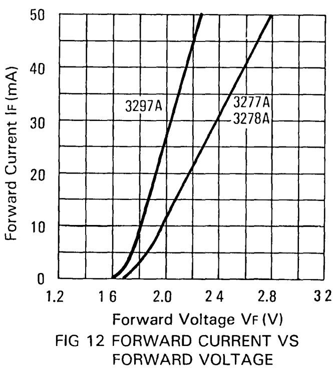


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

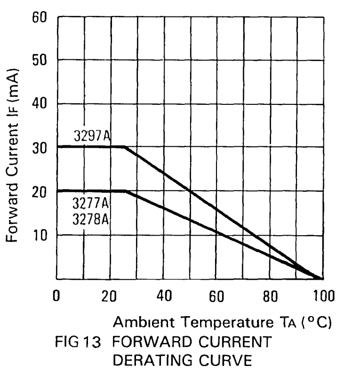


FIG 13 FORWARD CURRENT DERATING CURVE

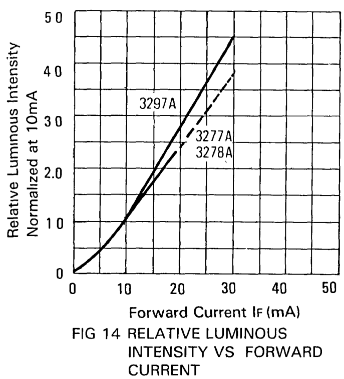


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

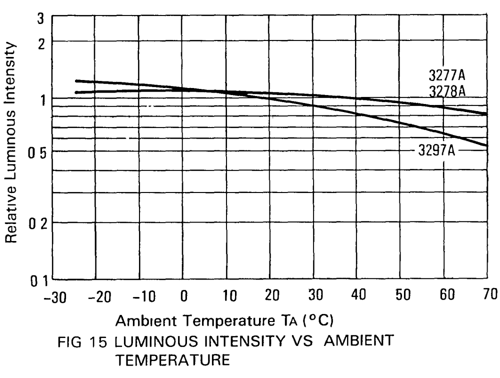


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

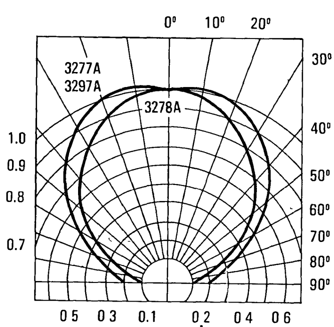


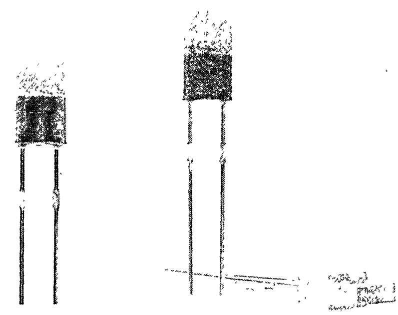
FIG. 16 SPATIAL DISTRIBUTION

1.5x3.8 RECTANGULAR BAR LED LAMPS

LTL-13218A BRIGHT RED **LTL-13258A YELLOW**
LTL-13238A GREEN **LTL-13278A AMBER**

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I. C. COMPATIBLE.



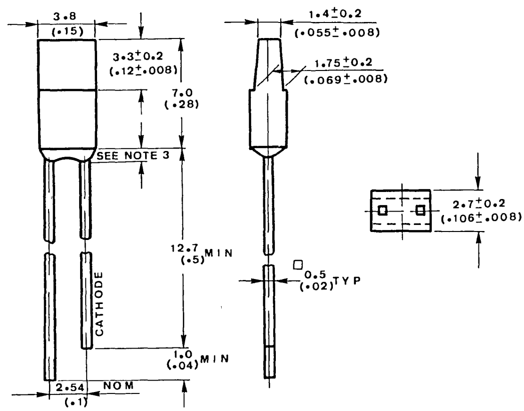
DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
13218A	Red	Diffused	Bright Red
13238A	Green	Diffused	Green
13258A	Yellow	Diffused	Yellow
13278A	Amber	Diffused	Amber

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW AMBER	UNIT
Power Dissipation	40	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	mA
Continuous Forward Current	15	30	20	mA
Derating Linear From 25°C	0.2	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	–55°C to +100°C			
Storage Temperature Range	–55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds			

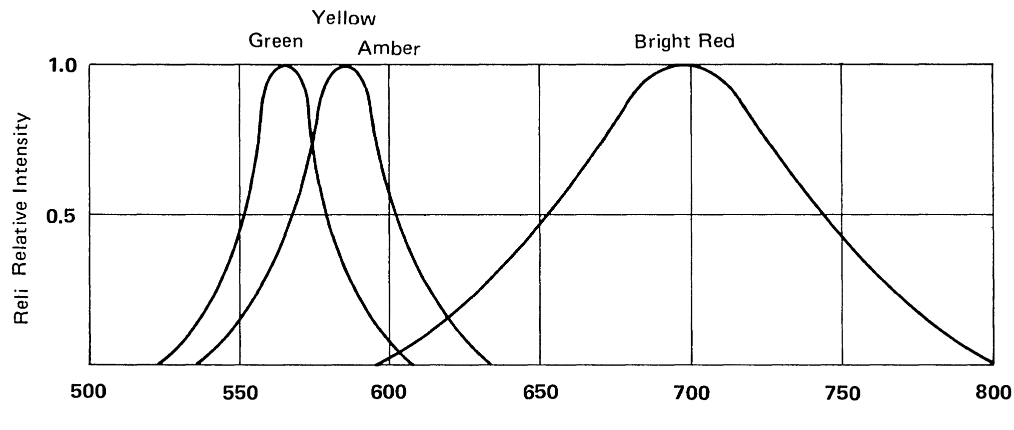


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	13218A	0.1	0.3		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	13218A		180		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	13218A		697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	13218A		90		nm	
Forward Voltage	V_F	13218A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	13218A			100	μA	V_R = 5V
Capacitance	C	13218A		55		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

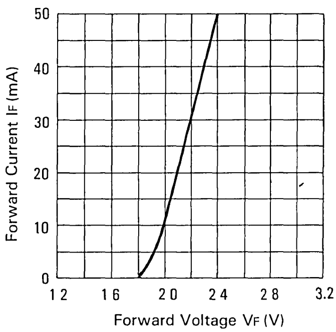


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

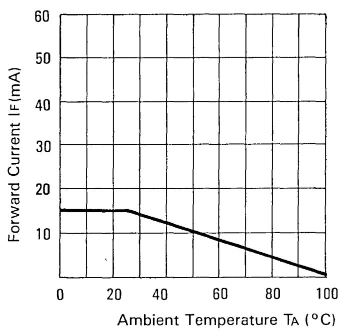


FIG 3 FORWARD CURRENT DERATING CURVE

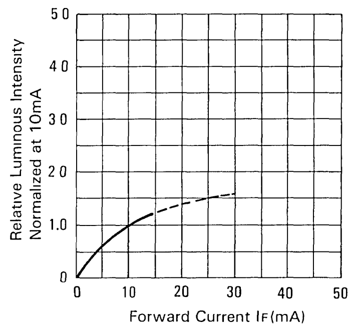


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

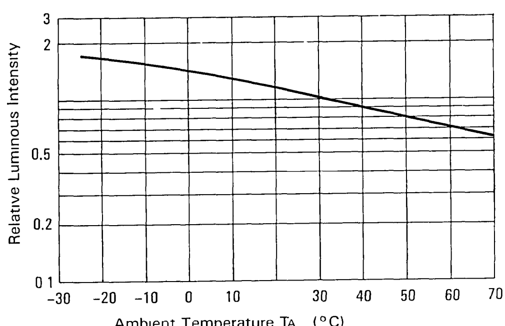


FIG.5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

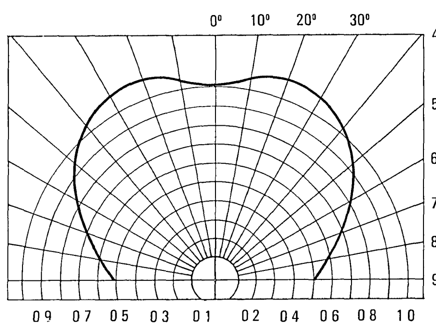


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT TA = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	13238A 13258A	0.4 0.4	1.1 1.1		mcd	IF = 10 mA Note 1
Viewing Angle	2θ½	13238A 13258A		180		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	13238A 13258A		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	13238A 13258A		30 35		nm	
Forward Voltage	VF	13238A 13258A		2.1	2.8	V	IF = 20 mA
Reverse Current	IR	13238A 13258A			100	μA	VR = 5V
Capacitance	C	13238A 13258A		35 15		PF	VF = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

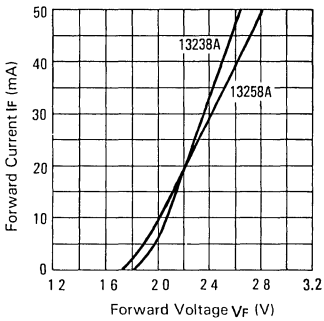


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

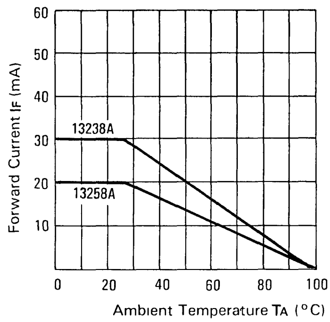


FIG 8 FORWARD CURRENT DERATING CURVE

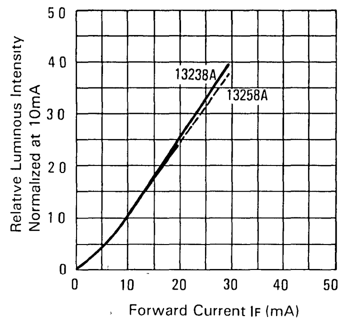


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

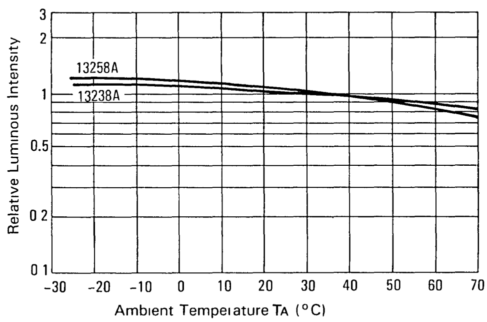


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

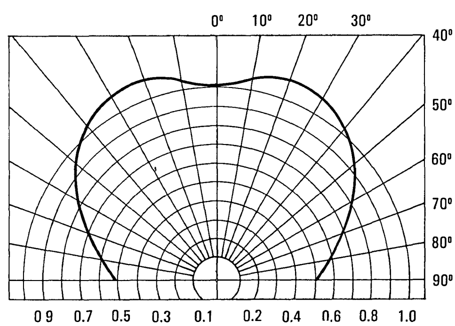


FIG. 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	13278A	0.4	1.1		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta ½$	13278A		180		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	13278A		600		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	13278A		35		nm	
Forward Voltage	V_F	13278A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	13278A			100	μA	V_R = 5V
Capacitance	C	13278A		15		PF	V_F = 0 f = 1MHZ

NOTES: 1 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

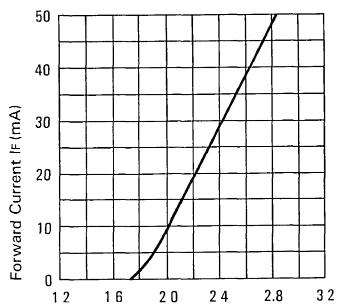


FIG. 12 FORWARD CURRENT VS FORWARD VOLTAGE

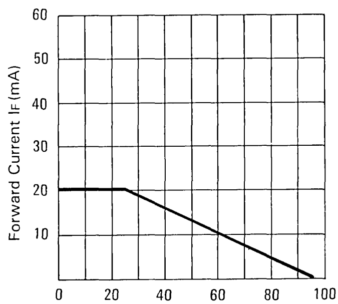


FIG 13 FORWARD CURRENT DERATING CURVE

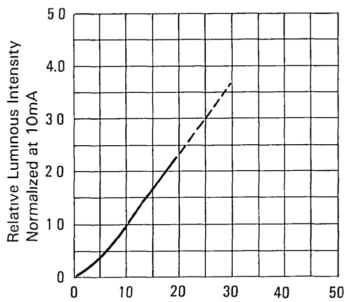


FIG. 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

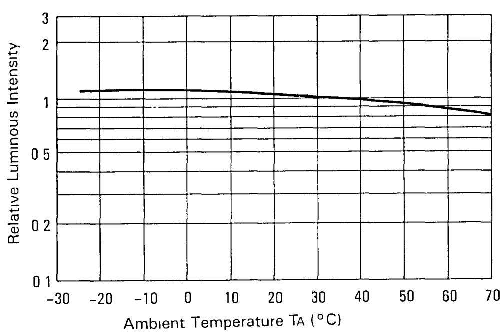


FIG 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

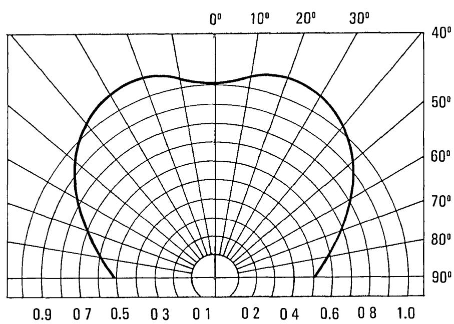


FIG. 16 SPATIAL DISTRIBUTION

LED LAMPS

LITEON

1.5x7.0 RECTANGULAR BAR LED LAMPS

LTL-13215A BRIGHT RED
LTL-13225A HIGH EFFICIENCY RED
LTL-13235A GREEN
LTL-13255A YELLOW
LTL-13295A ORANGE

FEATURES

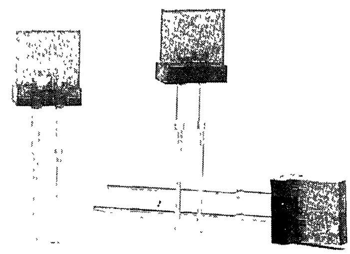
- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.

DESCRIPTION

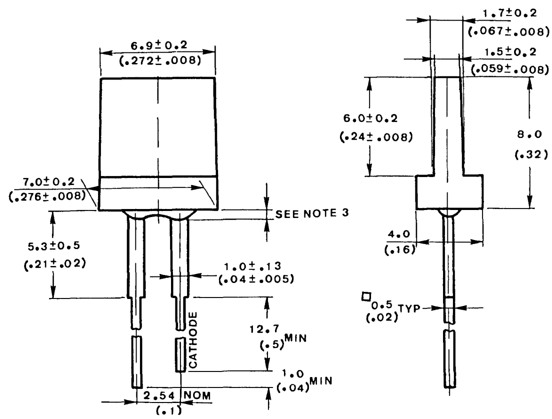
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
13215A	Red	Diffused	Bright Red
13225A	Red	Diffused	Hi.Eff.Red
13235A	Green	Diffused	Green
13255A	Yellow	Diffused	Yellow
13295A	Orange	Diffused	Orange



PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW	HI.EFF.RED ORANGE	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

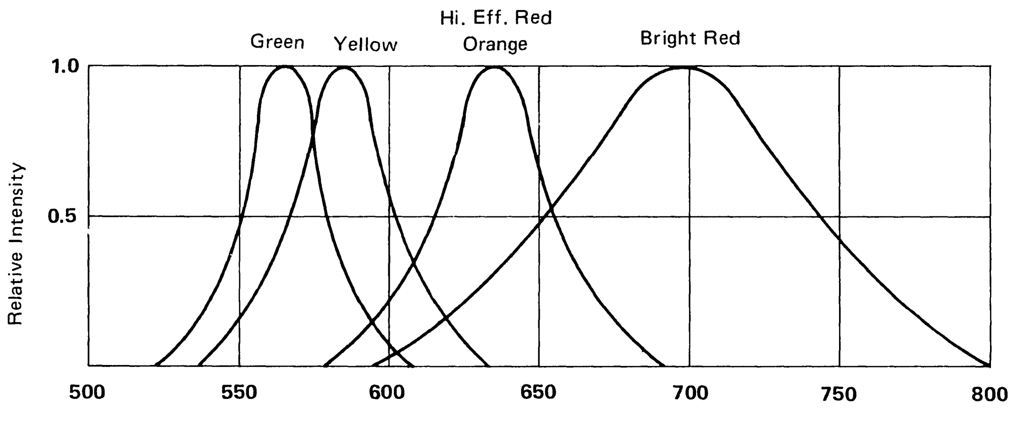


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	I_V	13215A 13225A	0.2 0.3	0.4 0.8		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta_{1/2}$	13215A 13225A		150		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	13215A 13225A		697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	13215A 13225A		90 40		nm	
Forward Voltage	V_F	13215A 13225A		2.1 2.0	2.8	V	I_F = 20mA
Reverse Current	I_R	13215A 13225A			100	μA	V_R = 5V
Capacitance	C	13215A 13225A		55 20		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.

2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

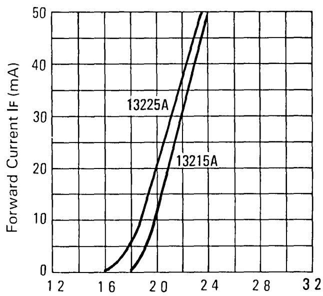


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

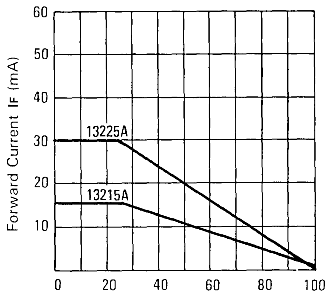


FIG 3 FORWARD CURRENT DERATING CURVE

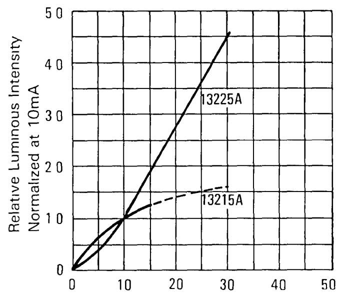


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

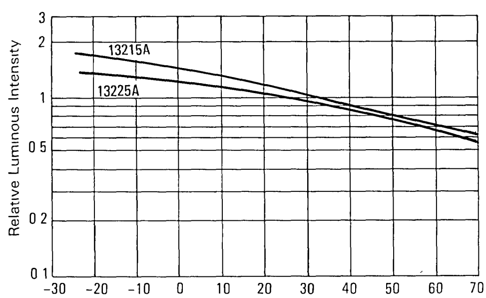


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

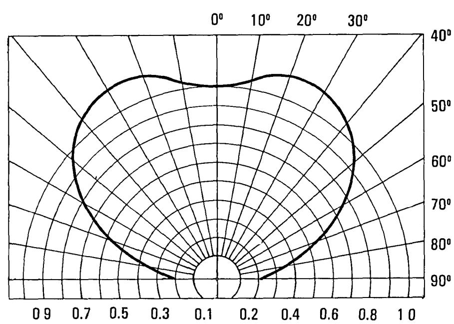


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	I_V	13235A 13255A	0.3 0.3	0.8 0.8		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	13235A 13255A		150		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}	13235A 13255A		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	13235A 13255A		30 35		nm	
Forward Voltage	V_F	13235A 13255A		2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	13235A 13255A			100	μA	V_R = 5V
Capacitance	C	13235A 13255A		35 15			V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

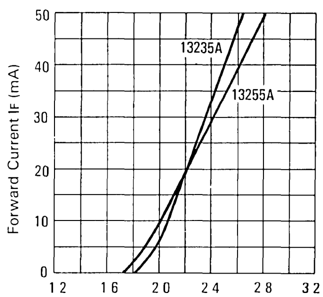


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

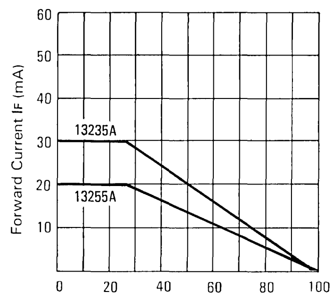


FIG 8 FORWARD CURRENT DERATING CURVE

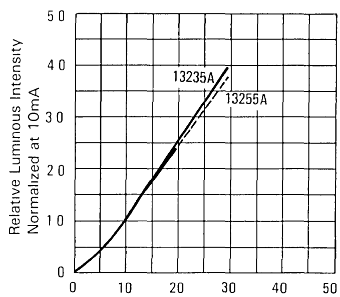


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

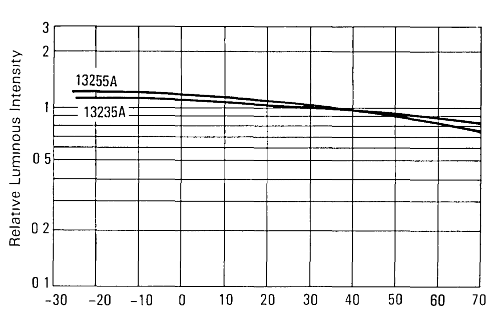


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

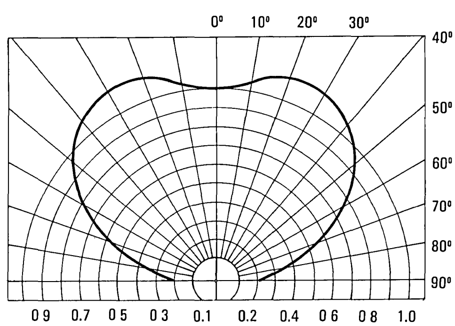


FIG. 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	I_V	13295A	0.3	0.8		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	13295A		150		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

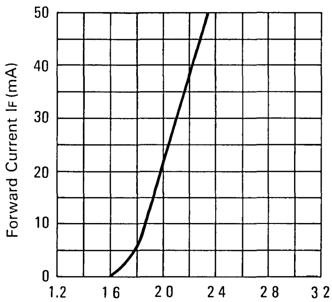


FIG. 12 FORWARD CURRENT VS FORWARD VOLTAGE

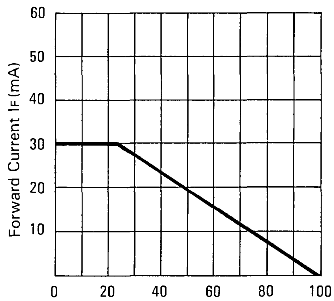


FIG. 13 FORWARD CURRENT DERATING CURVE

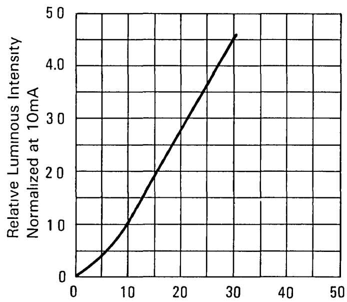


FIG. 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

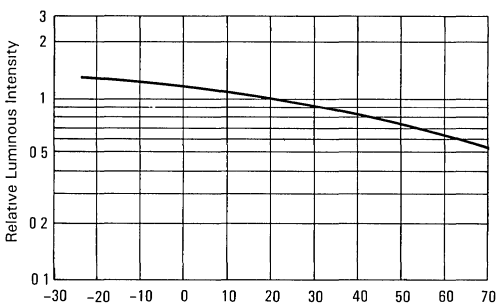


FIG 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

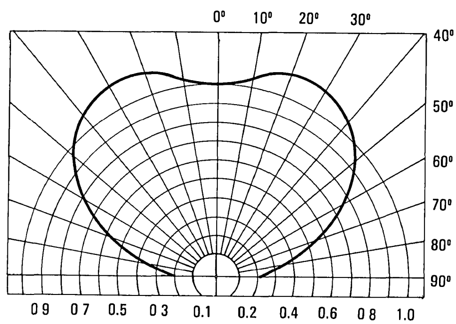


FIG. 16 SPATIAL DISTRIBUTION

LITEON

2.2x4.5 RECTANGULAR BAR LED LAMPS

LTL-13219B BRIGHT RED LTL-13259B YELLOW
LTL-13239B GREEN LTL-13279B AMBER

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.

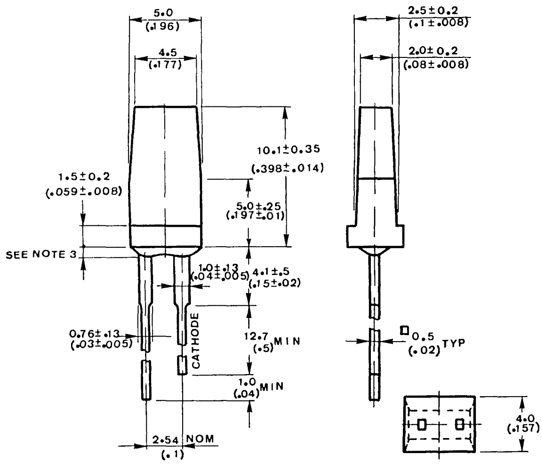
DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
13219B	Red	Diffused	Bright Red
13239B	Green	Diffused	Green
13259B	Yellow	Diffused	Yellow
13279B	Amber	Diffused	Amber

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW AMBER	UNIT
Power Dissipation	40	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	mA
Continuous Forward Current	15	30	20	mA
Derating Linear From 25°C	0.2	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	–55°C to +100°C			
Storage Temperature Range	–55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds			

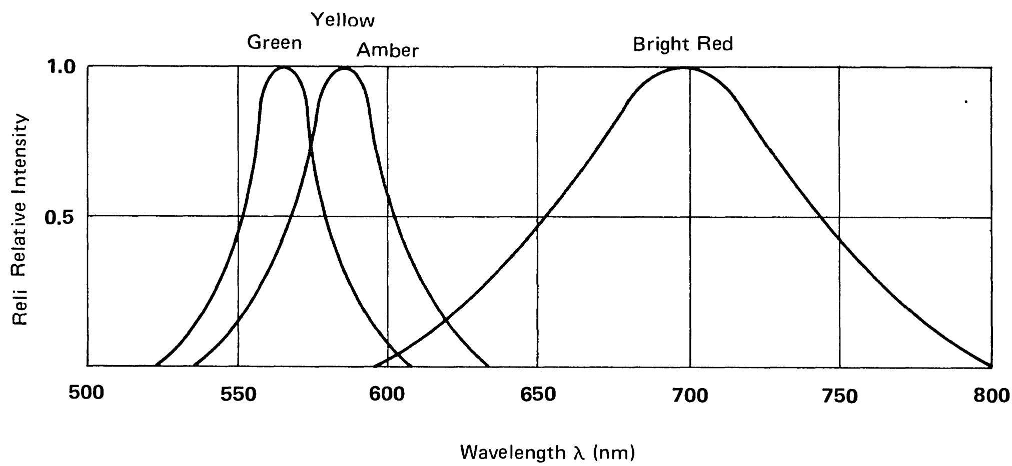


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	13219B	0.1	0.26		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	13219B		170		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}			697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			90		nm	
Forward Voltage	V_F			2.1	2.8	V	I_F = 20mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			55		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

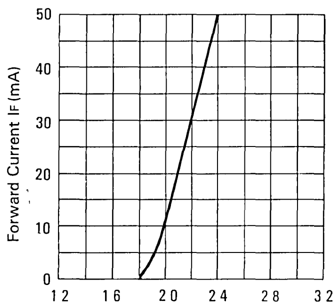


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE

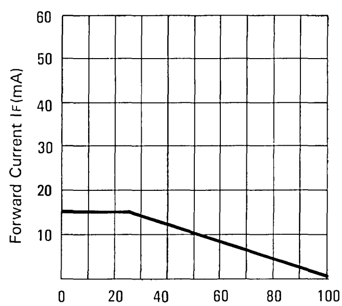


FIG 3 FORWARD CURRENT DERATING CURVE

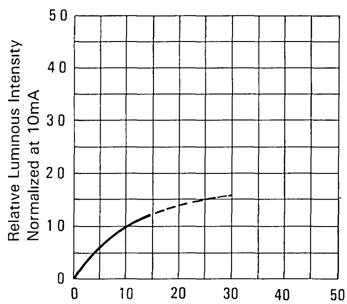


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

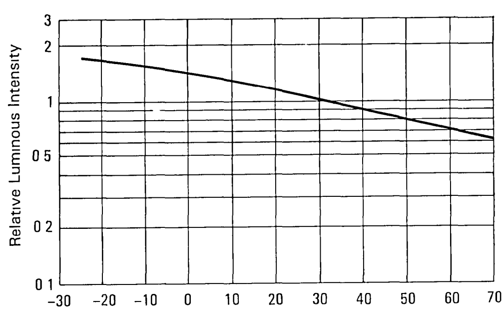


FIG.5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

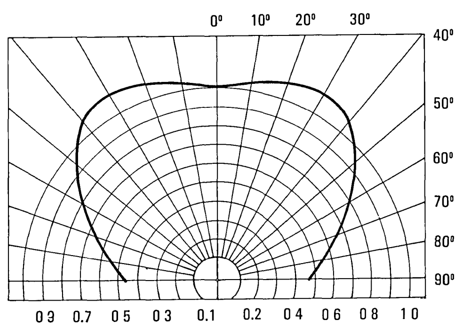


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	13239B 13259B	0.3 0.4	0.75 1.1		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	13239B 13259B		170		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	13239B 13259B		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	13239B 13259B		30 35		nm	
Forward Voltage	V_F	13239B 13259B		2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	13239B 13259B			100	μA	V_R = 5V
Capacitance	C	13239B 13259B		35 15		PF	f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

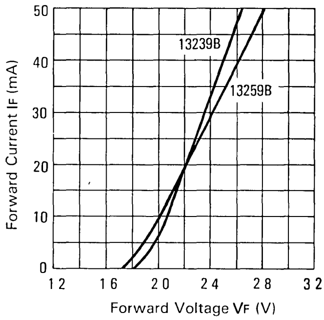


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

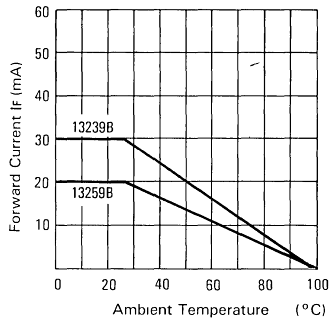


FIG 8 FORWARD CURRENT DERATING CURVE

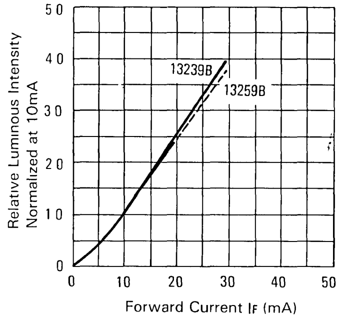


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

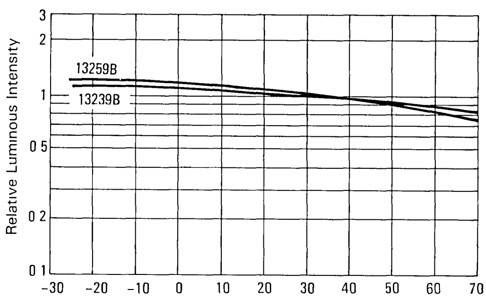


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

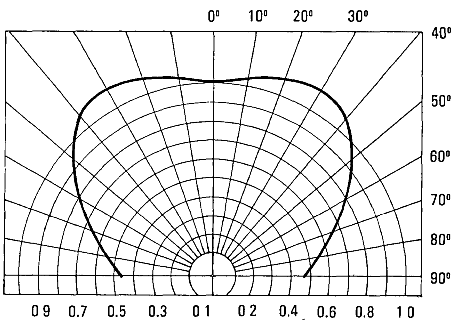


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	13279B	0.4	1.1		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	13279B		170		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}			600		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			35		nm	
Forward Voltage	V_F			2.1	2.8	V	I_F = 20mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			15		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

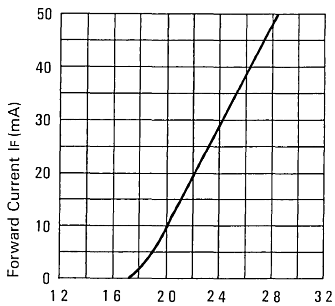


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

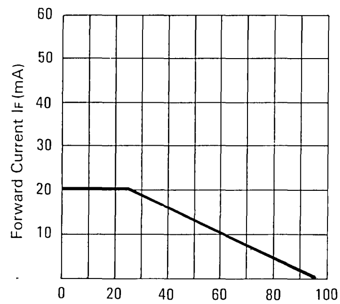


FIG 13 FORWARD CURRENT DERATING CURVE

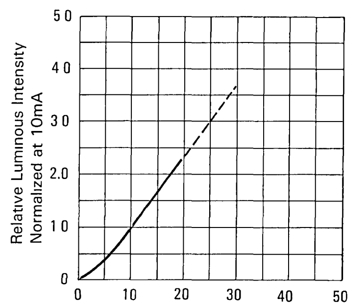


FIG. 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

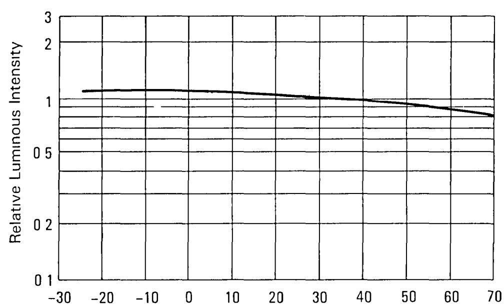


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

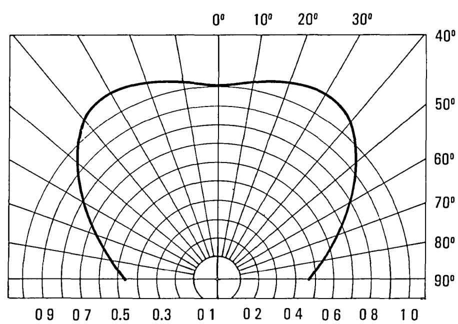


FIG. 16 SPATIAL DISTRIBUTION

LED LAMPS

LITEON

2.4x5.0 RECTANGULAR BAR LED LAMPS

LTL-23201AL RED
LTL-23211AL BRIGHT RED
LTL-23221AL HIGH EFFICIENCY RED
LTL-23231AL GREEN
LTL-23251AL YELLOW
LTL-23291AL ORANGE

FEATURES

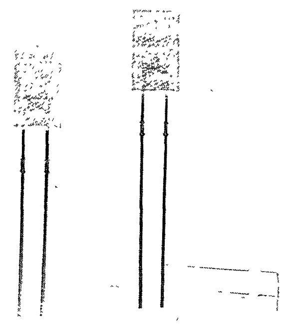
- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.

DESCRIPTION

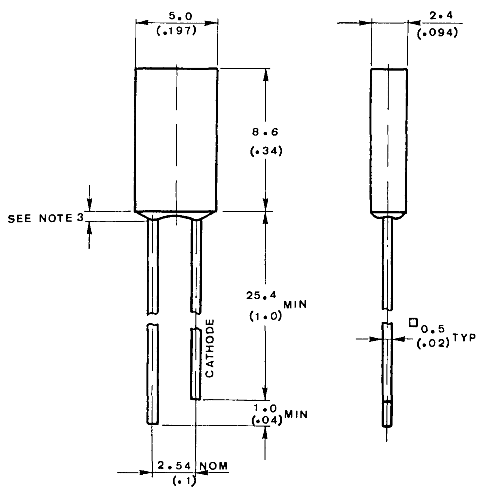
The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
23201AL	Red	Diffused	Red
23211AL	Red	Diffused	Bright Red
23221AL	Red	Diffused	Hi. Eff. Red
23231AL	Green	Diffused	Green
23251AL	Yellow	Diffused	Yellow
23291AL	Orange	Diffused	Orange



PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	80	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	80	120	mA
Continuous Forward Current	40	15	30	20	30	mA
Derating Linear From 25°C	0.5	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C					
Storage Temperature Range	–55°C to +100°C					
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds					

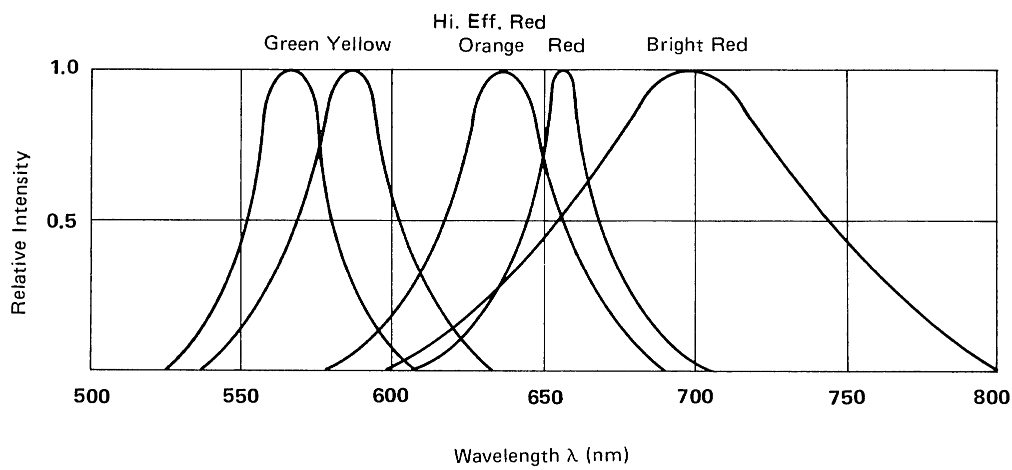


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL—	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	23201AL 23211AL 23221AL	0.08 0.2 0.4	0.2 0.4 1.3		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	23201AL 23211AL 23221AL		130		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	23201AL 23211AL 23221AL		655 697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	23201AL 23211AL 23221AL		24 90 40		nm	
Forward Voltage	V_F	23201AL 23211AL 23221AL		1.7 2.1 2.0	2.0 2.8 2.8	V	I_F = 20 mA
Reverse Current	I_R	23201AL 23211AL 23221AL			100	μA	V_R = 5V
Capacitance	C	23201AL 23211AL 23221AL		30 55 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

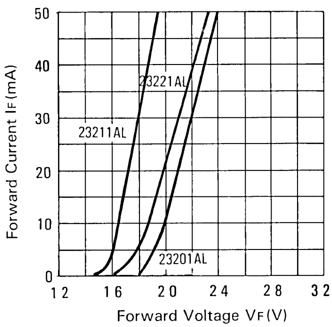


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

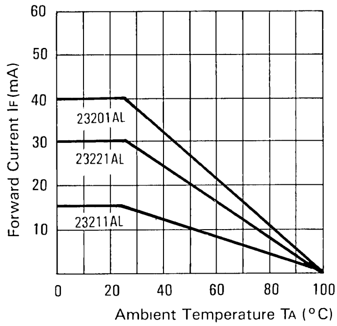


FIG 3 FORWARD CURRENT DERATING CURVE

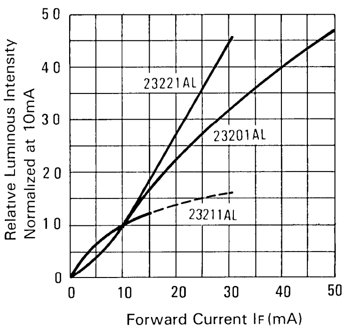


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

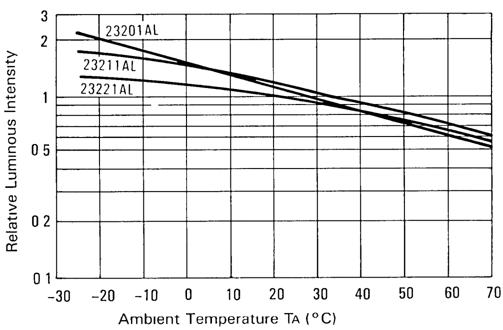


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

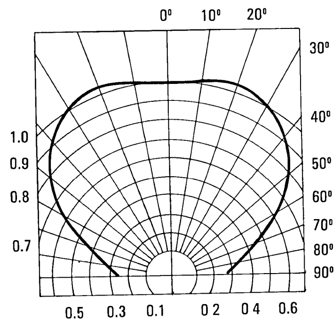


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	23231AL 23251AL	0.4 0.4	1.3 1.3		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	23231AL 23251AL		130		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	23231AL 23251AL		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	23231AL 23251AL		30 35		nm	
Forward Voltage	V_F	23231AL 23251AL		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	23231AL 23251AL			100	μA	V_R = 5V
Capacitance	C	23231AL 23251AL		35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

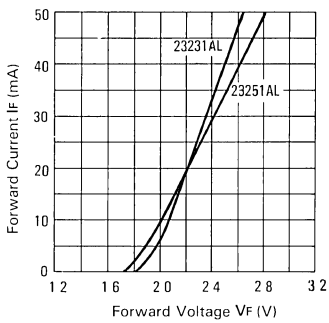


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

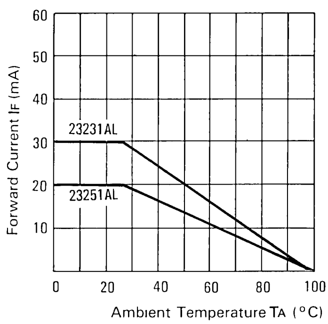


FIG 8 FORWARD CURRENT DERATING CURVE

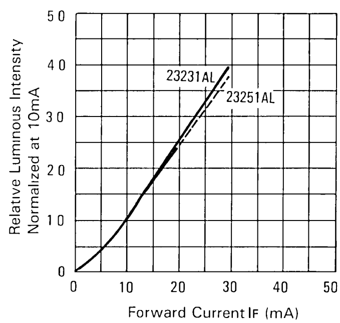


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

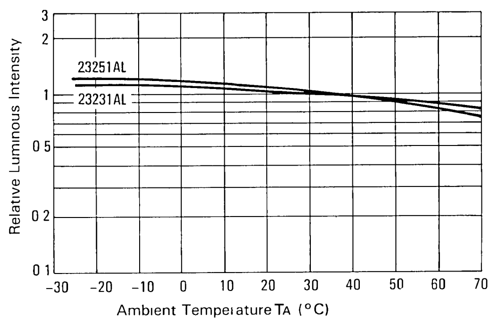


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

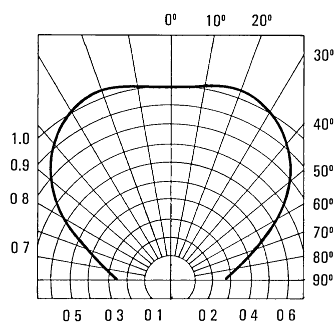


FIG. 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL—	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	23291AL	0.4	1.3		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	23291AL		130		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

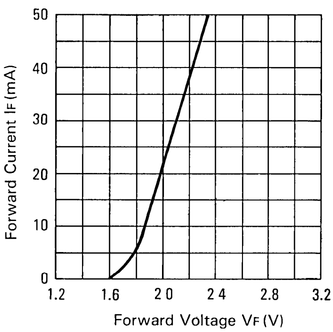


FIG. 12 FORWARD CURRENT VS FORWARD VOLTAGE

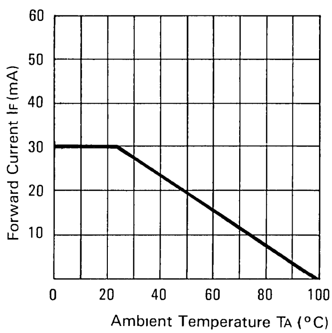


FIG 13 FORWARD CURRENT DERATING CURVE

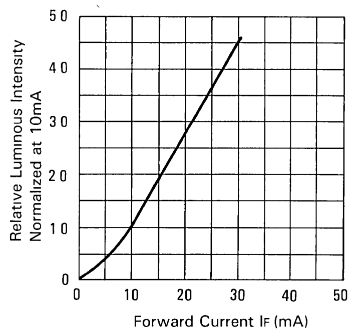


FIG. 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

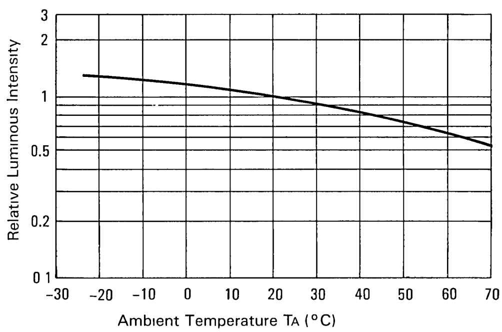


FIG 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

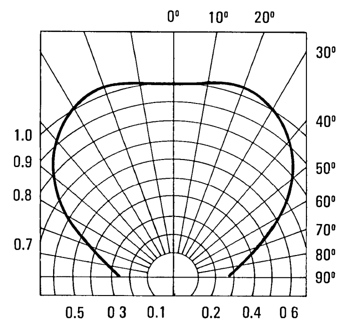


FIG. 16 SPATIAL DISTRIBUTION

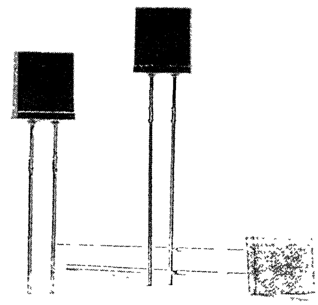
LITEON

2.0x6.0 RECTANGULAR BAR LED LAMPS

LTL-23214A BRIGHT RED LTL-23254A YELLOW
LTL-23234A GREEN LTL-23274A AMBER

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.



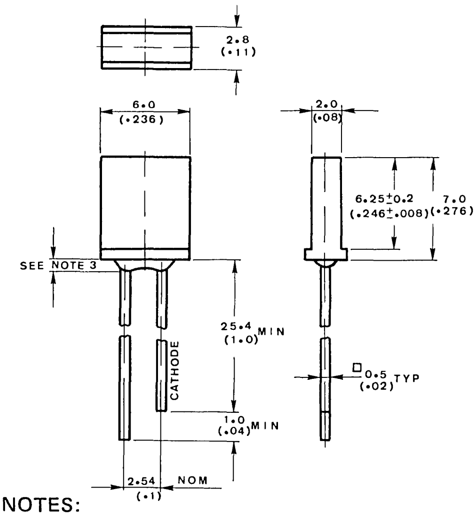
DESCRIPTION

The Bright Red source color aevices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
23214A	Red	Diffused	Bright Red
23234A	Green	Diffused	Green
23254A	Yellow	Diffused	Yellow
23274A	Amber	Diffused	Amber

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW AMBER	UNIT
Power Dissipation	40	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	mA
Continuous Forward Current	15	30	20	mA
Derating Linear From 25°C	0.2	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	–55°C to +100°C			
Storage Temperature Range	–55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds			

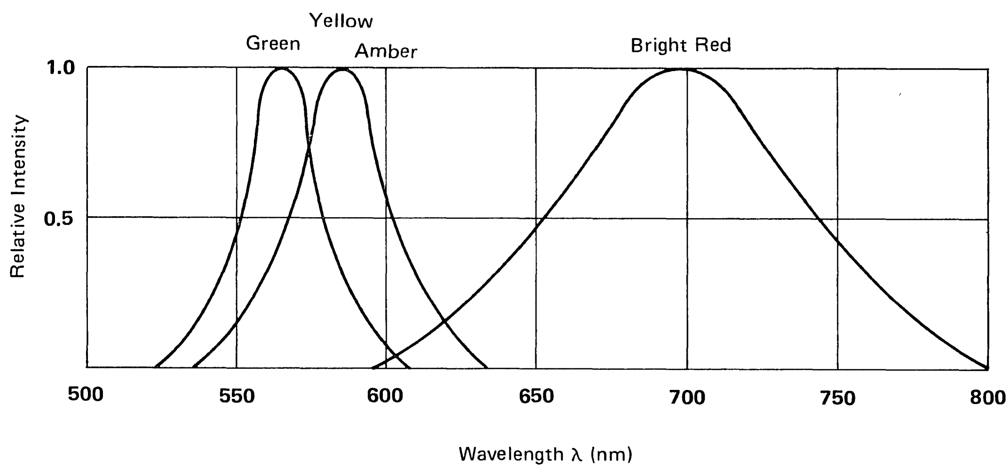


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	23214A	0.3	0.6		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta ½$	23214A		125		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	23214A		697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	23214A		90		nm	
Forward Voltage	V_F	23214A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	23214A			100	μA	V_R = 5V
Capacitance	C	23214A		55		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

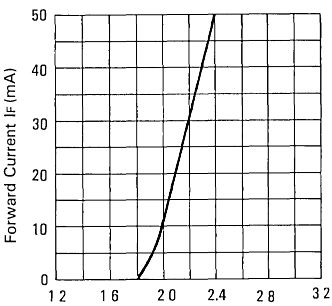


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

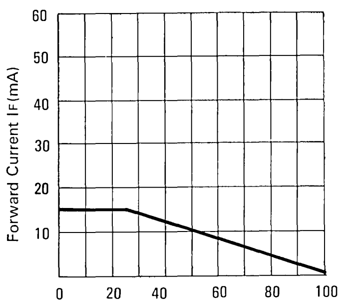


FIG 3 FORWARD CURRENT DERATING CURVE.

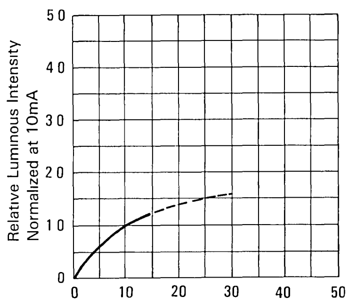


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

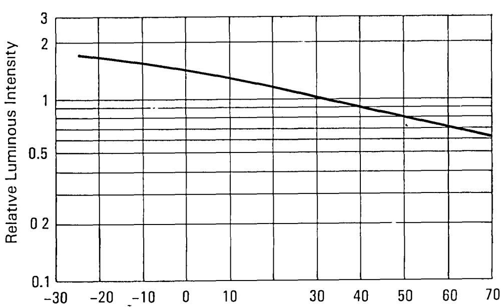


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

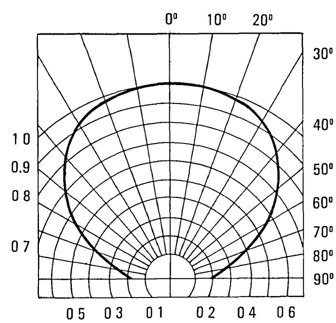


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	23234A 23254A	0.3 0.5	0.75 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	23234A 23254A		125		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	23234A 23254A		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	23234A 23254A		30 35		nm	
Forward Voltage	V_F	23234A 23254A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	23234A 23254A			100	μA	V_R = 5V
Capacitance	C	23234A 23254A		35 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

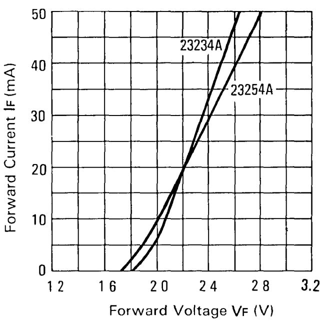


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

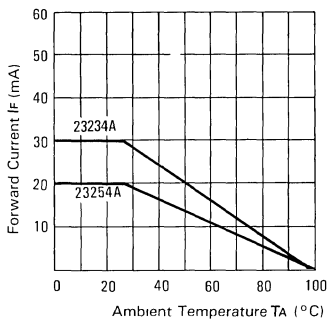


FIG 8 FORWARD CURRENT DERATING CURVE

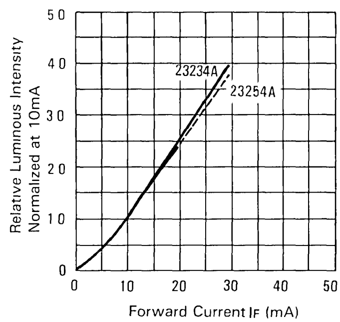


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

TA

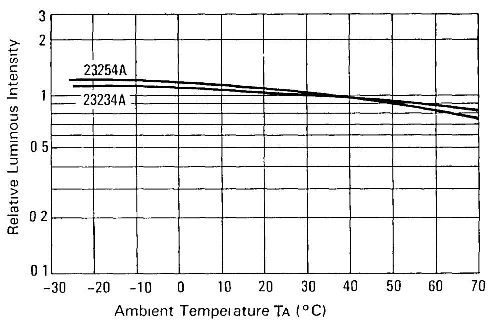


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

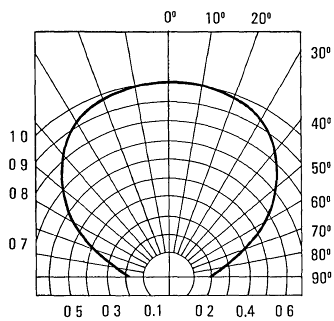


FIG. 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	23274A	0.5	1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta\frac{1}{2}$	23274A		125		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	$\lambda PEAK$	23274A		600		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	23274A		35		nm	
Forward Voltage	V_F	23274A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	23274A			100	μA	V_R = 5V
Capacitance	C	23274A		1.5		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta\frac{1}{2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

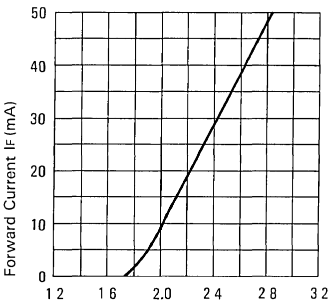


FIG. 12 FORWARD CURRENT VS. FORWARD VOLTAGE

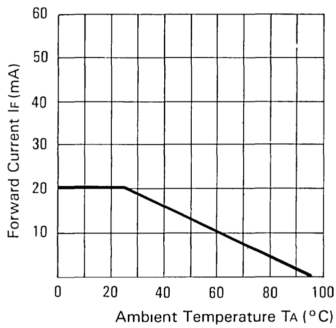


FIG 13 FORWARD CURRENT DERATING CURVE

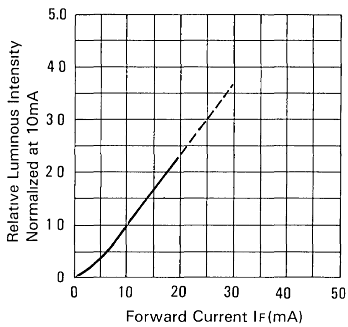


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

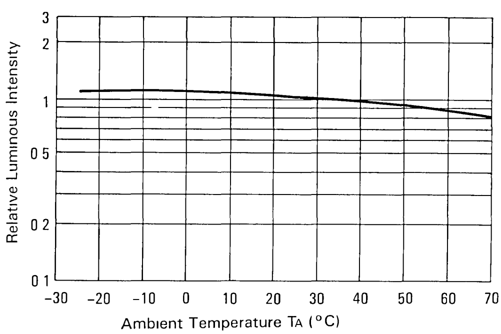


FIG. 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

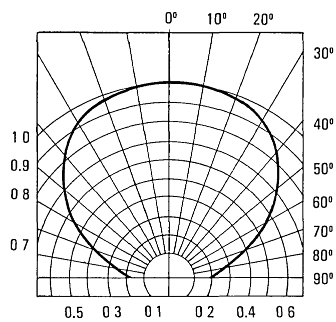


FIG 16 SPATIAL DISTRIBUTION

LED LAMPS

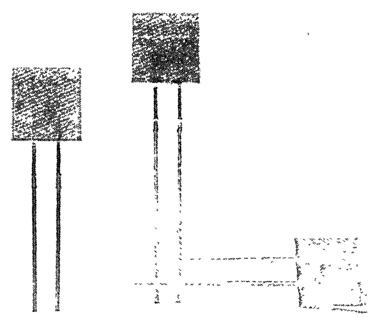
LITEON

2.5x7.1 RECTANGULAR BAR LED LAMPS

LTL-3213A BRIGHT RED
LTL-3223A HI. EFF. RED
LTL-3233A GREEN
LTL-3253A YELLOW
LTL-3293A ORANGE

FEATURES

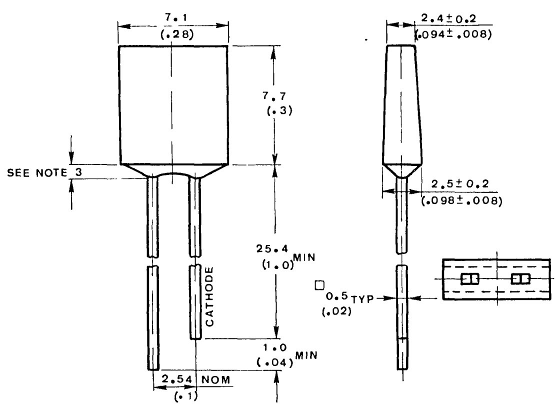
- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.



DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
3213A	Red	Diffused	Bright Red
3223A	Red	Diffused	Hi. Eff. Red
3233A	Green	Diffused	Green
3253A	Yellow	Diffused	Yellow
3293A	Orange	Diffused	Orange

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW	HI. EFF. RED ORANGE	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

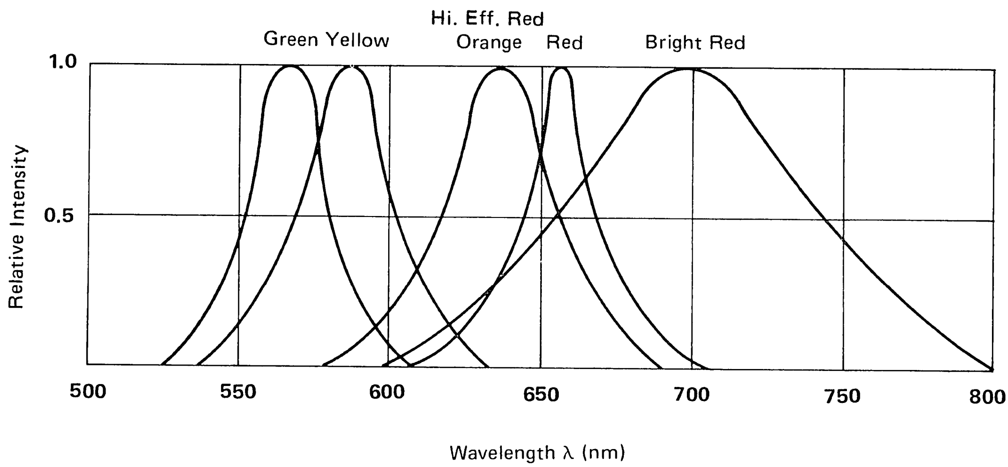


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	3213A 3223A	0.3 1.1	0.7 2.5		mcd	I_F = 10 mA Note 1
Viewing Angle	2θ½	3213A 3223A		130		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	3213A 3223A		697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	3213A 3223A		90 40		nm	
Forward Voltage	V_F	3213A 3223A		2.1 2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R	3213A 3223A			100	μA	V_R = 5V
Capacitance	C	3213A 3223A		55 20		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

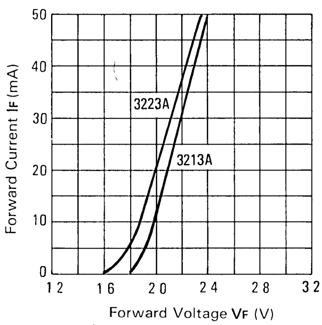


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

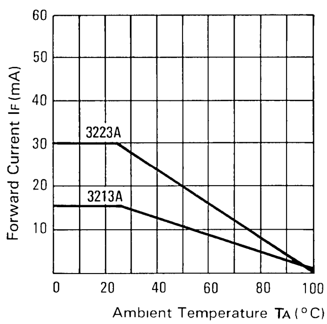


FIG 3 FORWARD CURRENT DERATING CURVE

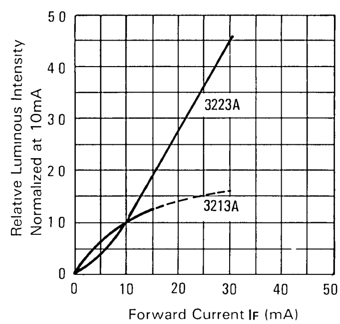


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

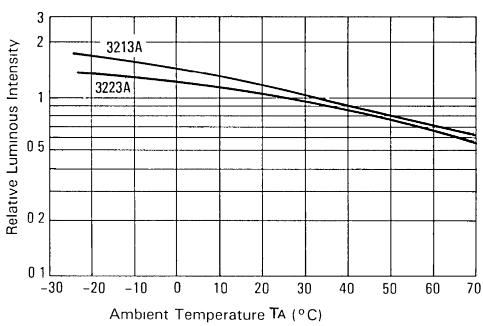


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

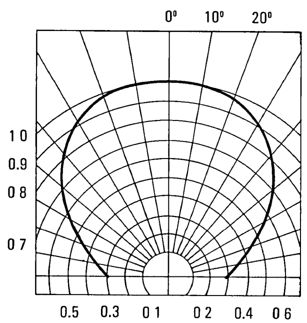


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	3233A 3253A	0.8 0.5	1.9 1.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	3233A 3253A		130		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	3233A 3253A		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	3233A 3253A		30 35		nm	
Forward Voltage	V_F	3233A 3253A		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	3233A 3253A			100	μA	V_R = 5V
Capacitance	C	3233A 3253A		35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

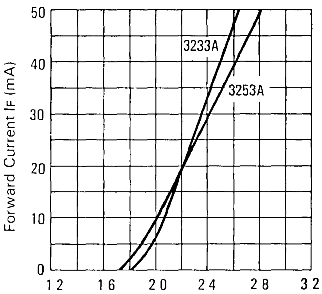


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

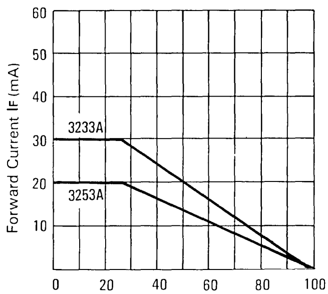


FIG 8 FORWARD CURRENT DERATING CURVE

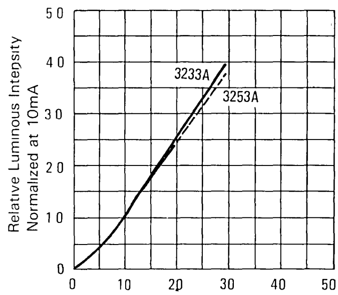


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

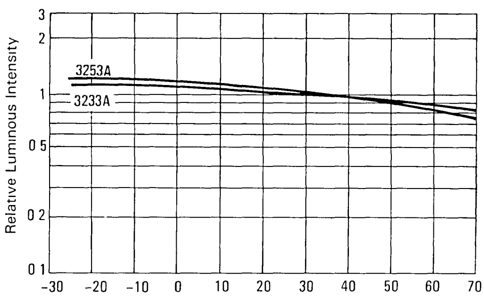


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

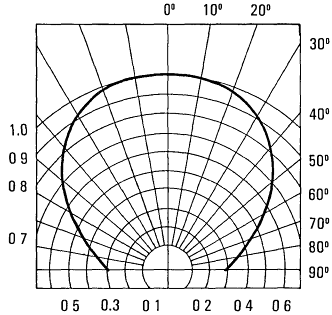


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	3293A	1.1	2.5		mcd	$I_F = 10$ mA Note 1
Viewing Angle	$2\theta_{1/2}$	3293A		130		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	3293A		630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	3293A		40		nm	
Forward Voltage	V_F	3293A		2.0	2.8	V	$I_F = 20$ mA
Reverse Current	I_R	3293A			100	μA	$V_R = 5V$
Capacitance	C	3293A		20		PF	$V_F = 0$ f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity

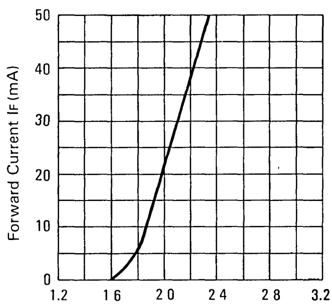


FIG. 12 FORWARD CURRENT VS FORWARD VOLTAGE

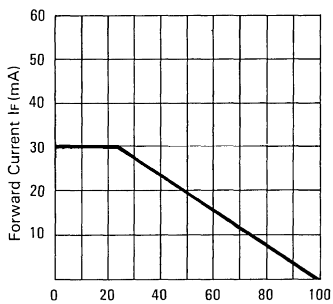


FIG 13 FORWARD CURRENT DERATING CURVE

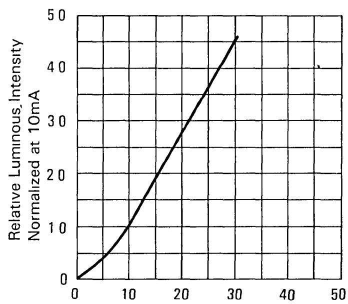


FIG. 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

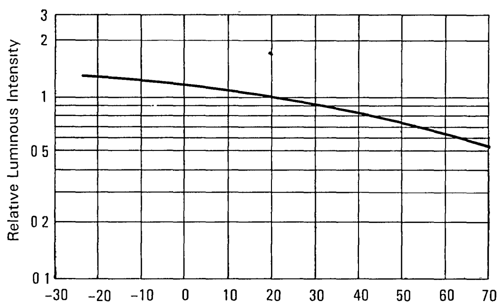


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

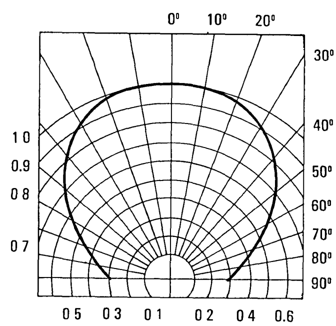


FIG. 16 SPATIAL DISTRIBUTION

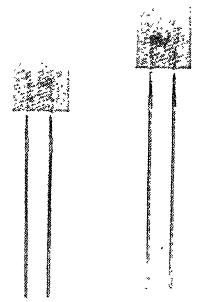
LITEON

DOUBLE 2.0 SQUARE TOP LED LAMPS

LTL-23216A BRIGHT RED
LTL-23236A GREEN
LTL-23256A YELLOW
LTL-23276A AMBER
LTL-23296A DRANGE

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.



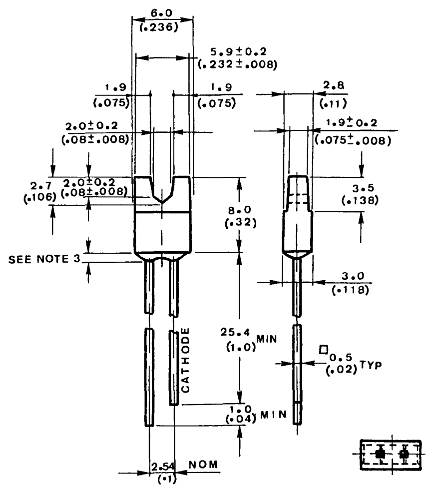
DESCRIPTION

The bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
23216A	Red	Diffused	Bright Red
23236A	Green	Diffused	Green
23256A	Yellow	Diffused	Yellow
23276A	Amber	Diffused	Amber
23296A	Orange	Diffused	Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW AMBER	ORANGE	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

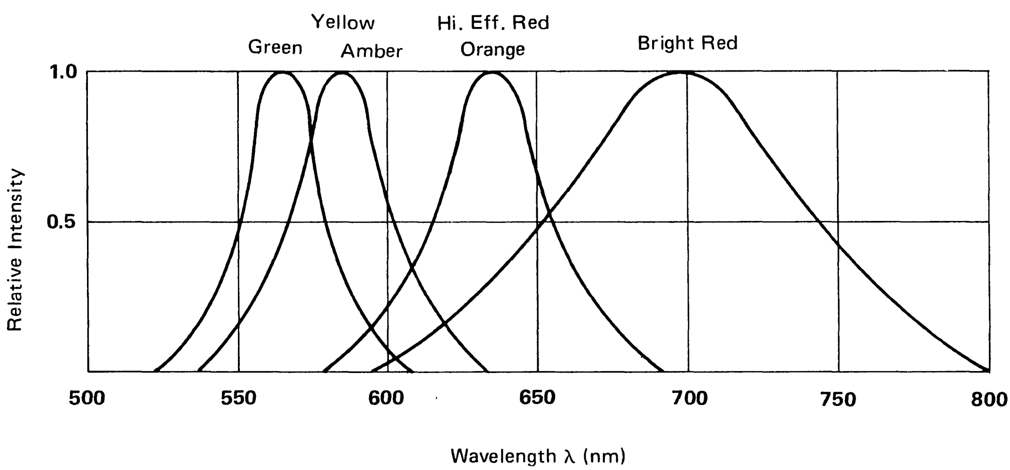


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	23216A	0.1	0.3		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta ½$	23216A		120		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}			697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			90		nm	
Forward Voltage	V_F			2.1	2.8	V	I_F = 20mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			55		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

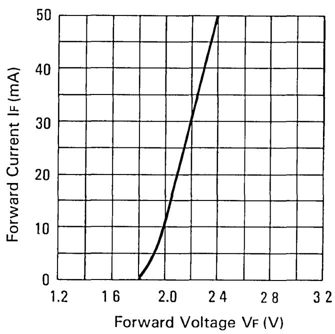


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

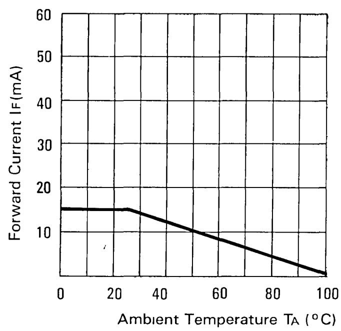


FIG. 3 FORWARD CURRENT DERATING CURVE.

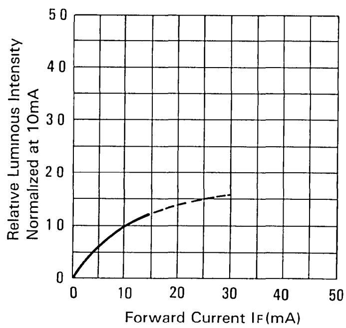


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

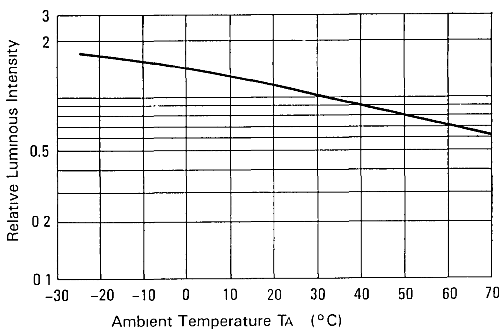


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

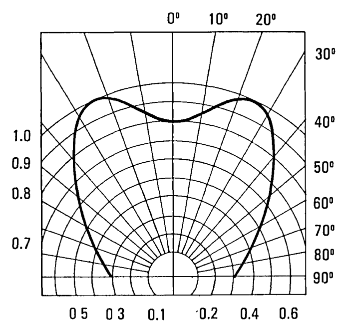


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	23236A 23256A	0.4 0.4	1.2 1.2		mcd	$I_F = 10mA$ Note 1
Viewing Angle	$2\theta½$	23236A 23256A		120		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ PEAK	23236A 23256A		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	23236A 23256A		30 35		nm	
Forward Voltage	V_F	23236A 23256A		2.1	2.8	V	$I_F = 20mA$
Reverse Current	I_R	23236A 23256A			100	μA	$V_R = 5V$
Capacitance	C	23236A 23256A		35 15		PF	$V_F = 0$ f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

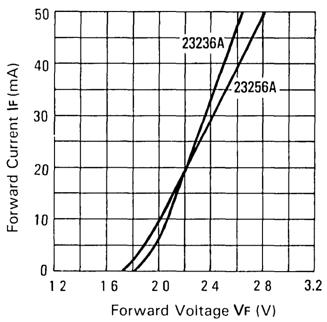


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

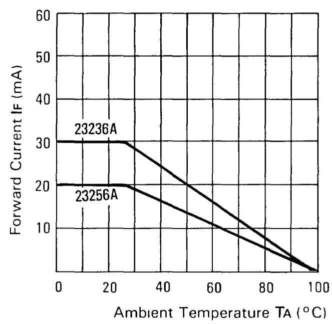


FIG 8 FORWARD CURRENT DERATING CURVE

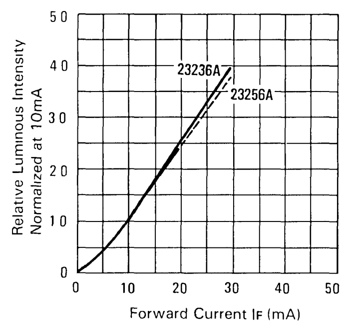


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

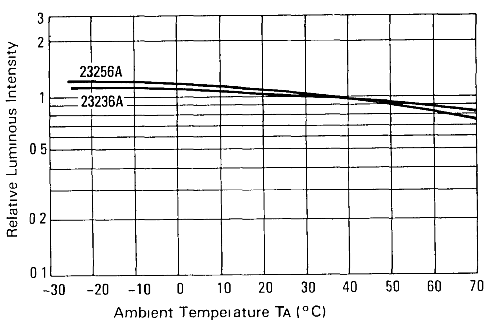


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

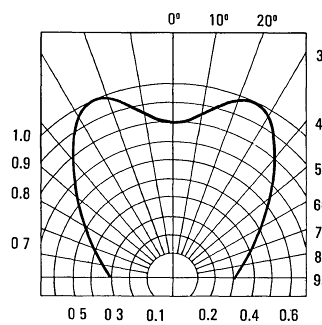


FIG 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	23276A 23296A	0.4 0.4	1.2 1.2		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta_{1/2}$	23276A 23296A		120		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	23276A 23296A		600 630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	23276A 23296A		35 40		nm	
Forward Voltage	V_F	23276A 23296A		2.1 2.0	2.8	V	I_F = 20mA
Reverse Current	I_R	23276A 23296A			100	μA	V_R = 5V
Capacitance	C	23276A 23296A		15 20		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-respose curve.
2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

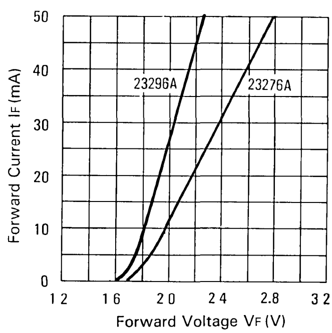


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

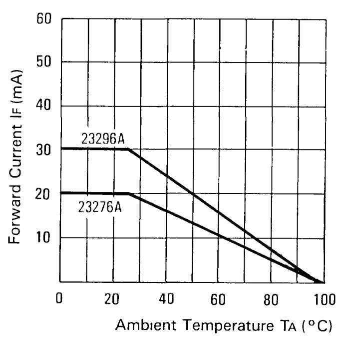


FIG 13 FORWARD CURRENT DERATING CURVE

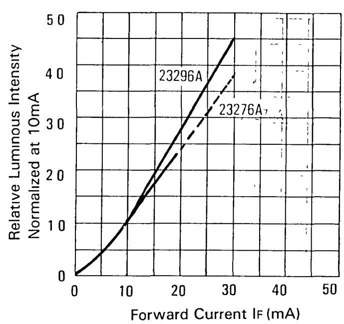


FIG 14 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

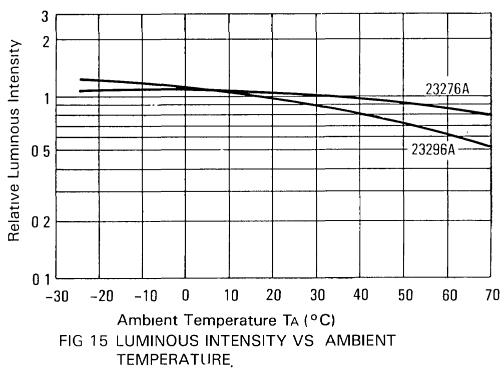


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

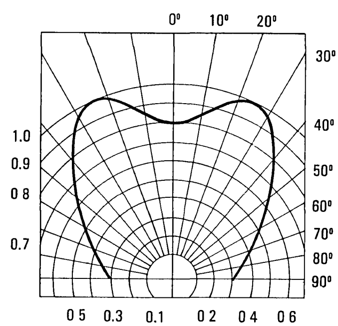


FIG 16 SPATIAL DISTRIBUTION

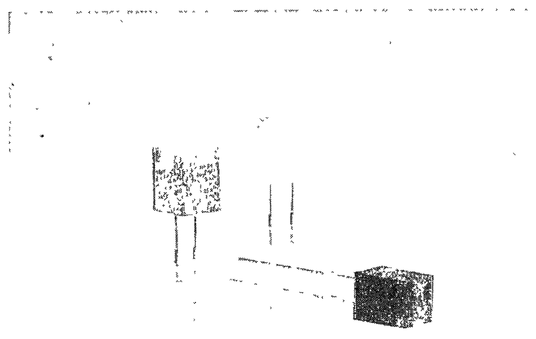
LED LAMPS

DOUBLE 1.5×5 RECTANGULAR TOP LED LAMPS

LTL-472P BRIGHT RED
LTL-472G GREEN
LTL-472Y YELLOW

FEATURE

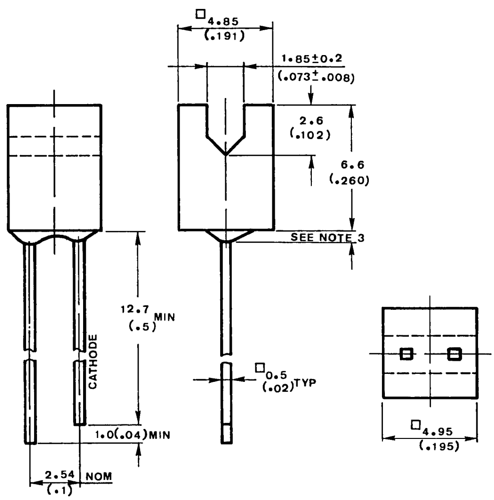
- LOW POWER CONSUMPTION
- MOST SUTIBLE FOR USE LIKE LEVEL INDICATOR
- LONG LIFE SOLID STATE RELIABILITY
- I.C. COMPATIBLE.



DESCRIPTION

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
472P	Red	Diffused	Bright Red
472G	Green	Diffused	Green
472Y	Yellow	Diffused	Yellow

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25^\circ C$

PARAMETER	BRIGHT RED	GREEN	YELLOW	UNIT
Power Dissipation	40	100	60	mW
Peak Forward Current (1/10 DutyCycle, 0.1ms Pulse Width)	60	120	80	mA
Continuous Forward Current	15	30	20	mA
Derating Linear From 25°C	0.2	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	−55°C to +100°C			
Storage Temperature Range	−55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds			

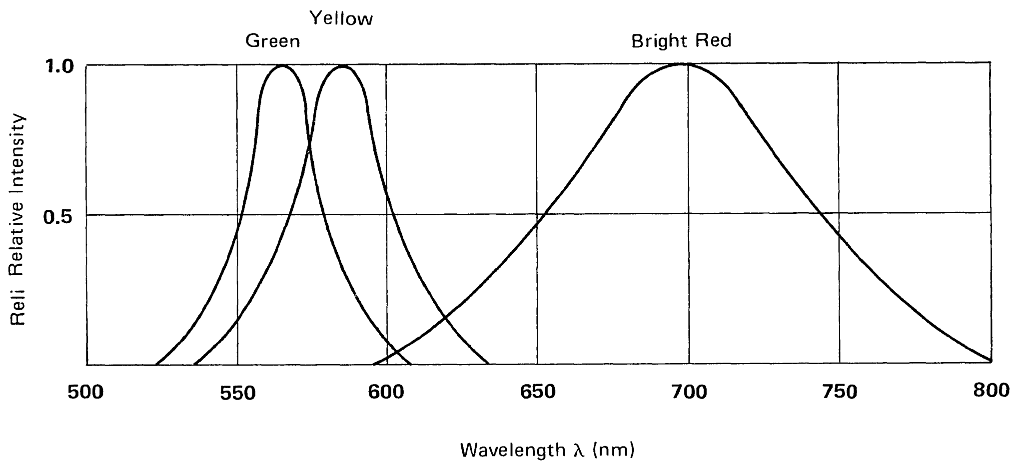


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	472P	0.1	0.3		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta½$	472P		200°		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	472P		697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	472P		90		nm	
Forward Voltage	V_F	472P		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	472P			100	μA	V_R = 5V
Capacitance	C	472P		55		PF	V_F = 0 f = 1 MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

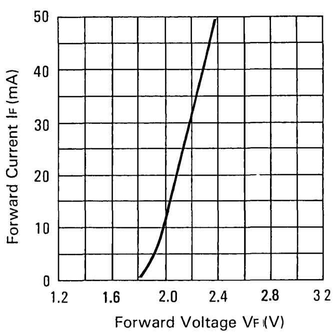


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

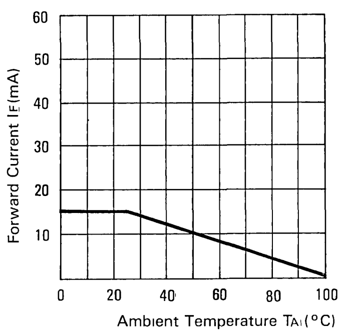


FIG 3 FORWARD CURRENT DERATING CURVE.

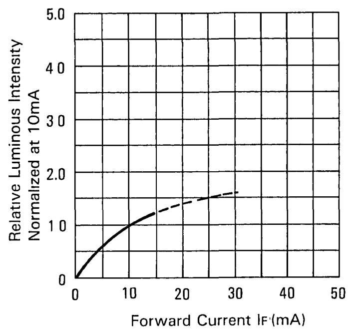


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

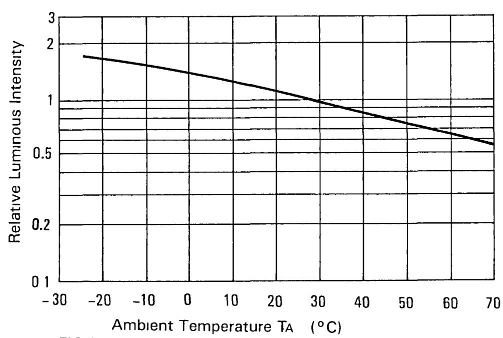


FIG.5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

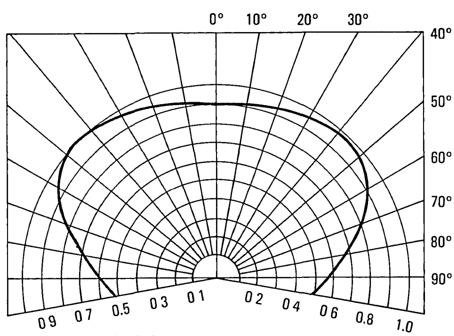


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	472G 472Y	0.3 0.3	0.7 0.7		mcd	I_F = 10 mA Note 1
Viewing Angle	$2\theta_{1/2}$	472G 472Y		200°		deg.	Note 2 (Fig 11)
Peak Emission Wavelength	λ_{PEAK}	472G 472Y		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	472G 472Y		30 35		nm	
Forward Voltage	V_F	472G 472Y		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	472G 472Y			100	μA	V_R = 5V
Capacitance	C	472G 472Y		35 15		PF	V_F = 0 f = 1 MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

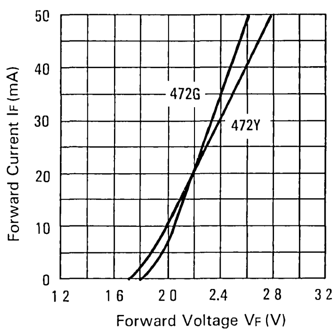


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE

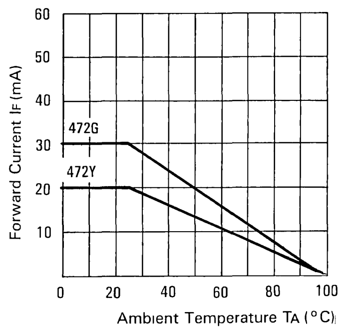


FIG 8 FORWARD CURRENT DERATING CURVE

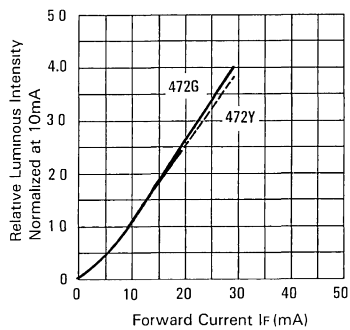


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

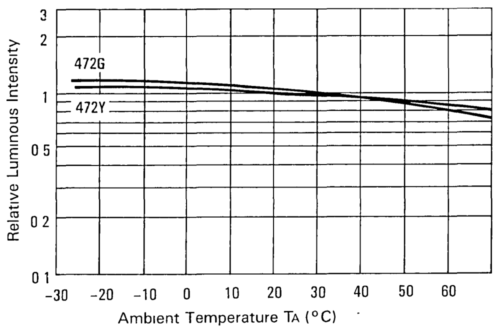


FIG 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

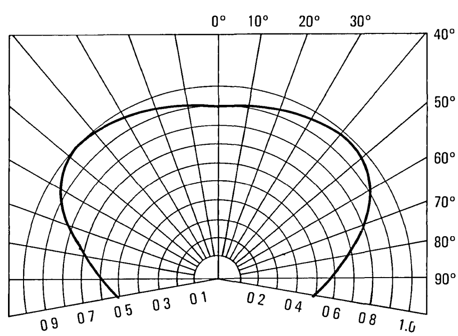


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

3.0, 5.0 SQUARE TOP LED LAMPS

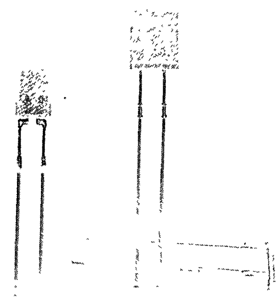
LTL-9212A/9213A BRIGHT RED
LTL-9222A/9223A HIGH EFFICIENCY RED
LTL-9232A/9233A GREEN
LTL-9252A/9253A YELLOW
LTL-9272A/9273A AMBER
LTL-9292A/9293A ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- MOST SUITABLE FOR USE LIKE LEVEL INDICATOR.
- EXCELLENT UNIFORMITY OF LIGHT EMITTANCE.
- LONG LIFE-SOLID STATE RELIABILITY.
- I.C. COMPATIBLE.

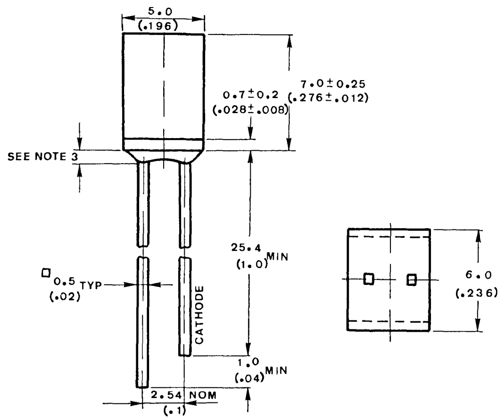
DESCRIPTION

The bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.
The High Efficiency Red and Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow and Amber source color devices are made with gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

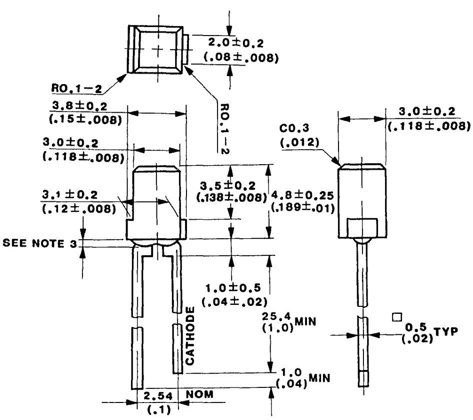


PACKAGE DIMENSIONS

LTL-92x3A Series



LTL-92x2A Series



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package..
5. Specifications are subject to change without notice.

DEVICES

PART NO. LTL-	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
9212A	Red	Diffused	Bright Red
9222A	Red	Diffused	Hi.Eff.Red
9232A	Green	Diffused	Green
9252A	Yellow	Diffused	Yellow
9272A	Amber	Diffused	Amber
9292A	Orange	Diffused	Orange

PART NO. LTL-	LENS COLOR	LENS DIFFUSION	SOURCE COLOR
9213A	Red	Diffused	Bright Red
9223A	Red	Diffused	Hi.Eff.Red
9233A	Green	Diffused	Green
9253A	Yellow	Diffused	Yellow
9273A	Amber	Diffused	Amber
9293A	Orange	Diffused	Orange

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	YELLOW AMBER	HI.EFF.RED ORANGE	UNIT
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	–55°C to +100°C				
Storage Temperature Range	–55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds				

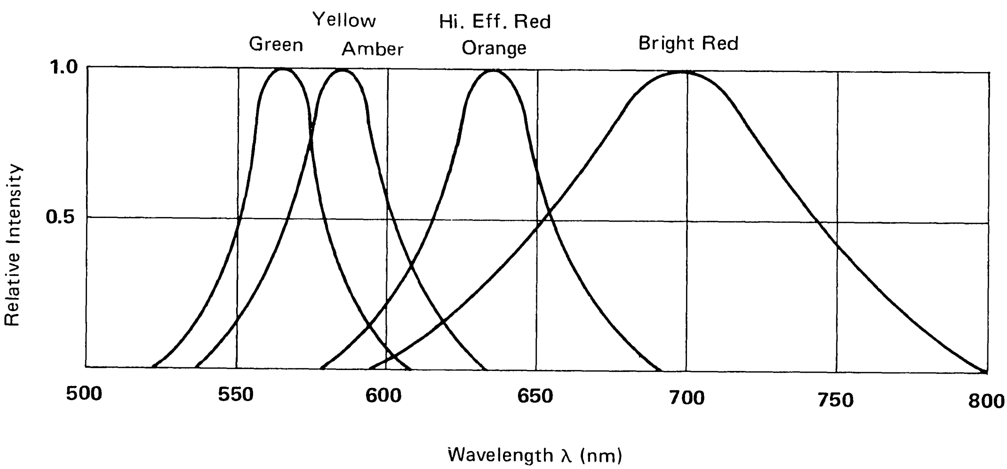


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	9212A 9222A 9213A 9223A	0.3 0.5 0.2 0.5	0.8 1.7 0.6 1.7		mcd	I_F = 10mA Note 1
Viewing Angle	2θ½	9212A 9222A 9213A 9223A		100 100 150 150		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	9212A 9222A 9213A 9223A		697 635 697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	9212A 9222A 9213A 9223A		90 40 90 40		nm	
Forward Voltage	V_F	9212A 9222A 9213A 9223A		2.1 2.0 2.1 2.0	2.8	V	I_F = 20mA
Reverse Current	I_R	9212A 9222A 9213A 9223A			100	μA	V_R = 5V
Capacitance	C	9212A 9222A 9213A 9223A		55 20 55 20		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

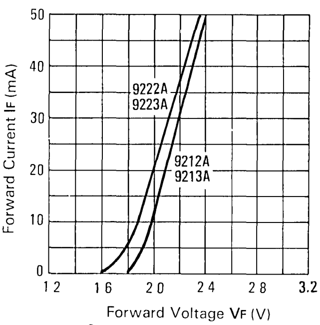


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

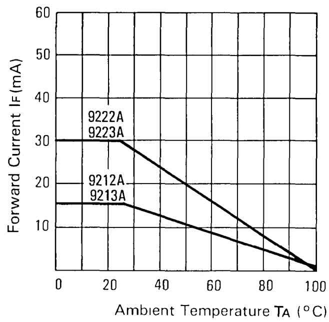


FIG 3 FORWARD CURRENT DERATING CURVE

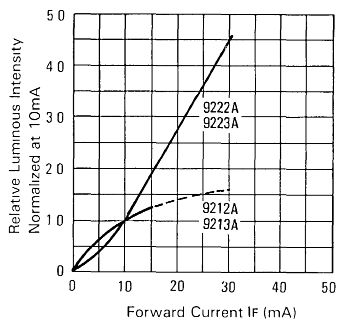


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

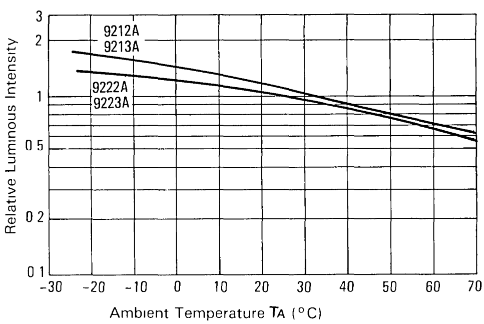


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

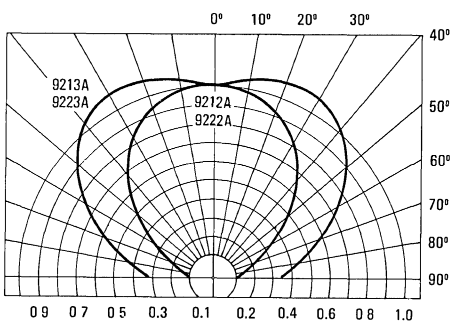


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	9232A 9252A 9233A 9253A	0.5 0.5 0.5 0.5	1.7 1.7 1.7 1 7		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	9232A 9252A 9233A 9253A		100 100 150 150		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λPEAK	9232A 9252A 9233A 9253A		565 585 565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	9232A 9252A 9233A 9253A		30 35 30 35		nm	
Forward Voltage	V_F	9232A 9252A 9233A 9253A		2 1	2.8	V	I_F = 20mA
Reverse Current	I_R	9232A 9252A 9233A 9253A			100	μA	V_R = 5V
Capacitance	C	9232A 9252A 9233A 9253A		35 15 35 15		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

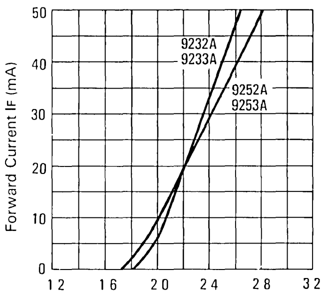


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

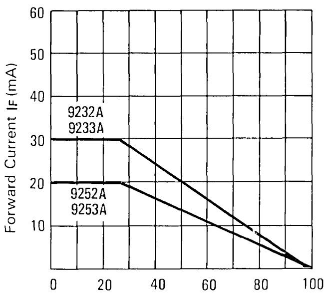


FIG 8 FORWARD CURRENT DERATING CURVE

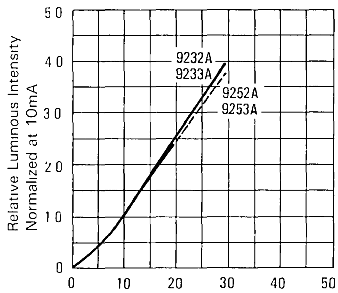


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

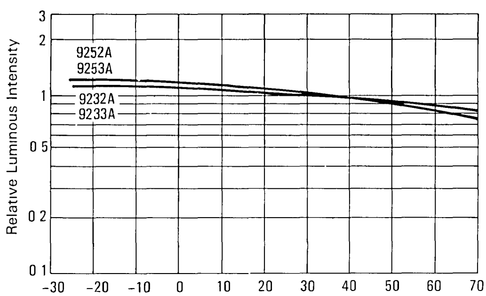


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

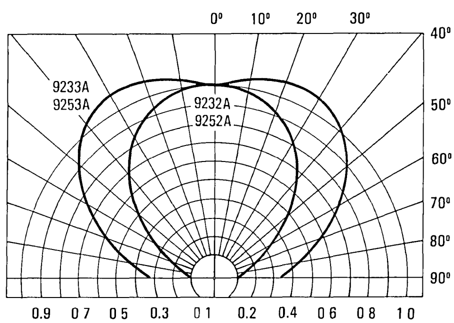


FIG 11 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity	Iv	9272A 9292A 9273A 9293A	0.5 0.5 0.5 0.5	1.7 1.7 1.7 1.7		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta ½$	9272A 9292A 9273A 9293A		100 100 150 150		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λPEAK	9272A 9292A 9273A 9293A		600 630 600 630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	9272A 9292A 9273A 9293A		35 40 35 40		nm	
Forward Voltage	V_F	9272A 9292A 9273A 9293A		2.1 2.0 2.1 2.0	2.8	V	I_F = 20mA
Reverse Current	I_R	9272A 9292A 9273A 9293A			100	μA	V_R = 5V
Capacitance	C	9272A 9292A 9273A 9293A		15 20 15 20		PF	V_F = 0 f = 1MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Intenationale De L'Eclairage) eye-response curve.

2. $\theta ½$ is the off-axis angle at which the liminous intensity is half the axial luminous intensity.

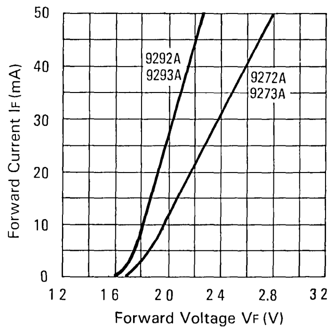


FIG 12 FORWARD CURRENT VS FORWARD VOLTAGE

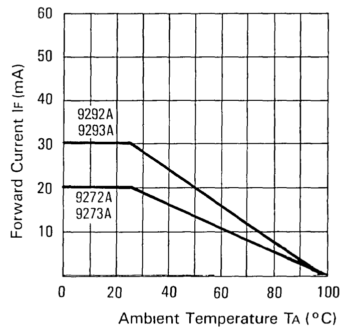


FIG 13 FORWARD CURRENT DERATING CURVE

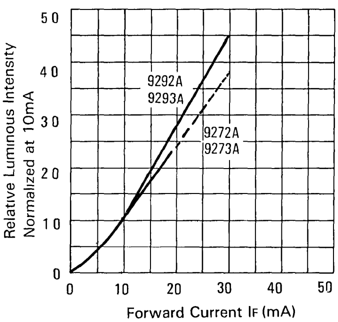


FIG 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

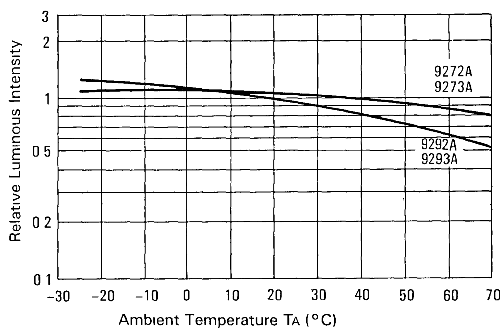


FIG 15 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

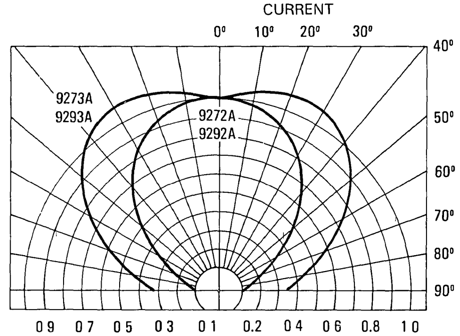


FIG 16 SPATIAL DISTRIBUTION

LITEON

3.2x5.6 REFLECTOR CAP RECTANGULAR BARS

LTL-33221AA HIGH EFFICIENCY RED
LTL-33231AA GREEN
LTL-33251AA YELLOW

APPLICATIONS

- LEGEND BACKLIGHTING.
- ILLUMINATED PUSHBUTTON.
- PANEL INDICATOR.
- BARGRAPH METER.

DESCRIPTION

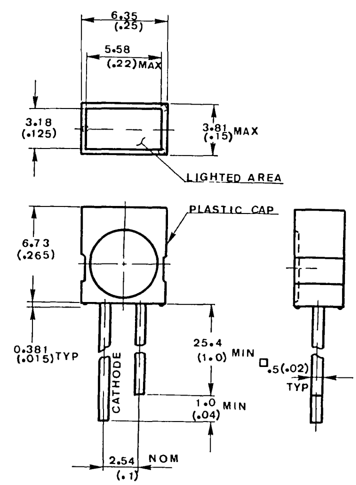
The High Efficiency Red source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
33221AA	Red	Diffused	Hi. Eff. Red
33231AA	Green	Diffused	Green
33251AA	Yellow	Diffused	Yellow

NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

PACKAGE DIMENSIONS



LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	HI. EFF. RED	GREEN	YELLOW	UNIT
Power Dissipation	100	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	120	80	mA
Continuous Forward Current	30	30	20	mA
Derating Linear From 25°C	0.4	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	–55°C to +100°C			
Storage Temperature Range	–55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds			

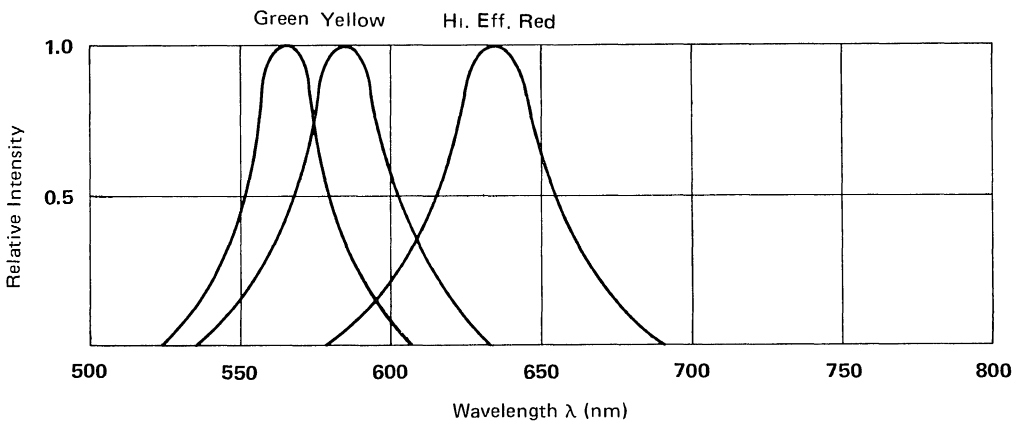


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	33221AA	1.1	3.8		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	33221AA		100		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	33221AA		635		nm	Measurement @Peak (Fig. 1)
Spectral Line Hall Width	$\Delta\lambda$	33221AA		40		nm	
Forward Voltage	V_F	33221AA		2.0	2.8	V	I_F = 20mA
Reverse Current	I_R	33221AA			100	μA	V_R = 5V
Capacitance	C	33221AA		20		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

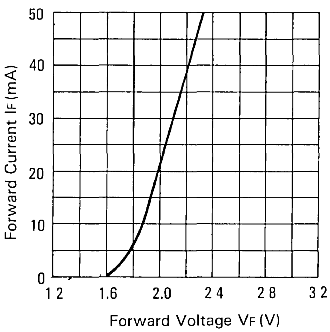


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

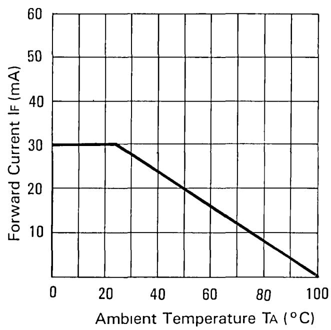


FIG 3 FORWARD CURRENT DERATING CURVE.

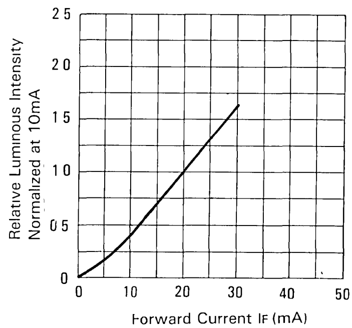


FIG. 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

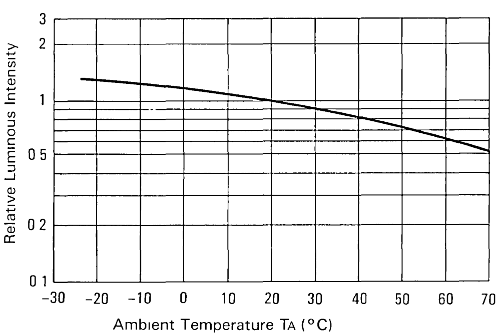


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

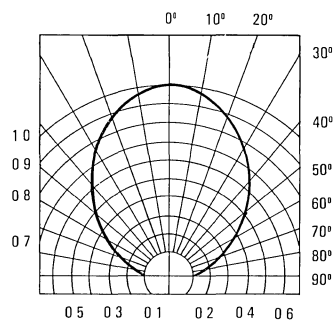


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	33231AA 33251AA	1.7 1.7	5.6 5.6		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	33231AA 33251AA		100		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}	33231AA 33251AA		565 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	33231AA 33251AA		30 35		nm	
Forward Voltage	V_F	33231AA 33251AA		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	33231AA 33251AA			100	μA	V_R = 5V
Capacitance	C	33231AA 33251AA		35 15		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

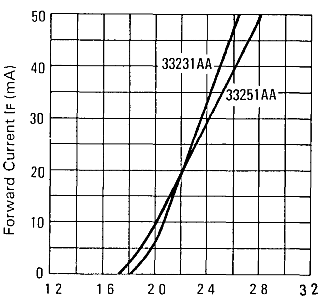


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

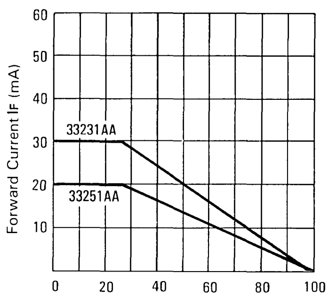


FIG 8 FORWARD CURRENT DERATING CURVE

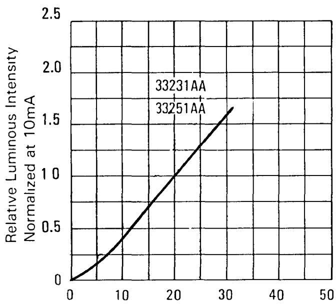


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

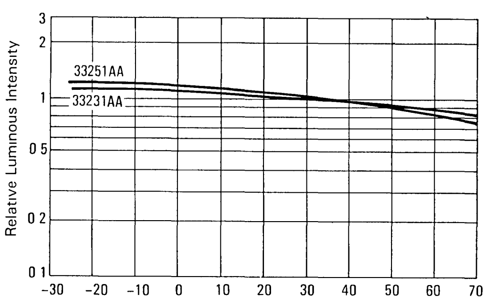


FIG 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

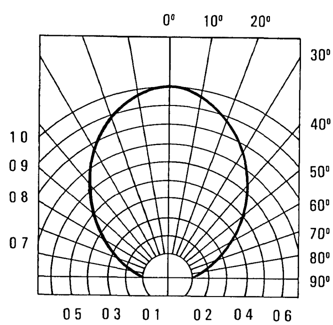


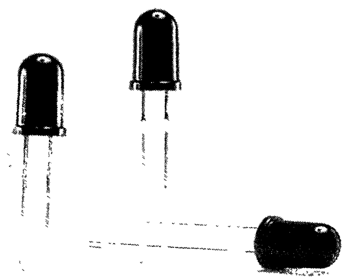
FIG 11 SPATIAL DISTRIBUTION

BIPOLAR INDICATOR LAMP

LTL-298E HIGH EFFICIENCY RED

FEATURES

- T-1¾ TYPE PACKAGE.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW POWER CONSUMPTION.
- I.C. COMPATIBLE.



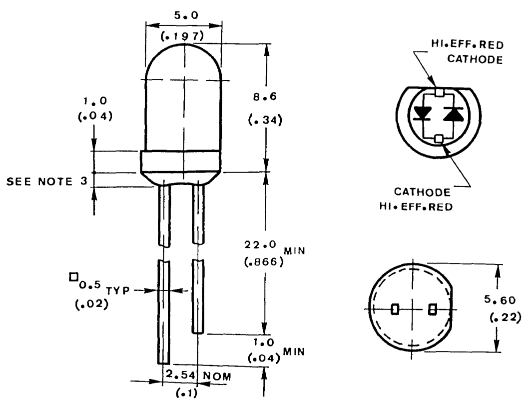
DESCRIPTION

High Efficiency Red source color chip is Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.
The LTL-298E is a red, diffused, wide viewing angle, dual chips, utilizing Gallium Arsenide Phosphide on Gallium Phosphide High Efficiency Red Light Emitting Diode.
The dual chips operating dependently of each other.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
298E	Red	Diffused	Hi. Eff. Red

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	HI. EFF. RED	UNIT
Power Dissipation	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	mA
Continuous Forward Current	30	mA
Derating Linear From 25°C	0.4	mA/°C
Reverse Voltage	5	V
Operating Temperature Range	–55°C to +100°C	
Storage Temperature Range	–55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds	

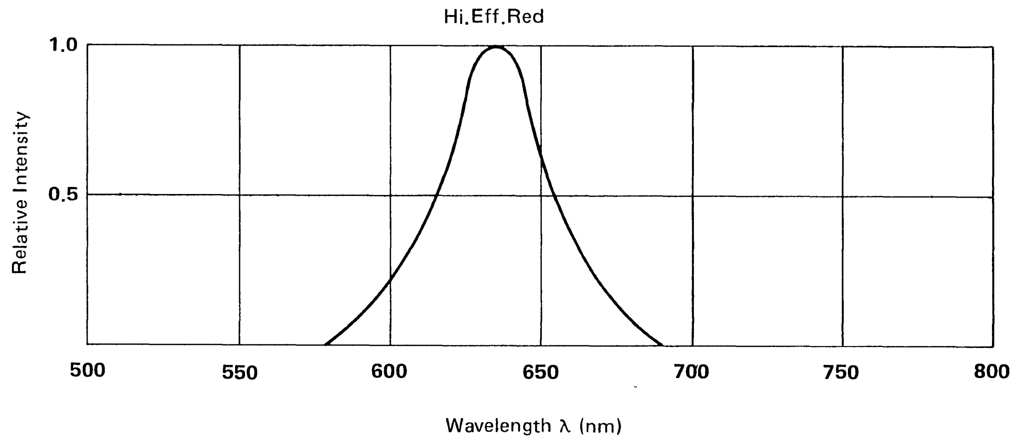


FIG. 1 RELATIVE INTENSITY VS WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-298E	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	298E	1.5	5.0		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	298E		50		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}			635		nm	Measurement @ Peak (Fig 1)
Spectral Line Half Width	$\Delta\lambda$			40		nm	
Forward Voltage	V_F			2.0	2.8	V	I_F = 20 mA
Reverse Current	I_R				100	μA	V_R = 5V
Capacitance	C			20		PF	V_F = 0 f = 1 MHZ

NOTES: 1 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2 $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity

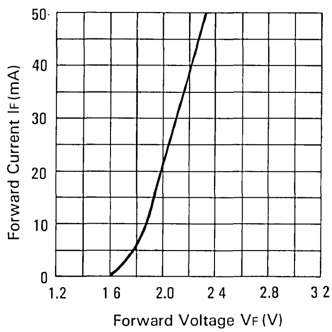


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

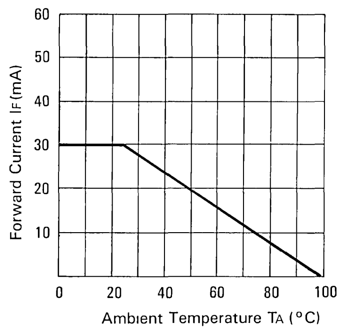


FIG 3 FORWARD CURRENT DERATING CURVE.

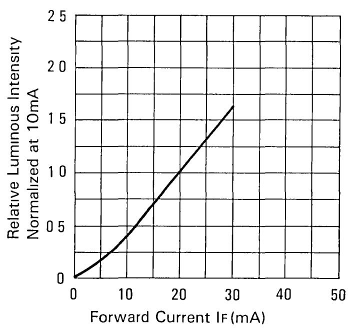


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT.

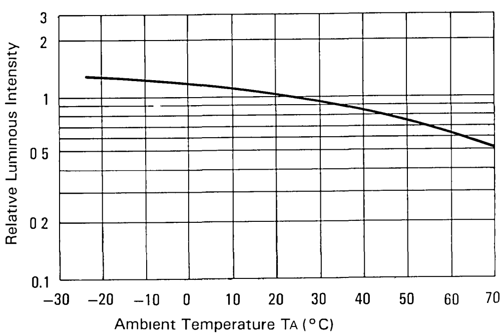


FIG. 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

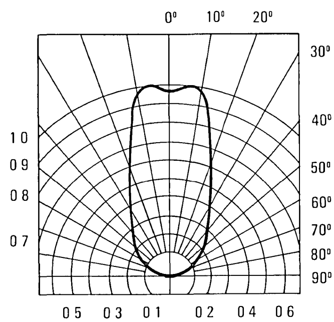


FIG 6 SPATIAL DISTRIBUTION

DUAL COLOR INDICATOR LAMP

LTL-298VJ RED-GREEN

FEATURES

- RED AND GREEN CHIPS ARE MATCHED FOR UNIFORM LIGHT OUTPUT.
- T-1¾ TYPE PACKAGE.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW POWER CONSUMPTION.
- I.C. COMPATIBLE.

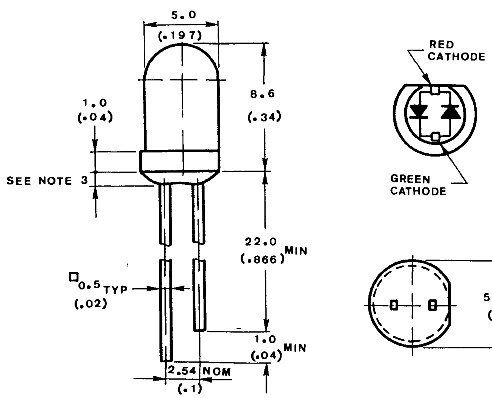
DESCRIPTION

The Red/Green LTL-298VJ bicolor lamp is a white diffused, wide viewing angle, dual chips, utilizing Gallium Arsenide Phosphide on Gallium Phosphide red Light Emitting Diode and Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The dual chips operating depently of each other.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
298VJ	White	Diffused	Red
			Green

PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010″) unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059″) max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	GREEN	UNIT
Power Dissipation	80	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	120	mA
Continuous Forward Current	40	30	mA
Derating Linear From 25°C	0.5	0.4	mA/°C
Reverse Voltage	5	5	V
Operating Temperature Range	–55°C to +100°C		
Storage Temperature Range	–55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		

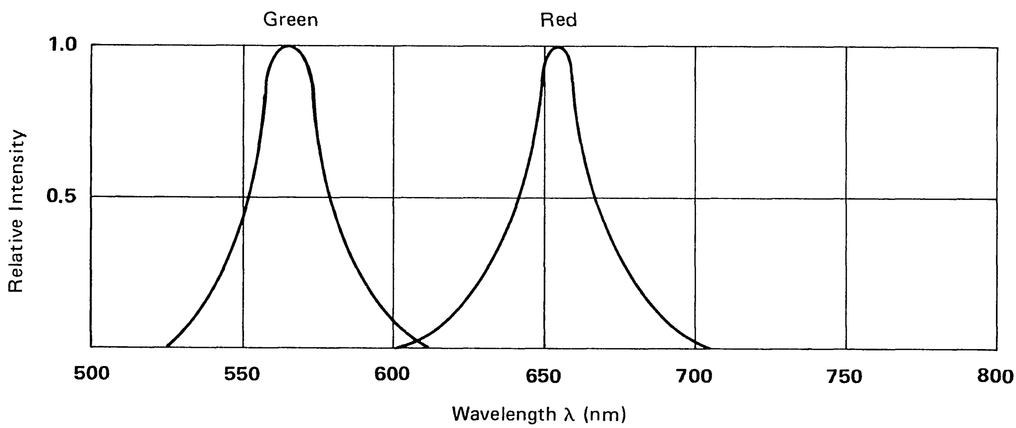


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL-298VJ	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	Red Green	0.4 2.5	1.2 8.7		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	Red Green		50		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK	Red Green		655 565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	Red Green		24 30		nm	
Forward Voltage	V_F	Red Green		1.7 2.1	2.0 2.8	V	I_F = 20 mA
Reverse Current	I_R	Red Green			100	μA	V_R = 5V
Capacitance	C	Red Green		30 35		PF	V_F = 0 f = 1 MHZ

NOTES. 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve
2 $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity

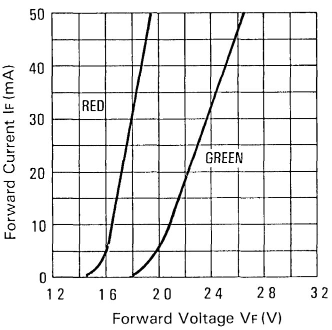


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

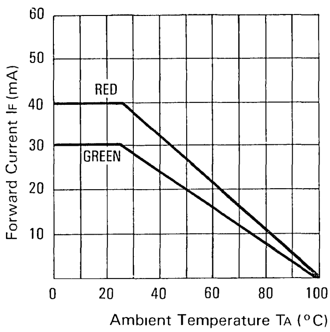


FIG. 3 FORWARD CURRENT DERATING CURVE

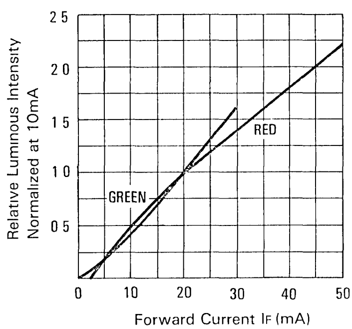


FIG 4 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

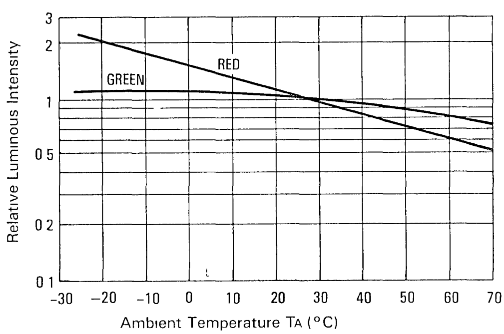


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

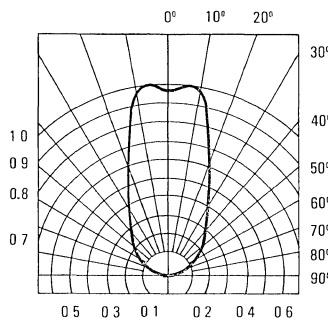


FIG 6 SPATIAL DISTRIBUTION

DUAL COLOR INDICATOR LAMP

LTL-298WJ ORANGE-GREEN

FEATURES

- ORANGE AND GREEN CHIPS ARE MATCHED FOR UNIFORM LIGHT OUTPUT.
- T-1¾ TYPE PACKAGE.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW POWER CONSUMPTION.
- I.C. COMPATIBLE.

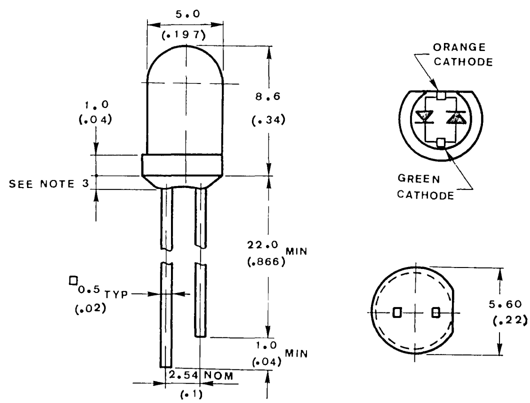
DESCRIPTION

The Green/Orange LTL-298WJ bicolor lamp is a white diffused, wide viewing angle, dual chips, utilizing Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode and Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode. The dual chips operating dependently of each other.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
298WJ	White	Diffused	Green
			Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

LED LAMPS

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	GREEN	ORANGE	UNIT
Power Dissipation	100	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	120	mA
Continuous Forward Current	30	30	mA
Derating Linear From 25°C	0.4	0.4	mA/°C
Reverse Voltage	5	5	V
Operating Temperature Range	–55°C to +100°C		
Storage Temperature Range	–55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		

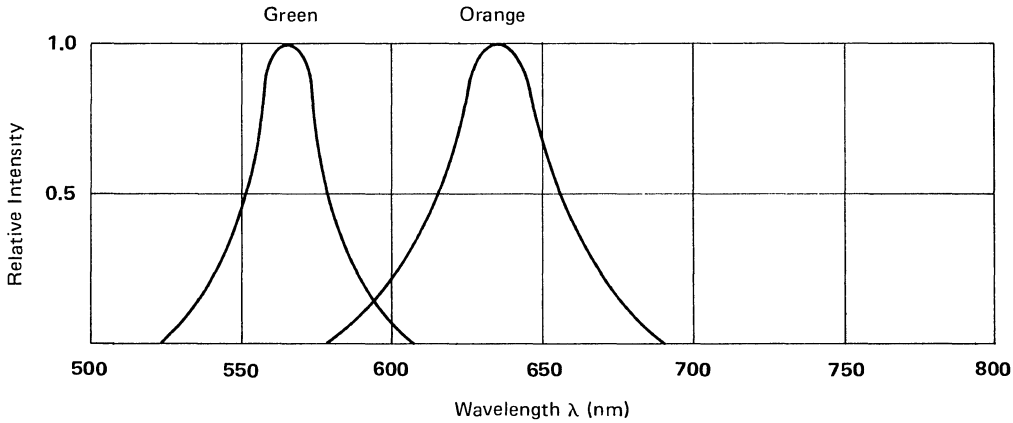


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-298WJ	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	Orange Green	1.7 2.5	5.5 8.7		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	Orange Green		50		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK	Orange Green		630 565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	Orange Green		40 30		nm	
Forward Voltage	V_F	Orange Green		2.0 2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	Orange Green			100	μA	V_R = 5V
Capacitance	C	Orange Green		20 35		PF	V_F = 0 f = 1 MHZ

NOTES 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity

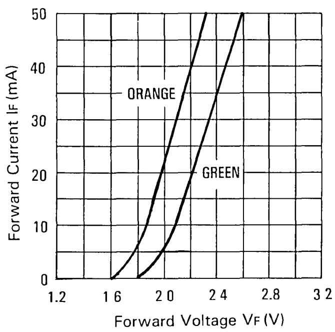


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

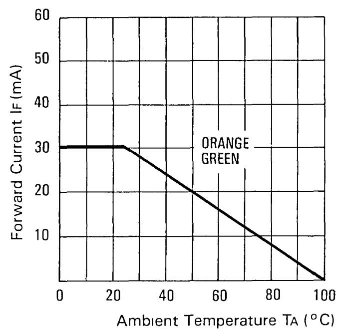


FIG. 3 FORWARD CURRENT DERATING CURVE

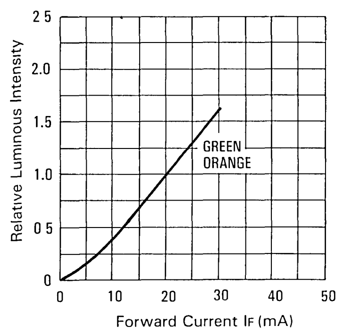


FIG 4 RELATIVE LUMINOUS INTENSITY VS

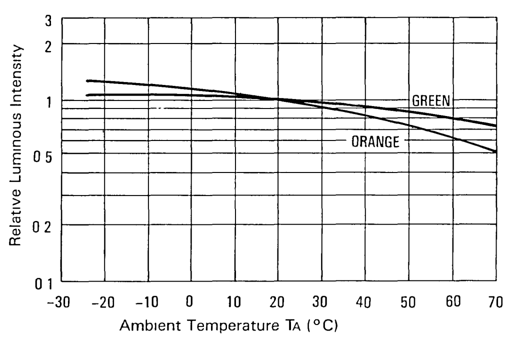


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

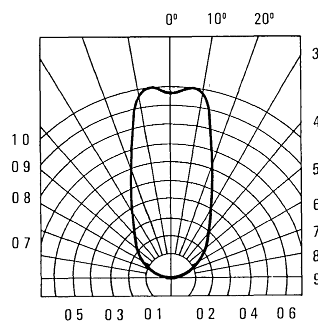


FIG 6 SPATIAL DISTRIBUTION

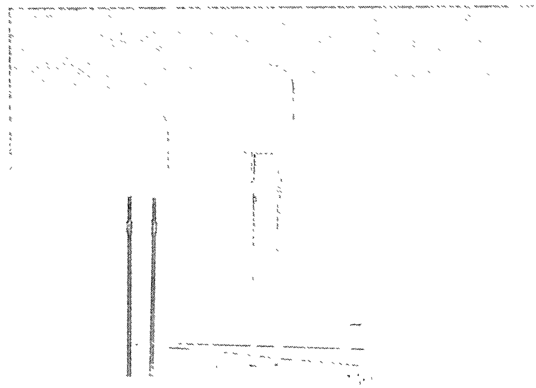
LITEON

DUAL COLOR INDICATOR LAMP

LTL-293SJ CaAIAS RED-GREEN

FEATURES

- ULTRA-BRIGHTNESS.
- T-1¾ TYPE PACKAGE.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW POWER CONSUMPTION.
- I.C. COMPATIBLE.



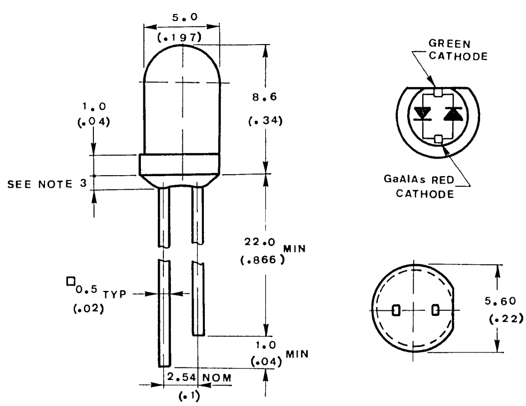
DESCRIPTION

The Red/Green LTL-293SJ bicolor lamp is white diffused, wide viewing angle, dual chips utilizing Gallium Aluminum Arsenide Ultra-brightness Red Light Emitting Diode and Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.
The Red and the Green operating dependently of each other.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
293SJ	White	Diffused	GaAIAs Red
			Green

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	GREEN	GaAlAs RED	UNIT
Power Dissipation	100	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	200	mA
Continuous Forward Current	30	40	mA
Derating Linear From 25°C	0.4	0.5	mA/°C
Reverse Voltage	5	4	V
Operating Temperature Range	–55°C to +100°C		
Storage Temperature Range	–55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		

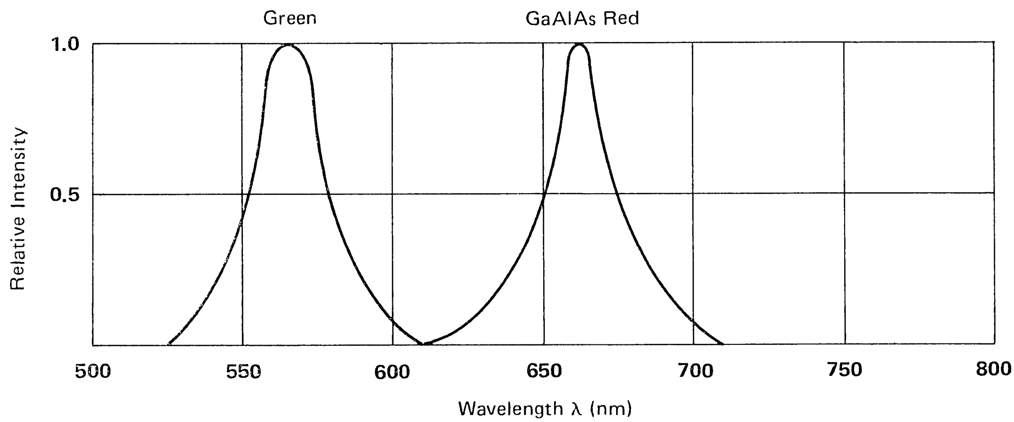


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-293SJ	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	GaAlAs Red Green	5.6 4.0	19.0 12.0		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	GaAlAs Red Green		80		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK	GaAlAs Red Green		660 565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	GaAlAs Red Green		20 30		nm	
Forward Voltage	V_F	GaAlAs Red Green		1.8 2.1	2.4 2.8	V	I_F = 20 mA
Reverse Current	I_R	GaAlAs Red Green			100 100	μA	V_R = 4V V_R = 5V
Capacitance	C	GaAlAs Red Green		30 35		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

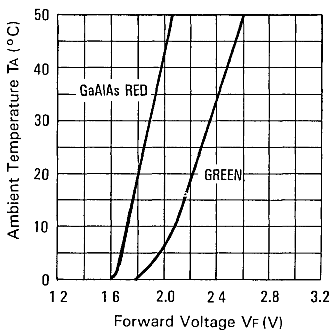


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE

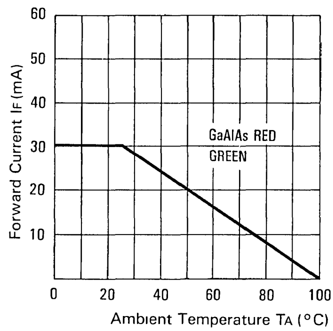


FIG. 3 FORWARD CURRENT DERATING CURVE

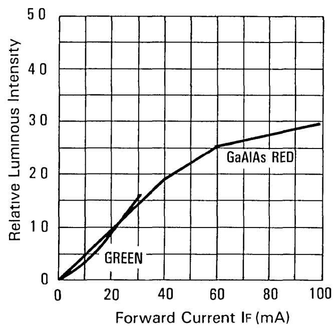


FIG. 4 RELATIVE LUMINOUS INTENSITY VS

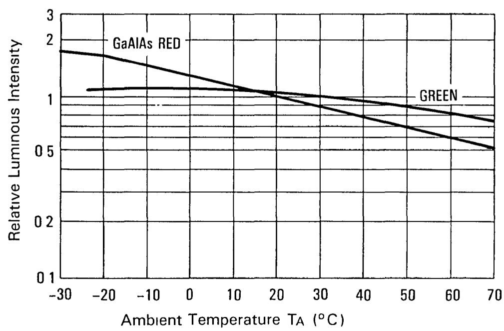


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

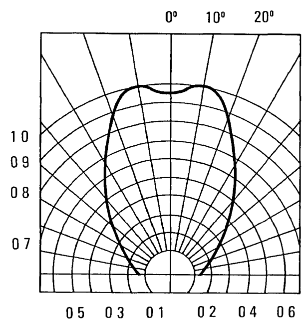


FIG 6 SPATIAL DISTRIBUTION

DUAL COLOR INDICATOR LAMP

LITEON

LTL-293SJ CaAIAS RED-GREEN

FEATURES

- ULTRA-BRIGHTNESS
- T-1¾ TYPE PACKAGE
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW POWER CONSUMPTION
- I.C. COMPATIBLE.

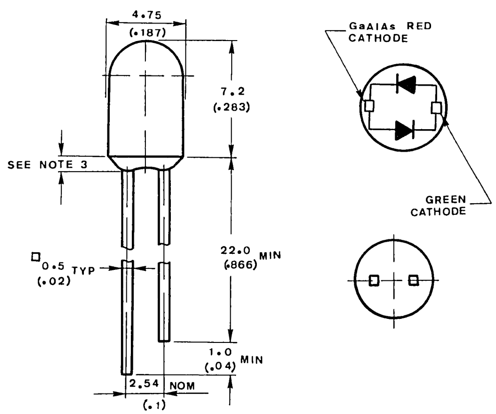
DESCRIPTION

The Red/Green LTL-313SJ bicolor Lamp is a white diffused, wide viewing angle, dual chips, utilizing Gallium Aluminum Arsenide Ultra-brightness Red Light Emitting Diode and Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode. The dual chips operating depently of each other.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
313SJ	White	Diffused	GaAlAs Red
			Green

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	GREEN	GaAlAs RED	UNIT
Power Dissipation	100	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	200	mA
Continuous Forward Current	30	40	mA
Derating Linear From 25°C	0.4	0.5	mA/°C
Reverse Voltage	5	4	V
Operating Temperature Range	–55°C to +100°C		
Storage Temperature Range	–55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		

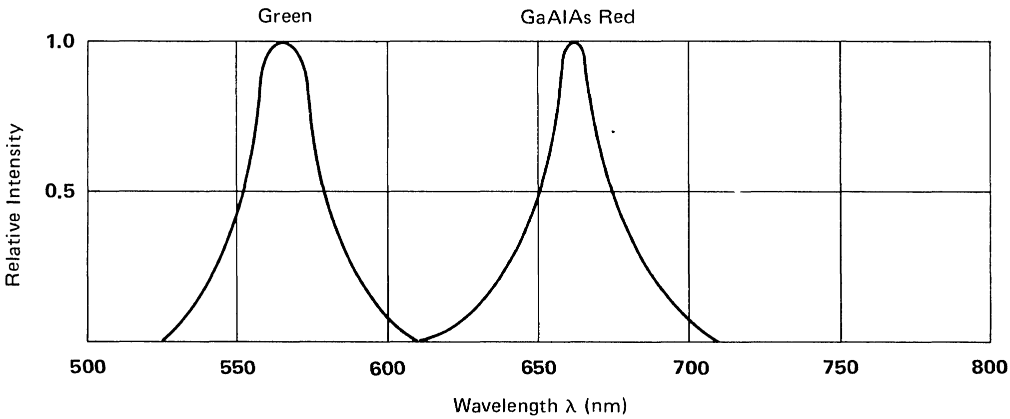


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-313SJ	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	GaAlAs Red Green	11 4.0	38.0 13.0		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	GaAlAs Red Green		60		deg.	Note 2 (Fig 6)
Peak Emission Wavelength	λ_{PEAK}	GaAlAs Red Green		660 565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	GaAlAs Red Green		20 30		nm	
Forward Voltage	V_F	GaAlAs Red Green		1.8 2.1	2.4 2.8	V	I_F = 20 mA
Reverse Current	I_R	GaAlAs Red Green			100 100	μA	V_R = 4V V_R = 5V
Capacitance	C	GaAlAs Red Green		30 35		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

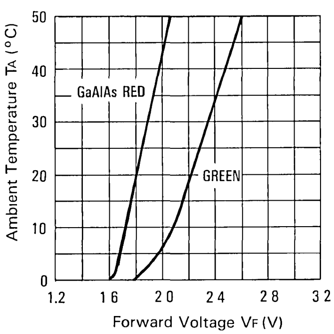


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

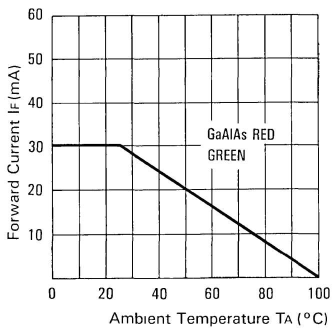


FIG 3 FORWARD CURRENT DERATING CURVE

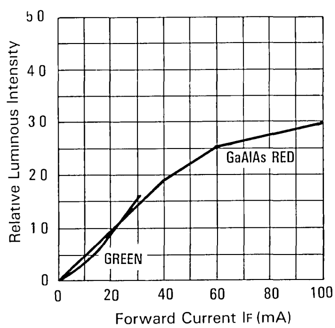


FIG 4 RELATIVE LUMINOUS INTENSITY VS

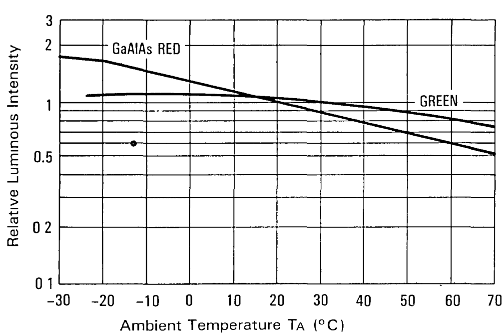


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

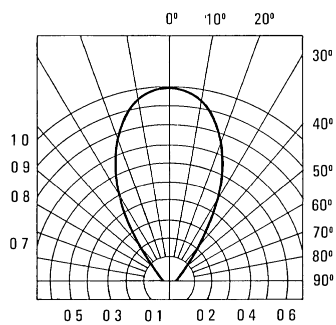


FIG 6 SPATIAL DISTRIBUTION

LED LAMPS

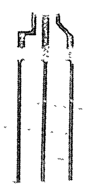
LITEON

DUAL COLOR INDICATOR LAMP

LTL-52EG ORANGE-GREEN

FEATURES

- ORANGE AND GREEN CHIPS ARE MATCHED FOR UNIFORM LIGHT OUTPUT.
- T-1¾ TYPE PACKAGE.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW POWER CONSUMPTION I.C. COMPATIBLE.



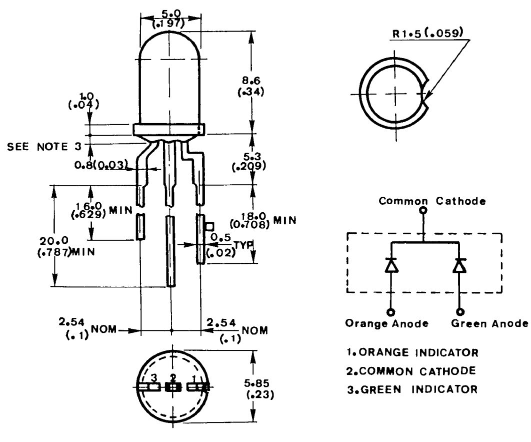
DESCRIPTION

The orange/Green LTL-52EG bicolor Lamp is a white diffused, wide viewing angle, dual chips, utilizing Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode and Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode. The Orange and the Green operating independently of each other with a common cathode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
52EG	White	Diffused	Green
			Orange

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	GREEN	ORANGE	UNIT
Power Dissipation	100	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	120	mA
Continuous Forward Current	30	30	mA
Derating Linear From 25°C	0.4	0.4	mA/°C
Reverse Voltage	5	5	V
Operating Temperature Range	−55°C to +100°C		
Storage Temperature Range	−55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		

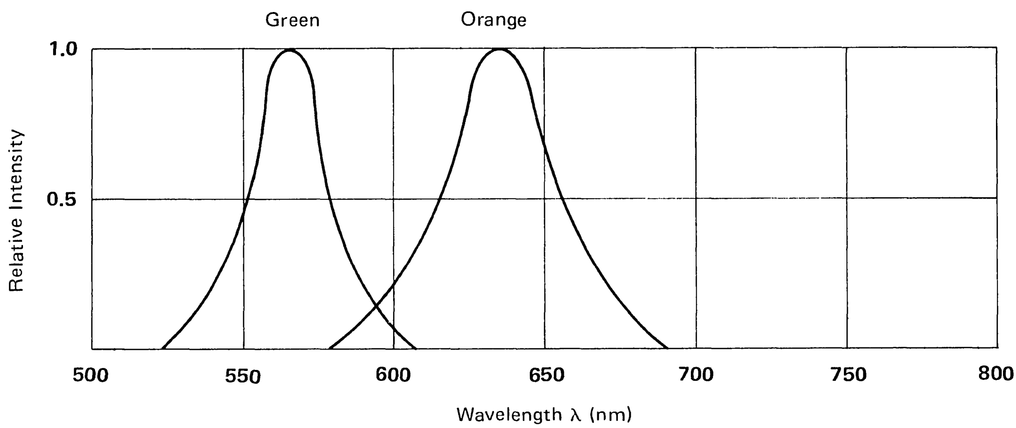


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-52EG	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	Orange Green	1.5 1.5	5.0 5.0		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	Orange Green		54		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	Orange Green		630 565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	Orange Green		40 30		nm	
Forward Voltage	V_F	Orange Green		2.0 2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	Orange Green			100	µA	V_R = 5V
Capacitance	C	Orange Green		20 35		PF	V_F = 0 f = 1 MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

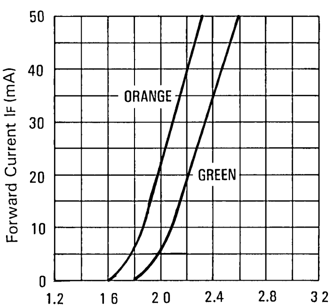


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

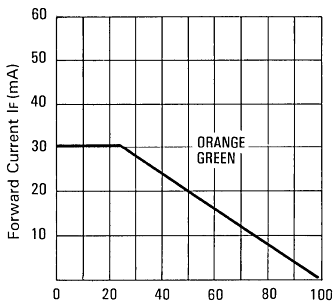


FIG. 3 FORWARD CURRENT DERATING CURVE

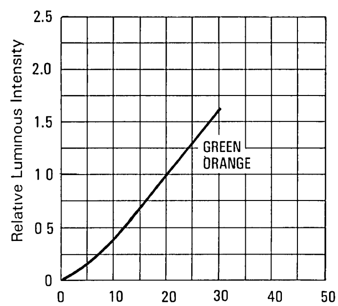


FIG 4 RELATIVE LUMINOUS INTENSITY VS.

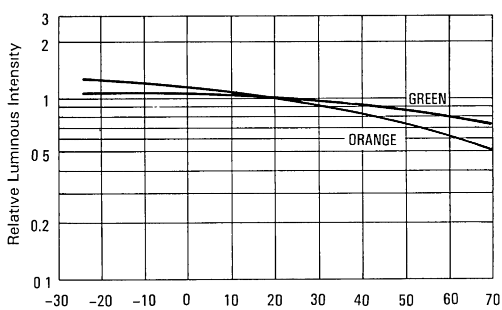


FIG 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

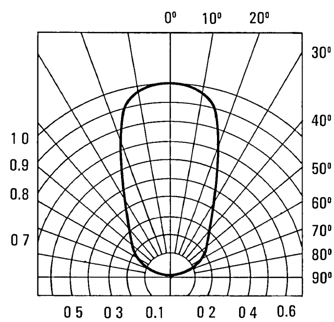


FIG 6 SPATIAL DISTRIBUTION

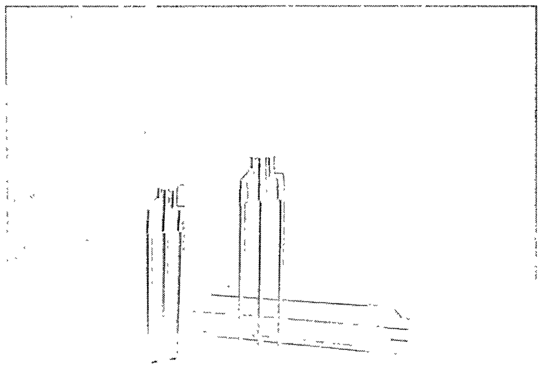
LITEON

DUAL COLOR INDICATOR LAMP

LTL-52RG BRIGHT RED – GREEN

FEATURES

- RED AND GREEN CHIPS ARE MATCHED FOR UNIFORM LIGHT OUTPUT.
- T-1¾ TYPE PACKAGE.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW POWER CONSUMPTION I.C. COMPATIBLE.



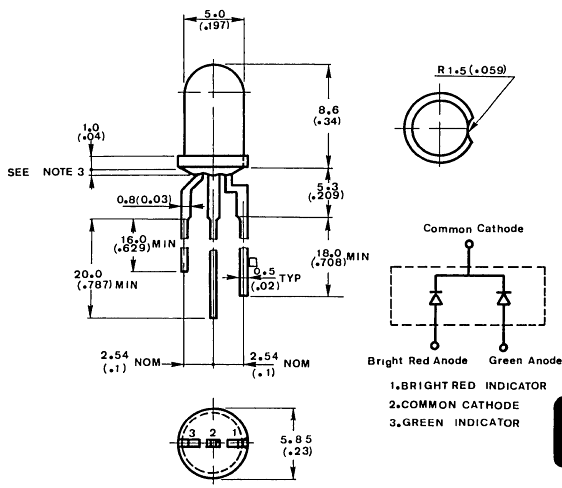
DESCRIPTION

The Bright Red/Green LTL-52RG bicolor Lamp is a white diffused, wide viewing angle, dual chips, utilizing Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode and Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode. The Bright Red and the Green operating independently of each other with a common cathode.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
52RG	White	Diffused	Green
			Bright Red

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	BRIGHT RED	GREEN	UNIT
Power Dissipation	40	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	mA
Continuous Forward Current	15	30	mA
Derating Linear From 25°C	0.2	0.4	mA/°C
Reverse Voltage	5	5	V
Operating Temperature Range	−55°C to +100°C		
Storage Temperature Range	−55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		

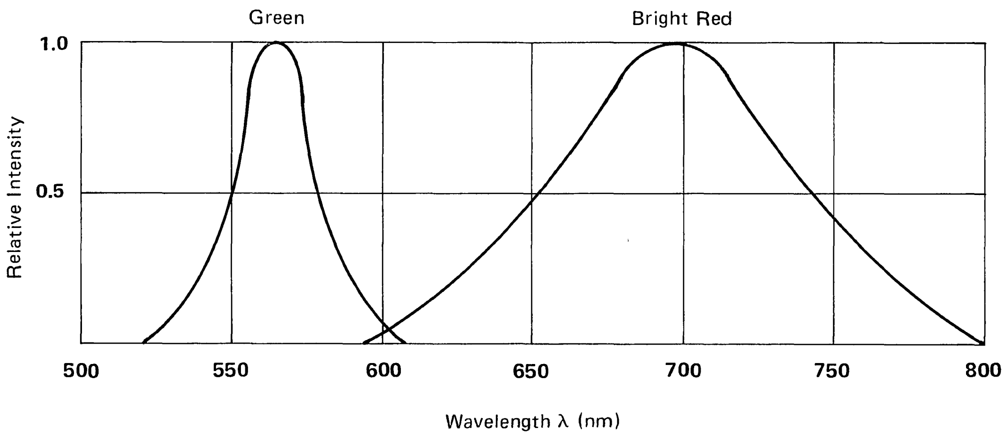


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL-52RG	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	Bright Red Green	0.5 1 5	1.7 5.0		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta ½$	Bright Red Green		54		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λPEAK	Bright Red Green		697 565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	Δλ	Bright Red Green		90 30		nm	
Forward Voltage	V_F	Bright Red Green		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R	Bright Red Green			100	μA	V_R = 5V
Capacitance	C	Bright Red Green		55 35		PF	V_F = 0 f = 1 MHz

NOTES: 1 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve
2. $\theta ½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

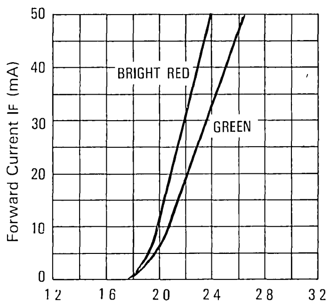


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

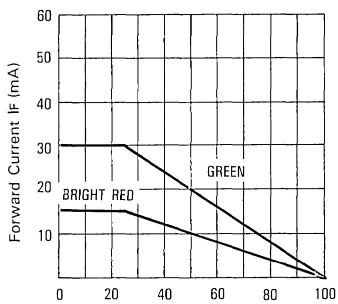


FIG 3 FORWARD CURRENT DERATING CURVE

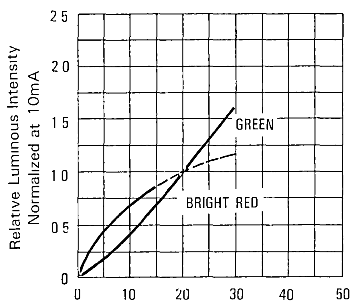


FIG 7 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

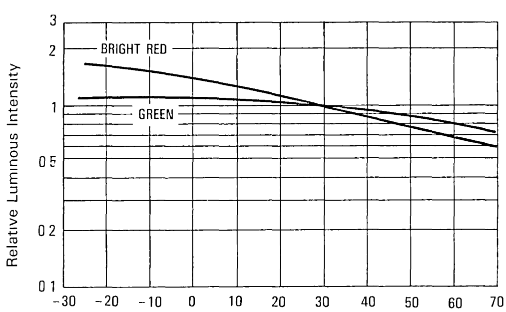


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

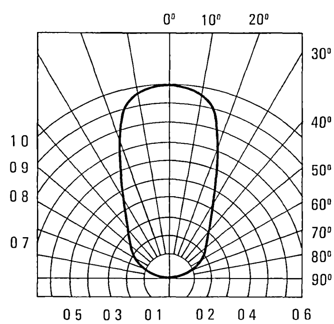


FIG 6 SPATIAL DISTRIBUTION

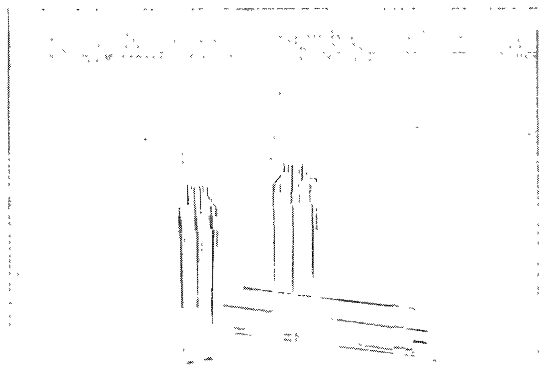
LITEON

DUAL COLOR INDICATOR LAMP

LTL-52DG DUAL GREEN

FEATURES

- T-1¾ TYPE PACKAGE.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW POWER CONSUMPTION I.C. COMPATIBLE.



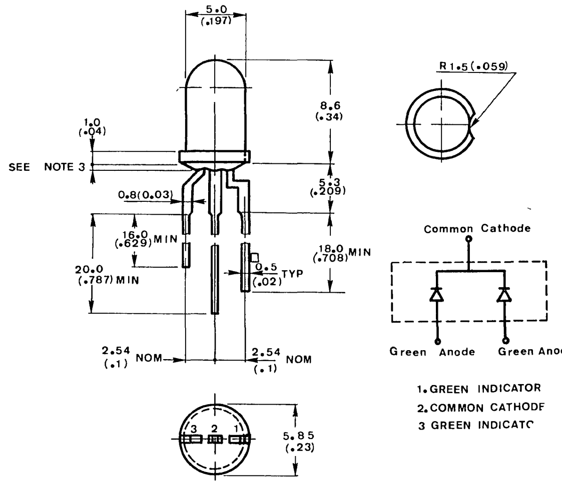
DESCRIPTION

The Green LTL-52DG bicolor Lamp is a Green diffused, wide viewing angle, dual chips, utilizing Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode. The dual chips operating dependently of each other.

DEVICES

PART NO. LTL–	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
52DG	Green	Diffused	Green

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	GREEN	UNIT
Power Dissipation	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	mA
Continuous Forward Current	30	mA
Derating Linear From 25°C	0.4	mA/°C
Reverse Voltage	5	V
Operating Temperature Range	−55°C to +100°C	
Storage Temperature Range	−55°C to +100°C	
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds	

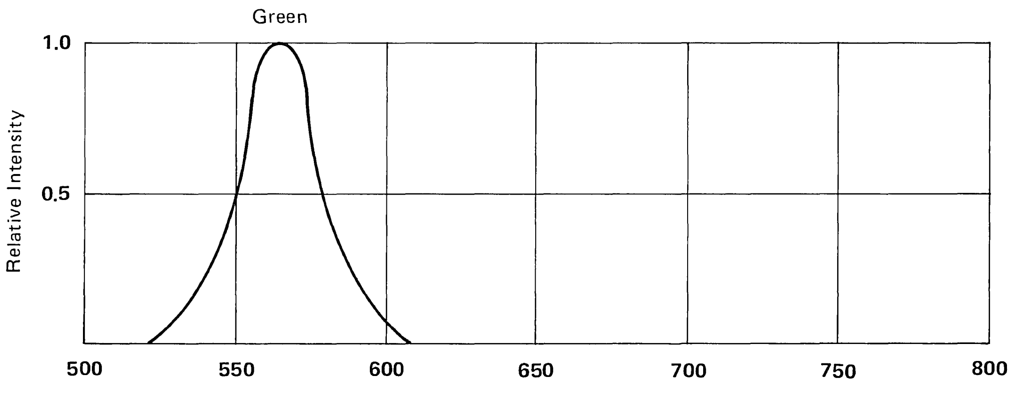


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	52DG	2.5	8.7		mcd	I_F = 20 mA Note 1
Viewing Angle	$2\theta½$	52DG		54		deg	Note 2 (Fig 6)
Peak Emission Wavelength	$\lambda PEAK$	52DG		565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	52DG		30		nm	
Forward Voltage	V_F	52DG		2 1	2.8	V	I_F = 20 mA
Reverse Current	I_R	52DG			100	μA	V_R = 5V
Capacitance	C	52DG		35		PF	V_F = 0 f = 1 MHz

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

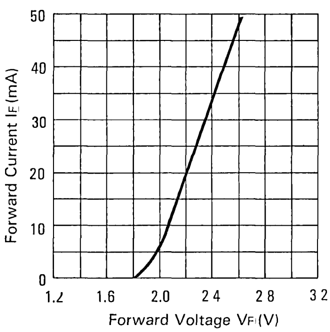


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE

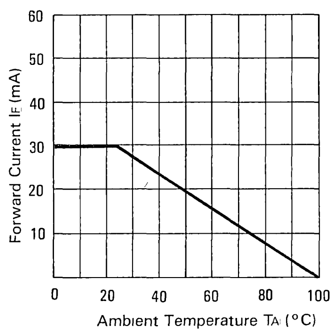


FIG 3 FORWARD CURRENT DERATING CURVE

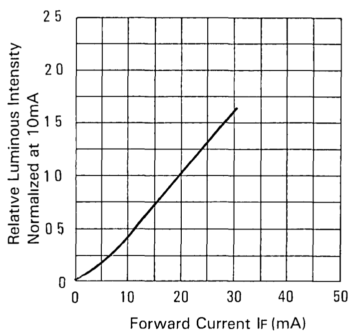


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

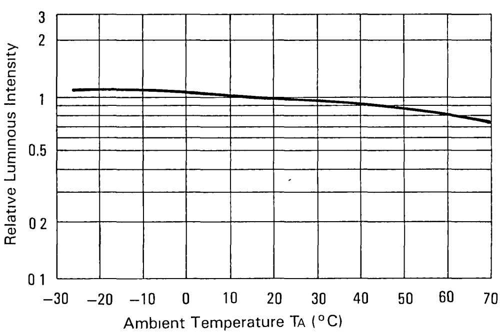


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

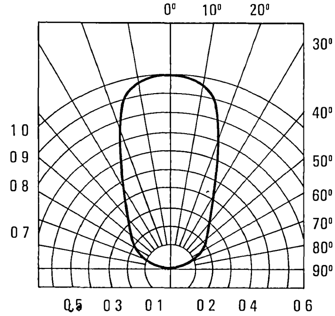


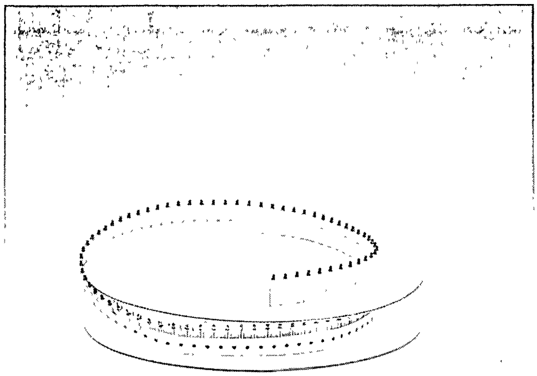
FIG 6 SPATIAL DISTRIBUTION

LITEON

LAMPS ARE AVAILABLE IN TAPE AND REEL

FEATURES

- AUTOMATICALLY INSERTABLE WITH RADIAL 5mm (.197") and 2.54mm (0.1") STRAIGHT LEAD SPACING AVAILABLE.
- MOST RADIAL LEAD PLASTIC LED LAMPS AVAILABLE PACKAGED IN TAPE AND REEL.
- 5mm (.197") AND 2.54mm (0.1") STRAIGHT LEAD SPACING AVAILABLE.
- REEL PACKAGING SIMPLIFIES HANDLING AND TESTING.



DESCRIPTION

The option 001 Lamp devices have preformed leads with 5mm (0.197 inch) spacing for automotic insertion into P.C. boards by radial lead linsetion equipment. The option 002 Lamp devices have straight leads with 2.54 mm (0.1 inch) spacing. Packaged taped and reeled for ease of handling. Most standard catalog radial lead LED Lamps are available packaged in the tape and reel.

ORDERING INFORMATION

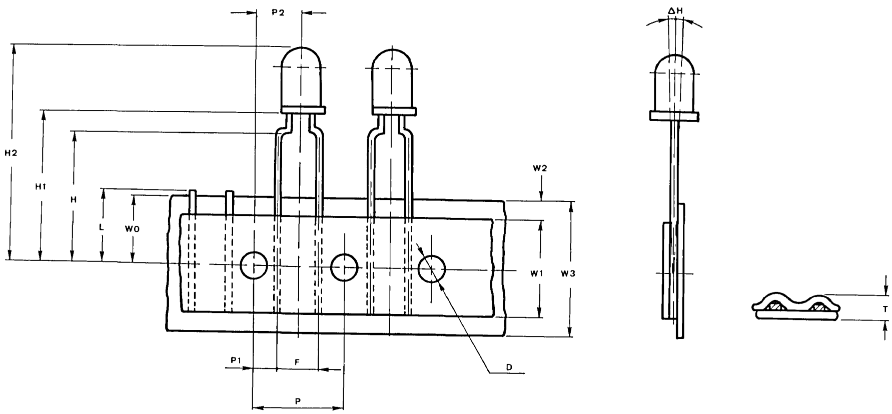
To order LED Lamps packaged on tape and reel include the approprate option code along with the device catalog part number. Example: To order the LTL-4200 Series on tape and reel with preformed leads (5mm lead spacing) order as follows: LTL-4200-001 or LTL-4200-011.

LED Lamps with 0.5mm square leads with 5mm lead spacing are recommented for use with automatic insertion equipment. It is suggested that insertion machine compatibility be comfirmed.

DEVICES

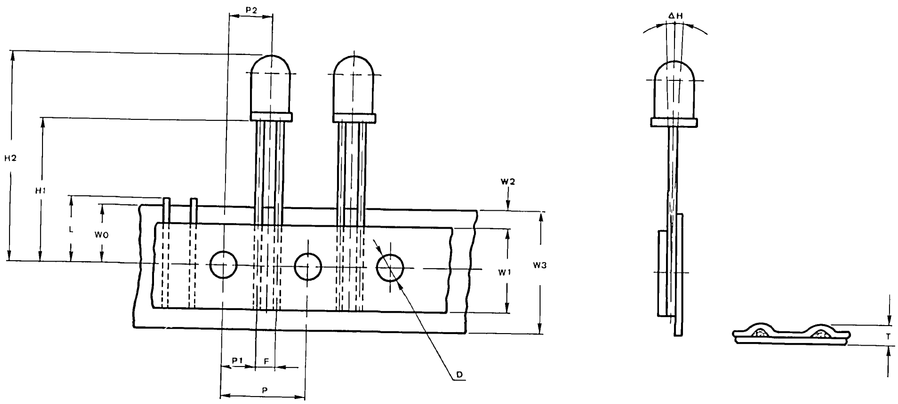
OPTION CODE	FIG.	DESCRIPTION
–001	1	Tape and Reel 5mm (0.197") Preformed Leads with 2.54mm (0.1") From Lamp Seating Plane to Lamp Bottom.
–011	1	Tape and Reel 5mm (0.197") Preformed Leads with 4.0mm (0.157") From Lamp Seating Plane to Lamp Bottom.
–021	1	Tape and Reel 5mm (0.197") Preformed Leads with 7.5mm (0.295") From Lamp Seating Plane to Lamp Bottom.
–002	2	Tape and Reel 2.54mm (0.1") Straight Leads with 18mm (0.709") From Feed Hole to Lamp Bottom.
–012	2	Tape and Reel 2.54mm (0.1") Straight Leads with 22mm (0.866") From Feed Hole to Lamp Bottom
–022	2	Tape and Reel 2.54mm (0.1") Straight Leads with 26mm (1.024") From Feed Hole to Lamp Bottom.

FIG. 1: Forming Lead Radial Devices



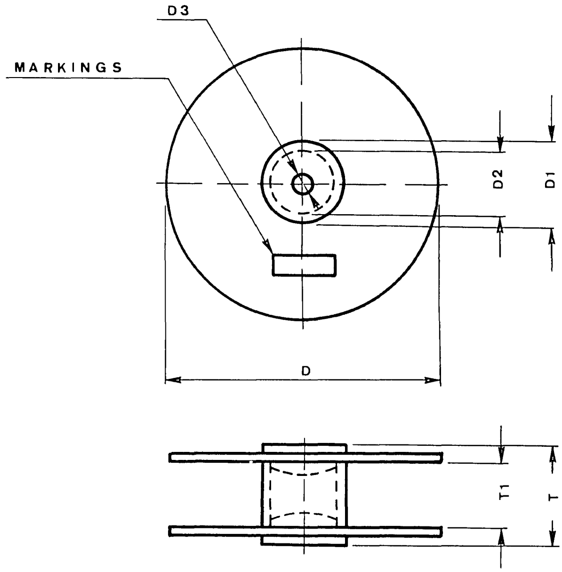
ITEM	OPTION CODE	SYMBOL	SPECIFICATION			
			MINIMUM		MAXIMUM	
			MM	INCH	MM	INCH
Tape Feed Hole Diameter	—	D	3.8	0.149	4.2	0.165
Component Lead Pitch	—	F	4.8	0.188	5.8	0.228
Front to Rear Deflection	—	ΔH	—	—	2.0	0.078
Height of Seating Plane	—	H	15.5	0.610	16.5	0.649
Feed Hole to Botton of Component	–001	H1	17.5	0.689	19.5	0.767
	–011		19.0	0.748	21.0	0.826
	–021		22.5	0.886	24 5	0.965
Feed Hole to Overall Component Height	—	H2	—	—	32.0	1.259
Lead Length After Component height	—	L	W_0		11.0	0.433
Feed Hole Pitch	—	P	12.4	0.488	13.0	0.511
Lead Location	—	P1	3.15	0.124	4.55	0.179
Center of Component Location	—	P2	5.05	0.198	7.65	0.301
Overall Taped Package Thickness	—	T	—	—	1.42	0.056
Feed Hole Location	—	W_0	8.5	0.334	9.75	0.384
Adhesive Tape Width	—	W_1	14.5	0.571	15.5	0.610
Adhesive Tape Position	—	W_2	0	0	4.0	0.157
Tape Width	—	W_3	17.5	0.689	19.0	0.748

FIG. 2: Straight Lead Devices



ITEM	OPTION CODE	SYMBOL	SPECIFICATION			
			MINIMUM		MAXIMUM	
			MM	INCH	MM	INCH
Tape Feed Hole Diameter	—	D	3.8	0.149	4.2	0.165
Component Lead Pitch	—	F	2.3	0.091	3.0	0.118
Front to Rear Deflection	—	$\triangle H$	—	—	2.0	0.078
Feed Hole to Bottom of Component	–002	H1	17.5	0.689	18.5	0.728
	–012		21.5	0.846	22.5	0.886
	–022		25.5	1.004	26.5	1.043
Feed Hole to Overall Component Height	—	H2	—	—	32.0	1.259
Lead Length After Component Height	—	L	W_0		11.0	0.433
Feed Hole Pitch	—	P	12.4	0.488	13.0	0.511
Lead Location	—	P1	4.4	0.173	5.8	0.228
Center of Component Location	—	P2	5.05	0.198	7.65	0.301
Overall Taped Package Thickness	—	T	—	—	1.42	0.056
Feed Hole Location	—	W_0	8.5	0.334	9.75	0.384
Adhesive Tape Width	—	W_1	14.5	0.571	15.5	0.610
Adhesive Tape Position	—	W_2	0	0	4.0	0.157
Tape Width	—	W_3	17.5	0.689	19.0	0.748

FIG. 3: Device Packaging



ITEM	SYMBOL	SPECIFICATION				REMARKS
		MINIMUM		MAXIMUM		
		MM	INCH	MM	INCH	
Reel Diameter	D	78.2	3.07	380.0	14.96	
Core Diameter	D1	34.9	1.37	102.0	4.02	
Hub Recess Inside Diameter	D2	28.6	1.12	88.0	3.47	
Arbor Hole Diameter	D3	13.8	0.54	38.1	1.5	
Overall Reel Thickness	T	–	–	57.2	2.25	
Inside Reel Flange Thickness	T1	30.0	1.18	50.0	1.97	

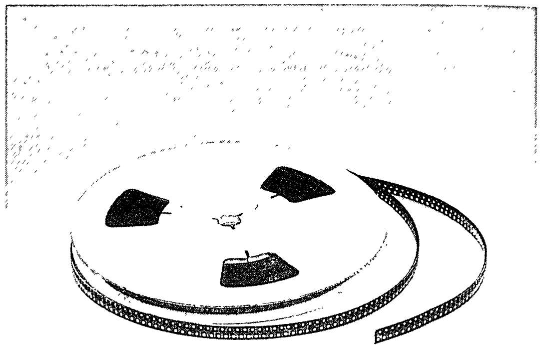
LITEON

SURFACE MOUNT OPTION FOR SOT-23 PACKAGE LED LAMPS

LTL-907TA/LTL-907TB

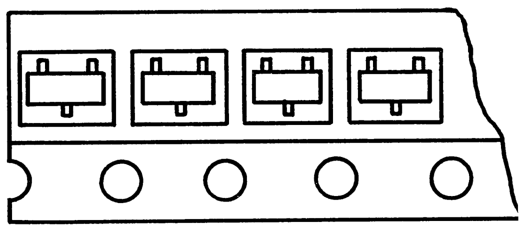
FEATURES

- COMPATIBLE WITH AUTOMATIC PLACEMENT EQUIPMENT.
- MICROMINIATURE PACKAGE LED LAMP.
- SURFACE MOUNT ASSEMBLY LAMP.
- HIGH EFFICIENCY/LOWER POWER CONSUMPTION.
- LONG LIFE SOLID STATE RELIABILITY.



DESCRIPTION

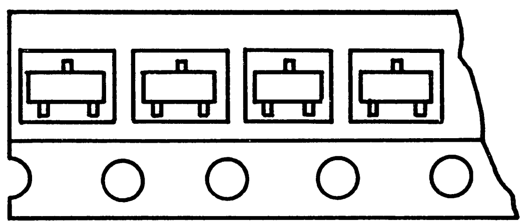
The LTL-907TA and LTL-907TB are used robust' Plastic tape and each reel contains 3000 devices.
The allowable missing are 0.5% devices/tape and no more than 3 consecutive vacant spaces on the tape, which Tapes are 100 min. allowable vacant spaces at the start of the reel and 50 min. at end of reel.
Tape peel-off strength of 30 to 60 gram at 10° angle, at 120mm per minute pull rate, Available with choice of orientation.



OPTION A

ORDERING INFORMATION

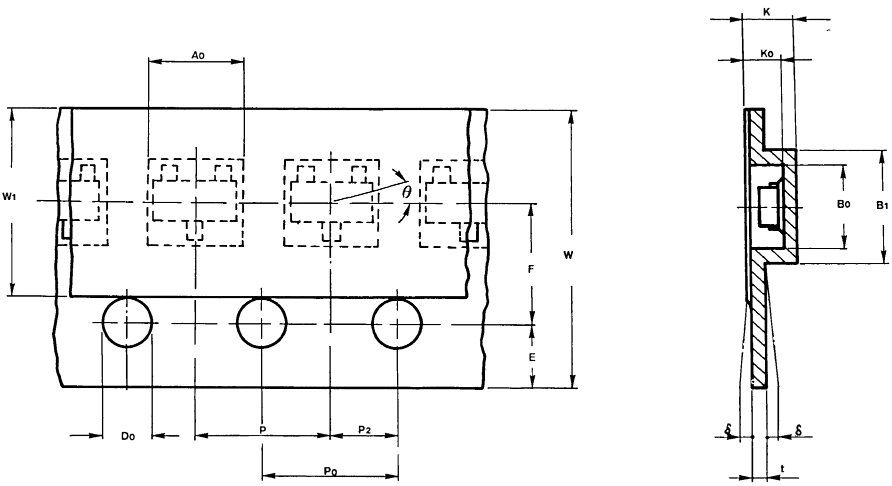
To obtain LTL-907Series LED Lamps Package on tape and reel, include the approprate option code along with the devices catalogue Part Number.
Example: To order the LTL-907PK on tape and reel with option A, which Part No. as follow LTL-907PK TA. To order the LTL-907PK on tape and reel with option B. which Part No. as follow: LTL-907PK TB



OPTION B

TAPING AND PACKAGING SPECIFICATION

Fig. 1 Configuration of bandolier. (dimension in mm.)



Compartment	Symbol	Dimension	Tol.
Length		3,2	+0,2
Width		2,7	+0,2
Depth	K_0	0,95	+0,2
Width Outside	B_1	3,3	max.
Pitch	P	4,0	±0,1
Deviation	Θ	15°	max.

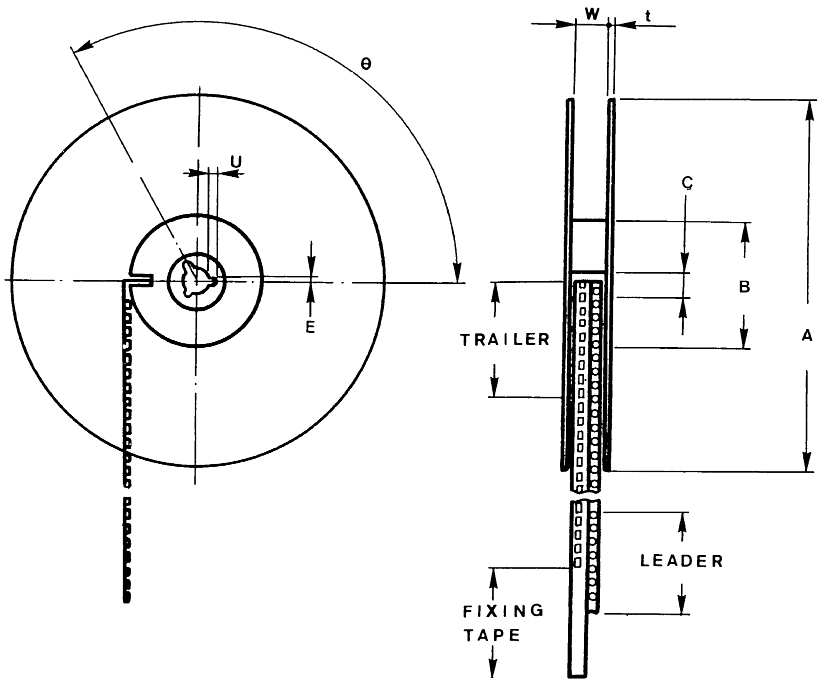
Centers line dimensions	Symbol	Dimension	Tol.
Length direction	P_2	2,0	±0,05
Width direction	F	3,5	±0,05

Carrier tape	Symbol	Dimension	Tol.
Width	W	8,0	±0,2
Bending	δ	0,3	max.
Thickness	t	0,3	max.
Overall thickness	K	1,4	max.

Sprocket hole	Symbol	Dimension	Tol.
Diameter	D_0	1,5	+0,1
Pitch	P_0	4,0	±0,1
Distance	E	1,75	±0,1
Cumulative (10) Pitch error		±0,1	

Fixing tape	Symbol	Dimension	Tol.
Width	W_1	5,5	±0,25
Thickness	—	0,1	max.

Fig. 2 Configuration of reel and flange (dimensions in mm).



Flange	Symbol	Dimension	Tol.
Diameter	A	178	+0 −2
Thickness	t	2.0	±0,5
Space between flanges	W	10,5	±0,5

Hub	Symbol	Dimension	Tol.
Diameter	B	8,0	±2,0
Spindle hole	C	13	±0,5

Key Slit	Symbol	Dimension	Tol.
Width	E	2	±0,5
Depth	U	4	±0,5
Location	Θ	120	deg

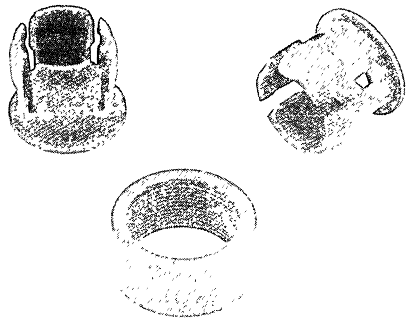
LITEON

PANEL MOUNTING GROMMETS (FOR LED PANEL INDICATORS)

LTL-001B LTL-001C

DESCRIPTON

1. The LTL-001 Series of mounting grommets is intended for panel mounting of many standard Liton Light emitting diode indicators. The gormmets are made of plastic and are aviailable in clear and black.
2. The LTL-001 Series will easily mount the applicable lamps on any panel thickness up to 2.80mm(.110") (See figure A.)
3. For panel thicknell greater than 2.80mm (.110") counterboring is reguired.(See figure B.)



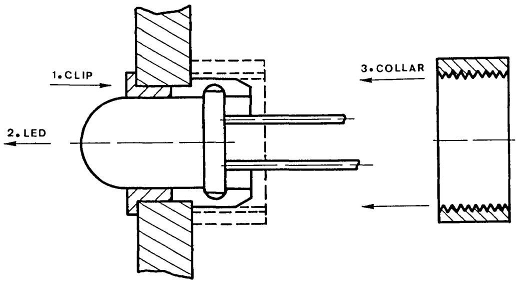


FIG A: PANEL THICKNESS 2.80mm (.110") MAX.

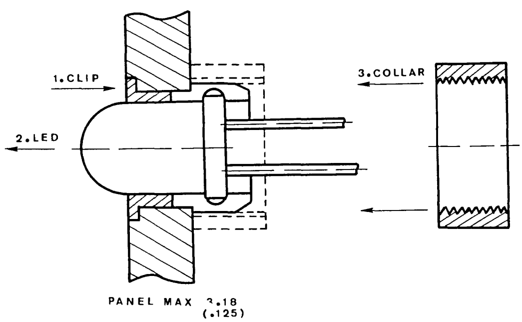
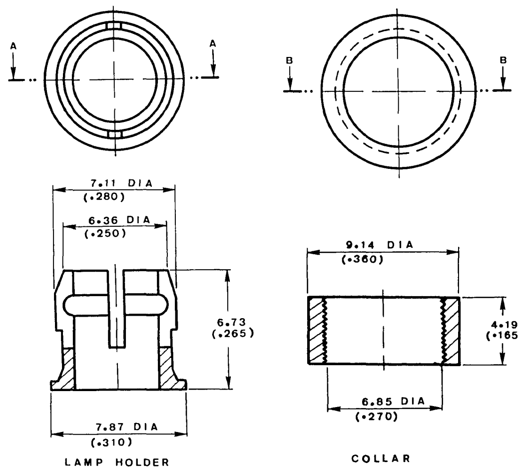


FIG B: PANEL THICKNESS GREATER THAN 2.80mm (.110").

PACKAGE DIMENSIONS



NOTES:

1. Alll dimensions are in millimeters (inches), tolerance is 0.25mm (0.1") unless otherwise notes.
2. Material: Polypropylene equivalent for mounting drill a 6.35mm (.25") hole.

APPLICATION

PART NO.	AVAILABILITY
LTL-001B (Black)	Standard
LTL-001C (Clear)	Special order only

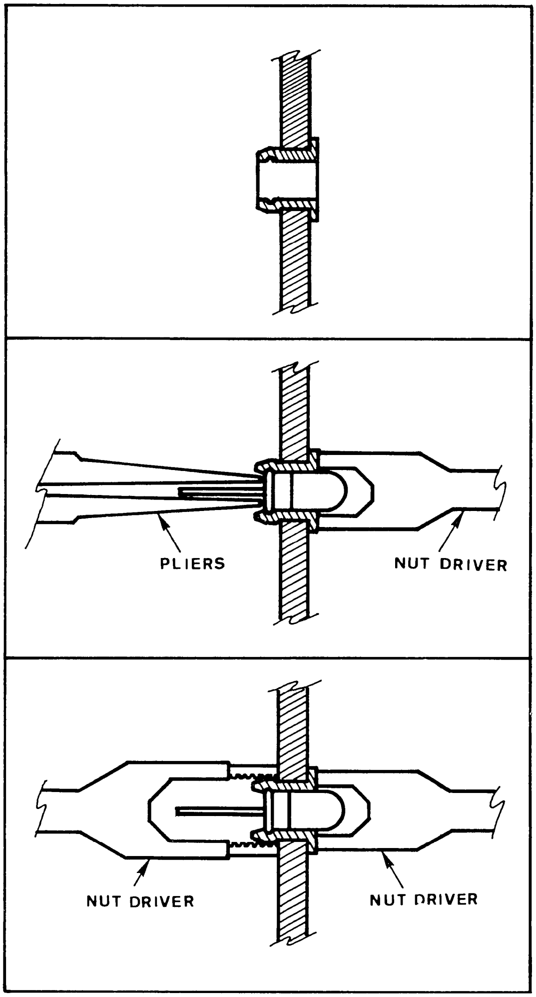
APPLICATION LAMPS

LTL-203 Series LTL-4203 Series. LTL-10203 Series. All 5mm (.2") diameter package.

MOUNTING INSTRUCTIONS

Drill an ASA C size 6.35mm (.250") diameter hole in the panel. Deburr but do not chamfer the edges of the hole.

1. Press the holder into the hole from the front of the panel.
2. Press the LED into the holder from the back. Use blunt long nose pliers to push on the LED. Do not use force on the LED Leads. A tool such as a nut driver may be used to press on the holder.
3. Slip a collar onto the back of the clip and press tight using tools such as two nut drivers.



LED LAMPS

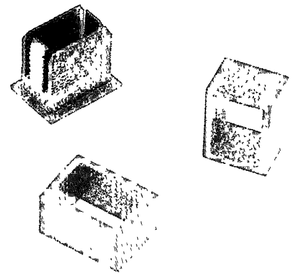
LITEON

PANEL MOUNTING GROMMETS FOR LTL-332x1AA SERIES LAMP

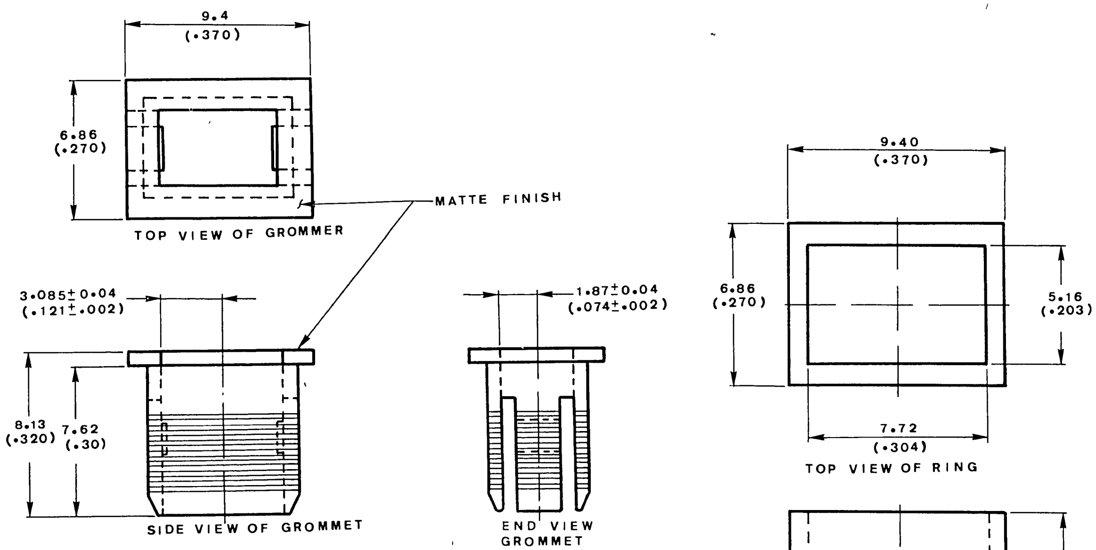
LTL-004B

DESCRIPTION

The LTL-004B mounting grommet is intended for panel mounting the LTL-332x1AA Series of rectangular lamps. The grommets are made of black plastic and provide the user with an easy to mount, professional appearance when viewed on a front panel. The LTL-004B can be used on any panel thickness up to 3.18mm (.125").



PACKAGE DIMENSIONS



NOTES:

1. All dimensions are in millimeters (inches), tolerance is 0.25mm (.01") unless otherwise noted.
2. Material: Black Polypropylene.

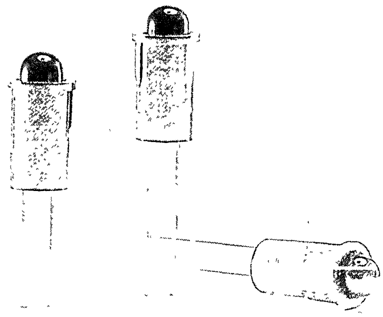
LITEON

SNAP-IN LED INDICATORS

LTL-603-1 RED
LTL-633-1 GREEN
LTL-653-1 YELLOW

FEATURES

- SNAP-IN MOUNTING REQUIRES NO ADDITIONAL HARDWARE.
- STRAIGHT TERMINALS SUITABLE FOR SOLDERING.
- DESIGNED FOR QUICK POSITIVE INSERTION IN PANELS FROM 0.8mm (0.31") THROUGH 1.6mm (0.062").
- BLACK HOUSING ENHANCES CONTRAST RATIO.
- ANODE LEAD TRIMMED LONGER THAN CATHODE FOR POLARITY IDENTIFICATION.
- WIDE ANGLE VISIBILITY.
- I.C. COMPATIBLE.



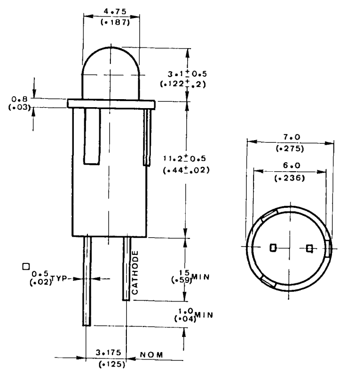
APPLICATIONS

- COMPUTERS.
- PROCESS CONTROLLERS.
- INSTRUMENTATION.
- POINT OF SALE.
- COMMUNICATIONS EQUIPMENT.
- HOME ENTERTAINMENT EQUIPMENT.
- VENDING MACHINES.

DEVICES

PART NO. LTL–	LED LENS COLOR		SOURCE COLOR
	COLOR	DIFFUSION	
603-1	Red	Diffused	Red
633-1	Green	Diffused	Green
653-1	Yellow	Diffused	Yellow

PACKAGE DIMENSIONS



NOTES:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. The holder color is black only.
4. The holder raw material is thermal plastic polypropylene.
5. The LED lamps are LTL-10203W (short lead) series.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	GREEN	YELLOW	UNIT
Power Dissipation	80	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	120	80	mA
Continuous Forward Current	40	30	20	mA
Derating Linear From 25°C	0.5	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range		–55°C to +100°C		
Storage Temperature Range		–55°C to +100°C		
Lead Soldering Temperature [1.6mm (0.063in) From Body]		260°C for 5 Seconds		

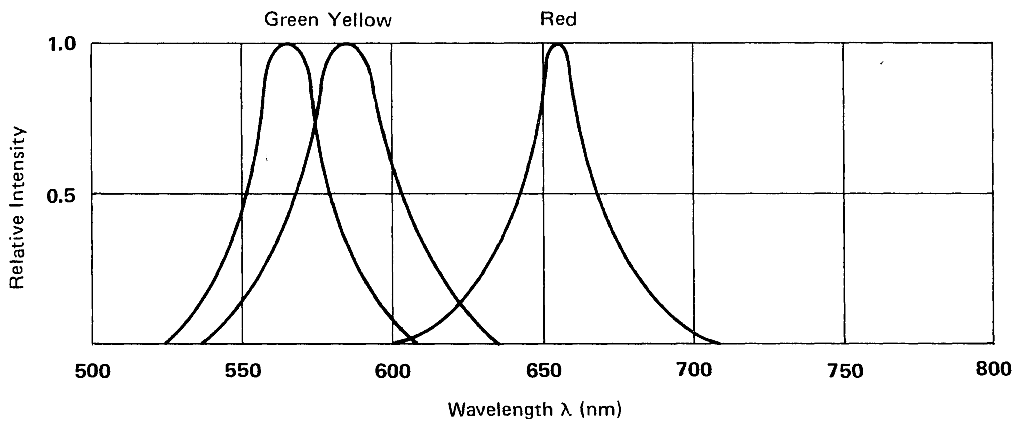


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL—	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	603-1	0.3	0.8		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	603-1		60		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	603-1		655		nm	Measurement @Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	603-1		24		nm	
Forward Voltage	V_F	603-1		1.7	2.0	V	I_F = 20mA
Reverse Current	I_R	603-1			100	μA	V_R = 5V
Capacitance	C	603-1		30		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

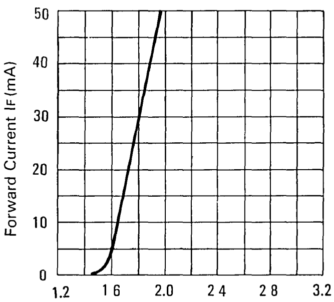


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE.

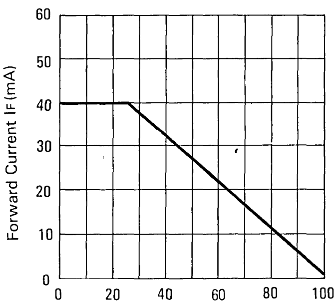


FIG 3 FORWARD CURRENT DERATING CURVE

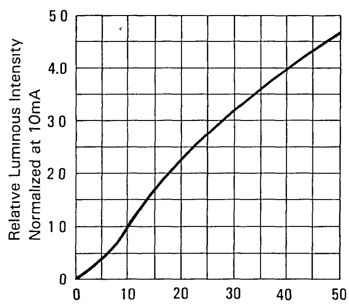


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

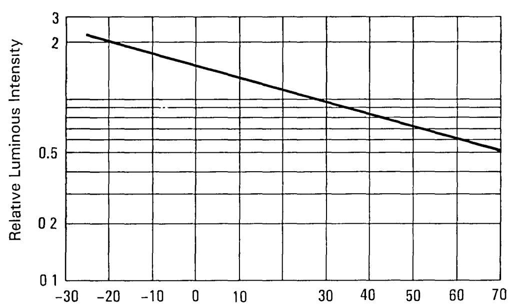


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

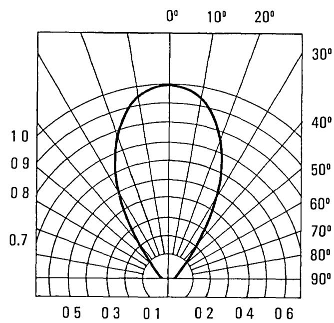


FIG. 6 SPATIAL DISTRIBUTION

LED LAMPS

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT T_A = 25°C

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	633-1 653-1	1.7 1.7	5.6 5.6		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	633-1 653-1		60		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ PEAK	633-1 653-1		565 585		nm	Measurement @Peak (Fig. 1)
Spectral Line Half Width	Δλ	633-1 653-1		30 35		nm	
Forward Voltage	V_F	633-1 653-1		2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	633-1 653-1			100	μA	V_R = 5V
Capacitance	C	633-1 653-1		35 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.
2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

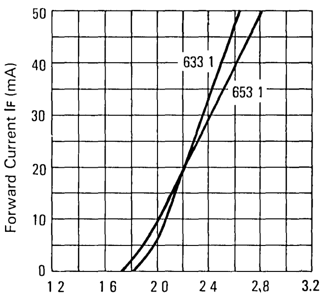


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

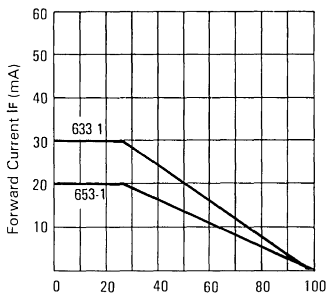


FIG 8 FORWARD CURRENT DERATING CURVE

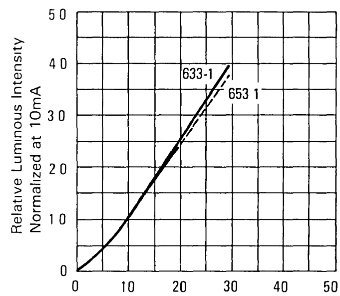


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

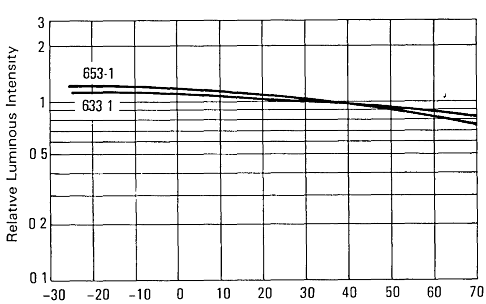


FIG 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

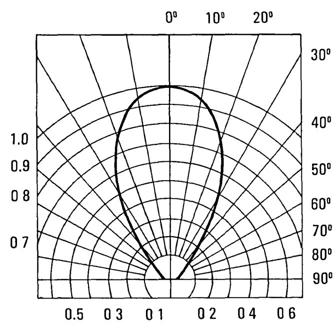


FIG. 11 SPATIAL DISTRIBUTION

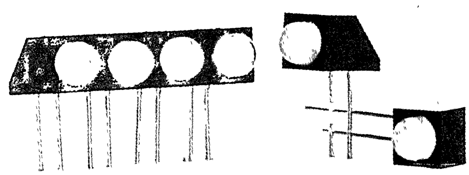
LITEON

ONE AND FOUR ELEMENT LED ARRAYS

LTL-5 x 3-14 SERIES
LTL-5 x 3-11 SERIES

FEATURES

- DESIGNED FOR EASE IN CIRCUIT BOARD ASSEMBLY.
- BLACK CASE ENHANCES CONTRAST RATIO.
- DESIGNED TO ALLOW FOR HIGH DENSITY PACKAGING.
- SINGLE PACKAGE PROVIDES 4-LINE STATUS INDICATIONS.
- SOLID STATE LIGHT SOURCE.
- WIDE VIEWING ANGLE.
- HIGH RELIABILITY-LIFE MEASURED IN YEARS.

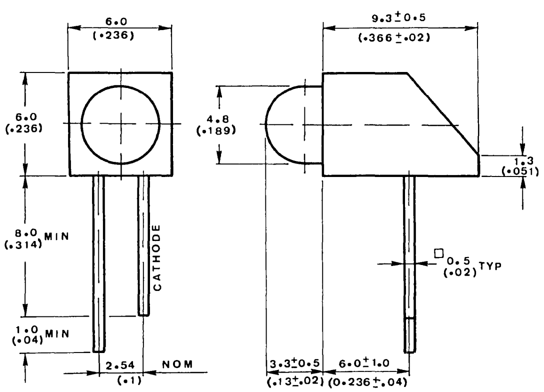


APPLICATIONS

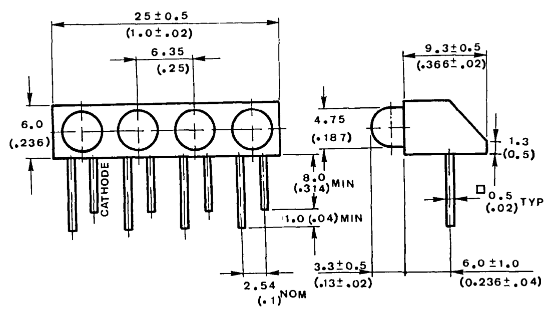
- CIRCUIT BOARD INDICATOR.
- PANEL ILLUMINATION.
- LOGIC STATUS INDICOTOR.
- BINARY DATA DISPLAY-PERMITS STACKING SO THAT MULTIPLE FUNCTIONS CAN BE DISPLAYED.
- POSITION INDICATOR

PACKAGE DIMENSIONS

LTL-5x3-11 Series



LTL-5x3-14 Series



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.010") unless otherwise noted.
3. The holder color is black only.
4. The holder raw material is thermal plastic polypropylene.
5. The LED lamps are LTL-10203W (short lead) series.

DEVICES

PART NO. LTL—	LED LENS COLOR		SOURCE COLOR
	COLOR	DIFFUSION	
503-11 503-14	Red	Diffused	Red
533-11 533-14	Green	Diffused	Green
553-11 553-14	Yellow	Diffused	Yellow

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	LTL— 503-11 503-14	LTL— 533-11 533-14	LTL— 553-11 553-14	UNIT
Power Dissipation	80	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	120	80	mA
Continuous Forward Current	40	30	20	mA
Derating Linear From 25°C	0.5	0.4	0.25	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	–55°C to +100°C			
Storage Temperature Range	–55°C to +100°C			
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds			

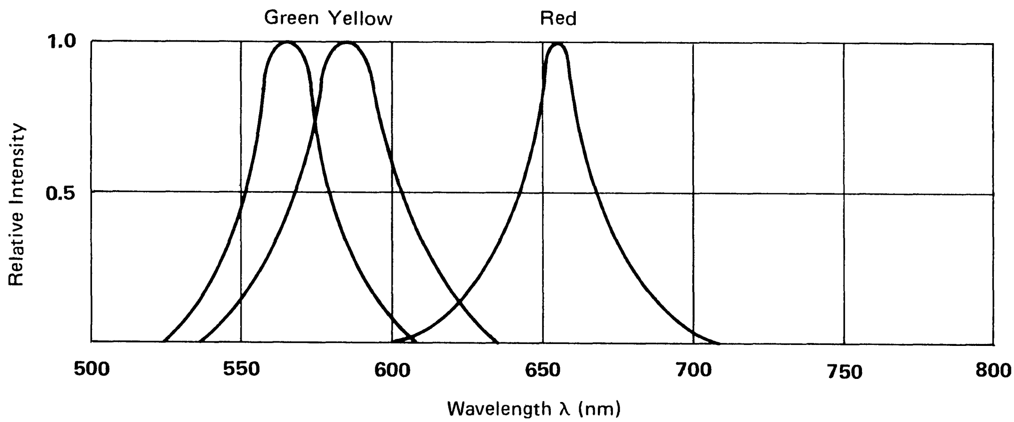


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	503-11 503-14	0.3 0.3	0.8 0.8		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	503-11 503-14		60		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ PEAK	503-11 503-14		655		nm	Measurement @Peak (Fig. 1)
Spectral Line Hall Width	Δλ	503-11 503-14		24		nm	
Forward Voltage	V_F	503-11 503-14		1.7	2.0	V	I_F = 20mA
Reverse Current	I_R	503-11 503-14			100	μA	V_R = 5V
Capacitance	C	503-11 503-14		30		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

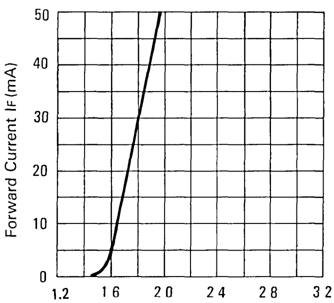


FIG 2 FORWARD CURRENT VS FORWARD VOLTAGE

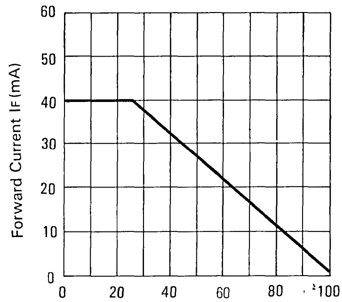


FIG 3 FORWARD CURRENT DERATING CURVE

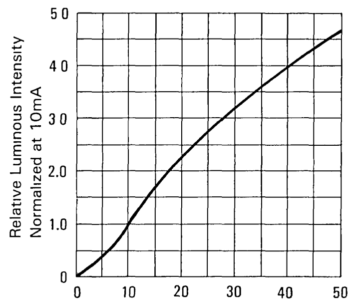


FIG 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

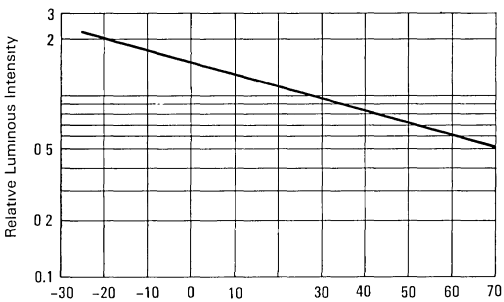


FIG 5 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

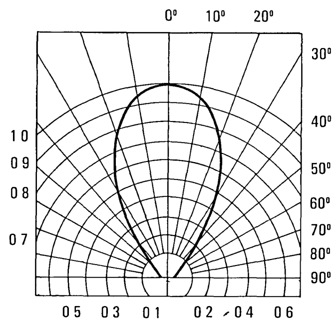


FIG 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25°C$

PARAMETER	SYMBOL	PART NO. LTL–	MIN.	TYF.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	533-11/-14 553-11/-14	1.7 1.7	5.6 5.6		mcd	I_F = 10mA Note 1
Viewing Angle	$2\theta½$	533-11/-14 553-11/-14		60		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ PEAK	533-11/-14 553-11/-14		565 585		nm	Measurement @Peak (Fig. 1)
Spectral Line Hall Width	Δλ	533-11/-14 553-11/-14		30 35		nm	
Forward Voltage	V_F	533-11/-14 553-11/-14		2.1	2.8	V	I_F = 20mA
Reverse Current	I_R	533-11/-14 553-11/-14			100	μA	V_R = 5V
Capacitance	C	533-11/-14 553-11/-14		35 15		PF	V_F = 0 f = 1MHZ

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

2. $\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

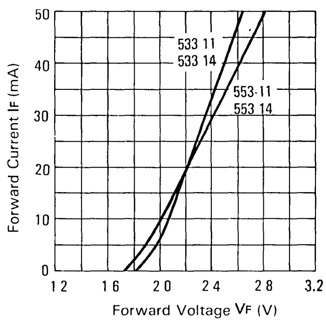


FIG 7 FORWARD CURRENT VS FORWARD VOLTAGE

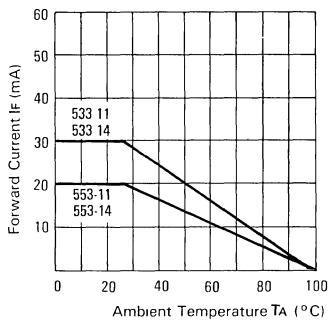


FIG 8 FORWARD CURRENT DERATING CURVE

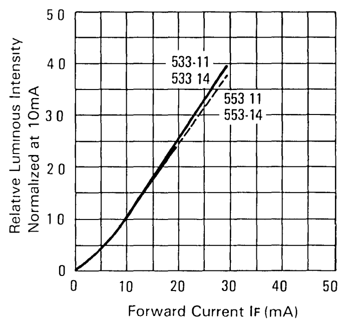


FIG 9 RELATIVE LUMINOUS INTENSITY VS FORWARD CURRENT

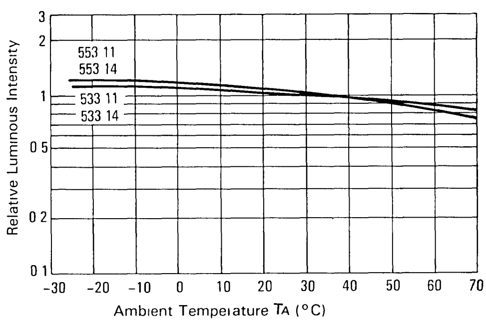


FIG 10 LUMINOUS INTENSITY VS AMBIENT TEMPERATURE

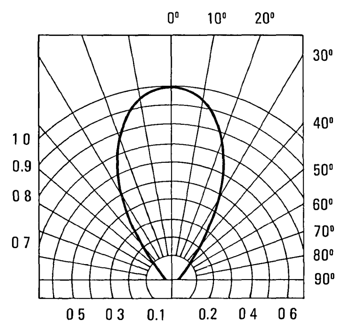
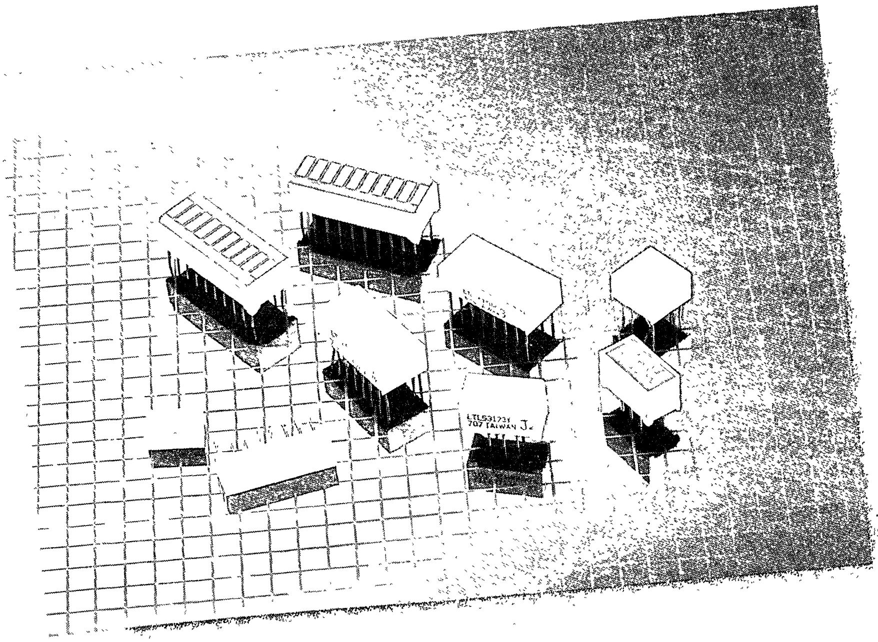


FIG. 11 SPATIAL DISTRIBUTION

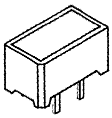
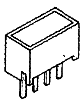
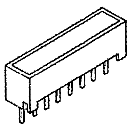
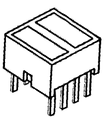
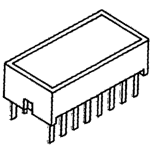
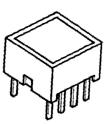

707 TAIWAN

3. LED Light Bars & Bar Graph Arrays

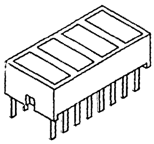
- SELECTION GUIDE
- LED LIGHT BARS
- LED BAR GRAPH ARRAYS

SELECTION GUIDE

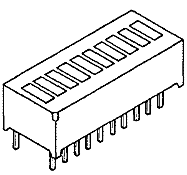
LED LIGHT BARS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10 mA	TYPICAL VIEWING ANGLE 2θ½*	Vf TYP. @ 20 mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	5 Pin DIP .100″ Centers .550″ L x .295″ W x .315″ H	LTL-57173HR	Hi. Eff. Red (635 nm)	Diffused	4.2 mcd	100°	2.0 V	
		LTL-54173G	Green (565 nm)	Diffused	4.2 mcd	100°	2.1 V	3–3
		LTL-53173Y	Yellow (585 nm)	Diffused	4.2 mcd	100°	2.1 V	
	4 Pin In-Line .100″ Centers .400″ L x .195″ W x .240″ H	LTL-2300HR	Hi. Eff. Red (635 nm)	Diffused	4.2 mcd	100°	2.0 V	
		LTL-2500G	Green (565 nm)	Diffused	4.2 mcd	100°	2.1 V	3–8
		LTL-2400Y	Yellow (585 nm)	Diffused	4.2 mcd	100°	2.1 V	
	8 Pin In-Line .100″ Centers .800″ L x .195″ W x .240″ H	LTL-2350HR	Hi Eff. Red (635 nm)	Diffused	8.0 mcd	100°	2.0V	
		LTL-2550G	Green (565 nm)	Diffused	8.0 mcd	100°	2.1 V	3–8
		LTL-2450Y	Yellow (585 nm)	Diffused	8.0 mcd	100°	2.1 V	
	8 Pin DIP .100″ Centers .400″ L x .400″ W x .240″ H	LTL-2600HR	Hi. Eff. Red (635 nm)	Diffused	4.2 mcd	100°	2.0 V	
		LTL-2800G	Green (565 nm)	Diffused	4.2 mcd	100°	2.1 V	3–8
		LTL-2700Y	Yellow (585 nm)	Diffused	4.2 mcd	100°	2.1 V	
	16 Pin DIP .100″ Centers .800″ L x. .400″ W x .240″ H	LTL-2620HR	Hi. Eff. Red (635 nm)	Diffused	4.2 mcd	100°	2.0 V	
		LTL-2820G	Green (565 nm)	Diffused	4.2 mcd	100°	2.1 V	3–8
		LTL-2720Y	Yellow (585 nm)	Diffused	4.2 mcd	100°	2.1 V	
	8 Pin DIP .100″ Centers .400″ L x .400″ W x .240″ H	LTL-2655HR	Hi. Eff. Red (635 nm)	Diffused	8.0 mcd	100°	2.0 V	
		LTL-2855G	Green (565 nm)	Diffused	8.0 mcd	100°	2.1 V	3–8
		LTL-2755Y	Yellow (585 nm)	Diffused	8.0 mcd	100°	2.1 V	

Notes: * 2θ½ is the off-axis angle at which the luminous intensity is half the axial luminous intensity
** Peak Emission wavelength (nm).

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10 mA	TYPICAL VIESING ANGLE $2\theta½$*	Vf TYP. @ 20 mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	16 Pin DIP .100" Centers .800" L x .400" W x .240" H	LTL-2685HR	Hi. Eff. Red (635 nm)	Diffused	16.0 mcd	100°	2.0 V	
		LTL-2885G	Green (565 nm)	Diffused	16.0 mcd	100°	2.1 V	3–8
		LTL-2785Y	Yellow (585 nm)	Diffused	16.0 mcd	100°	2.1 V	

○ LED BAR GRAPH ARRAYS

OUTLINE	DEVICE		DESCRIPTION		LUMINOUS INTENSITY Iv TYP. @ 10 mA	TYPICAL VIESING ANGLE $2\theta½$*	Vf TYP. @ 20 mA	PAGE NO.
	PACKAGE	PART NO.	COLOR**	LENS				
	20 Pin DIP .100" Centers 995" Lx .400" W x 315" H	LTA-1000R	Red (655 nm)	Diffused	0.5 mcd	100°	1.7 V	
		LTA-1000P	Bright Red (697 nm)	Diffused	0.7 mcd	100°	2.1 V	
		LTA-1000G	Green (565 nm)	Diffused	2.0 mcd	100°	2.1 V	
		LTA-1000Y	Yellow (585 nm)	Diffused	2.0 mcd	100°	2.1 V	3–15
		LTA-1000E	Orange (630 nm)	Diffused	2.0 mcd	100°	2.0 V	
		LTA-1000HR	Hi Eff Red (635 nm)	Diffused	2.0 mcd	100°	2.0 V	

Notes: 1. * $2\theta½$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity
2. ** Peak Emission wavelength (nm).
3. Specifications are subject to change without notice.
4. Brightness data for refrence only.

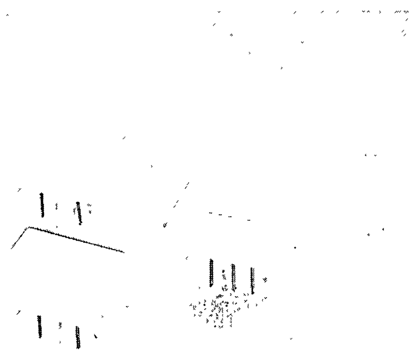
LITEON

LTL- 53173Y / 54173G / 57173HR SERIES

12.7mm x 6.35mm LIGHT BAR

FEATURES

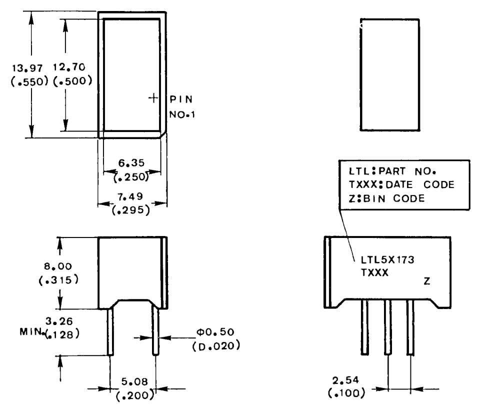
- 12.7mm x 6.35mm RECTANGULAR LIGHT BAR.
- CHOICE OF THREE BRIGHT COLORS-GREEN/ YELLOW/ HIGH EFFICIENCY RED.
- LARGE, BRIGHT, UNIFORM LIGHT EMITTING AREAS.
- LOW POWER REQUIREMENT.
- I.C. COMPATIBLE.
- EXCELLENT ON-OFF CONTRAST.
- CAN BE USED WITH PANEL AND LEGEND MOUNT.
- SUITABLE FOR MULTIPLEX OPERATION.
- EASY MOUNTING ON P.C. BOARD.



DESCRIPTION

The LTL-53173Y/54173G/57173HR series bars are rectangular light sources designed for a variety of applications where a large bright source of light is required. These light bars are configured in dual-in-line packages. The green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow and high efficiency red series devices utilize LED chips which are made from GaAsP on transparent GaP substrate. The green devices have green bar color, yellow devices have yellow bar color, and high-efficiency red devices have red bar color.

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

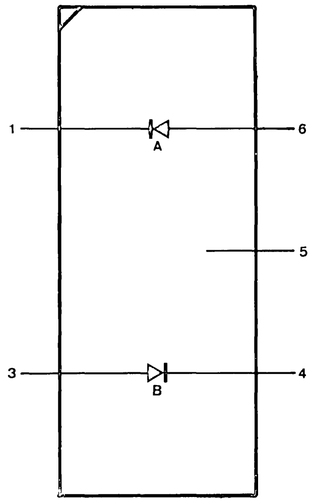
1. Lead length (from seating plane): minimum value $\frac{{+1.00 \atop -0.00}\text{ mm}}{\left({+0.040'' \atop -0.000''}\right)}$
2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PART NO. LTL–			DESCRIPTION
GREEN	YELLOW	HI.-EFF. RED	
54173G	53173Y	57173HR	Universal, Rectangular Bar

PIN CONNECTION

PIN NO.	CONNECTION
1	Cathode A
2	No Pin
3	Anode B
4	Cathode B
5	No Connection
6	Anode A

INTERNAL CIRCUIT DIAGRAM



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	GREEN	YELLOW	HI.-EFF. RED	UNIT
Power Dissipation Per Chip	75	60	75	mW
Peak Forward Current Per Chip (1/10 Duty Cycle, 0.1ms Pulse Width)	100	80	100	mA
Continuous Forward Current Per Chip	25	20	25	mA
Derating Linear From 25°C Per Chip	0.3	0.24	0.3	mA/°C
Reverse Voltage Per Chip	5	5	5	V
Operating Temperature Range	–25°C to +85°C			
Storage Temperature Range	–25°C to +85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTL-54173G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Bar	I_V	2.3	4.2		mcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		35		nm	I_F = 20 mA
Forward Voltage any Chip	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Chip	I_R			100	μA	V_R = 5V

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

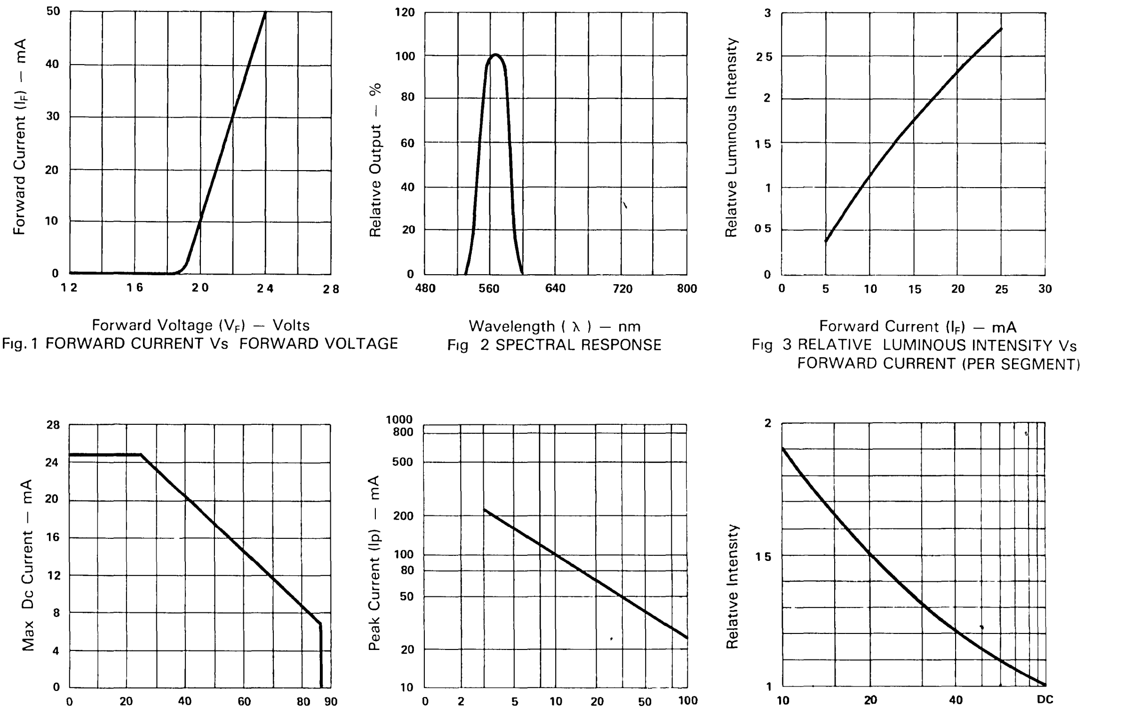


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

Fig 2 SPECTRAL RESPONSE

Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE − F = 1 KHz)

Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTL-53173Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Bar	I_V	2.3	4.2		mcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		30		nm	I_F = 20 mA
Forward Voltage any Chip	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Chip	I_R			100	μA	V_R = 5V

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

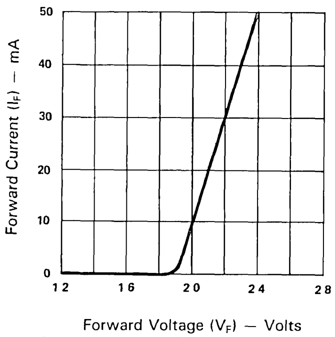


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

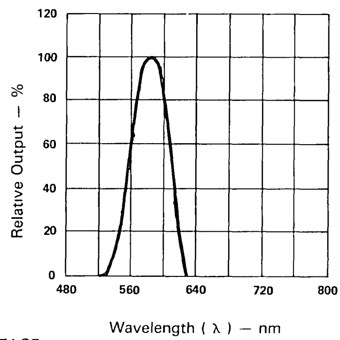


Fig. 2 SPECTRAL RESPONSE.

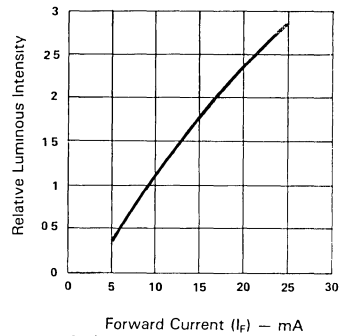


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

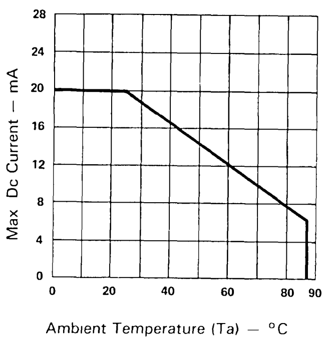


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

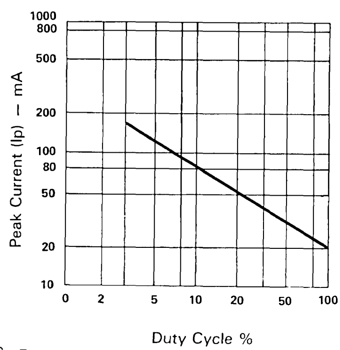


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

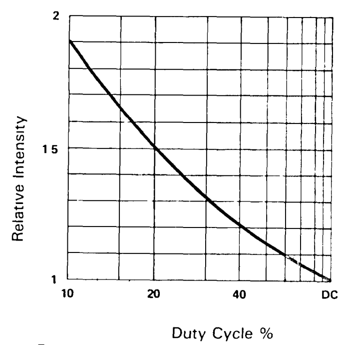


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTL-53173HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Bar	I_V	2.3	4.2		mcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		635		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	$I_F = 20$ mA
Forward Voltage any Chip	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current any Chip	I_R			100	μA	$V_R = 5V$

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

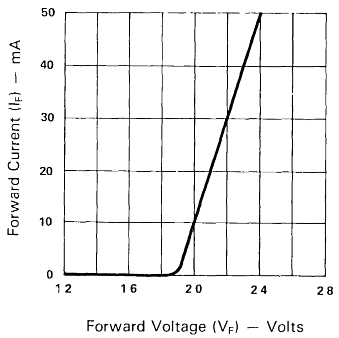


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

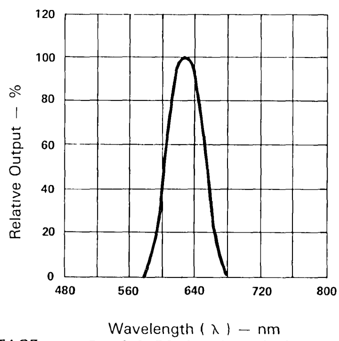


Fig 2 SPECTRAL RESPONSE

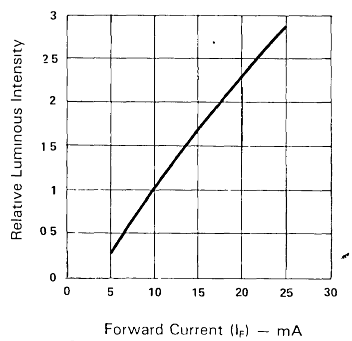


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

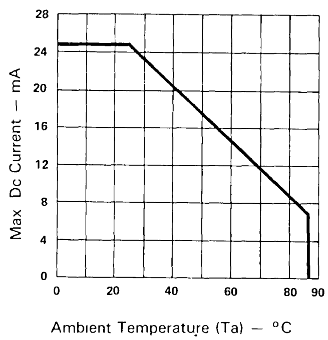


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

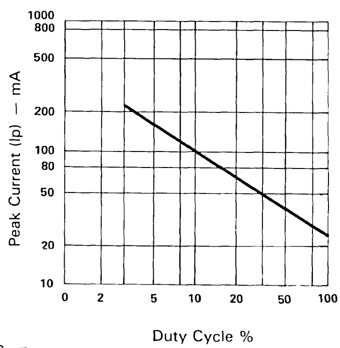


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

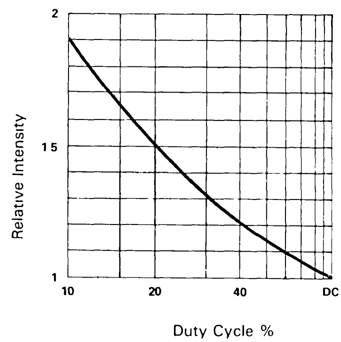


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

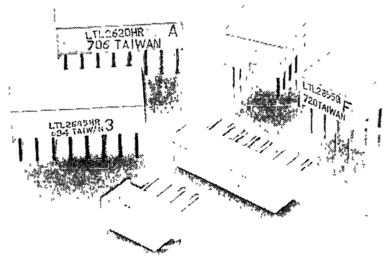
LITEON

LTL- 2300/2600 2400/2700 2500/2800 SERIES

LIGHT BARS

FEATURES

- RECTANGULAR LIGHT BAR.
- CHOICE OF THREE BRIGHT COLORS-GREEN/ YELLOW/ HIGH EFFICIENCY RED.
- LARGE, BRIGHT, UNIFORM LIGHT EMITTING AREAS.
- LOW POWER REQUIREMENT.
- EXCELLENT ON-OFF CONTRAST.
- CAN BE USED WITH PANEL AND LEGEND MOUNT.
- SUITABLE FOR MULTIPLEX OPERATION.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARDS.



DESCRIPTION

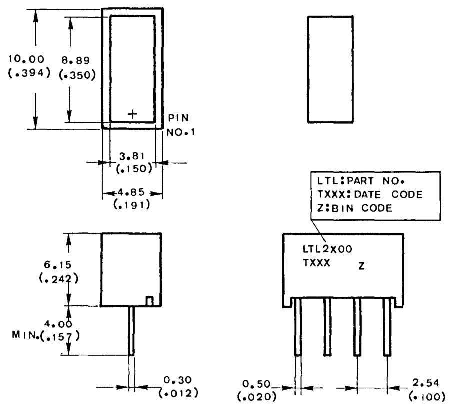
The LTL-2300/2400/2500/2600/2700/2800 series light bars are rectangular light sources designed for a variety of applications where a large bright source of light is required. These light bars are configured in single-in-line and dual-in-line packages. The green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow and high efficiency red series devices utilize LED chips which are made from GaAsP on transparent GaP substrate. All devices have white bar color.

DEVICES

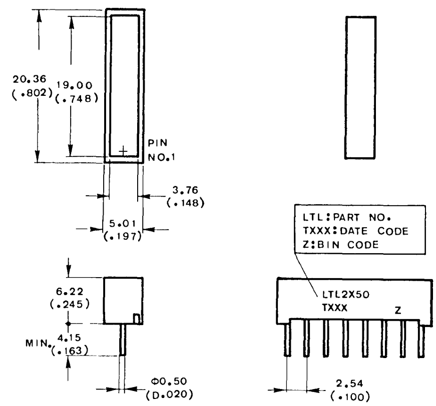
PART NO. LTL–			Size of Light Emitting Areas	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	YELLOW	HI.-EFF. RED			
2500G	2400Y	2300HR	8.89 mm x 3.81 mm (.350 in x .150 in.)	A	A
2550G	2450Y	2350HR	19.05 mm x 3.81 mm (.750 in x .150 in.)	B	B
2800G	2700Y	2600HR	8.89 mm x 3.81 mm (.350 in x .150 in.)	C	C
2855G	2755Y	2655HR	8.89 mm x 8.89 mm (.350 in x .350 in.)	D	D
2820G	2720Y	2620HR	8.89 mm x 3.81 mm (.350 in x .150 in.)	E	E
2885G	2785Y	2685HR	8.89 mm x 19.05 mm (.350 in x .750 in.)	F	F

PACKAGE DIMENSIONS

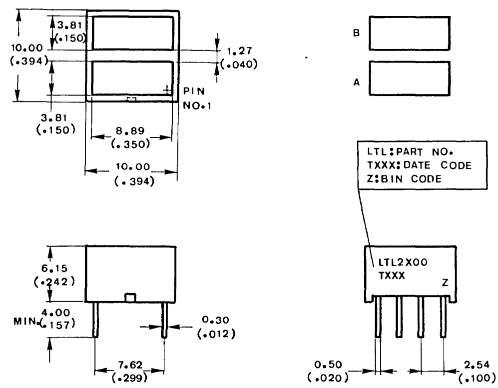
A. LTL-2300/2400/2500



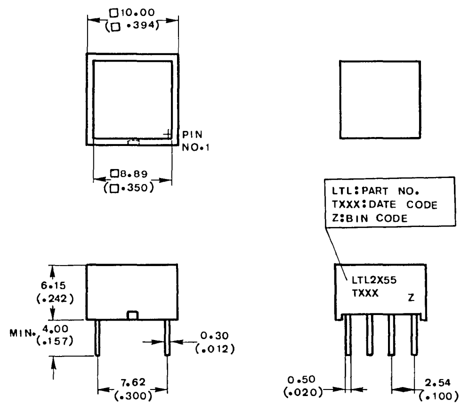
B. LTL-2350/2450/2550



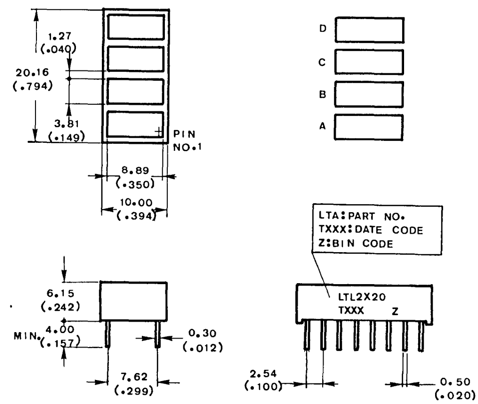
C. LTL-2600H/2700/2800



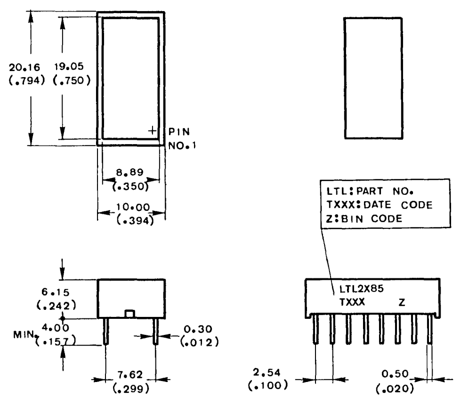
D. LTL-2655/2755/2855



E. LTL-2620/2720/2820



F. LTL-2685/2785/2885



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $\frac{+1.00}{-0.000}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

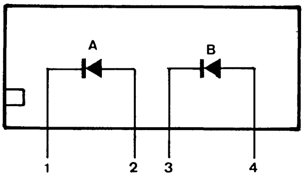
PIN CONNECTION

PIN NO.	CONNECTION			
	A LTL-2300/2400/2500	B LTL-2350/2450/2550	C LTL-2600/2700-2800	D LTL-2655/2755/2855
1	Cathode A	Cathode A	Cathode A	Cathode A
2	Anode A	Anode A	Anode A	Anode A
3	Cathode B	Cathode B	Anode B	Anode B
4	Anode B	Anode B	Cathode B	Cathode B
5		Cathode C	Cathode C	Cathode C
6		Anode C	Anode C	Anode C
7		Cathode D	Anode D	Anode D
8		Anode D	Cathode D	Cathode D

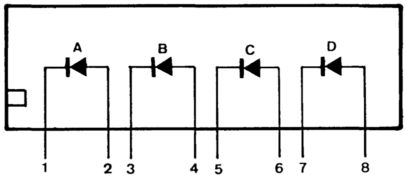
PIN NO.	CONNECTION	
	E. LTL-2620/2720/2820	F. LTL-2685/2785/2885
1	Cathode A	Cathode A
2	Anode A	Anode A
3	Anode B	Anode B
4	Cathode B	Cathode B
5	Cathode C	Cathode C
6	Anode C	Anode C
7	Anode D	Anode D
8	Cathode D	Cathode D
9	Cathode E	Cathode E
10	Anode E	Anode E
11	Anode F	Anode F
12	Cathode F	Cathode F
13	Cathode G	Cathode G
14	Anode G	Anode G
15	Anode H	Anode H
16	Cathode H	Cathode H

INTERNAL CIRCUIT DIAGRAM

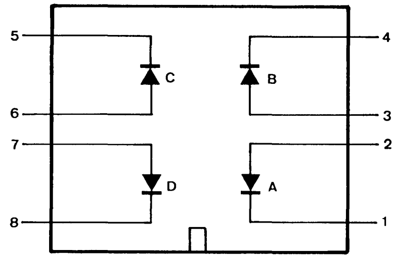
A. LTL-2300/2400/2500



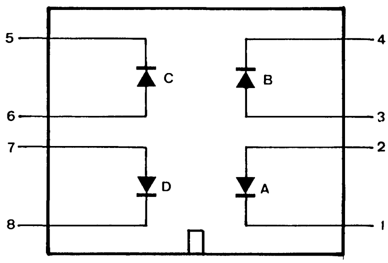
B. LTL-2350/2450/2550



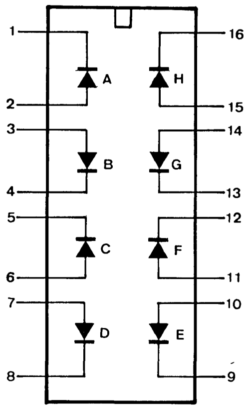
C. LTL-2600/2700/2800



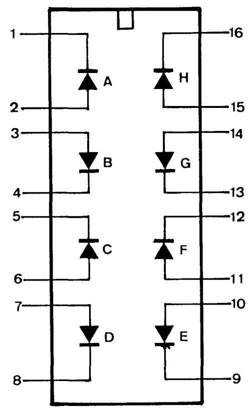
D. LTL-2655/2755/2855



E. LTL-2620/2720/2820



F. LTL-2685/2785/2885



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

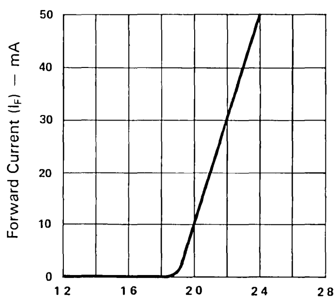
PARAMETER	GREEN	YELLOW	HI.-EFF. RED	UNIT
Power Dissipation Per Chip	75	60	75	mW
Peak Forward Current Per Chip (1/10 Duty Cycle, 0.1ms Pulse Width)	100	80	100	mA
Continuous Forward Current Per Chip	25	20	25	mA
Derating Linear From 25°C Per Chip	0.3	0.24	0.3	mA/°C
Reverse Voltage Per Chip	5	5	5	V
Operating Temperature Range	–25°C to +85°C			
Storage Temperature Range	–25°C to +85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
HI-EFF RED LTL-2300HR/2600HR SERIES

PARAMETER	LTL–	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Bar	2300	Iv	1.3	4 2		mcd	I_F = 10 mA
	2350		3.5	8			
	2600		1.3	4.2			
	2620		1.3	4.2			
	2655		3 5	8			
	2685		7	16			
Peak Emission Wavelength		λp		635		nm	I_F = 20 mA
Spectral Line Half-Width		Δλ		40		nm	I_F = 20 mA
Forward Voltage any Chip		V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Chip		I_R			100	μA	V_R = 5V

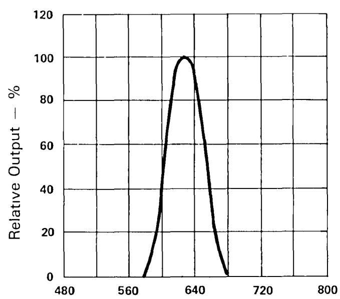
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)



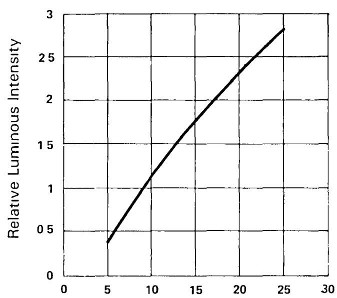
Forward Voltage (V_F) — Volts

Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



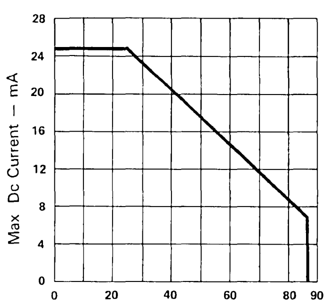
Wavelength (λ) — nm

Fig 2 SPECTRAL RESPONSE



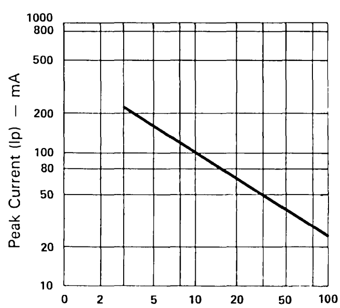
Forward Current (I_F) — mA

Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



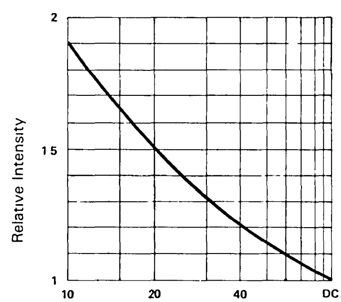
Ambient Temperature (Ta) — °C

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
YELLOW LTL-2400Y/2700Y SERIES

PARAMETER	LTL–	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Bar	2400	Iv	1.3	4.2		mcd	I_F = 10 mA
	2450		3.5	8			
	2700		1.3	4.2			
	2720		1.3	4.2			
	2755		3.5	8			
	2785		7	16			
Peak Emission Wavelength		λp		585		nm	I_F = 20 mA
Spectral Line Half-Width		Δλ		35		nm	I_F = 20 mA
Forward Voltage any Chip		V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Chip		I_R			100	μA	V_R = 5V

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

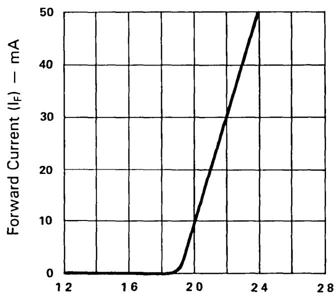


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

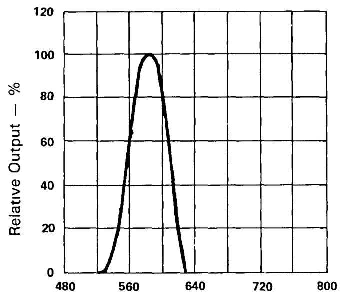


Fig. 2 SPECTRAL RESPONSE.

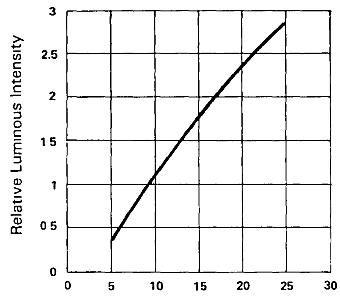


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

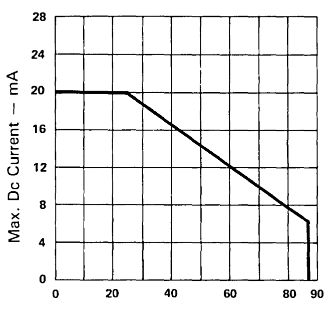


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

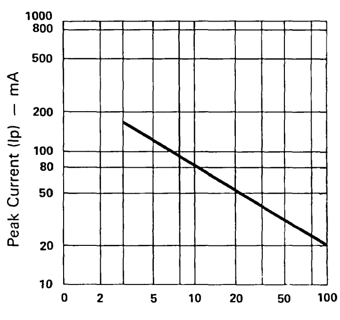


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

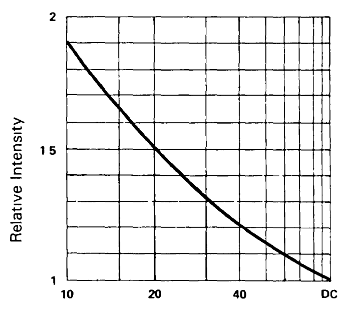
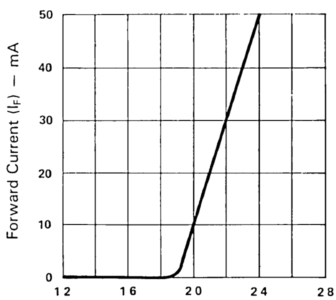


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

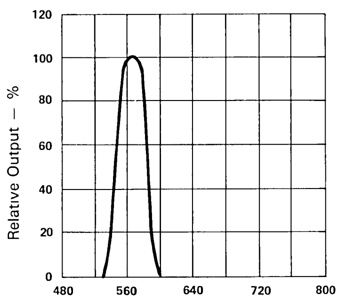
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
GREEN LTL-2500G/2800G SERIES

PARAMETER	LTL–	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity Per Bar	2500	Iv	1.3	4.2		mcd	I_F = 10 mA
	2550		3.5	8			
	2800		1.3	4.2			
	2820		1.3	4.2			
	2855		3.5	8			
	2885		7	16			
Peak Emission Wavelength		λp		565		nm	I_F = 20 mA
Spectral Line Half-Width		Δλ		30		nm	I_F = 20 mA
Forward Voltage any Chip		V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Chip		I_R			100	μA	V_R = 5V

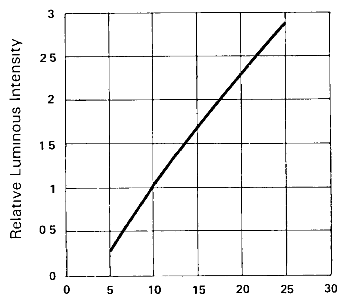
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



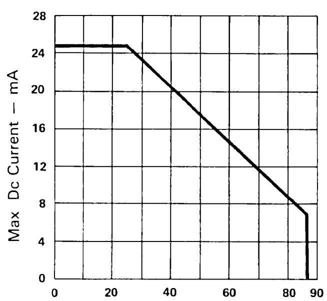
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



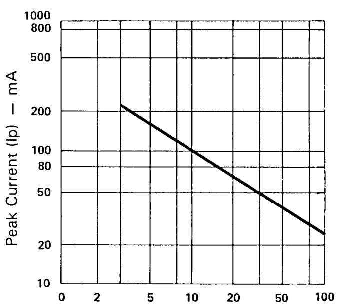
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE



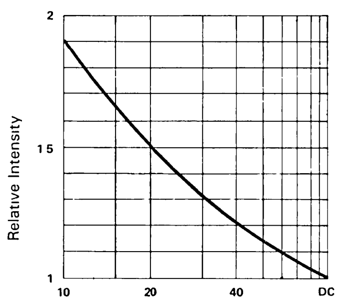
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

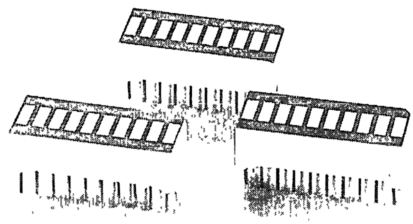
LITEON

LTA-1000 SERIES

BAR GRAPH ARRAY

FEATURES

- LARGE SEGMENTS, CLOSELY SPACED.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED / GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- END STACKABLE.
- FAST SWITCHING, EXCELLENT FOR MULTIPLEXING.
- LOW POWER REQUIREMENT.
- IC COMPATIBLE.
- WIDE VIEWING ANGLE.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



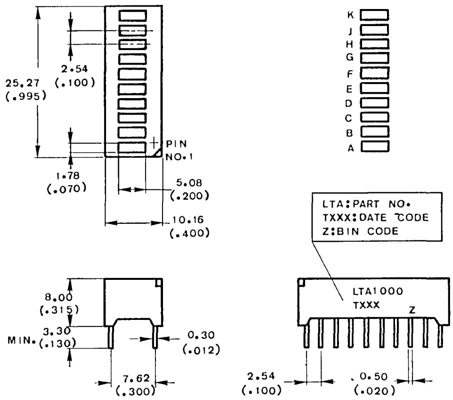
DESCRIPTION

The LTA-1000 series are ten rectangular light sources array displays designed for a variety of applications where a continuously large, bright source of light is required. The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. The red, bright red, green, yellow, and orange devices have gray face and white segment color. The high efficiency red devices have red face and red segment color.

DEVICES

PART NO. LTA–						DESCRIPTION
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	
1000R	1000P	1000G	1000Y	1000E	1000HR	Universal, Ten Rectangular Bar

PACKAGE DIMENSIONS



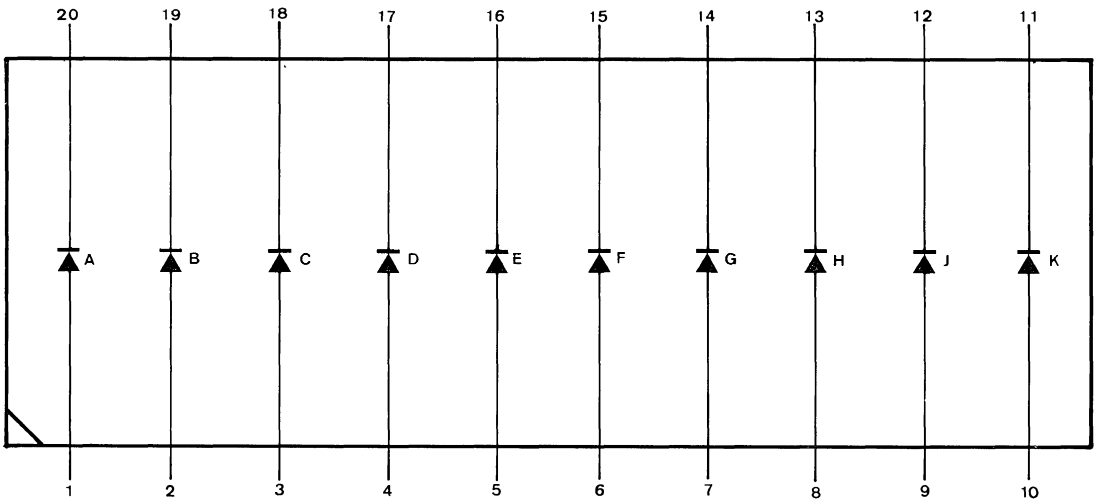
NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $\frac{+1.00}{-0.000}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$
2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

PIN NO.	CONNECTION	PIN NO.	CONNECTION
1	Anode A	11	Cathode K
2	Anode B	12	Cathode J
3	Anode C	13	Cathode H
4	Anode D	14	Cathode G
5	Anode E	15	Cathode F
6	Anode F	16	Cathode E
7	Anode G	17	Cathode D
8	Anode H	18	Cathode C
9	Anode J	19	Cathode B
10	Anode K	20	Cathode A

INTERNAL CIRCUIT DIAGRAM



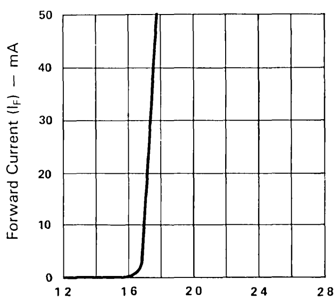
ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Bar	55	40	75	60	75	75	mW
Peak Forward Current Per Bar (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Bar	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Bar	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage PerBar	5	5	5	5	5	5	V
Operating Temperature Range	–25°C to +85°C						
Storage Temperature Range	–25°C to +85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

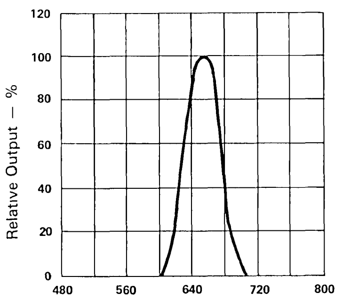
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTA-1000R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	I_V	200	500		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		655		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		24		nm	$I_F = 20$ mA
Forward Voltage any Bar	V_F		1.7	2.0	V	$I_F = 20$ mA
Reverse Current, any Bar	I_R			100	μA	$V_R = 5V$
Luminous Intensity Matching Ratio	Iv-m			2:1		$I_F = 20$ mA

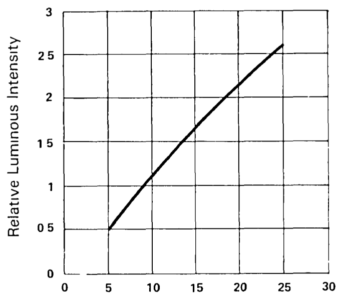
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



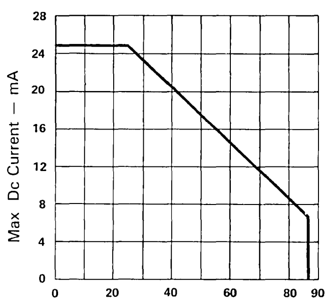
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



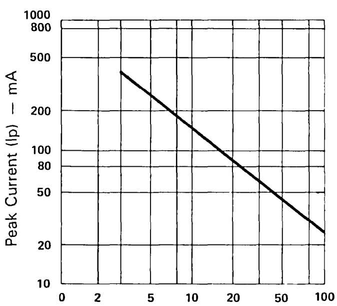
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



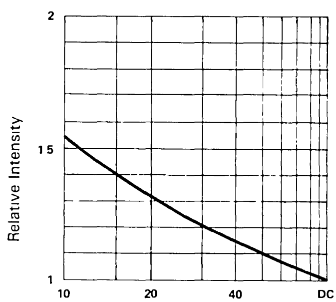
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

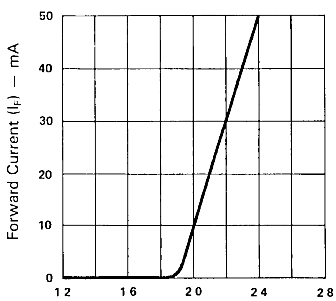


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

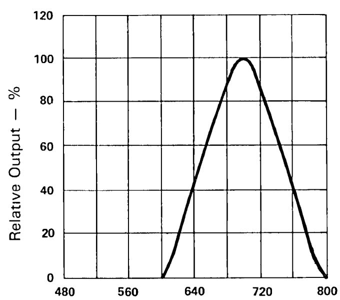
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTA-1000P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	I_V	300	700		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	I_F = 20 mA
Forward Voltage any Bar	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Bar	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		I_F = 20 mA

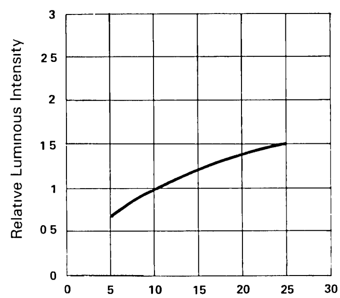
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



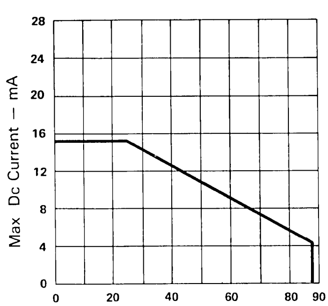
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



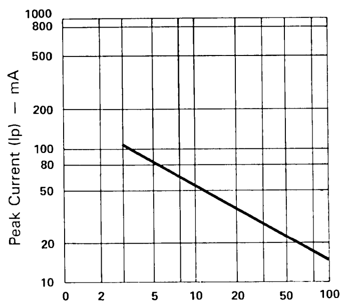
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTA-1000G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage any Bar	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Bar	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

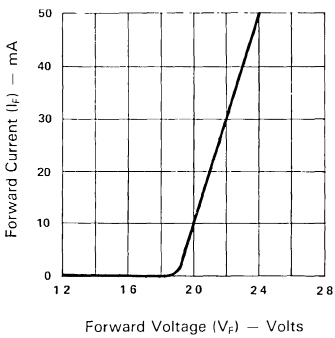


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

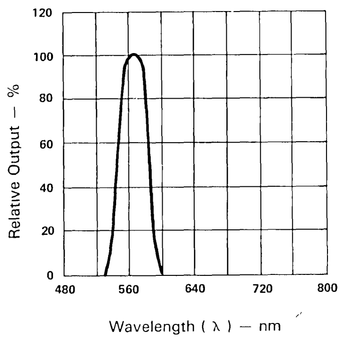


Fig 2 SPECTRAL RESPONSE

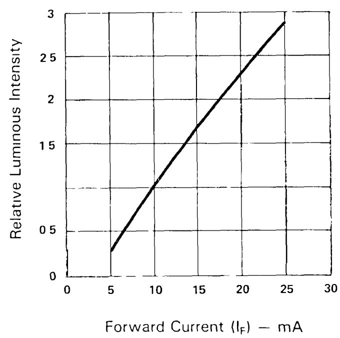


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

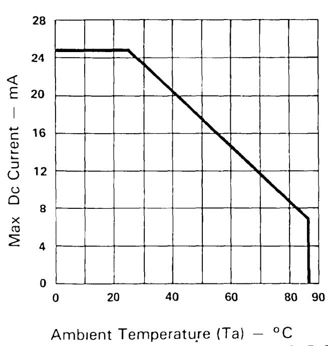


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

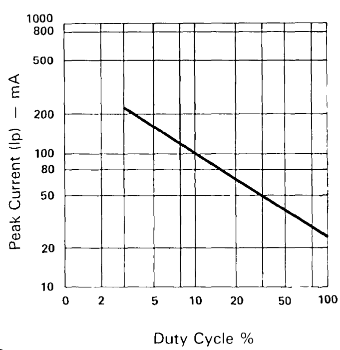


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

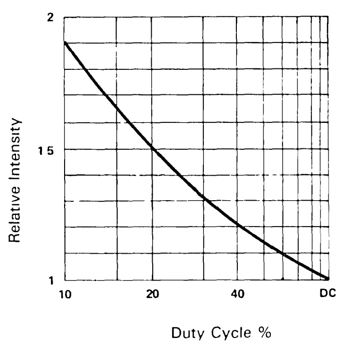
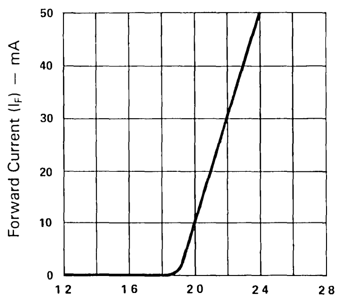


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

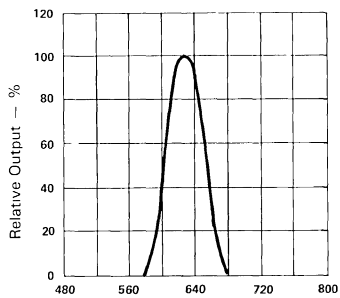
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTA-1000Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage any Bar	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Bar	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

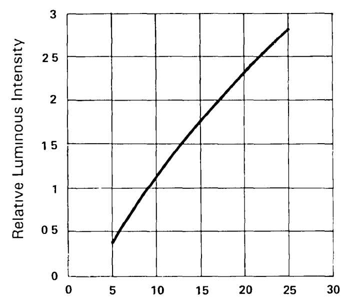
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



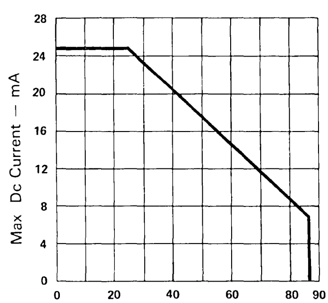
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



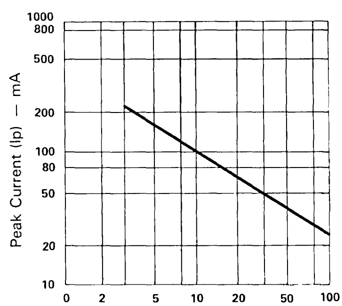
Wavelengtn (λ) — nm
Fig 2 SPECTRAL RESPONSE



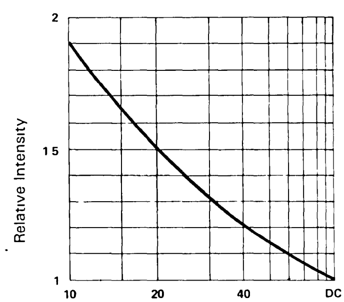
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTA-1000E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage any Bar	V_F		2.1	2.8	V	I = 20 mA
Reverse Current, any Bar	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2 1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

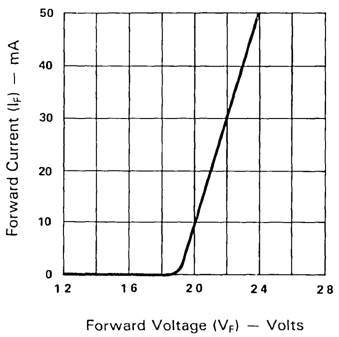


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

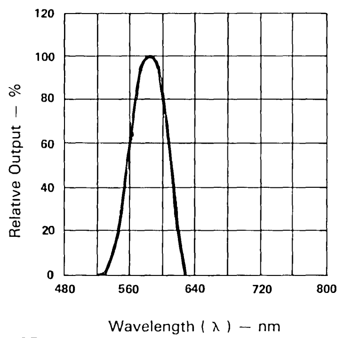


Fig 2 SPECTRAL RESPONSE

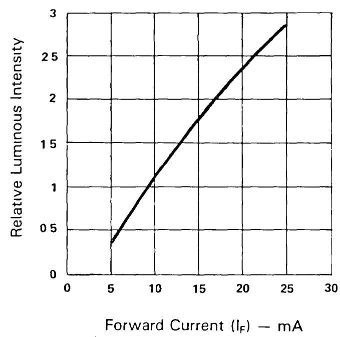


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

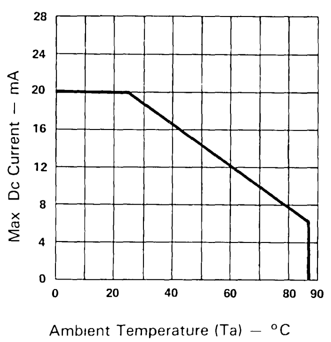


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

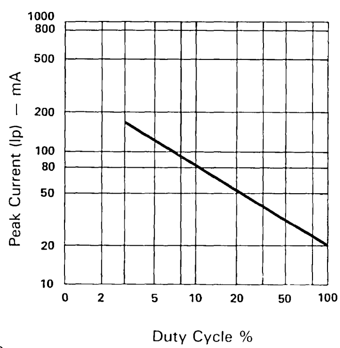


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

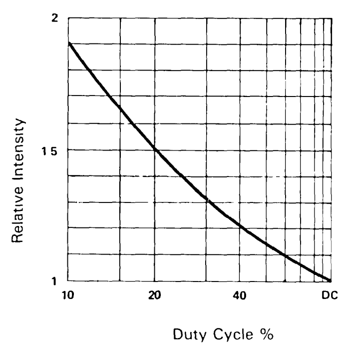


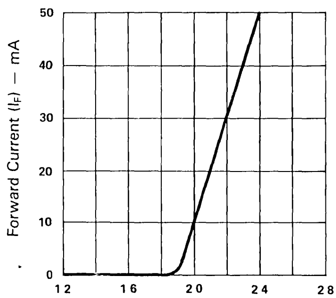
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTA-1000HR

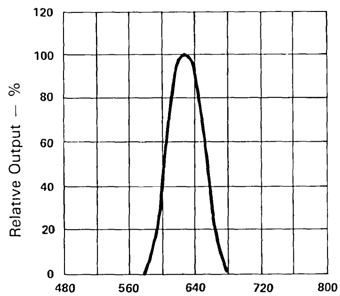
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	I_V	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	I_F = 20 mA
Forward Voltage any Bar	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Bar	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	$I_{V\text{-}m}$			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

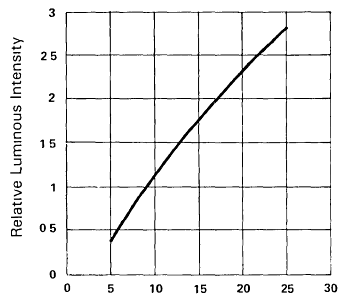
(25° C Ambient Temperature Unless Otherwise Noted)



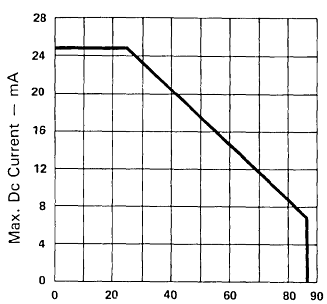
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



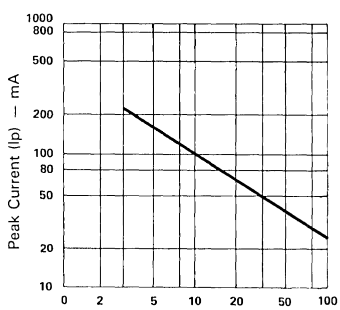
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



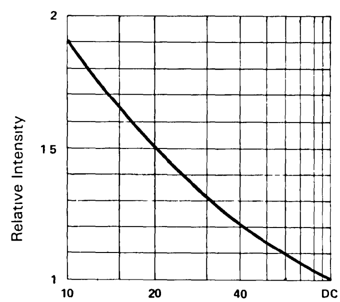
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

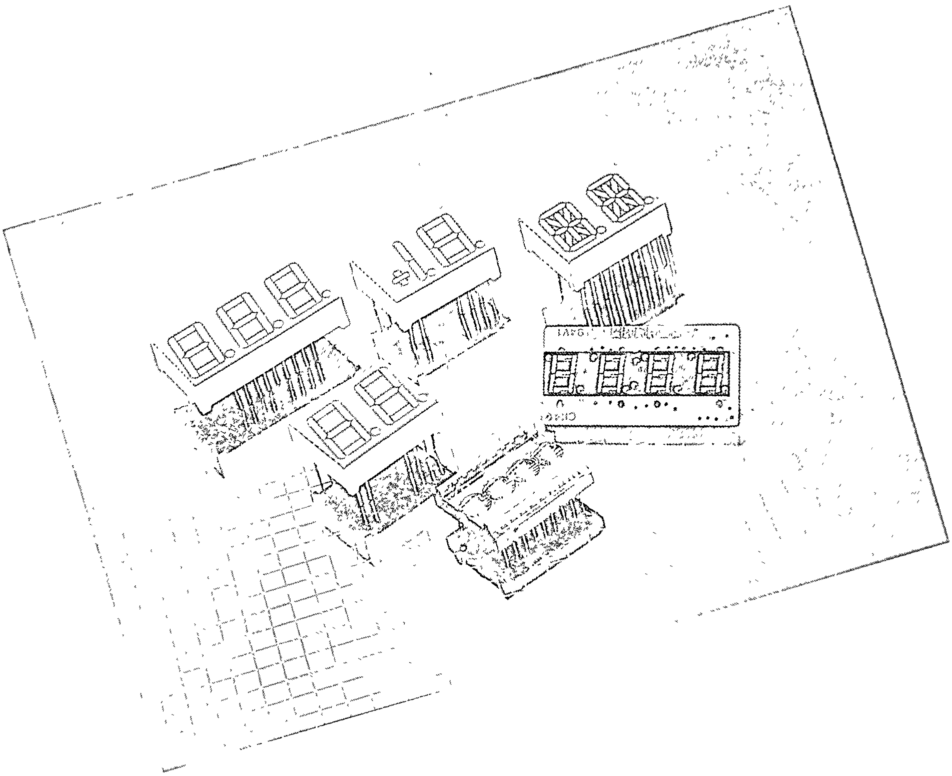


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

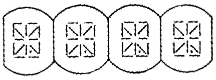
NOTES: 1 Clean only in water, isopropanol, ethanol, freon TF (or equivalent).
2. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission International De L'Eclairage) eye-response curve.

4. LED Displays with Driver IC Built-In

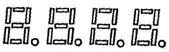
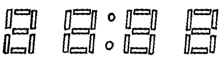
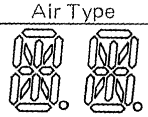
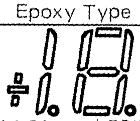
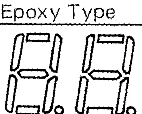
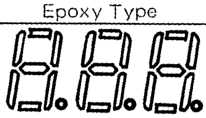
- SELECTION GUIDE
- PROGRAMMABLE DISPLAY (DISCONTINUED)
- LED DISPLAY WITH DRIVER IC BUILT-IN



• PROGRAMMABLE DISPLAY (DISCONTINUED)

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/**** V = 5.0V	PAGE NO.
 4.06mm (.16") Dual-In-Line .79"H x 1"W x .26"D Epoxy Type	LTM-2416	Red	Magnified Four Character	1250 μcd	4–2

• LED DISPLAY WITH DRIVER IC BUILT-IN

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @ I = 0.4mA	PAGE NO.
 7.62mm (.3") Single-In-Line .8"H x 1.6"W x .23"D Air Type	LTM- 8328 PKR-04 8328GKR-04	Bright Red Green	Four Digit, Rt. Hand Decimal With 2 Extra Output Bits	155 μcd 220 μcd	4–6
 7.62mm (.3") 0.7"H x 1.6"W x .23"D Air Type	LTM- 8631GMH 8631YMH	Green Yellow	Four Digit with Colon	220 μcd 270 μcd	4–12
 13.8mm (.54") Dual-In-Line .74"H x 1"W x .3"D Epoxy Type	LTM- 8647AR 8647AP 8647AG 8647AE 8647AHR	Red Bright Red Green Orange Hi-Eff Red	Dual Character, With 4 Extra Output Bits	400 μcd 650 μcd 1800 μcd 1800 μcd 1800 μcd	4–17
 14.22mm (.56") Dual-In-Line .75"H x 1"W x .32"D Epoxy Type	LTM- 8529R 8529P 8529G 8529Y 8529E 8529HR	Red Bright Red Green Yellow Orange Hi-Eff Red	1½ Digit, Rt. Hand Decimal With 8 Extra Output Bits	600 μcd 950 μcd 2400 μcd 2400 μcd 2400 μcd 2400 μcd	4–24
 14.22mm (.56") Dual-In-Line .75"H x 1"W x .32"D Epoxy Type	LTM- 8530R 8530P 8530G 8530Y 8530E 8530HR	Red Bright Red Green Yellow Orange Hi-Eff Red	Dual Digit, Rt. Hand Decimal With 8 Extra Output Bits	600 μcd 950 μcd 2400 μcd 2400 μcd 2400 μcd 2400 μcd	4–24
 14.22mm (.56") Dual-In-Line .75"H x 1.5"W x .32"D Epoxy Type	LTM- 8522R 8522P 8522G 8522Y 8522E 8522HR	Red Bright Red Green Yellow Orange Hi-Eff Red	Triple Digit, Rt Hand Decimal With 8 Extra Output Bits	600 μcd 950 μcd 2400 μcd 2400 μcd 2400 μcd 2400 μcd	4–24

LITEON

LTM-2416

ALPHANUMERIC PROGRAMABLE DISPLAY WITH MEMORY/DECODER/DRIVER

PROGRAMMABLE DISPLAY & LED DISPLAYS WITH DRIVER IC BUILT-IN

DISCONTINUED

FEATUERES:

- μP BUS COMPATIBLE.
- END STACKABLE.
- TTL COMPATIBLE.
- 64 CHARACTER ASCII FORMAT.
- ON BOARD MEMORY, DECODE, MIX, DRIVE.
- TOTALLY ENCAPSULATED PACKAGE.
- INDEPENDENT AND ASYNCHRONOUS DIGIT ACCESS.
- ULTRA-FAST ACCESS TIME-50 ns.
- PARALLEL ENTRY.
- MEMORY CLEAR FUNCTION.
- DISPLAY BLANK FUNCTION.

APPLICATIONS

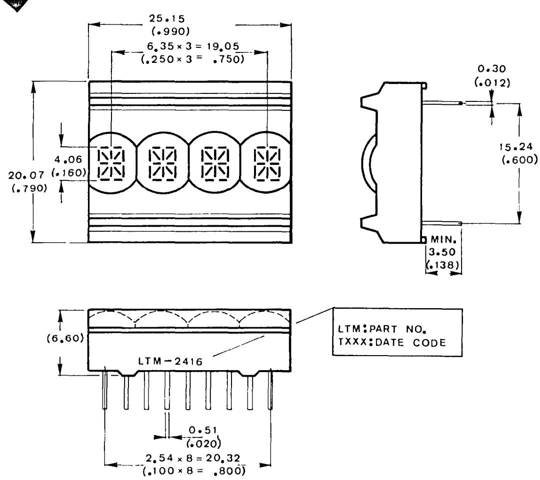
- HAND HELD TERMINALS.
- TELECOMMUNICATION.
- INSTRUMENTATIONS.
- MINICOMPUTERS.
- WORD PROCESSORS.

GENERAL DESCRIPTION

The IC chip monolithic LED intelligent disp[illegible] circuit is manufactured using stand[illegible] complem[illegible]ary MOS technology. The convention an[illegible] of [illegible] data entry procedure is designed to b[illegible] micropr[illegible]ssor bus and TTL compatible with no in[illegible]face ci[illegible]uitry required.

The intergrated circuit contai[illegible] memory, ASCII ROM decoder, multiplexing circuit[illegible] and [illegible]vers. The integrated circuit has me[illegible] to [illegible]r 7-bit ASCII Words coresponding t[illegible]he f[illegible] digits. An ASCII to alphanumeric ROM d[illegible]tiplexing and drive circuitry to drive [illegible] digits. [illegible]ta entry is asychronous and can be ra[illegible] internal memory can be written as[illegible]us[illegible]hrough the 7-bit data bus (D0-D6) in[illegible] the dig[illegible]ocation addressed by the 2-bit address bus [illegible]-A1). For multiple chip circuit, chip select input ca[illegible]decoded or a One-of-n decoder IC's can be used to extend the address for large displays. The cursor function causes all segments of a digit position to illuminate. The cursor is not a character, however, and upon removal the previously displayed character will reappear.

PA[illegible]KAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$, tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTIONS

PIN NO.	CONNECTIONS	PIN NO.	CONNECTIONS
1	$\overline{CE1}$ Chip Enable	10	Gnd
2	$\overline{CE2}$ Chip Enable	11	D0 Data Input
3	$\overline{CLR}$ Clear	12	D1 Data Input
4	CUE Cursor Enable	13	D2 Data Input
5	$\overline{CU}$ Cursor Select	14	D3 Data Input
6	$\overline{WR}$ Write	15	D[illegible] Data [illegible]put
7	A1 Address Input	16	[illegible] Data I[illegible]t
8	A0 Address Input	17	D4 [illegible]ta [illegible]put
9	VCC	18	[illegible]L Display Blank

DISCONTINUED

ABSOLUTE MAXIMUM RATING:

1. Voltage, Any pin respect to GND . . . . −0.3V to VCC + 0.3V
2. Operating Temperature range . . . . −20°C to +70°C
3. Storage temperature range . . . . −40°C to +85°C
4. Power dissipantion at 25°C . . . . 595 mw
5. Operating VCC range . . . . 4.5V to 5.5V
6. VCC max 7.0V
7. Solder temperature (soldering 10 sec) . . . . 260°C

OPTICAL/ELECTRICAL CHARACTERISTICS (T_A = 25°)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Vcc	Supply Voltage		4.5	5.0	5.5	V
Icc		(Vcc = 5.0) Allsegs. on		75		mA
Icc		(Vcc = 5.0) Eight seg./dig.		40	100	mA
Icc		(Vcc = 5.0) Display blank		0.6		mA
VIL	Input Voltage Low	(Vcc = 5.0)			0.8	V
VIH	Input Voltage [illegible]	(Vcc = 5.0)	2.0		Vcc	V
IIL	Input Current Max.	(Vcc = 5.0)		35	125	μA
tW	W[illegible] Pulse	Vcc = 5.0V	60			ns
tDS	Data [illegible]up Time	Vcc = 5.0V	50			ns
tDH	[illegible] Hold Time	Vcc = 5.0V	40			ns
tAS	Address Set-up Time	Vcc = 5.0V	70			ns
tAH	Address Hold Time	Vcc = 5.0V	40			ns
Segment Luminous Intensity		Vcc = 5.0V		1250		μcd
Intensity Matching. Within A Digit		Vcc = 5.0V		±33		%
Off-Axis Viewing Angle		Vcc = 5.0V		±50		degrees
Digit Size				160		mil
Spectral Peak Wavelength		Vcc = 5.0V		655		nm
Spectral Width Half Intensity		Vcc = 5.0V		40		nm

FUNCTIONAL DESCRIPTION

ENTRY INTO DATA MEMORY

To enter an ASCII code CE1 and CE2 inputs must be low, CU must be high. When the address is set up at A0 and A1, the WR can go low, at which time the internal RAM will respond to the data inputs (D0-D6). Note that the data need not be set up prior to the WR transition all digits can be cleared by holding the CLR input low for the specified interval.

ENTRY INTO CURSOR MEMORY

This is accomplished by setting the CE1 and CE2 inputs as well as the CU input low. The cursor memory consists of 4 bits corresponding to the four digits, each one addressable by way of the A0 and A1 inputs. Once the address is stable, the WR input must go low and the cursor memory will respond to the D0 input. That is, if D0 is high, a cursor will be written and if D0 is low, the cursor will be erased. CLR will not erase a cursor. A cursor will only be displayed when CUE is high and the cursor function can be bypassed by typing CUE low; flashing cursor can be inplemented by pulsing CUE, the results in alternately displaying the cursor and the character originally written in digit. CUE will not alter the contents of either the cursor or data memory.

BLANKING THE DISPLAY

Display blanking can be realized by using the BL input, by taking be low, the display will be disabled while leaving the contents of the data and cursor memory unchanged. A flashing display will occur if BL is pulsed. The display is blanked by BL regardless of whether a cursor of character is being displayed.

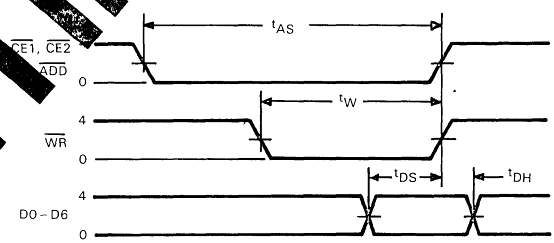
CLEARING THE DISPLAY

Pulsing the CLR pin low for the specified time will clear all internal data memories while leaving the cursor memories unchanged.
Timing characteristics write cycle waveforms.

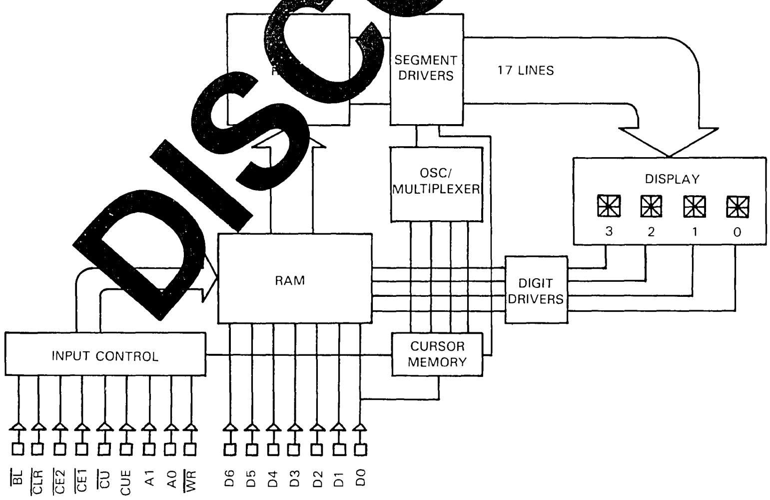
ILLEGAL CODE

If an illegal ASCII code is entered into the data memory [illegible] D6 = [illegible]5) the display will automatically be blanked [illegible] the corresponding digit.

TIMING DIAGRAM



INTERNAL BLOCK DIAGRAM



CHARACTER SET

				D0	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H
				D1	L	L	H	H	L	L	H	H	L	L	H	H	L	L	H	H
				D2	L	L	L	L	H	H	H	H	L	L	L	L	H	H	H	H
				D3	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H
	D6	D6	D4		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	L	H	L	2		!	"	#	$	%	&	'	(	)	*	[illegible]	[illegible]	—	.	/
	L	H	H	3	0	1	2	3	4	5	6	7	8	9	[illegible]	[illegible]	<	=	>	?
	H	L	L	4	@	A	B	C	D	E	F	G	[illegible]	[illegible]	[illegible]	K	L	M	N	O
	H	L	H	5	P	Q	R	S	T	U	V	[illegible]	[illegible]	Y	Z	[	\	]	^	—

DATE AND CURSOR ENTRY FUNCTION TABLE

FUNCTION	BL	CE1	CE2	CUE	CU	WR	CLR	A1	A0	D6	D5	D4	D3	D2	D1	D0	DIG 3	DIG 2	DIG 1	DIG 0
Write Date Memory	X	L	L	X	H	L	[illegible]	L	L	H	L	L	L	L	L	H	NC	NC	NC	A
								L	H	H	L	L	L	L	H	L	NC	NC	B	NC
								H	L	H	L	L	L	L	H	H	NC	C	NC	NC
								H	H	H	L	L	L	H	L	L	D	NC	NC	NC
Write Currsor	X	L	L	X	L	L		L	L	X	X	X	X	X	X	H	NC	NC	NC	⊠
								L	H	X	X	X	X	X	X	H	NC	NC	⊠	NC
								H	L	X	X	X	X	X	X	H	NC	⊠	NC	NC
								H	H	X	X	X	X	X	X	H	⊠	NC	NC	NC
Clear Cursor	X	L	[illegible]	X	[illegible]	L	X	L	L	X	X	X	X	X	X	L	NC	NC	NC	
								L	H	X	X	X	X	X	X	L	NC	NC		NC
								H	L	X	X	X	X	X	X	L	NC		NC	NC
								H	H	X	X	X	X	X	X	L		NC	NC	NC
CUE	H	X	X	L	X	X	H	Display previously written data									D	C	B	A
	H	X	X	H	X	X	H	Display previously written cursor									⊠	⊠	⊠	⊠
Clear	H	X	X	X	X	X	L	Clear data memory Cursor memory unchanged												
Blank	L	X	X	X	X	X	X	Blank display Data and cursor memories unchanged												

- "H" Logic high input
- "L" Logic low input.
- "X" Don't care
- NC· No change.
- ⊠ · cursor character (all segment on)

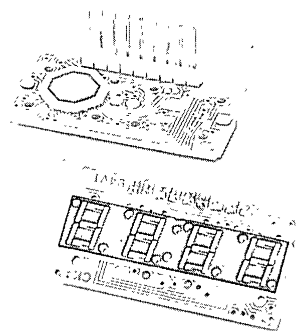
LITEON

LTM-8328XKR SERIES

0.3" FOUR DIGIT 7-SEGMENT NUMERIC DISPLAY WITH MOS IC DRIVER

FEATURES

- 0.3 INCH (7.62mm) DIGIT HEIGHT.
- FOUR-DIGIT, RIGHT HAND DECIMAL.
- WIDE SUPPLY VOLTAGE OPERATION.
- SERIAL DATA INPUT.
- CONSTANT CURRENT DRIVERS.
- CONTINUOUS BRIGHTNESS CONTROL
- OUTPUT AVAILABLE FOR TWO EXTERNAL LEDS.
- WIDE VIEWING ANGLE.
- CHOICE OF TWO BRIGHT COLORS – BRIGHT RED/GREEN
- TTL COMPATIBLE.



DESCRIPTION

The LTM-8328KR series are 0.3 inch (7.62mm) height numeric display modules, having a built-in M5450 MOS integrated circuits. The integrated circuit contains serial data input, 35 bit shift registers. 34 LED driver outputs and a brightness control. The bright red and green devices utilized LED chips which are made from GaP on a transparent GaP substrate. The MOS integrated circuits produced with N-channel silicon gate technology.
All the displays have black face with white diffused film.

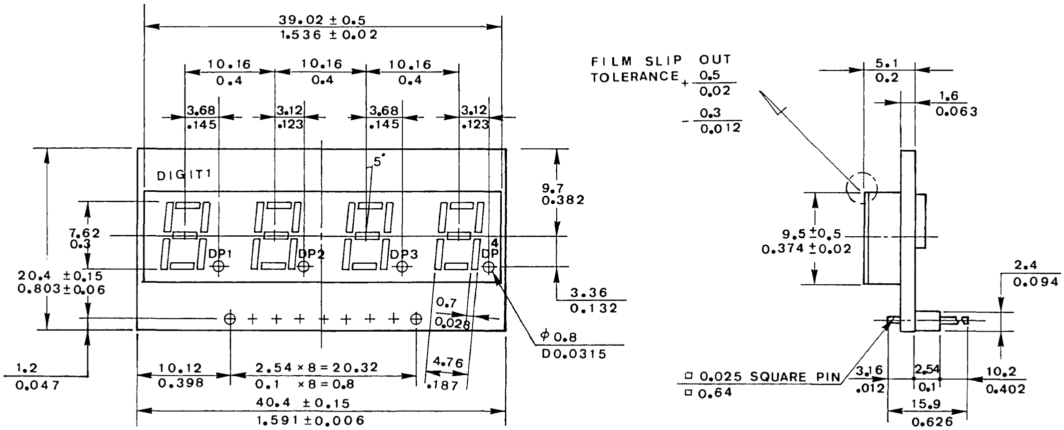
APPLICATIONS

- MICROPROCESSOR DISPLAY.
- DIGITAL CLOCK, THERMOMETER, COUNTER, VOLTMETER.
- INSTRUMENTATION READOUTS.

DEVICES

PART NO. LTM–		DESCRIPTION
BRIGHT RED	GREEN	
8328PKR-04	8328GKR-04	Four Digit R.H.D.P., With I.C. Driver

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$, tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

PIN NO.	DESCRIPTION
1	EXT LED 1
2	EXT LED 2
3	$\overline{\text{DATA ENABLE}}$
4	DATA SERIAL
5	CLOCK
6	VDD
7	DIMMER
8	GND
9	VLED

BLOCK DIAGRAM

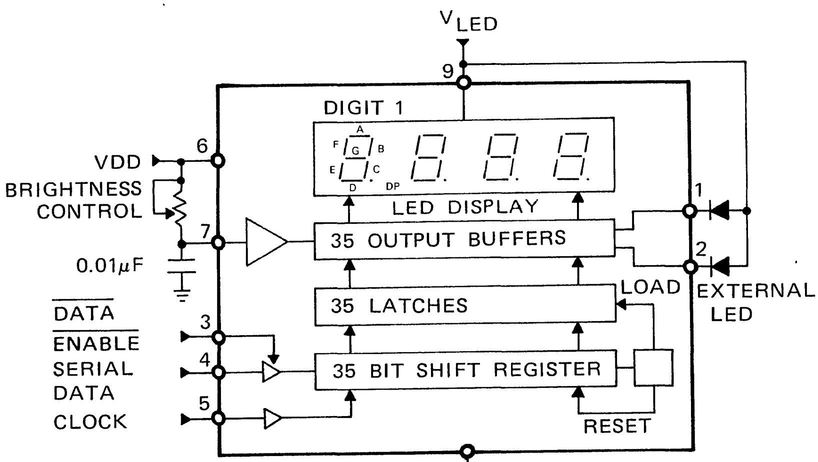


FIGURE1

ABSOLUTE MAXIMUM RATING AT $T_A = 25^\circ C$

PARAMETER	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage *1	V_{DD}	–0.3	15	V
Input Voltage	V_I	–0.3	15	V
Off State Output Voltage	Vo (off)		15	V
LED Supply Voltage	V_{LED}	2.8	3.5	V
Power Dissipation of IC *2	P_D (IC)		660	mW
Supply Current	I_{DD}		7	mA
Operating Temperature Range	Top	–20	+60	°C
Storage Temperature Range	Tstg	–20	+60	°C
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

NOTES: 1. All voltages are with respect to Vss (GND)
2. Power dissipation of IC is given by $P_D = (V_{LED} - V_F) \bullet (I_F) \bullet$ (No. of Segments) + (7mA) $\bullet V_{DD}$)
*V_F is LED forward voltage

RECOMMENDED OPERATING CONDITION AT $T_A = 25^\circ C$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Supply Voltage	V_{DD}	4.75		13.2	V	
Input Voltage						
Logical "0" Level		–0.3		0.8	V	±10μA Input Bias
Logical "1" Level	V_I	2.2		V_{DD}	V	$4.75V < V_{DD} < 5.25V$
Logical "1" Level		V_{DD} -2		V_{DD}	V	$V_{DD} > 5.25V$
Brightness Input Current	I_B	0		0.75	mA	
Brightness Input Voltage	V_B	3		4.3	V	Input Current = 750 μA
Off State Voltage	Vo (off)			13.2	V	
Output Sink Current						
Segment Off				10	μA	$I_B = 0$ μA
Segment On			3		mA	$I_B = 100$ μA
			6		mA	$I_B = 200$ μA
Input Clock Frequency	F_{CLOCK}	0		0.5	MHZ	
Output Matching	Io			±20	%	

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

LTM-8328PKR-04

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	120	250		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		697		nm	I_B = 0.4 mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2:1		I_B = 0.4 mA

LTM-8328GKR-04

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	400		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		565		nm	I_B = 0.4 mA
Spectral Line Half-Width	$\Delta\lambda$		30		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2:1		I_B = 0.4 mA

FUNCTIONAL DESCRIPTION

Serial data transfer from the data source to the display driver is accomplished with 2 signals serial data and clock. Using a format of a leading "1" followed by the 35 data bits allows data transfer without an additional load signal. The 35 data bits are latched after the 36th bit is complet, thus providing nonmultiplexed, direct drive to the display. Outputs change only if the serial data bits differ from the previous time.

Brightness of display is determined by control the output current of LED display. A InF capacitor should be connected to brightness control, Pin 7 to prevent possible oscillations. The output current is typically 25 times greater than the current into Pin 7 which is set by an external variable resistor. There is an internal limiting resistor of 400Ω nominal value.

Figure 1 shows the input data format. A start bit of logical "1" preceed the 35 bits of data. At the 36th clock, a LOAD signal is generated synchronously with the high state of the clock, which loads the 35 bits of the shift registers into the latches. At the low state of the clock a RESET signal is generaled which clears all the shift registers for the next set of data. The shift registers are static master-slave configuration. There is no clear for master portion of the first register, thus allowing continous operation.

There must be a complete set of 36 clocks or the shift registers won't clear. When power is first applied to the chip an internal power ON reset signal is generated which reset all registers and all latches. The START bit and first clock return the chip on its normal operation. Bit 1 is the first following the start bit and it will appear on the segment A of the digit 1. A logical "1" at the input will turn on the appropriate LED. Figure 2 shows the timing relationship between data, clock, and DATA ENABLE. A max. clock frequency of 0.5 MHz is assumed.

FIGURE 1 Input Data Format.

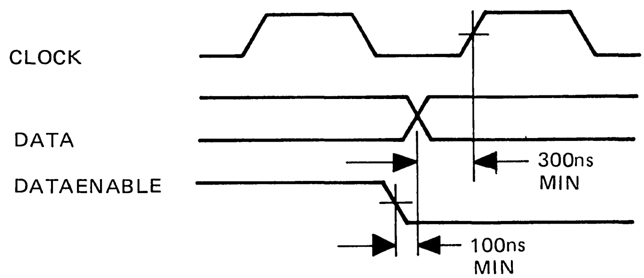
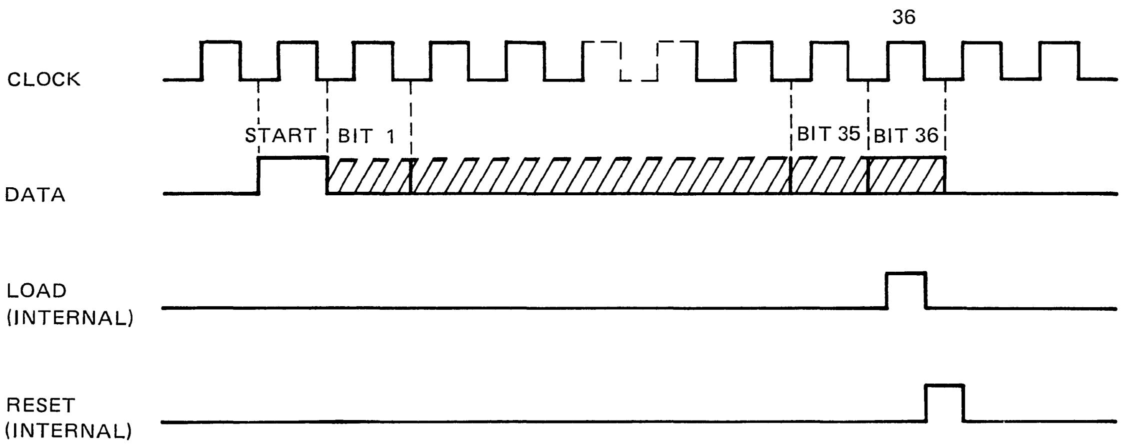
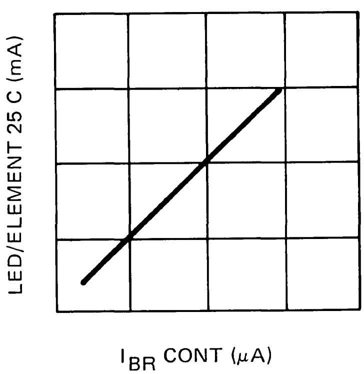


FIGURE 2 Timing Relationship.



Typical LED Element Current Vs Applied Brightness Control Current



LED Supply Voltage Range

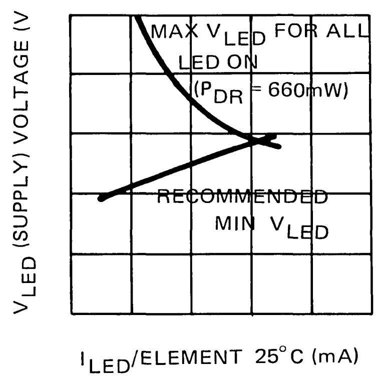


TABLE I SERIAL DATA INPUT SEQUENCE

BIT	DIGIT	SEGMENT	BIT	DIGIT	SEGMENT
1	1	A	18	3	B
2	1	B	19	3	C
3	1	C	20	3	D
4	1	D	21	3	E
5	1	E	22	3	F
6	1	F	23	3	G
7	1	G	24	3	DP
8	1	DP	25	4	A
9	2	A	26	4	B
10	2	B	27	4	C
11	2	C	28	4	D
12	2	D	29	4	E
13	2	E	30	4	E
14	2	F	31	4	G
15	2	G	32	4	DP
16	2	DP	33		LED 1
17	3	A	34		LED 2

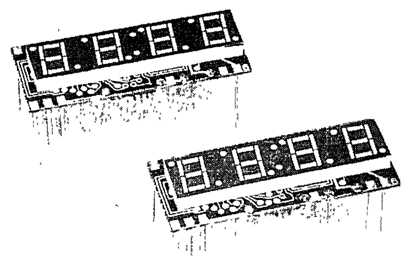
LITEON

LTM-8631XMH SERIES

0.3" FOUR DIGIT 7-SEGMENT NUMERIC DISPLAY WITH MOS IC DRIVER

FEATURES

- 0.3 INCH (7.62mm) DIGIT HEIGHT.
- FOUR-DIGIT WITH COLON.
- SUPPLY VOLTAGE 5V.
- SERIAL DATA INPUT.
- CURRENT GENERATOR OUTPUT FOR 5 EXTERNAL LEDS.
- DATA ENABLE.
- NO EXTERNAL CAPACITOR OR RESISTOR REQUIRED.
- CHOICE OF TWO COLORS – YELLOW/GREEN.
- TTL COMPATIBLE.



DESCRIPTION

The LTM-8631XMH series are 0.3 inch (7.62mm) height numeric display modules, having a built-in M5450 MOS integrated circuits. The integrated circuit contains serial data input, 35 bit shift registers. 34 LED driver outputs and a brightness control.
All the displays have black face with white diffused film.

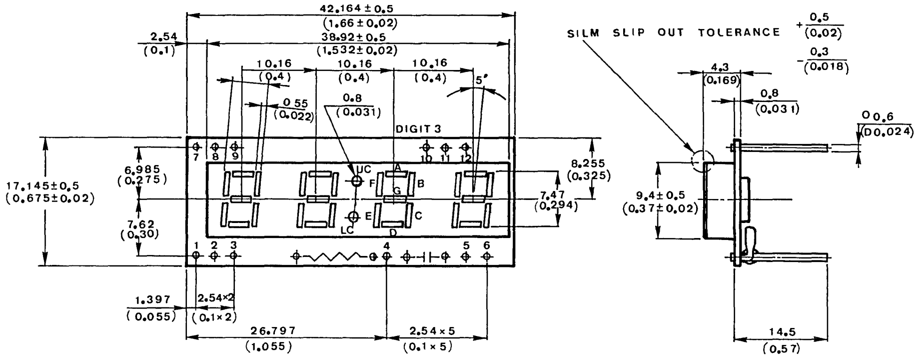
APPLICATIONS

- MICROPROCESSOR DISPLAY.
- DIGITAL CLOCK, THERMOMETER, COUNTER, VOLTMETER.
- INSTRUMENTATION READOUTS.
- DISPLAY FOR DIGITAL MEASURING INSTRUMENT.
- TV-, VIDEO- AND AUDIO-PANELS.

DEVICES

PART NO. LTM–		DESCRIPTION
YELLOW	GREEN	
8631 YMH	8631 GMH	Four Digit, Colon With I.C. Driver

PACKAGE DIMENSIONS

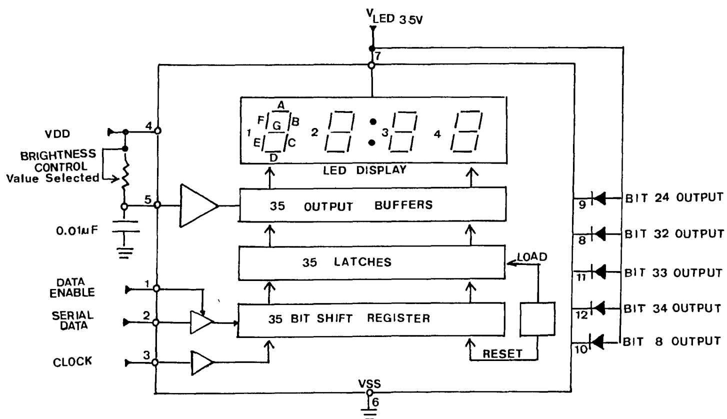


NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance is $\frac{\text{0.25 mm}}{\text{(0.010'')}}$ unless otherwise noted.

PIN CONNECTION

PIN NO.	DESCRIPTION
1	SERIAL DATA
2	CLOCK INPUT
3	V_{DD}
4	N.C.
5	GND
6	V_{LED}
7	DATA ENABLE
8	EXT. LED 2
9	EXT. LED 1
10	EXT. LED 3
11	EXT. LED 4
12	EXT. LED 5

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

V_{DD}	:	4.75V to 5.25V
V_{LED}	:	3.25V to 4.10V
Voltage at any other pin	:	–0.3V to 5.25V
Driver chip power dissipation	:	660mW max.
Operating temperature	:	–20°C to 70°C
Storage temperature	:	–20°C to 70°C
Lead temperature (Soldering: 5 sec. max.)	:	230°C

PROGRAMMABLE DISPLAY & LED DISPLAYS WITH DRIVER IC BUILT-IN

ELECTRICAL CHARACTERISTICS

V_{DD} = 5V ± 0.25V (if not otherwise specified)

SYMBOL	PARAMETER	CONDITIONS T = 25°C	MIN.	TYP.	MAX.	DIM.
I_{DD}	V_{DD} Supply Current, pin 3	V_{DD} = 5 25V			7.5	mA
I_{LED}	V_{LED} Supply Current, pin 6	V_{DD} = 5.25V, V_{LED} = 3.5V all segs & ext drives ON Ext drives loaded as per the circuit of Figure 1	180		300	mA
V_{IL}	Input Voltage "0" Level		–0.3		0.8	V
V_{I}	Input Voltage "1" Level		2.2		5.25	V
I_{L}	Input Leakage Current				10	μA
f_{C}	Input Clock Frequency				0.5	MHz
	Duty Cycle		40	50	60	%

OPTICAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS T = 25°C		MIN.	TYP.	MAX.	DIM.
I	Luminous Intensity per segment	V_{DD} = 4.75V, V_{LED} = 3.5V; (all segs & ext. drives ON)	O,G	0.3	0.5		mcd
			Y	0.16	0.3		mcd
	Intensity matching	V_{DD} = 5.0V, V_{LED} = 3.5V				± 40	%
λp	Wavelength of peak emission	V_{DD} = 5.0V, V_{LED} = 3.5V	O		630		nm
			Y		585		nm
			G		565		nm

Address
Address

FUNCTIONAL DESCRIPTION

The LTM-8631 series is specifically designed to operate with minimal interface with the data source. Serial data transfer from the data source to the display driver is accomplished with 2 signals, serial data and clock. Using a format of a leading "1" followed by the 35 data bits allows data transfer without an additional load signal. The 35 data bits are latched after the 36th bit is complete, thus providing non-multiplexed, direct drive to the display.

Outputs change only if the serial data bits differ from the previous time.

Figure 1 shows the timing relationship between DATA, CLOCK and DATA ENABLE and the input data format. The max. clock frequency is 0.5 MHz.

A start bit of logical "1" precedes the 35 bits of data. At the 36th clock a LOAD signal is generated synchronously with the high state of the clock, which loads the 35 bits of the shift registers into the latches.

At the low state of the clock a RESET signal is generated, which clears all the shift registers for the next set of data. The shift registers are static master-slave configurations. There is no clear for the master portion of the first shift register, thus allowing continuous operation.

There must be a complete set of 36 clocks or the shift registers will not clear!

When power is first applied to the chip an internal power ON reset signal is generated which resets all registers and all latches. The START bit and the first clock return the chip to its normal operation.

Bit 1 is the first bit following the start bit. A logical "1" at the input will turn on the appropriate LED.

FIGURE 1 Input Data Format.

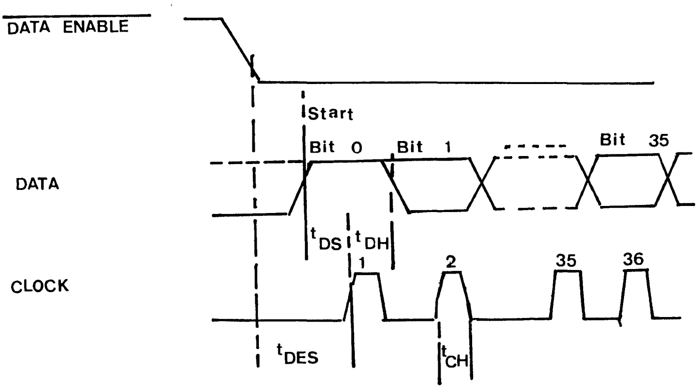


FIGURE 2 Timing Relationship.

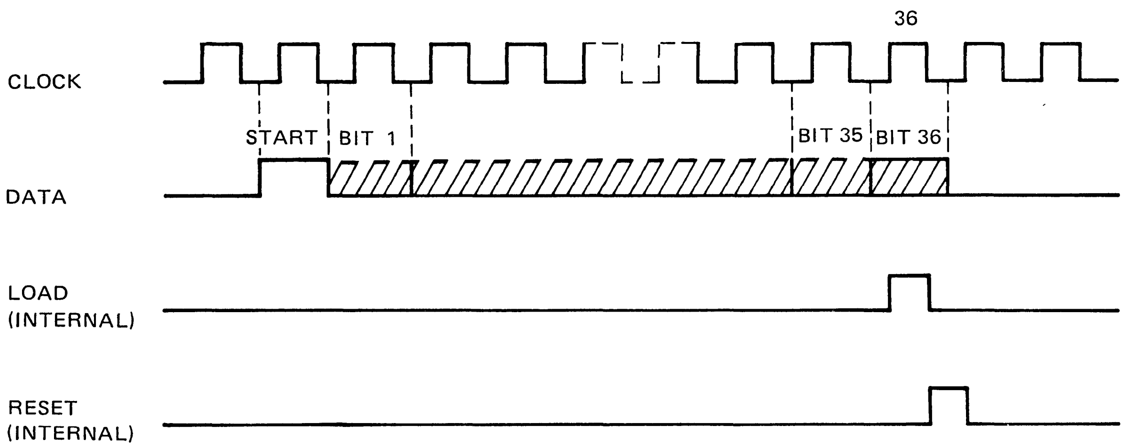


TABLE I SERIAL DATA INPUT SEQUENCE

BIT	DIGIT	SEGMENT	BIT	DIGIT	SEGMENT
1	1	A	18	3	B
2	1	B	19	3	C
3	1	C	20	3	D
4	1	D	21	3	E
5	1	E	22	3	F
6	1	F	23	3	G
7	1	G	24	EXT	LED 4
8	EXT	LED 3	25	4	A
9	2	A	26	4	B
10	2	B	27	4	C
11	2	C	28	4	D
12	2	D	29	4	E
13	2	E	30	4	E
14	2	F	31	4	G
15	2	G	32	EXT	LED 5
16	2	DP	33	EXT	LED 1
17	3	A	34	EXT	LED 2

PROGRAMMABLE DISPLAY & LED DISPLAYS WITH DRIVER IC BUILT-IN

AC CHARACTERISTICS

SYMBOL	PARAMETER	MIN	TYP	MAX	DIM	WAVEFORMS
t_{DE}	DATA ENABLE Set up time		400		ns	See Fig. 1
t_D	Set up time Data to clock	300			ns	
t_D	Hold time Data to clock	100			ns	
t_C	Clock — Hold time	400			ns	
f_C	Max. clock pulse frequency			500	KHz	

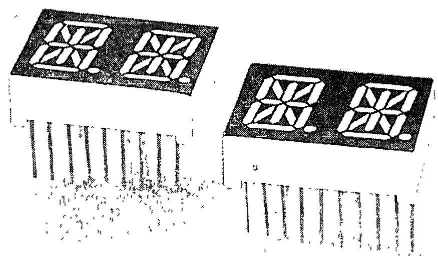
LITEON

LTM-8647A SERIES

0.54" 2-CHARACTER 14-SEGMENT ALPHANUMERIC DISPLAY WITH MOS I.C. DRIVER

FEATURES

- 0.54 INCH (13.8mm) DIGIT HEIGHT, 14-SEGMENT CHARACTER.
- WIDE SUPPLY VOLTAGE OPERATION.
- SERIES DATA INPUT.
- CONSTANT CURRENT DRIVERS.
- CONTINUOUS BRIGHTNESS CONTROL.
- SOLID STATE RELIABILITY, LONG OPERATION LIFE.
- WIDE VIEWING ANGLE.
- CHOICE OF FIVE BRIGHT COLORS-RED/BRIGHT RED/GREEN/ORANGE/HIGH EFFICIENCY RED.
- TTL COMPATIBLE.



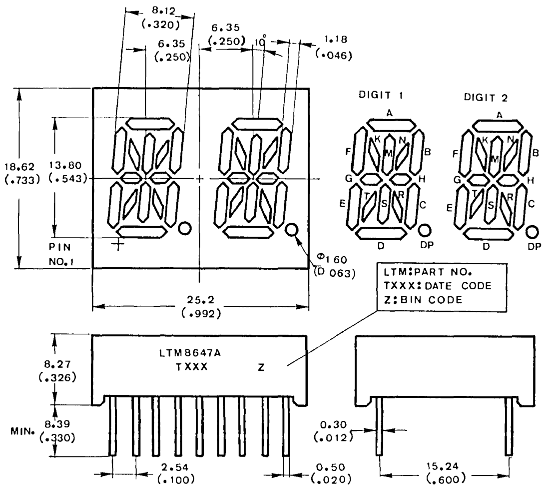
DESCRIPTION

The LTM-8647A series are dual character 14-segment alphanumeric display modules, having a built-in M5450 MOS integrated circuits. The integrated circuit contains series data input, 35 bit shift registers, 34 LED driver outputs and a brightness control. The red devices utilized LED chips which are made from GaAsP on a GaAs substrate. The bright red and green devices utilized LED chips which are made from GaP on a transparent GaP substrate. The orange and high efficiency red devices utilized LED chips which are made from GaAsP on a transparent GaP substrast. The MOS integrated circuits produced with N-channel silicon gate technology. Red and bright red displays have black face and red segment color. Green and orange displays have gray face and white segment color. High efficiency red displays have red face and red segment color.

DEVICES

PART NO. LTM–					DESCRIPTION
RED	BRIGHT RED	GREEN	ORANGE	HI.-EFF. RED	
8647AR	8647AP	8647AG	8647AE	8647AHR	Dual Character, with I.C. Driver

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are

1. Lead length (from seating plane): minimum valum $\frac{+1\ 00}{-0.000}$ mm $\left(\frac{+0.040''}{-0\ 000''}\right)$ 2 $\frac{\pm 0\ 25\text{mm}}{(0.010'')}$ unless otherwise noted

PACKAGE PIN CONNECTION

PIN NO.	CONNECTION	PIN NO.	CONNECTION
1	Bit 32 Output	10	No. Pin
2	Bit 33 Output	11	No Pin
3	Bit 34 Output	12	No. Pin
4	Data Input	13	Vss* 1
5	Clock Input	14	Vss* 1
6	Data Enable	15	No. Pin
7	VDD	16	No. Pin
8	V LED	17	Bit 31 Output
9	Brt Control	18	No. Pin

NOTE: Pin 13 & 14 are internally connected

PROGRAMMABLE DISPLAY & LED DISPLAYS WITH DRIVER IC BUILT-IN

ABSOLUTE MAXIMUM RATING AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage *1	V_{DD}	–0.3	15	V
Input Voltage	V_I	–0.3	15	V
Off State Output Voltage	V_O (off)		15	V
LED Supply Voltage	V_{LED}	2.8	3.5	V
Power Dissipation of IC *2	P_D (IC)		350	mW
Supply Current	I_{DD}		7	mA
operating Temperature Range	Top	–20	+60	°C
Storage Temperature Range	Tstg	–20	+60	°C
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

NOTES: 1. All voltages are with respect to V_{SS} (GND)

2. Power dissipation of IC is given by $P_D = (V_{LED} - V_F) \bullet (I_F) \bullet$ (No. of Segments) + (7mA) $\bullet V_{DD}$)

*V_F is LED forward voltage

RECOMMENDED OPERATING CONDITION AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Supply Voltage	V_{DD}	4.75		13.2	V	
Input Voltage						
Logical "0" Level		–0.3		0.8	V	±10μA Input Bias
Logical "1" Level	V_I	2.2		V_{DD}	V	4.75V < V < 5.25V
Logical "1" Level		V_{DD}-2		V_{DD}	V	V_{DD} > 5.25V
Brightness Input Current	I_B	0	0.75	mA		
Brightness Input Voltage	V_B	3		4.3	V	Input Current = 750μA
Off State Voltage	V_O (off)			13.2	V	
Output Sink Current						
Segment Off				10	μA	I_B = 0μA
Segment On			3		mA	I_B = 100μA
			6		mA	I_B = 200μA
Input Clock Frequency	F_{CLOCK}	0		0.5	MHZ	
Output Matching	Io			±20	%	

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

LTM-8647AR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	400		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		655		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		24		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2.1		I_B = 0.4 mA

PROGRAMMABLE DISPLAY & LED DISPLAYS WITH DRIVER IC BUILT-IN

LTM-8647AP

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	650		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		697		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		90		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2.1		I_B = 0.4 mA

LTM-8647AG

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	600	1800		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		565		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		30		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2.1		I_B = 0.4 mA

LTM-8647AE

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	600	1800		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		630		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		40		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2.1		I_B = 0.4 mA

LTM-8647AHR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	600	1800		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		635		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		40		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2:1		I_B = 0.4 mA

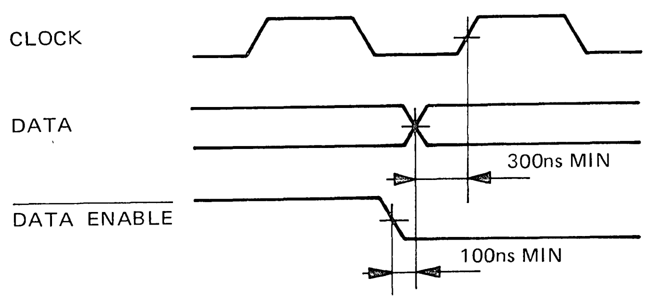
FUNCTIONAL DESCRIPTION

Serial data transfer from the data source to the display driver is accomplished with 2 signals serial data and clock. Using a format of a leading "1" followed by the 35 data bits allows data transfer without an additional load signal. The 35 data bits are latched after the 36th bit is complet, thus providing nonmultiplexed, direct drive to the display. Outputs change only if the serial data bits differ from the previous time.

Brightness of display is determined by control the output current of LED display. A InF capacitor should be connected to brightness control, Pin 9 to prevent possible oscillations. The output current is typically 25 times greater than the current into Pin 9 which is set by an external variable resistor. There is an internal limiting resistor of 400Ω nominal value.

Figure 1 shows the input data format. A start bit of logical "1" preceed the 35 bits of data. At the 36th clock, a LOAD signal is generated synchronously with the high state of the clock, which loads the 35 bits of the shift registers into the latches. At the low state of the clock a RESET signal is generaled which clears all the shift registers for the next set of data. The shift registers are static master-slave configuration. There is no clear for master portion of the first register, thus allowing continous operation.

There must be a complete set of 36 clocks or the shift registers won't clear. When power is first applied to the chip an internal power ON reset signal is generated which reset all registers and all latches. The START bit and first clock return the chip on its normal operation. Bit 1 is the first following the start bit and it will appear on the segment A of the digit 1. A logical "1" at the input will turn on the appropriate LED. Figure 2 shows the timing relationship between data, clock, and DATA ENABLE. A max. clock frequency of 0.5 MHz is assumed.



FIGURE/Input data format. FIG. 1 Input data format.

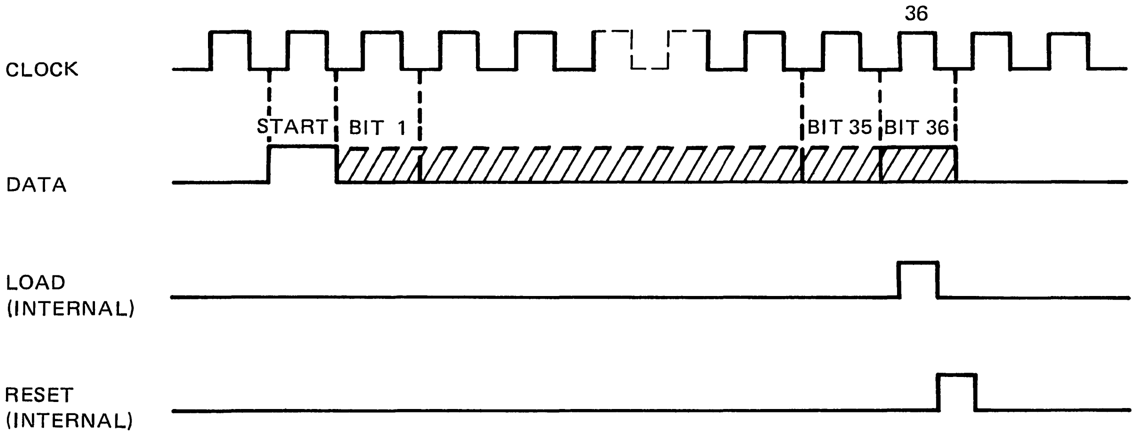


FIG. 2 Timing relationship

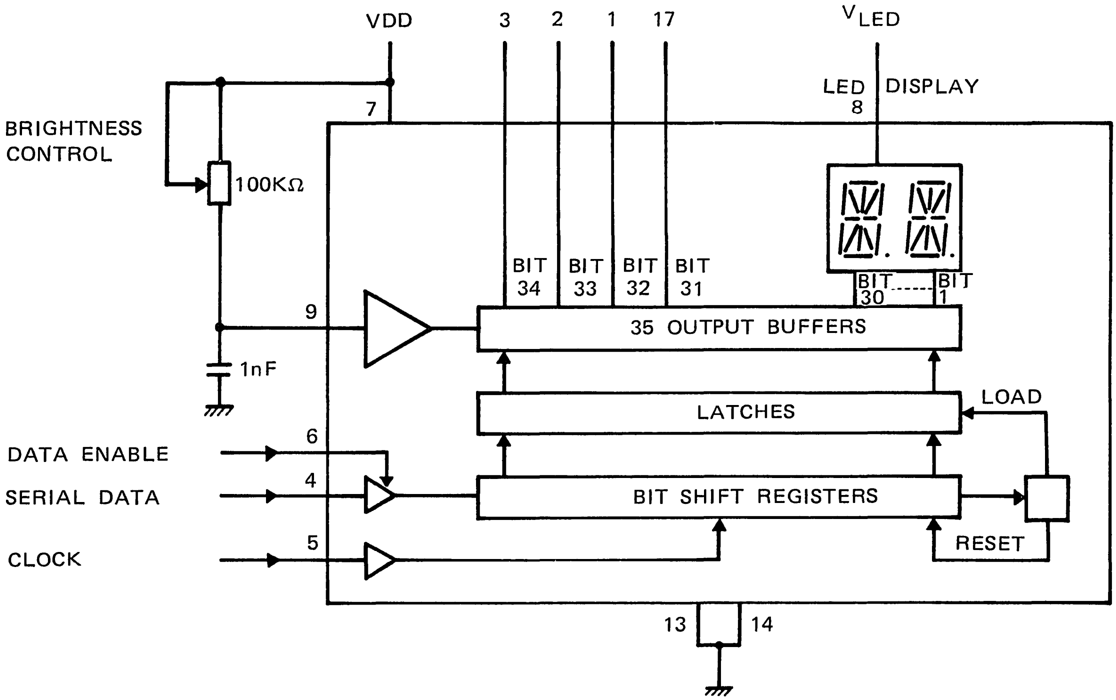


FIG. 3 Internal Block Diagram

TABLE I SERIAL DATA INPUT SEQUENCE

BIT	DIGIT	SEGMENT	BIT	DIGIT	SEGMENT
1	2	A	18	1	D
2	2	B	19	1	E
3	2	C	20	1	F
4	2	D	21	1	G
5	2	E	22	1	H
6	2	F	23	1	K
7	2	G	24	1	M
8	2	H	25	1	N
9	2	K	26	1	R
10	2	M	27	1	S
11	2	N	28	1	T
12	2	R	29	1	DP
13	2	S	30	2	DP
14	2	T	31		PIN 17
15	1	A	32		PIN 1
16	1	B	33		PIN 2
17	1	C	34		PIN 3

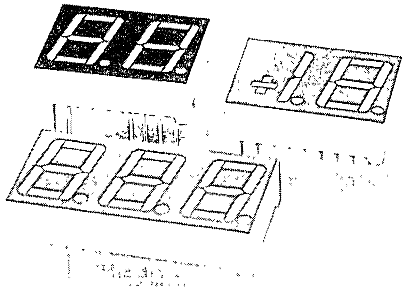
LITEON

LTM- 8522 / 8529 / 8530 SERIES

0.56 INCH 7-SEGMENT NUMERIC DISPLAY WITH MOS I.C. DRIVER

FEATURES

- 0.56 INCH (14.22mm) DIGIT HEIGHT.
- WIDE SUPPLY VOLTAGE OPERATION.
- SERIAL DATA INPUT.
- CONSTANT CURRENT DRIVERS.
- CONTINUOUS BRIGHTNESS CONTROL.
- SOLID STATE RELIABILITY-LONG OPERATION LIFE.
- WIDE VIEWING ANGLE.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED / GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.



DESCRIPTION

The LTM-8522/8529/8530 series are 0.56 inch (14.22mm) height numeric display modules, and a built-in M5450 MOS integrated circuits. The integrated circuit contains series data input, 35 bit shift register, 34 LED driver output and brightness control.

The red devices utilized LED chips which are made from GaAsP on a GaAs substrate. The bright red and green devices utilized LED chips which are made from GaP on a transparent GaP substrate. The orange and high efficiency red devices utilized LED chips which are made from GaAsP on a transparent GaP substarate. The MOS integrated circuits produced with N-channel silicon gate technology.

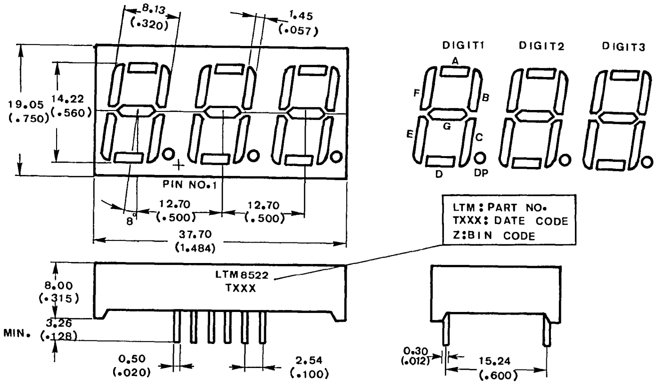
Red and bright red displays have black face and red segment color. Green and yellow displays have gray face and white segment color. Orange displays have orange face and orange segment color. High efficiency red displays have red face and red segment color.

DEVICES

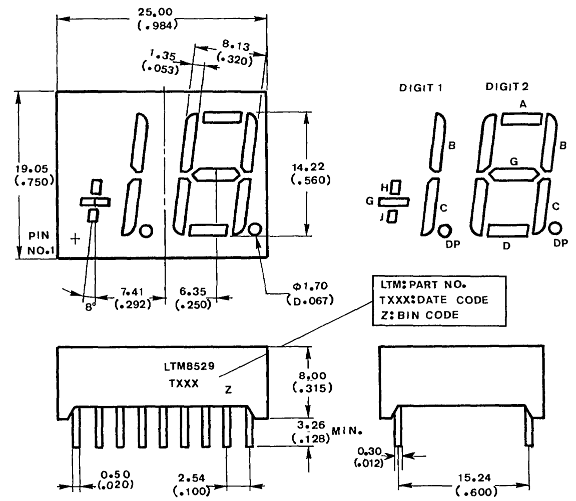
PART NO. LTM–						DESCRIPTION	PACKAGE DIMEN-SION
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED		
8522R	8522P	8522G	8522Y	8522E	8522HR	3 Digit, Rt. Hand Decimal	A
8529R	8529P	8529G	8529Y	8529E	8529HR	1½ Digit, Rt. Hand Decimal	B
8530R	8530P	8530G	8530Y	8530E	8530HR	2 Digit, Rt. Hand Decimal	C

PACKAGE DIMENSIONS

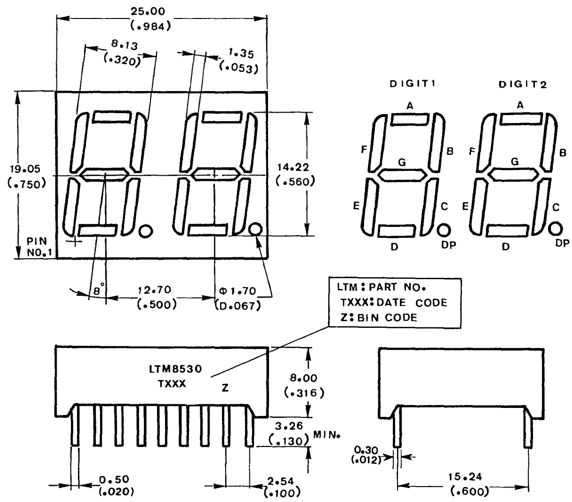
A. LTM-8522



B. LTM-8529



C. LTM-8530



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ toleranceare:

1. Lead length (from seating plane): minimum value $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

PIN NO.	CONNECTION		
	LTM-8522	LTM-8529	LTM-8530
1	Vss	Vss	Vss
2	VLED	VLED	VLED
3	VLED	NO PIN	NO PIN
4	Bit 25 Output	NO PIN	NO PIN
5	Bit 25 Output	NO PIN	NO PIN
6	Bit 27 Output	Bit 15 Output	Bit 17 Output
7	Bit 28 Output	Bit 16 Output	Bit 18 Output
8	Bit 29 Output	Bit 17 Output	Bit 19 Output
9	Bit 30 Output	Bit 18 Output	Bit 20 Output
10	Bit 31 Output	Bit 19 Output	Bit 21 Output
11	Bit 32 Output	Bit 20 Output	Bit 22 Output
12	Bit 33 Output	Bit 21 Output	Bit 23 Output
13	Bit 34 Output	Bit 22 Output	Bit 24 Output
14	Data Enable	Data Enable	Data Enable
15	Data Input	Data Input	Data Input
16	Clock Input	Clock Input	Clock Input
17	VDD	VDD	VDD
18	BRT. Control	BRT. Control	BRT. Control

ABSOLUTE MAXIMUM RATING AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage *1	V_{DD}	–0.3	15	V
Input Voltage	VI	–0.3	15	V
Off State Output Voltage	Vo (off)		15	V
LED Supply Voltage	V_{LED}	2.8	3.5	V
Power Dissipation of IC *2	PD (IC)		350	mW
Supply Current	I_{DD}		7	mA
Operating Temperature Range	Top	–20	+60	°C
Storage Temperature Range	Tstg	–20	+60	°C
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

NOTES: 1. All voltages are with respect to Vss (GND)
2. Power dissipation of IC is given by $P_D = (V_{LED} - V_F) \bullet (I_F) \bullet$ (No. of Segment + (7mA) V_{DD})
*VF is LED forward voltage.

RECOMMENDED OPERATING CONDITION AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Supply Voltage	V_{DD}	4.75		13.2	V	
Input Voltage						
Logical "0" Level	V_I	–0.3		0.8	V	± 10µA Input Bias
Logical "1" Level	V_I	2.2		V_{DD}	V	$4.75V < V_{DD} < 5.25V$
Logical "1" Level	V_I	V_{DD} -2		V_{DD}	V	$V_{DD} > 5.25V$
Brightness Input Current	I_B	0		0.75	mA	
Brightness Input Voltage	V_B	3		4.3	V	Input Current = 750µA
Off State Voltage	Vo (off)			13.2	V	
Output Sink Current						
Segment Off				10	µA	$I_B = 0$ µA
Segment On			3		mA	$I_B = 100$ µA
			6		mA	$I_B = 200$ µA
Input Clock Frequency	FICLOCK	0		0.5	MHZ	
Output Matching	Io			±20	%	

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

LTM-8522R/8529R/8530R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	500		µcd	$I_B = 0.4$mA
Peak Emission Wavelength	λp		655		nm	$I_B = 0.4$ mA
Spectral Line Half-Width	$\Delta\lambda$		24		nm	$I_B = 0.4$ mA
Luminous Intensity Matching Ratio	Iv-m			2:1		$I_B = 0.4$ mA

LTM-8522P/8529P/8530P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	700		µcd	$I_B = 0.4$mA
Peak Emission Wavelength	λp		700		nm	$I_B = 0.4$ mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	$I_B = 0.4$ mA
Luminous Intensity Matching Ratio	Iv-m			2:1		$I_B = 0.4$ mA

LTM-8522G/8529G/8530G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		565		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		30		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2:1		I_B = 0.4 mA

LTM-8522Y/8529Y/8530Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	700	1700		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		585		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		35		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2:1		I_B = 0.4 mA

LTM-8522E/8529E/8530E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		630		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		40		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2:1		I_B = 0.4 mA

LTM-8522HR/8529HR/8530HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_B = 0.4 mA
Peak Emission Wavelength	λp		635		nm	I_B = 0.4 mA
Spectral Line Half-Width	Δλ		40		nm	I_B = 0.4 mA
Luminous Intensity Matching Ratio	Iv-m			2:1		I_B = 0.4 mA

FUNCTION DESCRIPTION

Series data transfer from the data source to the display driver is accomplished with 2 signals serial data and clock. Using a format of a leading "1" following by the 35 data bits allows data transfer without an additional load signal. The 35 data bits are latched after the 36th bit is complet, thus providing nonmultiplexed, direct drive to the display. Outputs change only if the serial data bits differ from the previous time.

Brightness of display is determined by control the output current of LED display. A InF capacitor shouled be connected to brightness control, Pin 18 to prevent possible oscillations. The output current is typically 25 times greater than the current into Pin 18 which is set by an external variable resistor. There is an internal limiting resistor of 400Ω nominal value. Figure 2 shows the input data format. A start bit of logical "1" preceed the 35 bits of data. At the 36th clock, a LOAD signal is generated synchronously with the high state of the clock, which loads the 35 bits of the shift registers into the latches. At the low state of the clock a RESET signal is generaled which clears all the shift registers for the next set of data. The shift registers are static master-slave configuration. There is no clear for master portion of the first register, thus allowing contionous operation.

There must be a complete set of 36 clocks or the shift registers won't clear. When power is first applied to the chip an internal power ON reset signal is generated which reset all registers and all latches. The START bit and first clock return the chip on its normal operation. Bit 1 is the first following the start bit and it will appear on the segment A of the digit 1. A logical "1" at the input will turn on the appropriate LED. Figure 3 shows the timing relationship between data, clock, and DATA ENABLE. A max. clock frequency of 0.5 MHz is assumed.

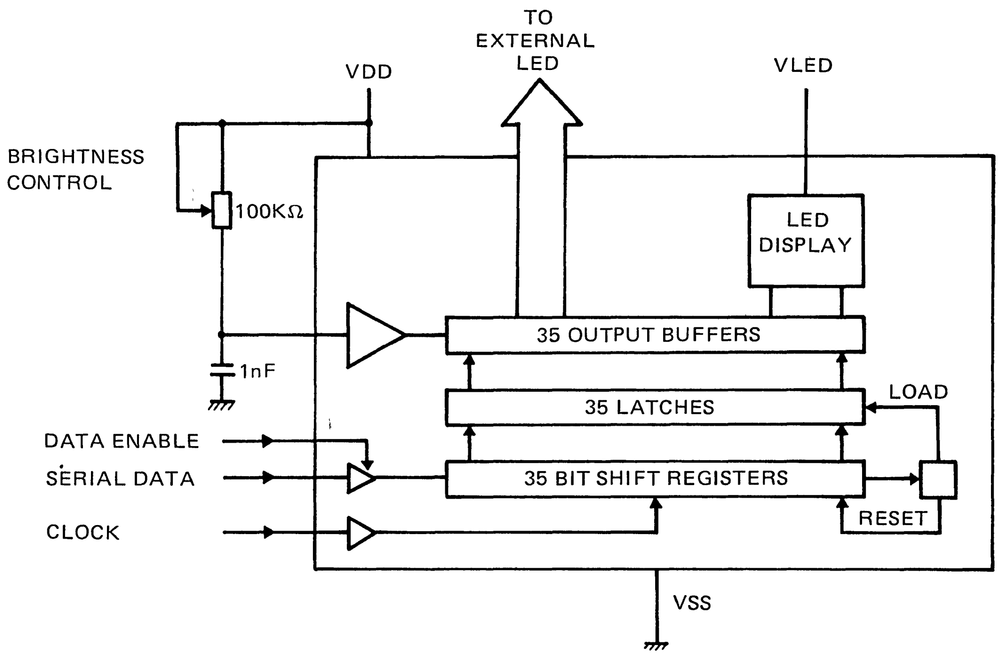


FIGURE 1. Internal Block Diagram

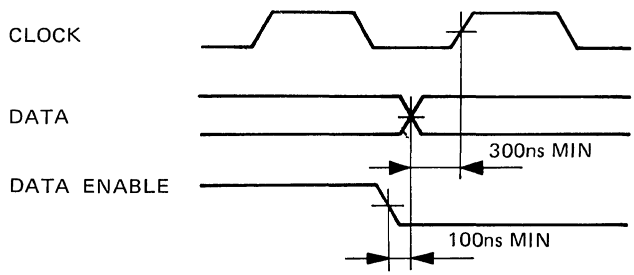


FIGURE 2. Input Data Format

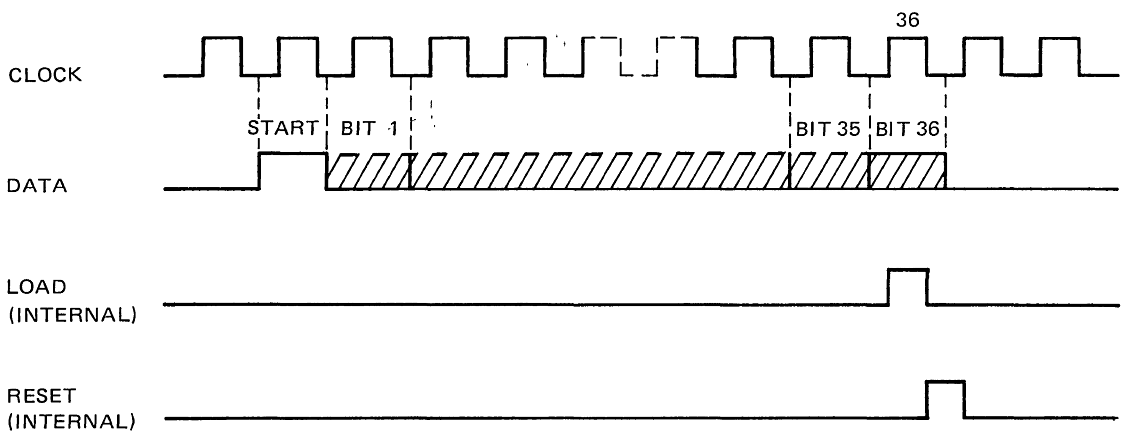


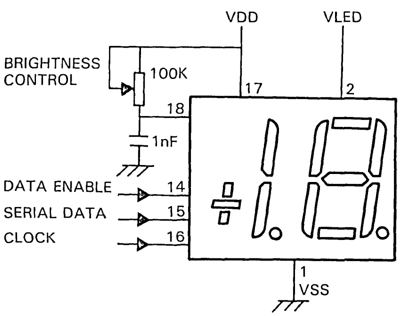
FIGURE 3. Timing Relationships

TABLE I SERIAL DAT INPUT SEQUENCE

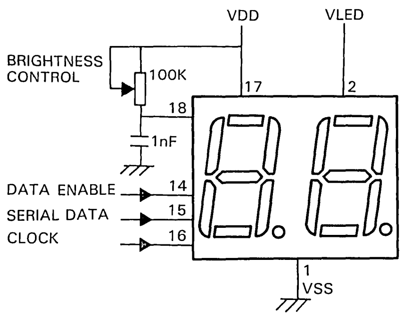
BIT	LTM-8522		LTM-8529		LTM-8530	
	DIGIT	SEGMENT	DIGIT	SEGMENT	DIGIT	SEGMENT
1	1	A	1	B	1	A
2	1	B	1	C	1	B
3	1	C	1	G	1	C
4	1	D	1	H	1	D
5	1	E	1	J	1	E
6	1	F	1	D.P.	1	F
7	1	G	2	A	1	G
8	1	D.P.	2	B	1	D.P.
9	2	A	2	C	2	A
10	2	B	2	D	2	B
11	2	C	2	E	2	C
12	2	D	2	F	2	D
13	2	E	2	G	2	E
14	2	F	2	D.P.	2	F
15	2	G		PIN 6	2	G
16	2	D.P.		PIN 7	2	D.P.
17	3	A		PIN 8		PIN 6
18	3	B		PIN 9		PIN 7
19	3	C		PIN 10		PIN 8
20	3	D		PIN 11		PIN 9
21	3	E		PIN 12		PIN 10
22	3	F		PIN 13		PIN 11
23	3	G		NO CONNECTION		PIN 12
24	3	D.P.		NO CONNECTION		PIN 13
25		PIN 4		NO CONNECTION		NO CONNECTION
26		PIN 5		NO CONNECTION		NO CONNECTION
27		PIN 6		NO CONNECTION		NO CONNECTION
28		PIN 7		NO CONNECTION		NO CONNECTION
29		PIN 8		NO CONNECTION		NO CONNECTION
30		PIN 9		NO CONNECTION		NO CONNECTION
31		PIN 10		NO CONNECTION		NO CONNECTION
32		PIN 11		NO CONNECTION		NO CONNECTION
33		PIN 12		NO CONNECTION		NO CONNECTION
34		PIN 13		NO CONNECTION		NO CONNECTION

TYPICAL APPLICATION

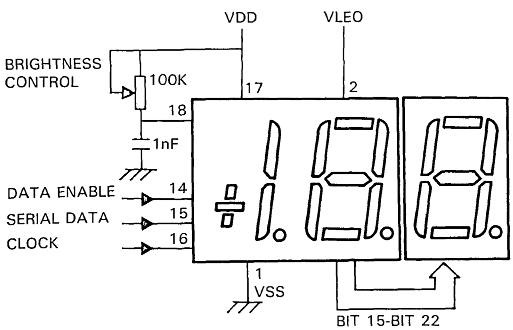
A. 1½ DIGIT DISPLAY



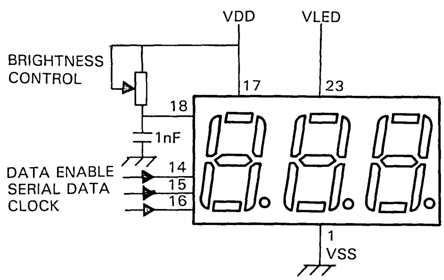
B. 2 DIGIT DISPLAY



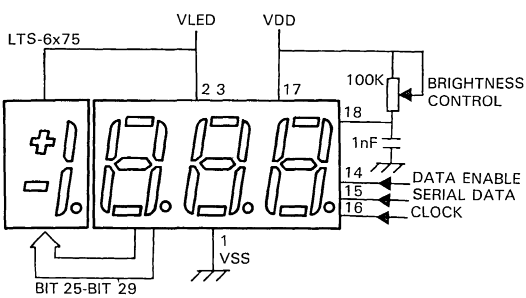
C. 2½ DIGIT DISPLAY



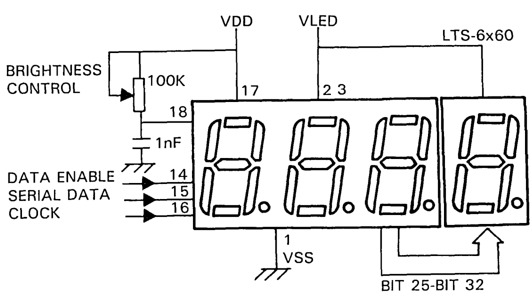
D. 3 DIGIT DISPLAY



E. 3½ DIGIT DISPLAY



F. 4 DIGIT DISPLAY



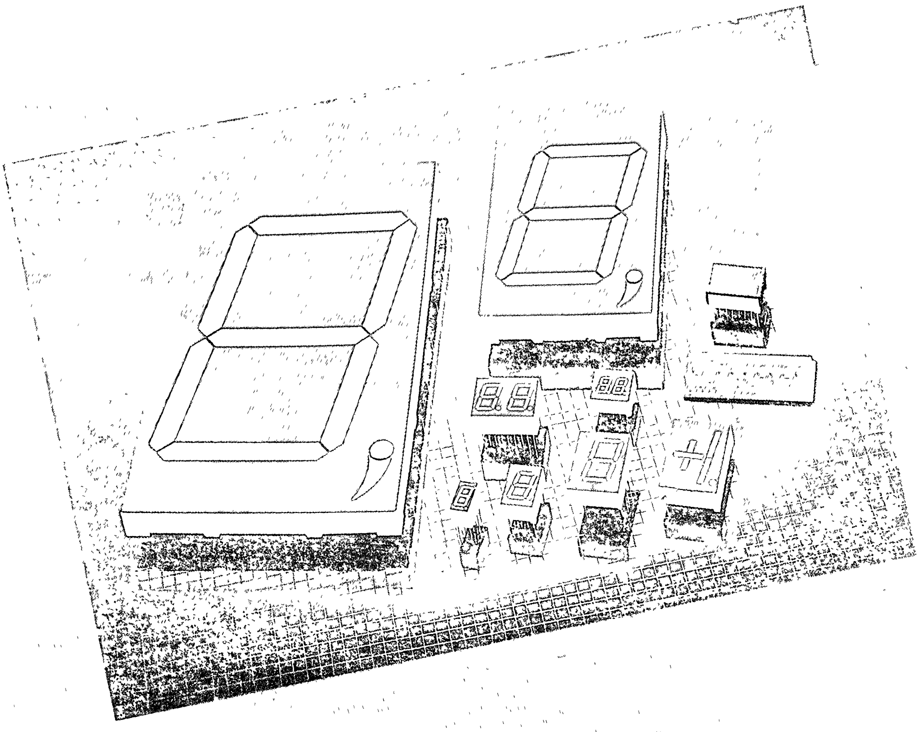
PROGRAMMABLE DISPLAY & LED DISPLAYS WITH DRIVER IC BUILT-IN

NOTES 1 Clean only in water, isopropanol, ethanol, freon TF (or equivalent).

2 Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission International De L'Eclairage) eye-response curve

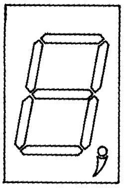
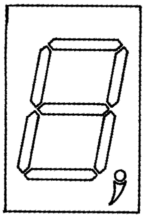
5. Seven-Segment LED Displays & Alphanumeric Displays

- SELECTION GUIDE
- CROSS REFERENCE GUIDE
- SINGLE COLOR ULTRALARGE SEVEN-SEGMENT LED DISPLAYS
- MULTICOLOR ULTRALARGE SEVEN-SEGMENT LED DISPLAYS
- SINGLE COLOR SINGLE DIGIT NUMERIC DISPLAYS
- MULTICOLOR SINGLE DIGIT NUMERIC DISPLAYS
- DUAL DIGIT NUMERIC DISPLAYS
- THREE-DIGIT NUMERIC DISPLAYS
- FOUR-DIGIT NUMERIC DISPLAYS
- ALPHANUMERIC DISPLAYS SELECTION GUIDE
- MULTIDIGIT LED DISPLAYS

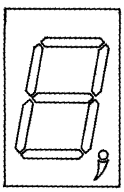
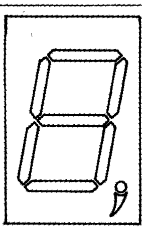


SELECTION GUIDE

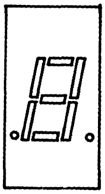
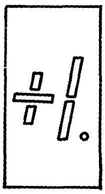
• SINGLE COLOR ULTRALARGE SEVEN-SEGMENT LED DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG.	PAGE NO.
 76.2mm (3.0") Dual-In-Line 4.3"Hx2.8"Wx.51"D	LTS- 30301G 30301HRB	Green Hi-Eff. Red	Comma Anode Rt. Hand Decimal & Comma	@ IF = 20mA 30 mcd 30 mcd	5-20
	30801G 30801HRB	Green Hi.-Eff. Red	Common Cathode Rt. Hand Decimal & Comma	30 mcd 30 mcd	
 127.0mm (5.0") Dual-In-Line 7.1"Hx4.3"Wx.51"D	LTS- 50301G 50301HRB	Green Hi.-Eff. Red	Common Anode Rt. Hand Decimal & Comma	@ IF = 30mA 60 mcd 60 mcd	5-27
	50801G 50801HRB	Green Hi.-Eff. Red	Common Cathode Rt. Hand Decimal & Comma	60 mcd 60 mcd	

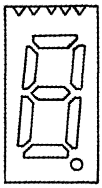
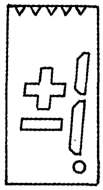
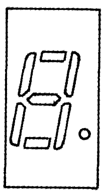
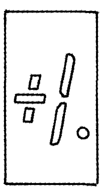
• MULTICOLOR ULTRALARGE SEVEN SEGMENT LED DISPLAYS

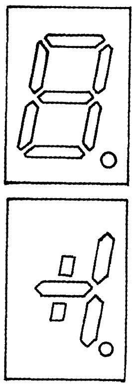
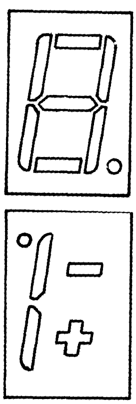
PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG.	PAGE NO.
 76.2mm (3.0") Dual-In-Line 4.3"Hx2.8"Wx.51"D	LTS- 30302A	Green & Orange	Common Anode Rt. Hand Decimal & Comma	@ IF = 10mA 15 mcd	5-20
	30802A	Green & Orange	Common Cathode Rt. Hand Decimal & Comma	15 mcd	
 127.0mm (5.0") Dual-In-Line 7.1"Hx4.3"Wx.51"D	LTS- 50302A	Green & Orange	Common Anode Rt. Hand Decimal & Comma	@ IF = 20mA 40 mcd	5-27
	50802A	Green & Orange	Common Cathode Rt. Hand Decimal & Comma	40 mcd	

SINGLE COLOR SINGLE DIGIT NUMERIC DISPLAYS

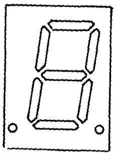
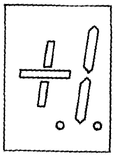
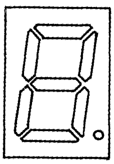
PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @ I_F = 10mA	PAGE NO.
	LTS-				
	311AR	Red	Universal, ± 1 Overflow	500 µcd	5-34
	311AP	Bright Red		750 µcd	
	311AG	Green		2000 µcd	
	311AY	Yellow		2000 µcd	
	311AE	Orange		2000 µcd	
	311AHR	Hi. -Eff. Red		2000 µcd	
	312AR	Red	Common Anode, Rt. & Lt. Hand Decimal	500 µcd	5-34
	312AP	Bright Red		750 µcd	
	312AG	Green		2000 µcd	
	312AY	Yellow		2000 µcd	
	312AE	Orange		2000 µcd	
	312AHR	Hi -Eff. Red		2000 µcd	
	313AR	Red	Common Cathode, Rt Hand, Decimal	500 µcd	5-34
	313AP	Bright Red		750 µcd	
	313AG	Green		2000 µcd	
	313AY	Yellow		2000 µcd	
	313AE	Orange		2000 µcd	
	313AHR	Hi. -Eff. Red		2000 µcd	
	315AR	Red	Common Cathode, Rt. Hand Decimal	500 µcd	5-34
	315AP	Bright Red		750 µcd	
	315AG	Green		2000 µcd	
	315AY	Yellow		2000 µcd	
	315AE	Orange		2000 µcd	
	315AHR	Hi. -Eff. Red		2000 µcd	
7.62mm (3") Dual-In-Line 74"H x 39"W x 2"D	316AR	Red	Common Anode ± 1 Overflow	500 µcd	5-34
	316AP	Bright Red		750 µcd	
	316AG	Green		2000 µcd	
	316AY	Yellow		2000 µcd	
	316AE	Orange		2000 µcd	
	316AHR	Hi -Eff. Red		2000 µcd	

SELECTION GUIDE

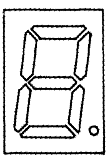
PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @ IF = 10mA	PAGE NO.
	LTS-				
	360R	Red	Common Anode, Rt. Hand Decimal	500 µcd	5-43
	360P	Bright Red		750 µcd	
	360G	Green		2000 µcd	
	360E	Orange		2000 µcd	
	360HR	Hi.-Eff. Red		2000 µcd	
	367R	Red	Common Cathode, Rt. Hand Decimal	500 µcd	
	367P	Bright Red		750 µcd	
	367G	Green		2000 µcd	
	367E	Orange		2000 µcd	
	367HR	Hi.-Eff. Red		2000 µcd	
9.20mm (.36") Dual-In-Line .56"Hx.26"Wx.34"D	368R	Red	Common Cathode, ± 1 Overflow	500 µcd	
	368P	Bright Red		750 µcd	
	368G	Green		2000 µcd	
	368E	Orange		2000 µcd	
	368HR	Hi.-Eff. Red		2000 µcd	
	LTS-				
	4705AR	Red	Universal, ± 1 Overflow	550 µcd	5-51
	4705AP	Bright Red		850 µcd	
	4505AG	Green		2200 µcd	
	4805AY	Yellow		2200 µcd	
	4605AE	Orange		2200 µcd	
	4905AHR	Hi.-Eff. Red		2200 µcd	
	4710AR	Red	Common Anode, Rt. Hand Decimal	550 µcd	
	4710AP	Bright Red		850 µcd	
	4510AG	Green		2200 µcd	
	4810AY	Yellow		2200 µcd	
	4610AE	Orange		2200 µcd	
	4910AHR	Hi.-Eff. Red		2200 µcd	
	4730AR	Red	Common Anode, ± 1 Overflow	550 µcd	
	4730AP	Bright Red		850 µcd	
	4530AG	Green		2200 µcd	
	4830AY	Yellow		2200 µcd	
	4630AE	Orange		2200 µcd	
	4930AHR	Hi.-Eff. Red		2200 µcd	
	4740AR	Red	Common Cathode, Rt. Hand Decimal	550 µcd	
	4740AP	Bright Red		850 µcd	
	4540AG	Green		2200 µcd	
	4840AY	Yellow		2200 µcd	
	4640AE	Orange		2200 µcd	
	4940AHR	Hi.-Eff. Red		2200 µcd	
10.16mm (.4") Dual-In-Line 74"H x .39"W x .2"D	4780AR	Red	Common Cathode, Rt. Hand Decimal	550 µcd	
	4780AP	Bright Red		850 µcd	
	4580AG	Green		2200 µcd	
	4880AY	Yellow		2200 µcd	
	4680AE	Orange		2200 µcd	
	4980AHR	Hi.-Eff. Red		2200 µcd	

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @ I_F = 10 mA	PAGE NO.
	LTS-				5-60
	546AR	Red	Common Anode, Rt Hand Decimal	500 μcd	
	546AP	Bright Red		750 μcd	
	546AG	Green		2000 μcd	
	546AY	Yellow		2000 μcd	
	546AE	Orange		2000 μcd	
	546AHR	Hi -Eff. Red		2000 μcd	
	547AR	Red	Common Cathode, Rt Hand Decimal	500 μcd	
	547AP	Bright Red		750 μcd	
	547AG	Green		2000 μcd	
	547AY	Yellow		2000 μcd	
	547AE	Orange		2000 μcd	
	547AHR	Hi -Eff. Red		2000 μcd	
	548AR	Red	Common Anode, ±1 Overflow	500 μcd	
	548AP	Bright Red		750 μcd	
	548AG	Green		2000 μcd	
	548AY	Yellow		2000 μcd	
	548AE	Orange		2000 μcd	
	548AHR	Hi -Eff Red		2000 μcd	
13.2mm (.52") Dual-In-Line 7"H x .49"W x .28"D	549AR	Red	Common Cathode, ±1 Overflow.	500 μcd	
	549AP	Bright Red		750 μcd	
	549AG	Green		2000 μcd	
	549AY	Yellow		2000 μcd	
	549AE	Orange		2000 μcd	
	549AHR	Hi. -Eff Red		2000 μcd	
	LTS-				5-69
	6760R	Red	Common Anode, Rt, Hand Decimal	600 μcd	
	6760P	Bright Red		950 μcd	
	6460G	Green		2400 μcd	
	6860Y	Yellow		2400 μcd	
	6660E	Orange		2400 μcd	
	6960HR	Hi. -Eff Red		2400 μcd	
	6780R	Red	Common Cathode, Rt. Hand Decimal	600 μcd	
	6780P	Bright Red		950 μcd	
	6480G	Green		2400 μcd	
	6880Y	Yellow		2400 μcd	
	6680E	Orange		2400 μcd	
	6980HR	Hi. -Eff. Red		2400 μcd	
	6775R	Red	Common Anode, ±1 Overflow	600 μcd	
	6775P	Bright Red		950 μcd	
	6475G	Green		2400 μcd	
	6875Y	Yellow		2400 μcd	
	6675E	Orange		2400 μcd	
	6975HR	Hi -Eff Red		2400 μcd	
14.22mm (.56") Dual-In-Line 75"H x .5"W x .32"D	6795R	Red	Common Cathode, ±1 Overflow	600 μcd	
	6795P	Bright Red		950 μcd	
	6495G	Green		2400 μcd	
	6895Y	Yellow		2400 μcd	
	6695E	Orange		2400 μcd	
	6995HR	Hi -Eff. Red		2400 μcd	

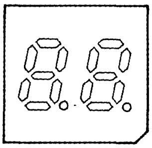
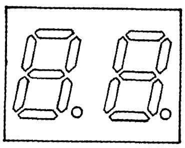
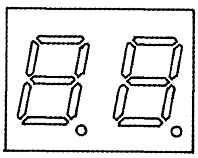
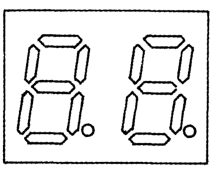
SELECTION GUIDE

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @ IF = 10 mA	PAGE NO.
  20.32mm (.8") Dual-In-Line 1.09"H x .79"W x .33"D	LTS- 3401LR 3401LP 3401LG 3401LY 3401LE	Red Bright Red Green Yellow Orange	Common Anode, Rt & Lt Hand Decimal	600 µcd 950 µcd 2400 µcd 2400 µcd 2400 µcd	5-78
	3403LR 3403LP 3403LG 3403LY 3403LE	Red Bright Red Green Yellow Orange	Common Cathode, Rt. & Lt. Hand Decimal	600 µcd 950 µcd 2400 µcd 2400 µcd 2400 µcd	
	3406LR 3406LP 3406LG 3406LY 3406LE	Red Bright Red Green Yellow Orange	Universal, ±1 Overflow	600 µcd 950 µcd 2400 µcd 2400 µcd 2400 µcd	
 25.4mm (1.0") Dual-In-Line 1.3"H x .9"W x .34"D	LTS- 10804G 10804Y 10804E	Green Yellow Orange	Common Anode, Rt. Hand Decimal	4500 µcd 4500 µcd 4500 µcd	5-86
	10304G 10304Y 10304E	Green Yellow Orange	Common Cathode, Rt. Hand Decimal	4500 µcd 4500 µcd 4500 µcd	

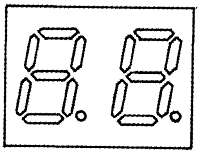
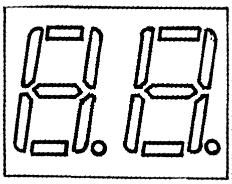
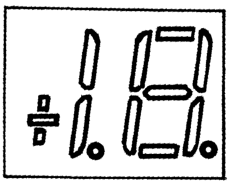
MULTICOLOR SINGLE DIGIT NUMERIC DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @ IF = 10 mA	PAGE NO.
 25.4mm (1.0") Dual-In-Line 1.3"H x .9"W x .34"D	LTS- 10805A	Green & Orange	Common Anode, Rt. Hand Decimal	4500 µcd	5-86
	10305A	Green & Orange	Common Cathode, Rt. Hand Decimal	4500 µcd	

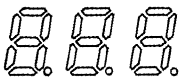
DUAL DIGIT NUMERIC DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @I_F = 10 mA	PAGE NO.
 7 62mm (.3") Dual-In-Line 6"H x .62"W x .29"D	LTD-				5-92
	322R	Red	Common Cathode, Dual Digit	400 μcd	
	322P	Bright Red		650 μcd	
	322G	Green		1600 μcd	
	323R	Red	Common Anode, Dual Digit	400 μcd	
	323P	Bright Red		650 μcd	
	323G	Green		1600 μcd	
 10.21mm (4") Dual-In-Line .63"H x .87"W x .32"D	LTD-				5-98
	432RC	Red	Common Cathode, Dual Digit	200 μcd	
	432PC	Bright Red		300 μcd	
	432GC	Green		800 μcd	
	432EC	Orange		800 μcd	
	482RC	Red	Common Anode, Dual Digit	200 μcd	
	482PC	Bright Red		300 μcd	
	482GC	Green		800 μcd	
	482EC	Orange		800 μcd	
 11.0mm (.43") Dual-In-Line .74"H x 94"W x .26"D	LTD-				5-105
	524P	Bright Red	Common Anode, Dual Digit	600 μcd	
	524G	Green		1800 μcd	
 127mm (5") Dual-In-Line .76"H x 1"W x 38"D	LTD-				5-110
	535R	Red	Common Cathode Dual Digit, Rt, Hand Decimal	500 μcd	
	535P	Bright Red		750 μcd	
	535G	Green		2000 μcd	
	535Y	Yellow		2000 μcd	
	535E	Orange		2000 μcd	
	535HR	Hi -Eff. Red		2000 μcd	
	585R	Red	Common Anode Dual Digit, Rt. Hand Decimal	500 μcd	
	585P	Bright Red		750 μcd	
	585G	Green		2000 μcd	
	585Y	Yellow		2000 μcd	
	585E	Orange		2000 μcd	
	585HR	Hi. -Eff Red		2000 μcd	

SELECTION GUIDE

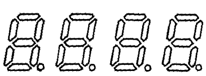
PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @IF = 10 mA	PAGE NO.
	LTD- 5250R 5250P 5250G 5250Y 5250E 5250HR	 Red Bright Red Green Yellow Orange Hi -Eff. Red	Common Anode, Dual Digit Rt. Hand Decimal	 500 µcd 750 µcd 2000 µcd 2000 µcd 2000 µcd 2000 µcd	5-119
13.2mm (0.52") Dual-In-Line .69"H x .99"W x .28"D	LTD- 5260R 5260P 5260G 5260Y 5260E 5260HR	 Red Bright Red Green Yellow Orange Hi. -Eff. Red	Common Cathode, Dual Digit Rt. Hand. Decimal	 500 µcd 750 µcd 2000 µcd 2000 µcd 2000 µcd 2000 µcd	
	LTD- 6710R 6710P 6410G 6810Y 6610E 6910HR	 Red Bright Red Green Yellow Orange Hi. -Eff. Red	Common Anode, Dual Digit, Rt. Hand Decimal	 600 µcd 950 µcd 2400 µcd 2400 µcd 2400 µcd 2400 µcd	5-128
	6730R 6730P 6430G 6830Y 6630E 6930HR	Red Bright Red Green Yellow Orange Hi. -Eff. Red	Common Anode, 1½ Digit, Rt. Hand Decimal	600 µcd 950 µcd 2400 µcd 2400 µcd 2400 µcd 2400 µcd	
	6740R 6740P 6440G 6840Y 6640E 6940HR	Red Bright Red Green Yellow Orange Hi. -Eff. Red	Common Cathode, Dual Digit Rt. Hand Decimal	600 µcd 950 µcd 2400 µcd 2400 µcd 2400 µcd 2400 µcd	
14.22mm (.56") Dual-In-Line 75"H x 1"W x .32"D	6750R 6750P 6450G 6850Y 6650E 6950HR	Red Bright Red Green Yellow Orange Hi. -Eff. Red	Common Cathode, 1½ Digit, Rt. Hand Dicimal	600 µcd 950 µcd 2400 µcd 2400 µcd 2400 µcd 2400 µcd	

THREE-DIGIT NUMERIC DISPLAYS



PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @IF = 10 mA	PAGE NO.
13.2mm (.52") Dual-In-Line .7"H x 1.5"W x .28"D	LTC-				5-137
	5836R	Red	Common Anode, Three-Digit Rt. Hand Decimal	500 μcd	
	5836P	Bright Red		750 μcd	
	5836G	Green		2000 μcd	
	5836Y	Yellow		2000 μcd	
	5836E	Orange		2000 μcd	
	5836HR	Hi.-Eff. Red		2000 μcd	
	5336R	Red	Common Cathode, Three-Digit Rt. Hand Decimal	500 μcd	
	5336P	Bright Red		750 μcd	
	5336G	Green		2000 μcd	
	5336Y	Yellow		2000 μcd	
	5336E	Orange		2000 μcd	
	5336HR	Hi.-Eff. Red		2000 μcd	

FOUR-DIGIT NUMERIC DISPLAYS



PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @IF = 10 mA	PAGE NO.
13.2mm (.52") Dual-In-Line .7"H x 2"W x .28"D	LTC-				5-146
	5837R	Red	Common Anode, Four-Digit Rt. Hand Decimal	500 μcd	
	5837P	Bright Red		750 μcd	
	5837G	Green		2000 μcd	
	5837Y	Yellow		2000 μcd	
	5837E	Orange		2000 μcd	
	5837HR	Hi-Eff. Red		2000 μcd	
	5337R	Red	Common Cathode, Four-Digit Rt. Hand Decimal	500 μcd	
	5337P	Bright Red		750 μcd	
	5337G	Green		2000 μcd	
	5337Y	Yellow		2000 μcd	
	5337E	Orange		2000 μcd	
	5337HR	Hi.-Eff. Red		2000 μcd	

SELECTION GUIDE

• MULTIDIGIT LED DISPLAYS

DIGIT SIZE	RED		BRIGHT RED		DESCRIPTION		
	PART NUMBER	TYP. Iv/SEG @ 5mA	PART NUMBER	TYP. Iv/SEG @ 10mA	DRIVE MODE	DISPLAY MODE (HOUR)	DISPLAY FONT
0.1"	LTB-0022	250μcd	—		MULTIPLEX C.C.	FF	8x8
	LTB-0028		—		MULTIPLEX C.C.	FF	x8.8.
	LTB-0038		—		MULTIPLEX C.C.	FF	88.8.
	LTB-0047		—		MULTIPLEX C.C.	FF	8888
	LTB-402		—		MULTIPLEX C.C.	FF	xxxx8.8.8.8.x
	LTB-1466		—		MULTIPLEX C.C.	FF	xx8.8888.8x
	LTB-1478		—		MULTIPLEX C.C.	FF	x8.8.8.88.8.8.x
	LTB-1488		—		MULTIPLEX C.C.	FF	x8.8.88.88.8.8
	LTB-1498		—		MULTIPLEX C.C.	FF	8.8.8.88.8.8.8.8.
0.2"			LTF-216141A1P	80μcd	MULTIPLEX C.C.	FF	x88.8.8--8.8.88x
0.3"			LTF-804-8P	80μcd	MULTIPLEX C.C.	FF	xx8.8.88.888.8.xx
			LTF-804-12P		MULTIPLEX C.C.	FF	8.8.8.88888.8.888.

NOTES C C · Common Cathode C.A : COMMON ANODE FF· FULL FEATURE.

CROSS REFERENCE GUIDE FOR:

G.I./H.P./TELEFUNKEN/SIEMENS/TOSHIBA/MATSUSHITA/ROHM

In order to designate the similarity between the other manufacturers' device and the nearest LITON equivalent. This guide has been included a letter code system to cover this.

Code Definitions:

A — LITON device is electrically and mechanically equivalent.
B — Minor electrical differences exist.
C — Minor mechanical differences exist.
D — Significant electrical differences exist.
E — Significant mechanical differences exist.

Since Optoelectronics is a relatively young industry, it is possible that different devices offered by two or more manufacturers will satisfy the requirements of one application. Therefore, slight mechanical of electrical variations should not disqualify the nearest equivalent.

The data contained in this quide is believed to be accurated. However, no responsibility is assumed by TAIWAN LITON ELECTRONIC CO., LTD. for the use of this data in actual circuit design.

SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

CROSS REFERENCE GUIDE

G.I. (General Instrument) Equivalent LED Numeric Display

GI PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
MAN-71A	0.3" 1D	RED	LTS-312AR	A
MAN-72A	0.3" 1D	RED	LTS-312AR	A
MAN-73A	0.3" 1D	RED	LTS-316AR	A
NAN-74A	0 3" 1D	RED	LTS-315AR	A
MAN-78A	03." 1D	RED	LTS-313AR	A
MAN-3410A	0.3" 1D	GREEN	LTS-312AG	A
MAN-3420A	0 3" 1D	GREEN	LTS-312AG	A
MAN-3430A	0.3" 1D	GREEN	LTS-316AG	A
MAN-3440A	0.3" 1D	GREEN	LTS-315AG	A
MAN-3480A	0.3" 1D	GREEN	LTS-313AG	A
MAN-3610A	0.3" 1D	ORANGE	LTS-312AE	A
MAN-3620A	0.3" 1D	ORANGE	LTS-312AE	A
MAN-3630A	0.3" 1D	ORANGE	LTS-316AE	A
MAN-3640A	0.3" 1D	ORANGE	LTS-315AE	A
MAN-3680A	0.3" 1D	ORANGE	LTS-313AE	A
MAN-3810A	0.3" 1D	YELLOW	LTS-312AY	A
MAN-3820A	0.3" 1D	YELLOW	LTS-312AY	A
MAN-3830A	0.3" 1D	YELLOW	LTS-316AY	A
MAN-3840A	0.3" 1D	YELLOW	LTS-315AY	A
MAN-3880A	0.3" 1D	YELLOW	LTS-313AY	A
MAN-3910A	0.3" 1D	H.R.	LTS-312AHR	A
MAN-3920A	03." 1D	H.R.	LTS-312AHR	A
MAN-3930A	0.3" 1D	H.R.	LTS-316AHR	A
MAN-3940A	0.3" 1D	H.R.	LTS-315AHR	A
MAN-3980A	0.3" 1D	H.R.	LTS-313AHR	A
FND-350	0.36" 1D	RED	LTS-360R	A
FND-357	0.36" 1D	RED	LTS-367R	A
FND-358	0.36" 1D	RED	LTS-368R	A
FND-360	0.36" 1D	BRIGHT RED	LTS-360P	A
FND-367	0.36" 1D	BRIGHT RED	LTS-367P	A
FND-368	0.36" 1D	BRIGHT RED	LTS-368P	A
FND-310	0.36" 1D	H.R.	LTS-360HR	A
FND-317	0.36" 1D	H.R.	LTS-367HR	A
FND-318	0.36" 1D	H.R.	LTS-368HR	A
MAN-4405A	0.4" 1D	GREEN	LTS-4505AG	A
MAN-4410A	0.4" 1D	GREEN	LTS-4510AG	A
MAN-4440A	0.4" 1D	GREEN	LTS-4540AG	A
MAN-4480A	0.4" 1D	GREEN	LTS-4580AG	A
MAN-4605A	0.4" 1D	ORANGE	LTS-4605AE	A

GI PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
MAN-4610A	0.4" 1D	ORANGE	LTS-4610AE	A
MAN-4640A	0.4" 1D	ORANGE	LTS-4640AE	A
MAN-4680A	0.4" 1D	ORANGE	LTS-4680AE	A
MAN-4705A	.0.4" 1D	RED	LTS-4705AR	A
MAN-4710A	0.4" 1D	RED	LTS-4710AR	A
MAN-4740A	0.4" 1D	RED	LTS-4740AR	A
MAN-4780A	0.4" 1D	RED	LTS-4780AR	A
MAN-4805A	0.4" 1D	YELLOW	LTS-4805AY	A
MAN-4810A	0 4" 1D	YELLOW	LTS-4810AY	A
MAN-4840A	0.4" 1D	YELLOW	LTS-4840AY	A
MAN-4880A	0.4" 1D	YELLOW	LTS-4880AY	A
MAN-4905A	0.4" 1D	H.R.	LTS-4905AHR	A
MAN-4910A	0.4" 1D	H.R.	LTS-4910AHR	A
MAN-4940A	0.4" 1D	H.R.	LTS-4940AHR	A
MAN-4980A	0.4" 1D	H.R.	LTS-4980AHR	A
MAN-6160	0.56" 1D	H.R.	LTS-6160WE	A
MAN-6180	0.56" 1D	H.R.	LTS-6108WE	A
MAN-6460	0.56" 1D	GREEN	LTS-6460G	A
MAN-6480	0.56" 1D	GREEN	LTS-6800G	A
MAN-6660	0.56" 1D	ORANGE	LTS-6660E	A
MAN-6680	0.56" 1D	ORANGE	LTS-6680E	A
MAN-6760	0.56" 1D	RED	LTS-6760R	A
MAN-6780	0.56" 1D	RED	LTS-6780R	A
MAN-6860	0.56" 1D	YELLOW	LTS-6860Y	A
MAN-6880	0.56" 1D	YELLOW	LTS-6880Y	A
MAN-6960	0.56" 1D	H.R.	LTS-6960HR	A
MAN-6980	0.56" 1D	H.R.	LTS-6980HR	A
MAN-6175	0.56" 1D	H.R.	LTS-6175WE	A
MAN-6195	0.56" 1D	H.R.	LTS-6195WE	A
MAN-6475	0.56" 1D	GREEN	LTS-6475G	A
MAN-6495	0.56" 1D	GREEN	LTS-6495G	A
MAN-6675	0.56" 1D	ORANGE	LTS-6675E	A
MAN-6695	0.56" 1D	ORANGE	LTS-6695E	A
MAN-6775	0.56" 1D	RED	LTS-6775R	A
MAN-6795	0.56" 1D	RED	LTS-6795R	A
MAN-6875	0.56" 1D	YELLOW	LTS-6875Y	A
MAN-6895	0.56" 1D	YELLOW	LTS-6895Y	A
MAN-6975	0.56" 1D	H.R.	LTS-6975HR	A
MAN-6995	0.56" 1D	H.R.	LTS-6995HR	A

G. I. (General Instrument) Equivalent LED Numeric Display

GI PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE	GI PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
MAN-8410	0 8" 1D	GREEN	LTS-3401LG	D	MAN-6650	0 56" 2D	ORANGE	LTD-6650E	A
MAN-8430	0 8" 1D	GREEN	LTS-3406LG	D	MAN-6710	0 56" 2D	RED	LTD-6710R	A
MAN-8440	0 8" 1D	GREEN	LTS-3403LG	D	MAN-6730	0 56" 2D	RED	LTD-6730R	A
MAN-8450	0.8" 1D	GREEN	LTS-3406LG	D	MAN-6740	0 56" 2D	RED	LTD-6740R	A
MAN-8610	0.8" 1D	ORANGE	LTS-3401LE	D	MAN-6750	0.56" 2D	RED	LTD-6750R	A
MAN-8630	0.8" 1D	ORANGE	LTS-3406LE	D	MAN-6810	0.56" 2D	YELLOW	LTD-6800Y	A
MAN-8640	0.8" 1D	ORANGE	LTS-3403LE	D	MAN-6830	0 56" 2D	YELLOW	LTD-6830Y	A
MAN-8650	0.8" 1D	ORANGE	LTS-3406LE	D	MAN-6840	0.56" 2D	YELLOW	LTD-6840Y	A
MAN-8810	0.8" 1D	YELLOW	LTS-3401LY	D	MAN-6850	0.56" 2D	YELLOW	LTD-6850Y	A
MAN-8830	0.8" 1D	YELLOW	LTS-3406LY	D	MAN-6910	0.56" 2D	H.R.	LTD-6910HR	A
MAN-8840	0 8" 1D	YELLOW	LTS-3403LY	D	MAN-6930	0.56" 2D	H.R.	LTD-6930HR	A
MAN-8850	0 8" 1D	YELLOW	LTS-3406LY	D	MAN-6940	0.56" 2D	H.R	LTD-6940HR	A
MAN-8910	0.8" 1D	H R	LTS-3401LE	D	MAN-6950	0.56" 2D	H.R.	LTD-6950HR	A
MAN-8930	0.8" 1D	H R.	LTS-3406LE	D	MAN-2A	0 32" 1D	RED	LTP-305R	A
MAN-8940	0 8" 1D	H.R.	LTS-3403LE	D	GMA-2175	2 0" 1D	ORANGE	LTP-2057AE	A
MAN-8950	0.8" 1D	H.R	LTS-3406LE	D	GMC-2175	2 0" 1D	ORANGE	LTP-2157AE	A
MAN-6110	0 56" 2D	H.R	LTD-6110WE	A	GMA-2975	2.0" 1D	H R	LTP-2057AHR	A
MAN-6130	0 56" 2D	H.R.	LTD-6130WE	A	GMC-2975	2 0" 1D	H.R.	LTP-2157AHR	A
MAN-6140	0 56" 2D	H R.	LTD-6140WE	A	GMA-2475	2.0" 1D	GREEN	LTP-2057AG	A
MAN-6150	0.56" 2D	H R.	LTD-6150WE	A	GMC-2475	2 0" 1D	GREEN	LTP-2157AG	A
MAN-6410	0.56" 2D	GREEN	LTD-6410G	A	GMA-2185	2.4" 1D	ORANGE	LTP-2058AE	A
MAN-6430	0.56" 2D	GREEN	LTD-6430G	A	GMC-2185	2.4" 1D	ORANGE	LTP-2158AE	A
MAN-6440	0.56" 2D	GREEN	LTD-6440G	A	GMA-2985	2.4" 1D	H.R.	LTP-2058AHR	A
MAN-6450	0.56" 2D	GREEN	LTD-6450G	A	GMC-2985	2 4" 1D	H.R	LTP-2158AHR	A
MAN-6610	0.56" 2D	ORANGE	LTD-6610E	A	GMA-2485	2.4" 1D	GREEN	LTP-2058AG	A
MAN-6630	0.56" 2D	ORANGE	LTD-6630E	A	GMC-2485	2.4" 1D	GREEN	LTP-2158AG	A
MAN-6640	0.56" 2D	ORANGE	LTD-6640E	A					

CROSS REFERENCE GUIDE

H.P. (Hewlett Packard) Equivalent LED Numeric Display

H.P. PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
HDSP-7301	0.3" 1D	RED	LTS-360R	C
HDSP-7303	0.3" 1D	RED	LTS-367R	C
HDSP-7308	0.3" 1D	RED	LTS-368R	C
HDSP-7311	0.3" 1D	BRIGHT TED	LTS-360P	C
HDSP-7313	0.3" 1D	BRIGHT RED	LTS-367P	C
HDSP-7318	0.3" 1D	BRIGHT RED	LTS-368P	C
HDSP-7501	0.3" 1D	H.R.	LTS-360HR	C
HDSP-7503	0.3" 1D	H.R.	LTS-367HR	C
HDSP-7508	0.3" 1D	H.R.	LTS-368HR	C
HDSP-7511	0.3" 1D	H.R.	LTS-360WE	C
HDSP-7513	0.3" 1D	H.R.	LTS-367WE	C
HDSP-7518	0.3" 1D	H.R.	LTS-368WE	C
HDSP-7801	0.3" 1D	GREEN	LTS-360G	C
HDSP-7803	0.3" 1D	GREEN	LTS-367G	C
HDSP-7808	0.3" 1D	GREEN	LTS-368G	C
5082-7730	0.3" 1D	RED	LTS-312AR	A
5082-7731	0.3" 1D	RED	LTS-312AR	A
5082-7736	0.3" 1D	RED	LST-311AR	A
5082-7740	0.3" 1D	RED	LTS-313AR	A
5082-7610	0.3" 1D	H.R.	LTS-312AHR	A
5082-7611	0.3" 1D	H.R.	LTS-312AHR	A
5082-7613	0.3 1D	H.R.	LTS-313AHR	A
5082-7616	0.3" 1D	H.R.	LTS-311AHR	A
5082-7620	0.3" 1D	YELLOW	LTS-312AY	A
5082-7621	0.3" 1D	YELLOW	LTS-312AY	A
5082-7623	0.3" 1D	YELLOW	LTS-313AY	A
5082-7626	0.3" 1D	YELLOW	LTS-311AY	A
HDSP-3600	0.3" 1D	GREEN	LTS-312AG	A
HDSP-3601	0.3" 1D	GREEN	LTS-312AG	A
HDSP-3603	0.3" 1D	GREEN	LTS-313AG	A
HDSP-3606	0.3" 1D	GREEN	LTS-311AG	A
HDSP-3530	0.3" 1D	ORANGE	LTS-312AE	B
HDSP-3531	0.3" 1D	ORANGE	LTS-312AE	B
HDSP-3533	0.3" 1D	ORANGE	LTS-313AE	B
HDSP-3536	0.3" 1D	ORANGE	LTS-311AE	B
HDSP-4030	0.3" 1D	YELLOW	LTS-312AY	B
HDSP-4031	0.3" 1D	YELLOW	LTS-312AY	B
HDSP-4033	0.3" 1D	YELLOW	LTS-313AY	B
HDSP-4036	0.3" 1D	YELLOW	LTS-311AY	B
5082-7750	0.43" 1D	RED	LTS-7751R	A

H.P. PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
5082-7751	0.43" 1D	RED	LTS-7751R	A
5082-7756	0.43" 1D	RED	LTS-7756R	A
5028-7760	0.43" 1D	RED	LTS-7760R	A
5082-7650	0.43" 1D	H.R.	LTS-7651HR	A
5082-7651	0 43" 1D	H.R.	LTS-7651HR	A
5082-7653	0.43" 1D	H.R.	LTS-7653HR	A
5082-7656	0.43" 1D	H.R.	LTS-7656HR	A
5082-7660	0.43" 1D	YELLOW	LTS-7661YN	A
5082-7661	0.43" 1D	YELLOW	LTS-7661YN	A
5082-7663	0.43" 1D	YELLOW	LTS-7663YN	A
5082-7666	0.43" 1D	YELLOW	LTS-7666YN	A
HDSP-4600	0.43" 1D	GREEN	LTS-7671GN	A
HDSP-4601	0.43" 1D	GREEN	LTS-7671GN	A
HDSP-4603	0.43" 1D	GREEN	LTS-7673GN	A
HDSP-4606	0.43" 1D	GREEN	LTS-7676GN	A
HDSP-3730	0.43" 1D	ORANGE	LTS-3731E	A
HDSP-3731	0.43" 1D	ORANGE	LTS-3731E	A
HDSP-3733	0.43" 1D	ORANGE	LTS-3733E	A
HDSP-3736	0.43" 1D	ORAGE	LTS-3736E	A
HDSP-3351	0.43" 1D	H.R.	LTS-3351WE	A
HDSP-3353	0.43" 1D	H.R.	LTS-3353WE	A
HDSP-3356	0.43" 1D	H.R.	LTS-3356WE	A
HDSP-4130	0.43" 1D	YELLOW	LTS-7661YN	B
HDSP-4131	0.43" 1D	YELLOW	LTS-7661YN	B
HDSP-4133	0.43" 1D	YELLOW	LTS-7663YN	B
HDSP-4136	0.43" 1D	YELLOW	LTS-7666YN	B
HDSP-5301	0.56" 1D	RED	LTS-5301AR	A
HDSP-5303	0.56" 1D	RED	LTS-5303AR	A
HDSP-5307	0.56" 1D	RED	LTS-5307AR	A
HDSP-5308	0.56" 1D	RED	LTS-5308AR	A
HDSP-5501	0.56" 1D	ORANGE	LTS-5501AE	A
HDSP-5503	0.56" 1D	ORANGE	LTS-55034E	A
HDSP-5507	0.56" 1D	ORANGE	LTS-5507AE	A
HDSP-5508	0.56" 1D	ORANGE	LTS-5508AE	A
HDSP-5551	0.56" 1D	H.R.	LTS-5551WE	A
HDSP-5553	0.56" 1D	H.R.	LTE-5553WE	A
HDSP-5601	0.56" 1D	GREEN	LTS-5801AG	A
HDSP-5603	0.56" 1D	GREEN	LTS-5803AG	A
HDSP-5607	0.56" 1D	GREEN	LTS-5807AG	A
HDSP-5608	0.56" 1D	GREEN	LTS-5808AG	A

H.P. (Hewiett Packard) Equivalent LED Numeric Display

H.P. PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
HDSP-5701	0 56" 1D	YELLOW	LTS-5701AY	A
HDSP-5703	0 56" 1D	YELLOW	LTS-5703AY	A
HDSP-5707	0.56" 1D	YELLOW	LTS-5707AY	A
HDSP-5708	0 56" 1D	YELLOW	LTS-5708AY	A
HDSP-5531	0.56" 1D	ORANGE	LTS-5501AE	B
HDSP-5533	0.56" 1D	ORANGE	LTS-5503AE	B
HDSP-5537	0 56" 1D	ORANGE	LTS-5507AE	B
HDSP-5538	0.56" 1D	ORANGE	LTS-5508AE	B
HSDP-5731	0.56" 1D	YELLOW	LTS-5701AY	B
HDSP-5733	0.56" 1D	YELLOW	LTS-5703AY	B
HDSP-5737	0.56" 1D	YELLOW	LTS-5707AY	B
HDSP-5738	0 56" 1D	YELLOW	LTS-5708AY	B
HDSP-3400	0.8" 1D	RED	LTS-3401LR	A
HDSP-3401	0.8" 1D	RED	LRS-3401LR	A
HDSP-3403	0.8" 1D	RED	LTS-3403LR	A
HDSP-3405	0.8" 1D	RED	LTS-3403LR	A
HDSP-3406	0.8" 1D	RED	LTS-3406LR	A
HDSP-3900	0 8" 1D	ORANGE	LTS-3401LE	A
HDSP-3901	0.8" 1D	ORANGE	LTS-3401LE	A
HDSP-3903	0.8" 1D	ORANGE	LTS-3403LE	A
HDSP-3905	0 8" 1D	ORANGE	LTS-3403LE	A
HDSP-3906	0 8" 1D	ORANGE	LTD-3406LE	A
HDSP-4200	0 8" 1D	YELLOW	LTD-3401LY	A
HDSP-4201	0 8" 1D	YELLOW	LTD-3401LY	A
HDSP-4203	0 8" 1D	YELLOW	LTS-3403LY	A
HDSP-4205	0.8" 1D	YELLOW	LST-3403LY	A
HDSP-4206	0 8" 1D	YELLOW	LTS-3406LY	A
HDSP-8600	0.8" 1D	GREEN	LTS-3401LG	A
HDSP-8601	0.8" 1D	GREEN	LTS-3401LG	A
HDSP-8603	0.8" 1D	GREEN	LTS-3403LG	A
HDSP-8605	0.8" 1D	GREEN	LTS-3403LG	A
HDSP-8606	0.8" 1D	GREEN	LTS-3406LG	A
HDSP-5321	0.56" 2D	RED	LTD-5321RA	A
HDSP-5323	0.56" 2D	RED	LDT-5323AR	A
HDSP-5521	0.56" 2D	ORANGE	LTD-5521AE	A
HDSP-5523	0.56" 2D	ORAGEN	LTD-5523AE	A
HDSP-5621	0 56" 2D	GREEN	LTD-5621AG	A
HDSP-5623	0 56" 2D	GREEN	LTD-5623AG	A
HDSP-5721	0.56" 2D	YELLOW	LTD-5721AY	A
HDSP-5723	0.56" 2D	YELLOW	LTD-5723AY	A

CROSS REFERENCE GUIDE

TELEFUNKEN Equivalent LED Numeric Display

TELEFUNKEN PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
D200-PA	0.4" 1D	RED	LTS-4710AR	E
D200-PK	0.4" 1D	RED	LTS-4780AR	E
D201-PA	0.4" 1D	ORANGE	LTS-4610AE	E
D201-PK	0 4" 1K 1D	ORANGE	LTS-4680AE	E
D202-PA	0.4" 1D	GREEN	LTD-4510AG	E
D202-PK	0.4" 1D	GREEN	LTS-4580AG	E
D203-PA	0.4" 1D	YELLOW	LTS-4810AY	E
D203-PK	0.4" 1D	YELLOW	LTS-4880AY	E
D290-PA	0.4" 1D	RED	LTS-4705AR	E
D290-PK	0.4" 1D	RED	LTS-4705AR	E
D291-PA	0.4" 1D	ORANGE	LTS-4605AE	E
D291-PK	0.4" 1D	ORANGE	LTS-4605AE	E
D292-PA	0.4" 1D	GREEN	LTS-4505AG	E
D292-PK	0.4" 1D	GREEN	LTS-4505AG	E
D293-PA	0.4" 1D	YELLOW	LTS-4805AY	E
D293-PK	0 4" 1D	YELLOW	LTS-4055AY	E
D390-PA	0.51" 1D	RED	LTS-548AR	D
D390-PK	0.51" 1D	RED	LTS-549AR	D
D391-PA	0.51" 1D	ORANGE	LTS-548AE	D
D391-PK	0.51" 1D	ORANGE	LTS-549AE	D
D392-PA	0.51" 1D	GREEN	LTS-548AG	D
D392-PK	0.51" 1D	GREEN	LTS-549AG	D
D393-PA	0.51" 1D	YLELOW	LTS-548AY	D
D393-PK	0.51" 1D	YELLOW	LTS-549AY	D

TELEFUNKEN PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
D350-PA	0.51" 1D	RED	LTS-5301AR	C
D350-PK	0.51" 1D	RED	LTS-5303AR	C
D351-PA	0.51" 1D	ORANGE	LTS-5501AE	C
D351-PK	0.51" 1D	ORANGE	LTS-5503AE	C
D352-PA	0.51" 1D	GREEN	LTS-5801AG	C
D352-PK	0.51" 1D	GREEN	LTS-5803AG	C
D353-PA	0.51" 1D	YELLOW	LTS-5701AY	C
D353-PK	0.51" 1D	YELLOW	LTS-5703AY	C
D380-PA	0.51" 1D	RED	LTS-5307AR	E
D380-PK	0.51" 1D	RED	LTS-5308AR	E
D381-PK	0.51" 1D	ORANGE	LTS-5507AE	E
D381-PK	0.51" 1D	ORANGE	LTS-5508AE	E
D382-PA	05.1" 1D	GREEN	LTS-5807AG	E
D382-PK	0.51" 1D	GREEN	LTS-5808AG	E
D383-PA	0.51" 1D	YELLOW	LTS-5707AY	E
D383-PK	0.51" 1D	YELLOW	LTS-5708AY	E
TDDR-5250	0.51" 2D	RED	LTD-6710R	C
TDDR-5260	0.51" 2D	RED	LTD-6740R	C
TDDO-5250	0.51" 2D	ORANGE	LTD-6610E	C
TDDO-5260	0.51" 2D	ORANGE	LTD-6640E	C
TDDY-5250	0.51" 2D	YELLOW	LTD-6810Y	C
TDDY-5260	0 51" 2D	YELLOW	LTD-6840Y	C
TDDG-5250	0.51" 2D	GREEN	LTD-6410G	C
TDDG-5260	0.51" 2D	GREEN	LTD-6440G	C

SIEMENS (LITRONIX) EQUIVALENT LED NUMERIC DISPLAY

SIEMENS PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
HD-1105R	0.39" 1D	RED	LTS-360R	E
HD-1107R	0.39" 1D	RED	LTS-367R	E
HD-1108R	0 39" 1D	RED	LTS-368R	E
HD-1105O	0.39" 1D	H.R.	LTS-360HR	E
HD-1107O	0.39" 1D	H.R.	LTS-367HR	E
HD-1108O	0.39" 1D	H.R	LTS-368HR	E
HD-1105G	0 39" 1D	GREEN	LTS-360G	E
HD-1107G	0.39" 1D	GREEN	LTS-367G	E
HD-1108G	0.39" 1D	GREEN	LTS-368G	E
DL-7750R	0.43" 1D	RED	LTS-7751R	A
DL-7751R	0.43" 1D	RED	LTS-7751R	A
DL-7756R	0.43" 1D	RED	LTS-7756R	A
DL-7760R	0 43" 1D	RED	LTS-7760R	A
DL-7650O	0 43" 1D	H.R	LTS-7651HR	A
HD-7651O	0 43" 1D	H.R.	LTS-7651HR	A
HD-7653O	0.43" 1D	H R	LTS-7653HR	A
HD-7656O	0.43" 1D	H.R	LTS-7656HR	A
HD-7660Y	0.43" 1D	YELLOW	LTS-7661YN	A
HD-7661Y	0 43" 1D	YELLOW	LTS-7661YN	A
HD-7663Y	0.43" 1D	YELLOW	LTS-7663YN	A
HD-7666Y	0.43" 1D	YELLOW	LTS-7666YN	A
HD-7670G	0.43" 1D	GREEN	LTS-7671GN	A
HD-7671G	0.43" 1D	GREEN	LTS-7671GN	A
HD-7673G	0.43" 1D	GREEN	LTS-7673GN	A
HD-7676G	0.43" 1D	GREEN	LTS-7676GN	A
HD-1131R	0.53" 1D	RED	LTS-546AR	C
HD-1123R	0.53" 1D	RED	LTS-548AR	D
HD-1133R	0.53" 1D	RED	LTS-547AR	C
HD-1134R	0.53" 1D	RED	LTS-549AR	D
HD-1131O	0.53" 1D	H.R	LTS-546AHR	C
HD-1132O	0.53" 1D	H.R	LTS-548AHR	D
HD-1133O	0.53" 1D	H.R	LTS-537AHR	C
HD-1134O	0.53" 1D	H.R	LTS-549AHR	D
HD-1131Y	0 53" 1D	YELLOW	LTS-546AY	C
HD-1132Y	0.53" 1D	YELLOW	LTS-548AY	D
HD-1133Y	0.53" 1D	YELLOW	LTS-547AY	C
HD-1134Y	0.53" 1D	YELLOW	LTS-549AY	D
HD-1131G	0 53" 1H	GREEN	LTS-546AG	C
HD-1132G	0.53" 1D	GREEN	LTS-548AG	D
HD-1133G	0 53" 1D	GREEN	LTS-547AG	C
HD-1134G	0.53" 1D	GREEN	LTS-549AG	D
DL-3400	0.8" 1D	RED	LTS-3401LR	A
DL-3401	0.8" 1D	RED	LTS-3401LRA	A
DL-3403	0.8" 1D	RED	LTS-3403LR	A
DL-3405	0 8" 1D	RED	LTS-3403LR	A
DL-3406	0.8" 1D	RED	LTS-3406LR	A
DL-3900	0.8" 1D	ORANGE	LTS-3401LE	A
DL-3901	0.8" 1D	ORANGE	LTS-3401LE	A
LD-3903	0.8" 1D	ORANGE	LTS-3403LE	A
DL-3905	0.8" 1D	ORANGE	LTS-3403LE	A
DL-3906	0.8" 1D	ORANGE	LTS-3406LE	A
DL-5735	0.7" 1D	RED	LTP-747R	D
DLG-5735	0.7" 1D	GREEN	LTP-747G	D
DL-57	0.3" 1D	RED	LTP-305R	A
RBG-1000	10 ARRAY	RED	LTA-1000R	C
OBG-1000	10 ARRAY	ORANGE	LTA-1000E	C
YBG-1000	10 ARRAY	YELLOW	LTA-1000Y	C
GBG-1000	10 ARRAY	GREEN	LTA-1000G	C

SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

CROSS REFERENCE GUIDE

TOSHIBA EQUIVALENT LED NUMERIC DISPLAY

TOSHIBA PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
TLR-332	0.3" 1D	RED	LTS-313AR	A
TLR-333	0.3" 1D	RED	LTS-312AR	A
TLR-334	0.3" 1D	RED	LTS-311AR	A
TLR-335	0.3" 1D	RED	LTS-312AR	A
TLG-332	0.3" 1D	GREEN	LTS-313AG	A
TLG-333	0.3" 1D	GREEN	LTS-312AG	A
TLG-334	0.3" 1D	GREEN	LTS-311AG	A
TLG-335	0.3" 1D	GREEN	LTS-312AG	A
TLR-342	0.43" 1D	RED	LTS-7760R	A
TLR-343	0.43" 1D	RED	LTS-7751R	A
TLR-344	0.43" 1D	RED	LTS-7756R	A
TLR-345	0.43" 1D	RED	LTS-7751R	A
TLG-342	0.43" 1D	GREEN	LTS-7673GN	A
TLG-343	0.43" 1D	GREEN	LTS-7671GN	A
TLG-344	0.43" 1D	GREEN	LTS-7676GN	A
TLG-345	0.43" 1D	GREEN	LTS-7671GN	A
TLR-368	0.53" 1D	RED	LTS-547AR	A
TLR-369	0.53" 1D	RED	LTS-546AR	A
TLG-368	0.53" 1D	GREEN	LTS-547AG	A
TLG-369	0.53" 1D	GREEN	LTS-546AG	A
TLR-362	0.56" 1D	BRIGHT RED	LTS-5303AP	C
TLR-363	0.56" 1D	BRIGHT RED	LTS-5301AP	C
TLR-364	0.56" 1D	BRIGHT RED	LTS-5308AP	C
TLR-365	0.56" 1D	BRIGHT RED	LTS-5307AP	C
TLG-362	0.56" 1D	GREEN	LTS-5803AG	C
TLG-363	0.56" 1D	GREEN	LTS-5801AG	C
TLG-364	0.56" 1D	GREEN	LTS-5808AG	C

TOSHIBA PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
TLG-365	0.56" 1D	GREEN	LTS-5807AG	C
TLR-312	0.33" 1D	BRIGHT RED	LTS-367P	E
TLR-313	0.33" 1D	BRIGHT RED	LTD-360P	E
TLR-315	0.33" 1D	BRIGHT RED	LTS-368P	E
TLR-312	0.33" 1D	GREEN	LTS-367G	E
TLR-313	0.33" 1D	GREEN	LTS-360G	E
TLG-315	0.33" 1D	GREEN	LTS-368G	E
TLR-370	0.5" 1D	BRIGHT RED	LTP-537P	A
TLR-371	0.5" 1D	BRIGHT RED	LTP-578P	A
TLR-370	0.5" 1D	GREEN	LTP-537G	A
TLR-371	0.5" 1D	GREEN	LTP-587G	A
TLR-322	0.3" 2D	RED	LTD-322R	A
LTR-323	0.3" 2D	RED	LTD-323R	A
TLR-322	0.3" 2D	GREEN	LTD-322G	A
TLG-323	0.3" 2D	GREEN	LTD-323G	A
TLR-320	0.4" 2D	BRIGHT RED	LTD432PC	A
TLR-321	0.4" 2D	BRIGHT RED	LTD-482PC	A
TLG-320	0.4" 2D	GREEN	LTD-432GC	A
TLG-321	0.4" 2D	GREEN	LTD-482GC	A
TLG-324	0.5" 2D	BRIGHT RED	LTD-535P	A
TLR-325	0.5" 2D	BRIGHT RED	LTD-585P	A
TLG-324	0.5" 2D	GREEN	LTD-535G	A
TLG-325	0.5" 2D	GREEN	LTD-585G	A
TLR-366	0.56" 2D	BRIGHT RED	LTD-6740P	C
TLR-367	0.56" 2D	BRIGHT RED	LTD-6710P	C
TLG-366	0.56" 2D	GREEN	LTD-6440G	C
TLG-367	0.56" 2D	GREEN	LTD-6410G	C

MATSUSHITA (PANASONIC) EQUIVALENT LED NUMERIC DISPLAY

MATSUSHITA PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
LN-513RA	0.3" 1D	RED	LTS-312AR	C
LN-513RK	0 3" 1D	RED	LTS-315AR	D
LN-513GA	0.3" 1D	GREEN	LTS-312AG	C
LN-513GK	0.3" 1D	GREEN	LTS-315AG	D
LN-513YA	0.3" 1D	YELLOW	LTS-312AY	C
LN-513YK	0.3" 1D	YELLOW	LTS-315AY	C
LN-513OA	0.3" 1D	ORANGE	LTS-312AE	C
LN-513OK	0.3" 1D	ORANGE	LTS-315AE	D
LN-513RKS	0.3" 1D	RED	LTS-313AR	D
LN-513GKS	0.3" 1D	GREEN	LTS-313AG	D
LN-513YKS	0.3" 1D	YELLOW	LTS-313AY	D
LN-513OKS	0 3" 1D	ORANGE	LTS-313AE	D
LN-514RA	0.4" 1D	RED	LTS-7751R	C
LN-514RK	0 4" 1D	RED	LTS-7760R	C
LN-514GA	0.4" 1D	GREEN	LTS-7671GN	C
LN-514GK	0 4" 1D	GREEN	LTS-7673GN	C
LN-514YA	0 4" 1D	YELLOW	LTS-7661YN	C
LN-514K	0.4" 1D	YELLOW	LTS-7663YN	C
LN-514OA	0.4" 1D	ORANGE	LTS-7651HR	C
LN-514OK	0.4" 1D	ORANGE	LTS-7653HR	C
LN-516RA	0.56" 1D	RED	LTS-5301AR	C
LN-516RK	0.56" 1D	RED	LTS-5303AR	C

MATSUSHITA PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
LN-516GA	0 56" 1D	GREEN	LTS-5801AG	C
LN-516GK	0.56" 1D	GREEN	LTS-5803AG	C
LN-516YA	0 56" 1D	YELLOW	LTS-5701AY	C
LN-516YK	0 56" 1D	YELLOW	LTS-5703AY	C
LN-516OA	0 56" 1D	ORANGE	LTS-5501AE	C
LN-516OK	0.56" 1D	ORANGE	LTS-5503AE	C
LN-524RA	0.43" 1D	RED	LTD-6710R	C
LN-524RK	0.43" 2D	RED	LTD-6740R	C
LN-524GA	0.43" 2D	GREEN	LTD-6410G	C
LN-524GK	0.43" 2D	GREEN	LTD-6440G	C
LN-524YA	0.43" 2D	YELLOW	LTD-6810Y	C
LN-524YK	0.43" 2D	YELLOW	LTD-6840Y	C
LN-524OA	0.43" 2D	ORANGE	LTD-6610E	C
LN-524OK	0.43" 2D	ORANGE	LTD-6640E	C
LN-526RA	0.56" 2D	RED	LTD-6710R	C
LN-526RK	0.56" 2D	RED	LTD-6740R	C
LN-526GA	0 56" 2D	GREEN	LTD-6410G	C
LN-526GK	0.56" 2D	GREEN	LTD-6440G	C
LN-526YA	0.56" 2D	YELLOW	LTD-6810Y	C
LN-526YK	0.56" 2D	YELLOW	LTD-6840Y	C
LN-526OA	0.56" 2D	ORANGE	LTD-6610E	C
LN-526OK	0.56" 2D	ORANGE	LTD-6640E	C

CROSS REFERENCE GUIDE

ROHM EQUIVALENT LED NUMERIC DISPLAY

ROHM PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
LA-301VB	0.31" 1D	BRIGHT RED	LTS-360P	D
LA-301VL	0.31" 1D	BRIGHT RED	LTD-367P	D
LA-301VM	0.31" 1D	BRIGHT RED	LTS-368P	D
LA-301OB	0.31" 1D	H.R.	LTS-360HR	D
LA-301OL	0.31" 1D	H.R.	LTS-367HR	D
LA-301OM	0.31" 1D	H.R.	LTS-368HR	D
LA-301MB	0.31" 1D	GREEN	LTS-360G	D
LA-301ML	0.31" 1D	GREEN	LRS-367G	D
LA-301MM	0.31" 1D	GREEN	LTS-368G	D
LA-301VA	0.31" 1D	RED	LTS-312AR	C
LA-301VK	0.31" 1D	RED	LTS-315AR	D
LA-301OA	0.31" 1D	H.R.	LTS-312AHR	C
LA-301OK	0.31" 1D	H R	LRS-315AHR	D
LA-301YA	0.31" 1D	YELLOW	LTS-312AY	C
LA-301YK	0.31" 1D	YELLOW	LTS-315AY	D
LA-301MA	0.31" 1D	GREEN	LTS-312AG	C
LA-301MK	0.31" 1D	GREEN	LTS-315AG	D
LA-401VA	0.4" 1D	RED	LTS-7751R	C
LA-401VK	0.4" 1D	RED	LTS-7760R	C
LA-401OA	0.4" 1D	H.R.	LTS-7651HR	C
LA-401OK	0.4" 1D	H.R.	LTS-7653HR	C
LA-401YA	0.4" 1D	YELLOW	LTS-7661YN	C
LA-401YK	0.4" 1D	YELLOW	LTS-7663YN	C
LA-401MA	0.4" 1D	GREEN	LTS-7671GN	C
LA-401MK	0.4" 1D	GRENE	LTS-7673GN	C
LA-401VF	0.4" 1D	RED	LTS-546AR	C
LA-401VP	0.4" 1D	RED	LTS-547AR	C
LA-401OF	0.4" 1D	H.R.	LTS-546AHR	C
LA-401OP	0.4" 1D	H.R.	LTS-547AHR	C
LA-401YF	0.4" 1D	YELLOW	LTS-546AY	C
LA-401YP	0.4" 1D	YELLOW	LTS-547AY	C
LA-401MF	0.4" 1D	GREEN	LTS-546AG	C
LA-401MP	0.4" 1D	GREEN	LTS-547AG	C
LA-501VA	0.5" 1D	RED	LTS-546AR	E
LA-501VK	0.5" 1D	RED	LTS-547AR	E
LA-501OA	0.5" 1D	H.R.	LTS-546AHR	E
LA-501OK	0.5" 1D	H.R.	LTS-547AHR	E
LA-501YA	0.5" 1D	YELLOW	LTS-546AY	E
LA-501YK	0.5" 1D	YELLOW	LTS-547AY	E
LA-501MA	0.5" 1D	GEEEN	LTS-546AG	A
LA-501MK	0.5" 1D	GREEN	LTS-547AG	E

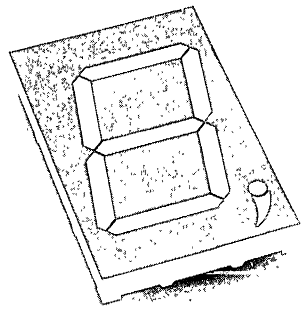
ROHM PART NO.	DIGIT SIZE	COLOR	LITON PART NO.	CODE
LAI-501VF	0.5" 1D	RED	LTS-546AR	C
LA-501VP	0.5" 1D	RED	LTS-547AR	C
LA-501OF	0.5" 1D	H.R.	LTS-546AHR	C
LA-501OP	0.5" 1D	H.R	LTS-547AHR	C
LA-501YF	0.5" 1D	YELLOW	LTS-546AY	C
LA-501YF	0.5" 1D	YELLOW	LTS-547AY	C
LA-501MF	0.5" 1D	GREEN	LTS-546AG	C
LT-501MP	0.5" 1D	GREEN	LTS-546AG	C
LA-801VF	0.8" 1D	BRIGHT RED	LTS-3401LP	E
LA-801VP	0.8" 1D	BRIGHT RED	LTS-3403LP	E
LA-801OF	0.8" 1D	H.R.	LTS-3401LE	E
LA-801OP	0.8" 1D	H.R.	LTS-3403LE	E
LA-801YF	0.8" 1D	YELLOW	LTS-3401LY	E
LA-801YP	0.8" 1D	YELLOW	LTS-3403LY	E
LA-801MF	0.8" 1D	GREEN	LTS-3401LG	E
LA-801MP	0.8" 1D	GREEN	LTS-3403LG	E
LA-101VF	1.0" 1D	BRIGHT RED	LTS-1720P	E
LA-101VP	1.0" 1D	BRIGHT RED	LTS-1723P	E
LA-101OF	1.0" 1D	H.R.	LTS-1720E	E
LA-101OP	1.0" 1S	H.R.	LTS-1723E	E
LA-101MF	1.0" 1D	GREEN	LTS-1720G	E
LA-101MP	1.0" 1D	GREEN	LTS-1723G	E
LB-202VB	0.3" 2D	RED	LTD-323R	D
LB-202VL	0.3" 2D	RED	LTD-322R	D
LB-202MB	0.3" 2D	GREEN	LTD-323G	D
LB-202ML	0.3" 2D	GREEN	LTD-322G	D
LB-402VA	0.4" 2D	RED	LTS-482RC	C
LB-402VK	0.4" 2D	RED	LTP-432RC	D
LB-402OA	0.4" 2D	H.R.	LTP-482PC	D
LB-402OK	0.4" 2D	H.R.	LTP-432PC	D
LA-402MA	0.4" 2D	GREEN	LTD-482PC	C
LA-402MA	0.4" 2D	GREEN	LTD-432GC	C
LA-602VA	0.56" 2D	BRIGHT RED	LTD-6710P	C
LA-602VK	0.56" 2D	BRIGHT RED	LTD-6740P	C
LA-602OA	0.56" 2D	H.R.	LTD-6910HR	C
LA-602OK	0.56" 2D	H.R.	LTD-6940HR	C
LA-602YA	0.56" 2D	YELLOW	LTD-6810Y	C
LA-602YK	0.56" 2D	YELLOW	LTD-6840Y	C
LA-602MA	0.56" 2D	GREEN	LTD-6410G	C
LA-602MK	0.56" 2D	GREEN	LTD-6440G	C

LTS- 30301/30801 30302A/30802A SERIES

3 INCH SINGLE COLOR & MULTICOLOR ULTRA LARGE SINGLE DIGIT LED NUMERICAL DISPLAY

FEATURES

- 3 INCH (76.2mm) ULTRA LARGE DIGIT.
- CONTINUOUS UNIFORM SEGMENTS.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE HIGH CONTRAST.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF TWO BRIGHT COLORS — GREEN/HIGH EFFICIENCY RED.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS — GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED).



DESCRIPTION

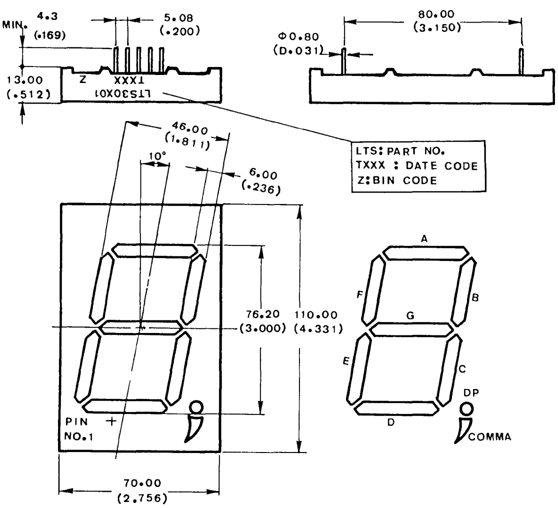
The LTS-30000 series are 3 inch (76.2mm) height ultra large single digit displays.
The LTS-30301/30801 series are single color displays. The green displays have black face and green segment color, the high efficiency red displays have black face and red segment color.
The LTS-30302A/30802A are multicolor displays. The multicolor displays have black face and white segment color.
The green series utilize LED chips which are made from GaP on a transparent GaP substrate. The high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

DEVICES

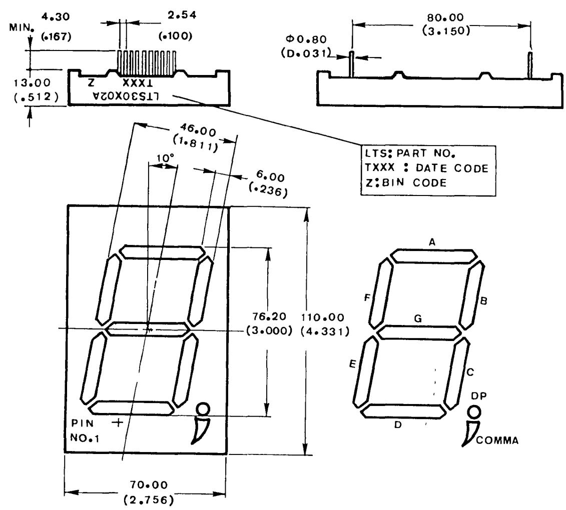
PART NO. LTS—			DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	HI.-EFF. RED	MULTI-COLOR			
30301G	30301HRB	—	Common Cathode	A	A
30801G	30801HRB	—	Common Anode	A	B
—	—	30302A	Common Cathode	B	C
—	—	30802A	Common Anode	B	D

PACKAGE DIMENSIONS

A. LTS-30301/30801



B. LTS-30302A/30802A



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are: 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

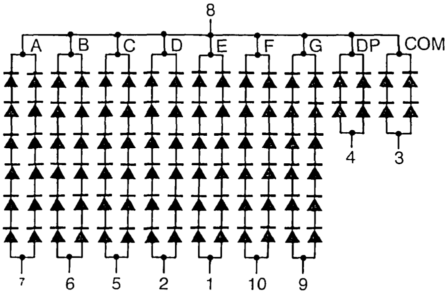
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$

PIN CONNECTION

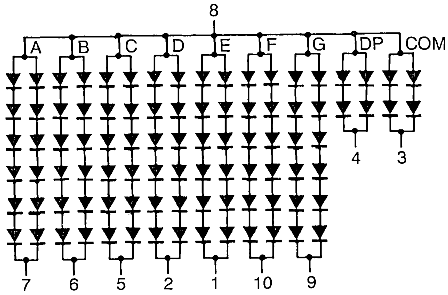
PIN NO.	CONNECTION			
	LTS-30301	LTS-30801	LTS-30302A	LTS-30802A
1	Segment E Anode	Segment E Cathode	Anode E, Green	Cathode E, Green
2	Segment D Anode	Segment D Cathode	Anode E, Orange	Cathode E, Orange
3	Comma Anode	Comma Cathode	Anode D, Green	Cathode D, Green
4	D. P. Anode	D. P. Cathode	Anode D, Orange	Cathode D, Orange
5	Segment C Anode	Segment C Cathode	Anode Comma, Green	Cathode Comma, Green
6	Segment B Anode	Segment B Cathode	Anode Comma, Orange	Cathode Comma, Orange
7	Segment A Anode	Segment A Cathode	Anode DP. Green	Cathode DP. Green
8	Common Cathode	Common Anode	Anode DP. Orange	Cathode DP. Orange
9	Segment G Anode	Segment G Cathode	Anode C, Green	Cathode C, Green
10	Segment F Anode	Segment F Cathode	Anode C, Orange	Cathode C, Orange
11			Anode B, Green	Cathode B, Green
12			Anode B, Orange	Cathode B, Orange
13			Anode A, Green	Cathode A, Green
14			Anode A, Orange	Cathode A, Orange
15			Cathode Common, Green	Anode Common, Green
16			Cathode Common, Orange	Anode Common, Orange
17			Anode F, Green	Cathode F, Green
18			Anode F, Orange	Cathode F, Orange
19			Anode G, Green	Cathode G, Green
20			Anode G, Orange	Cathode G, Orange

INTERNAL CIRCUIT DIAGRAM

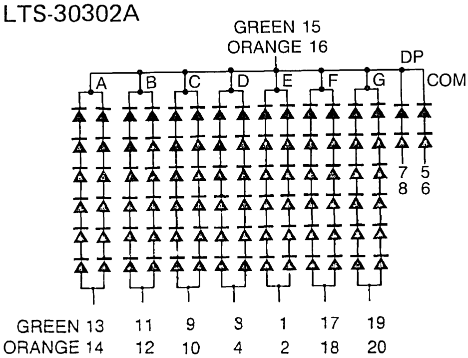
A. LTS-30301



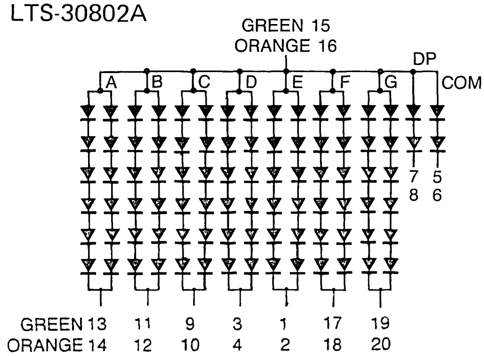
B. LTS-30801



C. LTS-30302A



D. LTS-30802A



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	30x01		30x02A		UNIT
	GREEN	HI.-EFF. RED	GREEN	ORANGE	
Power Dissipation Per Segment	650	650	330	330	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	160	80	80	mA
Continuous Forward Current Per Segment	40	40	20	20	mA
Derating Linear From 25°C Per Segment	0.48	0.48	0.24	0.24	mA/°C
Reverse Voltage Per Segment	30	30	30	30	V
Operating Temperature Range	– 25°C to + 85°C				
Storage Temperature Range	– 25°C to + 85°C				
Soler Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C					

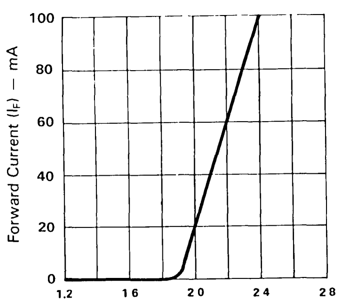
ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C

LTS-30301G/30801G

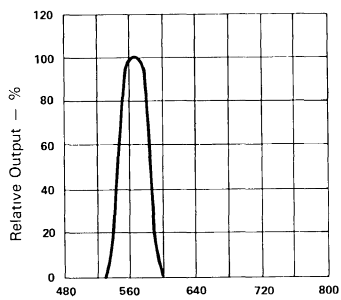
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	12	30		mcd	I_F = 20 mA
Peak Emission Wavelength	λp		565		nm	I_F = 40 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 40 mA
Forward Voltage, any Segment (D.P.)	V_F		12.6 (4.2)	16.8 (5.6)	V	I_F = 40 mA
Reverse Current, any Segment	I_R			200	μA	V_R = 30V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 40 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

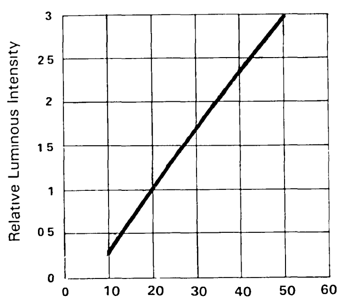
(25°C Ambient Temperature Unless Otherwise Noted)



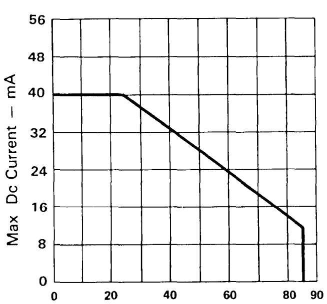
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



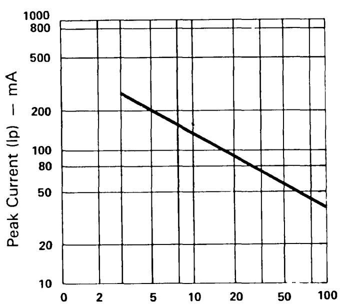
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



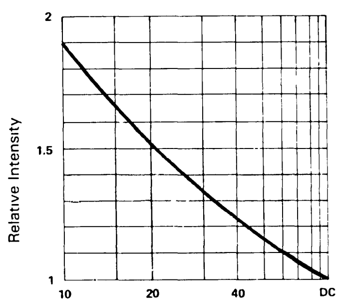
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

LTS-30301 HRB/30801 HRB

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	12	30		mcd	I_F = 20 mA
Peak Emission Wavelength	λP		635		nm	I_F = 40 mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	I_F = 40 mA
Forward Voltage, any Segment (D.P.)	V_F		12.6 (4.2)	16.8 (5.6)	V	I_F = 40 mA
Reverse Current, any Segment	I_R			200	μA	V_R = 30V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 40 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

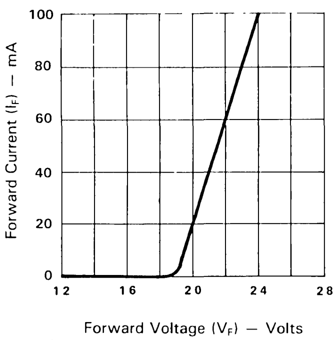


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

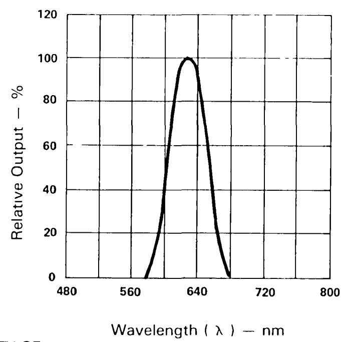


Fig 2 SPECTRAL RESPONSE

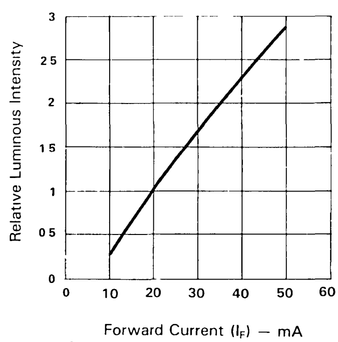


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

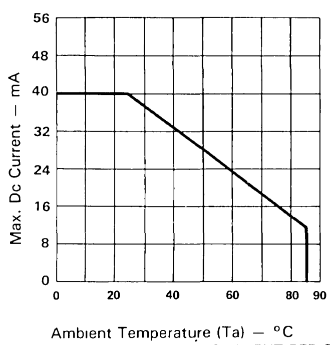


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

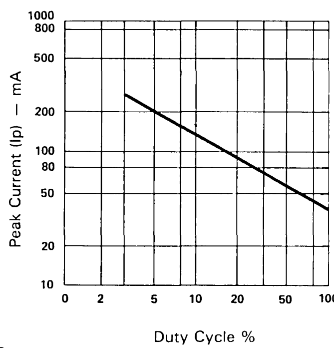


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

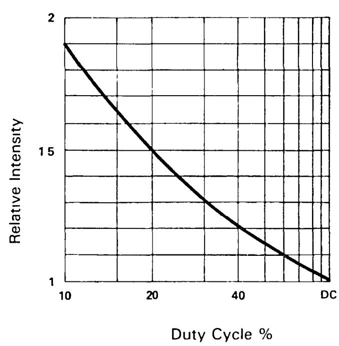


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-30302A/30802A (GREEN)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	6	15		mcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		30		nm	I_F = 20 mA
Forward Voltage, any Segment (D.P.)	V_F		12.6 (4.2)	16.8 (5.6)	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 30V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

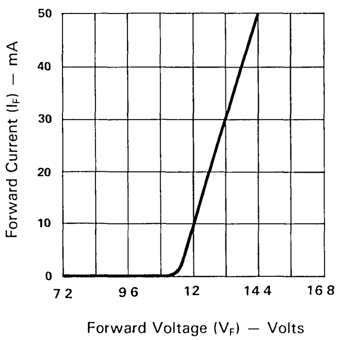


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

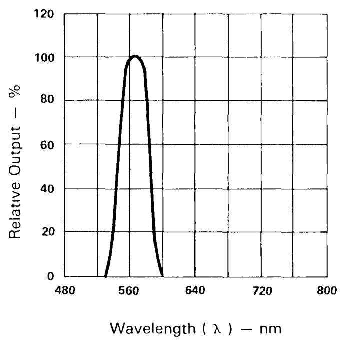


Fig 2 SPECTRAL RESPONSE

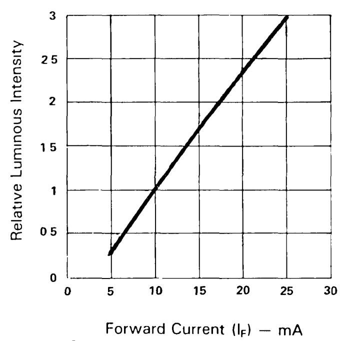


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

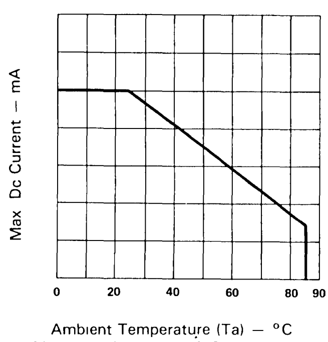


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

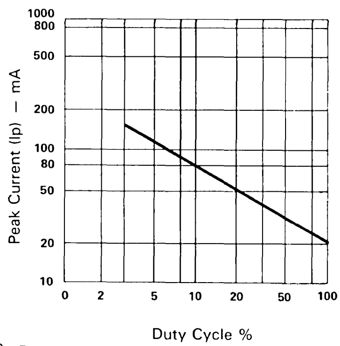


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

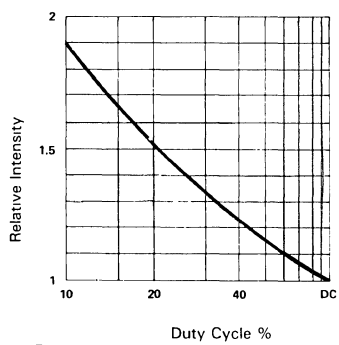


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-30302A/30802A (ORANGE)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	6	15		mcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment (D.P.)	V_F		12.6 (4.2)	16.8 (5.6)	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 30V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

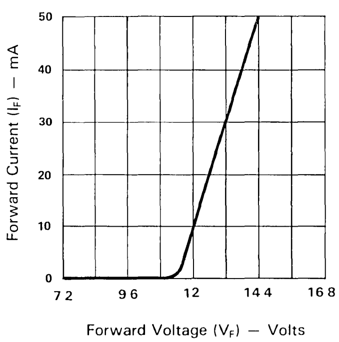


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

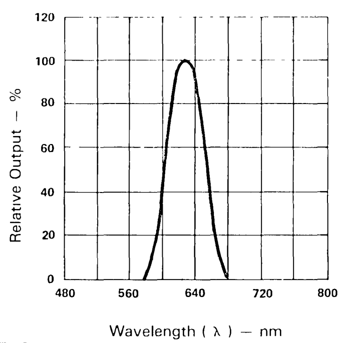


Fig 2 SPECTRAL RESPONSE

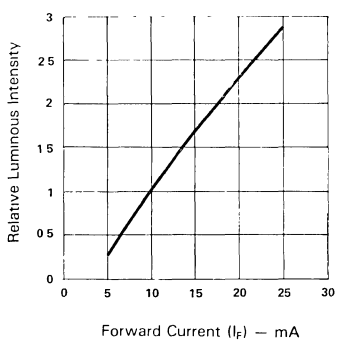


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

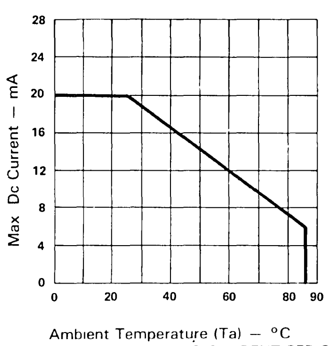


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

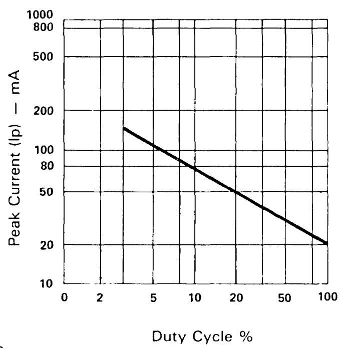


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

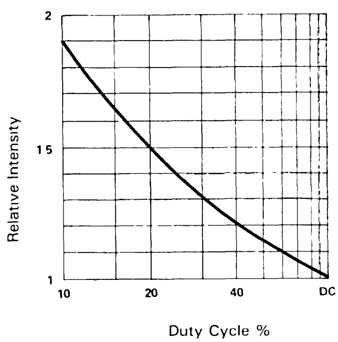


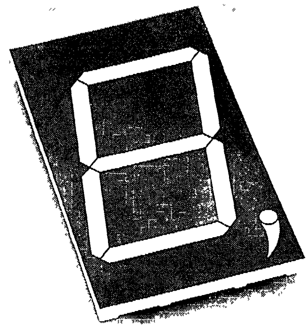
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LITEON

LTS- 50301/50801 50302A/50802A SERIES

5 INCH SINGLE COLOR & MULTICOLOR ULTRA LARGE SINGLE DIGIT LED NUMERICAL DISPLAY

FEATURES



- 5 INCH (127.0mm) ULTRA LARGE DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF TWO BRIGHT COLORS – GREEN/HIGH EFFICIENCY RED.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS – GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED).

DESCRIPTION

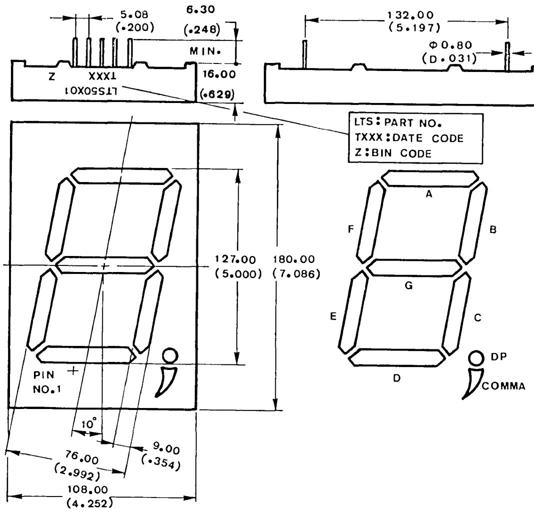
The LTS-50000 series are 5 inch (127 mm) height ultra large single digit displays.
The LTS-50301/50801 series are single color displays. The green displays have black face and green segment color, the high efficiency red displays have black face and red segment color.
The LTS-50302A/50802A are multicolor displays. The multicolor displays have black face and white segment color.
The green series utilize LED chips which are made from GaP on a transparent GaP substrate. The high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

DEVICES

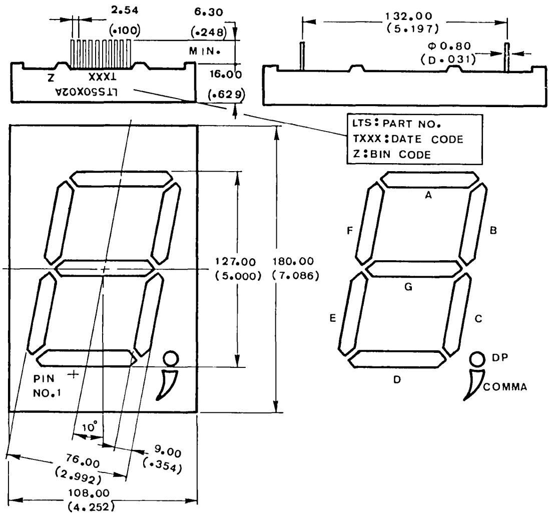
PART NO. LTS–			DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	HI.-EFF. RED	MULTI-COLOR			
50301G	50301HRB	—	Common Cathode	A	A
50801G	50801HRB	—	Common Anode	A	B
—	—	50302A	Common Cathode	B	C
—	—	50802A	Common Anode	B	D

PACKAGE DIMENSIONS

A. LTS-50301/50801



B. LTS-50302A /50802 A



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are.

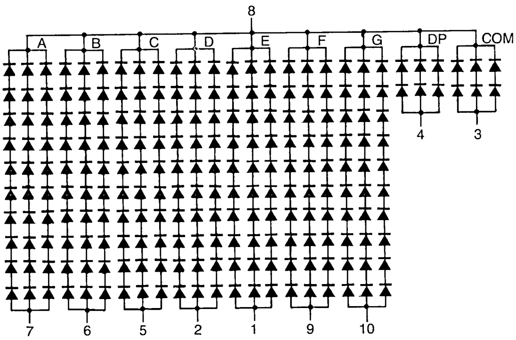
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$
2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

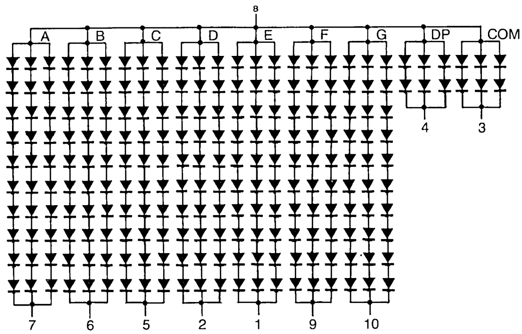
PIN NO.	CONNECTION			
	LTS-50301	LTS-50801	LTS-50302A	LTS-50802A
1	Segment E Anode	Segment E Cathode	Anode E, Green	Cathode E, Green
2	Segment D Anode	Segment D Cathode	Anode E, Orange	Cathode E, Orange
3	Comma Anode	Comma Cathode	Anode D, Green	Cathode D, Green
4	D.P. Anode	D.P. Cathode	Anode D, Orange	Cathode D. Orange
5	Segment C Anode	Segment C Cathode	Anode Comma, Green	Cathode Comma, Green
6	Segment B Anode	Segment B Cathode	Anode Comma, Orange	Cathode Comma, Orange
7	Segment A Anode	Segment A Cathode	Anode DP. Green	Cathode DP. Green
8	Common Cathode	Common Anode	Anode DP. Orange	Cathode DP. Orange
9	Segment F Anode	Segment F Cathode	Anode C, Green	Cathode C, Green
10	Segment G Anode	Segment G Cathode	Anode C, Orange	Cathode C, Orange
11			Anode B, Green	Cathode B, Green
12			Anode B, Orange	Cathode B, Orange
13			Anode A, Green	Cathode A, Green
14			Anode A, Orange	Cathode A, Orange
15			Cathode Common, Green	Anode Common, Green
16			Cathode Common, Orange	Anode Common, Orange
17			Anode G Green	Cathode G, Green
18			Anode G, Orange	Cathode G, Orange
19			Anode F, Green	Cathode F, Green
20			Anode E, Orange	Cathode F, Orange

INTERNAL CIRCUIT DIAGRAM

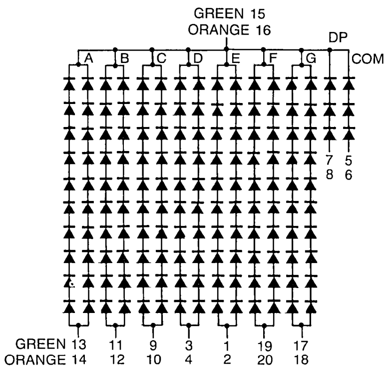
A. LTS-50301



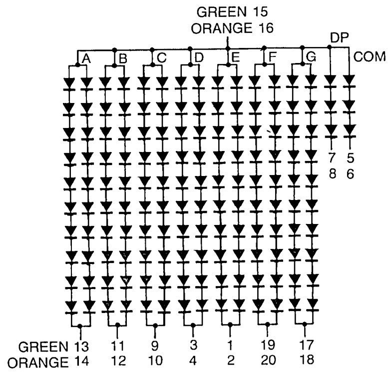
B. LTS-50801



C. LTS-50302A



D. LTS-50802A



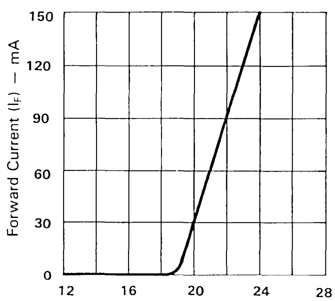
ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	50x01		50x02A		UNIT
	GREEN	HI.-EFF. RED	GREEN	ORANGE	
Power Dissipation Per Segment	1200	1200	900	900	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	180	180	160	160	mA
Continuous Forward Current Per Segment	60	60	40	40	mA
Derating Linear From 25°C Per Segment	0.72	0.72	0.48	0.48	mA/°C
Reverse Voltage Per Segment	50	50	50	50	V
Operating Temperature Range	– 25°C to + 85°C				
Storage Temperature Range	– 25°C to + 85°C				
Soler Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C					

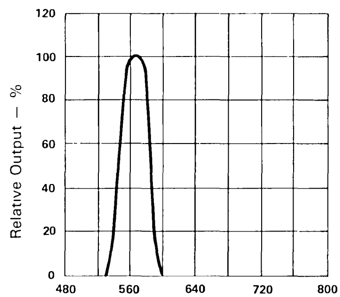
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-50301G/50801G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	21	60		mcd	I_F = 30 mA
Peak Emission Wavelength	λp		565		nm	I_F = 60 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 60 mA
Forward Voltage, any Segment (D P.)	V_F		21 (4.2)	28 (5.6)	V	I_F = 60 mA
Reverse Current, any Segment	I_R			300	μA	V_R = 50V
Luminous Intensity Matching Ratio	Iv-m			2.1		I_F = 60 mA

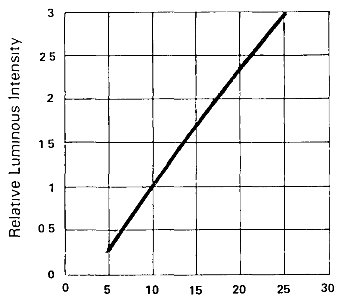
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



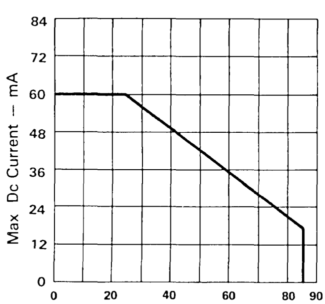
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



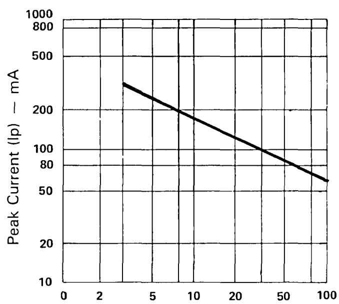
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



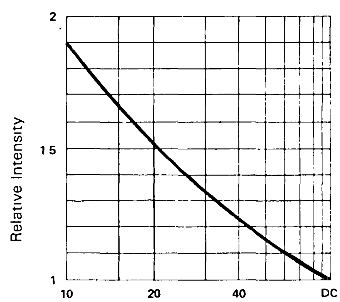
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-50301HRB/50801HRB

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	21	60		mcd	I_F = 30 mA
Peak Emission Wavelength	λp		630		nm	I_F = 60 mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	I_F = 60 mA
Forward Voltage, any Segment (D.P.)	V_F		21 (4 2)	28 (5.6)	V	I_F = 60 mA
Reverse Current, any Segment	I_R			300	μA	V_R = 50V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 60 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

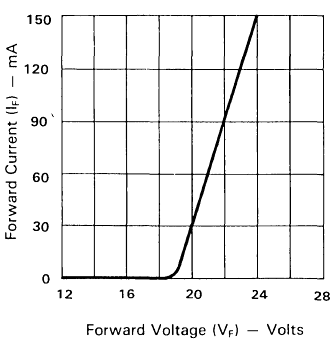


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

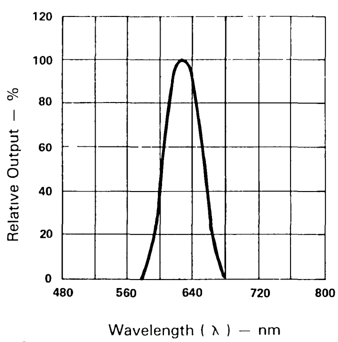


Fig 2 SPECTRAL RESPONSE

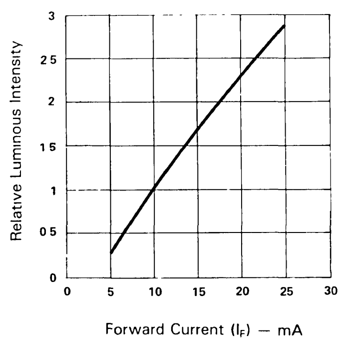


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

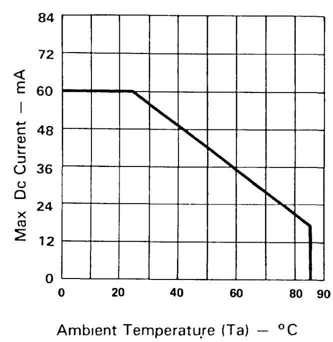


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

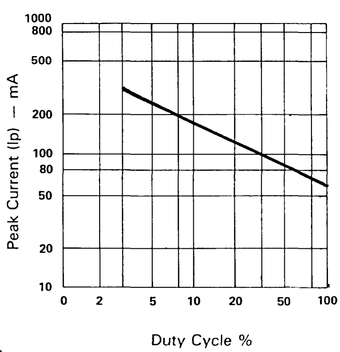


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

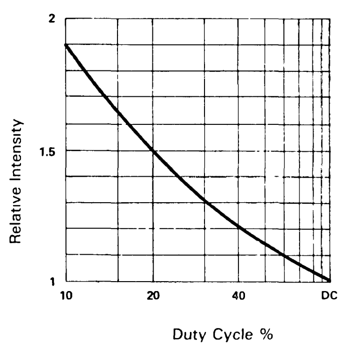
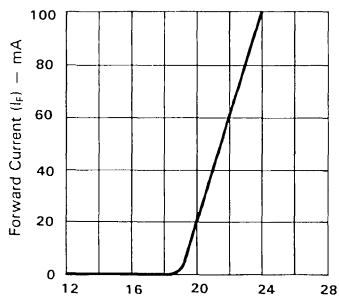


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

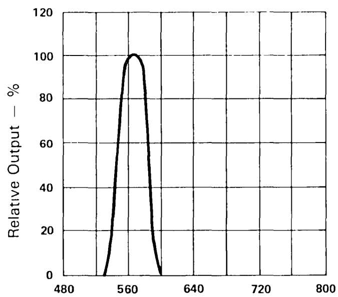
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-50302A/50802A (GREEN)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	13	40		mcd	I_F = 20 mA
Peak Emission Wavelength	λp		565		nm	I_F = 40 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 40 mA
Forward Voltage, any Segment (D.P.)	V_F		21 (6.3)	28 (8 4)	V	I_F = 40 mA
Reverse Current, any Segment	I_R			200	μA	V_R = 50V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 40 mA

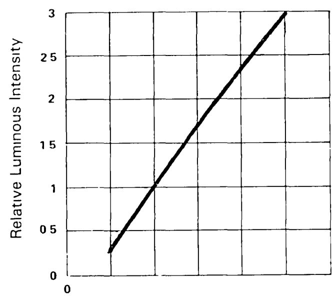
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



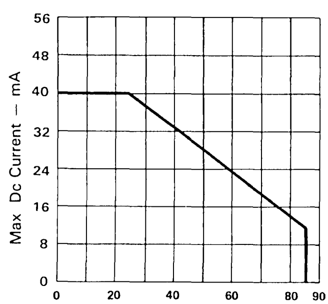
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



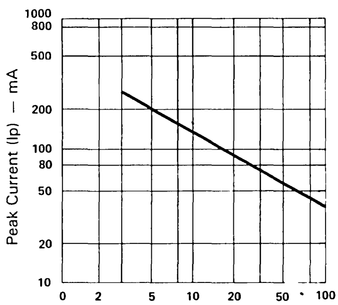
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



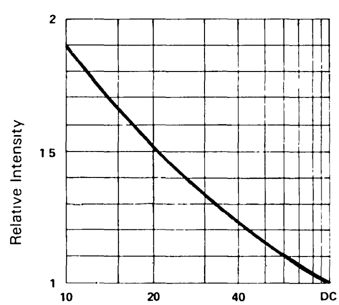
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



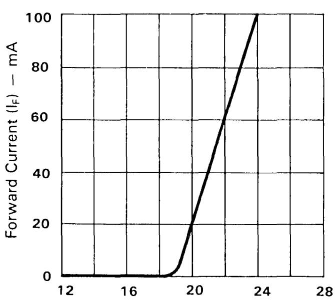
Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-50302A/50802A (ORANGE)

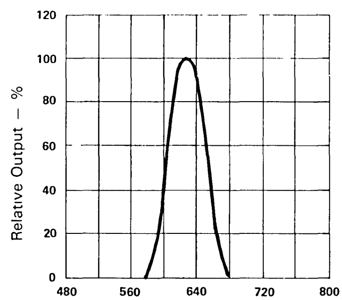
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	16	40		mcd	I_F = 20 mA
Peak Emission Wavelength	λp		630		nm	I_F = 40 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 40 mA
Forward Voltage, any Segment (D.P.)	V_F		21 (6.3)	28 (8.4)	V	I_F = 40 mA
Reverse Current, any Segment	I_R			200	μA	V_R = 50V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 40 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

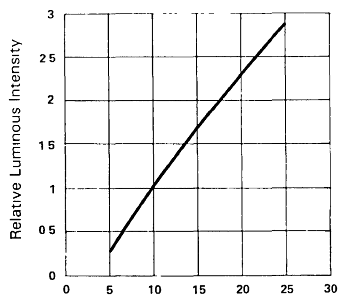
(25°C Ambient Temperature Unless Otherwise Noted)



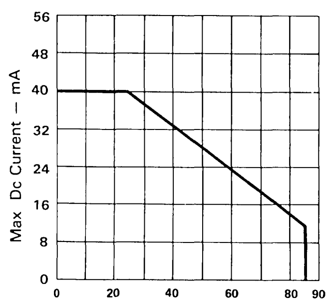
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



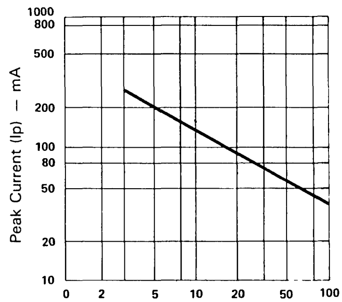
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



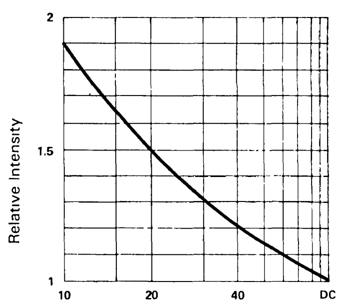
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

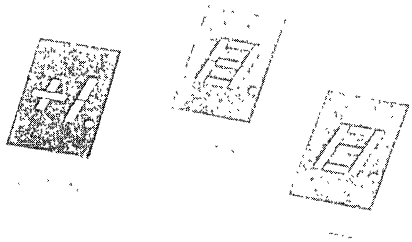


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LITEON

LTS-310A SERIES

0.3" SINGLE DIGIT NUMERIC DISPLAYS



FEATURES

- 0.3 INCH (7.62mm) DIGIT HEIGHT.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED / GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.

DESCRIPTION

The LTS-310A series are 0.3 inch (7.62mm) height single digit displays.

The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red and bright red displays have black face and red segment color. Green and yellow displays have gray face and white segment color. Orange displays have orange face and orange segment color. High efficiency red displays have red face and red segment color.

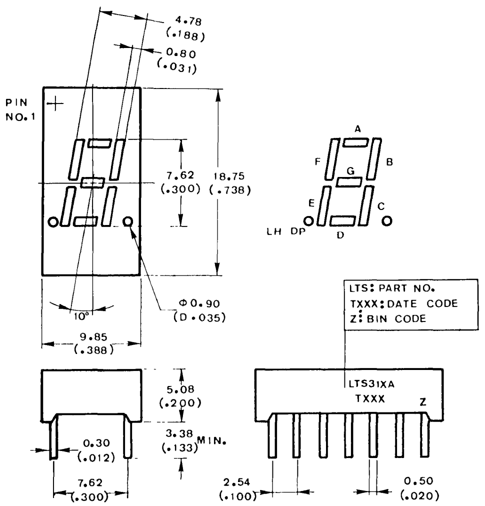
SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

DEVICES

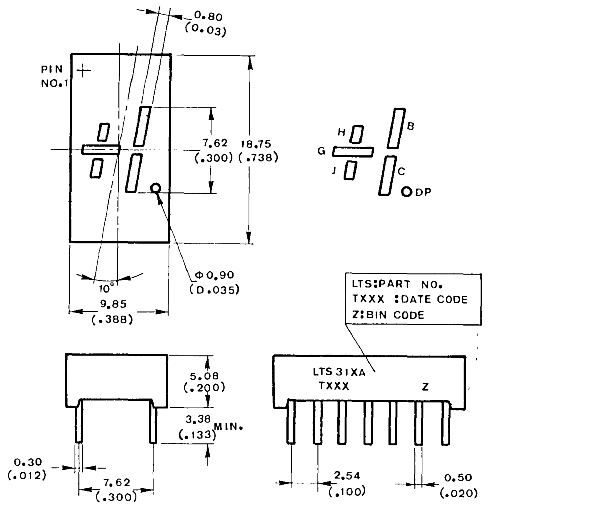
PART NO. LTS–						DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED			
311AR	311AP	311AG	311AY	311AE	311AHR	Universal, ± 1 Overflow	B	A
312AR	312AP	312AG	312AY	312AE	312AHR	Common Anode, Rt. and Lt. Hand Decimal	A	B
313AR	313AP	313AG	313AY	313AE	313AHR	Common Cathode, Rt. Hand Decimal	A	C
315AR	315AP	315AG	315AY	315AE	315AHR	Common Cathode, Rt. Hand Decimal	A	D
316AR	316AP	316AG	316AY	316AE	316AHR	Common Anode, ± 1 Overflow	B	E

PACKAGE DIMENSIONS

A. LTS-312A/313A/315A



B. LTS-311A/316A



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$
2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

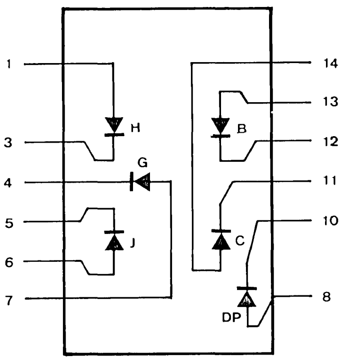
PIN CONNECTION

PIN NO.	CONNECTION				
	A. LTS-311A	**B. LTS-312A**	**C. LTS-313A**	**D. LTS-315A**	**E. LTS-316A**
1	Anode H	Cathode A	Common Cathode *2	Anode F	Anode G,H&J *4
2	No Pin	Cathode F	Anode F	Anode G	No Pin
3	Cathode H	Common Anode *1	Anode G	No Pin	Anode G, H&J *4
4	Cathode G	No Pin	Anode E	Common Cathode *3	No Pin
5	Cathode J	No Pin	Anode D	No Pin	No Pin
6	Anode J	Cathode L.D.P.	Common Cathode *2	Anode E	No Pin
7	Anode G	Cathode E	Anode D.P.	Anode D	Cathode H&J
8	Anode D.P.	Cathode D	Anode C	Anode C	Cathode G
9	No Pin	Cathode R.D.P.	Anode B	Anode D.P.	No Connection
10	Cathode D.P.	Cathode C	Anode A	No Pin	Cathode C
11	Cathode C	Cathode G	—	No Pin	Cathode B
12	Cathode B	No Pin	—	Common Cathode *3	No Pin
13	Anode B	Cathode B	—	Anode B	No Pin
14	Anode C	Common Anode *1	—	Anode A	Anode B&C

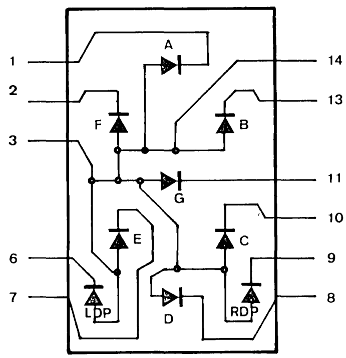
NOTES
1. Pin 3 & 14 are internally connected
2. Pin 1 & 6 are internally connected
3. Pin 4 & 12 are internally connected.
4. Pin 1 & 3 are internally connected

INTERNAL CIRCUIT DIAGRAM

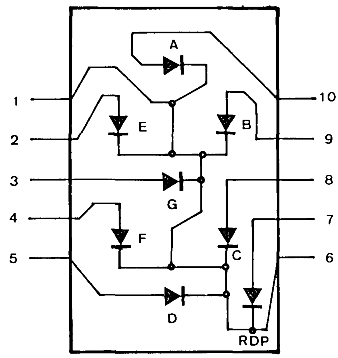
A. LTS-311A



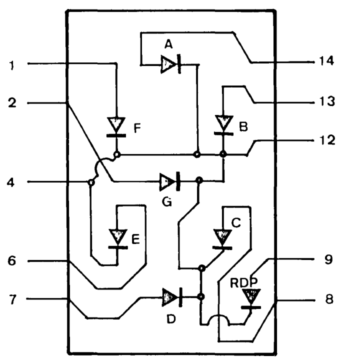
B. LTS-312A



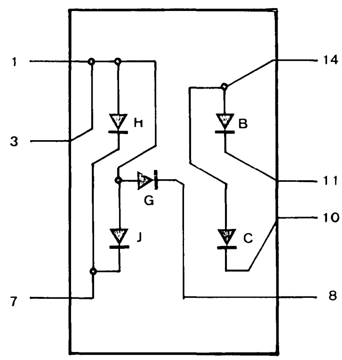
C. LTS-313A



D. LTS-315A



E. LTS-316A



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75*	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	– 25°C to + 85°C						
Storage Temperature Range	– 25°C to + 85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-310AR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	200	500		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

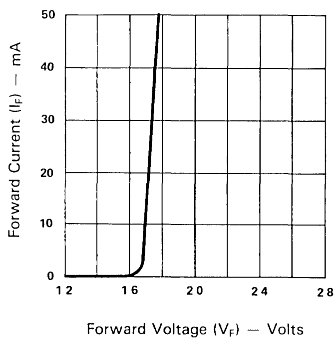


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

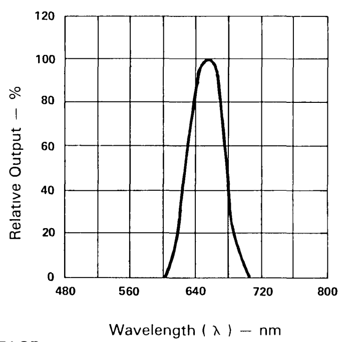


Fig 2 SPECTRAL RESPONSE

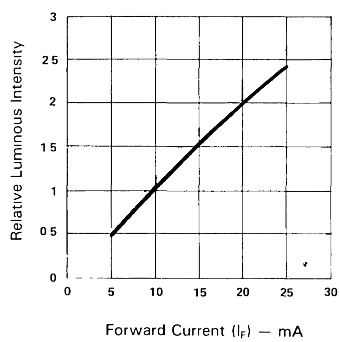


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

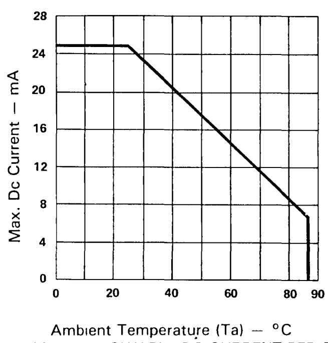


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

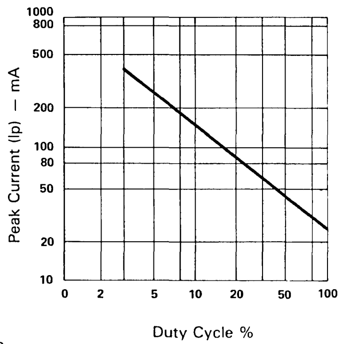


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

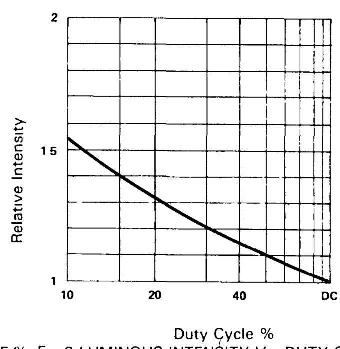


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-310AP SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	320	750		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

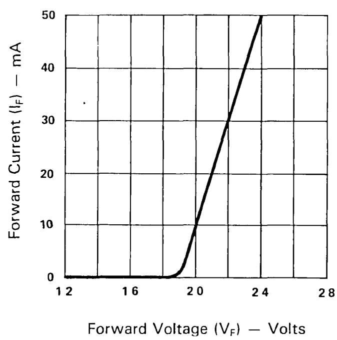


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

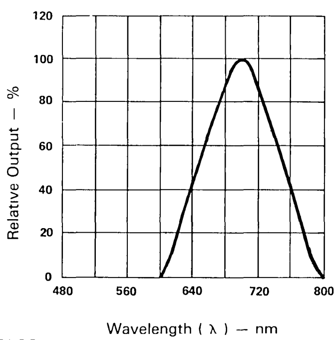


Fig 2 SPECTRAL RESPONSE

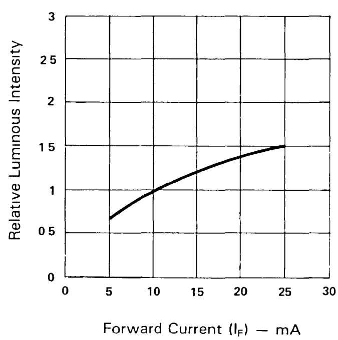


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

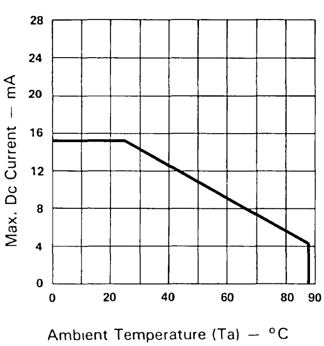


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

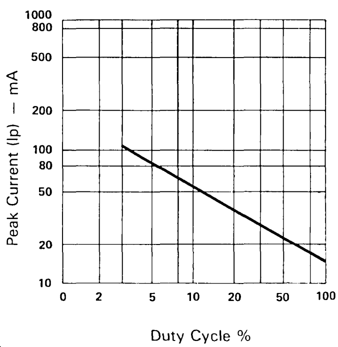


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-310AG SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	800	2000		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		565		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		30		nm	$I_F = 20$ mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	μA	$V_R = 5V$
Luminous Intensity Matching Ratio	Iv-m			2:1		$I_F = 20$ mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

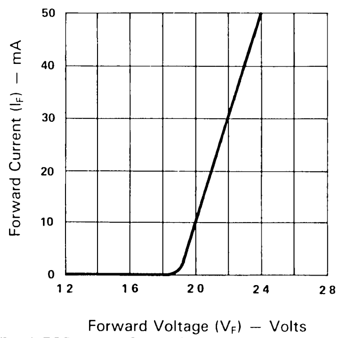


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

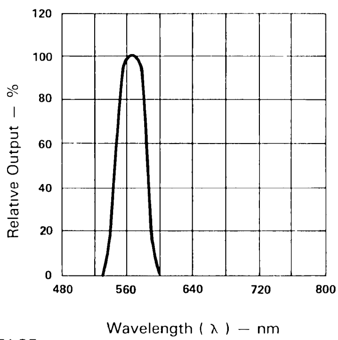


Fig 2 SPECTRAL RESPONSE

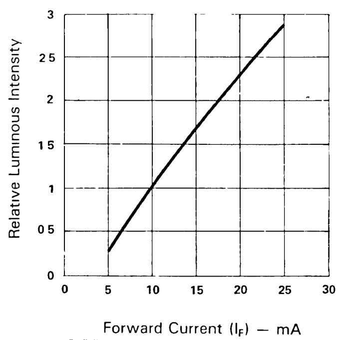


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

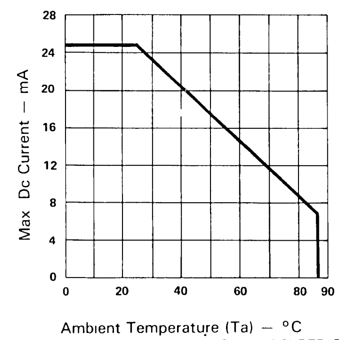


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

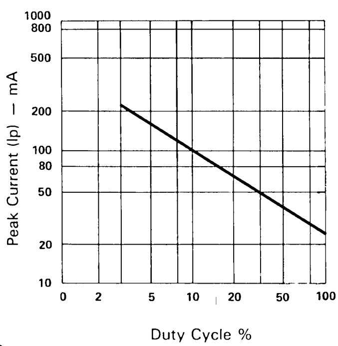


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

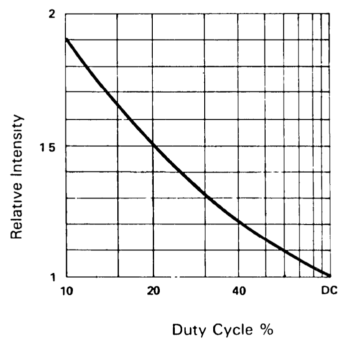


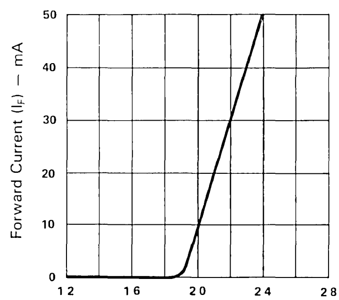
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-310AY SERIES

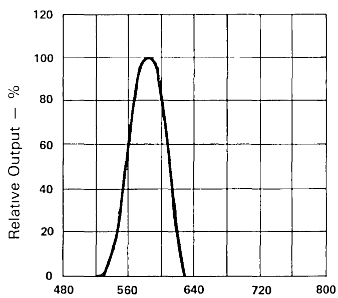
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	800	2000		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		585		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		35		nm	$I_F = 20$ mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	μA	$V_R = 5V$
Luminous Intensity Matching Ratio	Iv-m			2:1		$I_F = 20$ mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

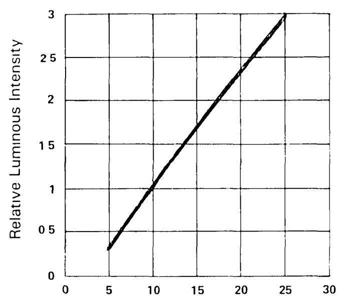
(25°C Ambient Temperature Unless Otherwise Noted)



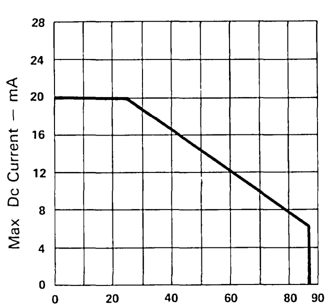
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



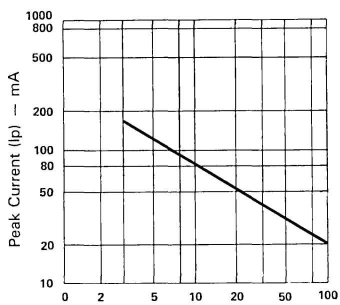
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



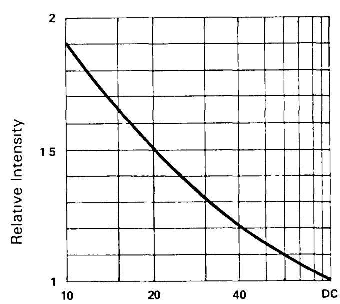
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



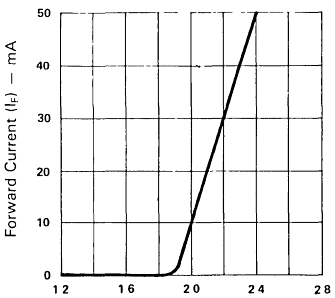
Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-310AE SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

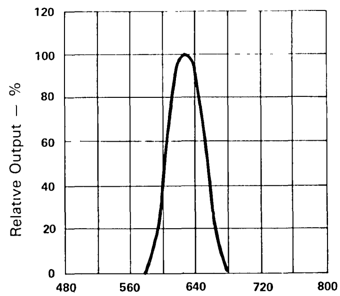
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)



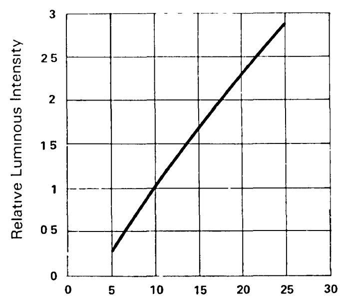
Forward Voltage (V_F) — Volts

Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



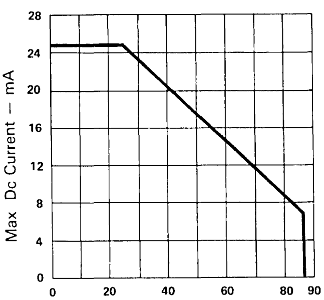
Wavelength (λ) — nm

Fig 2 SPECTRAL RESPONSE



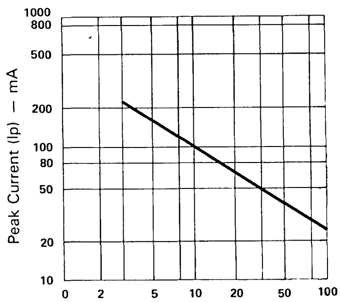
Forward Current (I_F) — mA

Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



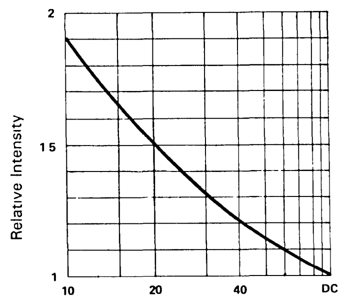
Ambient Temperature (Ta) — °C

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ C$
LTS-310AHR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_v	800	2000		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		635		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	$I_F = 20$ mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	μA	$V_R = 5V$
Luminous Intensity Matching Ratio	$I_{v\text{-}m}$			2:1		$I_F = 20$ mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

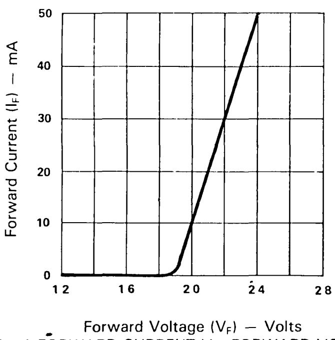


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

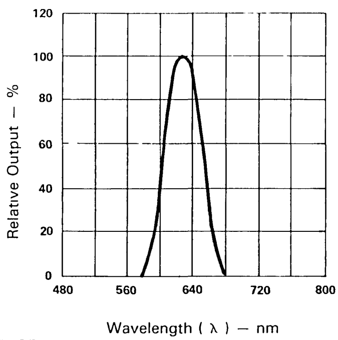


Fig 2 SPECTRAL RESPONSE

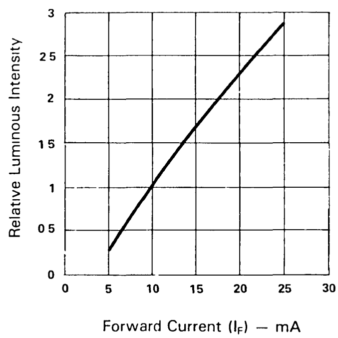


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

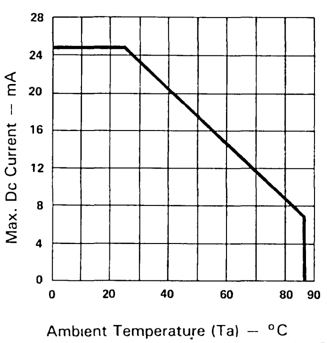


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

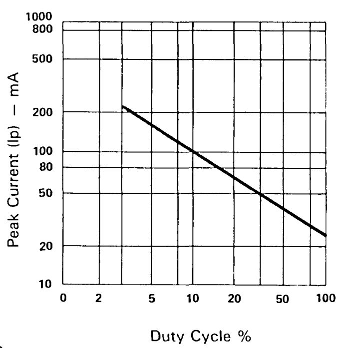


Fig 5 MAX. PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

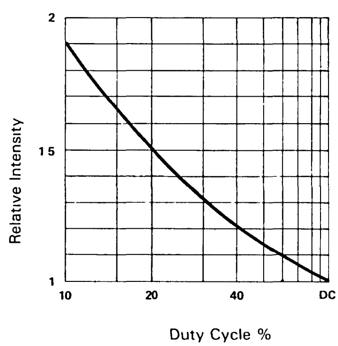


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

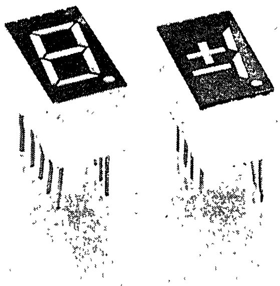
LITEON

LTS-360 SERIES

0.36" SINGLE DIGIT NUMERIC DISPLAYS

FEATURES

- 0.36 INCH (9.20mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF FIVE BRIGHT COLORS-RED/BRIGHT RED/GREEN/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARDS.



DESCRIPTION

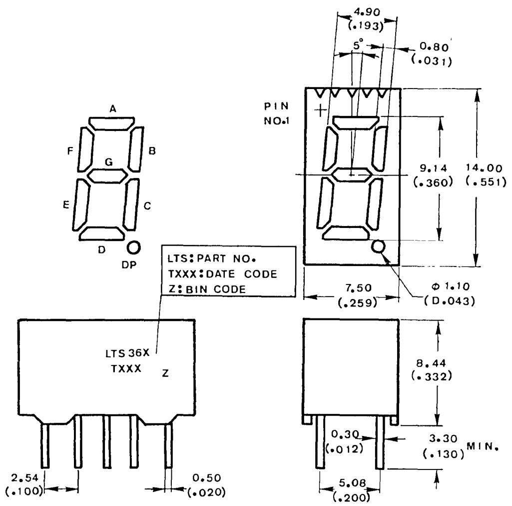
The LTS-360 series are 0.36 inch (9.20mm) height single digit displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red, bright red and high efficiency red displays have red face and red segment color. Green and orange displays have gray face and white segment color.

DEVICES

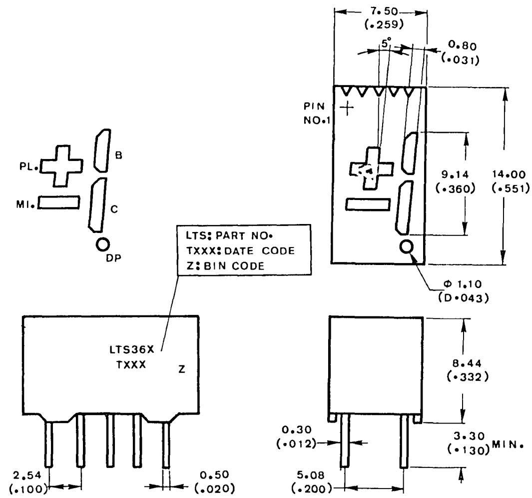
PART NO. LTS–					DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	ORANGE	HI.-EFF. RED			
360R	360P	360G	360E	360HR	Common Anode, Rt. Hand Decimal	A	A
367R	367P	367G	367E	367HR	Common Cathode, Rt. Hand Decimal	A	B
368R	368P	368G	368E	368HR	Common Cathode, ±1 Overflow	B	C

PACKAGE DIMENSIONS

A. LTS-360/367



B. LTS-368



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

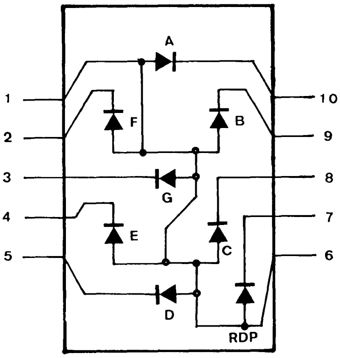
PIN CONNECTION

PIN NO.	CONNECTION		
	A. LTS-360	B. LTS-367	C. LTS-368
1	Common Anode *1	Common Cathode *1	Cathode Pl. & Mi. *
2	Cathode F	Anode F	Anode Plus Sign
3	Cathode G	Anode G	Anode Minus Sign
4	Cathode E	Anode E	Cathode Pl. & Mi. *2
5	Cathode D	Anode D	No Pin
6	Common Anode *1	Common Cathode *1	Cathode B, C & D.P. *3
7	Cathode D.P.	Anode D.P.	Anode D.P.
8	Cathode C	Anode C	Anode C
9	Cathode B	Anode B	Anode B
10	Cathode A	Anode A	Cathode B, C & D.P. *3

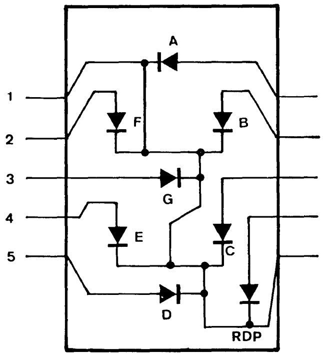
NOTES: 1. Pin 1 & 6 are internally connected.
2. Pin 1 & 4 are internally connected.
3. Pin 6 & 10 are internally connected.

INTERNAL CIRCUIT DIAGRAM

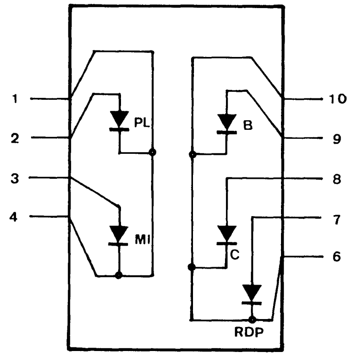
A. LTS-360



B. LTS-367



C. LTS-368



ABSOLUTE MAXIMUM RATINGS AT TA = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	100	100	mA
Continuous Forward Current Per Segment	25	15	25	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	V
Operating Temperature Range	– 25°C to + 85°C					
Storage Temperature Range	– 25°C to + 85°C					
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C						

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-360R SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	500		μcd	I_F = 10 mA
Peak Emission Wavelength	λ p		655		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		24		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

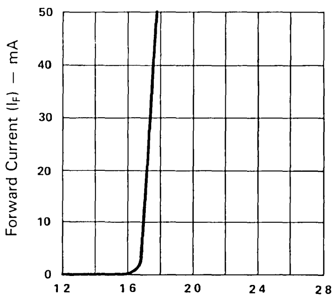


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

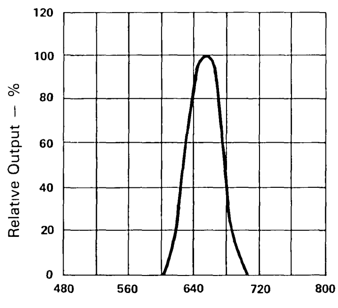


Fig. 2 SPECTRAL RESPONSE

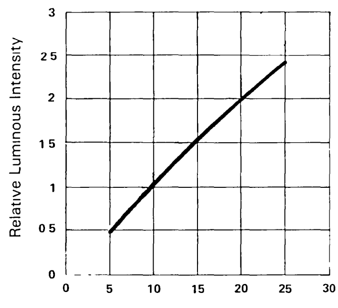


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

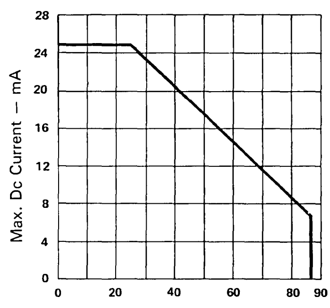


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

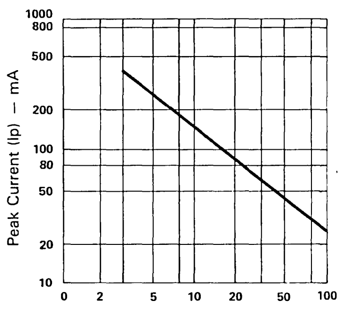


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

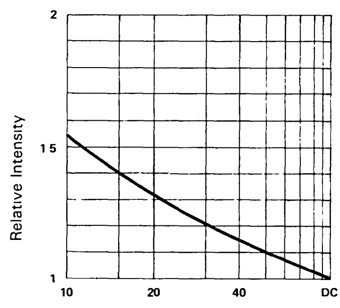


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-360P SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	320	750		μcd	I_F = 10 mA
Peak Emission Wavelength	λ p		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

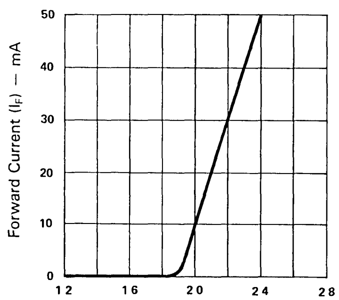


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE.

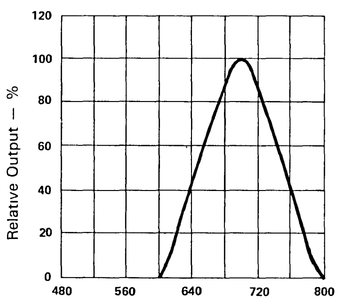


Fig. 2 SPECTRAL RESPONSE.

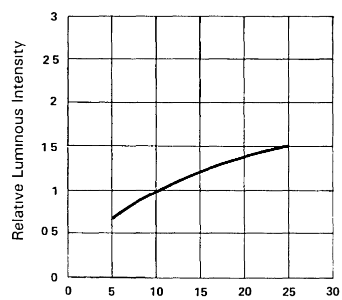


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

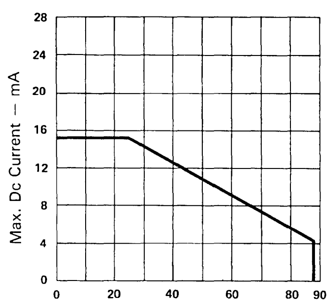


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

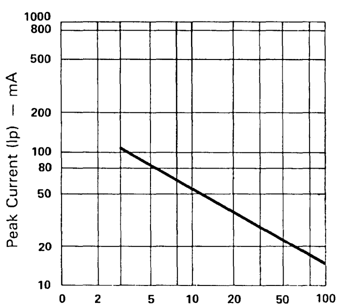


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

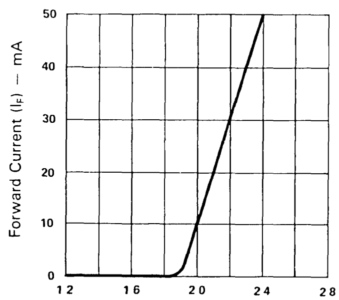
ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-360G SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

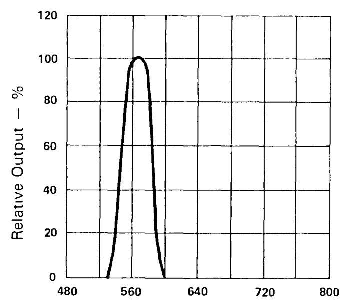
SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

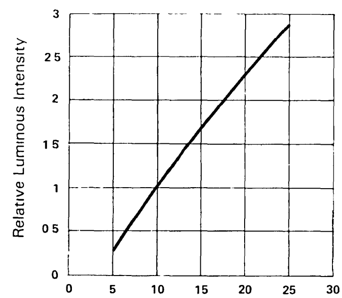
(25°C Ambient Temperature Unless Otherwise Noted)



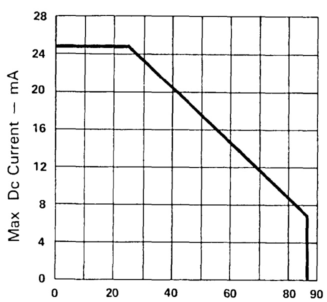
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



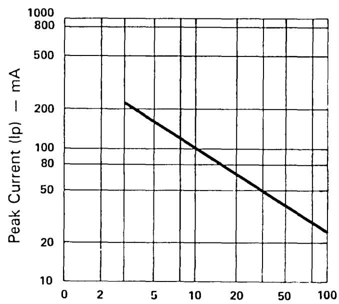
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



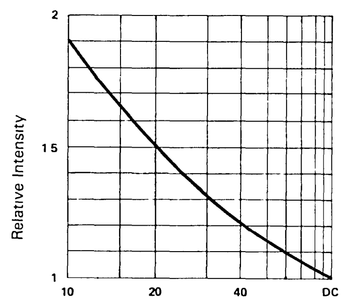
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



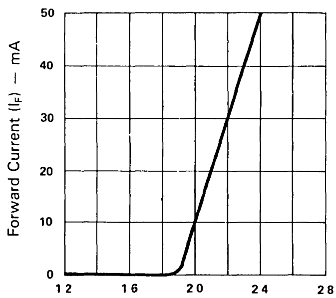
Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-360E SERIES

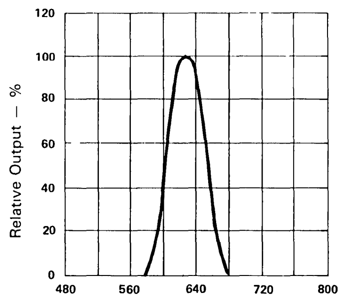
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λ p		630		nm	$I_F = 20$ mA
Spectral Line Half-Width	Δλ		40		nm	$I_F = 20$ mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	μA	$V_R = 5V$
Luminous Intensity Matching Ratio	Iv-m			2:1		$I_F = 20$ mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

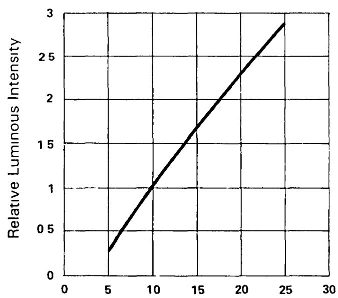
(25°C Ambient Temperature Unless Otherwise Noted)



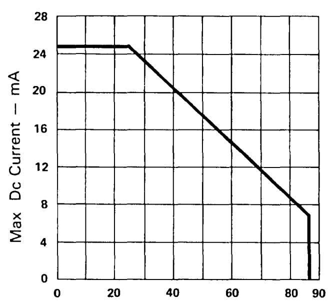
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



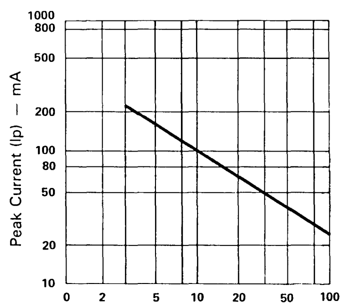
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



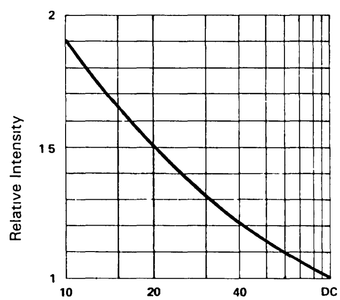
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-360HR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

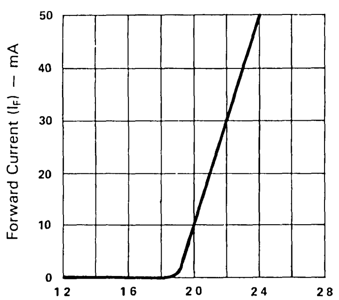


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

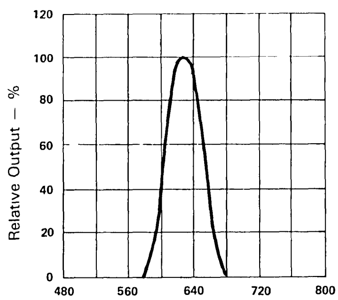


Fig 2 SPECTRAL RESPONSE

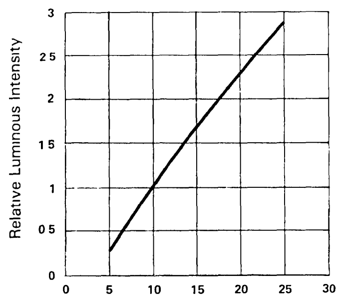


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

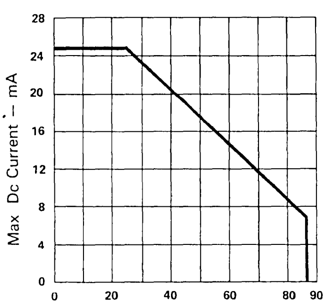


Fig. 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

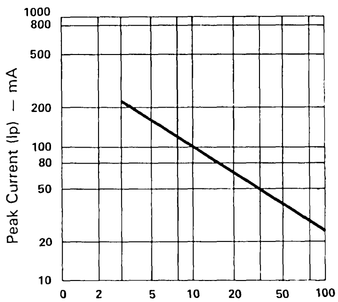


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

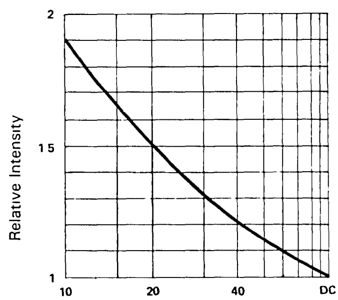


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

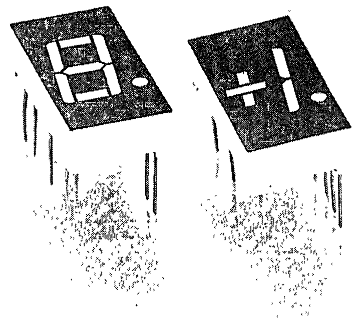
LITEON

LTS-4000A SERIES

0.4" SINGLE DIGIT NUMERIC DISPLAYS

FEATURES

- 0.4 INCH (10.16mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

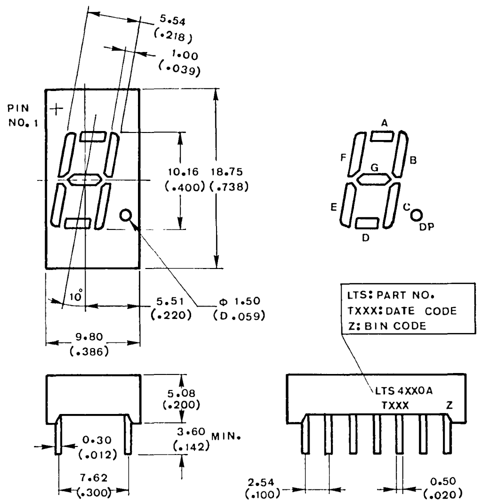
The LTS-4000A series are 0.4 inch (10.16mm) height single digit displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red and bright red displays have black face and red segment color. Green and yellow displays have gray face and white segment color. Orange displays have orange face and orange segment color. High efficiency red displays have red face and red segment color.

DEVICES

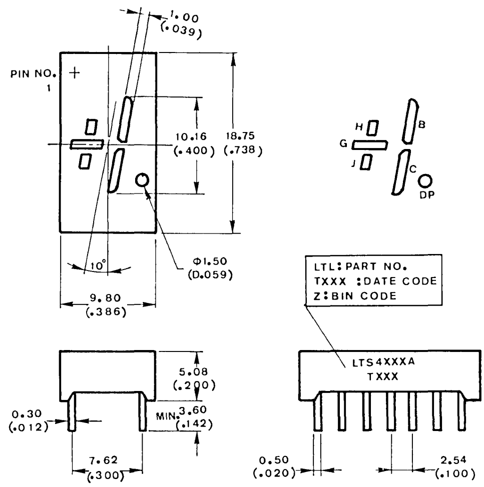
PART NO. LTS–						DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED			
4705AR	4705AP	4505AG	4805AY	4605AE	4905AHR	Universal, ±1 Overflow	B	A
4710AR	4710AP	4510AG	4810AY	4610AE	4910AHR	Common Anode, Rt. Hand Decimal	A	B
4730AR	4730AP	4530AG	4830AY	4630AE	4930AHR	Common Anode, ±1 Overflow	B	C
4740AR	4740AP	4540AG	4840AY	4640AE	4940AHR	Common Cathode, Rt. Hand Decimal	A	D
4780AR	4780AP	4580AG	4880AY	4680AE	4980AHR	Common Cathode, Rt. Hand Decimal	A	E

PACKAGE DIMENSIONS

A. LTS-4x10A/4x40A/4x80A



B. LTS-4x05A/4x30A



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$
2. $\frac{\pm 0.25 \text{ mm}}{(0.010'')}$ unless otherwise noted.

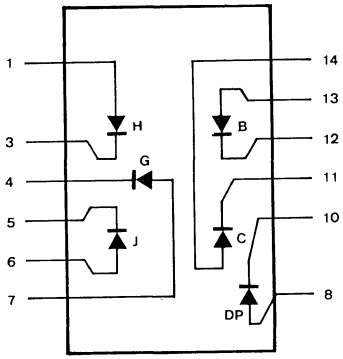
PIN CONNECTION

PIN NO.	CONNECTION				
	A. LTS-4x05A	B. LTS-4x10A	C. LTS-4x30A	D. LTS-4x40A	E. LTS-4x80A
1	Anode H	Cathode A	Anode G. H & J *2	Anode F	Common Cathode *4
2	No Pin	Cathode F	No Pin	Anode G	Anode F
3	Cathode H	Common Anode *1	Anode G, H & J *2	No Pin	Anode G
4	Cathode G	No Pin	No Pin	Common Cathode *3	Anode E
5	Cathode J	No Pin	No Pin	No Pin	Anode D
6	Anode J	No Pin	No connection	Anode E	Common Cathode *4
7	Anode G	Cathode E	Cathode H & J	Anode D	Anode D. P.
8	Anode D. P.	Cathode D	Cathode G	Anode C	Anode C
9	No Pin	Cathode D.P.	Cathode D.P.	Anode D P	Anode B
10	Cathode D.P.	Cathode C	Cathode C	No Pin	Anode A
11	Cathode C	Cathode G	Cathode B	No Pin	—
12	Cathode B	No Pin	No Pin	Common Cathode *3	—
13	Anode B	Cathode B	No Pin	Anode B	—
14	Anode C	Common Anode *1	Anode B, C & D.P.	Anode A	—

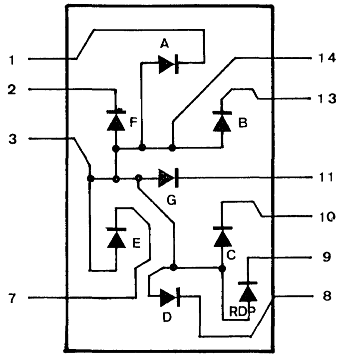
NOTES:
1. Pin 3 & 14 are internally connected.
2. Pin 1 & 3 are internally connected.
3. Pin 4 & 12 are internally connected.
4. Pin 1 & 6 are internally connected.

INTERNAL CIRCUIT DIAGRAM

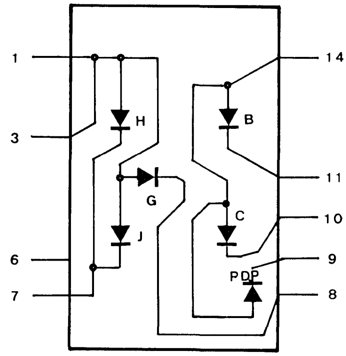
A. LTS-4x05A



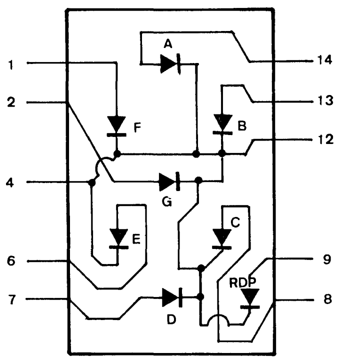
B. LTS-4x10A



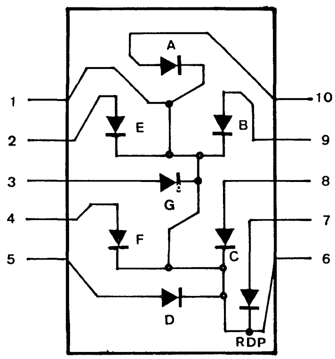
C. LTS-4x30A



D. LTS-4x40A



E. LTS-4x80A



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	– 25°C to + 85°C						
Storage Temperature Range	– 25°C to + 85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-4700AR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	550		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

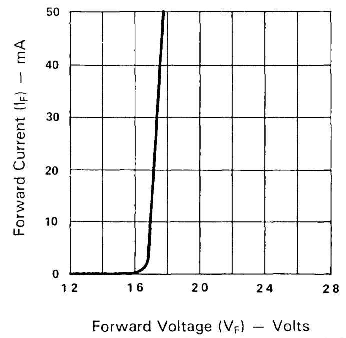


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

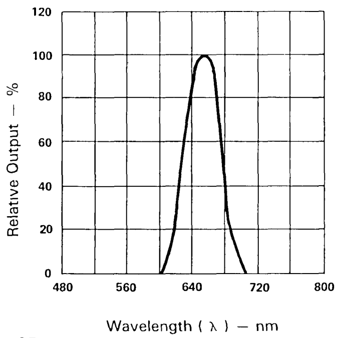


Fig 2 SPECTRAL RESPONSE

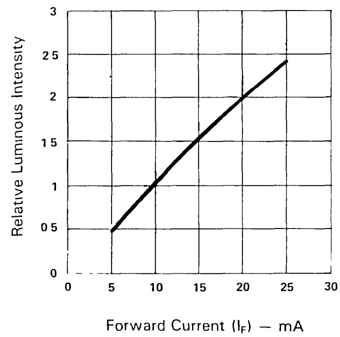


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

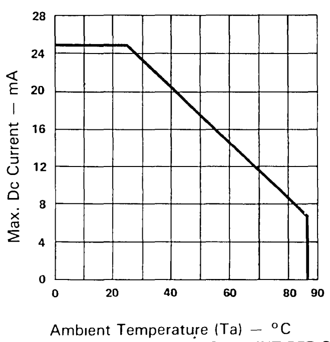


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

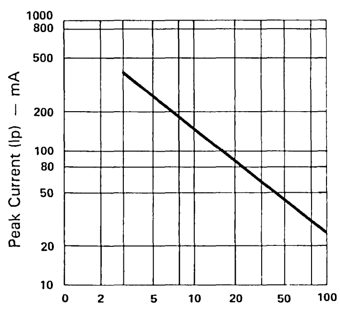


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

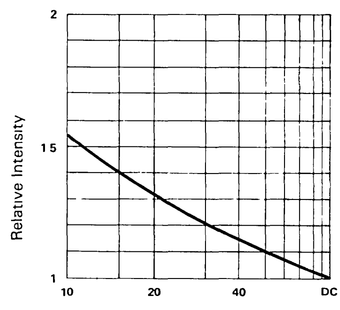


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-4700AP SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	340	850		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

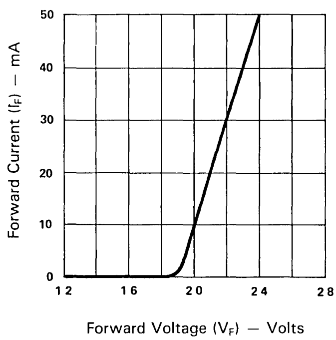


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

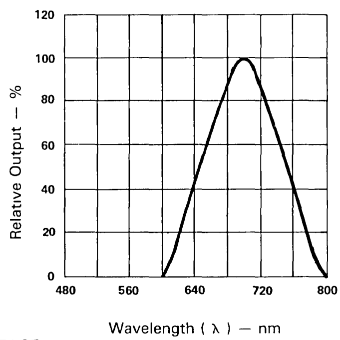


Fig 2 SPECTRAL RESPONSE.

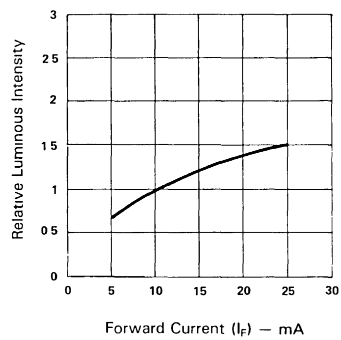


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

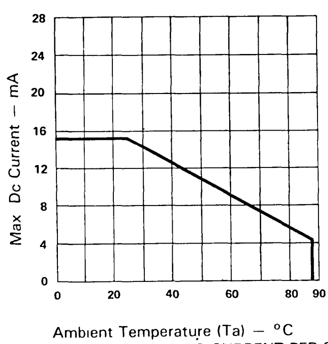


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

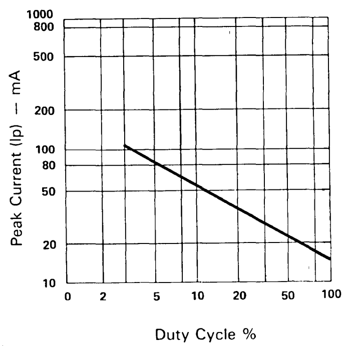


Fig.5 MAX PEAK CURRENT Vs DUTY CYCLE %
(REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-4500AG SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	850	2200		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

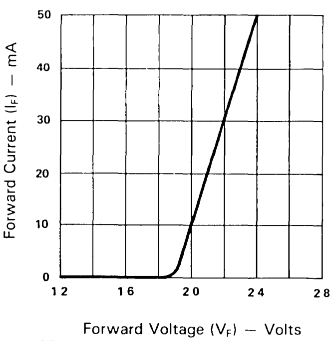


Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE

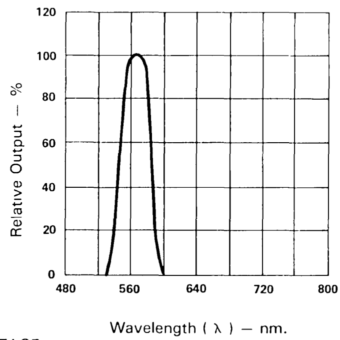


Fig 2 SPECTRAL RESPONSE.

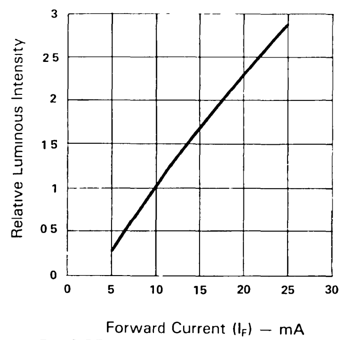


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

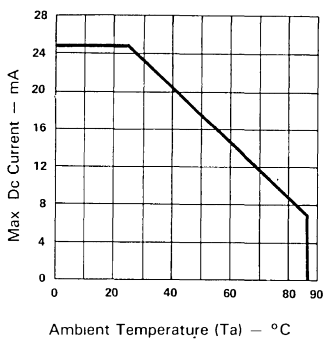


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

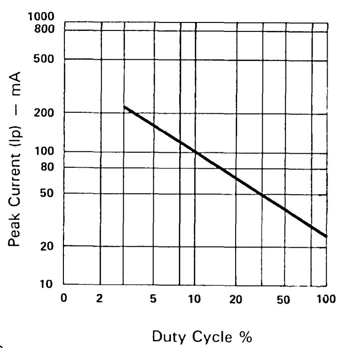


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

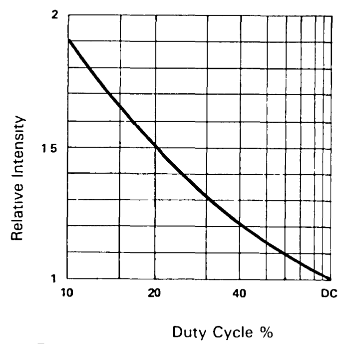


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-4800AY SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2200		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

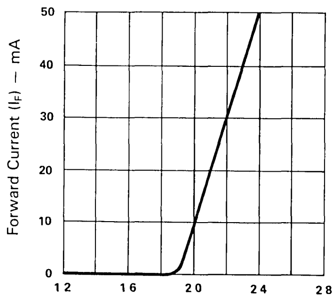


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

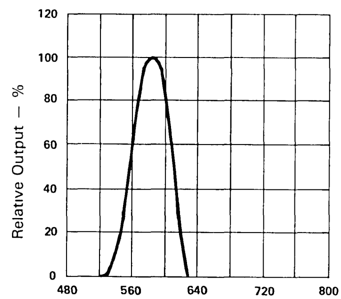


Fig 2 SPECTRAL RESPONSE

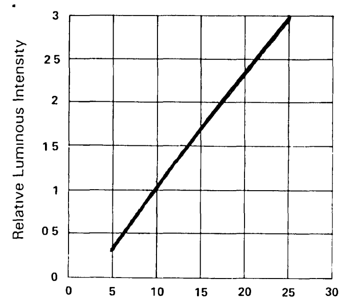


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

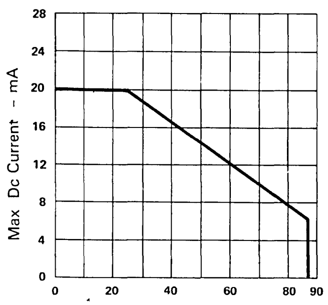


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

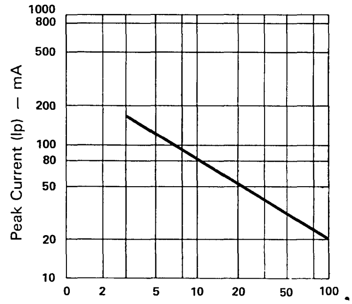


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

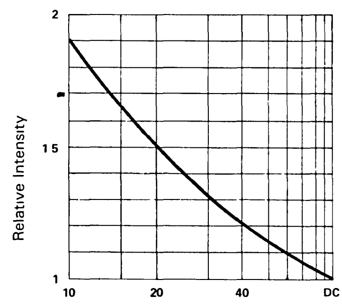


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-4600AE SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	850	2200		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

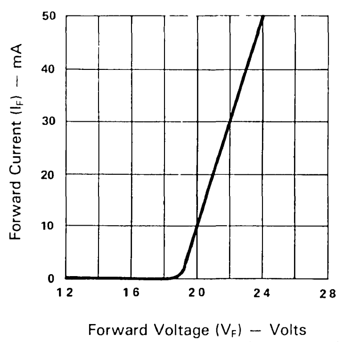


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

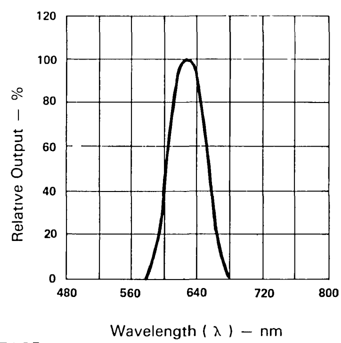


Fig 2 SPECTRAL RESPONSE

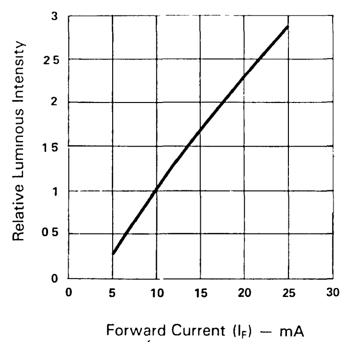


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

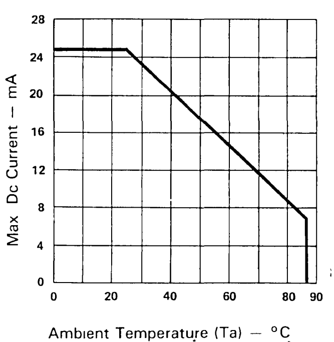


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.

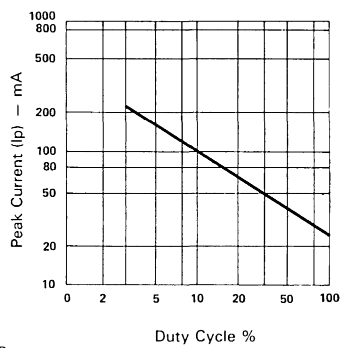


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

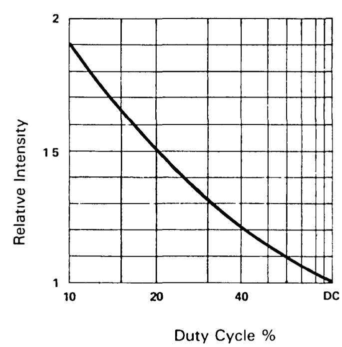


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-4900AHR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	850	2200		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

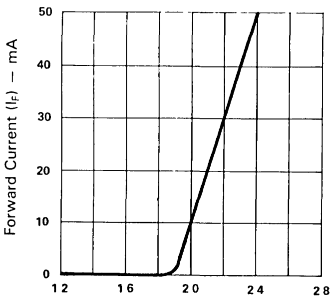


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

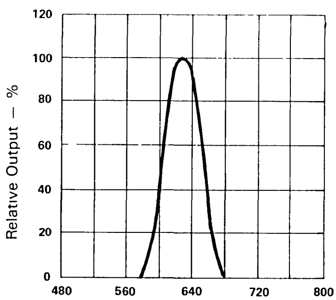


Fig 2 SPECTRAL RESPONSE

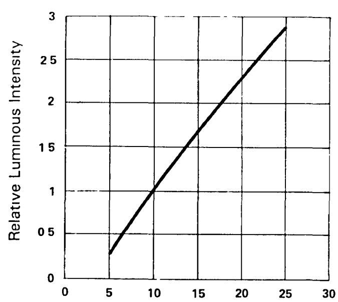


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

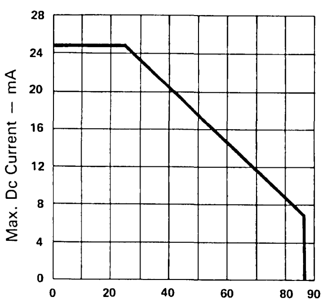


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

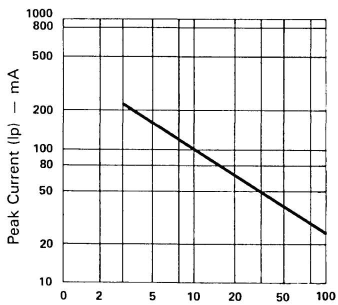


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

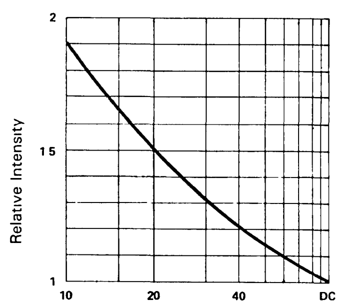


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

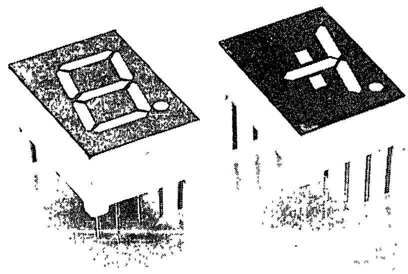
LITEON

LTS-540A SERIES

0.52" SINGLE DIGIT NUMERIC DISPLAYS

FEATURES

- 0.52 INCH (13.2mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

The LTS-540A series are 0.52 inch (13.2mm) height single digit displays.

The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices are utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red, bright red, yellow and orange displays have gray face and white segment color. Green displays have gray face and green segment color. High efficiency red displays have red face and red segment color.

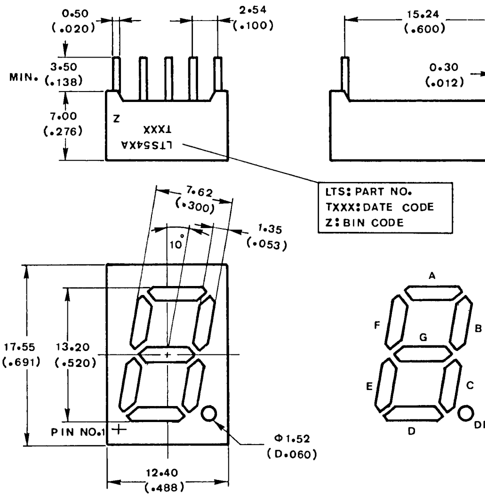
SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

DEVICES

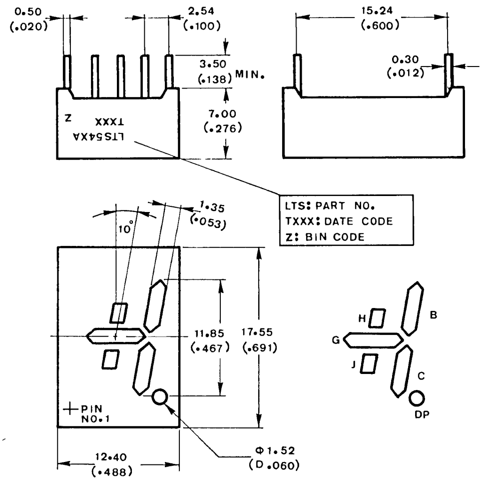
PART NO. LTS–						DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF RED			
546AR	546AP	546AG	546AY	546AE	546AHR	Common Anode, Rt. Hand Decimal	A	A
547AR	547AP	547AG	547AY	547AE	547AHR	Common Cathode, Rt. Hand Decimal	A	B
548AR	548AP	548AG	548AY	548AE	548AHR	Common Anode, ±1 Overflow	B	C
549AR	549AP	549AG	549AY	549AE	549AHR	Common Cathode, ±1 Overflow	B	D

PACKAGE DIMENSIONS

A. LTS-546A/547A



B. LTS-548A/549A



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ toleranceare:

1. Lead length (from seating plane): minimum valum $\frac{\begin{smallmatrix}+1.00\\-0.000\end{smallmatrix}\text{ mm}}{\left(\begin{smallmatrix}+0.040''\\-0.000''\end{smallmatrix}\right)}$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

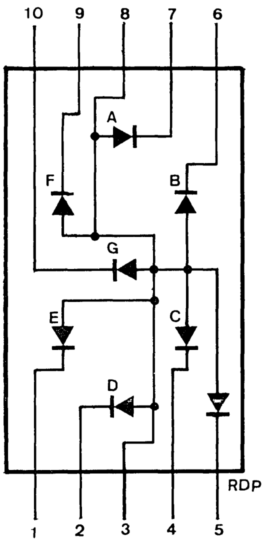
PIN CONNECTION

PIN NO.	CONNECTION			
	A. LTS-546A	B. LTS-547A	C. LTS-548A	D. LTS-549A
1	Cathode E	Anode E	Cathode J	Anode J
2	Cathode D	Anode D	No Connection	No Connection
3	Common Anode*	Common Cathode*	Common Anode*	Common Cathode*
4	Cathode C	Anode C	Cathode C	Anode C
5	Cathode D.P.	Anode D.P.	Cathode D.P.	Anode D.P.
6	Cathode B	Anode B	Cathode B	Anode B
7	Cathode A	Anode A	No Connection	No Connection
8	Common Anode*	Common Cathode*	Common Anode*	Common Cathode*
9	Cathode F	Anode F	Cathode H	Anode H
10	Cathode G	Anode G	Cathode G	Anode G

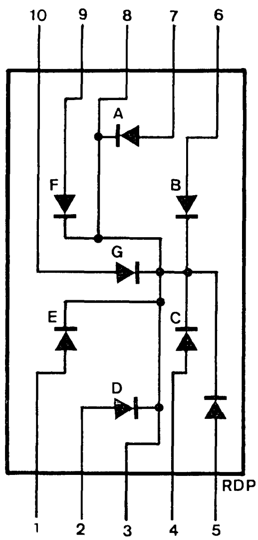
NOTES: 1. Pin 3 & 8 are internally connected.
2. Pin 5 & 6 are internally connected.

INTERNAL CIRCUIT DIAGRAM

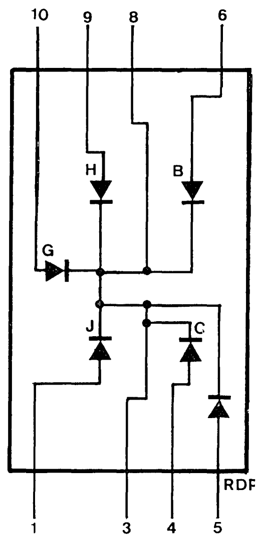
A. LTS-546A



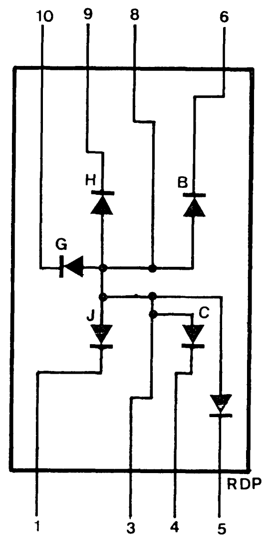
B. LTS-547A



C. LTS-548A



D. LTS-549A



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	– 25°C to + 85°C						
Storage Temperature Range	– 25°C to + 85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-540AR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	500		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

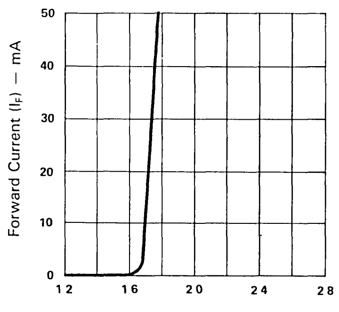


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

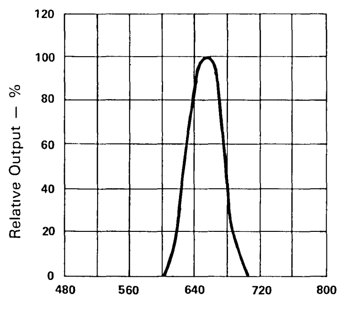


Fig 2 SPECTRAL RESPONSE

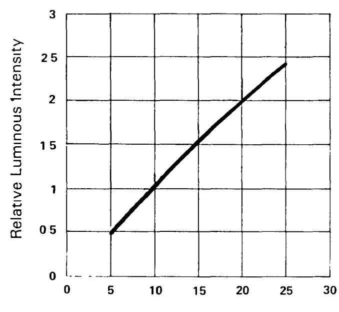


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

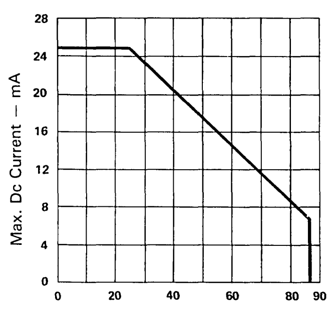


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

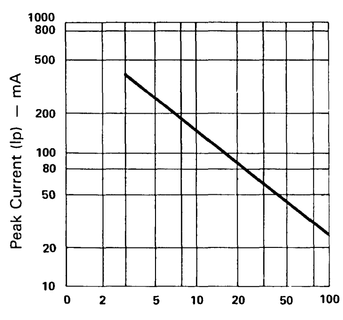


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

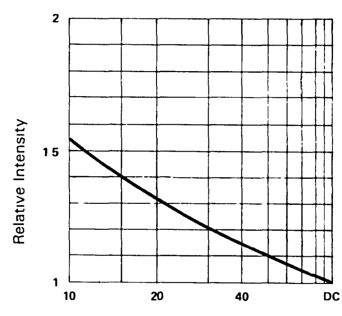
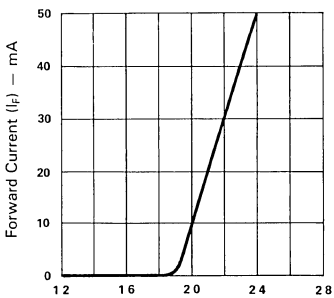


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

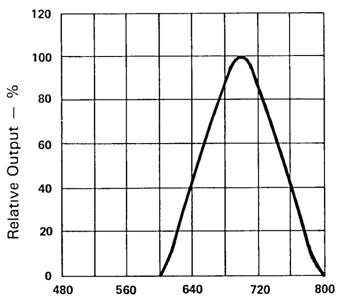
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-540AP SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	750		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

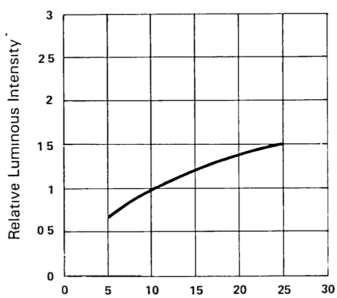
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



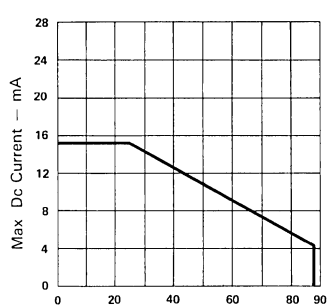
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



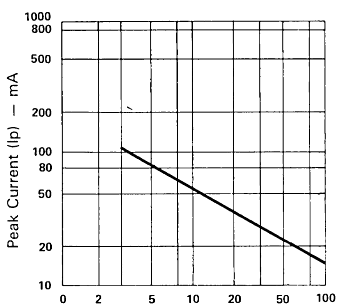
Wavelength (λ) — nm
Fig. 2 SPECTRAL RESPONSE



Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-540AG SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

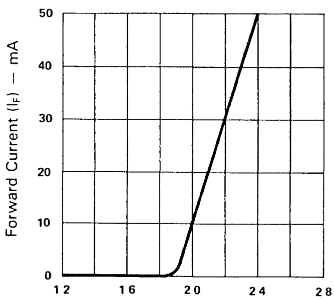


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

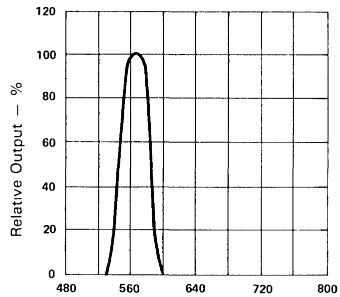


Fig 2 SPECTRAL RESPONSE

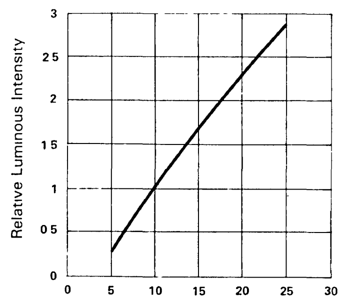


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

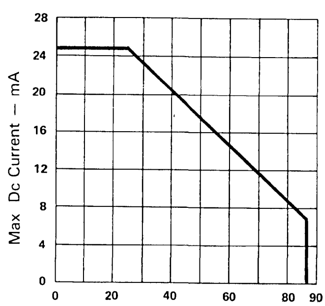


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

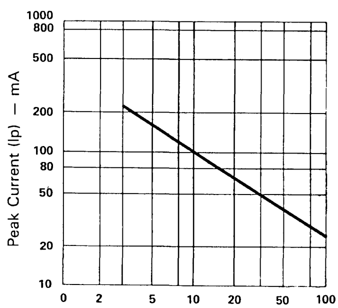


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

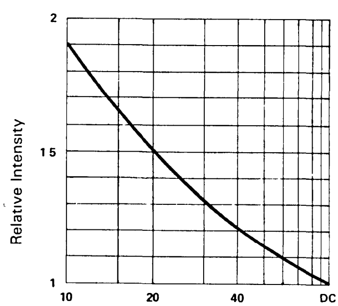


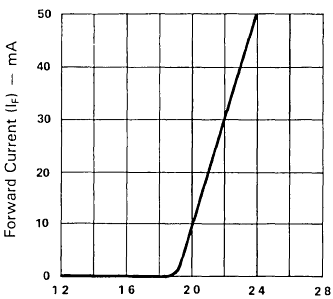
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-540AY SERIES

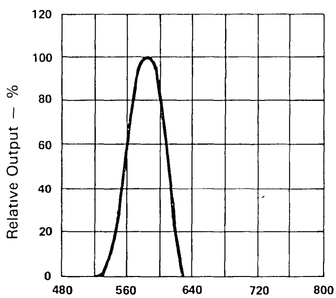
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	700	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		35		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

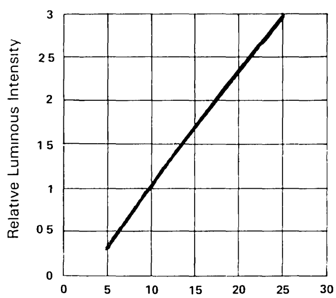
(25° C Ambient Temperature Unless Otherwise Noted)



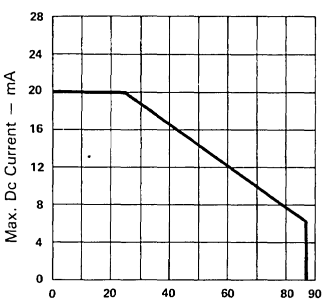
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



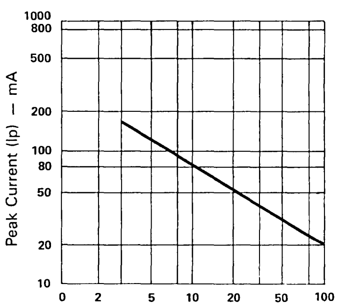
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



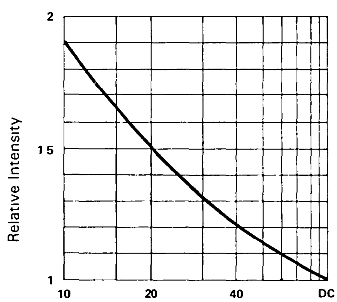
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

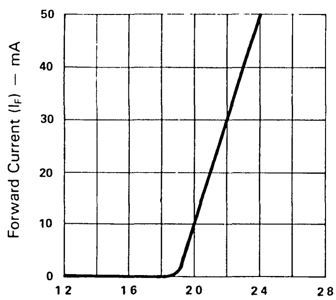


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

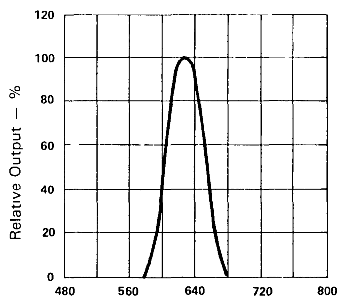
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-540AE SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

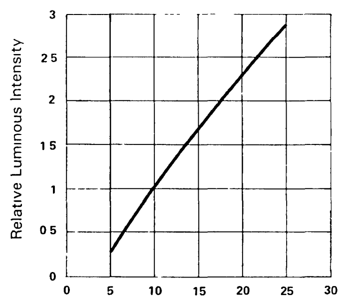
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



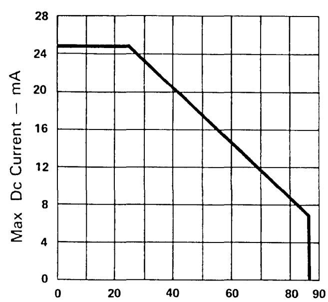
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



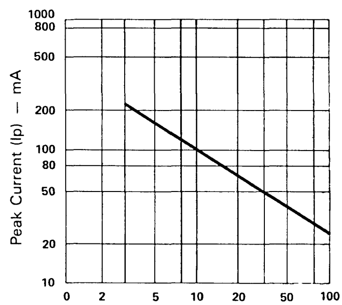
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



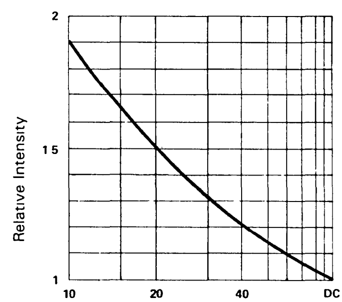
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-540AHR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	900	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_F			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

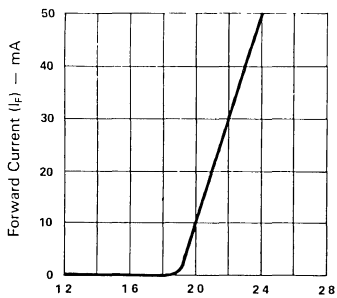


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

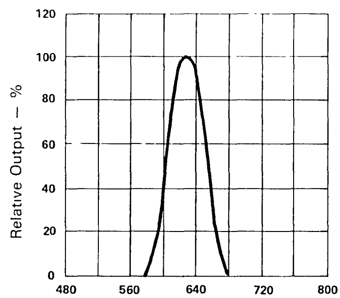


Fig 2 SPECTRAL RESPONSE

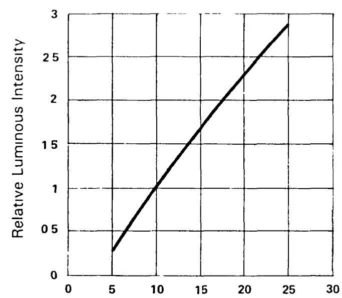


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

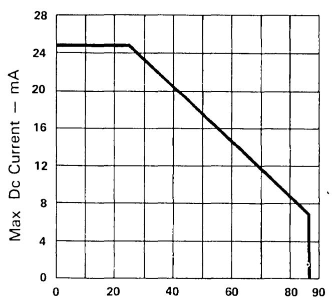


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

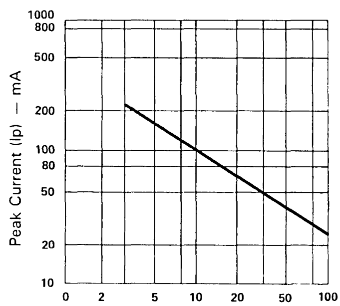


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

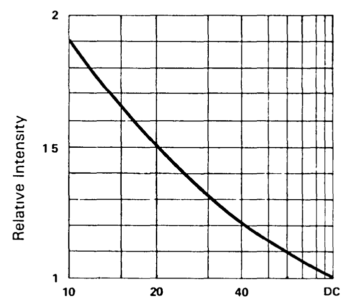


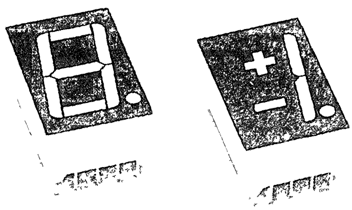
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LTS-6000 SERIES

0.56 SINGIE DIGIT NUMERIC DISPLAYS

FEATURES

- 0.56 INCH (14.2mm) DIGIT HEIGHT.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED / GREEN / YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

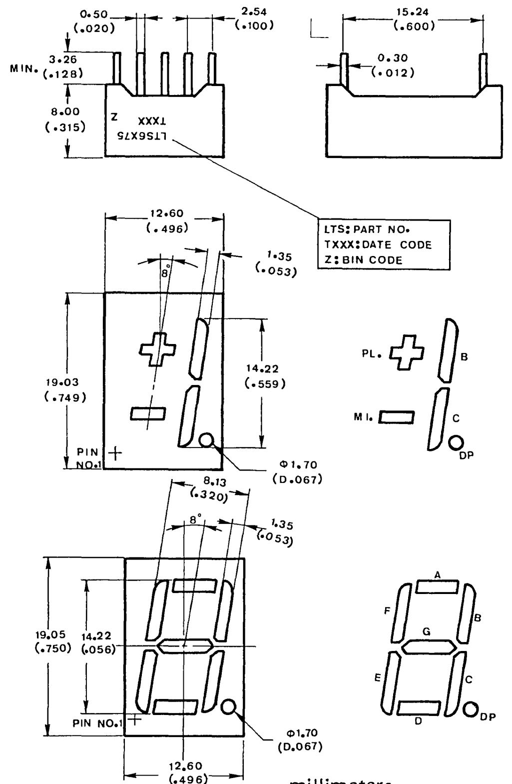
The LTS-6000, series are 0.56 inch (14.2mm) height single digit displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red and bright red displays have black face and red segment color. Green and yellow displays have gray face and white segment color. Orange displays have orange face and orange segment color. High efficiency red displays have red face and red segment color.

DEVICES

PART NO.						DESCRIPTION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED		
LTS-6760R	6760P	6460G	6860Y	6660E	6960HR	Common Anode, Rt. Hand Decimal	A
LTS-6780R	6780P	6480G	6880Y	6680E	6980HR	Common Cathode, Rt. Hand Decimal	B
LTS-6775R	6775P	6475G	6875Y	6675E	6975HR	Common Anode, ±1 Overflow	C
LTS-6795R	6795P	6495G	6895Y	6695E	6995HR	Common Cathode, ±1 Overflow	D

PACKAGE DIMENSION

LTS-6x60/6x80/6x75/6x95

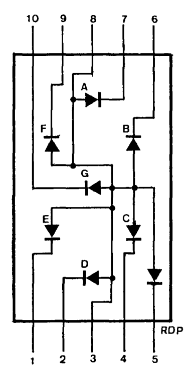


NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

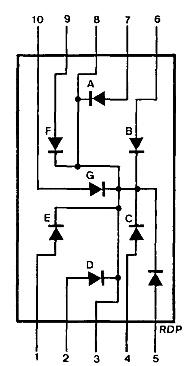
1. Lead length (from seating plane): minimum valum $\frac{\begin{smallmatrix}+1.00\\-0.00\end{smallmatrix}\ \text{mm}}{\left(\begin{smallmatrix}+0.040''\\-0.000''\end{smallmatrix}\right)}$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

INTERNAL CIRCUIT DIAGRAM

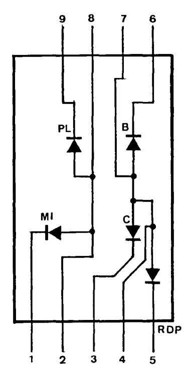
A. LTS-6x60



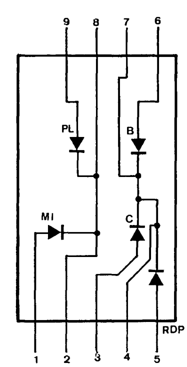
B. LTS-6x80



C. LTS-6x75



D. LTS-6x95



PIN CONNECTION

PIN	CONNECTION			
NO.	A. LTS-6x60	B. LTS-6x80	C. LTS-6x75	D. LTS-6x95
1	Cathode E	Anode E	Cathode Minus Sign	Anode Minus Sign
2	Cathode D	Anode D	Anode Pl., Mi *2	Cathode Pl., Mi *2
3	Common Anode *1	Common Cathode *1	Cathode C	Anode C
4	Cathode C	Anode C	Anode B.C.Dp *3	Cathode B.C.Dp *3
5	Cathode D.P	Anode D.P.	Cathode Cp	Anode Dp
6	Cathode B	Anode B	Cathode B	Anode B
7	Cathode A	Anode A	Anode B.C.Dp *3	Cathode B.C.Dp *3
8	Common Anode *1	Common Cathode *1	Anode Pl., Mi. *2	Cathode Pl., Mi. *2
9	Cathode F	Anode F	Cathode Plus Sign	Anode Plus Sign
10	Cathode G	Anode G	No Connection	No Connection

NOTES: 1. Pin 3 & 8 are internally connected.
2. Pin 2 & 8 are internally connected.
3. Pin 4 7 are internally connected.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	– 25°C to + 85°C						
Storage Temperature Range	– 25°C to + 85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-6700R SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	600		μcd	I_F = 10 mA
Peak Emission Wavelength	λP		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		1 7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

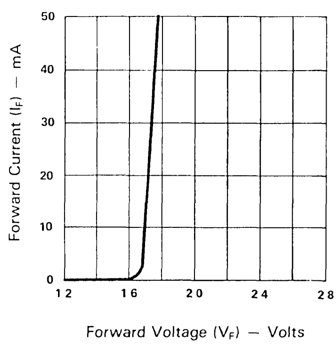


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

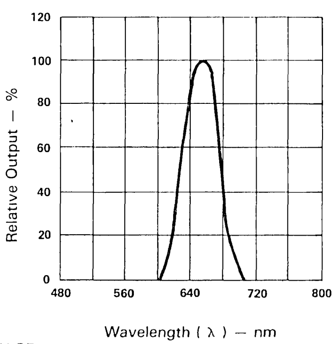


Fig 2 SPECTRAL RESPONSE

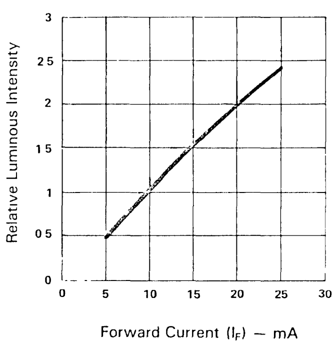


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

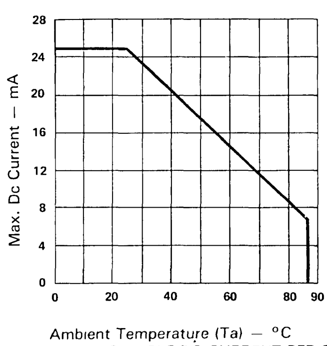


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

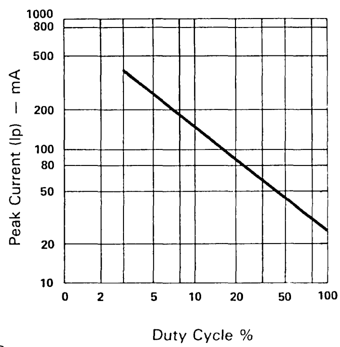


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

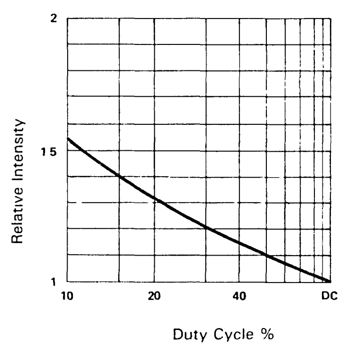


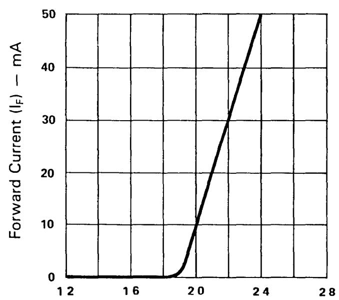
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-6700P SERIES

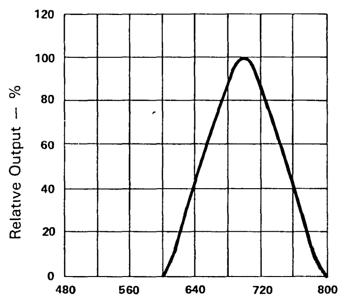
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	950		μcd	I_F = 10 mA
Peak Emission Wavelength	λP		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

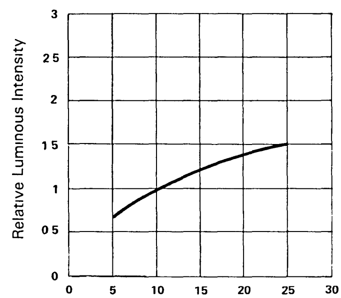
(25° C Ambient Temperature Unless Otherwise Noted)



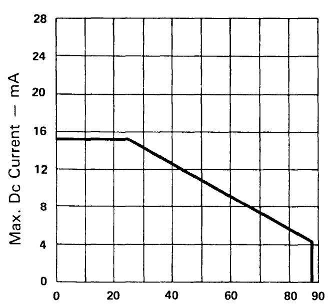
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.



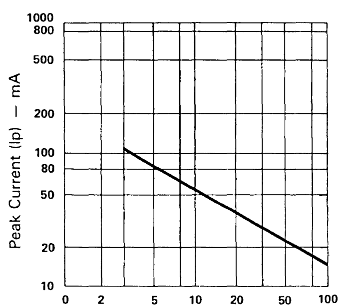
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE.



Forward Current (I_F) — mA
Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

LTS-6400G SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λP		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

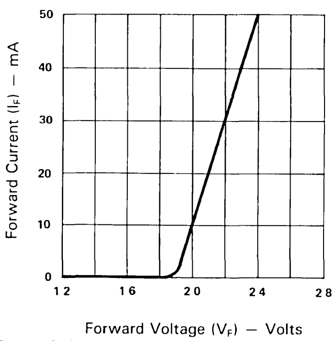


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

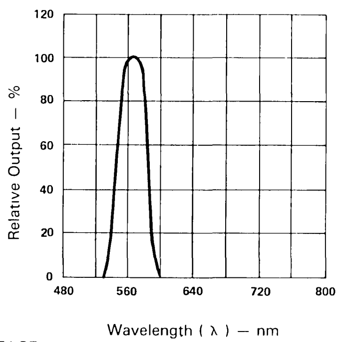


Fig 2 SPECTRAL RESPONSE

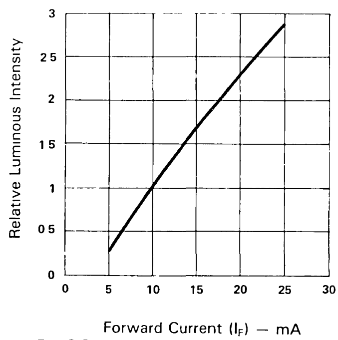


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

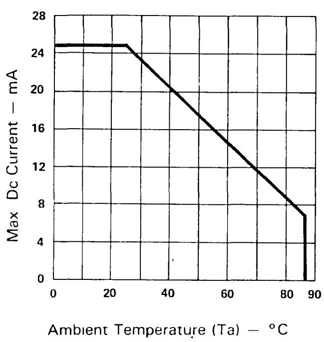


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

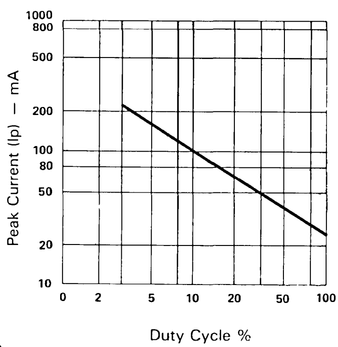


Fig.5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

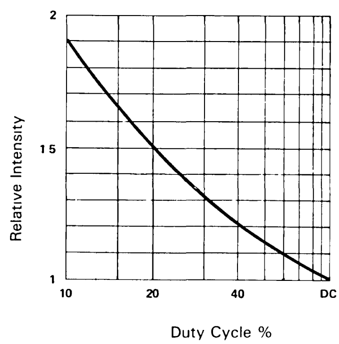


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-6800Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λP		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

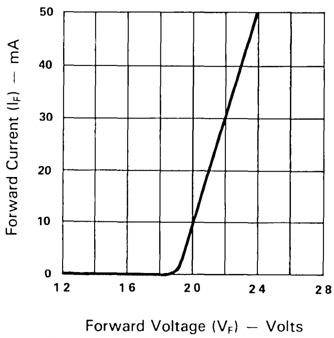


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

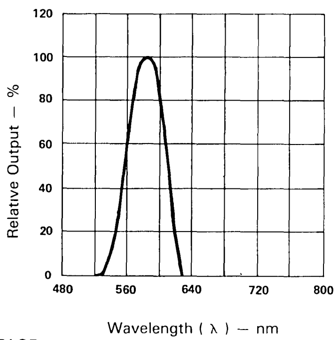


Fig 2 SPECTRAL RESPONSE

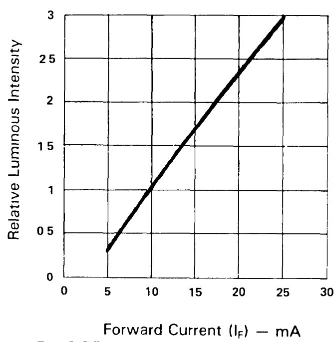


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)

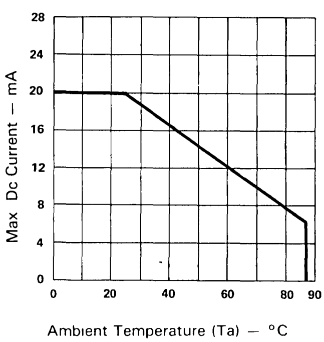


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

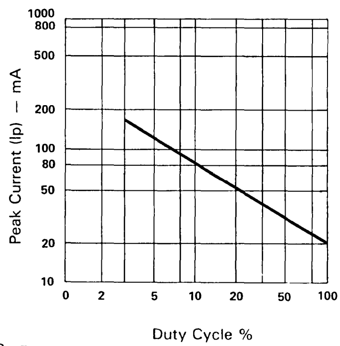


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

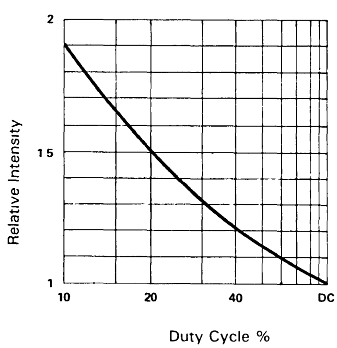


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

LTS-6600E SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λP		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		45		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

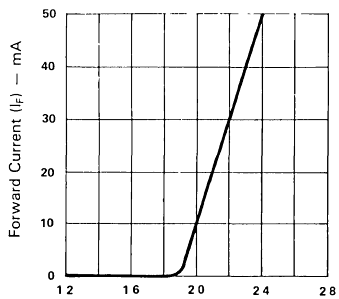


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

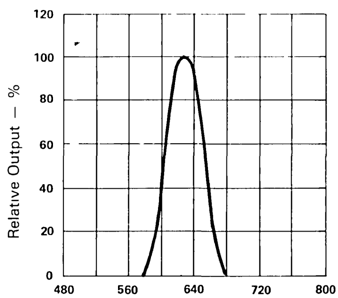


Fig 2 SPECTRAL RESPONSE

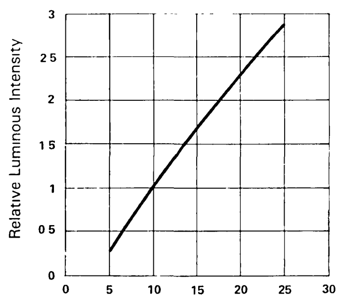


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

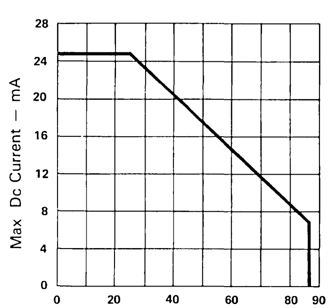


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

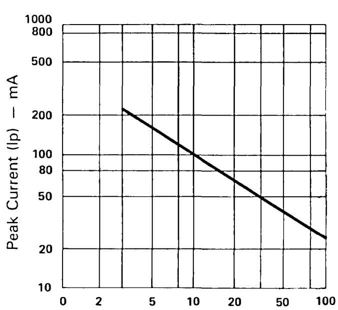


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE - F = 1 KHz)

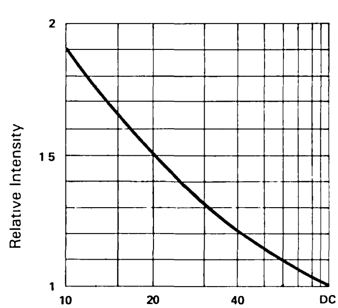


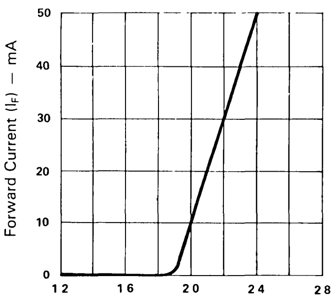
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-6900HR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	800	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λP		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		45		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

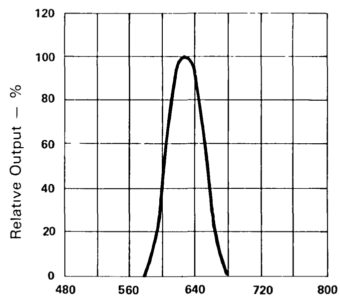
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)



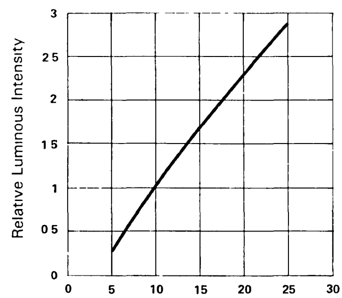
Forward Voltage (V_F) — Volts

Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



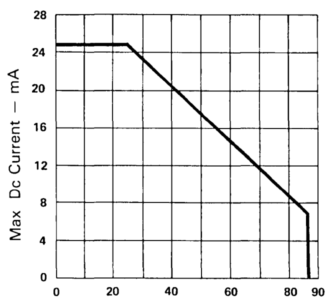
Wavelength (λ) — nm

Fig 2 SPECTRAL RESPONSE



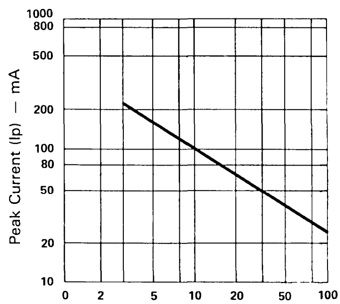
Forward Current (I_F) — mA

Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



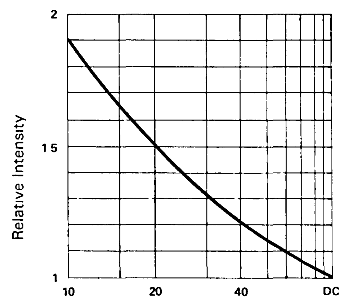
Ambient Temperature (Ta) — °C

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

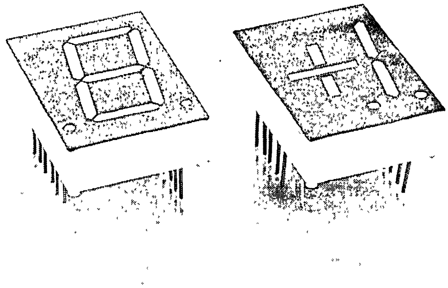
LITEON

LTS-3400L SERIES

0.8" SINGLE DIGIT NUMERIC DISPLAYS

FEATURES

- 0.8 INCH (20.32mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF FIVE BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I. C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

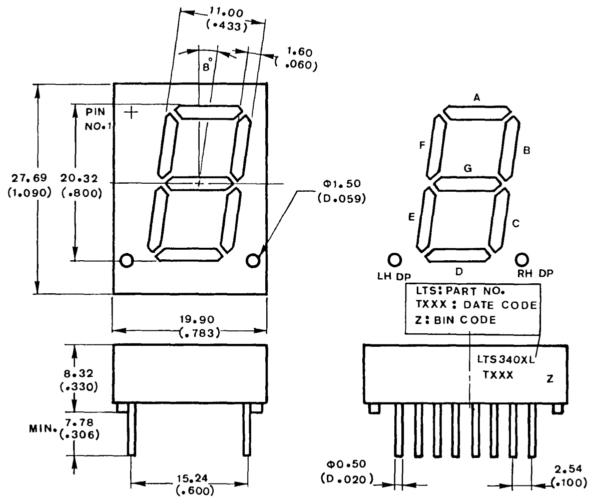
The LTS-3400L series are 0.8 inch (20.32mm) height single digit displays.
The red series devices utilized LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The orange series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. All devices have gray face and white segment color.

DEVICES

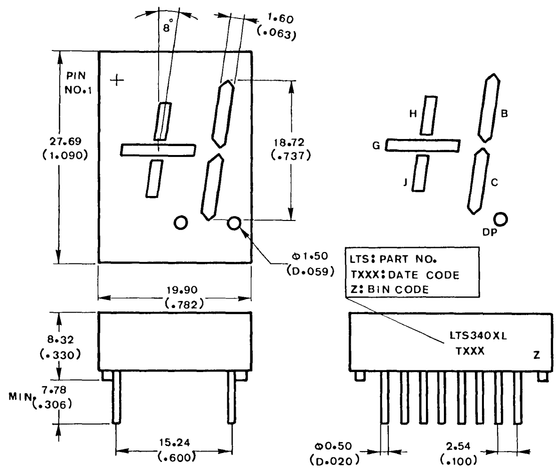
PART NO. LTS–					DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE			
3401LR	3401LP	3401LG	3401LY	3401LE	Common Anode, Rt. & Lt. Hand Decimal	A	A
3403LR	3403LP	3403LG	3403LY	3403LE	Common Cathode, Rt. & Lt. Hand Decimal	A	B
3406LR	3406LP	3406LG	3406LY	3406LE	Universal, ± 1 Overflow, Rt. Hand Decimal	B	C

PACKAGE DIMENSIONS

A. LTS-3401L/3403L



B. LTS-3406L



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

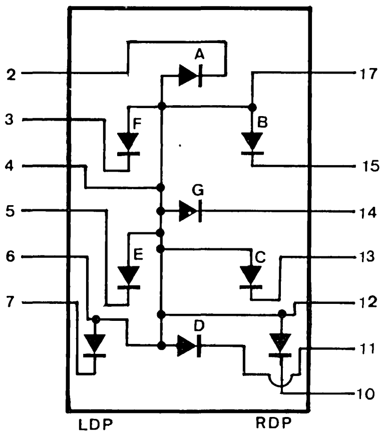
PIN CONNECTION

PIN NO.	CONNECTION		
	A. LTS-3401L	B. LTS-3403L	C. LTS-3406L
1	No Pin	No Pin	No Pin
2	Cathode A	Anode A	Cathode B *2
3	Cathode F	Anode F	Anode H
4	Common Anode *1	Common Cathode *1	Cathode H
5	Cathode E	Anode E	Cathode G
6	Common Anode *1	Common Cathode *1	Cathode J
7	Cathode L.D.P.	Anode L.D.P.	Anode J
8	No Pin	No Pin	Cathode D.P. *3
9	No Pin	No Pin	No Pin
10	Cathode R.D.P.	Anode R.D.P.	Anode D.P.
11	Cathode D	Anode D	Cathode D.P. *3
12	Common Anode *1	Common Cathode *1	Cathode C
13	Cathode C	Anode C	Anode C
14	Cathode G	Anode G	Anode G
15	Cathode B	Anode B	Anode B
16	No Pin	No Pin	No Pin
17	Common Anode *1	Common Cathode *1	Cathode B *2
18	No Pin	No Pin	No Pin

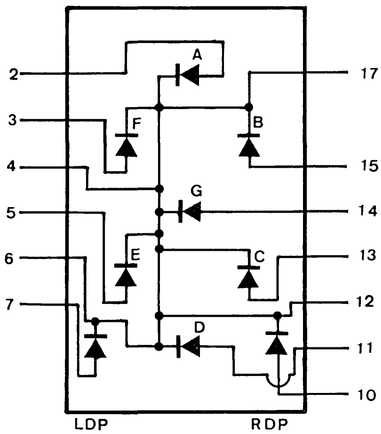
NOTES 1. Pin & 4, 6, 12 & 17 are internally connected.
2. Pin 2 & 17 are internally connected.
3. Pin 8 & 11 are internally connected.

INTERNAL CIRCUIT DIAGRAM

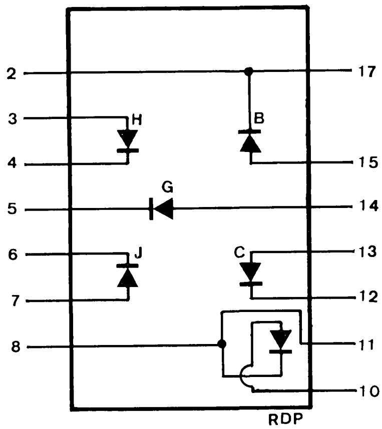
A. LTS-3401Lx



B. LTS-3403Lx



C. LTS-3406Lx



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	V
Operating Temperature Range	– 25°C to + 85°C					
Storage Temperature Range	– 25°C to + 85°C					
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C						

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-3400LR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	200	600		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		24		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

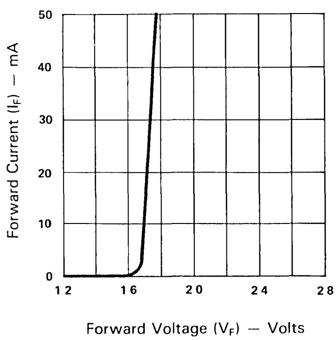


Fig.1 FORWARD CURRENT Vs FORWARD VOLTAGE

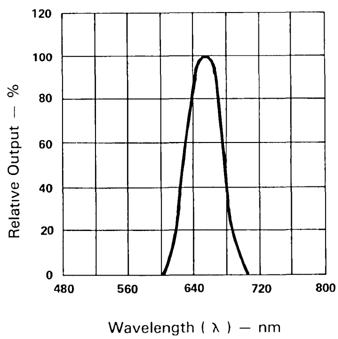


Fig 2 SPECTRAL RESPONSE

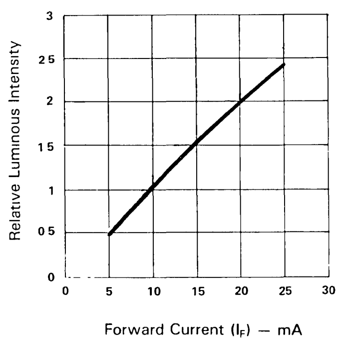


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

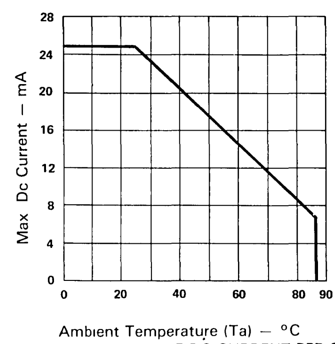


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

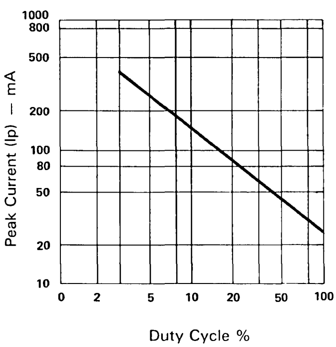


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

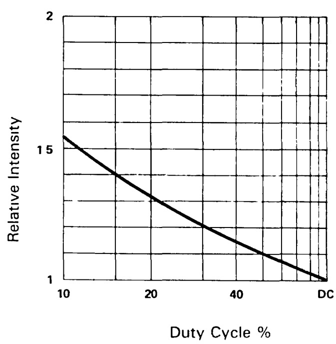


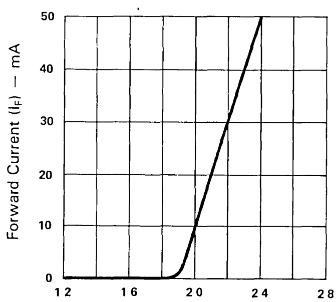
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-3400LP SERIES

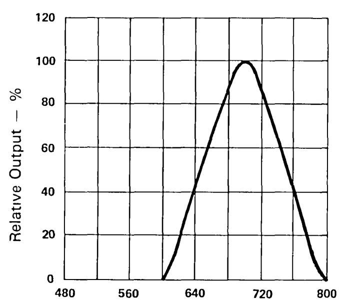
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	950		µcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		697		nm	$I_F = 20$ mA
Spectral Line Half-Width	Δλ		90		nm	$I_F = 20$ mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	µA	$V_R = 5V$
Luminous Intensity Matching Ratio	Iv-m			2:1		$I_F = 20$ mA

SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

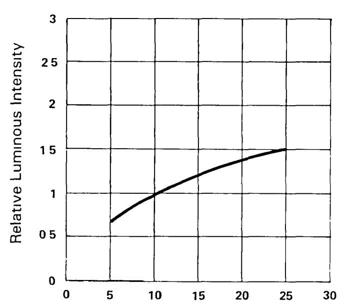
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



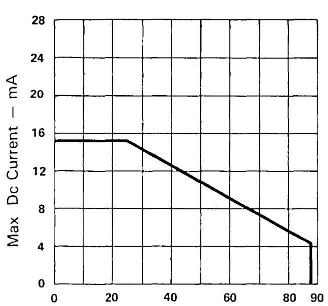
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



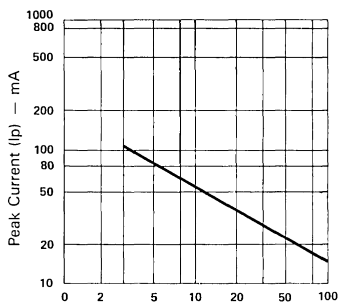
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



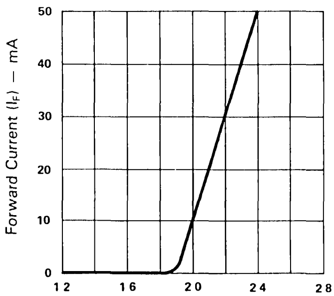
Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT TA = 25°C
LTS-3400LG SERIES

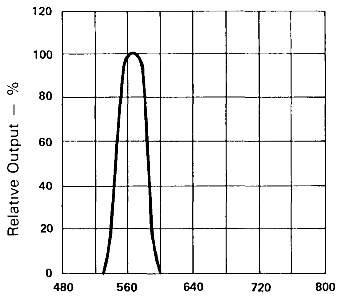
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	IF = 10 mA
Peak Emission Wavelength	λp		565		nm	IF = 20 mA
Spectral Line Half-Width	Δλ		30		nm	IF = 20 mA
Forward Voltage, any Segment or D.P.	VF		2.1	2.8	V	IF = 20 mA
Reverse Current, any Segment or D.P.	IR			100	μA	VR = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		IF = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

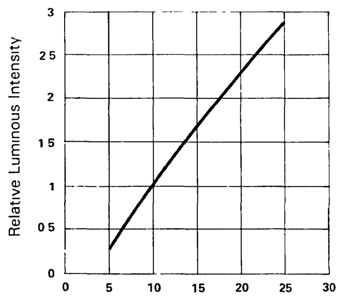
(25°C Ambient Temperature Unless Otherwise Noted)



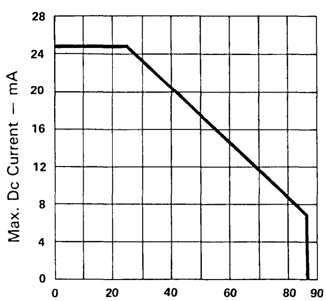
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



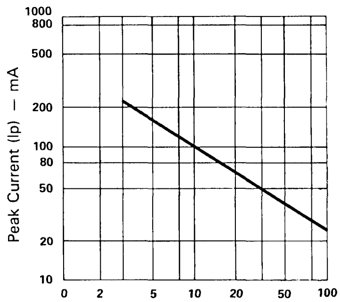
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



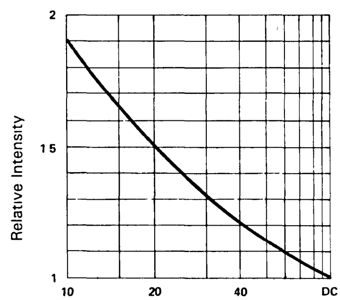
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-3400LY SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	750	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

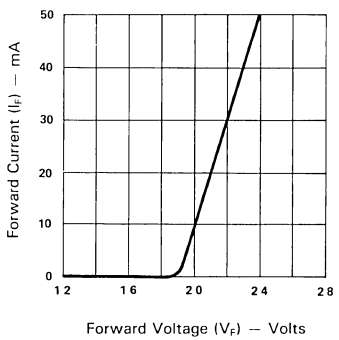


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

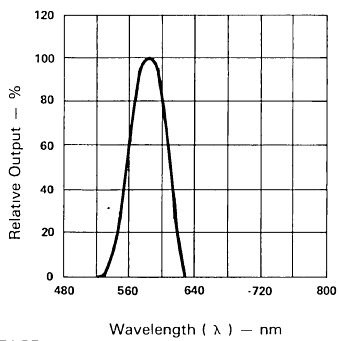


Fig 2 SPECTRAL RESPONSE

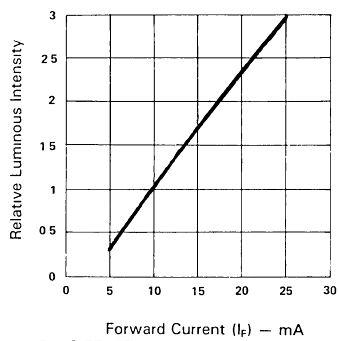


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)

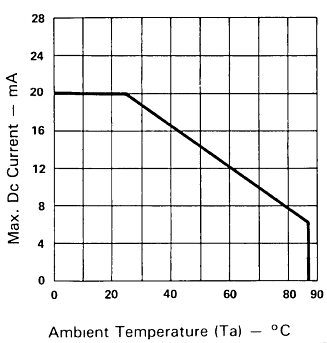


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

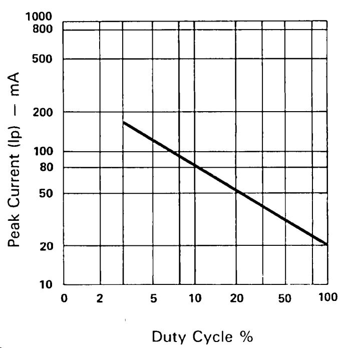


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

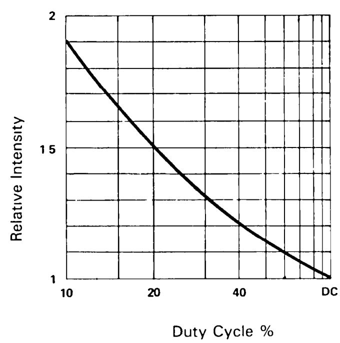
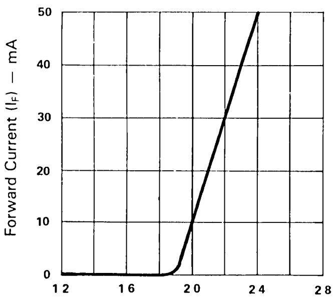


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

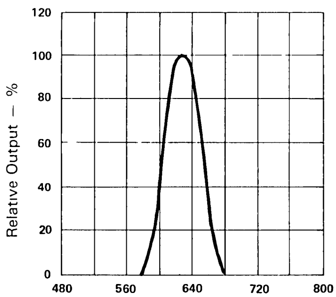
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTS-3400LE SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

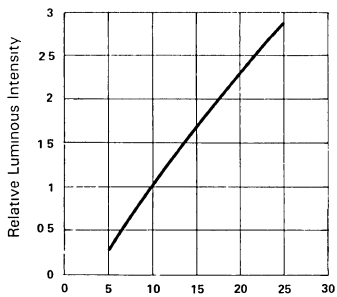
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



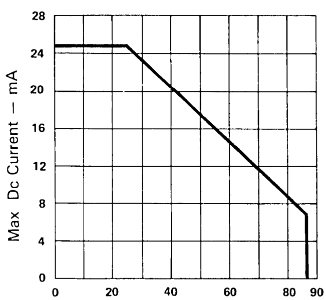
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



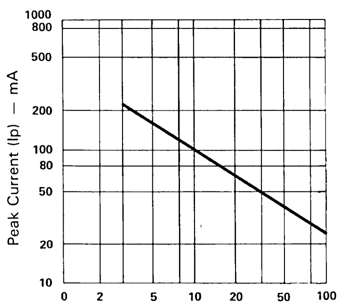
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



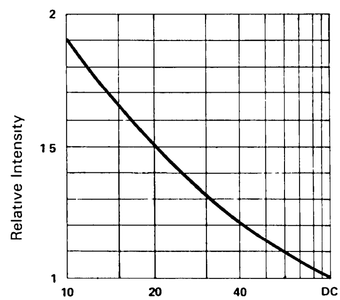
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



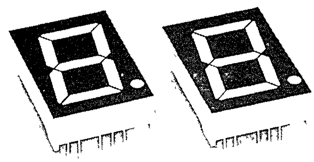
Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

LTS-10804/10304 10805A/10305A SERIES

1.0" SINGLE DIGIT NUMERIC DISPLAYS

FEATURES

- 1.0 INCH (25.4mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF THREE BRIGHT COLORS-GREEN/ YELLOW/ORANGE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

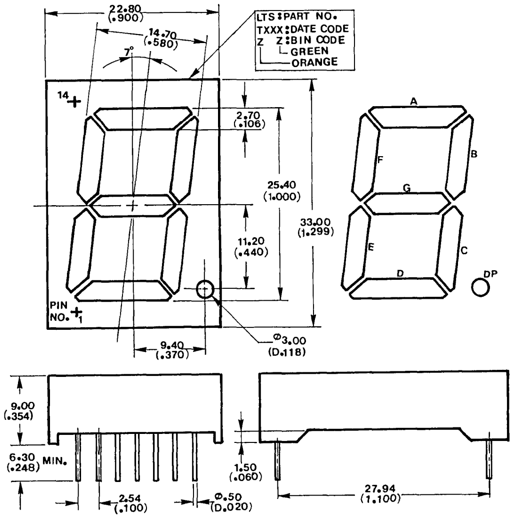
The LTS-10000 series are 1.0 inch (25.4mm) height single digit displays.
The and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow and orange series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. All devices have black face and white segment color.

DEVICES

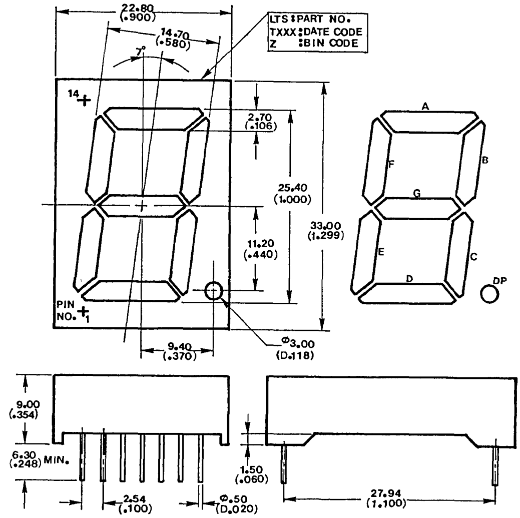
PART NO. LTS–				DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	YELLOW	ORANGE	MULTI-COLOR			
10804G	10804Y	10804E	–	Common Anode, Rt. Hand Decimal	A	A
10304G	10304Y	10304E	–	Common Cathode Rt. Hand Decimal	A	B
–	–	–	10805A	Common Anode, Rt Hand Decimal	B	C
–	–	–	10305A	Common Cathode, Rt. Hand Decimal	B	D

PACKAGE DIMENSIONS

A. LTS-10x04



B. LTS-10x05A



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

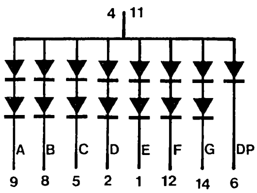
1. Lead length (from seating plane): minimum valum $\frac{\frac{+1.00}{-0.00}\text{ mm}}{\left(\frac{+0.040''}{-0.000''}\right)}$ 2. $\frac{\pm 0.25\text{ mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

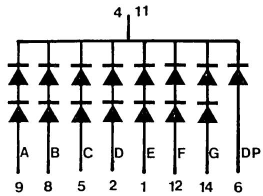
PIN NO.	CONNECTION			
	A. LTS-10804	**B. LTS-10304**	**C. LTS-10805A**	**D. LTS-10305A**
1	Cathode E	Anode E	Cathode E	Anode E
2	Cathode D	Anode D	Cathode D	Anode D
3	No Pin	No Pin	No Pin	No Pin
4	Common Anode	Common Cathode	Common Anode Green	Common Cathode Green
5	Cathode C	Anode C	Cathode C	Anode C
6	Cathode D.P.	Anode D.P.	Cathode D.P.	Anode D.P.
7	No Pin	No Pin	No Pin	No Pin
8	Cathode B	Anode B	Cathode B	Anode B
9	Cathode A	Anode A	Cathode A	Anode A
10	No Pin	No Pin	No Pin	No Pin
11	Common Anode	Common Cathode	Common Anode Orange	Common Cathode Orange
12	Cathode F	Anode F	Cathode F	Anode F
13	No Pin	No Pin	No Pin	No Pin
14	Cathode G	Anode G	Cathode G	Anode G

INTERNAL CIRCUIT DIAGRAM

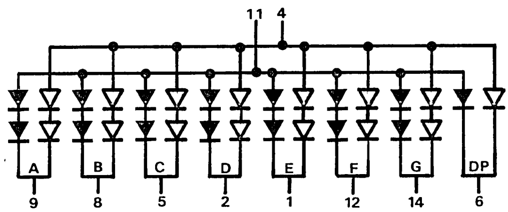
A. LTS-10804



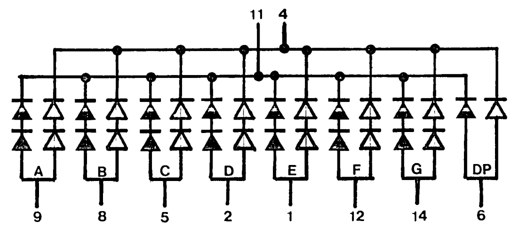
B. LTS-10304

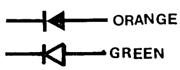


C. LTS-10805A



D. LTS-10305A





ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

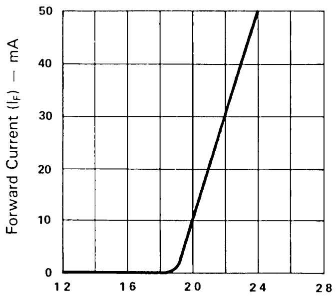
PARAMETER	GREEN	YELLOW	ORANGE	UNIT
Power Dissipation Per Segment	120	100	120	mW
Feak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	100	80	100	mA
Continuous Forward Current Per Segment	25	20	25	mA
Derating Linear From 25°C Per Segment	0.3	0.24	0.3	mA/°C
Reverse Voltage Per Segment	10	10	10	V
Operating Temperature Range	−25°C to +85°C			
Storage Temperature Range	−25°C to +85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-10000G/10000A (GREEN)

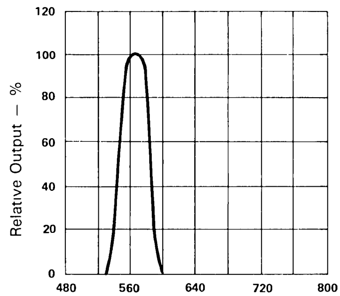
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	2.5	4.5		mcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		4.2 (2.1)	5.6 (2.8)	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 10V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

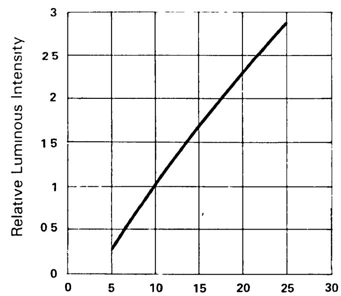
(25° C Ambient Temperature Unless Otherwise Noted)



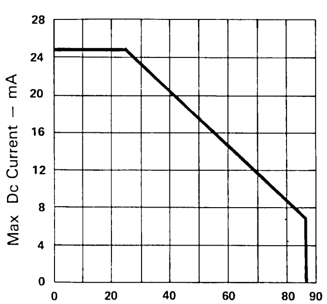
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



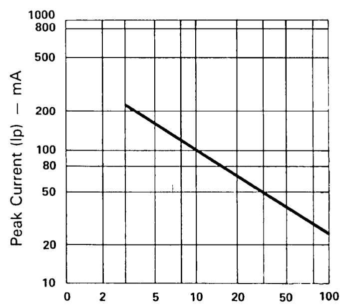
Wavelength (λ) — nm
Fig. 2 SPECTRAL RESPONSE



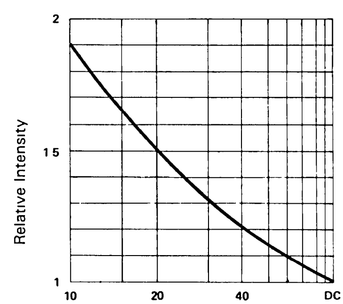
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-10000Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	2.5	4.5		mcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		4.2 (2.1)	5.6 (2.8)	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 10V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

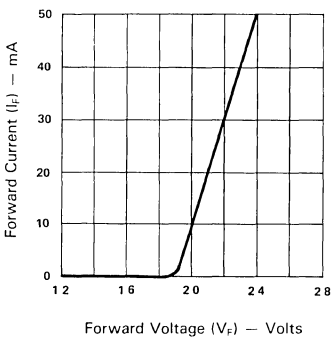


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

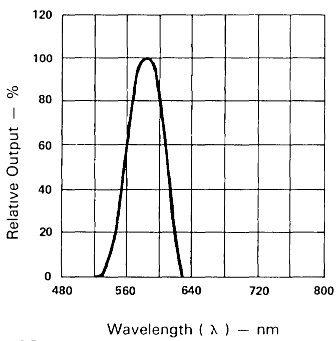


Fig 2 SPECTRAL RESPONSE

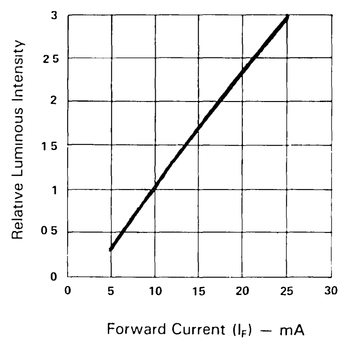


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)

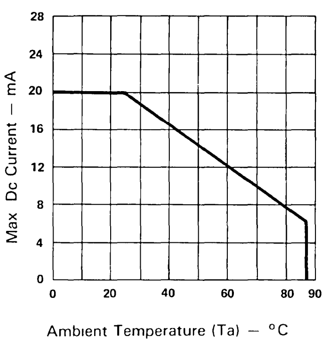


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

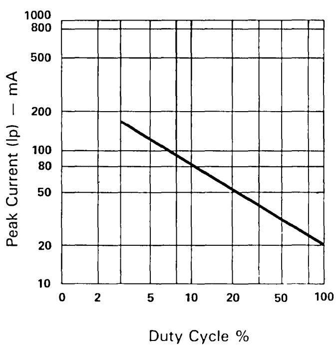


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

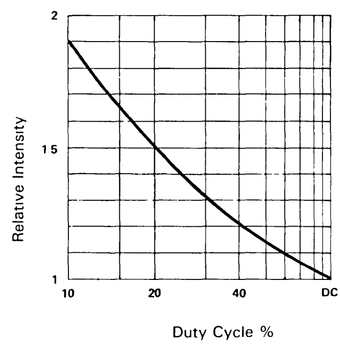


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTS-10000E/10000A (ORANGE)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	2.5	4.5		mcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		4.2 (2.1)	5.6 (2.8)	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 10V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

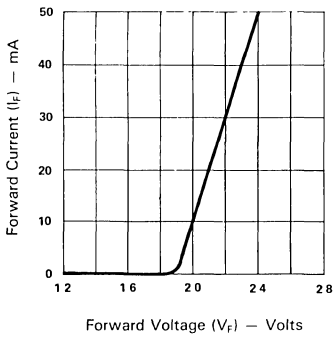


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

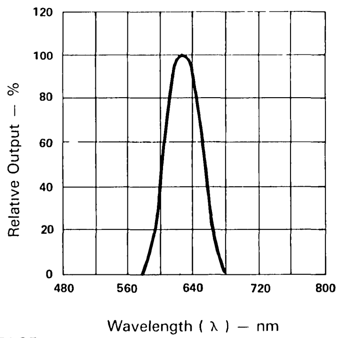


Fig 2 SPECTRAL RESPONSE.

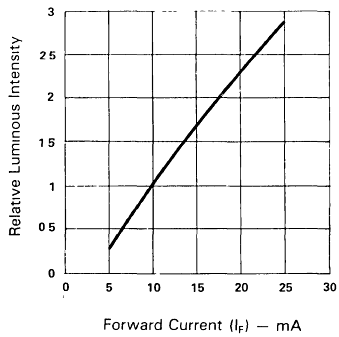


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

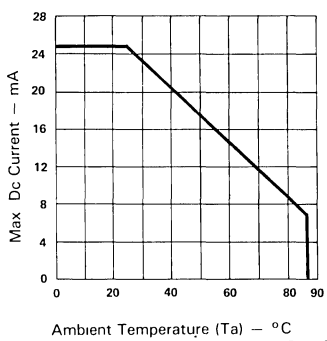


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

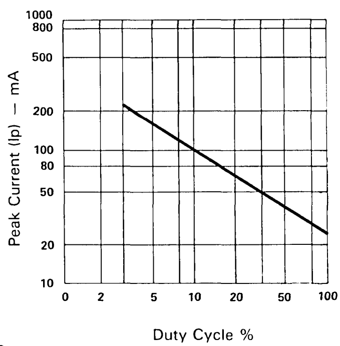


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

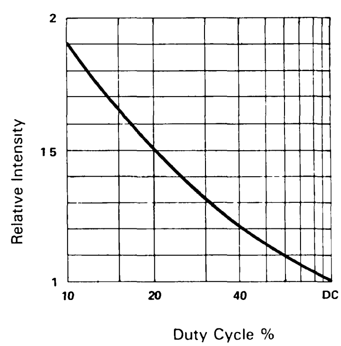


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

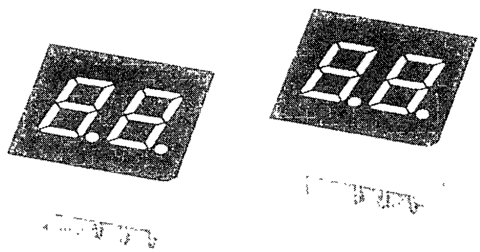
LITEON

LTD- 322/323 SERIES

0.3" DUAL DIGIT NUMERIC DISPLAYS

FEATURES

- 0.3 INCH (7.62mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF THREE BRIGHT COLORS-RED/BRIGHT RED/GREEN.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- COMMON ANODE OR COMMON CATHODE MODELS.
- TWO DIGIT PACKAGE SIMPLIFIES ALIGNMENTS & ASSEMBLY.
- LEADS ON .100" (2.54mm) CENTERS.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD.



DESCRIPTION

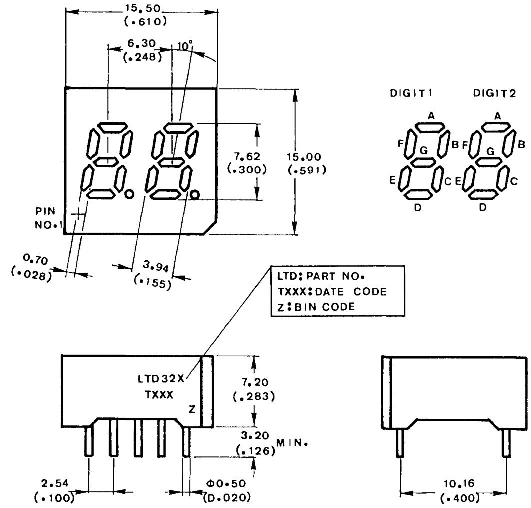
The LTD-322/323 series are 0.3 inch (7.62 mm) height dual digit displays.

The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. Red, bright red and green displays have black face and white segment color.

DEVICES

PART NO. LTD–			DESCRIPTION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN		
322R	322P	322G	Common Cathode	A
323R	323P	323G	Common Anode	B

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

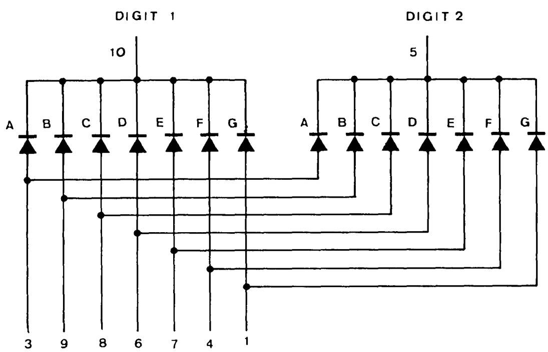
1. Lead length (from seating plane): minimum valum $\frac{\begin{smallmatrix}+1.00\\-0.000\end{smallmatrix}\ \text{mm}}{\left(\begin{smallmatrix}+0.040''\\-0.000''\end{smallmatrix}\right)}$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

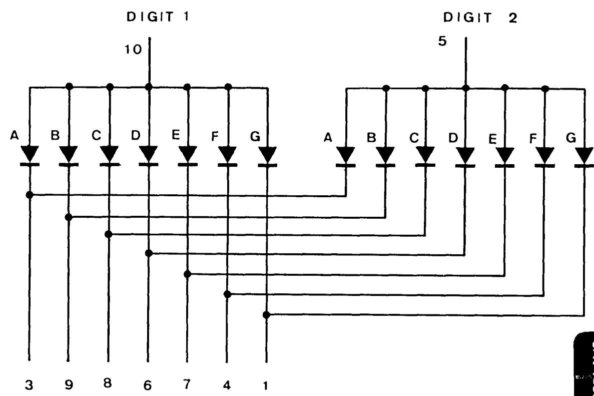
PIN NO.	CONNECTION	
	A. LTD-322	**B. LTD-323**
1	Anode G	Cathode G
2	No Pin	No Pin
3	Anode A	Cathode A
4	Anode F	Cathode F
5	Common Cathode (Digit 2)	Common Anode (Digit 2)
6	Anode D	Cathode D
7	Anode E	Cathode E
8	Anode C	Cathode C
9	Anode B	Cathode B
10	Common Cathode (Digit 1)	Common Anode (Digit 1)

INTERNAL CIRCUIT DIAGRAM

A. LTD-322



B. LTD-323



SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	UNIT
Power Dissipation Per Segment	55	40	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	mA
Continuous Forward Current Per Segment	25	15	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	V
Operating Temperature Range	–25°C to +85°C			
Storage Temperature Range	–25°C to +85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-322R/323R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	Iv	200	400		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Reverse Current, any Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

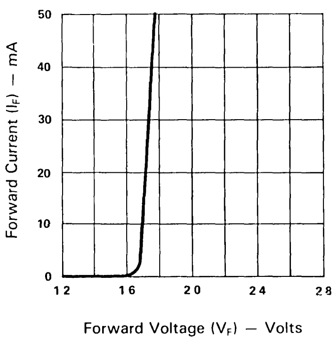


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

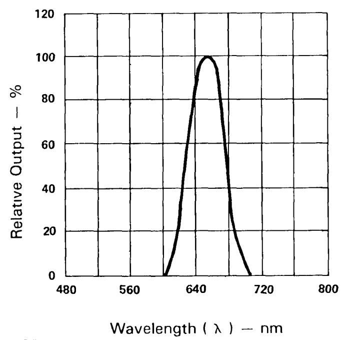


Fig 2 SPECTRAL RESPONSE

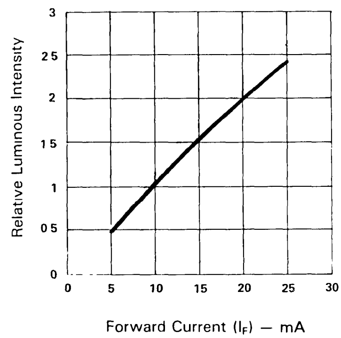


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

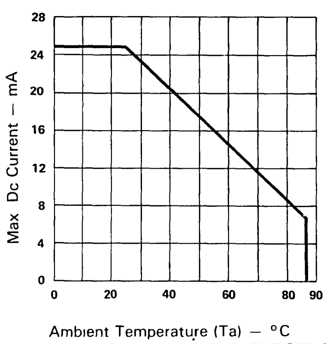


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

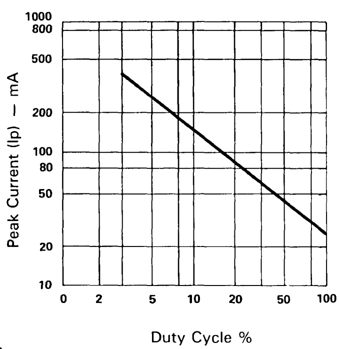


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

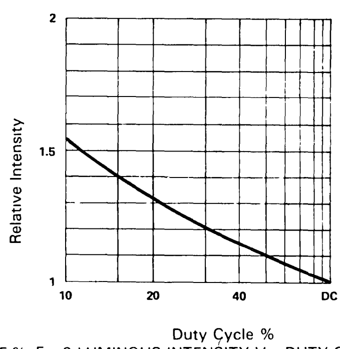
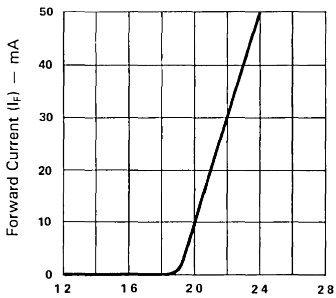


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

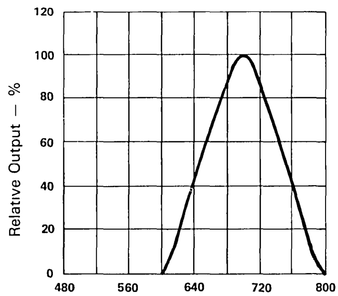
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ C$
LTD — 322P/323P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	I_V	250	650		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		697		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	$I_F = 20$ mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	μA	$V_R = 5V$
Luminous Intensity Matching Ratio	I_{V-m}			2:1		$I_F = 20$ mA

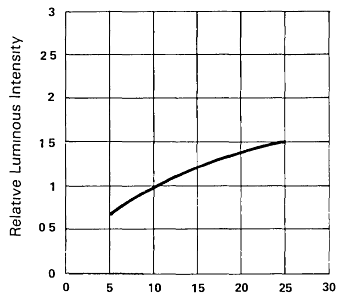
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



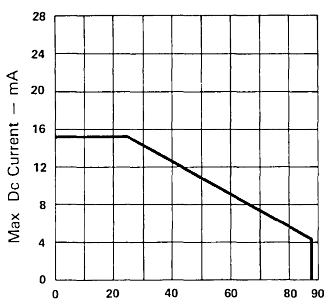
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



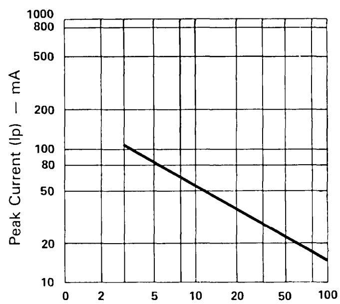
Wavelength (λ) — nm.
Fig 2 SPECTRAL RESPONSE.



Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTD-322G/323G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	Iv	600	1600		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

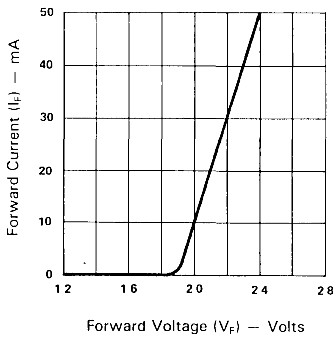


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

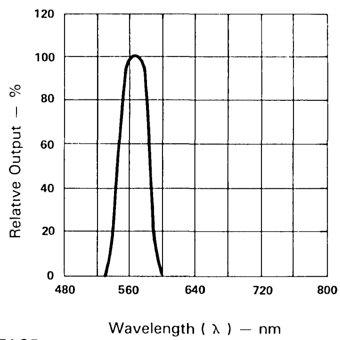


Fig 2 SPECTRAL RESPONSE

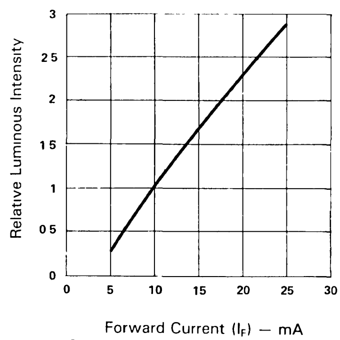


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

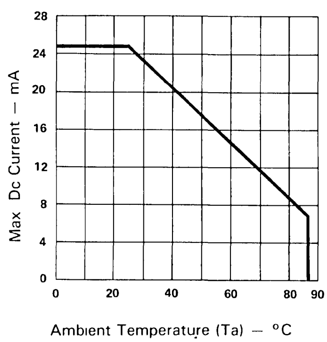


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

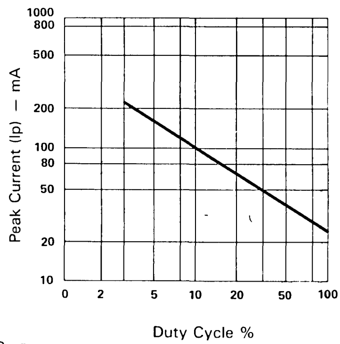


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

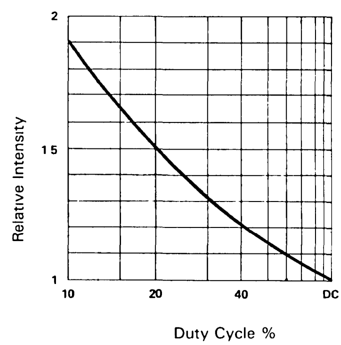


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

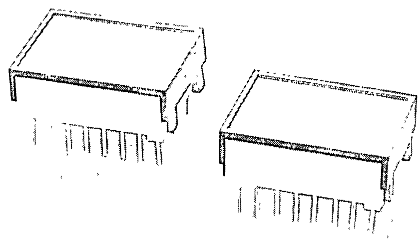
LITEON

LTD- 432XC / 482XC SERIES

0.4" DUAL DIGIT NUMERIC DISPLAYS

FEATURES

- 0.4 INCH (10.21 mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF FOUR BRIGHT COLORS-RED / BRIGHT RED/GREEN/ORANGE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- COMMON ANODE OR COMMON CATHODE MODELS.
- TWO DIGIT PACKAGE SIMPLIFIES ALIGNMENTS & ASSEMBLY.
- LEADS ON .100" (2.54mm) CENTERS.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD.



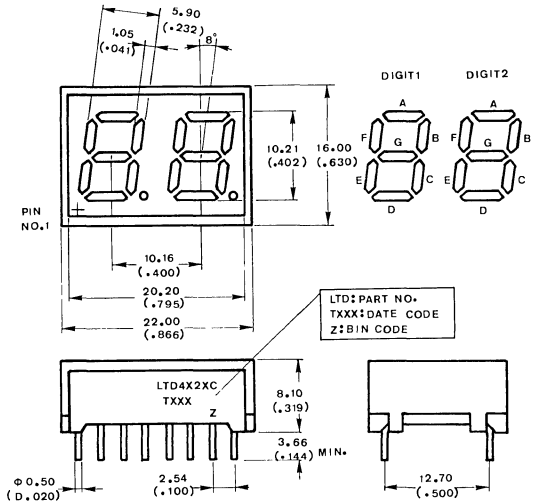
DESCRIPTION

The LTD-432XC/482XC series are 0.4 inch (10 21mm) height dual digit displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The orange series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red, bright red and orange displays have red cap. Green displays have green cap.

DEVICE

PART NO. LTD–				DESCRIPTION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	ORANGE		
432RC	432PC	432GC	432EC	Common Cathode	A
482RC	482PC	482GC	482EC	Common Anode	B

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

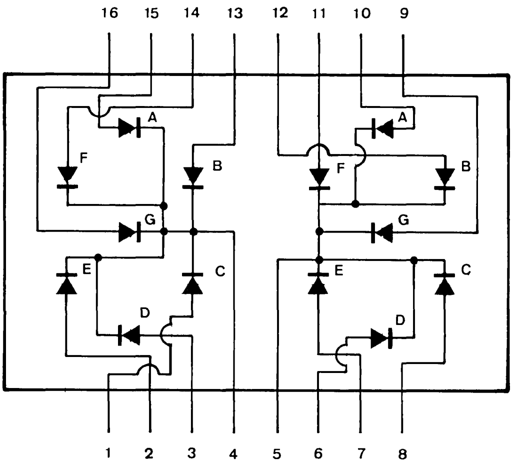
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

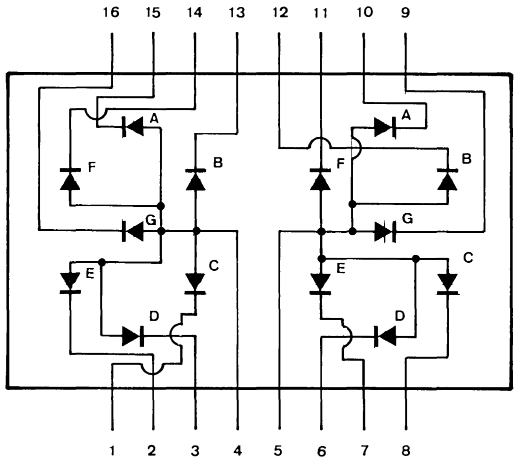
PIN NO.	CONNECTION	
	A. LTD-432XC	B. LTD-482XC
1	Anode C (Digit 1)	Cathode C (Digit 1)
2	Anode E (Digit 1)	Cathode E (Digit 1)
3	Anode D (Digit 1)	Cathode D (Digit 1)
4	Common Cathode (Digit 1)	Common Anode (Digit 1)
5	Common Cathode (Digit 2)	Common Anode (Digit 2)
6	Anode D (Digit 2)	Cathode D (Digit 2)
7	Anode E (Digit 2)	Cathode E (Digit 2)
8	Anode C (Digit 2)	Cathode C (Digit 2)
9	Anode G (Gigit 2)	Cathode G (Digit 2)
10	Anode A (Digit 2)	Cathode A (Digit 2)
11	Anode F (Digit 2)	Cathode F (Digit 2)
12	Anode B (Digit 2)	Cathode B (Digit 2)
13	Anode B (Digit 1)	Cathode B (Digit 1)
14	Anode F (Digit 1)	Cathode F (Digit 1)
15	Anode A (Digit 1)	Cathode A (Digit 1)
16	Anode G (Digit 1)	Cathode G (Digit 1)

INTERNAL CIRCUIT DIAGRAM

A. LTD-432XC



B. LTD-482XC



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	ORANGE	UNIT
Power Dissipation Per Segment	55	40	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	100	mA
Continuous Forward Current Per Segment	25	15	25	25	mA
Derating Linear From 25° C Per Segment	0.3	0.18	0.3	0.3	mA/° C
Reverse Voltage Per Segment	5	5	5	5	V
Operating Temperature Range	–25° C to +85° C				
Storage Temperature Range	–25° C to +85° C				
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260° C					

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-432RC/482RC SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	100	300		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

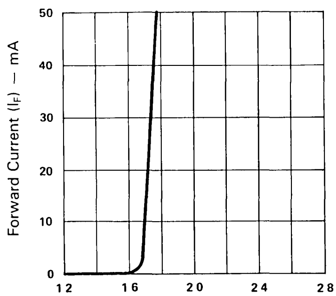


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

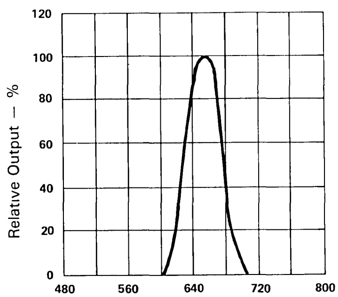


Fig. 2 SPECTRAL RESPONSE

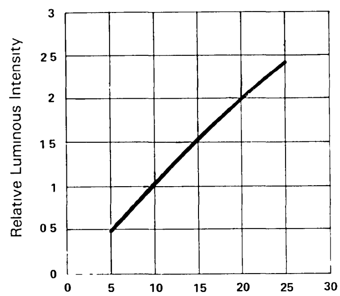


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

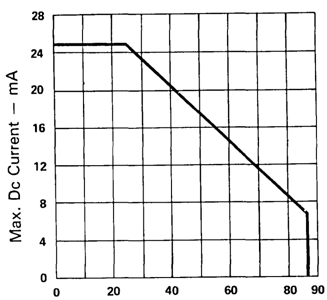


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

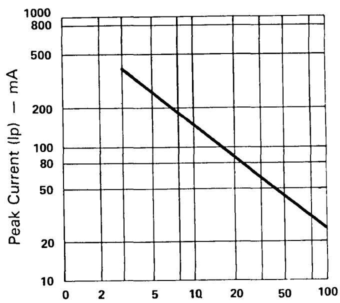


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

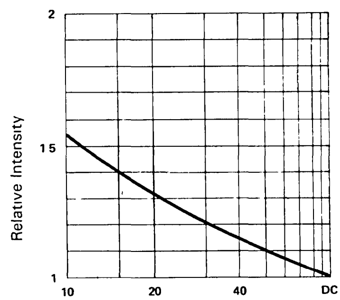


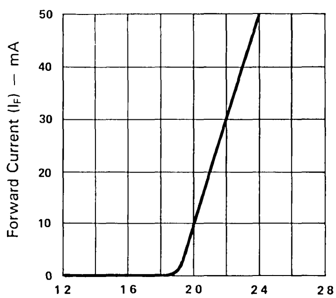
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-432PC/482PC SERIES

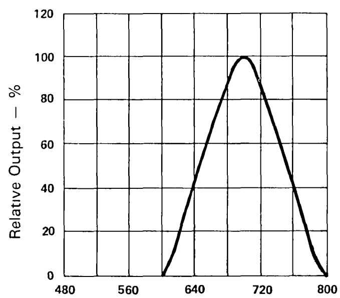
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	500		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

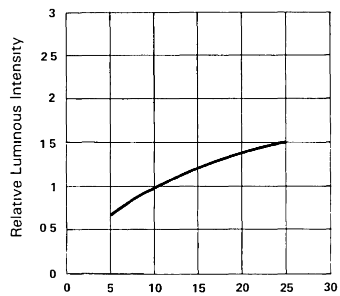
(25°C Ambient Temperature Unless Otherwise Noted)



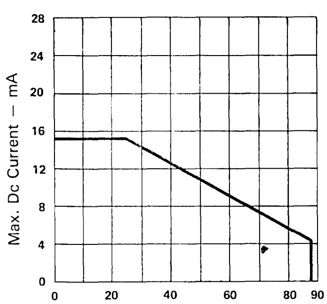
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



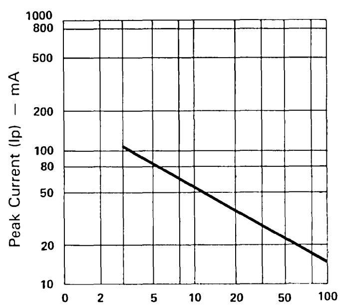
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

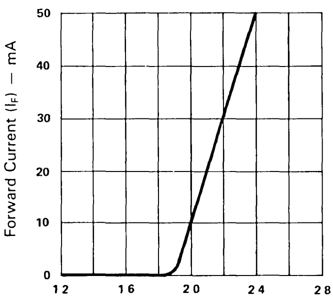


Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

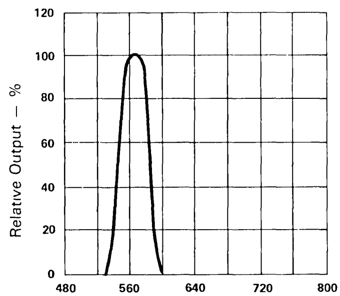
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-432GC/482GC SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	500	1100		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m		2:1			I_F = 20 mA

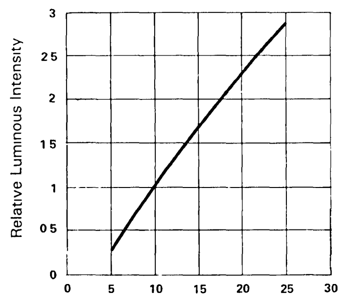
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



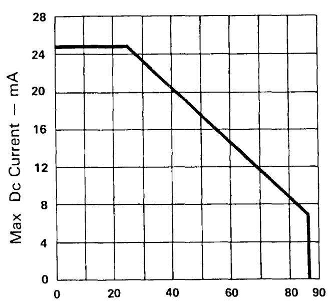
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



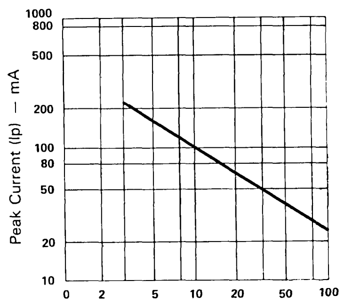
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



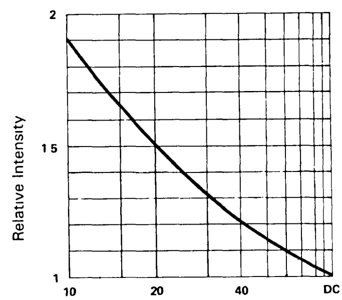
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-432EC/482EC SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	500	1100		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

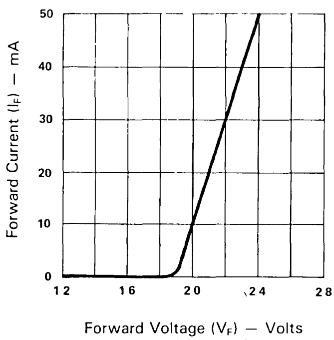


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

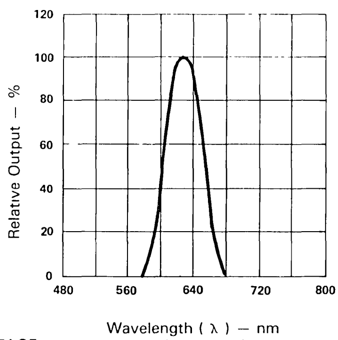


Fig 2 SPECTRAL RESPONSE

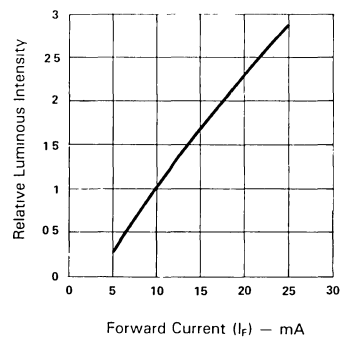


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

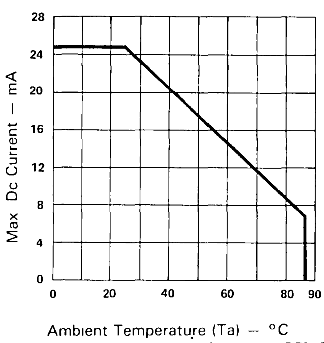


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

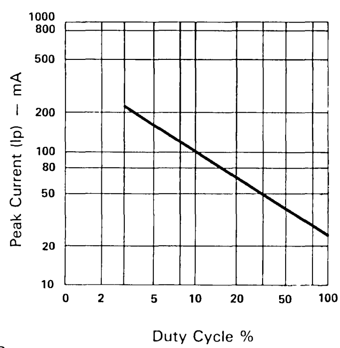


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

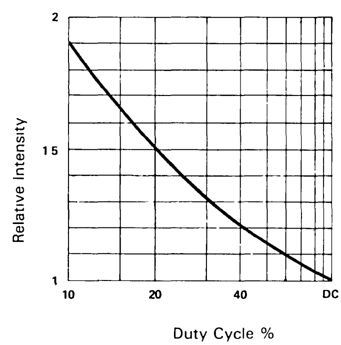


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

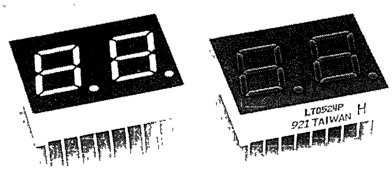
LITEON

LTD-524 SERIES

0.43" DUAL DIGIT NUMERIC DISPLAYS

FEATURES

- .43 INCH (11.0mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF FIVE BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

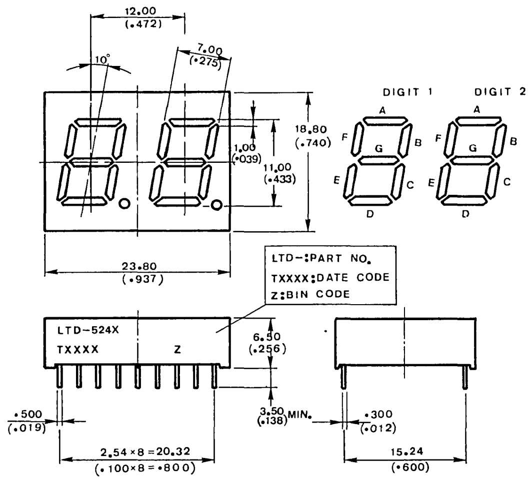
The LTD-524 series are .43 inch (11.0mm) height dual digit displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow and orange series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

Bright red displays have black face and red segment color.
Green, displays have black face and green segment color.

DEVICES

PART NO. LTD–		DESCRIPTION
BRIGHT RED	GREEN	
524P	524G	Common Anode

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

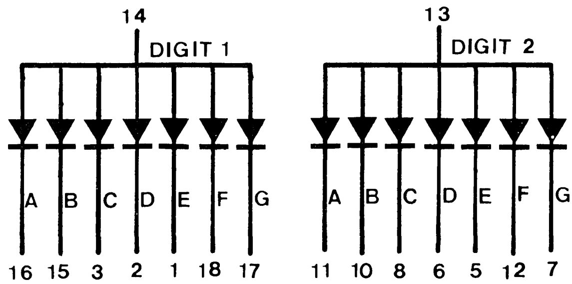
1. Lead length (from seating plane): minimum valum $\frac{{}^{+1.00}_{-0.00}\text{ mm}}{\left({}^{+0.040''}_{-0.000''}\right)}$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

PIN CONNECTION

PIN NO.	CONNECTION LTD-524	PIN NO.	CONNECTION LTD-524
1	Cathode E (Digit 1)	10	Cathode B (Digit 2)
2	Cathode D (Digit 1)	11	Cathode A (Digit 2)
3	Cathode C (Digit 1)	12	Cathode F (Digit 2)
4	No Connection	13	Common Anode (Digit 2)
5	Cathode E (Digit 2)	14	Common Anode (Digit 1)
6	Cathode D (Digit 2)	15	Cathode B (Digit 1)
7	Cathode G (Digit 2)	16	Cathode A (Digit 1)
8	Cathode C (Digit 2)	17	Cathode G (Digit 1)
9	No Connection	18	Cathode F (Digit 1)

INTERNAL CIRCUIT DIAGRAM



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

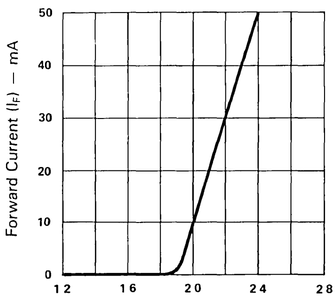
PARAMETER	BRIGHT RED	GREEN	UNIT
Power Dissipation Per Segment	40	75	nW
Feak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	60	100	mA
Continuous Forward Current Per Segment	15	25	mA
Derating Linear From 25°C Per Segment	0.18	0.3	mA/°C
Reverse Voltage Per Segment	5	5	V
Operating Temperature Range	–25°C to +85°C		
Storage Temperature Range	–25°C to +85°C		
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C			

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTD-524P SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	250	600		μcd	I F = 10 mA
Peak Emission Wavelength	λp		697		nm	I F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I F = 20 mA
Forward Voltage, any Segment	V F		2.1	2.8	V	I F = 20 mA
Reverse Current, any Segment	I R			100	μA	V R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I F = 20 mA

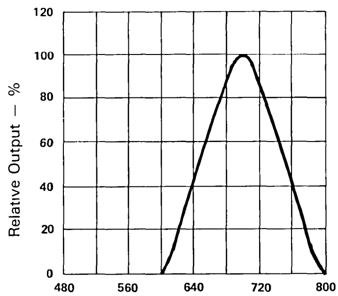
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)



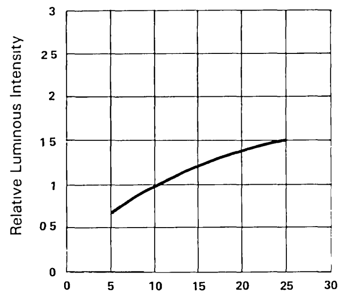
Forward Voltage (V_F) — Volts

Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE.



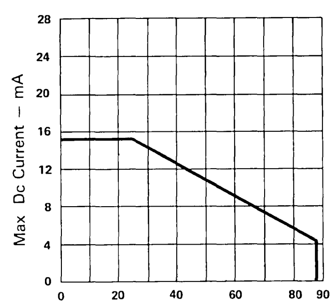
Wavelength (λ) — nm

Fig. 2 SPECTRAL RESPONSE



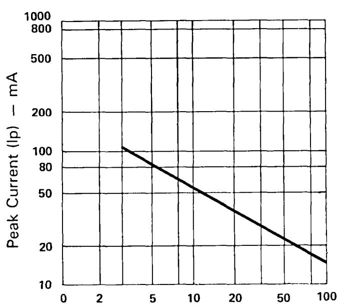
Forward Current (I_F) — mA

Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

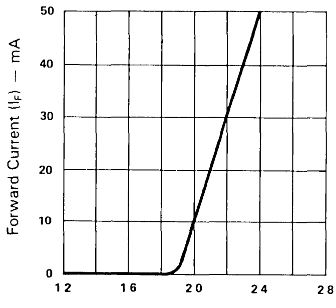
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE − F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C LTD-524G SERIES

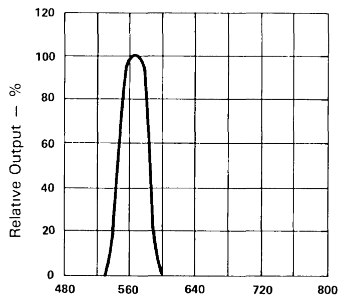
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	700	1800		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

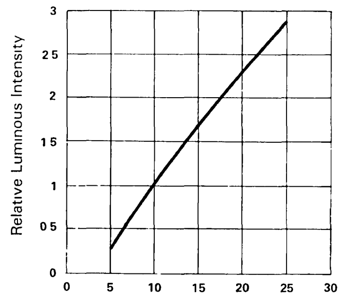
(25°C Ambient Temperature Unless Otherwise Noted)



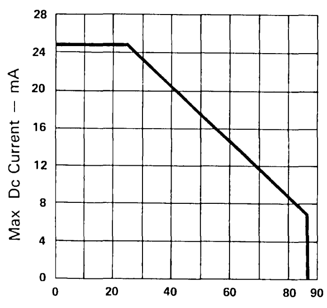
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



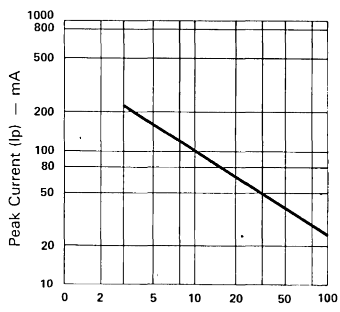
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



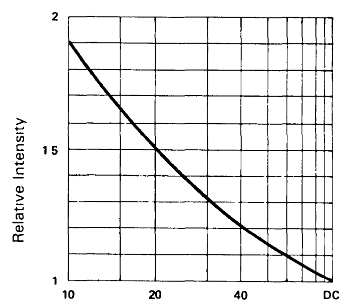
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

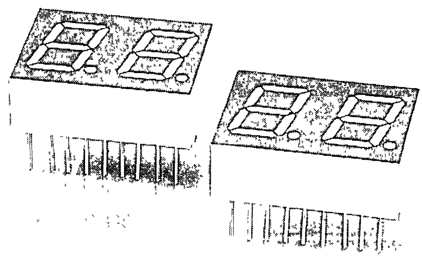


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LITEON

LTD-535/585 SERIES

0.5" DUAL DIGIT NUMERIC DISPLAYS



FEATURES

- 0.5 INCH (12.7mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- COMMON ANODE OR COMMON CATHODE MODELS.
- TWO DIGIT PACKAGE SIMPLIFIES ALIGNMENTS & ASSEMBLY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.

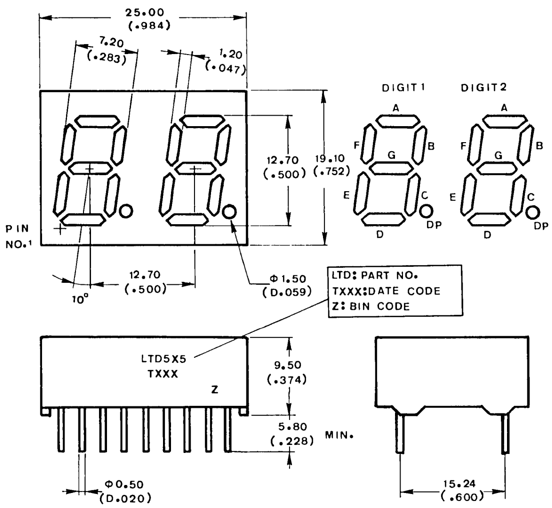
DESCRIPTION

The LTD-535/585 series are 0.5 inch (12.7mm) height dual digit displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red, bright red, green, yellow and orange displays have black face and white segment color. High efficiency red displays have red face and red segment color.

DEVICES

PART NO. LTD–						DESCRIPTION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED		
535R	535P	535G	535Y	535E	535HR	Common Cathode, Rt. Hand Decimal	A
585R	585P	585G	585Y	585E	585HR	Common Anode, Rt. Hand Decimal	B

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

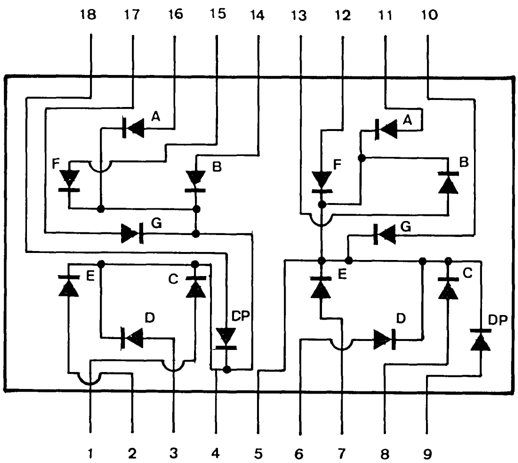
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

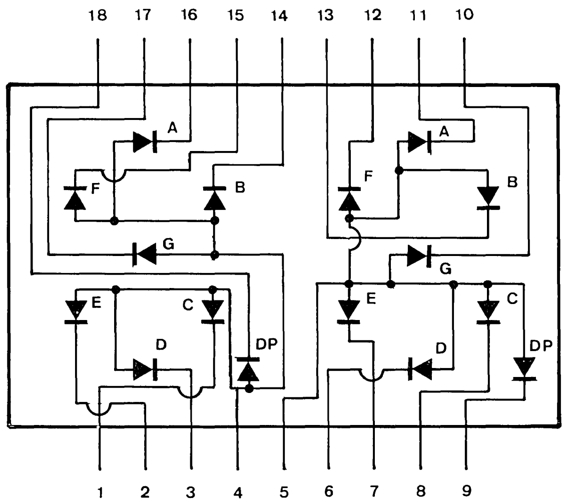
PIN NO.	CONNECTION	
	A. LTD-535	B. LTD-585
1	Anode C (Digit 1)	Cathode C (Digit 1)
2	Anode E (Digit 1)	Cathode E (Digit 1)
3	Anode D (Digit 1)	Cathode D (Digit 1)
4	Common Cathode (Digit 1)	Common Anode (Digit 1)
5	Common Cathode (Digit 2)	Common Anode (Digit 2)
6	Anode D (Digit 2)	Cathode D (Digit 2)
7	Anode E (Digit 2)	Cathode E (Digit 2)
8	Anode C (Digit 2)	Cathode C (Digit 2)
9	Anode D.P. (Digit 2)	Cathode D.P. (Digit 2)
10	Anode G (Gigit 2)	Cathode G (Digit 2)
11	Anode A (Digit 2)	Cathode A (Digit 2)
12	Anode F (Digit 2)	Cathode F (Digit 2)
13	Anode B (Digit 2)	Cathode B (Digit 2)
14	Anode B (Digit 1)	Cathode B (Digit 1)
15	Anode F (Digit 1)	Cathode F (Digit 1)
16	Anode A (Digit 1)	Cathode A (Digit 1)
17	Anode G (Digit 1)	Cathode G (Digit 1)
18	Anode D.P. (Digit 1)	Cathode D.P. (Digit 1)

INTERNAL CIRCUIT DIAGRAM

A. LTD-535



B. LTD-585



SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	−25°C to +85°C						
Storage Temperature Range	−25°C to +85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-535R/585R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	500		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

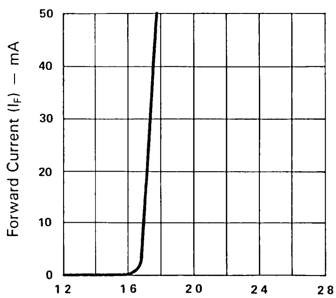


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

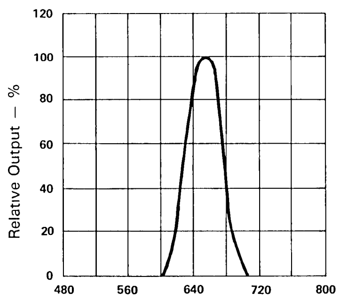


Fig 2 SPECTRAL RESPONSE

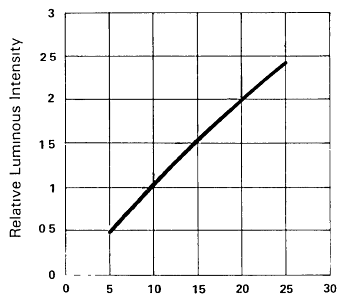


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

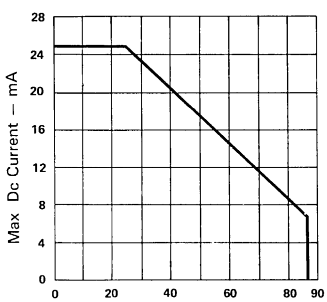


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

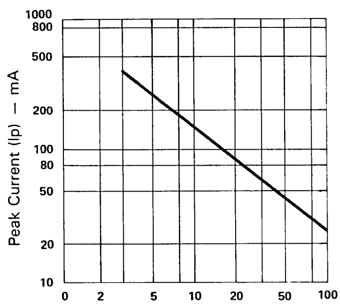


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

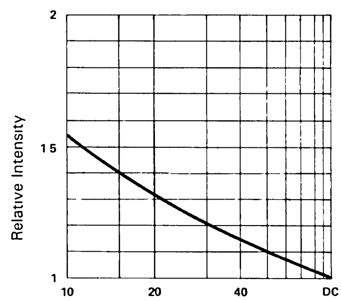


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-535P/585P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	300	750		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

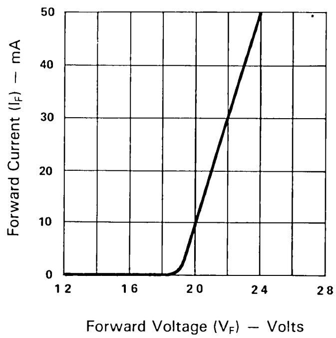


Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE

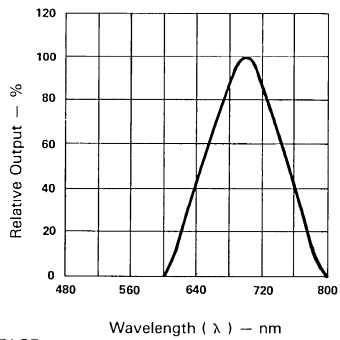


Fig. 2 SPECTRAL RESPONSE

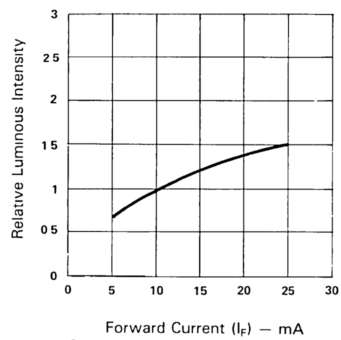


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

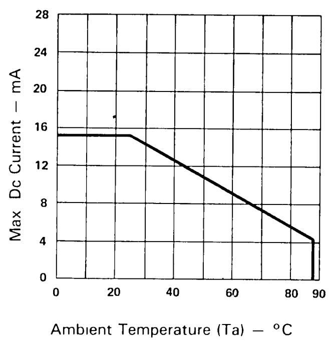


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

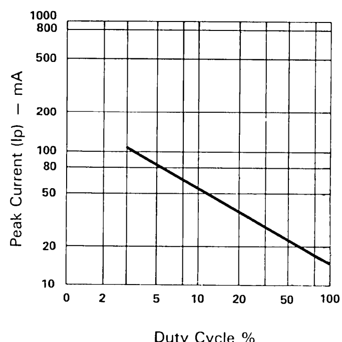


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-535G/585G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	750	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

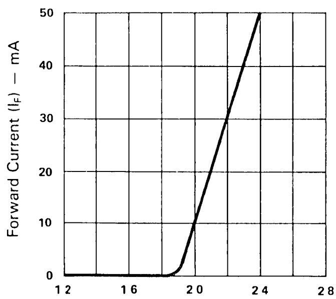


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

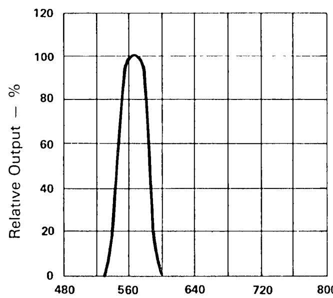


Fig 2 SPECTRAL RESPONSE

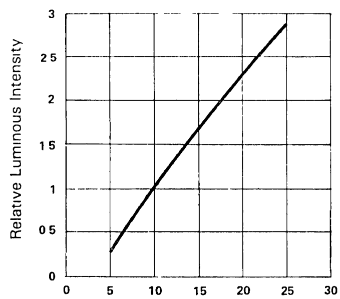


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).

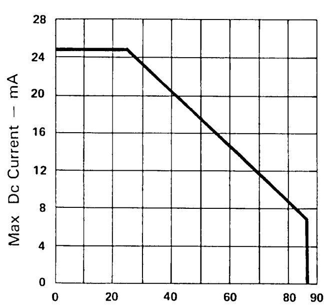


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

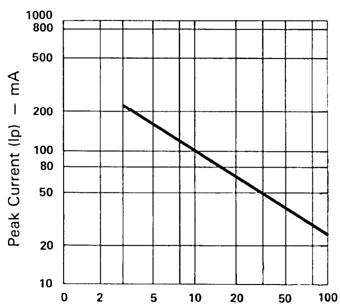


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

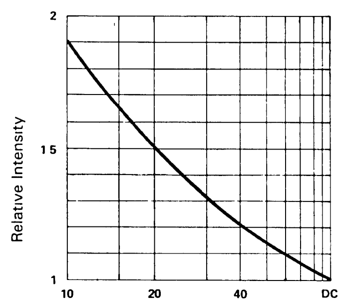


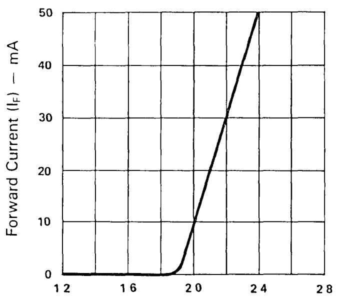
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTD-535Y/585Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	600	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		35		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

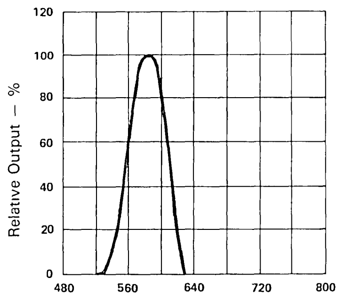
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)



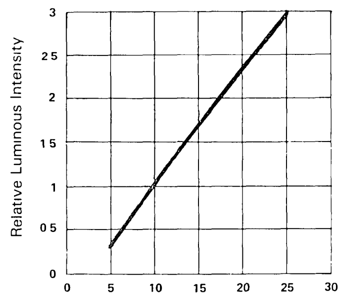
Forward Voltage (V_F) — Volts

Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



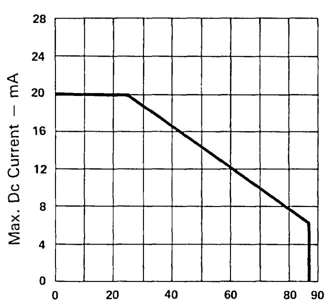
Wavelength (λ) — nm

Fig 2 SPECTRAL RESPONSE



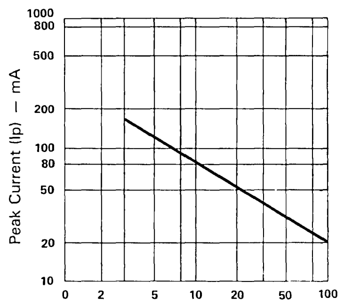
Forward Current (I_F) — mA

Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)



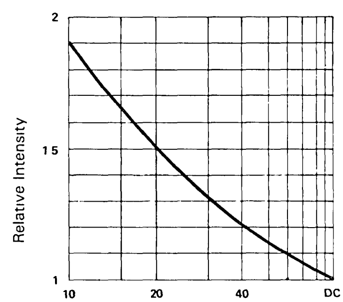
Ambient Temperature (Ta) — °C

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-535E/585E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	750	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

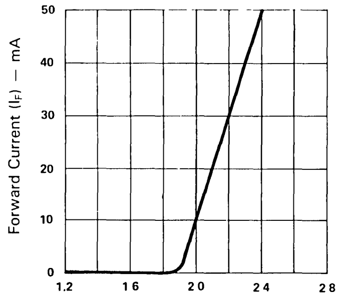


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

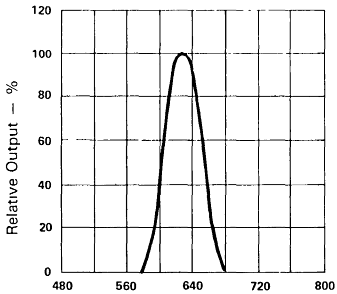


Fig 2 SPECTRAL RESPONSE

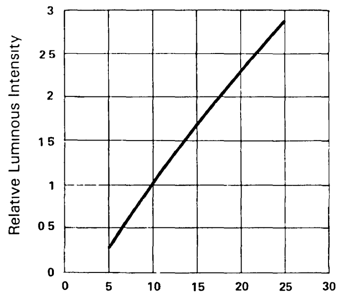


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

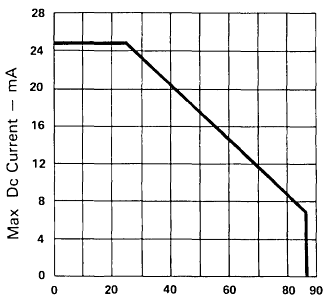


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

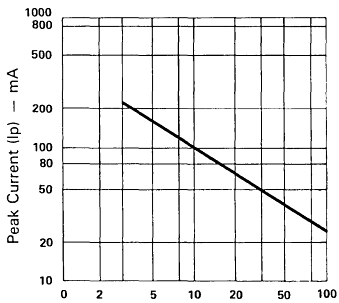


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

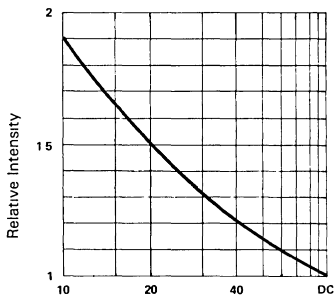


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

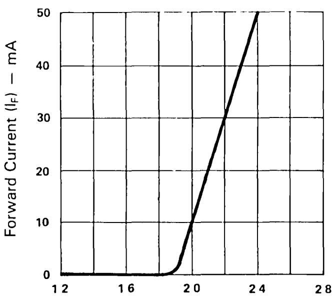
ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTD-535HR/585HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	750	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

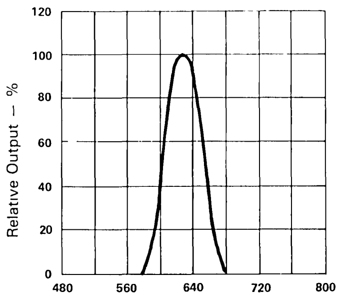
SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

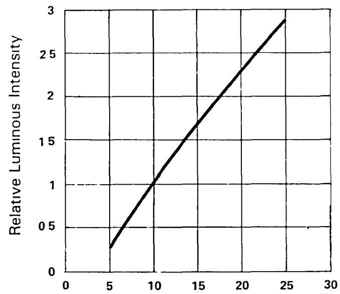
(25°C Ambient Temperature Unless Otherwise Noted)



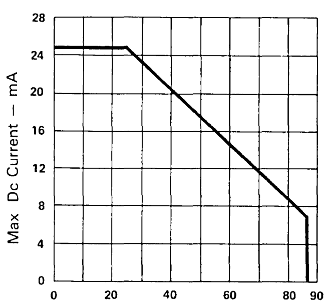
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



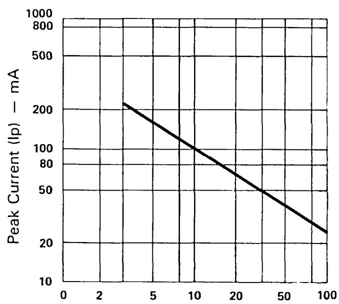
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



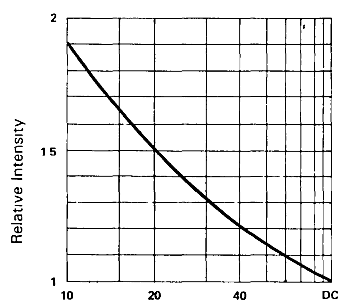
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

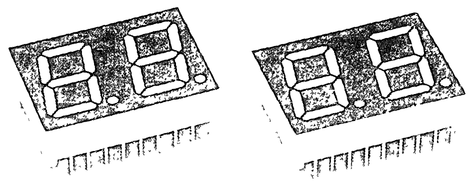
LITEON

LTD-5250 / 5260 SERIES

0.52" DUAL DIGIT NUMERIC DISPLAYS

FEATURES

- 0.52 INCH (13.2mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



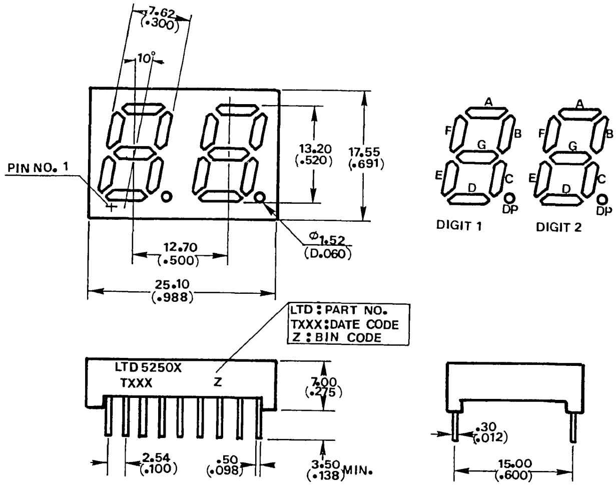
DESCRIPTION

The LTD-5000 series are 0.52 inch (13.2mm) height dual digit displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices are utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red, bright red, yellow and orange displays have gray face and white segment color. Green displays have gray face and green segment color. High efficiency red displays have red face and red segment color.

DEVICES

PART NO. LTD–						DESCRIPTION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED		
5250R	5250P	5250G	5250Y	5250E	5250HR	Common Anode, Rt. Hand Decimal	A
5260R	5260P	5260G	5260Y	5260E	5260HR	Common Cathode, Rt. Hand Decimal	B

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

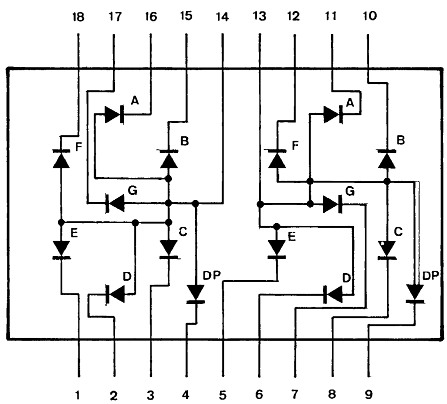
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

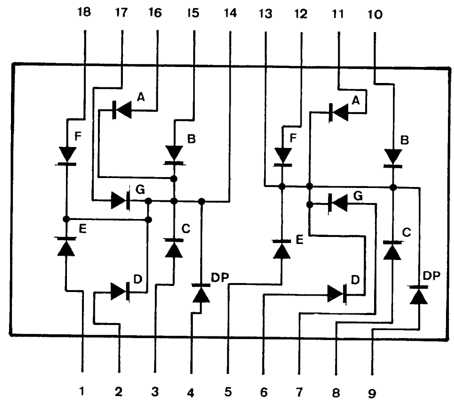
PIN NO.	CONNECTION	
	LTC-5250	LTC-5260
1	Cathode E (Digit 1)	Anode E (Digit 1)
2	Cathode D (Digit 1)	Anode D (Digit 1)
3	Cathode C (Digit 1)	Anode C (Digit 1)
4	Cathode D.P. (Digit 1)	Anode D.P. (Digit 1)
5	Cathode E (Digit 2)	Anode E (Digit 2)
6	Cathode D (Digit 2)	Anode D (Digit 2)
7	Cathode G (Digit 2)	Anode G (Digit 2)
8	Cathode C (Digit 2)	Anode C (Digit 2)
9	Cathode D P (Digit 2)	Anode D.P. (Digit 2)
10	Cathode B (Digit 2)	Anode B (Digit 2)
11	Cathode A (Digit 2)	Anode A (Digit 2)
12	Cathode F (Digit 2)	Anode F (Digit 2)
13	Common Anode (Digit 2)	Common Cathode (Digit 2)
14	Common Anode (Digit 1)	Common Cathode (Digit 1)
15	Cathode B (Digit 1)	Anode B (Digit 1)
16	Cathode A (Digit 1)	Anode A (Digit 1)
17	Cathode G (Digit 1)	Anode G (Digit 1)
18	Cathode F (Digit 1)	Anode F (Digit 1)

INTERNAL CIRCUIT DIAGRAM

A. LTD-5250



B. LTD-5260



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

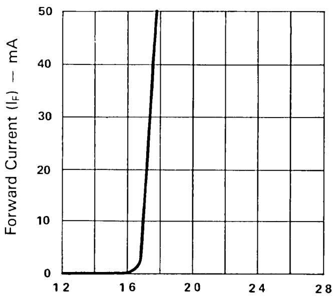
PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	−25°C to +85°C						
Storage Temperature Range	−25°C to +85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-5250R/5260R

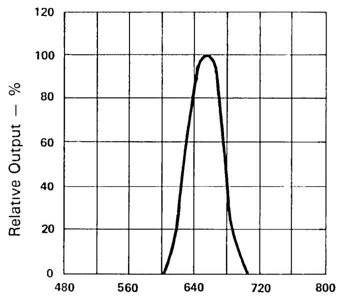
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	500		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

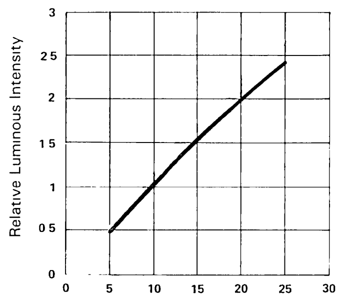
(25°C Ambient Temperature Unless Otherwise Noted)



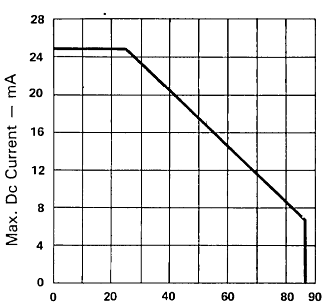
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



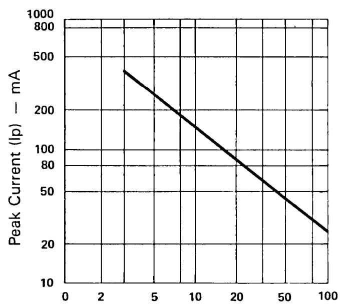
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



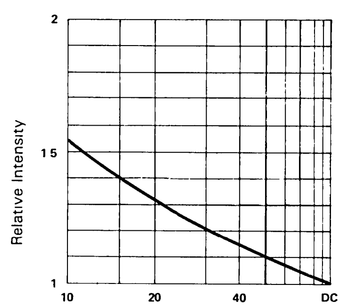
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT TA = 25°C
LTD-5250P/5260P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	750		μcd	IF = 10 mA
Peak Emission Wavelength	λp		697		nm	IF = 20 mA
Spectral Line Half-Width	Δλ		90		nm	IF = 20 mA
Forward Voltage, any Segment	VF		2.1	2.8	V	IF = 20 mA
Reverse Current, any Segment	IR			100	μA	VR = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		IF = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

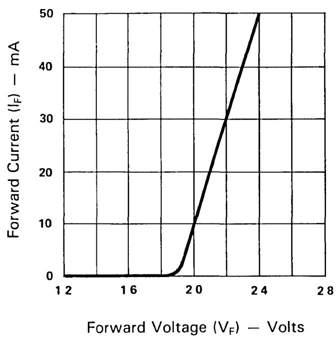


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

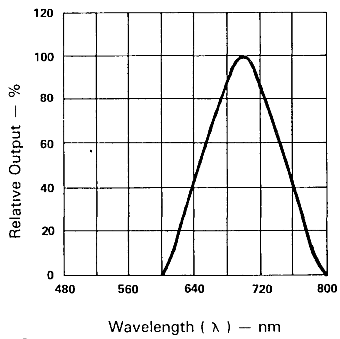


Fig. 2 SPECTRAL RESPONSE

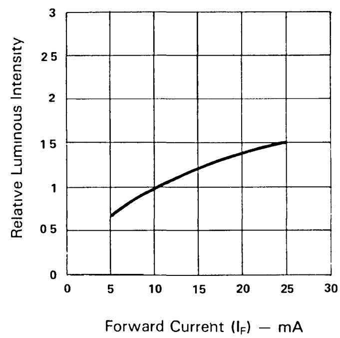


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

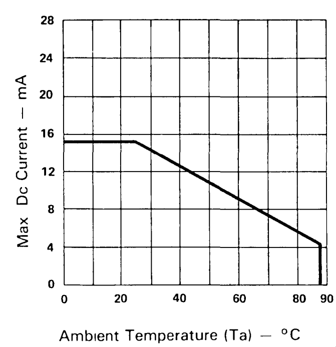


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

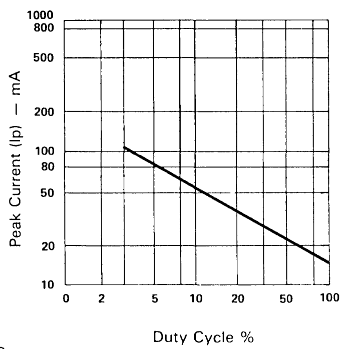


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-5250G/5260G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I F = 10 mA
Peak Emission Wavelength	λp		565		nm	I F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I F = 20 mA
Forward Voltage, any Segment	V F		2.1	2.8	V	I F = 20 mA
Reverse Current, any Segment	I R			100	μA	V R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

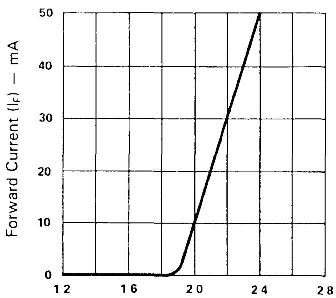


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

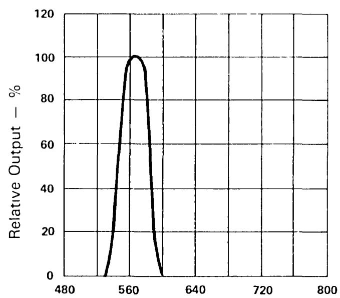


Fig 2 SPECTRAL RESPONSE

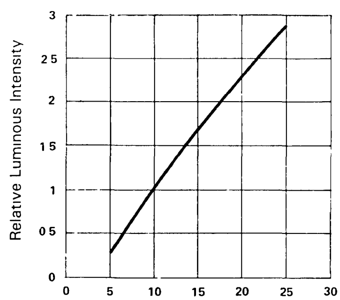


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

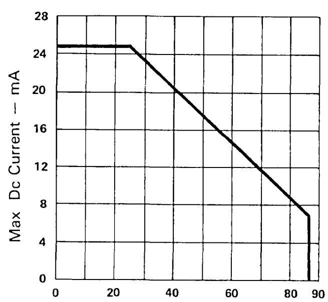


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

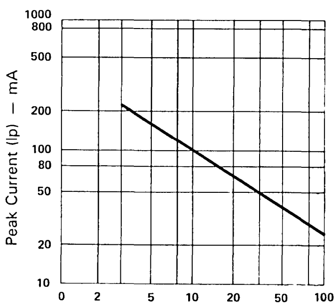


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

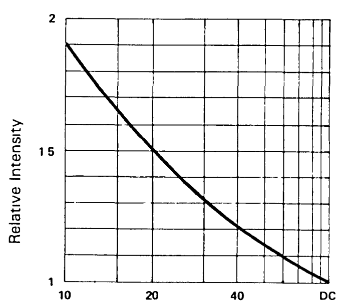
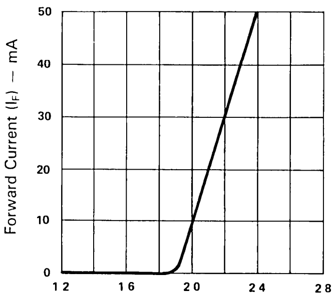


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

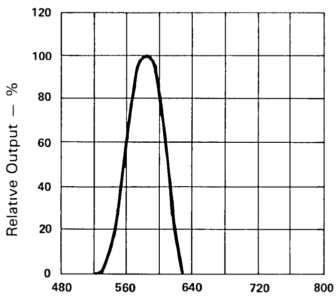
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-5250Y/5260Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	700	2000		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		585		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		35		nm	$I_F = 20$ mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment	I_R			100	μA	$V_R = 5$ V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		$I_F = 20$ mA

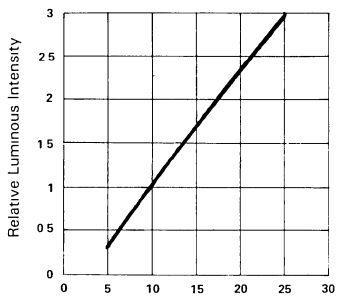
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



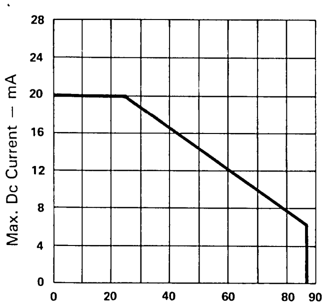
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



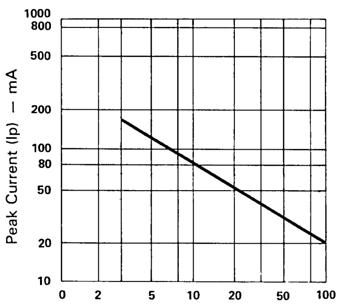
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE.



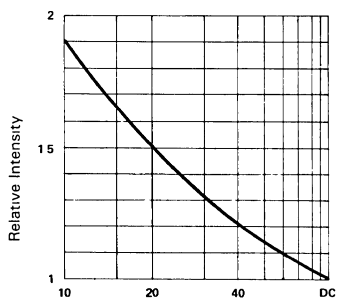
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-5250E/5260E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		µcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	µA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

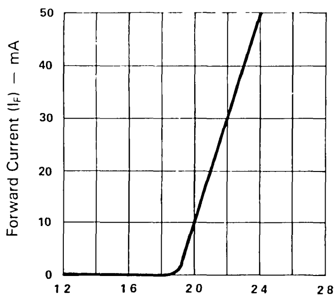


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

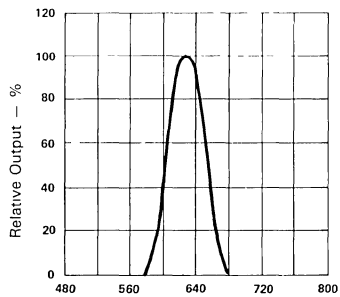


Fig 2 SPECTRAL RESPONSE

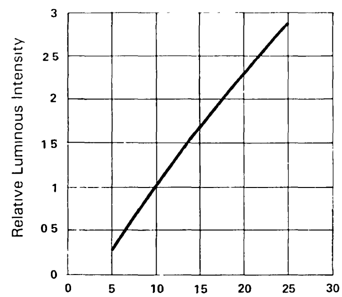


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

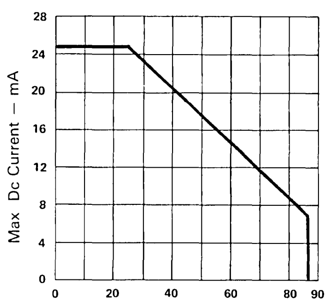


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

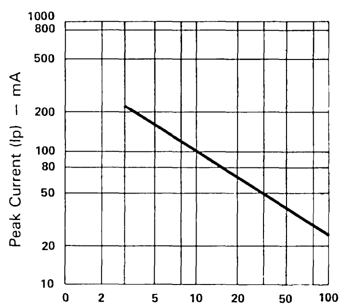


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

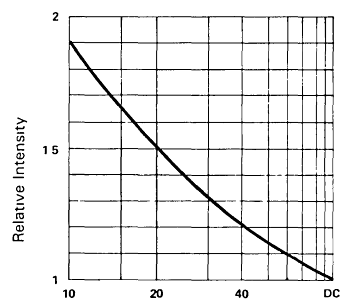
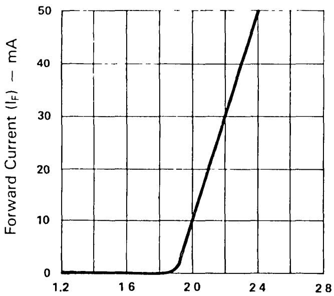


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

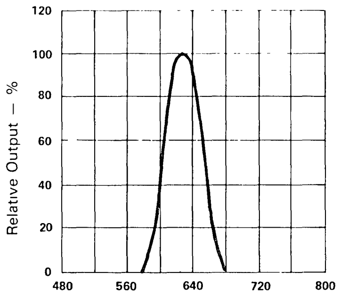
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-5250HR/5260HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	900	2000		μcd	IF = 10 mA
Peak Emission Wavelength	λp		635		nm	IF = 20 mA
Spectral Line Half-Width	Δλ		40		nm	IF = 20 mA
Forward Voltage Segment or D.P.	VF		2.1	2.8	V	IF = 20 mA
Reverse Current any Segment or D.P.	IR			100	μA	VR = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		IF = 20 mA

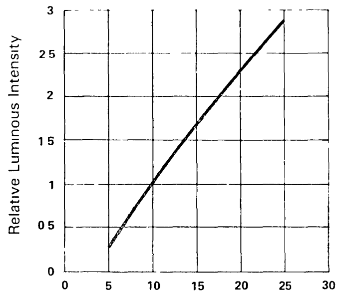
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



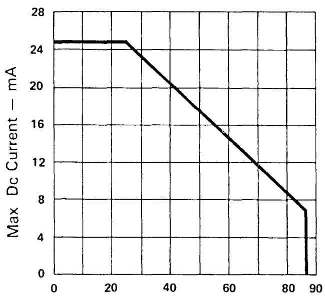
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



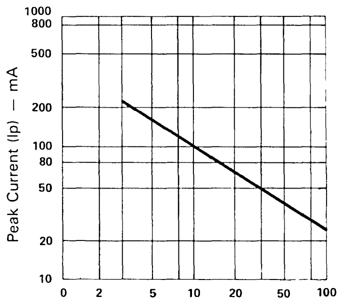
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



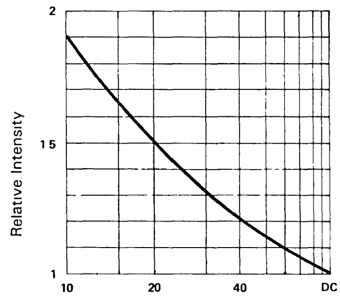
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG.)

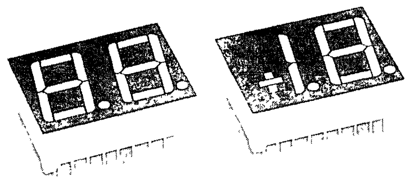
LITEON

LTD-6000 SERIES

0.56" DUAL DIGIT NUMERIC DISPLAYS

FEATURES

- 0.56 INCH (14.2mm) DIGIT HEIGHT.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

The LTD-6000, series are 0.56 inch (14.2mm) heigh, dual digit displays.

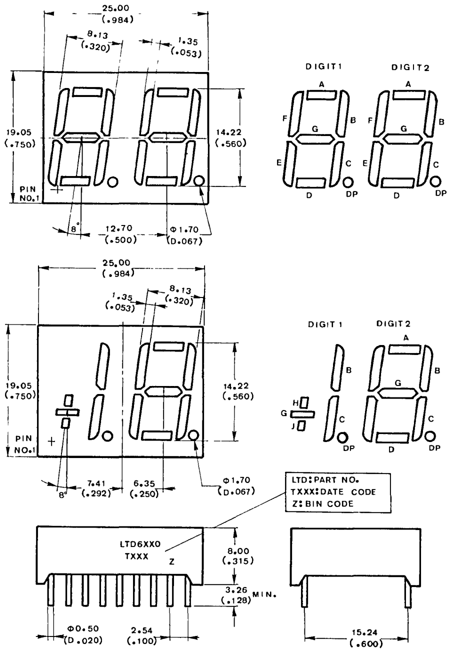
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices are utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red and bright red displays have black face and red segment color. Green and yellow displays have gray face and white segment color. Orange displays have orange face and orange segment color. High efficiency red displays have red face and red segment color.

DEVICES

PART NO. LTD–						DESCRIPTION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED		
6710R	6710P	6410G	6810Y	6610E	6910HR	Common Anode, Rt. Hand Decimal	A
6730R	6730P	6430G	6830Y	6630E	6930HR	Common Anode, ±1.8 Overflow	B
6740R	6740P	6440G	6840Y	6640E	6940HR	Common Cathode, Rt. Hand Decimal	C
6750R	6750P	6450G	6850Y	6650E	6950HR	Common Cathode, ±1.8 Overflow	D

PACKAGE DIMENSIONS

LTD-6x10/6x30/6x40/6x50



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane):

   minimum value $\dfrac{\frac{+1.00}{-0.00}\text{mm}}{\left(\frac{+0.040''}{-0.000''}\right)}$

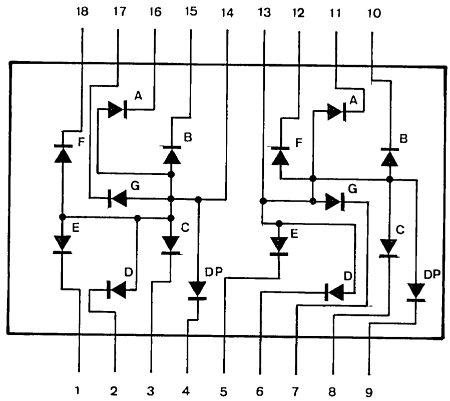
2. $\frac{\pm 0.25 \text{ mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

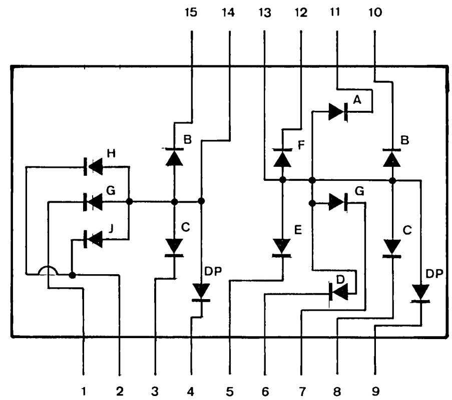
PIN NO.	CONNECTION			
	A. LTD-6x10	B. LTD-6x30	C. LTD-6x40	D. LTD-6x50
1	Cathode E (Digit 1)	Cathode G (Digit 1)	Anode E (Digit 1)	Anode G (Digit 1)
2	Cathode D (Digit 1)	Cathode J. H (Digit 1)	Anode D (Digit 1)	Anode J. H (Digit 1)
3	Cathode C (Digit 1)	Cathode C (Digit 1)	Anode C (Digit 1)	Anode C (Digit 1)
4	Cathode D.P. (Digit 1)	Cathode D.P. (Digit 1)	Anode D.P. (Digit 1)	Anode D.P. (Digit 1)
5	Cathode E (Digit 2)	Cathode E (Digit 2)	Anode E (Digit 2)	Anode E (Digit 2)
6	Cathode D (Digit 2)	Cathode D (Digit 2)	Anode D (Digit 2)	Anode D (Digit 2)
7	Cathode G (Digit 2)	Cathode G (Digit 2)	Anode G (Digit 2)	Anode G (Digit 2)
8	Cathode C (Digit 2)	Cathode C (Digit 2)	Anode C (Digit 2)	Anode C (Digit 2)
9	Cathode D.P. (Digit 2)	Cathode D.P. (Digit 2)	Anode D.P (Digit 2)	Anode D.P. (Digit 2)
10	Cathode B (Digit 2)	Cathode B (Digit 2)	Anode B (Digit 2)	Anode B (Digit 2)
11	Cathode A (Digit 2)	Cathode A (Digit 2)	Anode A (Digit 2)	Anode A (Digit 2)
12	Cathode F (Digit 2)	Cathode F (Digit 2)	Anode F (Digit 2)	Anode F (Digit 2)
13	Common Anode (Digit 2)	Common Anode (Digit 2)	Common Cathode (Digit 2)	Common Cathode (Digit 2)
14	Common Anode (Digit 1)	Common Anode (Digit 1)	Common Cathode (Digit 1)	Common Cathode (Digit 1)
15	Cathode B (Digit 1)	Cathode B (Digit 1)	Anode B (Digit 1)	Anode B (Digit 1)
16	Cathode A (Digit 1)	No Connection	Anode A (Digit 1)	No Connection
17	Cathode G (Digit 1)	No Connection	Anode G (Digit 1)	No Connection
18	Cathode F (Digit 1)	No Connection	Anode F (Digit 1)	No Connection

INTERNAL CIRCUIT DIAGRAM

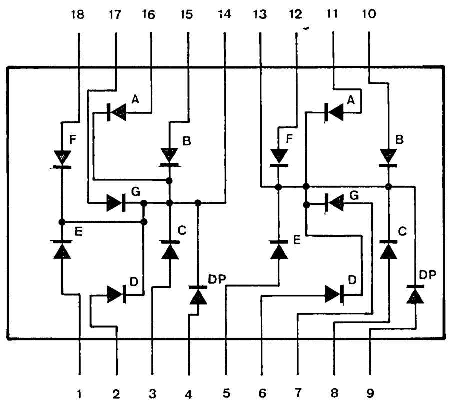
A. LTD-6x10



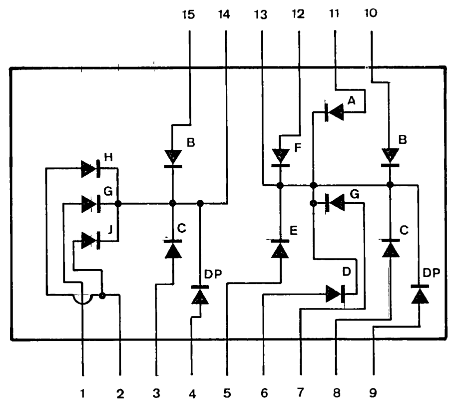
B. LTD-6x30



C. LTD-6x40



D. LTD-6x50



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

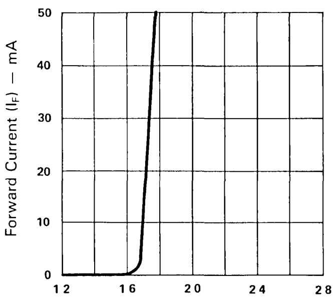
PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0 18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	–25°C to +85°C						
Storage Temperature Range	–25°C to +85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-6700R SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	200	600		µcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		655		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		24		nm	$I_F = 20$ mA
Forward Voltage, any Segment	V_F		1.7	2.0	V	$I_F = 20$ mA
Reverse Current, any Segment	I_R			100	µA	$V_R = 5$ V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		$I_F = 20$ mA

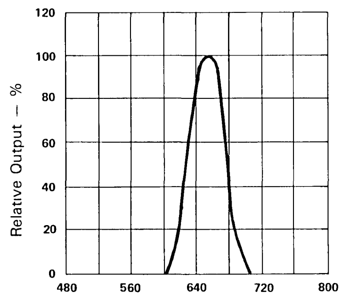
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)



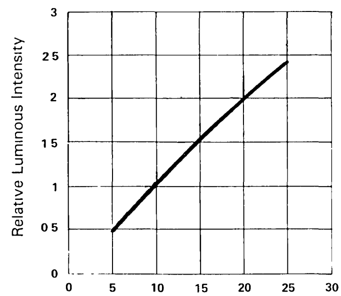
Forward Voltage (V_F) — Volts

Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



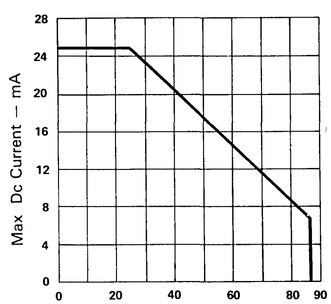
Wavelength (λ) — nm

Fig 2 SPECTRAL RESPONSE



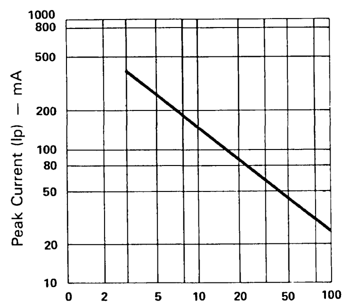
Forward Current (I_F) — mA

Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



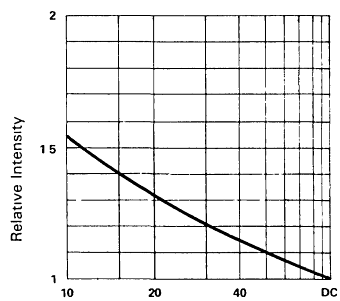
Ambient Temperature (Ta) — °C

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTD-6700P SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	950		µcd	IF = 10 mA
Peak Emission Wavelength	λp		697		nm	IF = 20 mA
Spectral Line Half-Width	Δλ		90		nm	IF = 20 mA
Forward Voltage, any Segment	VF		2.1	2.8	V	IF = 20 mA
Reverse Current, any Segment	IR			100	µA	VR = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		IF = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

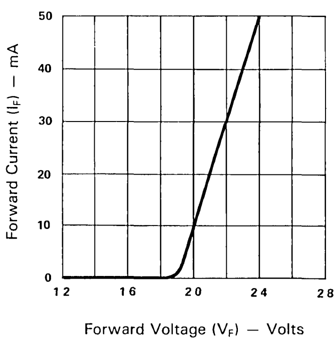


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

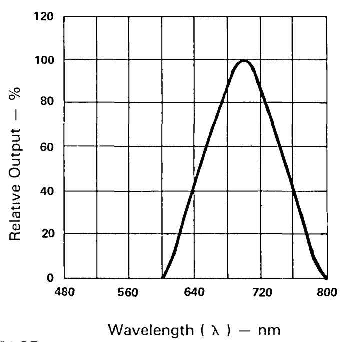


Fig 2 SPECTRAL RESPONSE

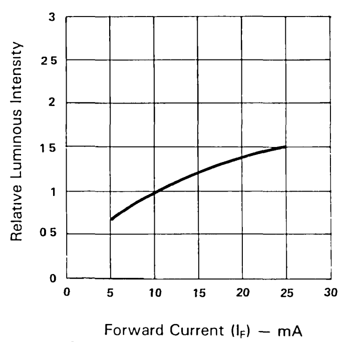


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

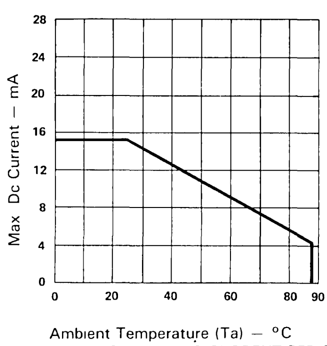


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

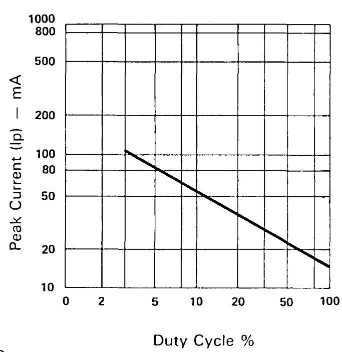


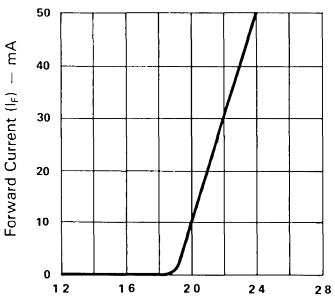
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-6400G SERIES

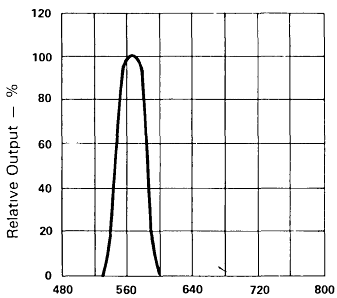
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

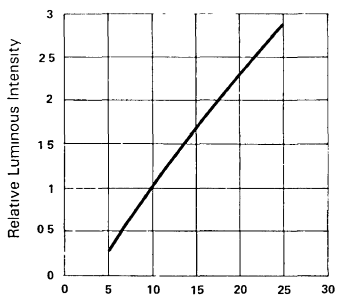
(25°C Ambient Temperature Unless Otherwise Noted)



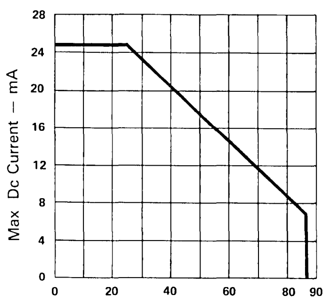
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



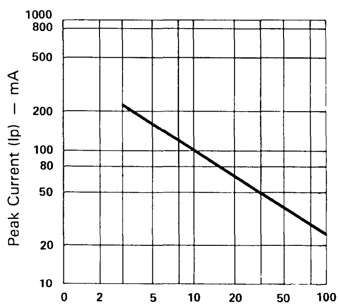
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



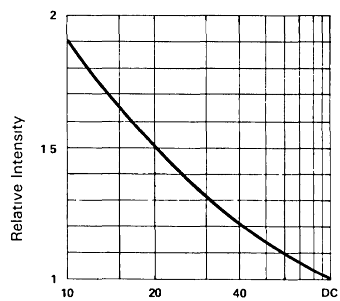
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTD-6800Y SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2.1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

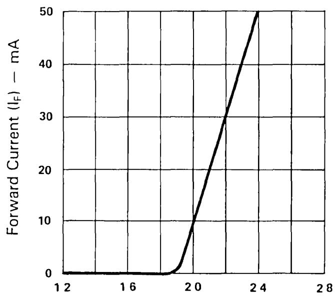


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

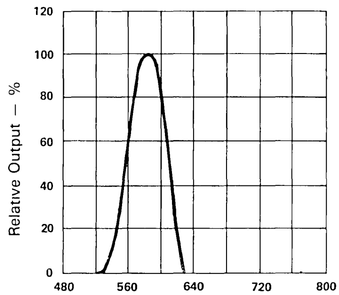


Fig 2 SPECTRAL RESPONSE

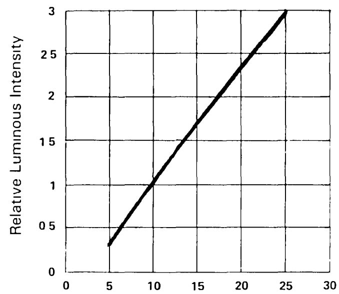


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)

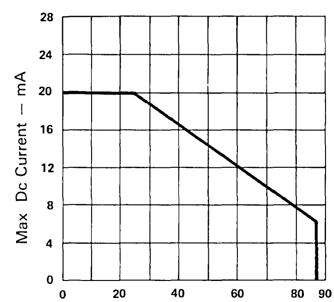


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

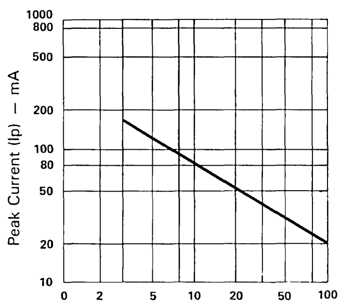


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

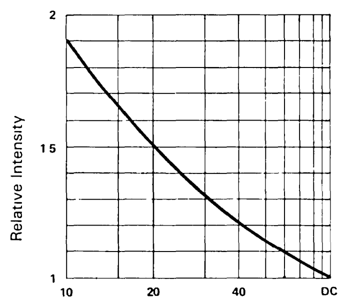
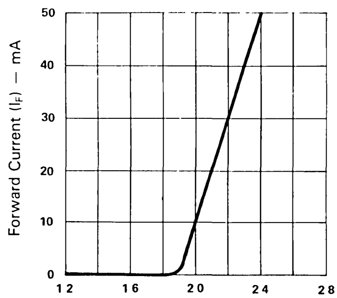


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

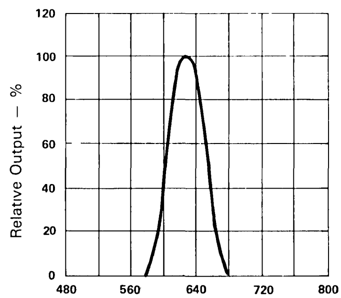
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-6600E SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		µcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment	V_R		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_F			100	µA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

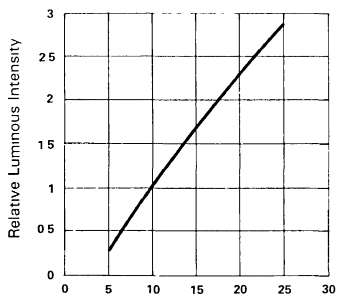
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



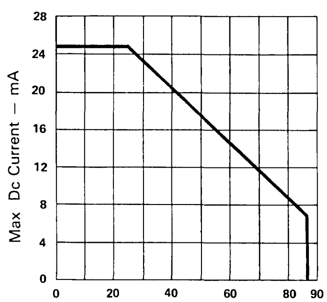
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



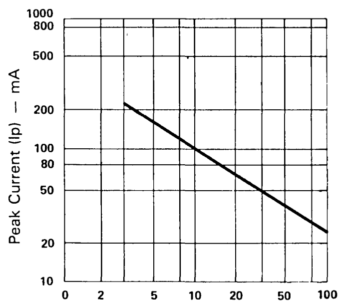
Wavelength (λ) — nm
Fig. 2 SPECTRAL RESPONSE.



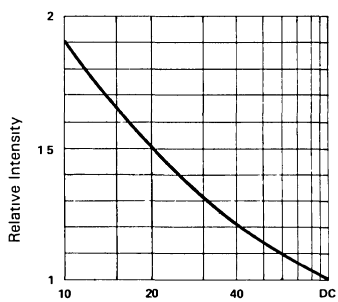
Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTD-6900HR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2 1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

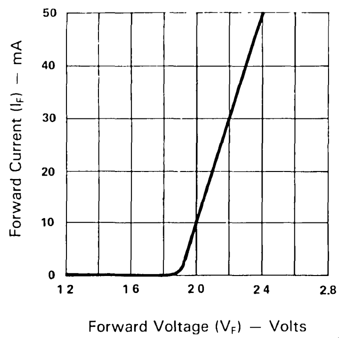


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

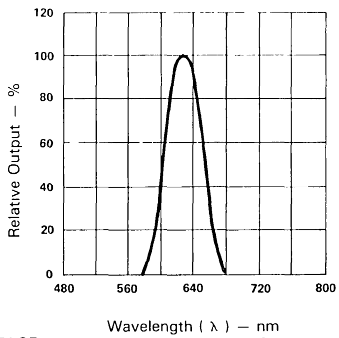


Fig 2 SPECTRAL RESPONSE

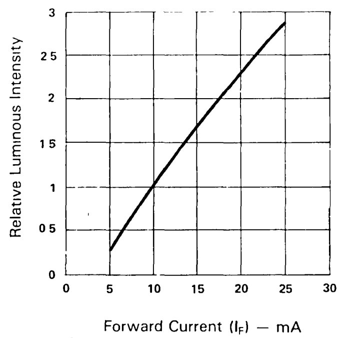


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

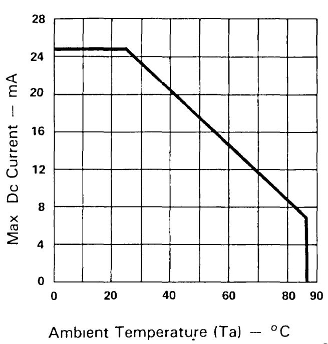


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

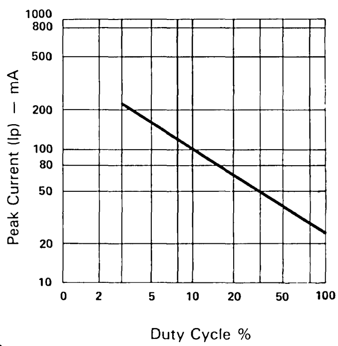


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

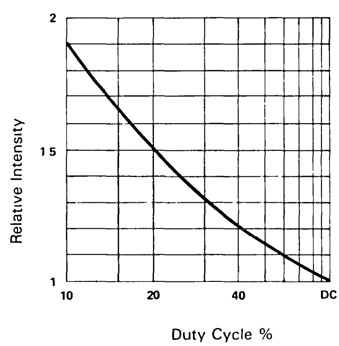


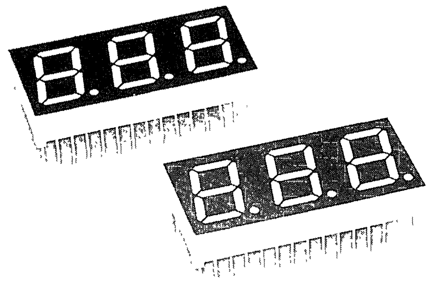
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LTC-5836 / 5336 SERIES

0.52" THREE-DIGIT NUMERIC DISPLAYS

FEATURES

- 0.52 INCH (13.2mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

The LTC-5000 series are 0.52 inch (13.2mm) height three-digit

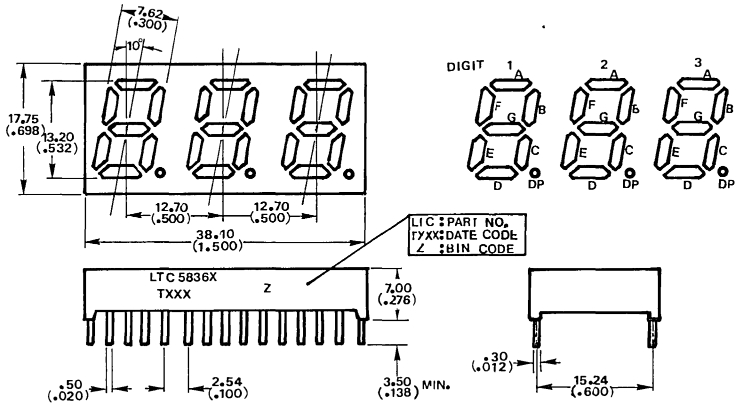
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices are utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red, bright red, yellow and orange displays have gray face and white segment color. Green displays have gray face and green segment color. High efficiency red displays have red face and red segment color.

DEVICES

PART NO. LTC–						DESCRIPTION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI-EFF. RED		
5836R	5836P	5836G	5836Y	5836E	5836HR	Common Anode Rt. Hand Decimal	A
5336R	5336P	5336G	5336Y	5336E	5336HR	Common Cathode Rt. Hand Decimal	B

PACKAGE DIMENSIONS

LTC-5x36



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

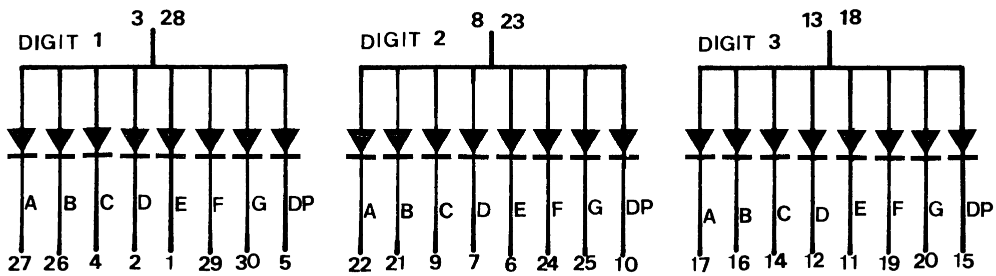
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$
2. $\frac{\pm 0.25 \text{ mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

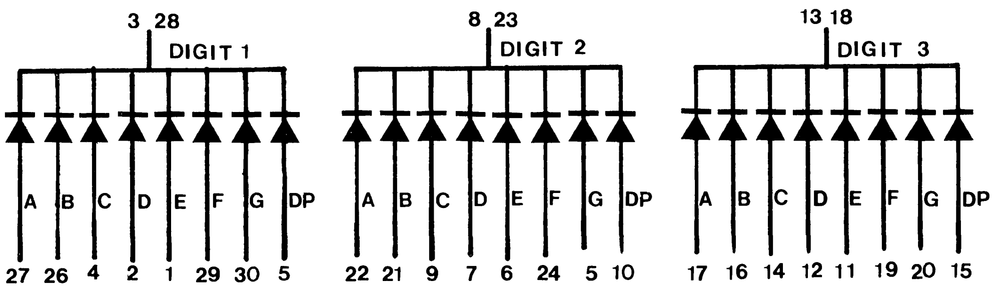
PIN NO.	CONNECTION LTC-5836	CONNECTION LTC-5336
1	Cathode E (Digit 1)	Anode E (Digit 1)
2	Cathode D (Digit 1)	Anode D (Digit 1)
3	Common Anode Digit 1	Common Cathode Digit 1
4	Cathode C (Digit 1)	Anode C (Digit 1)
5	Cathode DP (Digit 1)	Anode DP (Digit 1)
6	Cathode E (Digit 2)	Anode E (Digit 2)
7	Cathode D (Digit 2)	Anode D (Digit 2)
8	Common Anode Digit 2	Common Cathode Digit 2
9	Cathode C (Digit 2)	Anode C (Digit 2)
10	Cathode DP (Digit 2)	Anode DP (Digit 2)
11	Cathode E (Digit 3)	Anode E (Digit 3)
12	Cathode D (Digit 3)	Anode D (Digit 3)
13	Common Anode Digit 3	Common Cathode Digit 3
14	Cathode C (Digit 3)	Anode C (Digit 3)
15	Cathode DP (Digit 3)	Anode DP (Digit 3)
16	Cathode B (Digit 3)	Anode B (Digit 3)
17	Cathode A (Digit 3)	Anode A (Digit 3)
18	Common Anode Digit 3	Common Cathode Digit 3
19	Cathode F (Digit 3)	Anode F (Digit 3)
20	Cathode G (Digit 3)	Anode G (Digit 3)
21	Cathode B (Digit 2)	Anode B (Digit 2)
22	Cathode A (Digit 2)	Anode A (Digit 2)
23	Common Anode Digit 2	Common Cathode Digit 2
24	Cathode F (Digit 2)	Anode F (Digit 2)
25	Cathode G (Digit 2)	Anode G (Digit 2)
26	Cathode B (Digit 1)	Anode B (Digit 1)
27	Cathode A (Digit 1)	Anode A (Digit 1)
28	Common Anode Digit 1	Common Cathode Digit 1
29	Cathode F (Digit 1)	Anode F (Digit 1)
30	Cathode G (Digit 1)	Anode G (Digit 1)

INTERNAL CIRCUIT DIAGRAM

A. LTC-5836



B. LTC-5336



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Feak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	–25°C to +85°C						
Storage Temperature Range	–25°C to +85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ C$
LTC-5836R/5336R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	500		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2 1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

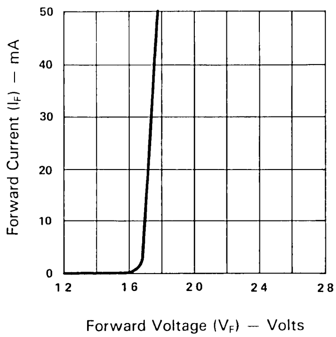


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

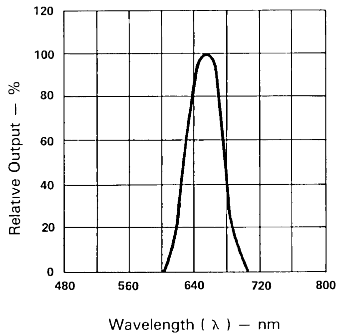


Fig 2 SPECTRAL RESPONSE

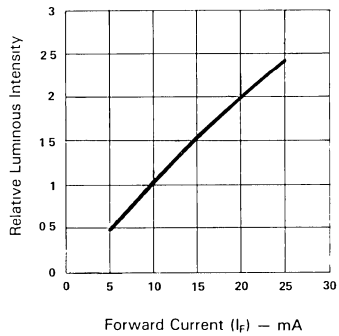


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

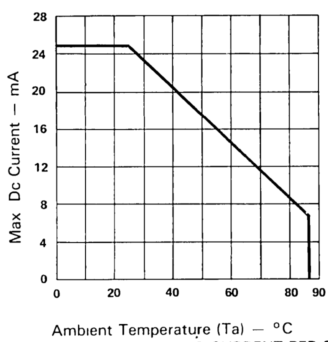


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

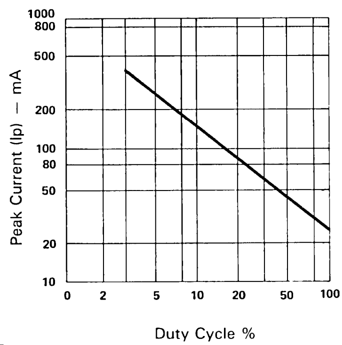


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

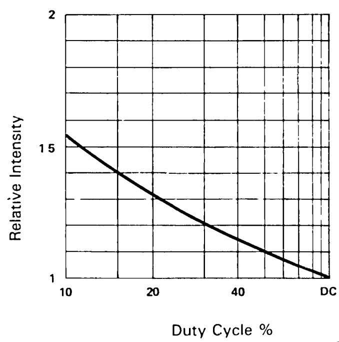


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTC-5836P/5336P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	750		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

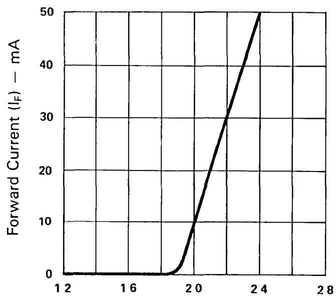


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

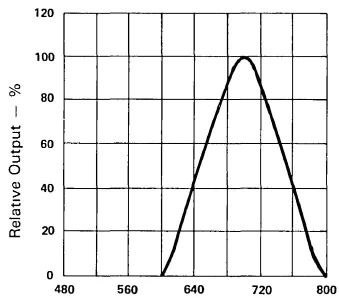


Fig. 2 SPECTRAL RESPONSE

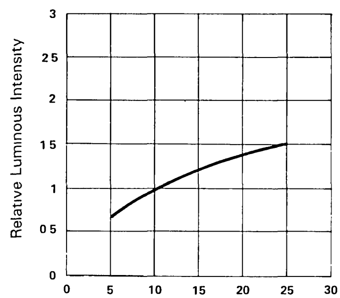


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

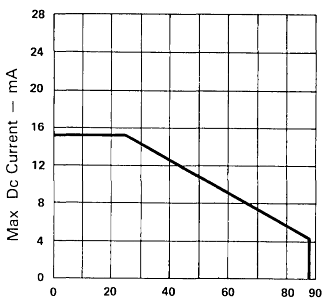


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

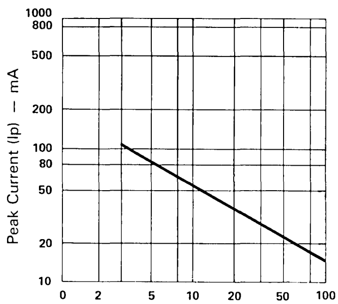


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTC-5836G/5336G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

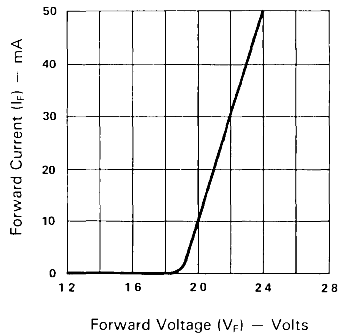


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

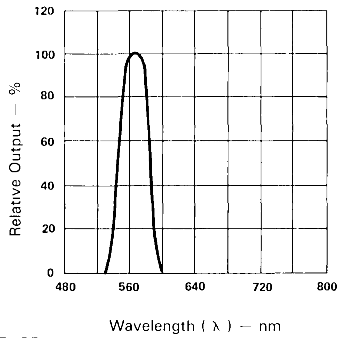


Fig 2 SPECTRAL RESPONSE

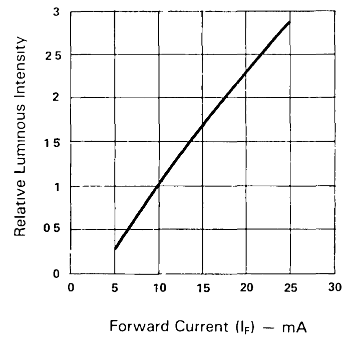


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

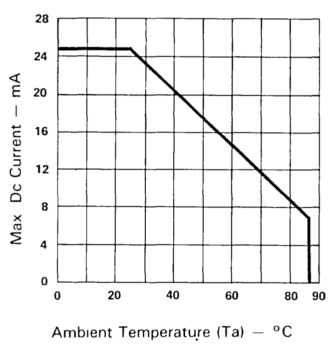


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

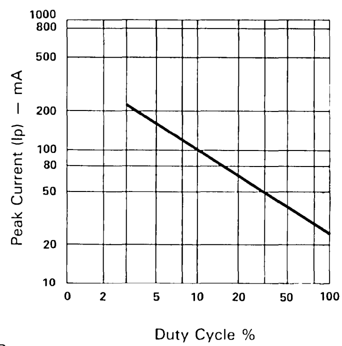


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

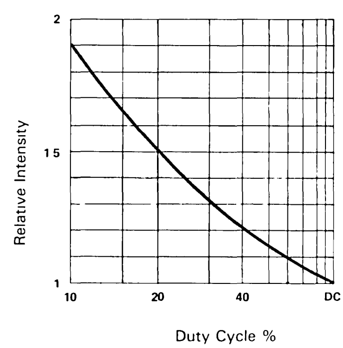


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT TA = 25°C
LTC-5836Y/5336Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	700	2000		μcd	I F = 10 mA
Peak Emission Wavelength	λp		585		nm	I F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I F = 20 mA
Forward Voltage, any Segment	V F		2.1	2.8	V	I F = 20 mA
Reverse Current, any Segment	I R			100	μA	V R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

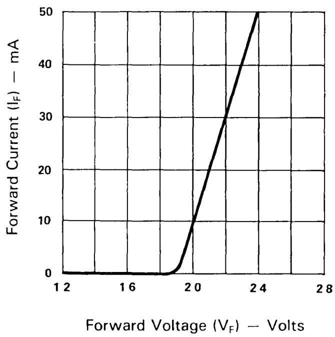


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

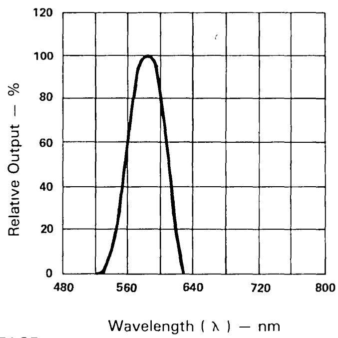


Fig 2 SPECTRAL RESPONSE

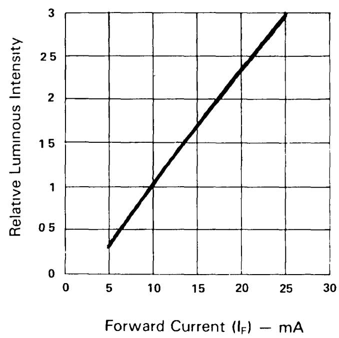


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)

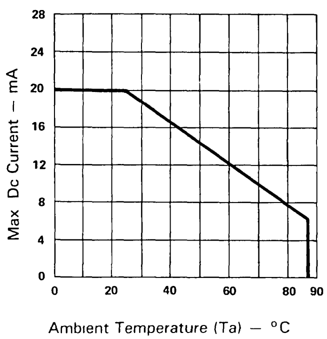


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

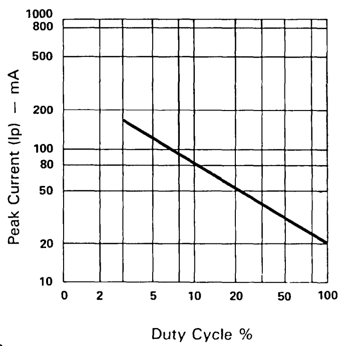


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

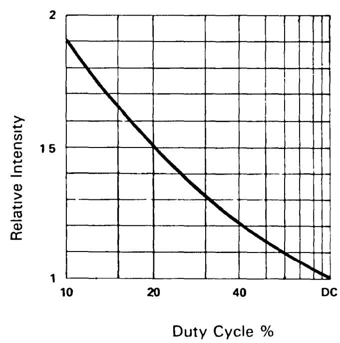


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTC-5836E/5336E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2.1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

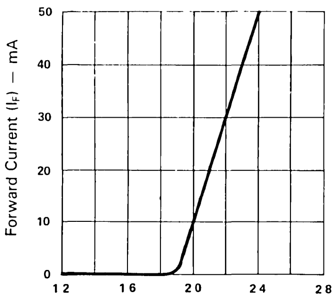


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

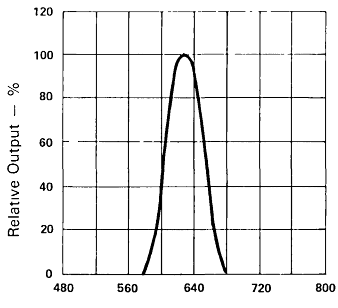


Fig 2 SPECTRAL RESPONSE

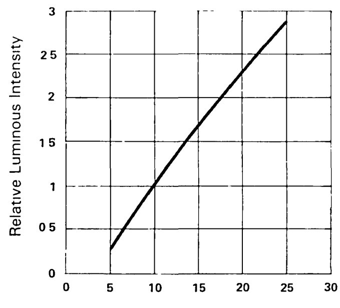


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

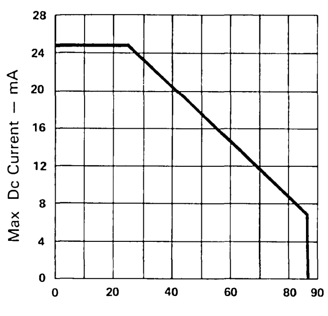


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

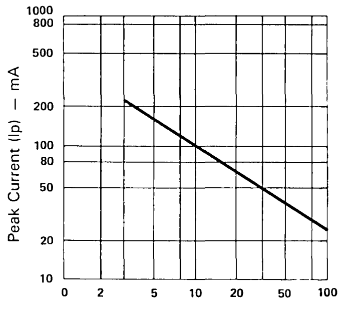


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

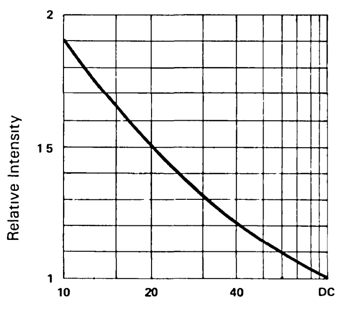


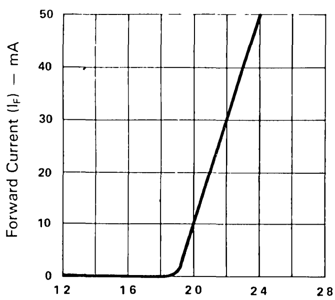
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT TA = 25°C
LTC-5836HR/5336HR

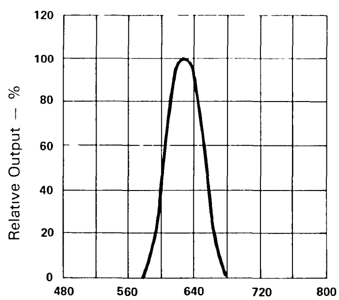
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	IF = 10 mA
Peak Emission Wavelength	λp		635		nm	IF = 20 mA
Spectral Line Half-Width	Δλ		40		nm	IF = 20 mA
Forward Voltage, any Segment	VF		2.1	2.8	V	IF = 20 mA
Reverse Current, any Segment	IR			100	μA	VR = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		IF = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

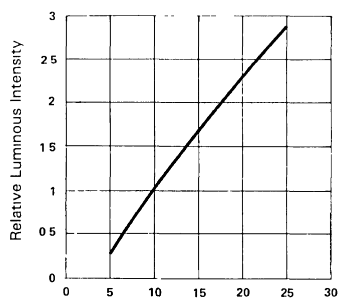
(25° C Ambient Temperature Unless Otherwise Noted)



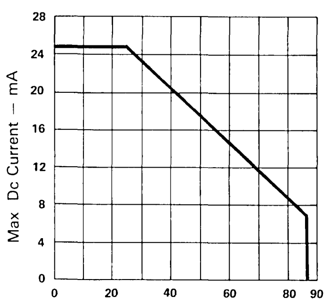
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



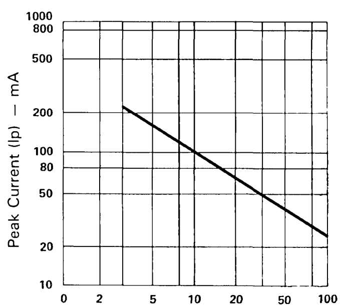
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



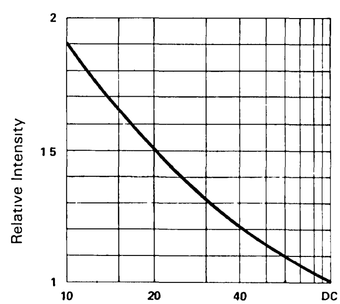
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

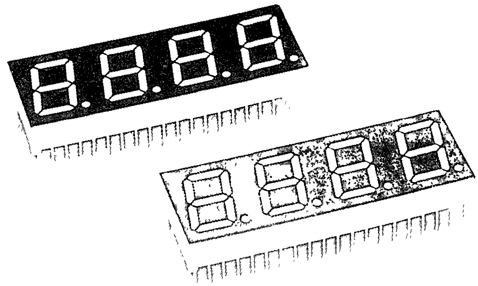
LITEON

LTC-5837 / 5337 SERIES

0.52" FOUR-DIGIT NUMERIC DISPLAYS

FEATURES

- 0.52 INCH (13.2mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED/GREEN/YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

DESCRIPTION

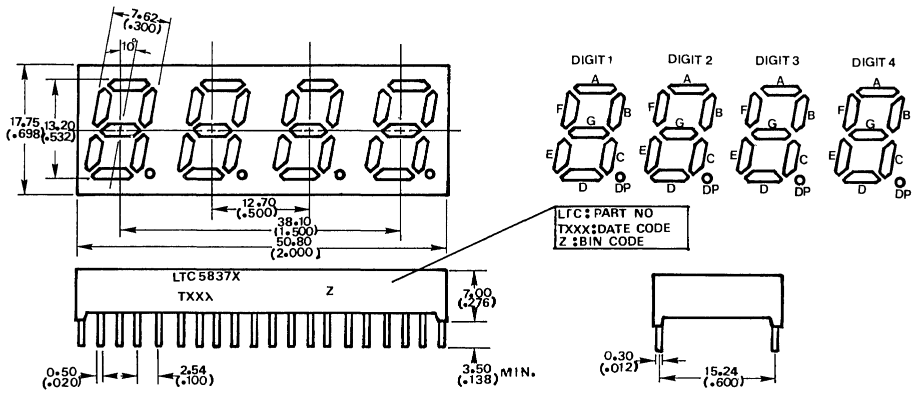
The LTD-5000 series are 0.52 inch (13.2mm) height four-digit.

The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices are utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red, bright red, yellow and orange displays have gray face and white segment color. Green displays have gray face and green segment color. High efficiency red displays have red face and red segment color.

DEVICES

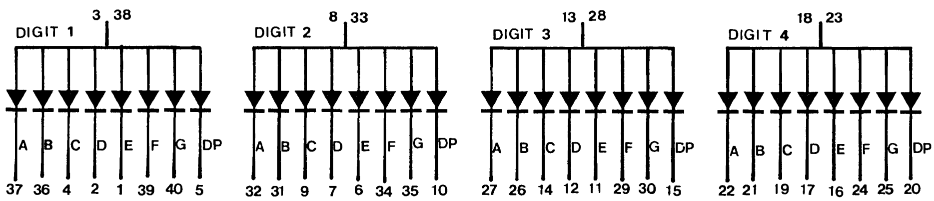
PART NO. LTD–						DESCRIPTION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED		
5837R	5837P	5837G	5837Y	5837E	5837HR	Common Anode Rt. Hand Decimal	A
5337R	5337P	5337G	5337Y	5337E	5337HR	Common Cathode Rt. Hand Decimal	B

PACKAGE DIMENSION

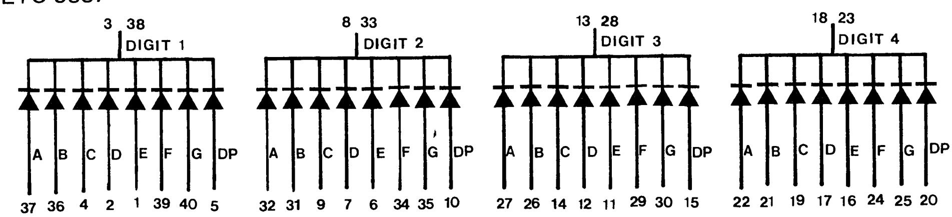


INTERNAL CIRCUIT DIAGRAM

A. LTC-5837



B. LTC-5337



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	–25°C to +85°C						
Storage Temperature Range	–25°C to +85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

PIN CONNECTION

PIN NO.	CONNECTION	
	LTC-5837	LTC-5337
1	Cathode E (Digit 1)	Anode E (Digit 1)
2	Cathode D (Digit 1)	Anode D (Digit 1)
3	Common Anode (Digit 1)	Common Cathode (Digit 1)
4	Cathode C (Digit 1)	Anode C (Digit 1)
5	Cathode D P. (Digit 1)	Anode D.P (Digit 1)
6	Cathode E (Digit 2)	Anode E (Digit 2)
7	Cathode D (Digit 2)	Anode D (Digit 2)
8	Common Anode (Digit 2)	Common Cathode (Digit 2)
9	Cathode C (Digit 2)	Anode C (Digit 2)
10	Cathode D.P. (Digit 2)	Anode D.P. (Digit 2)
11	Cathode E (Digit 3)	Anode E (Digit 3)
12	Cathode D (Digit 3)	Anode D (Digit 3)
13	Common Anode (Digit 3)	Common Cathode (Digit 3)
14	Cathode C (Digit 3)	Anode C (Digit 3)
15	Cathode D.P. (Digit 3)	Anode D.P. (Digit 3)
16	Cathode E (Digit 4)	Anode E (Digit 4)
17	Cathode D (Digit 4)	Anode D (Digit 4)
18	Common Anode (Digit 4)	Common Anode (Digit 4)
19	Cathode C (Digit 4)	Anode C (Digit 4)
20	Cathode D P. (Digit 4)	Anode D.P (Digit 4)
21	Cathode B (Digit 4)	Anode B (Digit 4)
22	Cathode A (Digit 4)	Anode A (Digit 4)
23	Common Anode (Digit 4)	Common Cathode (Digit 4)
24	Cathode F (Digit 4)	Anode F (Digit 4)
25	Cathode G (Digit 4)	Anode G (Digit 4)
26	Cathode B (Digit 3)	Anode B (Digit 3)
27	Cathode A (Digit 3)	Anode A (Digit 3)
28	Common Anode (Digit 3)	Common Cathode (Digit 3)
29	Cathode F (Digit 3)	Anode F (Digit 3)
30	Cathode G (Digit 3)	Anode G (Digit 3)
31	Cathode B (Digit 2)	Anode B (Digit 2)
32	Cathode A (Digit 2)	Anode A (Digit 2)
33	Common Anode (Digit 2)	Common Cathode (Digit 2)
34	Cathode F (Digit 2)	Anode F (Digit 2)
35	Cathode G (Digit 2)	Anode G (Digit 2)
36	Cathode B (Digit 1)	Anode B (Digit 1)
37	Cathode A (Digit 1)	Anode A (Digit 1)
38	Common Anode (Digit 1)	Common Cathode (Digit 1)
39	Cathode F (Digit 1)	Anode F (Digit 1)
40	Cathode G (Digit 1)	Anode G (Digit 1)

ELECTRICAL/OPTICAL CHARACTERISTICS AT TA = 25°C
LTC-5837R/5337R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	500		µcd	IF = 10 mA
Peak Emission Wavelength	λp		655		nm	IF = 20 mA
Spectral Line Half-Width	Δλ		24		nm	IF = 20 mA
Forward Voltage, any Segment	VF		1.7	2.0	V	IF = 20 mA
Reverse Current, any Segment	IR			100	µA	VR = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		IF = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

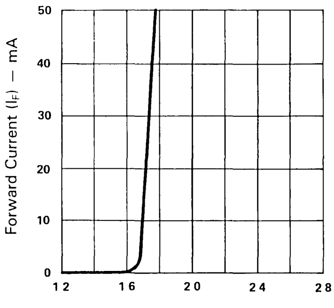


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

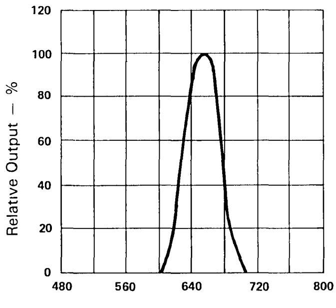


Fig 2 SPECTRAL RESPONSE

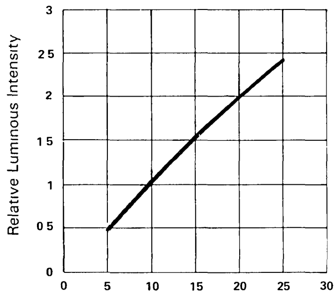


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).

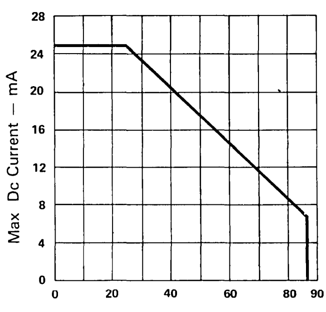


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

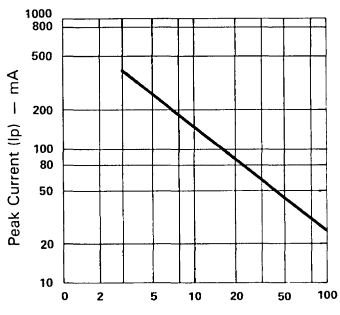


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

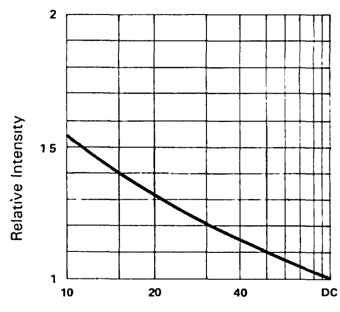


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C LTC-5837P/5337P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	300	750		μcd	I = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

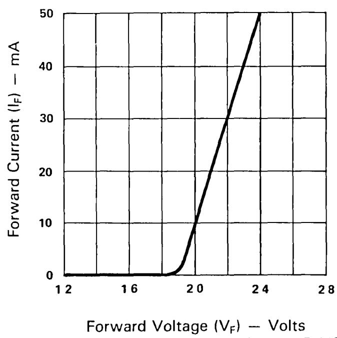


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE

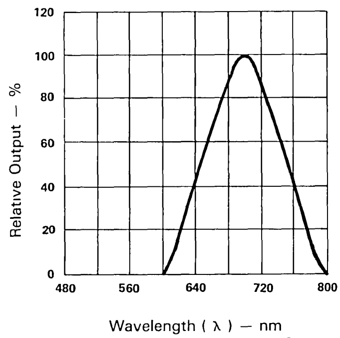


Fig 2 SPECTRAL RESPONSE.

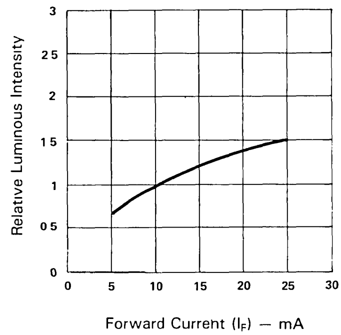


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).

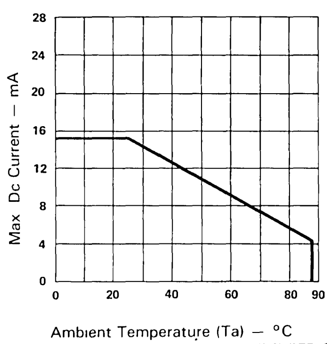


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

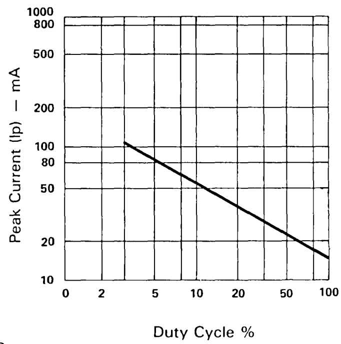


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTC-5837G/5337G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)

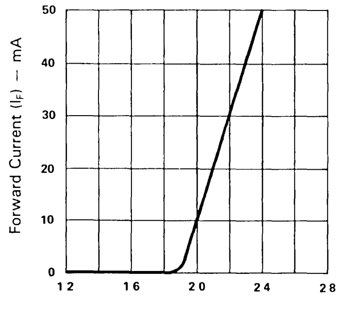


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

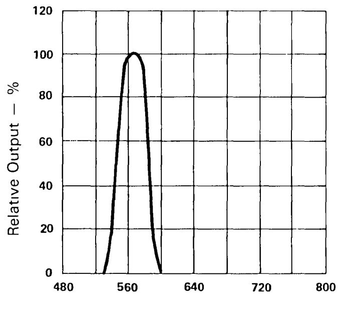


Fig 2 SPECTRAL RESPONSE

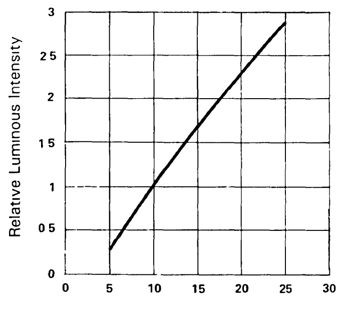


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

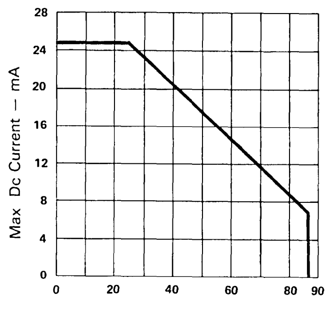


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

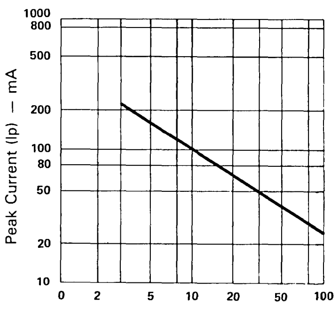


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

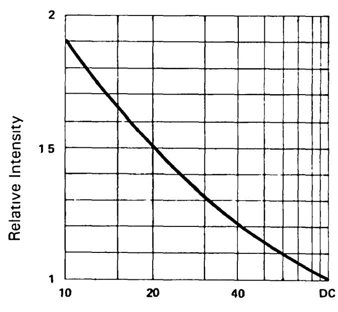


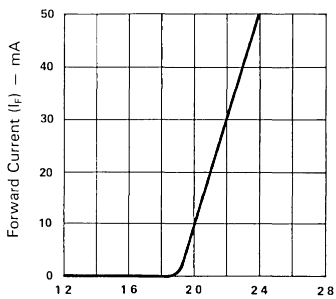
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-5837Y/5337Y

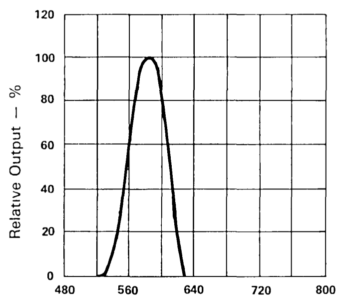
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	700	2000		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		585		nm	$I_F = 20$ mA
Spectral Line Half-Width	Δλ		35		nm	$I_F = 20$ mA
Forward Voltage, any Segment	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment	I_R			100	μA	$V_R = 5$ V
Luminous Intensity Matching Ratio	Iv-m			2:1		$I_F = 20$ mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

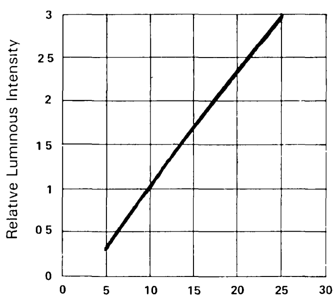
(25°C Ambient Temperature Unless Otherwise Noted)



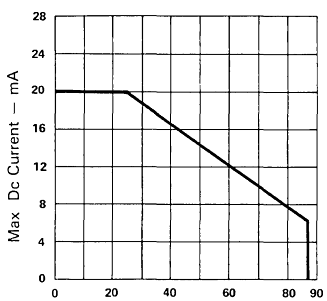
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



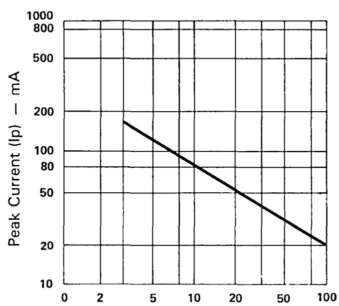
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



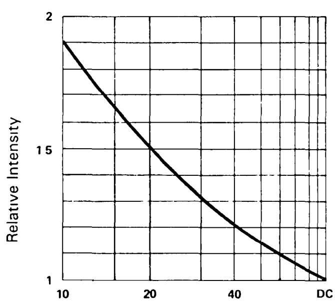
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-5837E/5337E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

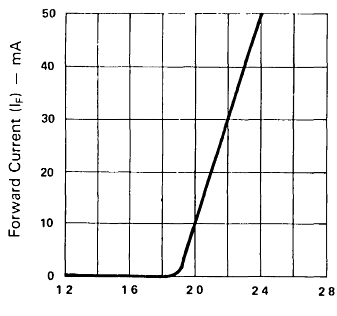


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

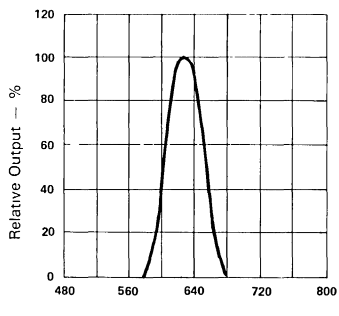


Fig 2 SPECTRAL RESPONSE

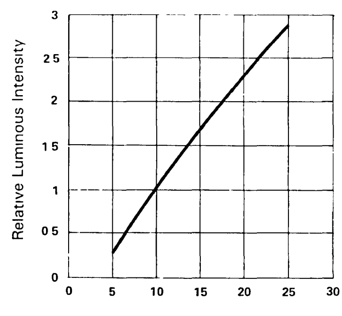


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

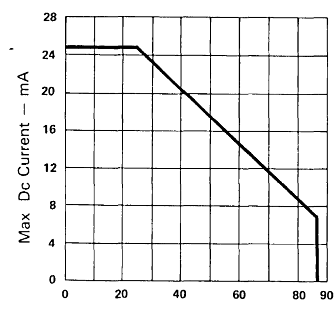


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

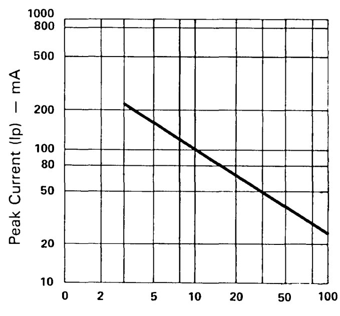


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

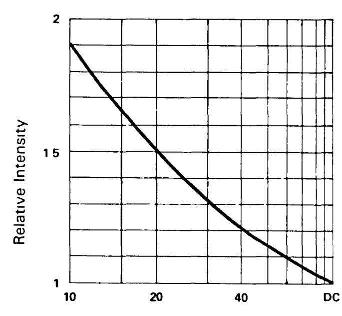


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

LTC-5837HR/5337HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2000		μcd	IF = 10 mA
Peak Emission Wavelength	λp		635		nm	IF = 20 mA
Spectral Line Half-Width	Δλ		40		nm	IF = 20 mA
Forward Voltage, any Segment	VF		2.1	2.8	V	IF = 20 mA
Reverse Current, any Segment	IR			100	μA	VR = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		IF = 20 mA

SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

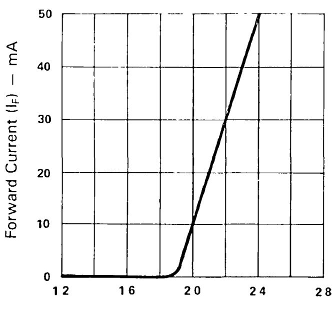


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

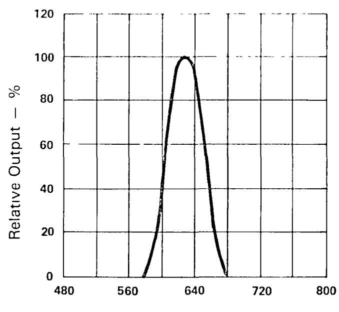


Fig 2 SPECTRAL RESPONSE

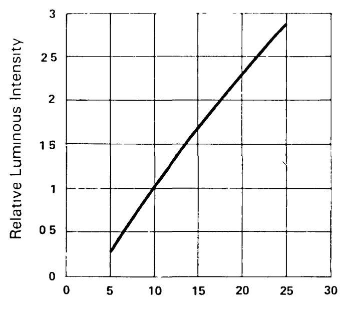


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

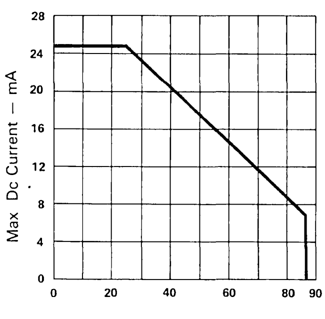


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

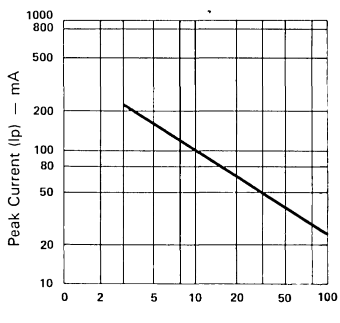


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

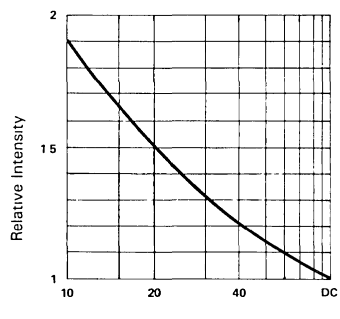
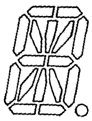
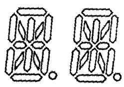


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE IF = 10mA PER SEG)

SELECTION GUIDE

• ALPHANUMERIC DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/SEG. @ I_F = 10 mA	PAGE NO.
	LTP- 537R 537P 537G 537Y 537E 537HR	 Red Bright Red Green Yellow Orange Hi. -Eff. Red	Common Cathode Single Character, Rt. Hand Decimal	 500 µcd 750 µcd 2000 µcd 2000 µcd 2000 µcd 2000 µcd	5-156
12.7mm (.5") Dual-In-Line 1"H x.63" W x .38" D	587R 587P 587G 587Y 587E 587HR	Red Bright Red Green Yellow Orange Hi. -Eff. Red	Common Anode, Single Character, Rt Hand Decimal	500 µcd 750 µcd 2000 µcd 2000 µcd 2000 µcd 2000 µcd	
	LTP- 3784R 3784G 3784E	 Red Green Orange	Multiplex, Dual Character. Rt. Hand Decimal	 400 µcd 1800 µcd 1800 µcd	5-156
13.8mm (.54") Dual-In-Line .84"H x 1" W x .32" D	3785R 3785G 3785E	Red Green Orange	Multiplex, Dual, Character. Rt. Hand Desimal	400 µcd 1800 µcd 1800 µcd	

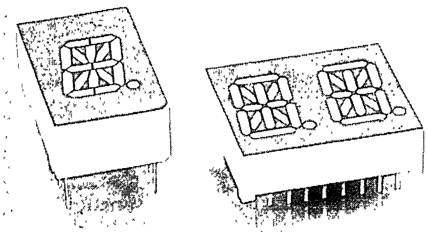
LITEON

LTP- 537/587 3784/3785 SERIES

0.5" & 0.54" ALPHANUMERIC DISPLAYS

FEATURES

- LOW POWER REQUIREMENTS.
- EXCELLENT CHARACTER APPEARANCE.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- COMMON ANODE OR COMMON CATHODE MODELS.
- CATEGORIZED FOR LUMINOUS INTENSITY. EASY MOUNTING ON P.C. BOARD.



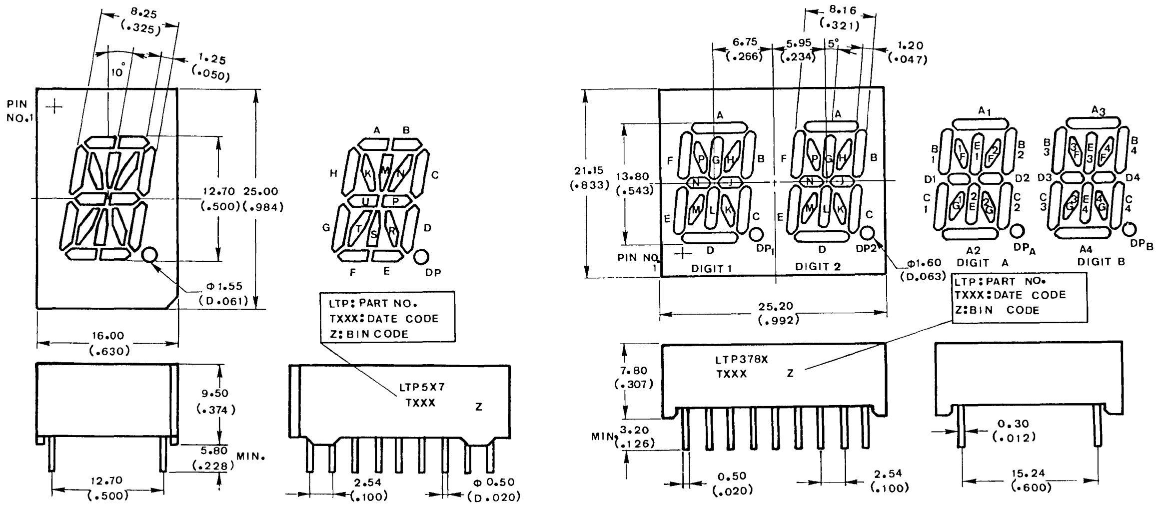
DESCRIPTION

The LTP-537/587 series are 0.5 inch (12.7mm) hieght 16-segment single digit alphanumeric displays.
The red, bright red, green and orange displays have black face and white segment colors. The high efficiency red display has red face and red segment colors.
The LTP-3784/3785 series are 0.54 inch (13.8mm) height 14-segment dual digit alphanumeric displays.
The dual digit displays have gray face and white segment color.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

DEVICES

PART NO. LTP–						DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED			
537R	537P	537G	537Y	537E	537HR	Common Cathode, Rt. Hand Decimal	A	A
587R	587P	587G	587Y	587E	587HR	Common Anode, Rt. Hand Decimal	A	B
3784R	–	3784G	–	3784E	–	Multiplex Common Cathode, Rt. Hand Decimal	B	C
3785R	–	3785G	–	3785E	–	Multiplex Common Cathode, Rt. Hand Decimal	B	D

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

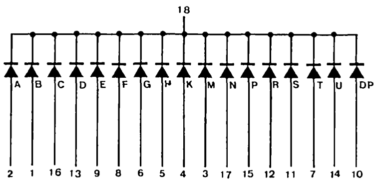
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.000}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

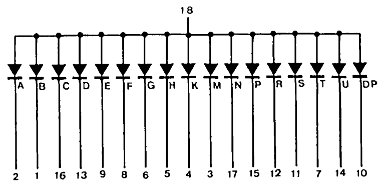
PIN NO.	CONNECTION			
	A. LTP-537	B. LTP-587	C. LTP-3784	D. LTP-3785
1	Anode B	Cathode B	Anode E	Anode D_1, D_2, D_3, D_4
2	Anode A	Cathode A	Anode M	No connection
3	Anode M	Cathode M	No Connection	Anode G_1, G_2, G_3, G_4
4	Anode K	Cathode K	Anode L	Anode C_1, C_2, C_3, C_4
5	Anode H	Cathode H	Anode K	Cathode A_2, B_2, C_2, E_2, F_2, G_2, D.P.A.
6	Anode G	Cathode G	Anode J	Anode D.P.A.
7	Anode T	Cathode T	Anode D	No Connection
8	Anode F	Cathode F	Anode D.P	Cathode A_3, B_3, C_3, D_3, E_3, F_3, G_3
9	Anode E	Cathode E	Anode C	Anode D.P.B.
10	Anode D.P.	Cathode D.P.	Anode B	Cathode A_4, B_4, C_4, D_4, E_4, F_4, G_4, D.P.B.
11	Anode S	Cathode S	Common Cathode, Character 2	No Connection
12	Anode R	Cathode R	Anode A	Anode A_1, A_2, A_3, A_4
13	Anode D	Cathode D	Anode N	No Connection
14	Anode U	Cathode U	Anode H	Anode B_1, B_2, B_3, B_4
15	Anode P	Cathode P	Anode G	Cathode A_1, B_1, C_1, D_1, E_1, F_1, G_1
16	Anode C	Cathode C	Common Cathode, Character 1	No Connection
17	Anode N	Cathode N	Anode P	Anode E_1, E_2, E_3, E_4
18	Common Cathode	Common Anode	Anode F	Anode F_1, F_2, F_3, F_4

INTERNAL CIRCUIT DIAGRAM

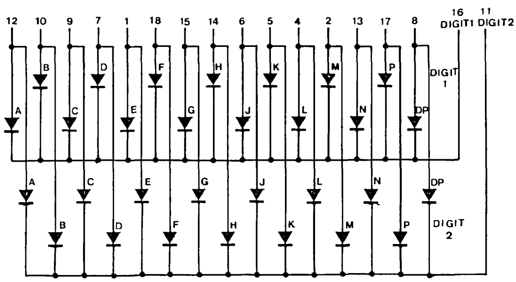
A. LTP-537



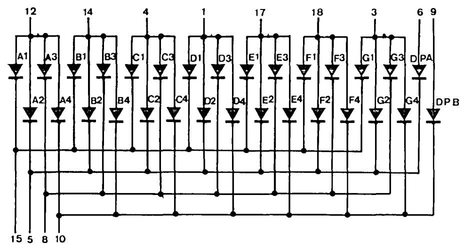
B. LTP-587



C. LTP-3784



D. LTP-3785



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	55	40	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	160	60	100	80	100	100	mA
Continuous Forward Current Per Segment	25	15	25	20	25	25	mA
Derating Linear From 25° C Per Segment	0.3	0.18	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	– 25° C to + 85° C						
Storage Temperature Range	– 25° C to + 85° C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260° C							

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-537R/587R & LTP-3784R/3785R

PARAMETER	LTP—	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	537R/587R	Iv	200	500		μcd	I_F = 10 mA
	3784R/3785R	Iv	200	400		μcd	I_F = 10 mA
Peak Emission Wavelength		λp		655		nm	I_F = 20 mA
Spectral Line Half-Width		Δλ		24		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.		V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.		I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio		Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

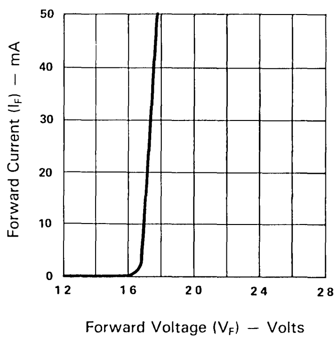


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE

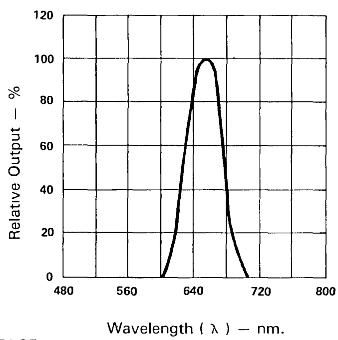


Fig. 2 SPECTRAL RESPONSE

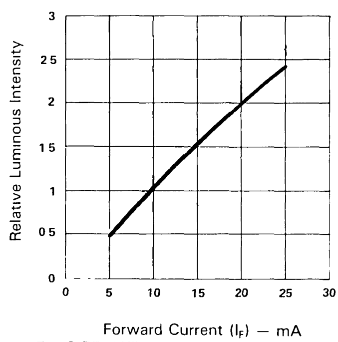


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

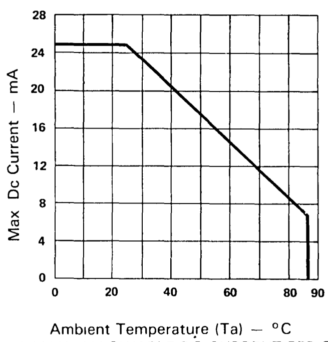


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

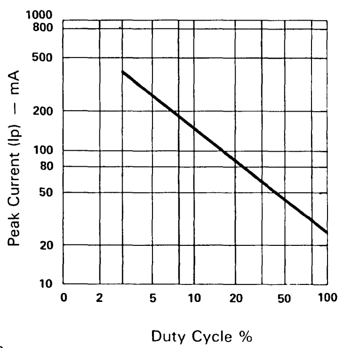


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

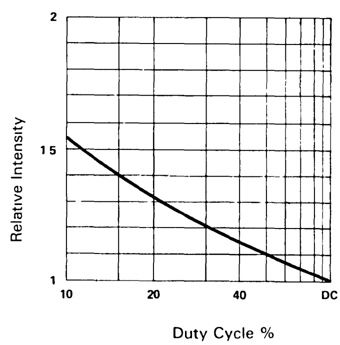


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

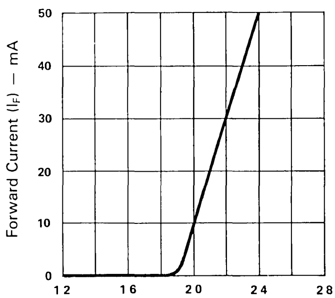
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^{\circ}C$

LTP-537P/587P

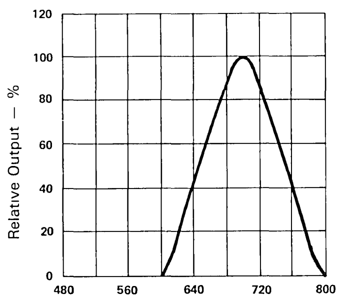
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	300	750		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		697		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	$I_F = 20$ mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	μA	$V_R = 5$ V
Luminous Intensity Matching Ratio	$I_{v\text{-}m}$			2:1		$I_F = 20$ mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

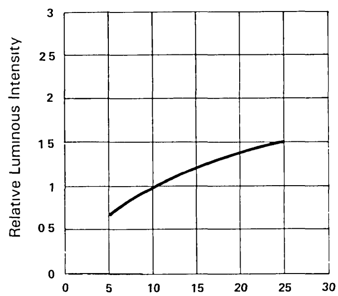
(25° C Ambient Temperature Unless Otherwise Noted)



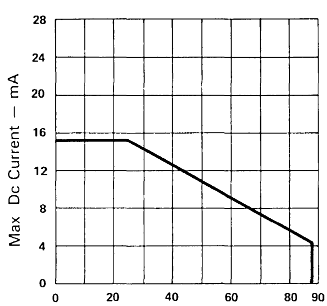
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



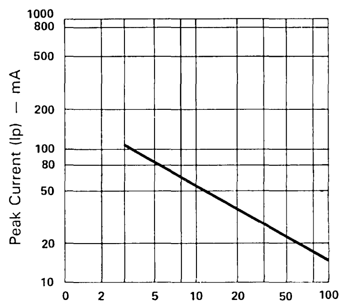
Wavelength (λ) — nm.
Fig 2 SPECTRAL RESPONSE



Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



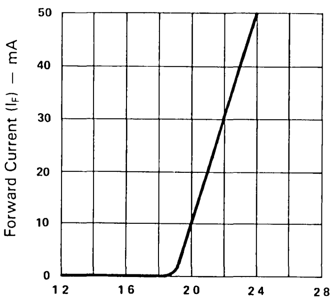
Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-537G/587G & LTP-3784G/3785G

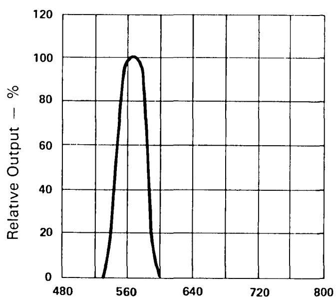
PARAMETER	LTP–	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	537G/587G	I_V	750	2000		μcd	I_F = 10 mA
	3784G/3785G	I_V	600	1800		μcd	I_F = 10 mA
Peak Emission Wavelength		λp		565		nm	I_F = 20 mA
Spectral Line Half-Width		$\Delta\lambda$		30		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.		V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.		I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio		Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

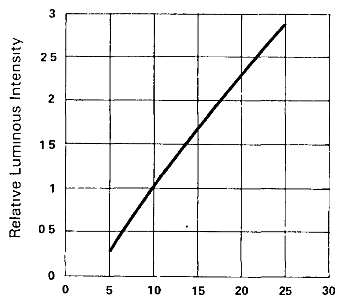
(25°C Ambient Temperature Unless Otherwise Noted)



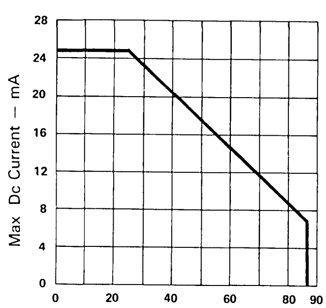
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



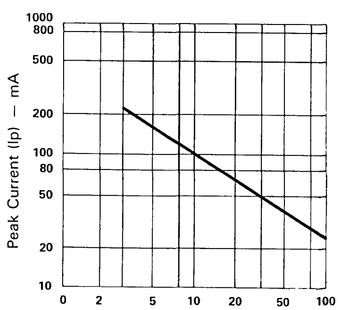
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



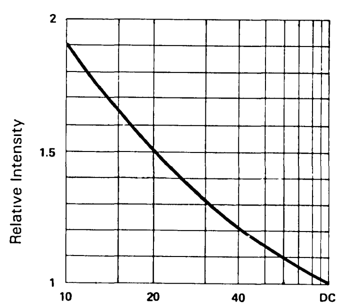
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT TA = 25°C
LTP-537Y/587Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	750	2000		μcd	IF = 10 mA
Peak Emission Wavelength	λp		585		nm	IF = 20 mA
Spectral Line Half-Width	Δλ		35		nm	IF = 20 mA
Forward Voltage, any Segment or D.P	VF		2.1	2.8	V	IF = 20 mA
Reverse Current, any Segment	IR			100	μA	VR = 5 V
Luminous Intensity Matching Ratio	Iv-m			2.1		IF = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

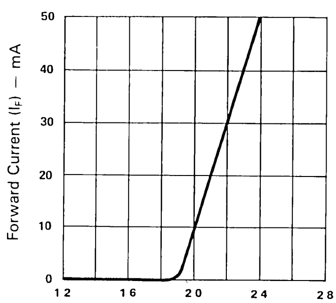


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

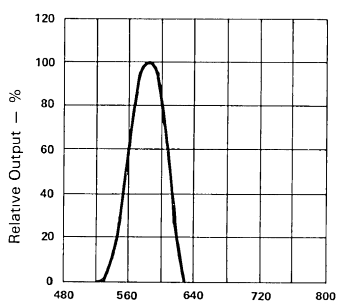


Fig 2 SPECTRAL RESPONSE.

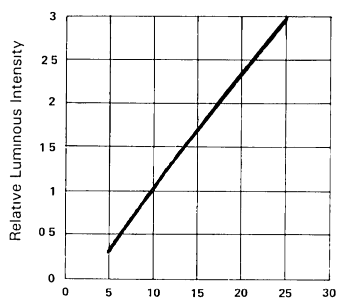


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

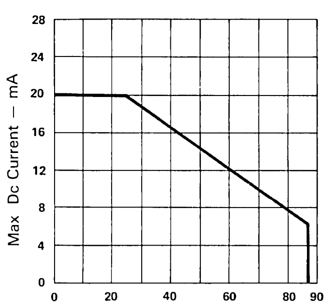


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

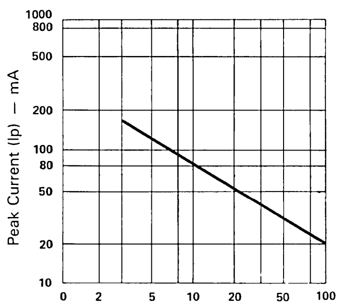


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

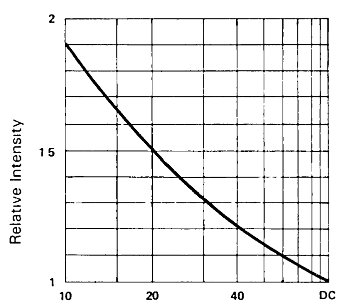


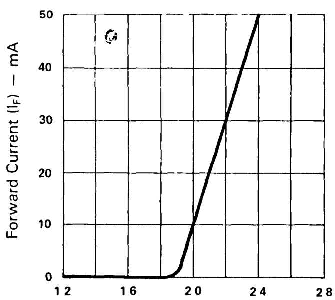
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT TA = 25°C
LTP-537E/587E & LTP-3784E/3785E

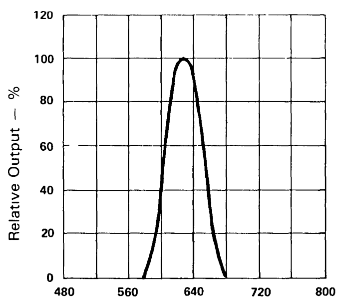
PARAMETER	LTP–	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	537E/587E	Iv	750	2000		μcd	IF = 10 mA
	3784E/3785E	Iv	600	1800		μcd	IF = 10 mA
Peak Emission Wavelength		λp		630		nm	IF = 20 mA
Spectral Line Half-Width		Δλ		40		nm	IF = 20 mA
Forward Voltage, any Segment or D.P.		VF		2.1	2.8	V	IF = 20 mA
Reverse Current, any Segment or D.P.		IR			100	μA	VR = 5 V
Luminous Intensity Matching Ratio		Iv-m			2:1		IF = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

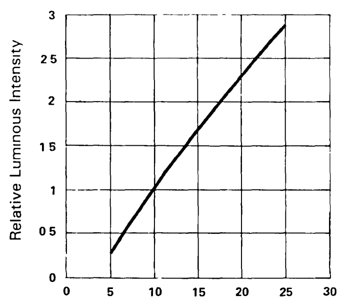
(25°C Ambient Temperature Unless Otherwise Noted)



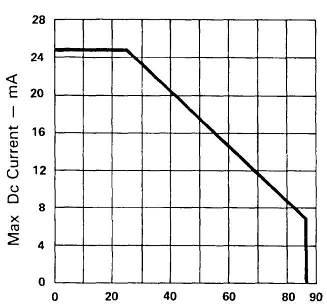
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



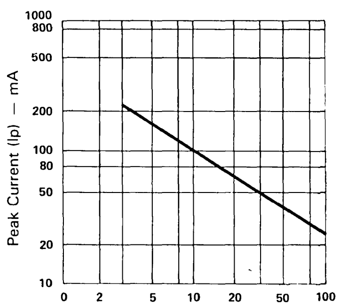
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



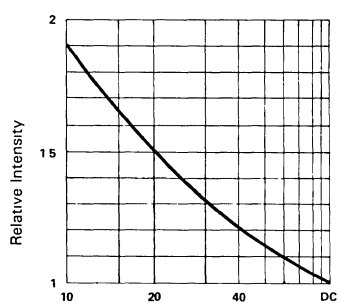
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

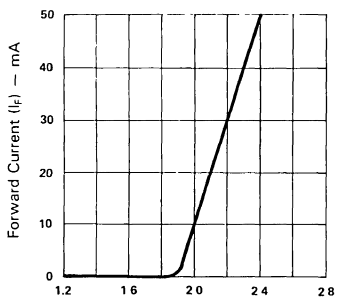


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

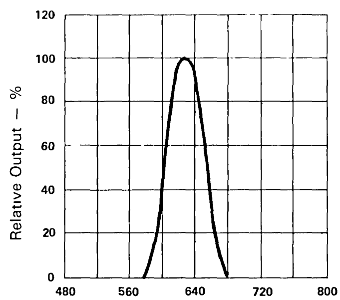
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-537HR/587HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	750	2000		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2.1		I_F = 20 mA

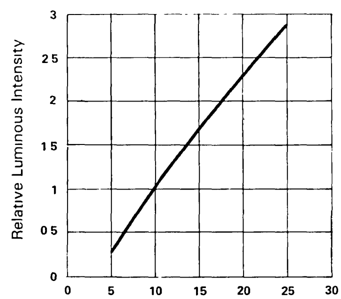
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



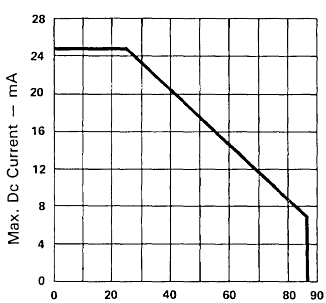
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



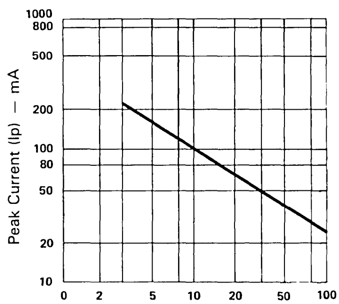
Wavelength (λ) — nm
Fig. 2 SPECTRAL RESPONSE



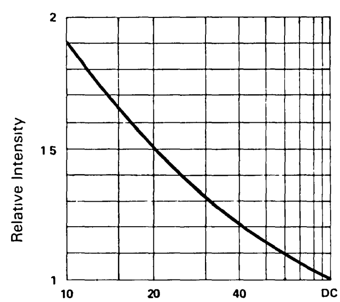
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

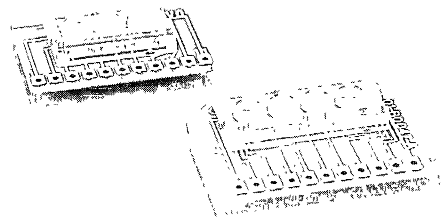
LITEON

LTB-1400 SERIES

RED 7-SEGMENT MAGNIFIED MONOLITHIC NUMERIC DISPLAYS

FEATURES

- INTEGRATED MAGNIFIER LENS.
- LOW POWER REQUIREMENTS.
- MONOLITHIC CONSTRUCTION FOR MAXIMUM BRIGHTNESS AT MINIMUM POWER.
- COMMON CATHODE FOR SIMPLICITY OF MULTI-PLEXING.
- CATEGORIZED FOR BRIGHTNESS UNIFORMITY.



DESCRIPTION

The LTB-0022/0028/0038/0047 & LTB-1466/1468/1488/1498 are red numeric LED displays. Low cost is achieved through minimum use of monlithic GaAsP material and magnification to full height using a simple integrated lens construction.

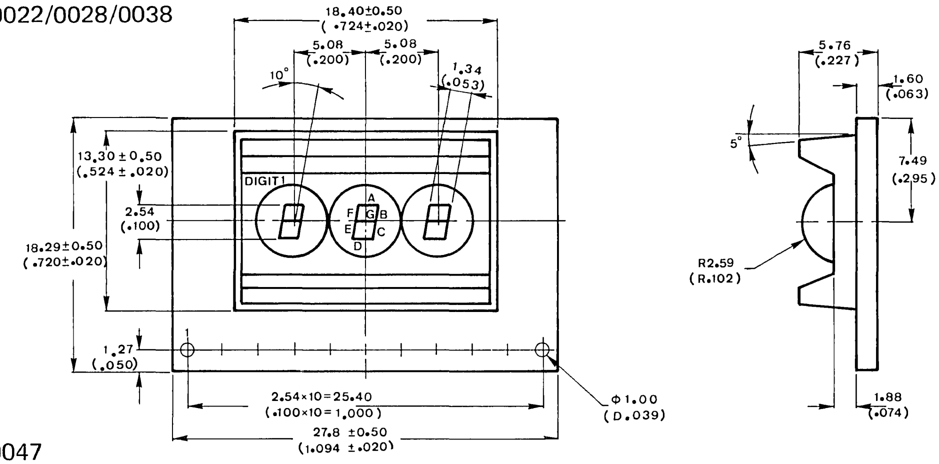
These displays are designed for multiplex operation the desired digit being displayed by selecting the appropriate cathode. A right hand decimal point is provided. All devices are optimized for low power portable battery operated equipment using MOS and CMOS integrated logic circuits.

DEVICES

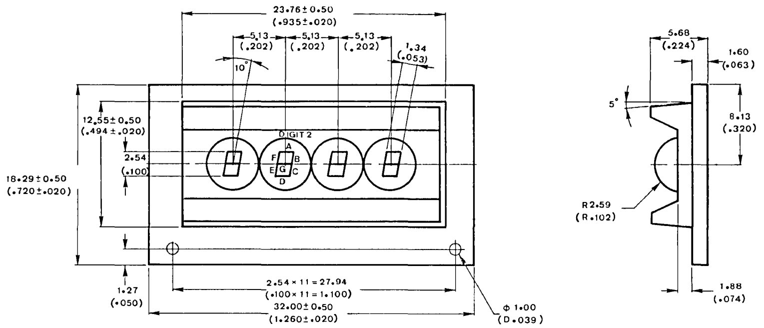
PART NO. LTB–	DESCRIPTION	DISPLAY FONT	CIRCUIT	PIN CODE	P.D.
0022	2	8x8	MPX	A	A
0028	2	x8.8	MPX	B	A
0038	3	8.8.8.	MPX	C	A
0047	4	8888	MPX	D	B
1466	6	xx8.8 8 8 8.8x	MPX	E	C
1478	7	x8.8.8 8.8.8.8.x	MPX	E	C
1488	8	x8 8.8.8.8.8.8.8.	MPX	E	C
1498	9	8.8.8.8.8.8.8.8.8.	MPX	E	C

PACKAGE DIMENSIONS

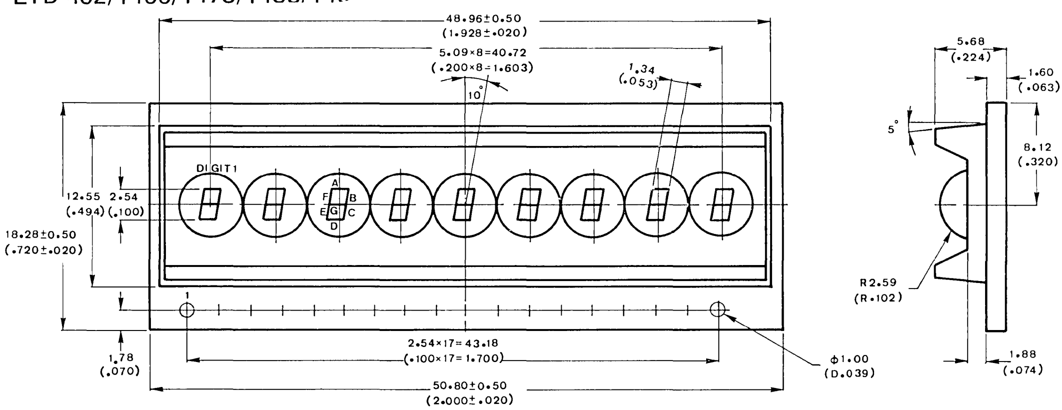
A. LTB-0022/0028/0038



B. LTB-0047



C. LTB-402/1466/1478/1488/1498

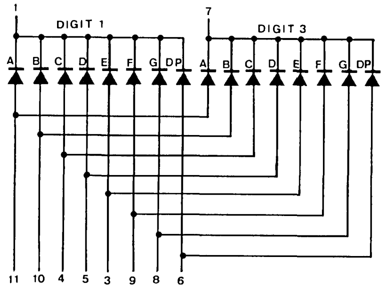


NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$, tolerance is $\frac{\text{0.25mm}}{\text{(0.010'')}}$ unless otherwise noted.

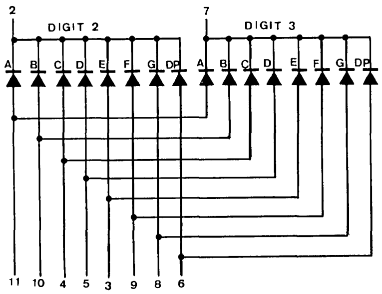
SEVEN-SEGMENT LED DISPLAYS & ALPHANUMERIC DISPLAYS

INTERNAL CIRCUIT DIAGRAM

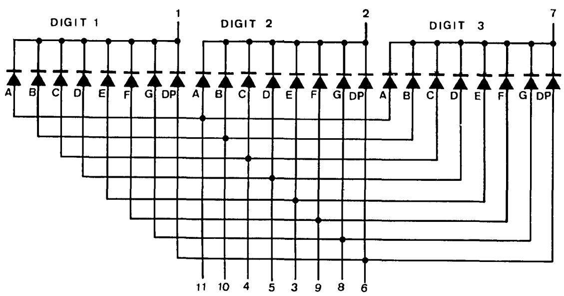
A. LTB-0022



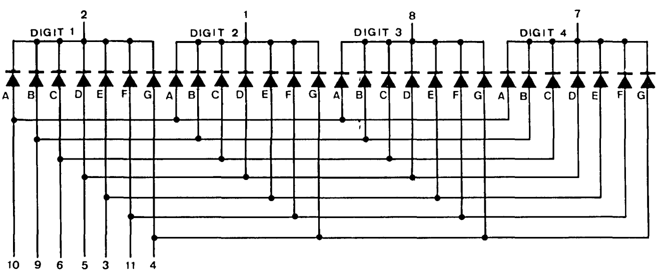
B. LTB-0028



C. LTB-0038



D. LTB-0047



PIN NO.	LTA-1498	LTA-1488	LTA-1478	LTA-1466	CATHODE	ANODE
1	NC	NC	NC	NC	NC	
2	Digit 1	NC	NC	NC	V	
3	Segment C	Segment C	Segment C	Segment C		V
4	Digit 2	Digit 1	Digit 1	NC	V	
5	DP	DP	DP	DP		V
6	Digit 3	Digit 2	Digit 2	Digit 1	V	
7	Segment A	Segment A	Segment A	Segment A		V
8	Digit 4	Digit 3	Digit 3	Digit 2	V	
9	Segment E	Segment E	Segment E	Segment E		V
10	Digit 5	Digit 4	Digit 4	Digit 3	V	
11	Segment D	Segment D	Segment D	Segment D		V
12	Digit 6	Digit 5	Digit 5	Digit 4	V	
13	Segment G	Segment G	Segment G	Segment G		V
14	Digit 7	Digit 6	Digit 6	Digit 5	V	
15	Segment B	Segment B	Segment B	Segment B		V
16	Digit 8	Digit 7	Digit 7	Digit 6	V	
17	Segment F	Segment F	Segment F	Segment F		
18	Digit 9	Digit 8	NC	NC	V	

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

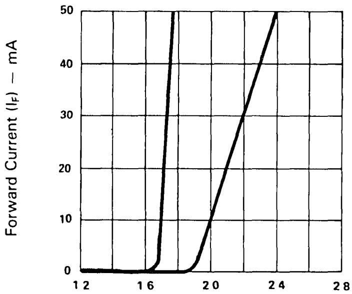
PARAMETER	SYMBOL	MAXIMUM RATING	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	5	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	40	mA
Reverse Voltage (Segment of Decimal Point)	V_R	3	V
Operating Temperature Range	Topr	–25°C to 60°C	
Storage Temperature Range	Tstg	–25°C to 70°C	
Power Dissipation per Digit	P_D	50	mW
Max. Solder Temperature 260°C From 3 Seconds at 2mm From the Case or Reflector Edge			

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C

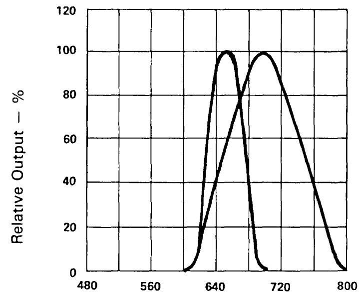
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Luminous Intensity per Digit	I_V		100		μcd	I_F = 5 mA
Peak Emission Wavelength	λp		655		nm	I_F = 5 mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	I_F = 5 mA
Forward Voltage	V_F		1.6			I_F = 5 mA
Reverse Current	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m				2:1	I_F = 5 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

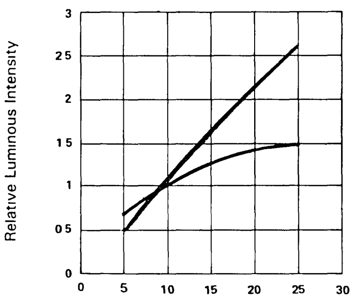
(25°C Ambient Temperature Unless Otherwise Noted)



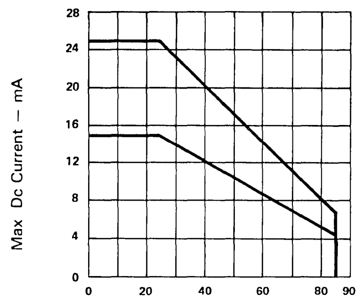
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



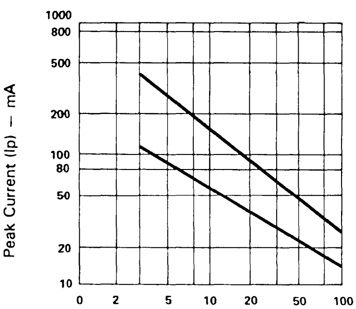
Wavelength (λ) — nm
Fig. 2 SPECTRAL RESPONSE



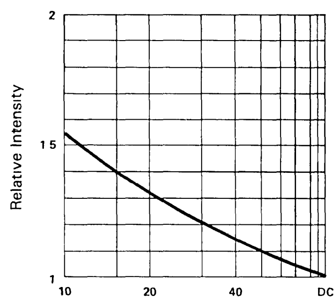
Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

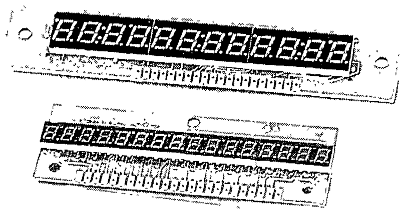
LITEON

LTF 216141/804 SERIES

0.2" & 0.3" MULTI-DIGIT DISPLAYS

FEATURES

- 0.2 & 0.3 INCH (5.08mm/7.6mm) HEIGHT CHARACTER RED COLOR.
- COMMON CATHODE, MULTIPLEX PINOUT ARE AVAILABLE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST.
- LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- RED (GaAsP) 14 DIGIT LED CLOCK DISPLAY VERSION STANDARD BRIGHT RED (GaP) DISPLAY SUFFIX PARE AVAILABLE.



DESCRIPTION

The LTF-2000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, microprocessor . . . etc.

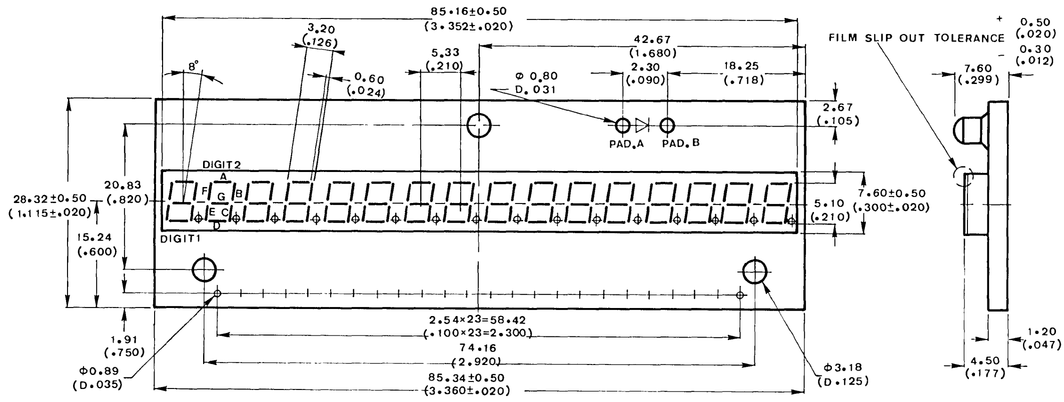
DEVICES

PART NO. LTF–	DESCRIPTION				DISPLAY FONT	PACKAGE DEMENSION	PIN CONNECTION
	DRIVE		COLOR				
	FORM	CIRCUIT	BRIGHT RED	RED			
216141A1	C. C.	MPX		V	x8888888888888.888x	A	A
216141A1P	C. C.	MPX	V		x88888888888888x	A	A
804-12P	C. C.	MPX	V		8888.88888888	B	B
804-12	C C.	MPX		V	88888888888.88	B	B
804-08P	C. C.	MPX	V		xx88888888xx	B	B
804-08	C. C.	MPX		V	xx88888888xx	B	B

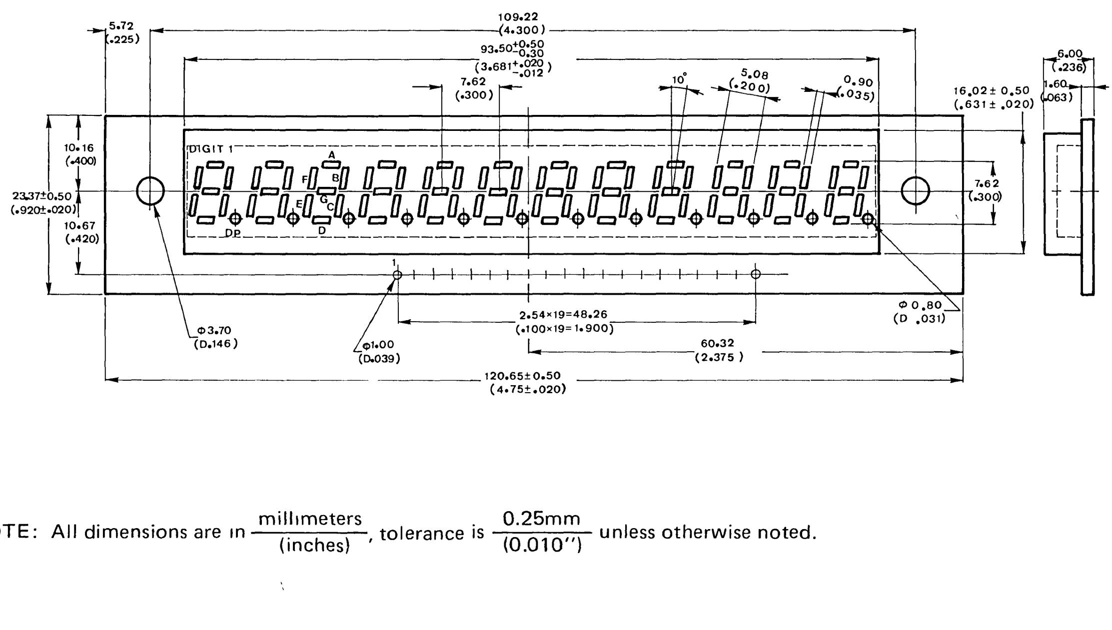
NOTES: 1. C.C. common cathode 2. MPX multiplex

PACKAGE DIMENSIONS

A. LTF-216141A1P



B. LTF-804



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$, tolerance is $\frac{\text{0.25mm}}{\text{(0.010'')}}$ unless otherwise noted.

PIN CONNECTION

A. LTF-216141

PIN NO.	FUNCTION	PIN NO.	FUNCTION	PIN NO.	FUNCTION
1	Pad A Anode	9	Digit 7 Cathodes	17	Digit 11 Cathodes
2	Digit 2 Cathodes	10	Segment E Anode	18	Segment F Anode
3	Digit 3 Cathodes	11	Digit 8 Cathodes	19	Digit 12 Cathodes
4	Digit 4 Cathodes	12	Segment A Anode	20	Segment B Anode
5	Digit 5 Cathodes	13	Digit 9 Cathodes	21	Digit 13 Cathodes
6	Decimal Point Anode	14	Segment G Anode	22	Digit 14 Cathodes
7	Digit 6 Cathodes	15	Digit 10 Cathodes	23	Digit 15 Cathodes
8	Segment C Anode	16	Segment D Anode	24	Pad B Cathode

B. LTF-804-12

PIN	FUNCTION	PIN	FUNCTION
1	Digit 1 Cathodes	11	Digit 11 Cathodes
2	Digit 4 Cathodes	12	Segment A Anode
3	Digit 3 Cathodes	13	Segment B Anocde
4	Digit 2 Cathodes	14	Segment C Anode
5	Digit 5 Cathodes	15	Segment D Anode
6	Digit 6 Cathodes	16	Decimal Point Anodes
7	Digit 7 Cathodes	17	Segment G Anode
8	Digit 8 Cathodes	18	Segment F Anode
9	Digit 9 Cathodes	19	Segment E Anode
10	Digit 10 Cathodes	20	Digit 12 Cathodes

LTF-804-8

PIN	FUNCTION	PIN	FUNCTION
1	Nc	11	Nc
2	Digit 4 Cathodes	12	Segment A Anode
3	Digit 3 Cathodes	13	Segment B Anode
4	NC	14	Segment C Anode
5	Digit 5 Cathodes	15	Segment D Anode
6	Digit 6 Cathodes	16	Decimal Point Anodes
7	Digit 7 Cathodes	17	Segment G Anode
8	Digit 8 Cathodes	18	Segment F Anode
9	Digit 9 Cathodes	19	Segment E Anode
10	Digit 10 Cathodes	20	Nc

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	SYMBOL	RED	BRIGHT RED	GREEN	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	25	20	20	mA
Peak Forward Current Per Segment D.P. (Duty 1/10 1 KHz)	I_{PF}	200	150	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F /pulse	30	30	30 30	mA
Reverse Voltage (Segment of Decimal Point)	V_R	5	5	5	V
Operating Temperature Range	Topr	–25°C to 60°C			
Storage Temperature Range	Tstg	–25°C to 70°C			
Power Dissipation Per Segment	P_D	60	60	60	mW
Derating Linear From 25°C		0.35	0.42	0.42	mA/°C
Max Solder Temperature 260°C C From 3 Seconds at 2mm From the Case or Reflector Edge					

NOTE: Caution

Please be careful of the following.

1) Avoid washing the LED DISPLAY in water.
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY

Freon TE or TF
Methyl or Ethyl Alcohol
Dai-Fron Solvent S3 or S3-E

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	DEVICES	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	RED	35	70		µcd	I_F = 10 mA
		BRIGHT RED	40	80			
Peack Emission Wavelength	λP	RED	630	655	680	nm	I_F = 20 mA
		BRIGHT RRE		697			
Spectral Line Half-Width	Δλ	RED		24		nm	I_F = 20 mA
		BRIGHT RED		90			
Forward Voltage	V_F	RED		1.7	2.2	V	I_F = 20 mA
		BRIGHT RED		2.1	2.8		
Reverse Current	I_R	RED			100	µA	V_R = 5V
		BRIGHT RED			100		
Luminous Intensity Matching Ratio	Ivm	All Model			2:1		I_F = 10 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

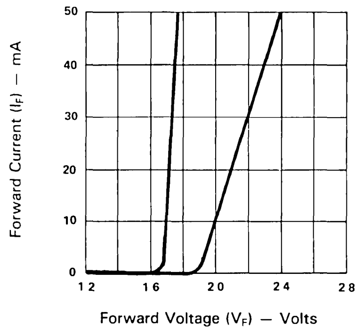


Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE

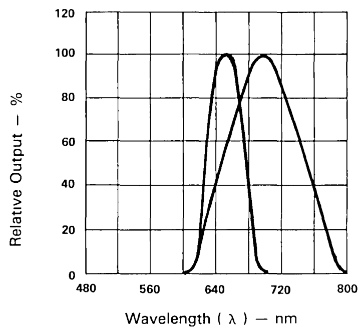


Fig. 2 SPECTRAL RESPONSE

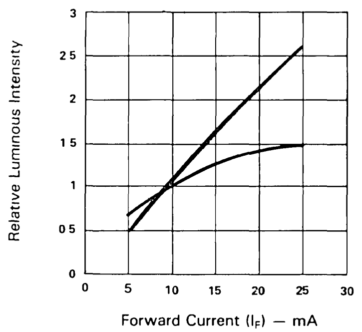


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

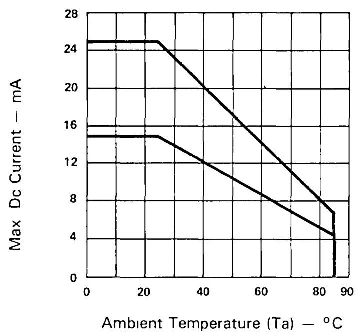


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

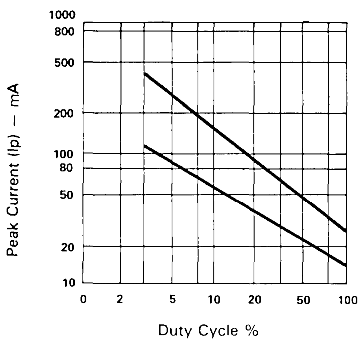


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE %
(REFRESH RATE – F = 1 KHz)

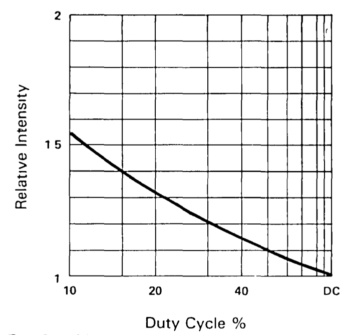


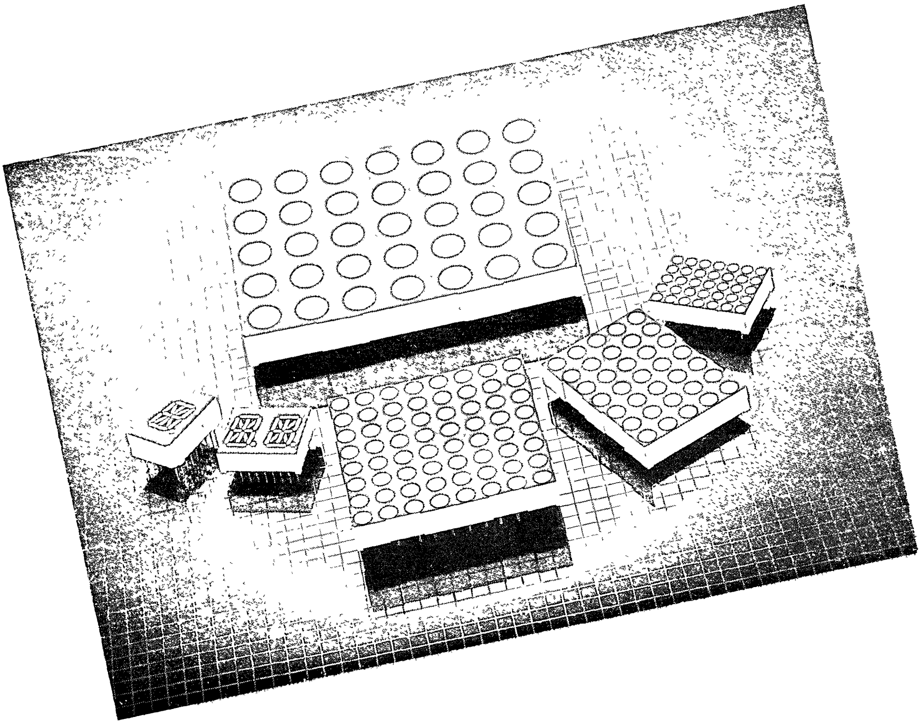
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE %
(AVERAGE I_F = 10mA PER SEG)

NOTES: 1. Clean only in water, isopropanol, ethanol, freon TF (or equivalent).

2. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

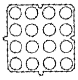
6. Dot Matrix Displays

- SELECTION GUIDE
- HOW TO USE LITON LED DISPLAYS
- 4x4 SINGLE COLOR DOT MATRIX DISPLAYS
- 4x4 MULTICOLOR DOT MATRIX DISPLAYS
- 5x7 SINGLE COLOR DOT MATRIX DISPLAYS
- 5x7 MULTICOLOR DOT MATRIX DISPLAYS
- 5x8 SINGLE COLOR DOT MATRIX DISPLAYS
- 5x8 MULTICOLOR DOT MATRIX DISPLAYS
- 8x8 SINGLE COLOR DOT MATRIX DISPLAYS
- 8x8 MULTICOLOR DOT MATRIX DISPLAYS

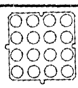


SELECTION GUIDE

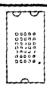
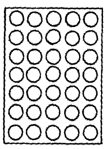
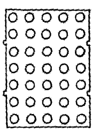
4 x 4 SINGLE COLOR DOT MATRIX DISPLAYS

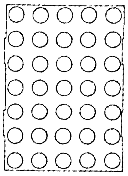
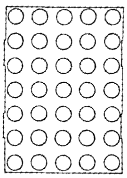
PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA 1/8 DUTY	PAGE NO.
 50.8mm (2.0") Dual-In-Line 2.0"M x 2.0"W x .34"D	LTP- 2344G 2344Y 2344E	Green Yellow Orange	Anode Row, Cathode Column	11000 μcd 9000 μcd 11000 μcd	6-11

4 x 4 MULTICOLOR DOT MATRIX DISPLAYS

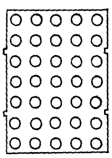
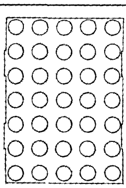
PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA 1/8 DUTY	PAGE NO.
 50 8mm (2.0") Dual-In-Line 2.0"H x 2 0"W x .34"D	LTP- 2044A3	Green & Orange	Anode Row, Cathode Column	11000 μcd 11000 μcd	6-11

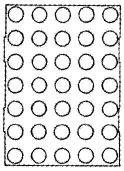
5 x 7 SINGLE COLOR DOT MATRIX DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA 1/8 DUTY	PAGE NO.
 7 62mm (.3") Dual-In-Line .73"H x .38"W x 12"D	LTP- 305R 305G 305HR	Red Green Hi. -Eff.Red	Anode Column, Cathode Row	400 μcd 1600 μcd 1600 μcd	6-17
 17.8mm (.7") Dual-In-Line .7"H x 5"W x .25"D	LTP- 747R 747G 747Y 747E 747HR	Red Green Yellow Orange Hi -Eff Red	Anode Column Cathode Row	500 μcd 2000 μcd 2000 μcd 2000 μcd 2000 μcd	6-23
	757R 757G 757Y 757E 757HR	Red Green Yellow Orange Hi. -Eff. Red	Cathode Column, Anode Row	500 μcd 2000 μcd 2000 μcd 2000 μcd 2000 μcd	
 30.48mm (1 2") Dual-In-Line 1 6"H x .9"W x .32"D	LTP- 1457AG 1457AY 1457AE 1457AHR	Green Yellow Orange Hi. -Eff. Red	Anode Column, Cathode Row	3000 μcd 3000 μcd 3000 μcd 3000 μcd	6-31
	1557AG 1557AY 1557AE 1557AHR	Green Yellow Orange Hi. -Eff. Red	Cathode Column, Anode Row	3000 μcd 3000 μcd 3000 μcd 3000 μcd	

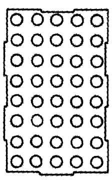
PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA $^1/_8$ DUTY	PAGE NO.
	LTP- 2057AG 2057AY 2057AE 2057AHR	Green Yellow Orange Hi. -Eff. Red	Anode Column, Cathode Row	4000 μcd 4000 μcd 4000 μcd 4000 μcd	6-39
50 8mm (2.0") Dual-In-Line 2 1"H x 1.5"W x .34" D	2157AG 2157AY 2157AE 2157AHR	Green Yellow Orange Hi -Eff Red	Cathode Column, Anode Row	4000 μcd 4000 μcd 4000 μcd 4000 μcd	
	LTP- 4057AG 4057AY 4057AE 4057AHR	Green Yellow Orange Hi -Eff Red	Anode Column, Cathode Row	8000 μcd 8000 μcd 8000 μcd 8000 μcd	6-47
101.6mm (4 0") Dual-In-Line 4.2"H x 3"W x 51"D	4157AG 4157AY 4157AE 4157AHR	Green Yellow Orange Hi.-Eff Red	Cathode Column, Anode Row	8000 μcd 8000 μcd 8000 μcd 8000 μcd	

5 x 7 MULTICOLOR DOT MATRIX DISPLAYS

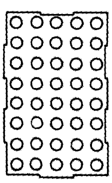
PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA $^1/_8$ DUTY	PAGE NO.
	LTP- 1257AA	Green & Orange	Anode Column, Cathode Row	3000 μcd 3000 μcd	6-31
30 48mm (1.2") Dual-In-Line 1 6"Hx 9"Wx 2"D	1357AA	Green & Orange	Cathode Column, Anode Row	3000 μcd 3000 μcd	
	LTP- 2657AA	Green & Orange	Anode Column, Cathode Row	4000 μcd 4000 μcd	6-39
50.8mm (2 0") Dual-In-Line 2 1"Hx1.5"Wx.34"D	2757AA	Green & Orange	Cathode Column, Anode Row	4000 μcd 4000 μcd	

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA 1/8 DUTY	PAGE NO.
	LTP- 4257AA	Green & Orange	Anode Column, Cathode Row	8000 μcd 8000 μcd	6-47
101.6mm (4.0") Dual-In-Line 4.2"Hx3"Wx.51"D	4357AA	Green & Orange	Cathode Column, Anode Row	8000 μcd 8000 μcd	

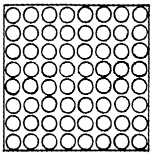
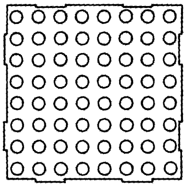
5 x 8 SINGLE COLOR DOT MATRIX DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA 1/8 DUTY	PAGE NO.
	LTP- 2058AG 2058AY 2058AE 2058AHR	 Green Yellow Orange Hi. -Eff. Red	Anode Column, Cathode Row	 4000 μcd 4000 μcd 4000 μcd 4000 μcd	6-55
58.42mm (2.3") Dual-In-Line 2.4"H x 1.5"W x .35"D	2158AG 2158AY 2158AE 2158AHR	Green Yellow Orange Hi. -Eff. Red	Cathode Column, Anode Row	4000 μcd 4000 μcd 4000 μcd 4000 μcd	

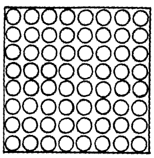
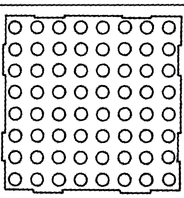
5 x 8 MULTICOLOR DOT MATRIX DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA 1/8 DUTY	PAGE NO.
	LTP- 2458AA	Green & Orange	Anode Column, Cathode Row	4000 μcd 4000 μcd	6-55
58.42mm (2.3") Dual-In-Line 2.4"Hx1.5"Wx.35"E	2558AA	Green & Orange	Cathode Column, Anode Row	4000 μcd 4000 μcd	

8 x 8 SINGLE COLOR DOT MATRIX DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA 1/8 DUTY	PAGE NO.
 47.0mm (1.85") Dual-In-Line 1.9"H x 1 9"W x .35"D	LTP– 18088G 18088E	Green Orange	Anode Column, Cathode Row	3500 μcd 3500 μcd	6-63
 58.42mm (2 3") Dual-In-Line 2.4"H x 2 4"W x 36"D	LTP- 2088AG 2088AY 2088AE 2088AHR	Green Yellow Orange Hi. -Eff. Red	Anode Column, Cathode Row	4000 μcd 4000 μcd 4000 μcd 4000 μcd	6-68

8 x 8 MULTICOLOR DOT MATRIX DISPLAYS

PACKAGE	PART NO.	COLOR	DESCRIPTION	TYP. Iv/DOT @ Ip=48 mA 1/8 DUTY	PAGE NO.
 47.0mm (1.85") Dual-In-Line 1.9"H x 1.9"W x .35"D	LTP- 18188A	Green & Orange	Anode Column, Cathode Row	3500 μcd 3500 μcd	6-63
 58.42mm (2.3") Dual-In-Line 2.4"Hx2.4"Wx.36"D	LTP- 2188A	Green & Orange	Anode Column, Cathode Row	4000 μcd 4000 μcd	6-68

HOW TO USE LITON LED DISPLAYS

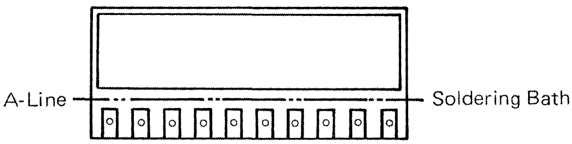
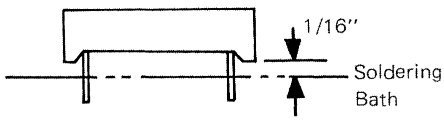
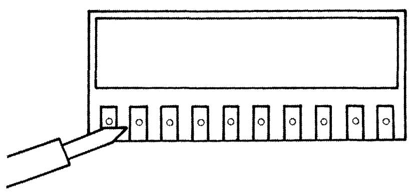
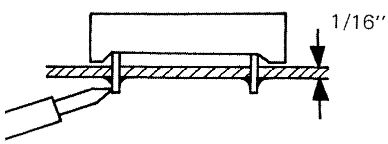
Generally, Liton LED displays can be used as same way as other general semiconductors. However the following precautions must be taken to protect the LED displays.

1. CLEANING

Do not use unspecified chemical liquids to clean display. They could harm the display. If cleaning is necessary, wipe the pin out with alcohol, Freon TE or Chlorosen at normal temperature for less than 1 minute, or wipe the surface with alcohol. When other chemical solutions not specified are used. It may cause crack or haze on the surface of the display.

2. SOLDERING

2.1 The soldering iron should be operated under 40W power comsumption.
2.2 The Liton LED displays soldering specification is shown as table 1.
2.3 The neutrality flux must be used before soldering.

METHOD	CONDITIONS	TEMP.	TIME
Soldering Bath Method	(1) Dip depth should under A-line  A-Line is the middle between the edge of soldering pad and the edge of lite pipe. (2) Dip depth should under 1/16 inch below seating plane 	260°C ± 5°C	Within 3 Seconds
Soldering Method	Soldering Iron: 40W Tip: 4.5ϕ x 32mm  	Tip Temp 205°C ± 5°C	Within 3 Seconds

3. PREVENTING OVER CURRENT

3.1 Do not overcurrent

3.2 In order to operate Liton LED displays under stable conditions. Put protective resistors in series (Fig. 1). Resistor values can be determined by supplying voltage or current for the led display. Recommended current is in the range of forward current 5mA to 20mA.

3.3 Circuit must be designed so that overvoltage (overcurrent) is not applied to the LED during on/off switching. Transients or pulse current will damage the junction of LED die.

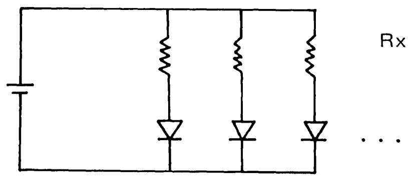


Fig. 1

4. BRIGHTNESS AND COLOR

4.1 For obtainning even brightness. Each segment should be at the same current, so the best circuit design is to supply constant current for each segment.

4.2 To increase brightness. Increase current. But do not over maximum rating.

4.3 To check the appearance defect of LED display, the viewing distance should be 30cm minimum.

4.4 For obtainning more uniform brightness on yellow and green display. The supplying forward current should over 10mA, but do not over maximum rating.

5. HOW TO TEST LUMINOUS INTENSITY OF LED DISPLAY

5.1 Equipment: Taktronix
- A. J16-Photometer
- B. J6501-Yellow & Green Probe
- C. J6505-Red Probe

5.2 Measurement Hints

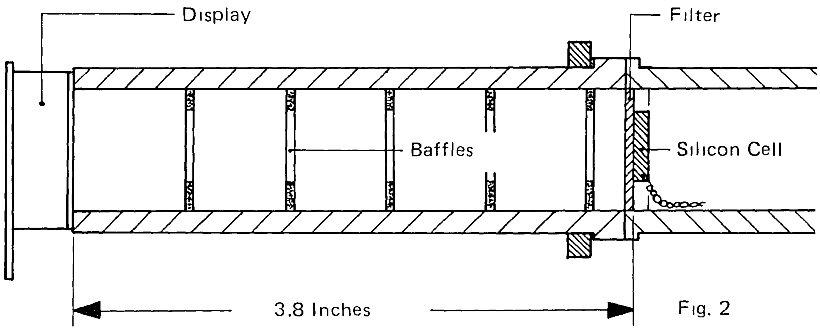


Fig. 2

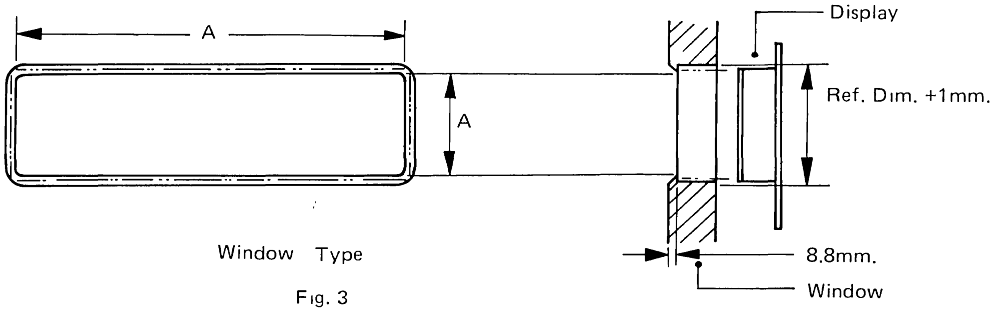
5.3 LED Probe and Adapter
At one foot, one footcandle is equivalent to one candela.
At 3.8 inches one footcandle is equivalent to 100 millicandelas.

5.4 The average luminous intensity is obtained by summing the luminous intensity of each segment and dividing by the total number of segments. The numeric displays are categorized for luminous intensity with the intensity category designated by a letter located on the side of the package.

6. RELIABILITY TESTS AND CONDITIONS

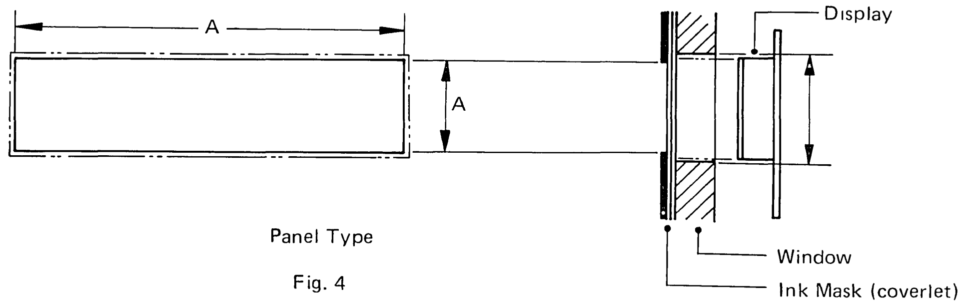
TEST	CONDITONS	DESCRIPTION
Operating Life Test	I_F = maximum rating current Ta = 25°C ± 5°C $1000\,^{+72}_{-24}$ Hours	This test is conducted for the purpose of determining the resistance of a part in electrical and thermal stresses.
High Temperature storage test	Ta = 65°C ± 5°C (Air type) Ta = 85°C ± 5°C (Epoxy type) $1000\,^{+72}_{-24}$ Hours	The purpose of this test is to determine the resistance of the device which is laid under condition of high temperature for hours.
Low Temperature storage test	Ta = 25°C ± 5°C (Air type) Ta = 35°C ± 5°C (Epoxy type) $1000\,^{+72}_{-24}$ Hours	The purpose of this test is to determine the resistance of the device which is laid under condition of low temperature for hours.
High Temperature high humidity Test	Ta = 40°C ± 2°C RH = 90 ~ 95% (Air type) Ta = 65°C ± 2°C RH = 90 ~ 95% (Epoxy type) $1000\,^{+72}_{-24}$ Hours	The purpose of this test is to determine the resistance of the device under tropical condition for hours.
Thermal Shock Test (Air to air)	–25°C ± 5°C to 65°C ± 5°C (Air type) –35°C ± 5°C to 85°C ± 5°C (Epoxy type) 10 Min./Temp., Transfer 5 Sec. 10 Cycles	The purpose of this test is to determine the resistance of the device to sudden extreme. Transition time between temp. Ambients shall be 5 sec. maximum
Solderability Test	(Ta = 230°C ± 5°C) Dwell flux T = 5 ± 1 Sec. Dwell solder T 5 ± .5 Sec.	This test is intended to see soldering is well performed or not.
Drop Test	0 ~ 9kg H = 760mm 9.1 ~ 22kg H = 610mm 22.1 ~ 45.5kg H = 530mm one angle, three corners, six surfaces.	This test is intended to see the certain height drop to affect the device.
Vibration Test	F = 600-3600RPM Amplitude = 1.5mm At acceleration of 9G T = 15 min. To each direction.	This vibration test is intended to determine the suitability of the device.

7. MECHANICAL



Window Type

Fig. 3



Panel Type

Fig. 4

Notes: 1. For mechanical design of LED display application, we recommend to refer Fig. 3 and Fig. 4.
2. For 8.6" ~ 1.8" clock display of liton's product, the "A" dimension design should cover typically 0.5mm on the each edge of lite pipe. For the special type LED clock display, such as the segments or the dots are too close to the edge of lite pipe. To obtain the 0.5mm buffer area, the "A" dimension should be adjusted to the optimun. Please refer to the detail package dimensions in Liton's data book.

8. The BIN brightness classification as follow:

CATEGORY A: μcd/seg.

BIN CODE	A	B	C	D	E	F	G	H	J	K
RANGE	80~ 130	131~ 210	211~ 340	341~ 540	541~ 860	861~ 1380	1381~ 2210	2211~ 3540	3541~ 5660	5661~ 9060

PROPERTY: LTS-4x05A, 4x10A, 4x30A, 4x80A, 6x60, 6x75, 6x80, 6x95
LTD-322, 323, 6x10, 6x30, 6x40, 6x50
LTA-1000
LTL-5x173
LTM-8522, 8529, 8530.

CATEGORY B: μcd/seg.

BIN CODE	B	C	D	E	F	G	H	J	K	L	M	N	P
RANGE	50~ 80	81~ 130	131~ 210	211~ 340	341~ 540	541~ 860	861~ 1380	1381~ 2210	2211~ 3540	3541~ 5660	5661~ 9060	9061~ 14500	14501~ 23200

PROPERTY: LTS-31xA, 36x , 54xA, 340x
LTD-4x2, 524, 52x0, 5x5
LTP-5x7, 378x
LTM-8647
LTC-5x36, 5x37

CATEGORY C: μcd/seg.

BIN CODE	A	B	C	D	E	F	G	H	I	J	K	L	M
RANGE	100~ 130	131~ 170	171~ 220	221~ 290	291~ 370	371~ 480	481~ 620	621~ 810	811~ 1050	1051~ 1370	1371~ 1780	1781~ 2310	2311~ 3000

BIN CODE	N	P	Q	R	S	T	U
RANGE	3001~ 3900	3901~ 5070	5071~ 6590	6591~ 8570	8571~ 11140	11141~ 14480	14481~ 18820

PROPERTY: All single color matrix . series displays.
(LTP-2x44 Exclude)

CATEGORY D: μcd/seg.

BIN CODE	D	E	F	G	H	I	J	K	L	M	N
RANGE	711~ 820	821~ 940	941~ 1080	1081~ 1240	1241~ 1430	1431~ 1640	1641~ 1890	1891~ 2170	2170~ 2500	2501~ 2880	2881~ 3310

BIN CODE	P	Q	R	S	T	U	V	W	X	Y	Z	Z_1
RANGE	3311~ 3810	3811~ 4380	4381~ 5040	5041~ 5800	5801~ 6670	6671~ 7670	7671~ 8820	8821~ 10140	10141~ 11660	11661~ 13410	13411~ 15020	15421~ 17730

PROPERTY: All multi-color dot matrix . series display.
(LTP-2x44 Exclude)

CATEGORY E: mcd/seg.

BIN CODE	3	2	1	A	B	C	D	E	F	G	M	J
RANGE	1.3~ 1.8	1.9~ 2.5	2.6~ 3.5	3.6~ 5.0	5.1~ 7.0	7.1~ 10.0	10.1~ 14.0	14.1~ 20.0	20.1~ 28.0	28.1~ 39.0	39.1~ 55.0	55.1~ 77.0

PROPERTY: LTJ-811
LTL-2x00, 2x20, 2x50, 2x55, 2x85
LTP-2x44

CATEGORY F: μcd/seg.

BIN CODE	3	2	1	A	B	C	D	E	F	G	H
RANGE	220~ 320	321~ 380	381~ 450	451~ 520	521~ 630	631~ 900	901~ 1250	1251~ 1750	1751~ 2450	2451~ 3430	3431~ 4450

PROPERTY: LTP-305

CATEGORY G: mcd/seg.

BIN CODE	E	F	G	H	J	K	L	M	N	O
RANGE	2.0~ 3.2	3.3~ 5.0	5.1~ 8.0	8.1~ 13.0	13.1~ 21.0	21.1~ 34.0	34.1~ 54.0	54.1~ 86.0	86.1~ 138.0	138.1~ 221.0

PROPERTY: LTS-30x01, 30x02, 50x01, 50x02, 10x04, 10x05.

NOTE: 1. The average luminous intensity is obtained by summing the luminous intensity of each segment and dividing by the total number of segments. The displays are categorized for luminous intensity with the intensity category designated by a letter located on the side of the package. The BIN brighteness classification is as above.

2. Please put same BIN grade of brightness together when displays are assembled together for the uniformity.

DOT MATRIX DISPLAYS

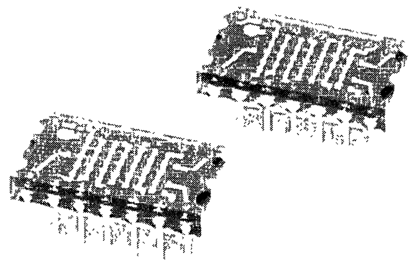
LITEON

LTP-305 SERIES

0.3" 5 x 7 SINGLE COLOR DOT MATRIX DISPLAYS

FEATURES

- 0.3 INCH (7.62mm) MATRIX HEIGHT.
- CHOICE OF THREE BRIGHT COLORS-RED/GREEN/HIGH EFFICIENCY RED.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- 36 LIGHT EMITTING DIODES.
- LOW POWER REQUIREMENTS.
- 5 x 7 ARRAY WITH X-Y SELECT AND DECIMAL POINT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

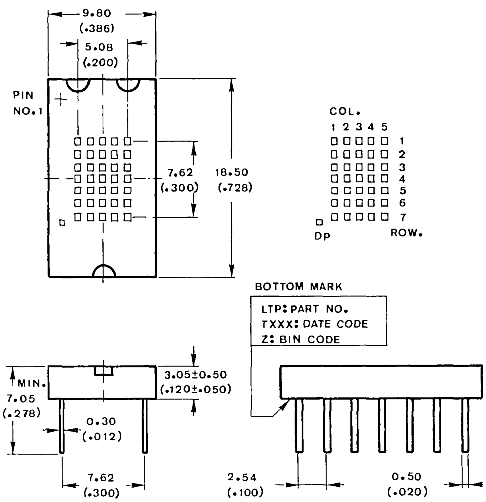
The LTP-305 series are 0.3 inch (7.62mm) matrix height 5x7 dot matrix displays.

The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The green series devices are utilize LED chips which are made from GaP on a transparent GaP substrate. The high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red displays have red package color. Green displays have green package color. High efficiency displays have red package color.

DEVICES

PART NO. LTP–			DESCRIPTION
RED	GREEN	HI.-EFF RED	
305R	305G	305HR	Anode Column, Cathode Row; Lt. Hand Decimal

PACKAGE DIMENSIONS



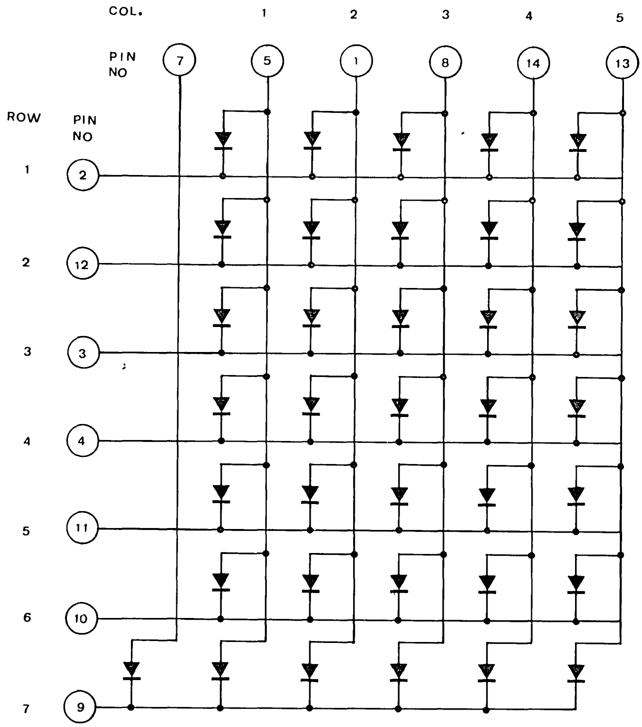
NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.000}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

PIN NO.	CONNECTION	PIN NO.	CONNECTION
1	Anode, Column 2	8	Anode, Column 3
2	Cathode, Row 1	9	Cathode, Row 7
3	Cathode, Row 3	10	Cathode, Row 6
4	Cathode, Row 4	11	Cathode, Row 5
5	Anode, Column 1	12	Cathode, Row 2
6	No Pin	13	Anode, Column 5
7	Anode, Decimal (Point)	14	Anode, Column 4

INTERNAL CIRCUIT DIAGRAM



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	GREEN	HI.-EFF. RED	UNIT
Power Dissipation Per Display	750	1000	1000	mW
Peak Forward Current Per Dot (1/10 Duty Cycle, 0.1ms Pulse Width)	100	60	60	mA
Continuous Forward Current Per Dot	20	20	20	mA
Derating Linear From 25°C Per Dot	0.25	0.25	0.25	mA/°C
Reverse Voltage Per Dot	5	5	5	V
Operating Temperature Range	–25°C to +85°C			
Storage Temperature Range	–25°C to +85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ C$
LTP-305R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	Iv	200	400		μcd	I_P = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage any Dot	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

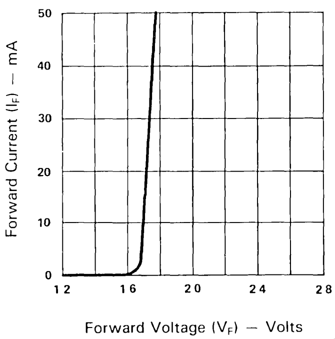


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

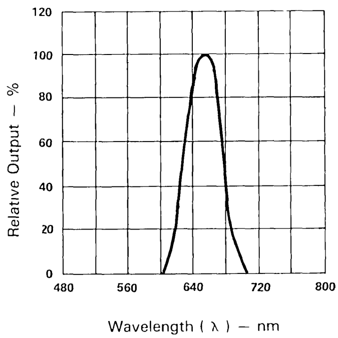


Fig 2 SPECTRAL RESPONSE

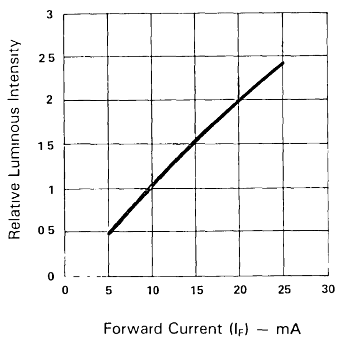


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

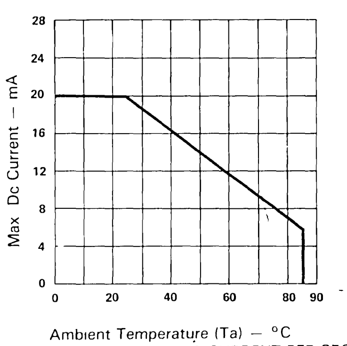


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

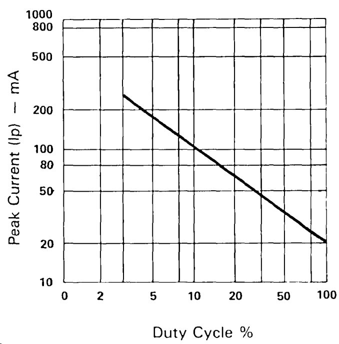


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

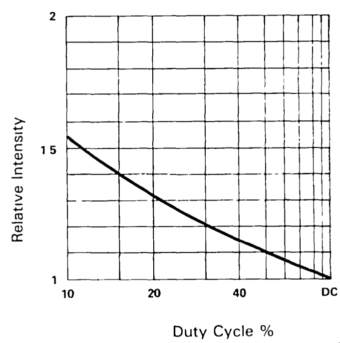


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

DOT MATRIX DISPLAYS

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-305G SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	Iv	600	1600		μcd	I_P = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

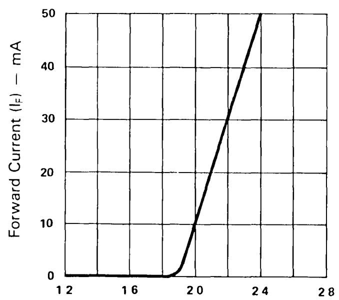


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

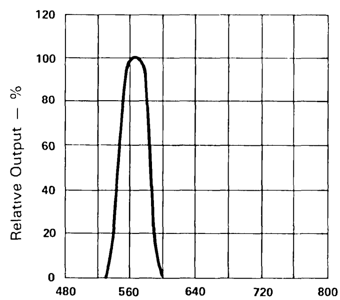


Fig 2 SPECTRAL RESPONSE

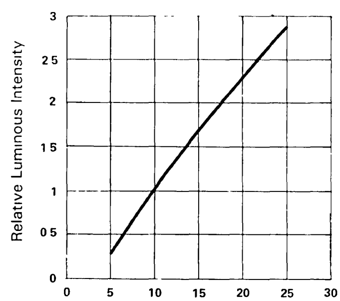


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

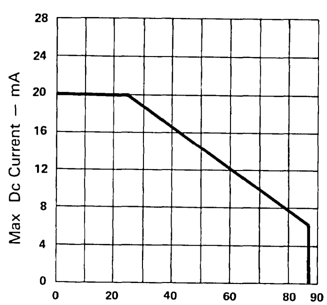


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

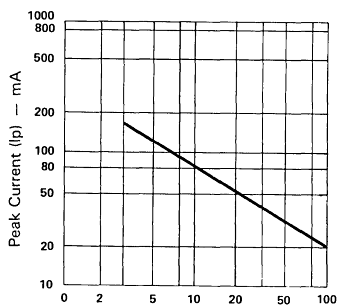


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

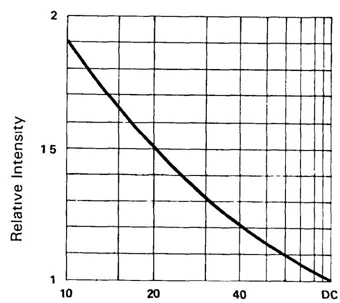


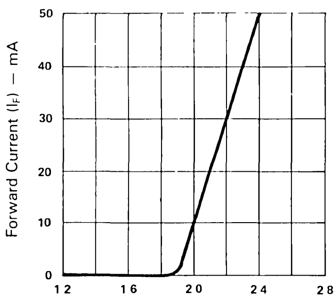
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-305HR SERIES

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous intensity	Iv	600	1600		μcd	I_P = 48 mA 1/8 DUTY
Peak Emission Wavelength	λ p		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

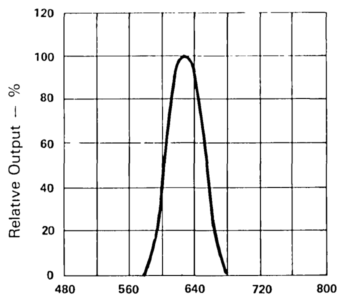
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)



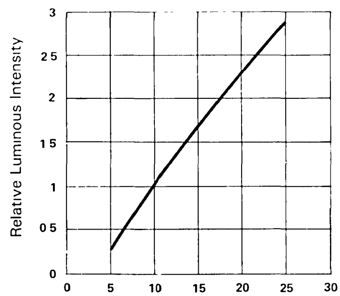
Forward Voltage (V_F) — Volts

Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE.



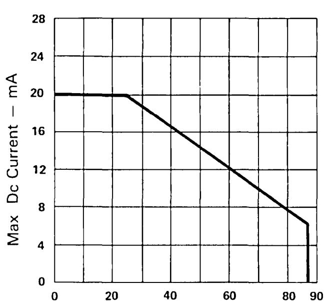
Wavelength (λ) — nm

Fig 2 SPECTRAL RESPONSE



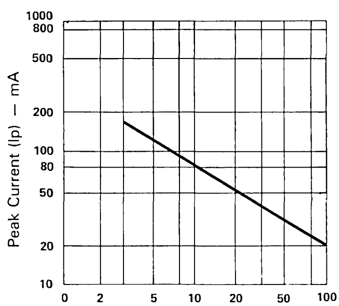
Forward Current (I_F) — mA

Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



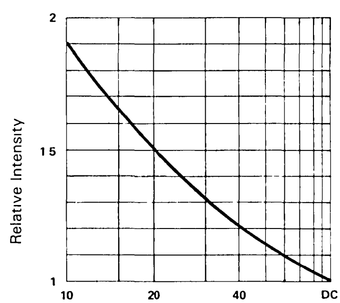
Ambient Temperature (Ta) — °C

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

DOT MATRIX DISPLAYS

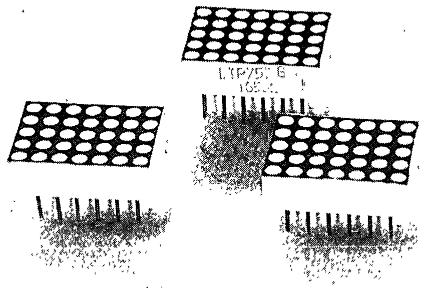
LITEON

LTP- 747 757 SERIES

0.7" 5 x 7 SINGLE COLOR DOT MATRIX DISPLAY

FEATURES

- 0.7 INCH (17.2 mm) MATRIX HEIGHT.
- CHOICE OF SIX BRIGHT COLORS – RED / BRIGHT RED / GREEN / YEELOW / ORANGE / HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- 5 x 7 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE VERTICALLY AND HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION CATHODE ROW, OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.
- CATEGORIZED FOR LUMINOUS INTENSITY.



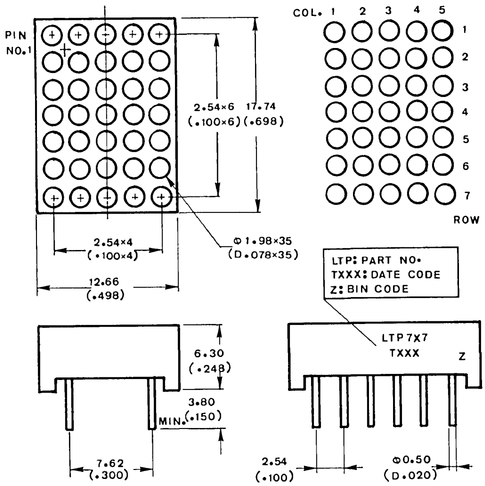
DESCRIPTION

The LTP-747/757 series are 0.7 inche (17.2 mm) matrix height 5 x 7 dot matrix displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high-efficiency red series utilize LED chips which are made from GaAsp on a transparent GaP substrate. The red, green, yellow and orange displays have gray face and white dot color. The bright red and high efficiency red displays have red face and red dot color.

DEVICES

PART NO. LTP–					DESCRIPTION	ITERNAL CIRCUIT DIAGRAM
RED	GREEN	YELLOW	ORANGE	HI.-EFF, RED		
747R	747G	747Y	747E	747HR	Anode Column, Cathode Row	A
757R	757G	757Y	757E	757HR	Cathode Column; Anode Row	B

PACKAGE DIMENSIONS



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

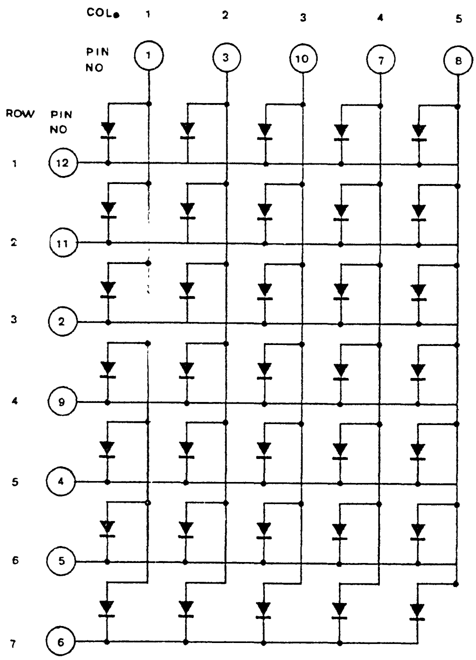
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.000}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

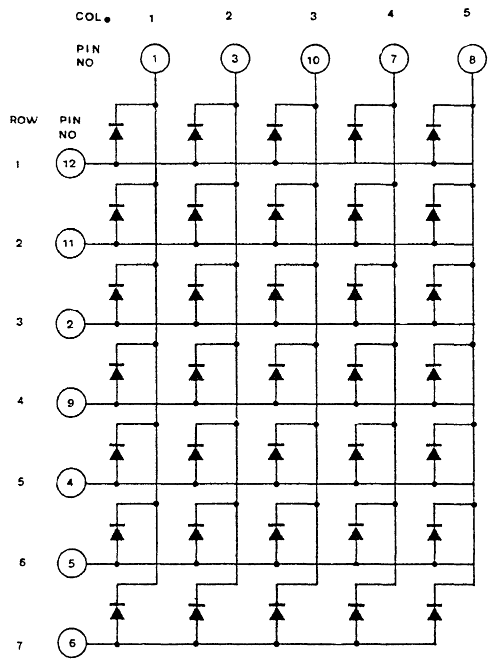
PIN NO.	CONNECTION	
	LTP-747	LTP-757
1	Anode Column 1	Cathode Column 1
2	Cathode Row 3	Anode Row 3
3	Anode Column 2	Cathode Column 2
4	Cathode Row 5	Anode Row 5
5	Cathode Row 6	Anode Row 6
6	Cathode Row 7	Anode Row 7
7	Anodel Column 4	Cathode Column 4
8	Anode Column 5	Cathode Column 5
9	Cathode Row 4	Anode Row 4
10	Anode Column 3	Cathode Column 3
11	Cathode Row 2	Anode Row 2
12	Cathode Row 1	Anode Row 1

INTERNAL CIRCUIT DIAGRAM

A. LTP-747



B. LTP-757



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Dot	45	60	50	60	60	mW
Peak Forward Current Per Dot (1/10 Duty Cycle, 0.1ms Pulse Width)	120	80	60	80	80	mA
Continuous Forward Current Per Dot	20	20	16	20	20	mA
Derating Linear From 25°C Per Dot	0.24	.0.24	0.2	0.24	0.24	mA/°C
Reverse Voltage Per Dot	5	5	5	5	5	V
Operating Temperature Range	−25°C to +85°C					
Storage Temperature Range	−25°C to +85°C					
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C						

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-747R/757R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_v	200	500		µcd	I_P = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	µA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

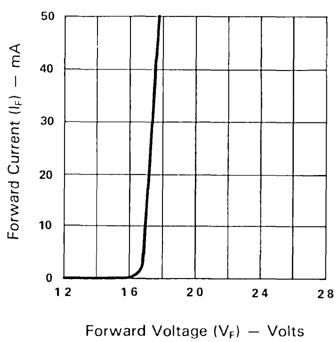


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

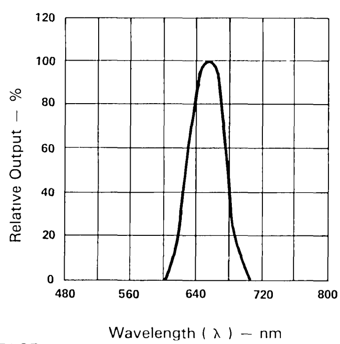


Fig 2 SPECTRAL RESPONSE

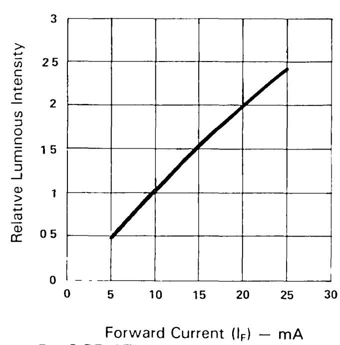


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

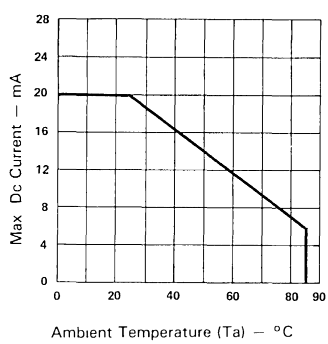


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

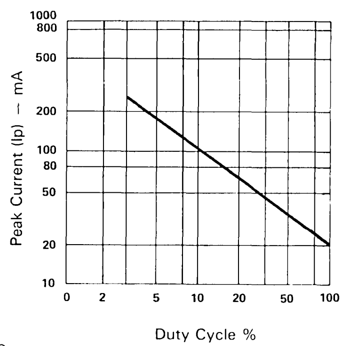


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

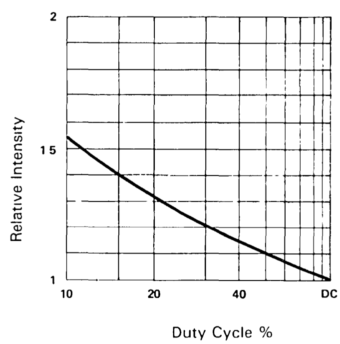


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-747Y/757Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	700	2000		μcd	I_P = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		35		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dct	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	$I_{V\text{-}m}$			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

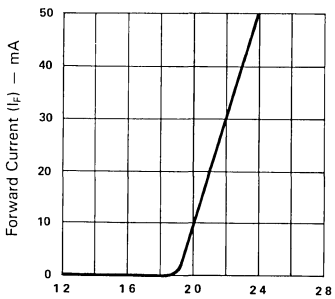


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

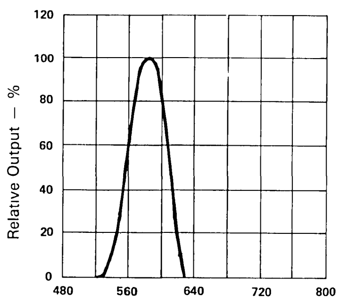


Fig 2 SPECTRAL RESPONSE

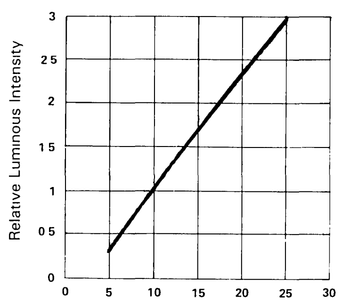


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

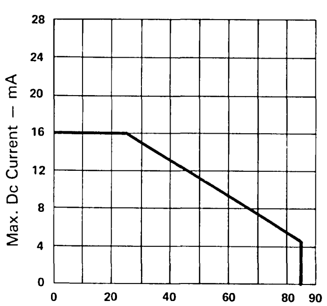


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

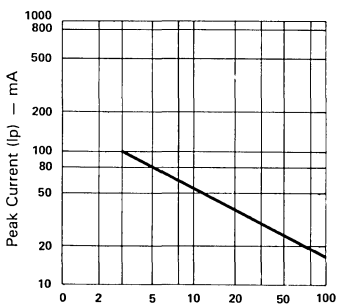


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

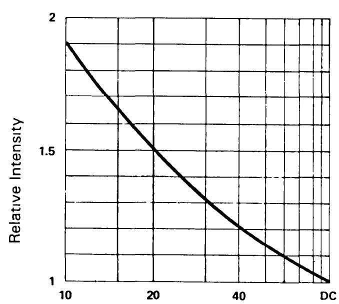


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-747G/757G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT'	TEST CONDITION
Average Luminous Intensity	Iv	700	2000		μcd	I_P = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dct	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

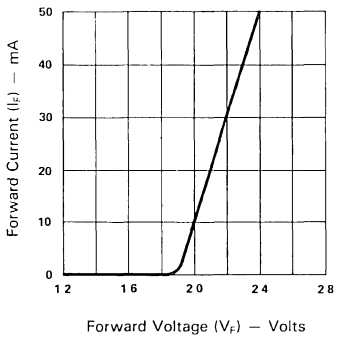


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

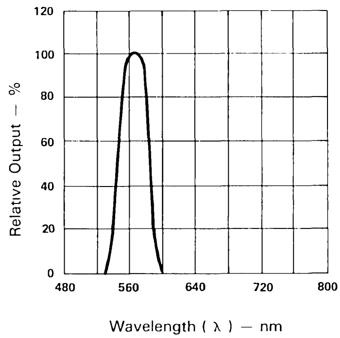


Fig 2 SPECTRAL RESPONSE

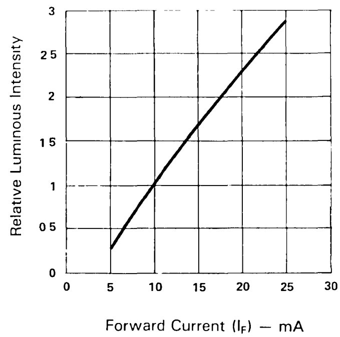


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

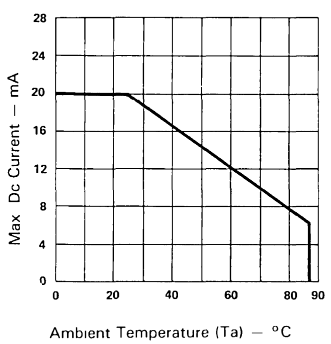


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

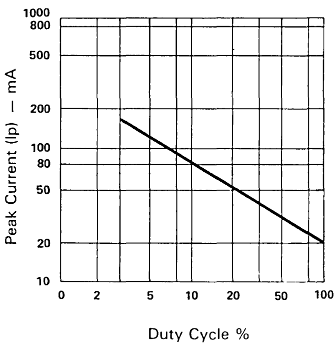


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

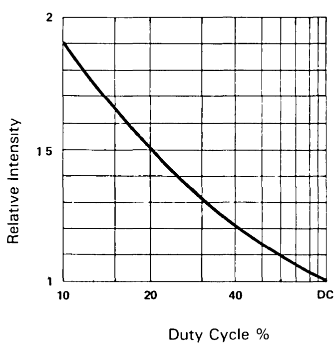
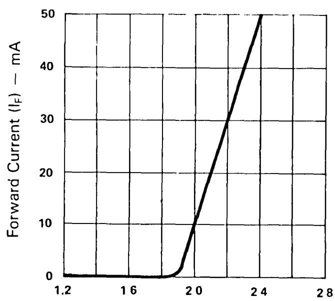


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

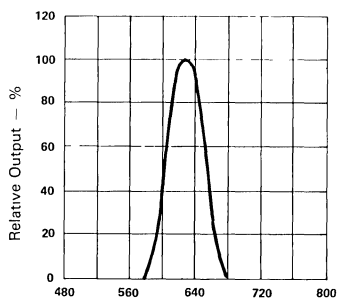
ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-747E/757E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CODITION
Average Luminous Intensity	Iv	700	2000		μcd	I_P = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dct	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

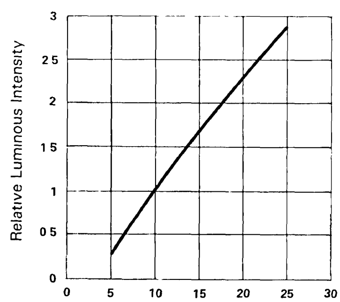
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



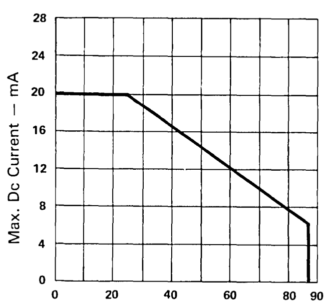
Forward Voltage (V_F) – Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



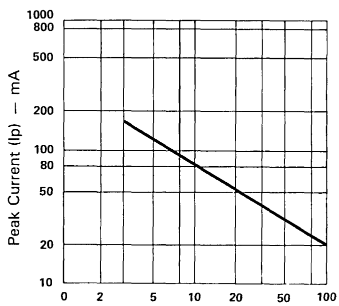
Wavelength (λ) – nm.
Fig 2 SPECTRAL RESPONSE



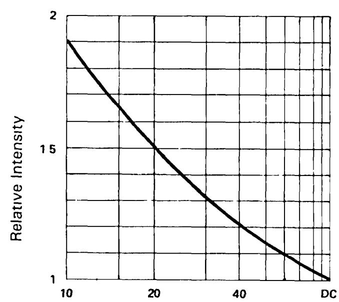
Forward Current (I_F) – mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) – °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

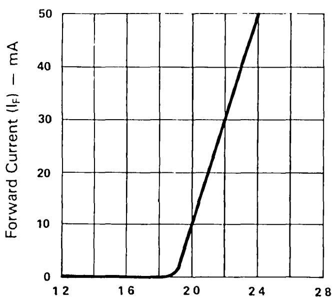


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

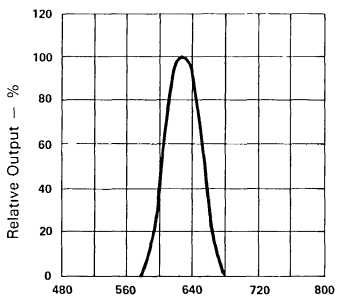
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-747HR/757HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CODITION
Average Luminous Intensity	Iv	700	2000		μcd	I_P = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dct	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

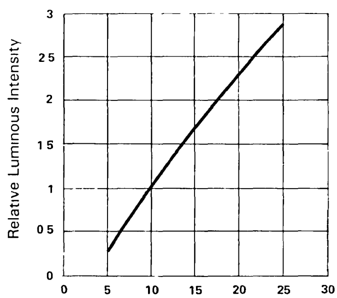
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



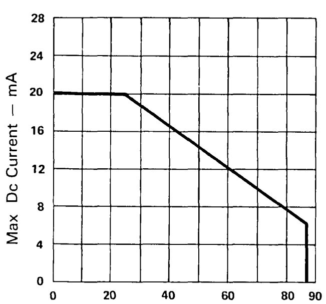
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



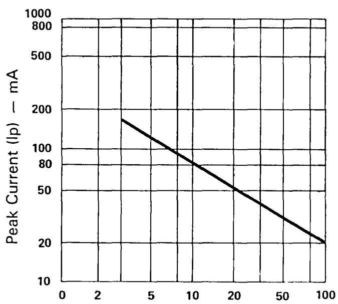
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



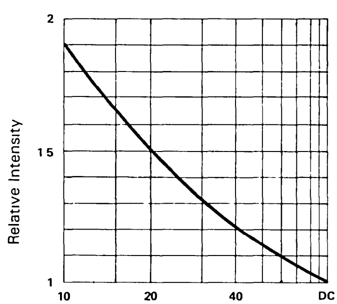
Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX. PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



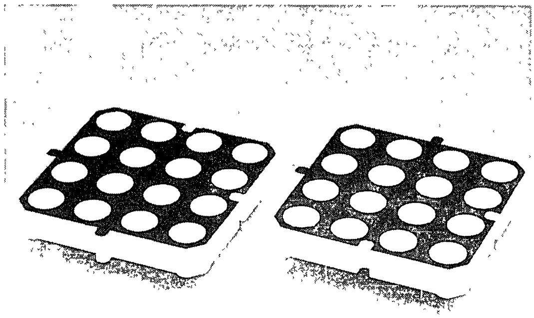
Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LTP-2344 / 2044 A3 SERIES

2.0" 4x4 SINGLE COLOR & MULTICOLOR DOT MATRIX DISPLAYS

FEATURES

- 2.0 INCH (50.80mm) MATRIX HEIGHT.
- LOW POWER REQUIREMENT.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- 4x4 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION CATHODE ROW OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF THREE BRIGHT COLORS-GREEN/YELLOW/ORANGE.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS: GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED).



DESCRIPTION

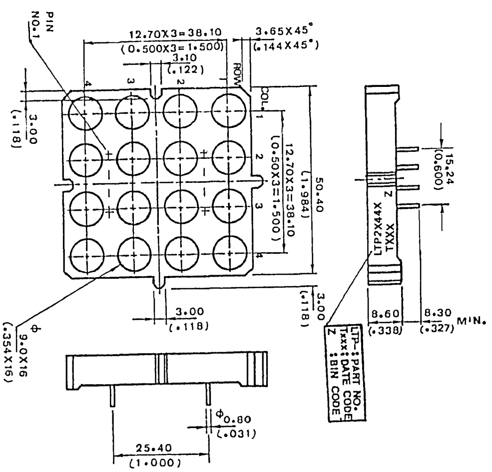
The LTP-2x44 series are 2.0 inch (50.80mm) matrix-height 4x4 dot matrix displays.
The LTP-2044A_3 are multicolor applicable displays. The multicolor displays have gray face and white dot color.
The LTP-2344 series are single color displays. The bright red green, yellow and orange displays have gray face and white dot color. The high efficiency red displays have red face and red dot color.
The green series devices are made from GaP on a utilize LED chips which transparent GaP substrate.
The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

DEVICES

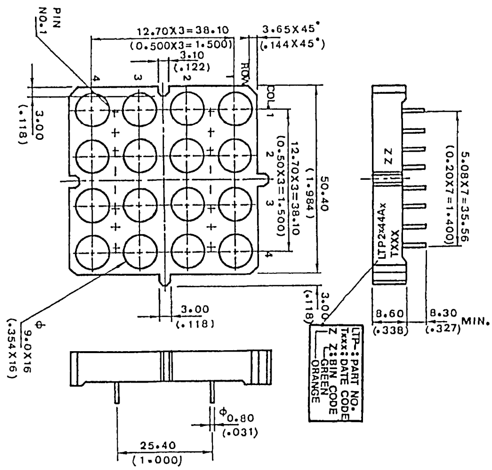
PART NO. LTP–				DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	YELLOW	ORANGE	MULTI-COLOR			
2344G	2344Y	2344E	–	Anode Row, Cathode Column	A	A
–	–	–	2044A_3	Anode Row, Cathode Column	B	B

PACKAGE DIMENSIONS

A. LTP-2344



B. LTP-2044A$_3$



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

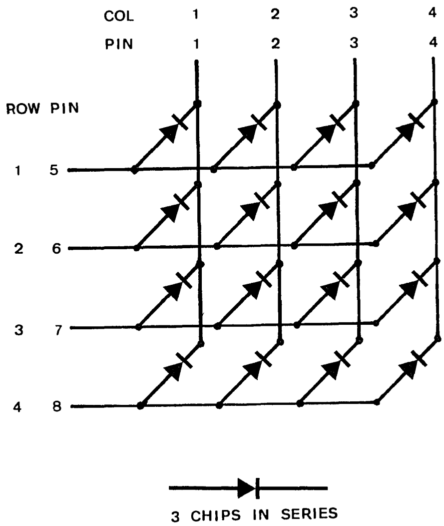
1. Lead length (from seating plane): minimum valum $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

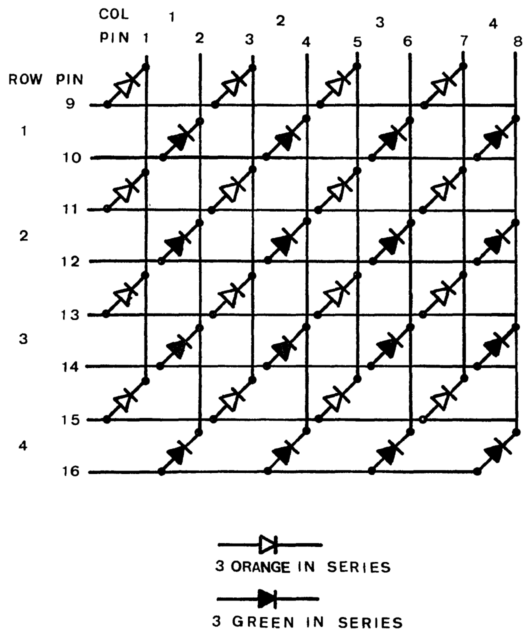
PIN NO.	CONNECTION	
	A. LTP-2344	B. LTP-2044A$_3$
1	Cathode Column 1	Cathode orange Column 1
2	Cathode Column 2	Cathode Green Column 1
3	Cathode Column 3	Cathode orange Column 2
4	Cathode Column 4	Cathode Green Column 2
5	Anode Row 1	Cathode orange Column 3
6	Anode Row 2	Cathode Green Column 3
7	Anode Row 3	Cathode orange Column 4
8	Anode Row 4	Cathode Green Column 4
9		Anode orange Row 1
10		Anode Green Row 1
11		Anode orange Row 2
12		Anode Green Row 2
13		Anode orange Row 3
14		Anode Green Row 3
15		Anode orange Row 4
16		Anode Green Row 4

INTERNAL CIRCUIT DIAGRAM

A. LTP-2344



B. LTP-2044A_3



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	GREEN	YELLOW	ORANGE	UNIT
Power Dissipation Per Dot	150	180	150	mW
Feak Forward Current Per Dot (1/10 Duty Cycle, 0.1ms Pulse Width)	75	80	75	mA
Continuous Forward Current Per Dot	18	20	18	mA
Derating Linear From 25°C Per Dot	0.26	0.24	0.26	mA/°C
Reverse Voltage Per Dot	15	15	15	V
Operating Temperature Range	–25°C to +85°C			
Storage Temperature Range	–25°C to +85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-2344G/2044A3 (GREEN)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	5.0	11.0		mcd	IP = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I F = 20 mA
Forward Voltage, any Dot	V F		6.3	8.4	V	I F = 20 mA
Reverse Current, any Dot	I R			100	μA	V R = 15V
Luminous Intensity Matching Ratio	Iv-m			2:1		I F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

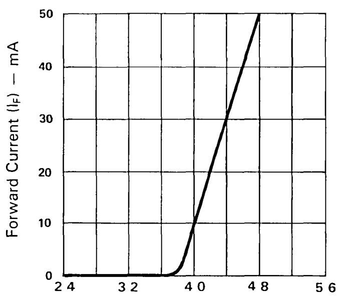


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

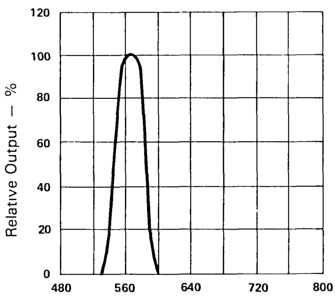


Fig 2 SPECTRAL RESPONSE

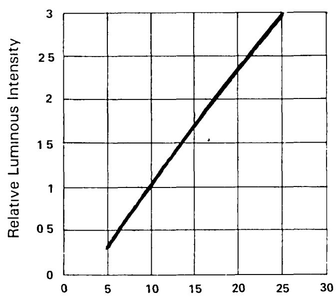


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

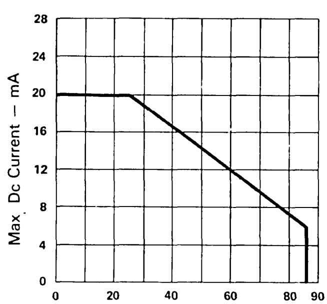


Fig 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

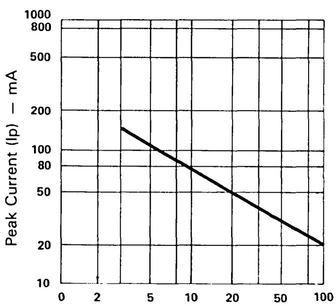


Fig 5 MAX. PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

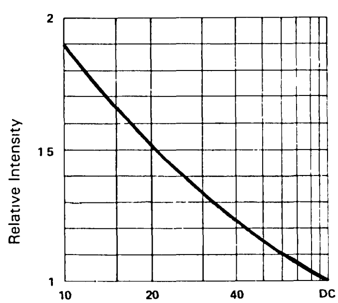


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG.)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-2344Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	5.0	9.0		mcd	IP = 48mA 1/8 DUTY
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		6.3	8.4	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 15V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

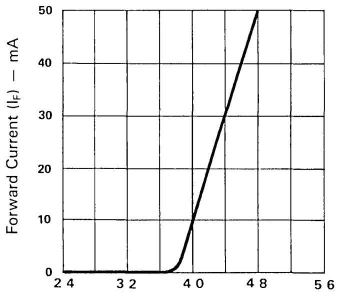


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

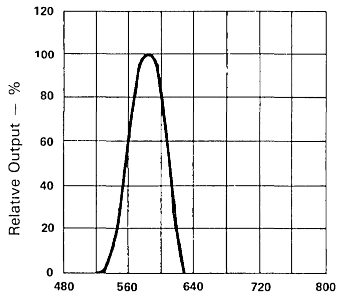


Fig 2 SPECTRAL RESPONSE

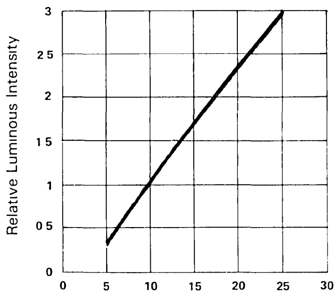


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

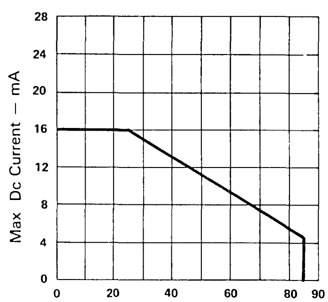


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

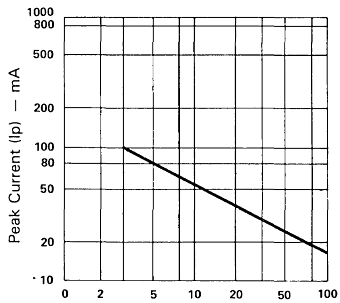


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

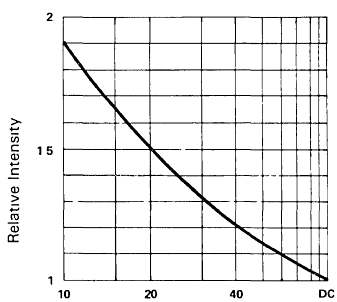


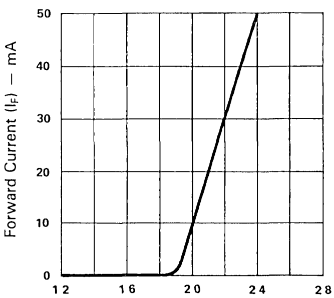
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-2344E/2044A_3 (ORANGE)

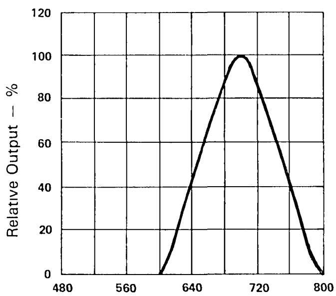
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	5.0	11.0		mcd	IP = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		6.3	8.4	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 15V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

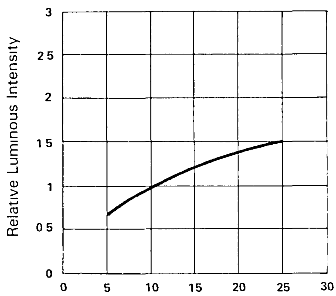
(25° C Ambient Temperature Unless Otherwise Noted)



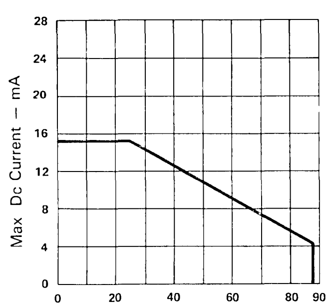
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



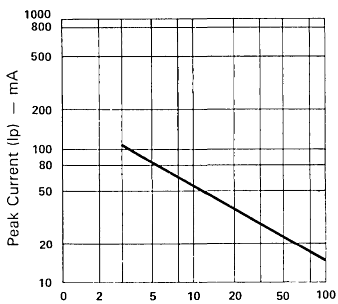
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

DOT-MATRIX DISPLAYS

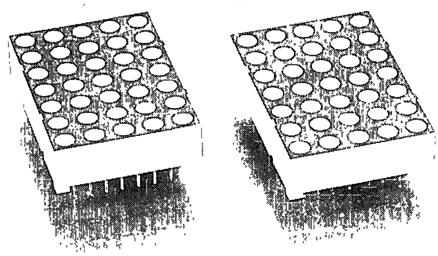
LITEON

LTP- 1257AA/1357AA 1457A/1557A SERIES

1.2" 5 x 7 SINGLE COLOR & MULTICOLOR DOT MATRIX DISPLAYS

FEATURES

- 1.2" INCH (30.48mm) MATRIX HEIGHT.
- LOW POWER REQUIREMENT.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- 5 x 7 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION CATHODE ROW OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF FOUR BRIGHT COLORS-GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS: GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED)



DESCRIPTION

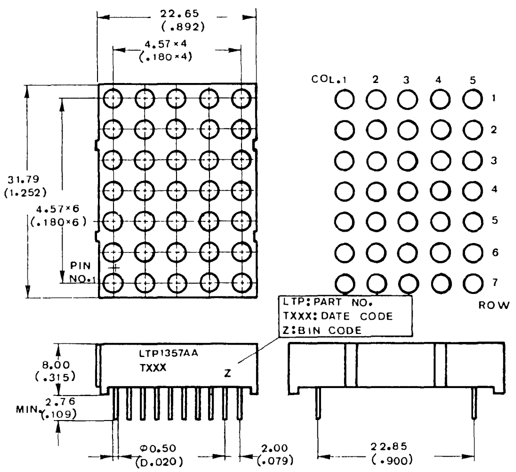
The LTP-1 x 57A series are 1.2 inch (30.48mm) matrix height 5 x 7 dot matrix displays.
The LTP-1257AA/1357AA are multicolor applicable displays. The multicolor displays have gray face and white dot color.
The LTP-1457A/1557A series are single color displays. The green, yellow and orange displays have gray face and white dot color. The high efficiency red displays have red face and red dot color.
The green series devices utilize LED chips which are mad e from GaP on a transparent GaP substrate.
The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

DEVICES

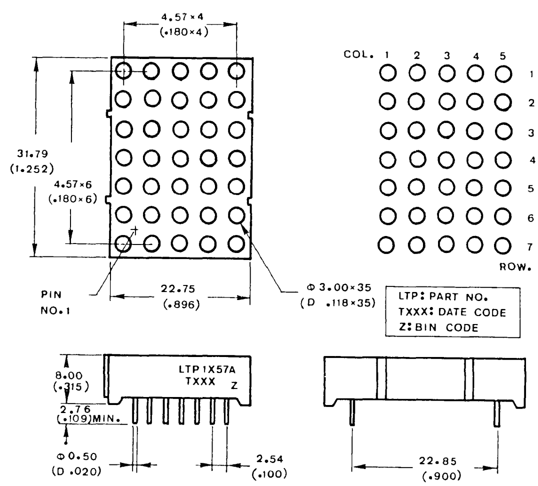
PART NO. LTP–					DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	YELLOW	ORANGE	HI.-EFF. RED	MULTI-COLOR			
—	—	—	—	1257AA	Anode Column, Cathode Row	A	A
—	—	—	—	1357AA	Cathode Column, Anode Row	A	B
1457AG	1457AY	1457AE	1457AHR	—	Anode Column, Cathode Row	B	C
1557AG	1557AY	1557AE	1557AHR	—	Cathode Column, Anode Row	B	D

PACKAGE DIMENSIONS

A. LTP-1257AA/1357AA



B. LTP-1457A/1557A



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $\frac{+1.00}{-0.000}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

DOT MATRIX DISPLAYS

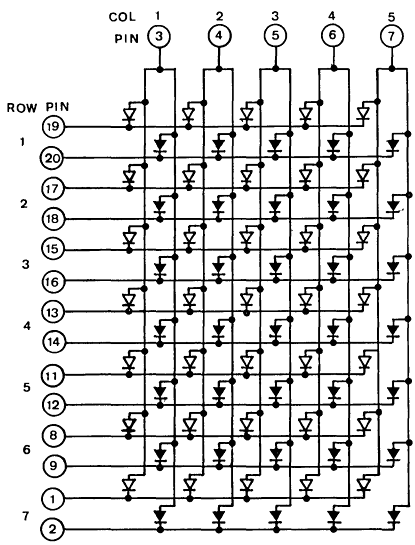
PIN CONNECTION

PIN NO.	CONNECTION			
	A LTP-1257AA	B LTP-1357AA	C LTP-1457A	D LTP-1557A
1	Cathode Row 7 Green	Anode Row 7 Green	Cathode Row 5	Anode Row 5
2	Cathode Row 7 Orange	Anode Row 7 Orange	Cathode Row 7	Anode Row 7
3	Anode Column 1	Cathode Column 1	Anode Column 2	Cathode Column 2
4	Anode Column 2	Cathode Column 2	Anode Column 3*1	Cathode Column 3*1
5	Anode Column 3	Cathode Column 3	Cathode Row 4*2	Anode Row 4*2
6	Anode Column 4	Cathode Column 4	Anode Column 5	Cathode Column 5
7	Anode Column 5	Cathode Column 5	Cathode Row 6	Anode Row 6
8	Cathode Row 6 Green	Anode Row 6 Green	Cathode Row 3	Anode Row 3
9	Cathode Row 6 Orange	Anode Row 6 Orange	Cathode Row 1	Anode Row 1
10	No Connection	No Connection	Anode Column 4	Cathode Column 4
11	Cathode Row 5 Green	Anode Row 5 Green	Anode Column 3*1	Cathode Column 3*1
12	Cathode Row 5 Orange	Anode Row 5 Orange	Cathode Row 4*2	Anode Row 4*2
13	Cathode Row 4 Green	Anode Row 4 Green	Anode Column 1	Cathode Column 1
14	Cathode Row 4 Orange	Anode Row 4 Orange	Cathode Row 2	Anode Row 2
15	Cathode Row 3 Green	Anode Row 3 Green		
16	Cathode Row 3 Orange	Anode Row 3 Orange		
17	Cathode Row 2 Green	Anode Row 2 Green		
18	Cathode Row 2 Orange	Anode Row 2 Orange		
19	Cathode Row 1 Green	Anode Row 1 Green		
20	Cathode Row 1 Orange	Anode Row 1 Orange		

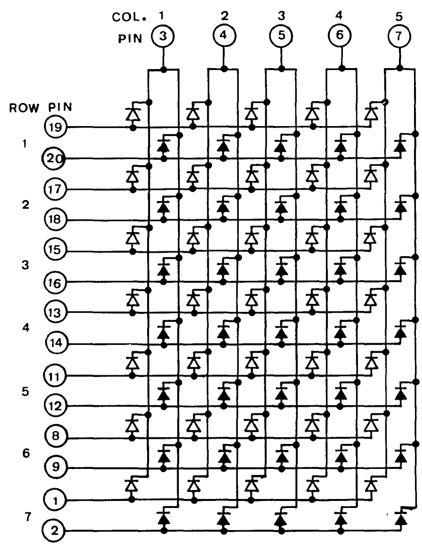
NOTES: 1. Pin 4 & 11 are internally connected.
2. Pin 5 & 12 are internally connected.

INTERNAL CIRCUIT DIAGRAM

A. LTP-1257AA

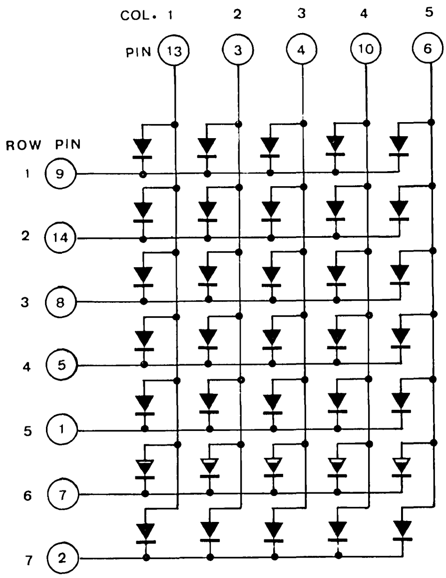


B. LTP-1357AA

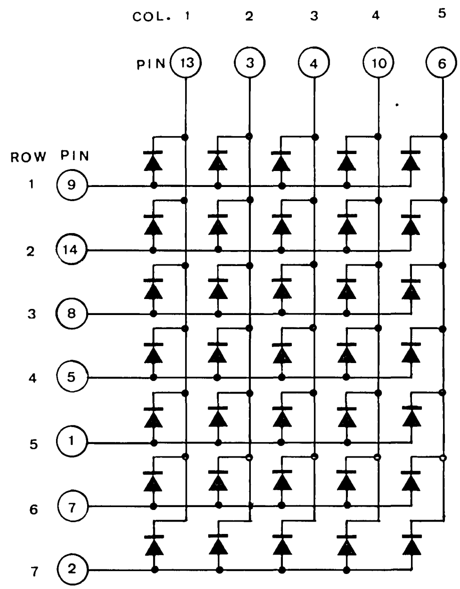


NOTE: The sign " —▷|— " stands for GREEN color chips
The sign " —▶|— " stands for ORANGE color chips

C. LTP-1457A



D. LTP-1557A



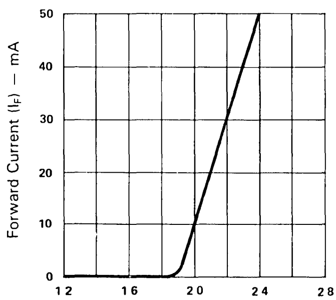
ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	GREEN	YELLOW	ORANGE	HI-EFF RED	UNIT
Power Dissipation Per Dot	75	60	75	75	mW
Peak Forward Current Per Dot (1/10 Duty Cycle, 0.1 ms Pulse Width)	100	80	100	100	mA
Continuous Forward Current Per Dot	25	20	25	25	mA
Derating Linear From 25°C Per Dot	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Dot	5	5	5	5	V
Operating Temperature Range		–25°C to + 85°C			
Storage Temperature Range		–25°C to + 85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Sec. at 260°C					

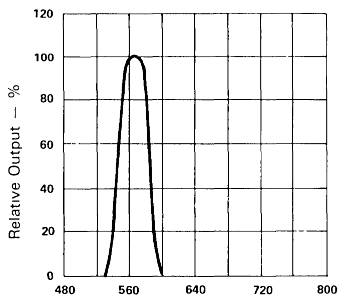
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-1257AA/1357AA (GREEN) & LTP-1457AG/1557AG

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	3000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

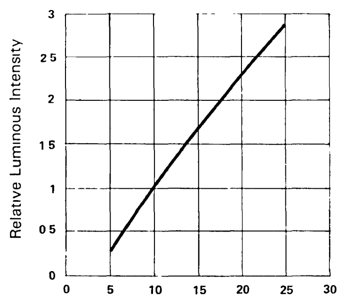
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



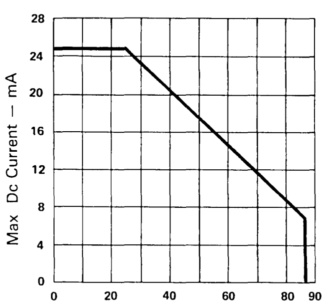
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



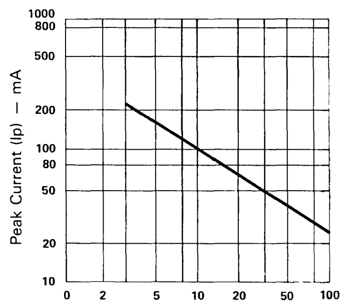
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



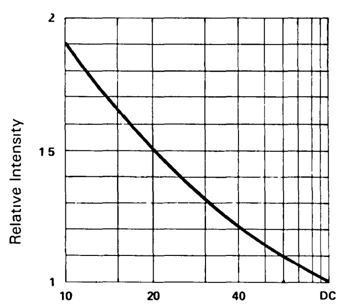
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



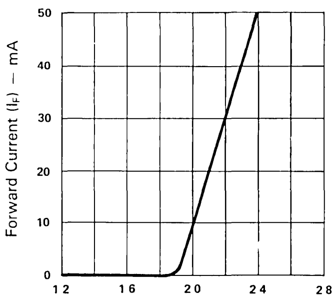
Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-1457AY/1557AY

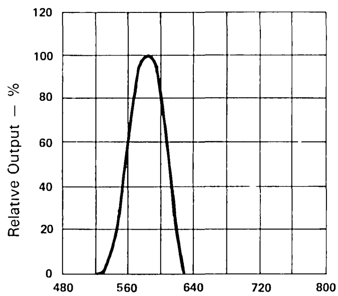
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity *1, 2	Iv	800	3000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

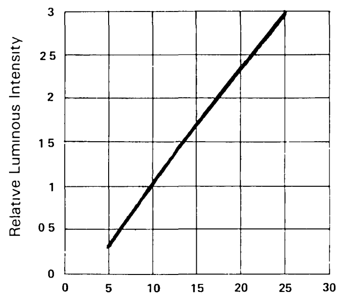
(25° Ambient Temperature Unless Otherwise Noted)



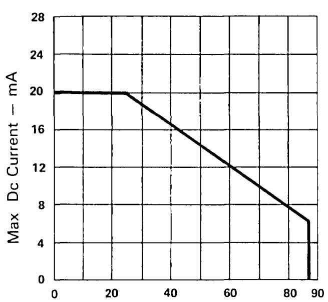
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



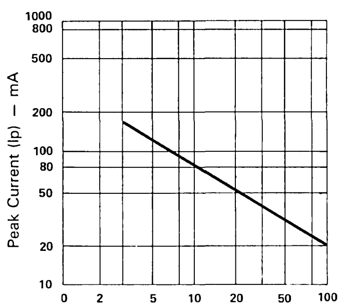
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



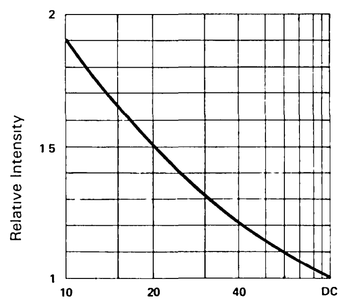
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PFR SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-1257AA/1357A (ORANGE) & LTP-1457AE/1557AE

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	3000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

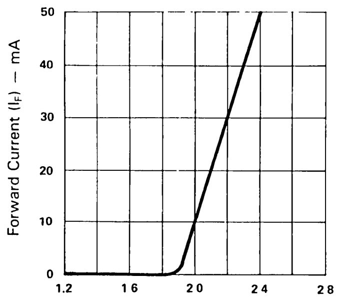


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

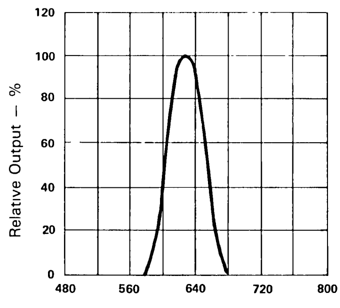


Fig 2 SPECTRAL RESPONSE.

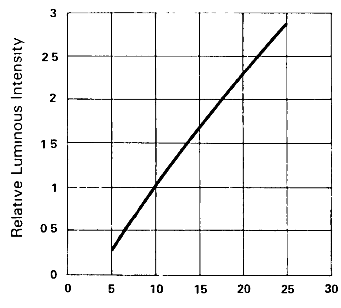


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

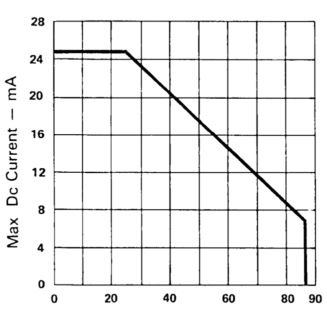


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

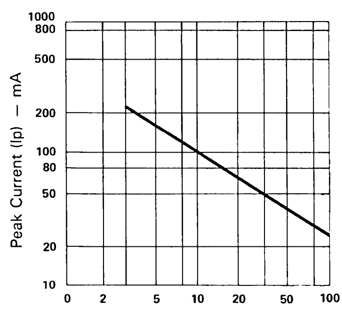


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

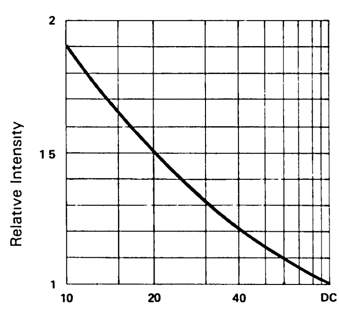


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ C$
LTP-1457AHR/1557AHR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	3000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° Ambient Temperature Unless Otherwise Noted)

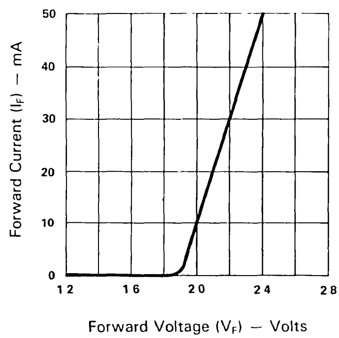


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

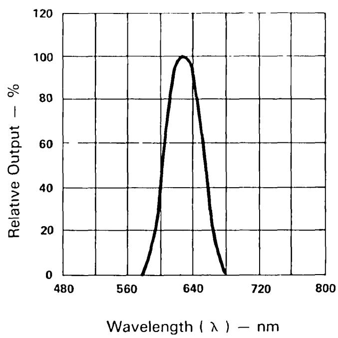


Fig 2 SPECTRAL RESPONSE

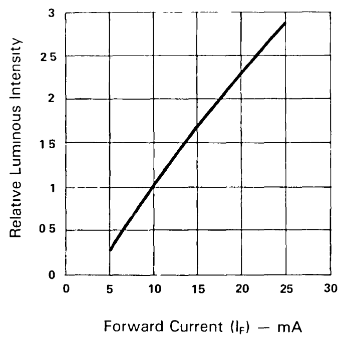


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

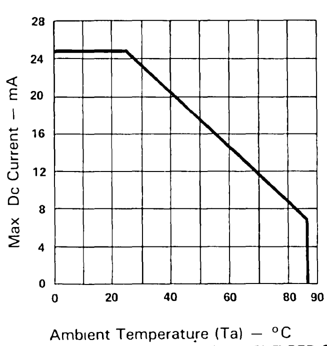


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

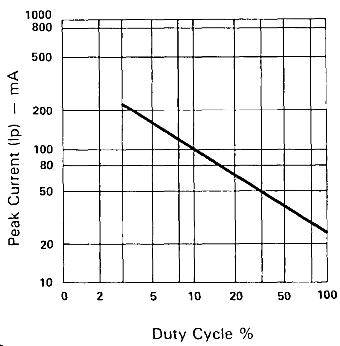


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

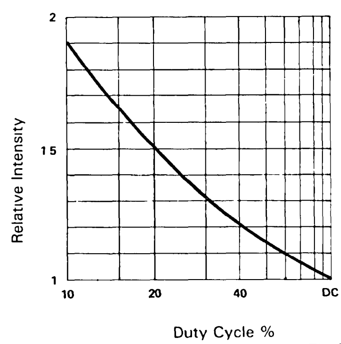


Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

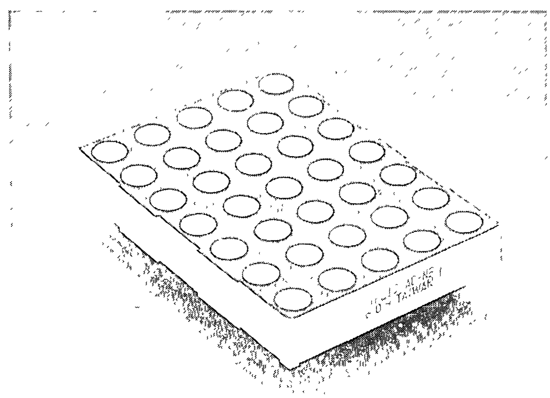
LITEON

LTP- 2057A/2157A 2657AA/2757AA SERIES

2.0" 5 x 7 SINGLE COLOR & MULTICOLOR DOT MATRIX DISPLAYS

FEATURES

- 2.0" INCH (50.8 mm) MATRIX HEIGHT.
- LOW POWER REQUIREMENT.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- SOLID STATE RELIABILITY.
- 5 x 7 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION CATHODE ROW OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD.
- CATEGORIZED FOR LUMINOUS INTENSITY. SINGLE COLOR DISPLAYS HAVE THE CHOICE OF FOUR BRIGHT COLORS-GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS: GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED)



DESCRIPTION

The LTP-2 x 57A series are 2.0 inch (50.80mm) matrix-height 5 x 7 dot matrix displays.

The LTP-2657AA/2757AA are multicolor applicable displays. The multicolor displays have gray face and white dot color.

The LTP-2057/2157A series are single color displays. The green, yellow and orange displays have gray face and white dot color. The high efficiency red displays have red face and red dot color.

The green series devices utilized LED chips which are made from GaP on a transparent GaP substrate.

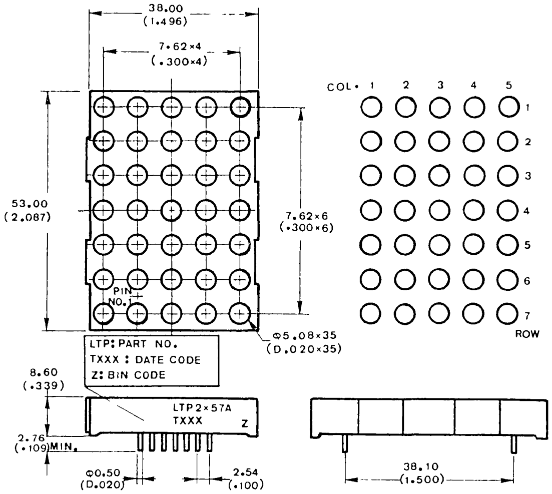
The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

DEVICES

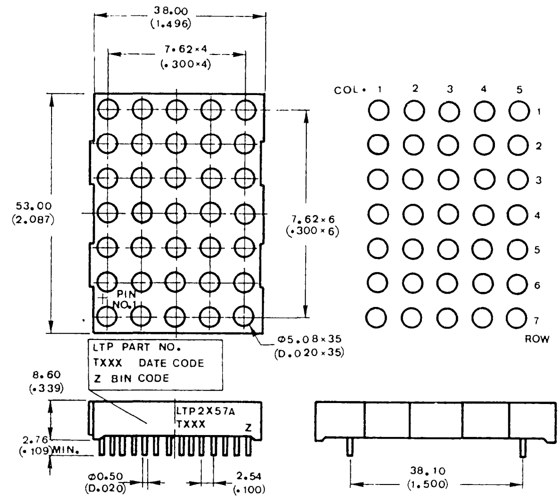
PART NO. LTP–					DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	YELLOW	ORANGE	HI.-EFF. RED	MULTI-COLOR			
2057AG	2057AY	2057AE	2057AHR	—	Anode Column, Cathode Row	A	A
2157AG	2157AY	2157AE	2157AHR	—	Cathode Column, Anode Row	A	B
—	—	—	—	2657AA	Anode Column, Cathode Row	B	C
—	—	—	—	2757AA	Cathode Column, Anode Row	B	D

PACKAGE DIMENSIONS

A. LTP-2057A/2157A



B. LTP-2657AA/2757AA



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

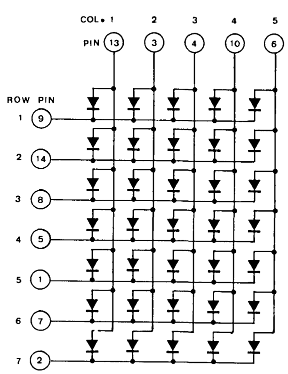
PIN NO.	CONNECTION	
	A. LTP-2057A	B. **LTP-2157A**
1	Cathode Row 5	Anode Row 5
2	Cathode Row 7	Anode Row 7
3	Anode Column 2	Cathode Column 2
4	Anode Column 3*1	Cathode Column 3*1
5	Cathode Row 4*2	Anode Row 4*2
6	Anode Column 5	Cathode Column 5
7	Cathode Row 6	Anode Row 6
8	Cathode Row 3	Anode Row 3
9	Cathode Row 1	Anode Row 1
10	Anode Column 4	Cathode Column 4
11	Anode Column 3*1	Cathode Column 3*1
12	Cathode Row 4*2	Anodr Row 4*2
13	Anode Column 1	Cathode Column 1
14	Cathode Row 2	Anode Row 2

NOTES: 1. Pin 4 & 11 are internally connected
2. Pin 5 & 12 are internally connected

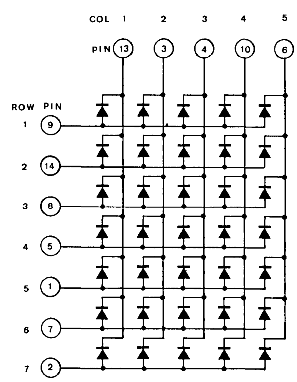
PIN NO.	CONNECTION	
	C. LTP-2657AA	D. LTP-2757AA
1	Anode Column 1 Green	Cathode Column 1 Green
2	Anode Column 1 Orange 1	Cathode Column 1 Orange
3	Cathode Row 7 Green	Anode Row 7 Green
4	Cathode Row 7 Orange	Anode Row 7 Orange
5	Anode Column 2 Green	Cathode Column 2 Green
6	Anode Column 2 Orange	Cathode Column 2 Orange
7	Anode Column 3 Green	Cathode Column 3 Green
8	Anode Colunn 3 Orange	Cathode Column 3 Orange
9	Cathode Row 5 Green	Anode Row 5 Green
10	Cathode Row 5 Orange	Anode Row 5 Orange
11	Cathode Row 4 Green	Anode Row 4 Green
12	Cathode Row 4 Orange	Anode Row 4 Orange
13	Cathode Row 6 Green	Anode Row 6 Green
14	Cathode Row 6 Orange	Anode Row 6 Orange
15	Anode Column 5 Green	Cathode Column 5 Green
16	Anode Column 5 Orange	Cathode Column 5 Orange
17	Cathode Row 1 Green	Anode Row 1 Green
18	Cathode Row 1 Orange	Anode Row 1 Orange
19	Anode Column 4 Green	Cathode Column 4 Green
20	Anode Column 4 Orange	Cathode Column 4 Orange
21	Anode Column 3 Green	Cathode Column 3 Green
22	Anode Column 3 Orange	Cathode Column 3 Orange
23	Cathode Row 3 Green	Anode Row 3 Green
24	Cathode Row 3 Orange	Anode Row 3 Orange
25	Cathode Row 4 Green	Anode Row 4 Green
26	Cathode Row 4 Orange	Anode Row 4 Orange
27	Cathode Row 2 Green	Anode Row 2 Green
28	Cathode Row 2 Orange	Anode Row 2 Orange

INTERNAL CIRCUIT DIAGRAM

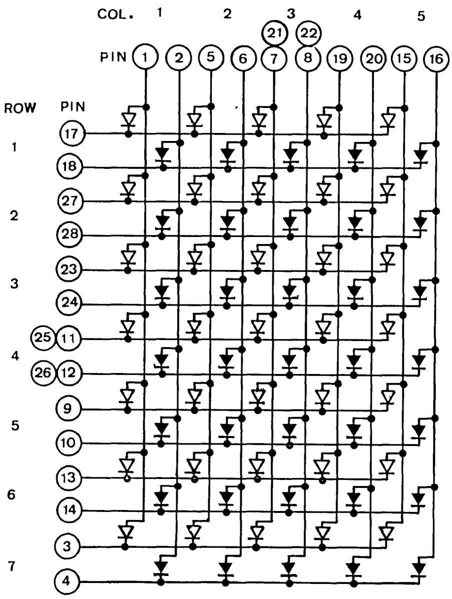
A. LTP-2057A



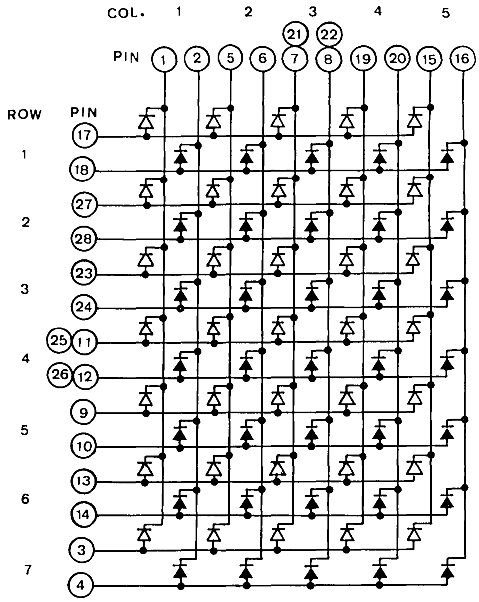
B. LTP-2157A



C. LTP-2657AA



D. LTP-2757AA



NOTES: 1. The sign "—▷|—" stands for GREEN color chips.
2. The sign "—▶|—" stands for ORANGE color chips.

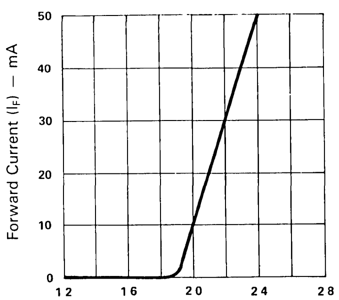
ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	GREEN	YELLOW	ORANGE	HI-EFF RED	UNIT
Power Dissipation Per Dot	75	60	75	75	mW
Peak Forward Current Per Dot (1/10 Duty Cycle, 0.1ms Pulse Width)	100	80	100	100	mA
Continuous Forward Current Per Dot	25	20	25	25	mA
Derating Linear From 25°C Per Dot	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Dot	5	5	5	5	V
Operating Temperature Range	−25°C to + 85°C				
Storage Temperature Range	−25°C to + 85°C				
Solder Temperature 1/16 inch Below Seating Plane for 3 Sec. at 260°C					

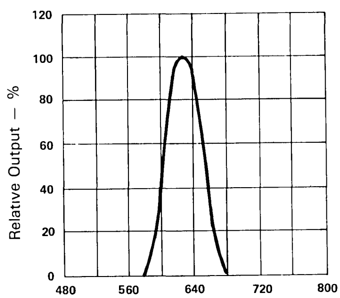
ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-2057AG/2157AG & LTP-2657AA/2757AA (GREEN)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1500	4000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

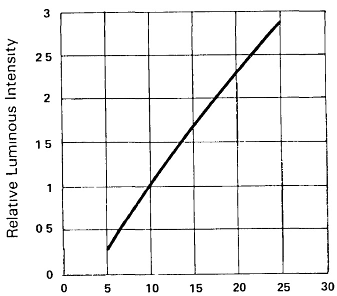
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



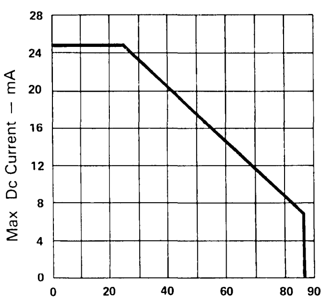
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



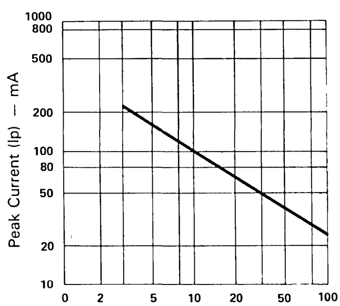
Wavelength (λ) — nm
Fig. 2 SPECTRAL RESPONSE



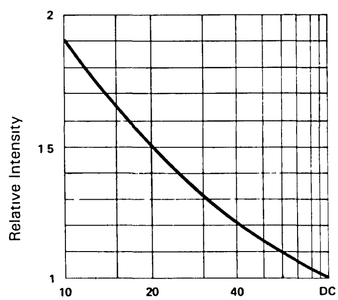
Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



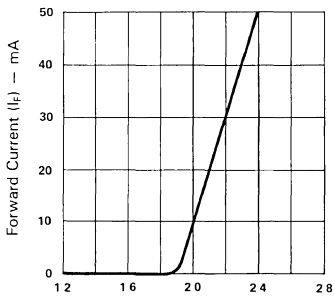
Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-2057AY/2157AY

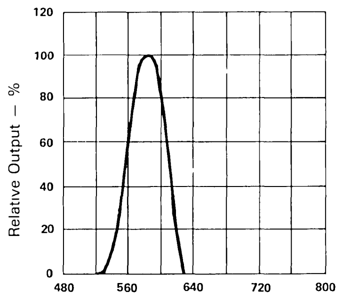
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	1200	4000		μcd	I_p = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		35		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

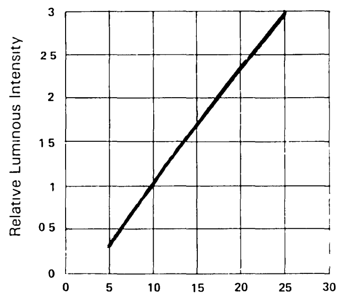
(25°C Ambient Temperature Unless Otherwise Noted)



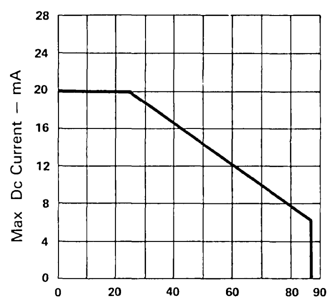
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



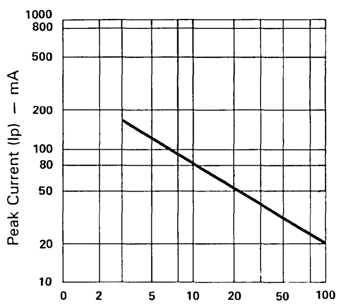
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



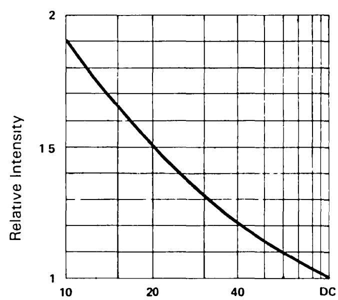
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



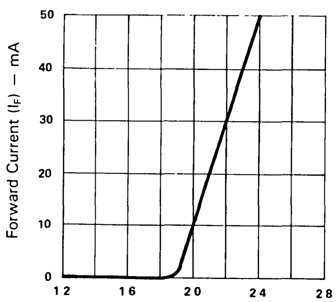
Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2057AE/2157AE & LTP-2657AA/2757AA (ORANGE)

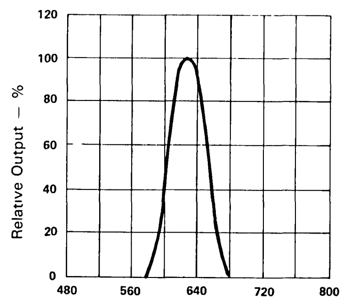
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1500	4000		µcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	µA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

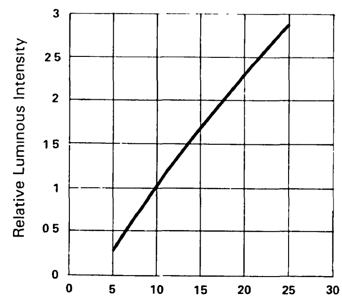
(25°C Ambient Temperature Unless Otherwise Noted)



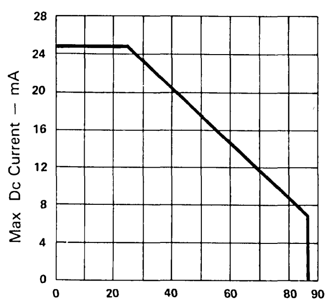
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



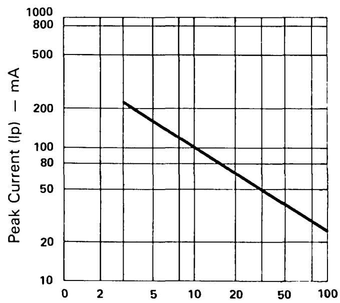
Wavelength (λ) — nm.
Fig 2 SPECTRAL RESPONSE



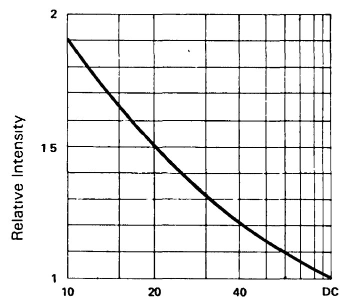
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2057AHR/2157AHR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	1500	4000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2·1		I = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

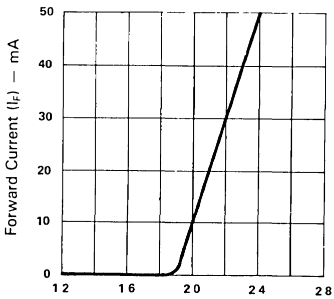


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

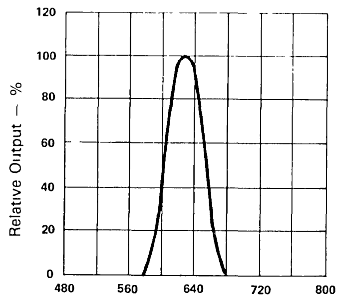


Fig 2 SPECTRAL RESPONSE

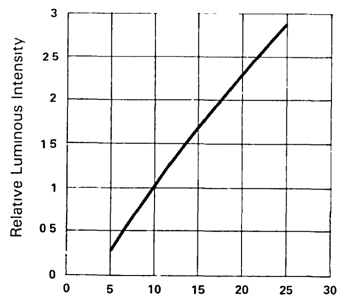


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

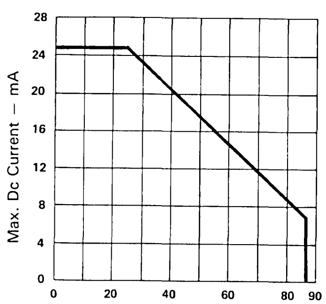


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

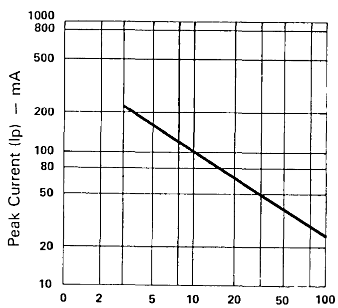


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

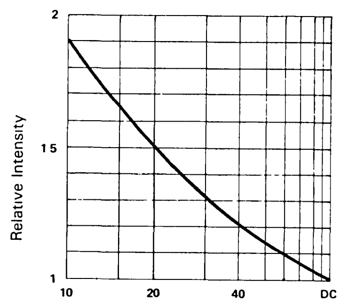


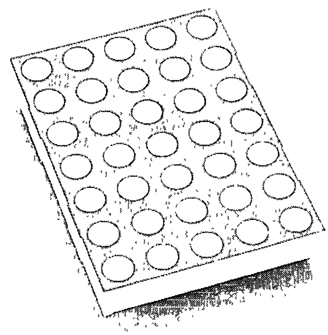
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LTP- 4057AX/4157AX 4257AA/4357AA SERIES

4" 5 x 7 SINGLE COLOR & MULTICOLOR DOT MATRIX DISPLAYS

FEATURES

- 4" INCH (101.6mm) MATRIX HEIGHT.
- LOW POWER REQUIREMENT.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- 5 x 7 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE VERTICALLY AND HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION – CATHODE ROW OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF FOUR BRIGHT COLORS-GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO-THREE BRIGHT COLORS: GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED).



DESCRIPTION

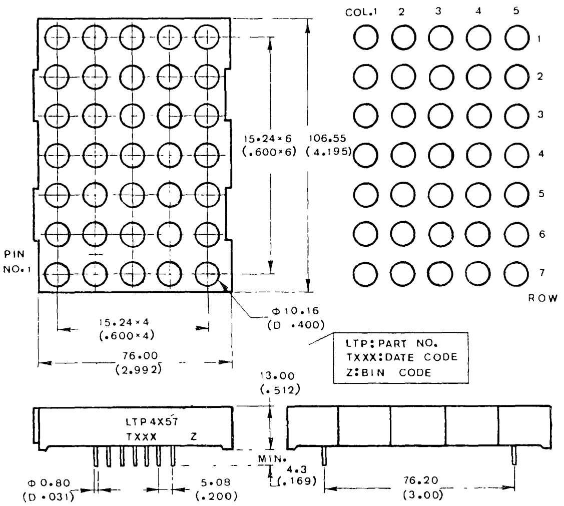
The LTP-4x57A series are 4.0 inch (101.6 mm) matrix height 5 x 7 dot matrix displays.
The LTP-4257AA/4357AA are multicolor applicable displays. The multicolor displays have gray face and white dot color.
The LTP-4057A/4157A series are single color displays. The green, yellow and orange displays have gray face and white dot color. The high efficiency red displays have red face and red dot color.
The green series devices utilize LED chips which are made from GaP on a transparent GaP substrate.
The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

DEVICES

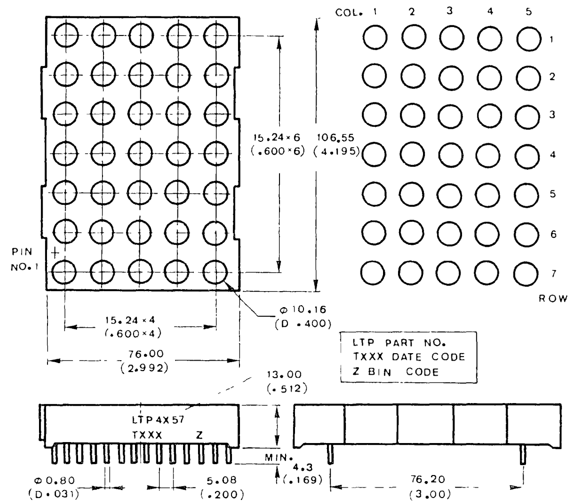
PART NO. LTP–					DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	YELLOW	ORANGE	HI.-EFF. RED	MULTI-COLOR			
4057AG	4057AY	4057AE	4057AHR	—	Anode Column, Cathode Row	A	A
4157AG	4157AY	4157AE	4157AHR	—	Cathode Column, Anode Row	A	B
—	—	—	—	4257AA	Anode Column, Cathode Row	B	C
—	—	—	—	4357AA	Cathode Column, Anode Row	B	D

PACKAGE DIMENSIONS

A. LTP-4057A/4157A



B. LTP-4257AA/4357AA



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $\frac{+1.00}{-0.000}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$
2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

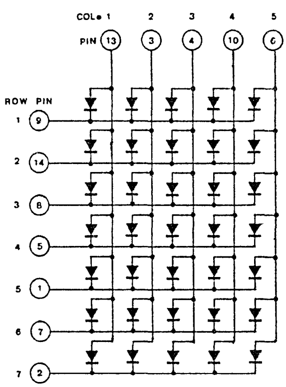
PIN NO.	CONNECTION	
	A. LTP-4057A	B. LTP-4157A
1	Cathode Row 5	Anode Row 5
2	Cathode Row 7	Anode Row 7
3	Anode Column 2	Cathode Column 2
4	Anode Column 3	Cathode Column 3
5	Cathode Row 4	Anode Row 4
6	Anode Column 5	Cathode Column 5
7	Cathode Row 6	Anode Row 6
8	Cathode Row 3	Anode Row 3
9	Cathode Row 1	Anode Row 1
10	Anode Column 4	Cathode Column 4
11	Anode Column 3	Cathode Column 3
12	Cathode Row 4	Anodr Row 4
13	Anode Column 1	Cathode Column 1
14	Cathode Row 2	Anode Row 2

DOT MATRIX DISPLAYS

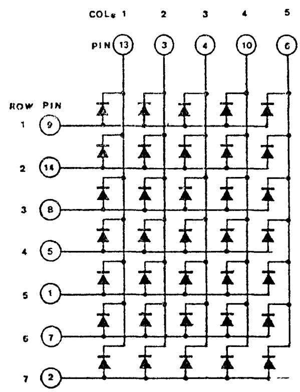
PIN NO.	CONNECTION	
	C. LTP-4257AA	D. LTP-4357AA
1	Anode Column 1 Green	Cathode Column 1 Green
2	Anode Column 1 Orange	Cathode Column 1 Orange
3	Cathode Row 7 Green	Anode Row 7 Green
4	Cathode Row 7 Orange	Anode Row 7 Orange
5	Anode Column 2 Green	Cathode Column 2 Green
6	Anode Column 2 Orange	Cathode Column 2 Orange
7	Anode Column 3 Green	Cathode Column 3 Green
8	Anode Colunn 3 Orange	Cathode Column 3 Orange
9	Cathode Row 5 Green	Anode Row 5 Green
10	Cathode Row 5 Orange	Anode Row 5 Orange
11	Cathode Row 4 Green	Anode Row 4 Green
12	Cathode Row 4 Orange	Anode Row 4 Orange
13	Cathode Row 6 Green	Anode Row 6 Green
14	Cathode Row 6 Orange	Anode Row 6 Orange
15	Anode Column 5 Green	Cathode Column 5 Green
16	Anode Column 5 Orange	Cathode Column 5 Orange
17	Cathode Row 1 Green	Anode Row 1 Green
18	Cathode Row 1 Orange	Anode Row 1 Orange
19	Anode Column 4 Green	Cathode Column 4 Green
20	Anode Column 4 Orange	Cathode Column 4 Orange
21	Anode Column 3 Green	Cathode Column 3 Green
22	Anode Column 3 Orange	Cathode Column 3 Orange
23	Cathode Row 3 Green	Anode Row 3 Green
24	Cathode Row 3 Orange	Anode Row 3 Orange
25	Cathode Row 4 Green	Anode Row 4 Green
26	Cathode Row 4 Orange	Anode Row 4 Orange
27	Cathode Row 2 Green	Anode Row 2 Green
28	Cathode Row 2 Orange	Anode Row 2 Orange

INTERNAL CIRCUIT DIAGRAM

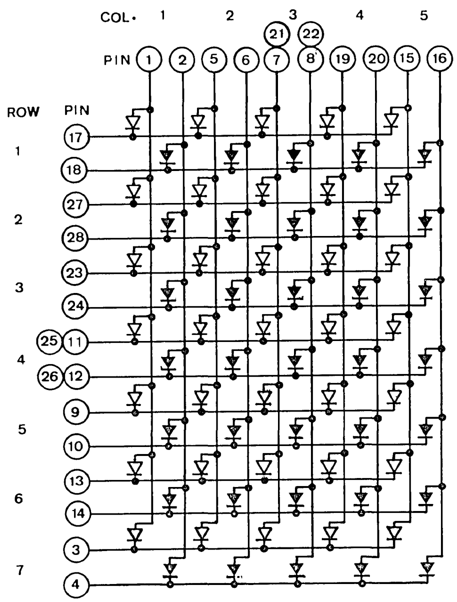
A. LTP-4057A



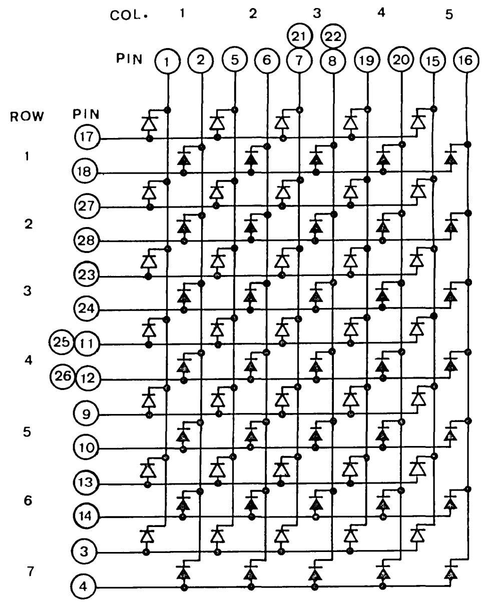
B. LTP-4157A



C. LTP-4257AA



D. LTP-4357AA



NOTE: The Sign " —▶|— " stands for ORANGE color 2 chips series
The Sign " —▷|— " stands for GREEN color 2 chips series

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

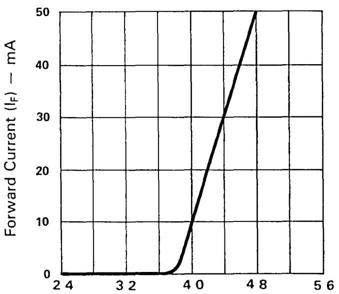
PARAMETER	GREEN	YELLOW	ORANGE	HI-EFF RED	UNIT
Power Dissipation Per Dot	120	100	120	120	mW
Peak Forward Current Per Dot (1/10 Duty Cycle, 0 1mS Pulse Width)	80	60	80	80	mA
Continuous Forward Current Per Dot	20	16	20	20	mA
Derating Linear From 25°C Per Dot	0.24	0.2	0 24	0 24	mA/°C
Reverse Voltage Per Dot	10	10	10	10	V
Operating Temperature Range		–25°C to + 85°C			
Storage Temperature Range		–25°C to + 85°C			
Solder Temperature 1/16 inch Below Seating Plane for 3 Sec. at 260°C					

DOT MATRIX DISPLAYS

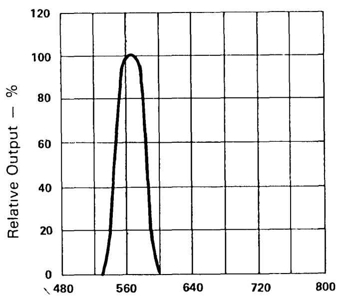
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-4057AG/4157AG & 4257AA/4357AA (GREEN)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST COND
Average Luminous Intensity	Iv	3000	8000		µcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		4.2	5.6	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	µA	V_R = 10V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

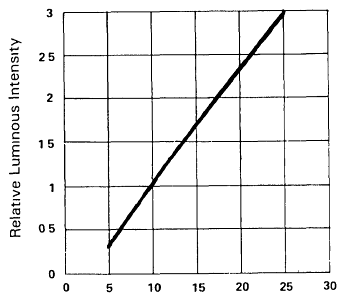
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° Ambient Temperature Unless Otherwise Noted)



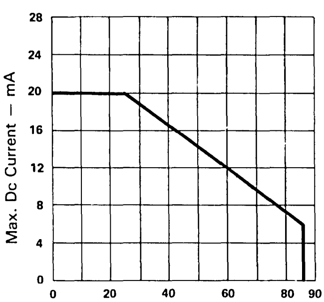
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



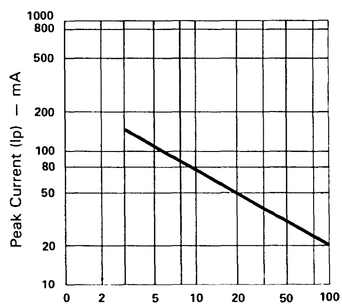
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



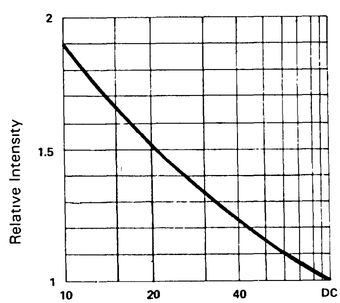
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE.% (REFRESH RATE – F = 1 KHz)

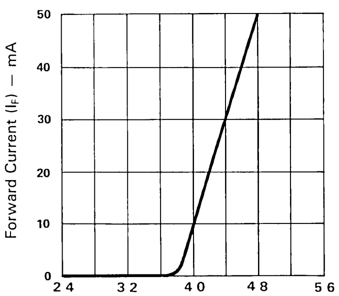


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

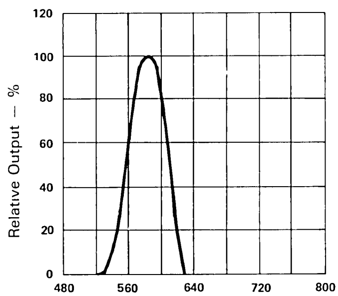
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-4057AY/4157AY

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST COND
Average Luminous Intensity	Iv	2000	8000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		4.2	5.6	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 10V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

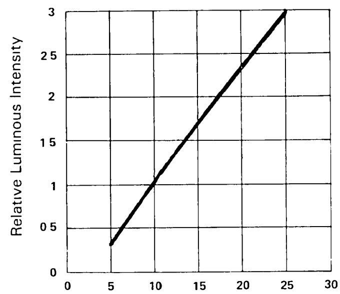
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

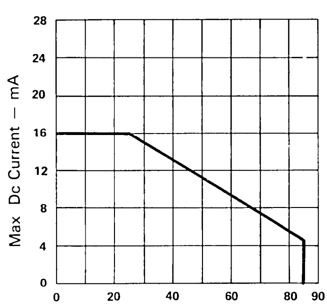


Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE

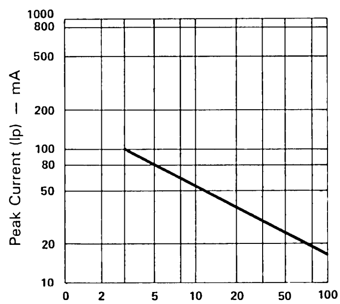


Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

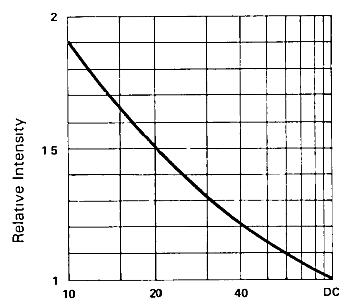
DOT MATRIX DISPLAYS



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-4057AE/4157AE & 4257AA/4357AA (ORANGE)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST COND
Average Luminous Intensity	Iv	3000	8000		µcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		4.2	5.6	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	µA	V_R = 10V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

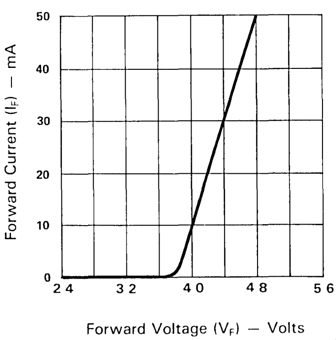


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

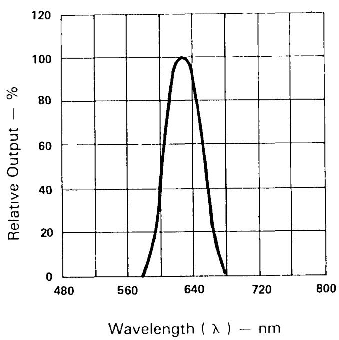


Fig 2 SPECTRAL RESPONSE

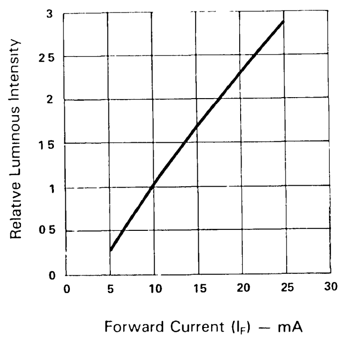


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

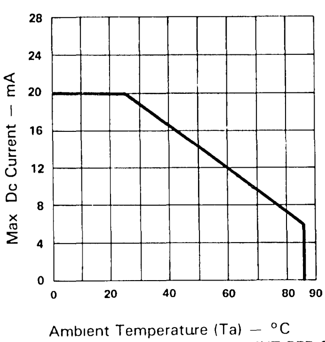


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

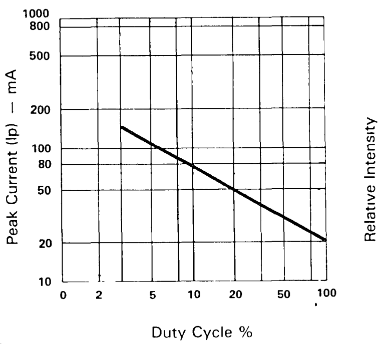


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

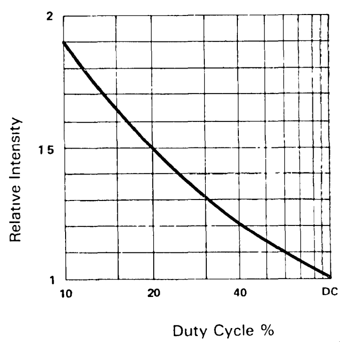


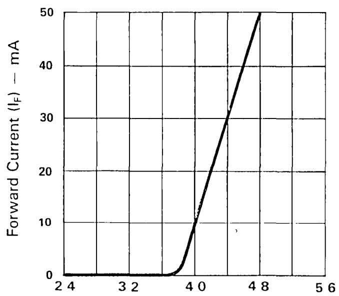
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-4057AHR/4157AHR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST COND
Average Luminous Intensity	Iv	3000	8000		µcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		4.2	5.6	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	µA	V_R = 10V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

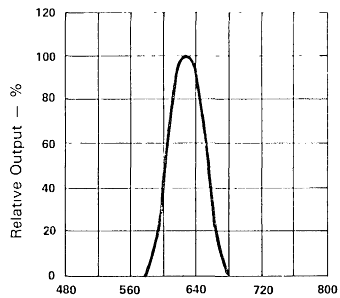
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)



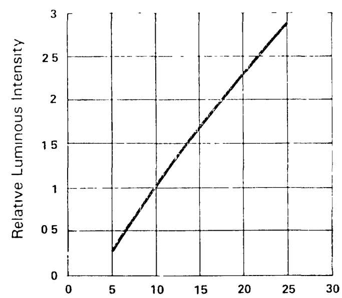
Forward Voltage (V_F) — Volts

Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



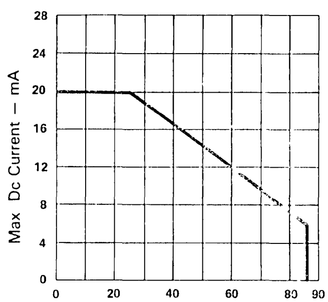
Wavelength (λ) — nm

Fig 2 SPECTRAL RESPONSE



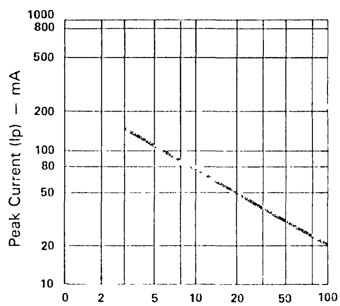
Forward Current (I_F) — mA

Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



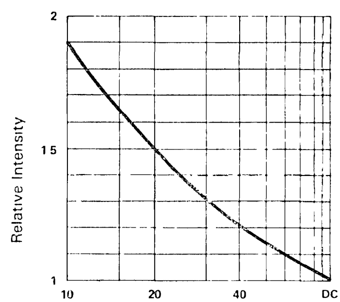
Ambient Temperature (Ta) — °C

Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

DOT MATRIX DISPLAYS

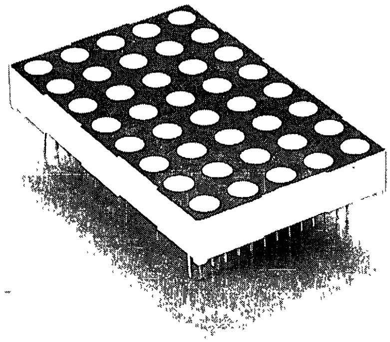
LITEON

LTP- 2058A/2158A 2458AA/2558AA SERIES

2.3" 5 x 8 SINGLE COLOR & MULTICOLOR DOT MATRIX DISPLAYS

FEATURES

- 2.3" INCH (58.42mm) MATRIX HEIGHT.
- LOW POWER REQUIREMENT.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- 5 x 7 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE VERTICALLY AND HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION CATHODE ROW OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF FOUR BRIGHT COLORS-GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS: GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED)



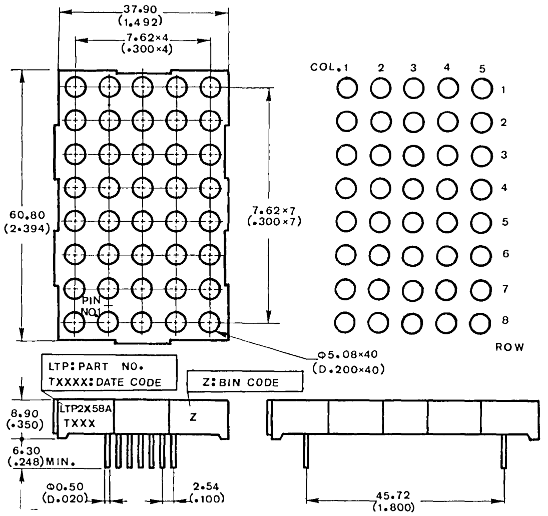
DESCRIPTION

The LTP-2 x 58A series are 2.3 inch (30.48mm) matrix-height 5 x 7 dot matrix displays.
The LTP-2458AA/2558AA are multicolor applicable displays. The multicolor displays have gray face and white dot color.
The LTP-2058A / 2158A series are single color displays. The green, yellow and orange displays have gray face and white dot color. The high efficiency red displays have red face and red dot color.
The green series devices utilize LED chips which are mad e from GaP on a transparent GaP substrate.
The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

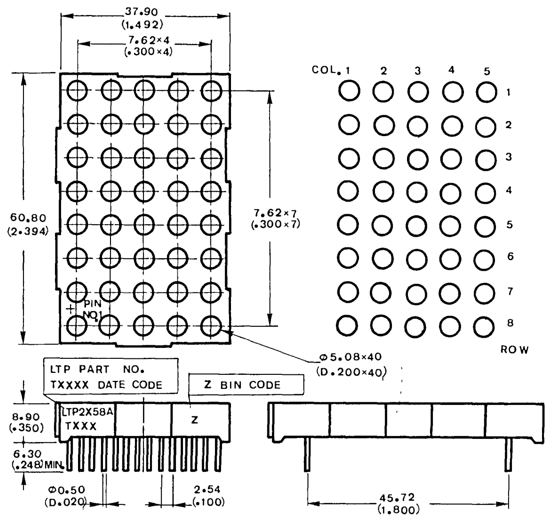
PART NO. LTP–					DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	YELLOW	ORANGE	HI.-EFF. RED	MULTI-COLOR			
2058AG	2058AY	2058AE	2058AHR	–	Anode Column, Cathode Row	A	A
2158AG	2158AY	2158AE	2158AHR	–	Cathode Column, Anode Row	A	B
–	–	–	–	2458AA	Anode Column, Cathode Row	B	C
–	–	–	–	2558AA	Cathode Column, Anode Row	B	D

PACKAGE DIMENSIONS

A. LTP-2058A/2158A



B. LTP-2458AA/2558AA



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $^{+1.00}_{-0.00}$ mm $\left(^{+0.040''}_{-0.000''}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

PIN CONNECTION

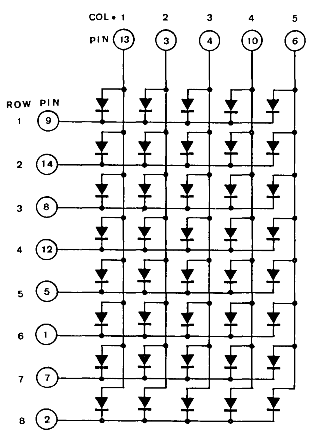
PIN NO.	CONNECTION	
	A. LTP-2058A	B. LTP-2158A
1	Cathode Row 6	Anode Row 6
2	Cathode Row 8	Anode Row 8
3	Anode Column 2	Cathode Column 2
4	Anode Column 3*1	Cathode Column 3*1
5	Cathode Row 5	Anode Row 5
6	Anode Column 5	Cathode Column 5
7	Cathode Row 7	Anode Row 7
8	Cathode Row 3	Anode Row 3
9	Cathode Row 1	Anode Row 1
10	Anode Column 4	Cathode Column 4
11	Anode Column 3*1	Cathode Column 3*1
12	Cathode Row 4	Anodr Row 4
13	Anode Column 1	Cathode Column 1
14	Cathode Row 2	Anode Row 2

NOTE: 1. Pin 4 & 11 are internally connected.

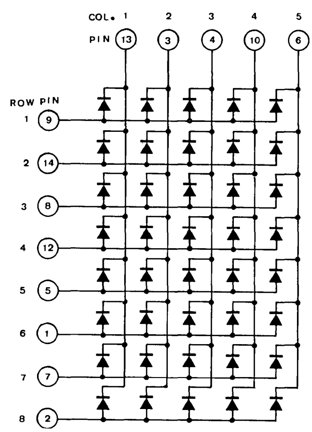
PIN NO.	CONNECTION	
	C. LTP-2458AA	D. LTP-2558AA
1	Cathode Row 6 Green	Anode Row 6 Green
2	Cathode Row 6 Orange	Anode Row 6 Orange
3	Cathode Row 8 Green	Anode Row 8 Green
4	Cathode Row 8 Orange	Anode Row 8 Orange
5	Anode Col. 2 Green	Cathode Col. 2 Green
6	Anode Col. 2 Orange	Cathode Col. 2 Orange
7	Anode Col. 3 Green	Cathode Col. 3 Green
8	Anode Col. 3 Orangw	Cathode Col. 3 Orange
9	Cathode Row 5 Green	Anode Row 5 Green
10	Cathode Row 5 Orange	Anode Row 5 Orange
11	Anode Col. 5 Green	Cathode Col. 5 Green
12	Anode Col. 5 Orange	Cathode Col. 5 Orange
13	Cathode Row 7 Green	Anode Row 7 Green
14	Cathode Row 7 Orange	Anode Row 7 Orange
15	Cathode Row 3 Green	Anode Row 3 Green
16	Cathode Row 3 Orange	Anode Row 3 Orange
17	Cathode Row 1 Green	Anode Row 1 Green
18	Cathode Row 1 Orange	Anode Row 1 Orange
19	Anode Col. 4 Green	Cathode Col. 4 Green
20	Anode Col. 4 Orange	Cathode Col. 4 Orange
21	Anode Col. 3 Green	Cathode Col. 3 Green
22	Anode Col. 3 Orange	Cathode Col. 3 Orange
23	Cathode Row 4 Green	Anode Row 4 Green
24	Cathode Row 4 Orange	Anode Row 4 Orange
25	Anode Col. 1 Green	Cathode Col. 1 Green
26	Anode Col. 1 Orange	Cathode Col. 1 Orange
27	Cathode Row 2 Green	Anode Row 2 Green
28	Cathode Row 2 Orange	Anode Row 2 Orange

INTERNAL CIRCUIT DIAGRAM

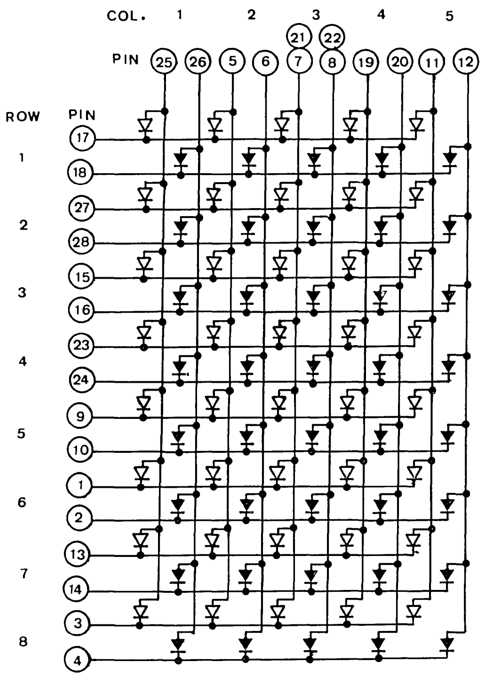
A. LTP-2058A



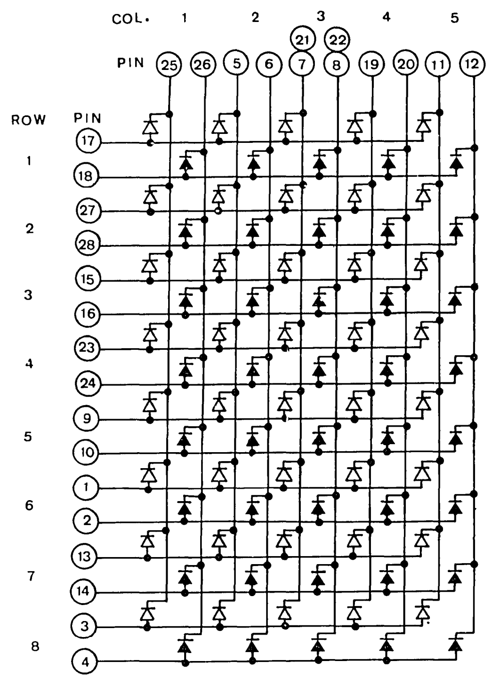
B. LTP-2158A



C. LTP-2458AA



D. LTP-2558AA



NOTES: 1. The sign " —▶|— " stands for ORANGE color chip.
2. The sign " —▷|— " stands for GREEN color chip.

ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	GREEN	YELLOW	ORANGE	HI-EFF RED	UNIT
Power Dissipation Per Dot	75	60	75	75	mW
Peak Forward Current Per Dot (1/10 Duty Cycle, 0.1ms Pulse Width)	100	80	100	100	mA
Continuous Forward Current Per Dot	25	20	25	25	mA
Derating Linear From 25°C Per Dot	0.3	0.24	0.3	0.3	mA/°C
Reverse Voltage Per Dot	5	5	5	5	V
Operating Temperature Range	−25°C to + 85°C				
Storage Temperature Range	−25°C to + 85°C				
Solder Temperature 1/16 inch Below Seating Plane for 3 Sec. at 260°C					

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2058AG/2158AG & LTP-2458AA/2558AA (GREEN)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1500	4000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		30		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

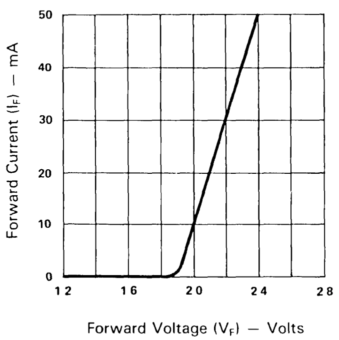


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

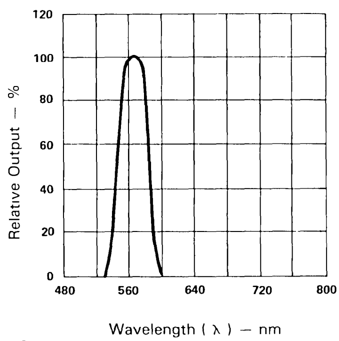


Fig 2 SPECTRAL RESPONSE

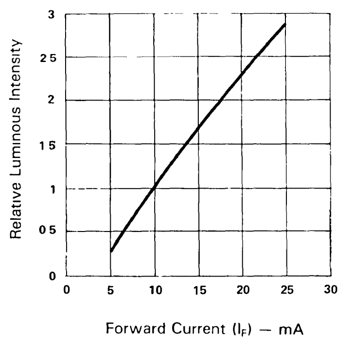


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

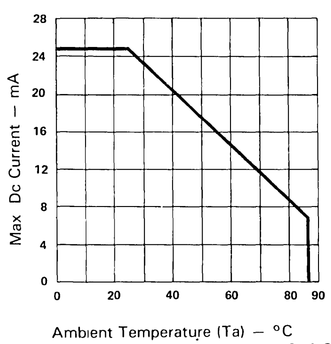


Fig 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

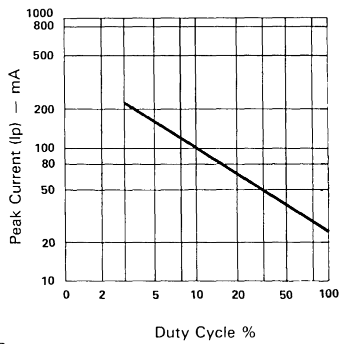


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

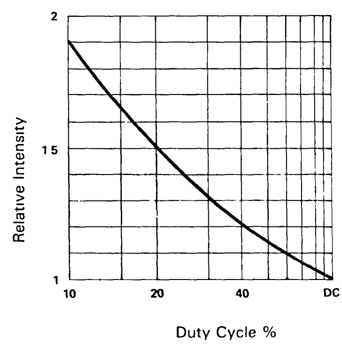


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2058AY/2158AY

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1200	4000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

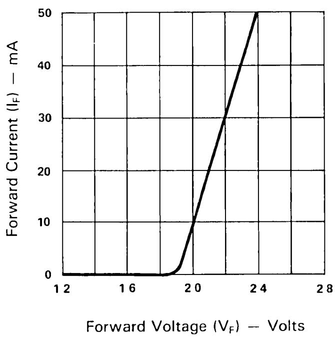


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

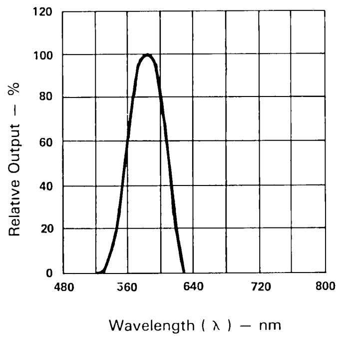


Fig 2 SPECTRAL RESPONSE

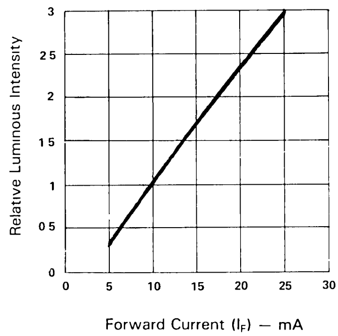


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

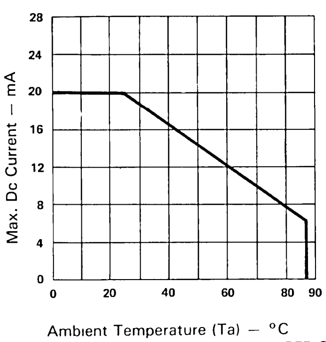


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

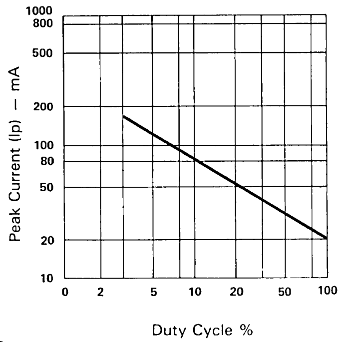


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

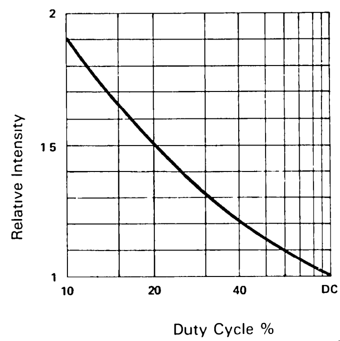
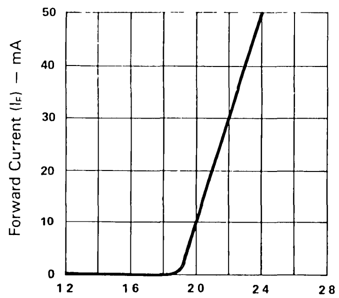


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

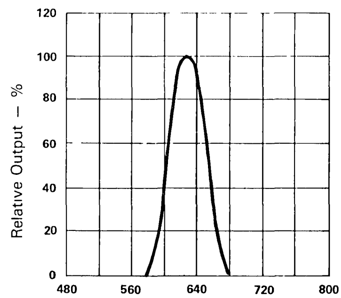
ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTP-2058AE/2158AE & LTP-2458AA/2558AA (ORANGE)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	1500	4000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λ_p		630		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

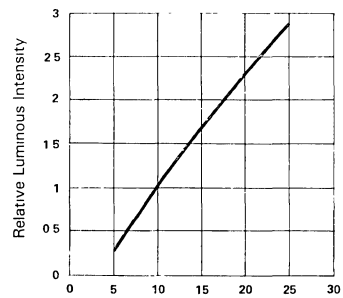
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



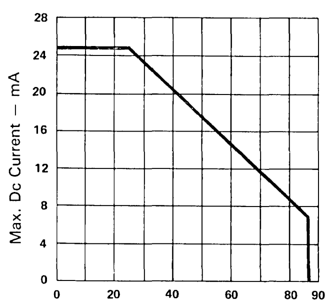
Forward Voltage (VF) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



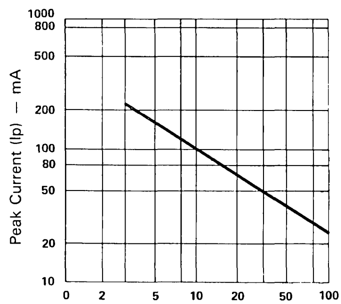
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



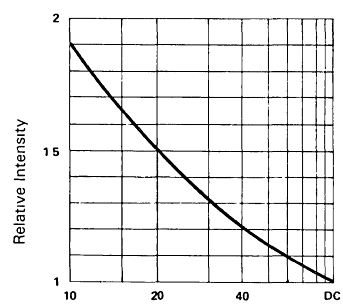
Forward Current (IF) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

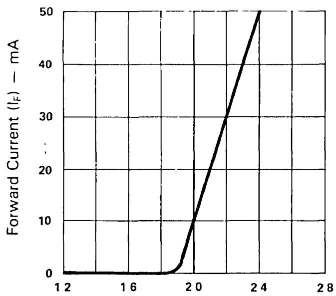


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

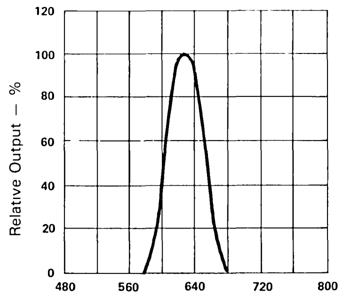
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2058AHR/2158AHR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1500	4000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Dot	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Dot	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

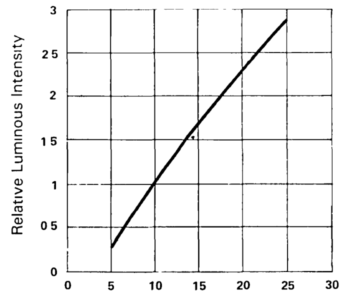
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



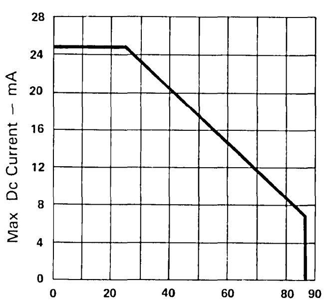
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



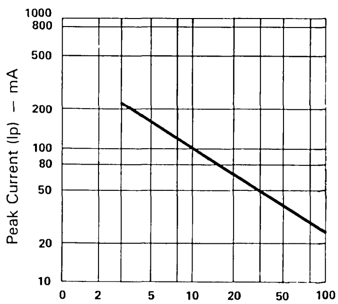
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



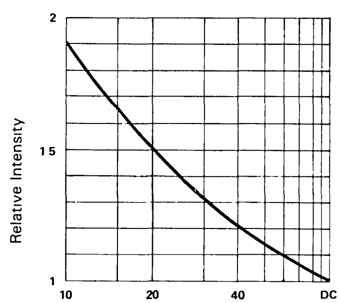
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

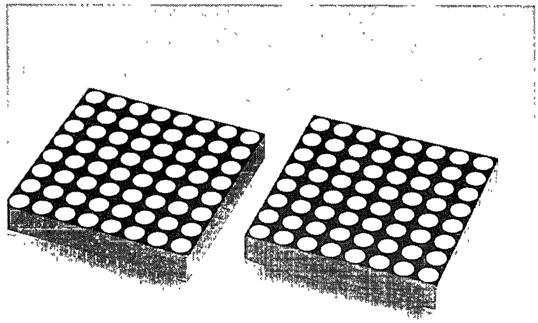
DOT MATRIX DISPLAYS

LTP-18088X / 18188A SERIES

1.85" 8 x 8 SINGLE COLOR & MULTICOLOR DOT MATRIX DISPLAYS

FEATURES

- 1.85INCH (47.0 mm) MATRIX HEIGHT.
- LOW POWER REQUIREMENT.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- 8 x 8 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE VERTICALLY AND HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION CATHODE ROW OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF BRIGHT COLORS-GREEN/ORANGE/.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS: GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED)



DESCRIPTION

The LTP-18x88 series are 1.85 inch (47.0 mm) matrix-height 8x8 dot matrix displays.
The LTP-18188A are multicolor applicable displays. The multicolor displays have black face and white dot color.
The LTP-18088 series are single color displays. The green, and orange displays have black face and white dot color.
The green series devices utilize LED chips which are made from GaP on a transparent GaP substrate.
The orange series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

DEVICES

PART NO. LTP–			DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	ORANGE	MULTI-COLOR			
LTP-18088G	18088E	–	Anode Column, Cathode Row	A	A
–	–	18188A	Anode Column, Cathode Row	B	B

PIN CONNECTION

PIN NO.	CONNECTION	
	A: LTP-18088	B: LTP-18188A
1	Cathode Row 2	Cathode Row 2
2	Anode Column 2	Anode Column 2 Green
3	No Pin	Anode Column 2 Orange
4	Cathode Row 4	Cathode Row 4
5	Anode Column 4	Anode Column 4 Green
6	No Pin	Anode Column 4 Orange
7	Cathode Row 6	Cathode Row 6
8	Anode Column 6	Anode Column 6 Green
9	No Pin	Anode Column 6 Orange
10	Cathode Row 8	Cathode Row 8
11	Anode Column 8	Anode Column 8 Green
12	No Pin	Anode Column 8 Orange
13	Cathode Row 7	Cathode Row 7
14	Anode Column 7	Anode Column 7 Green
15	No Pin	Anode Column 7 Orange
16	Cathode Row 5	Cathode Row 5
17	Anode Column 5	Anode Column 5 Green
18	No Pin	Anode Column 5 Orange
19	Cathode Row 3	Cathode Row 3
20	Anode Column 3	Anode Column 3 Green
21	No Pin	Anode Column 3 Orange
22	Cathode Row 1	Cathode Row 1
23	Anode Column 1	Anode Column 1 Green
24	No Pin	Anode Column 1 Orange

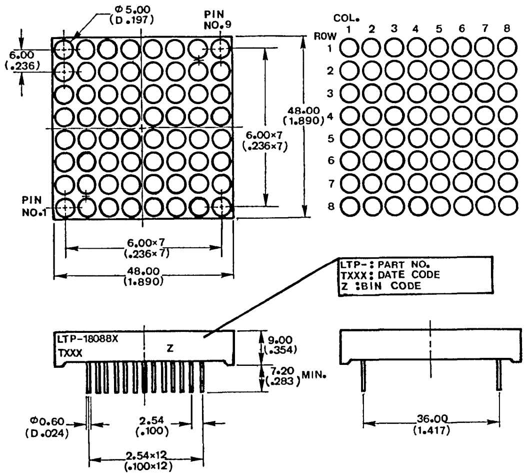
DOT MATRIX DISPLAYS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

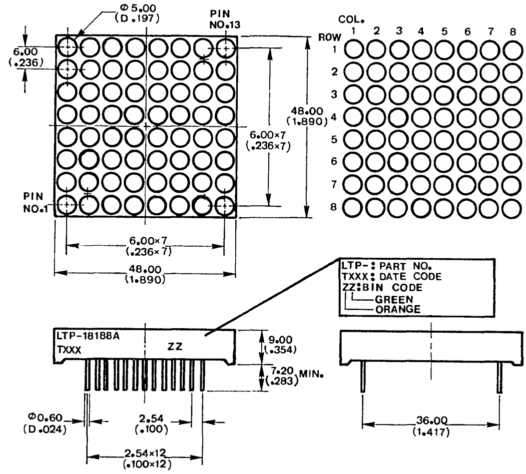
PARAMETER	GREEN	ORANGE	UNIT
Power Dissipation Per Dot	75	75	mW
Peak Forward Current Per Dot (1/16 Duty Cycle, 0.1ms Pulse Width)	100	100	mA
Continuous Forward Current Per Dot	25	25	mA
Derating Linear From 25°C Per Dot	0 3	0.3	mA/°C
Reverse Voltage Per Dot	5	5	V
Operating Temperature Range	–25°C to + 85°C		
Storage Temperature Range	–25°C to + 85°C		
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C			

PACKAGE DIMECTIONS

A. LTP-18088



B. LTP-18188A



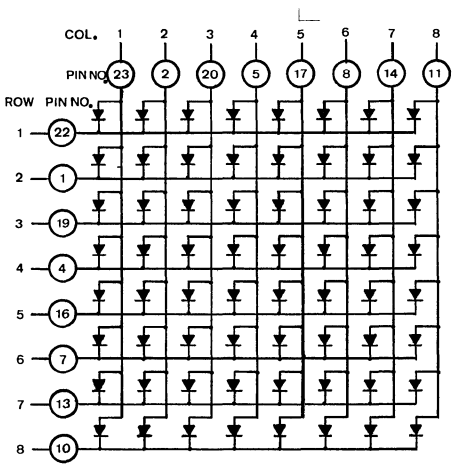
NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $\dfrac{\frac{+1.00}{-0.000}\text{ mm}}{\left(\frac{+0.040''}{-0.000''}\right)}$

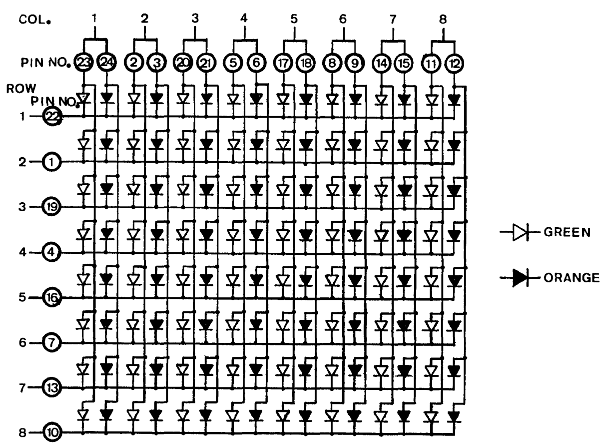
2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise otherwise noted.

INTERNAL CIRCUIT DIAGRAM

A. LTP-18088



B. LTP-18188A



ELECTRICAL/OPTICAL CHARACTERISTICS AT TA = 25°C
LTP-18088E/18188A (DRANGE)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1000	3500		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		630		nm	I = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I = 20 mA
Forward Voltage any Dot	V		2.1	2.8	V	I = 20 mA
Reverse Current any Dot	I			100	μA	V = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I = 20 mA

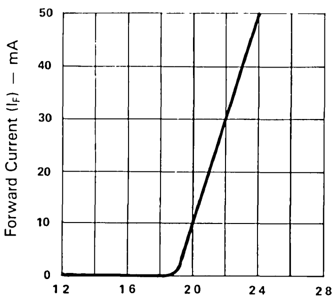


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

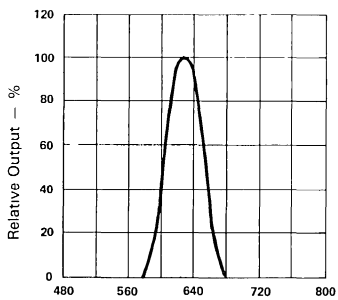


Fig 2 SPECTRAL RESPONSE

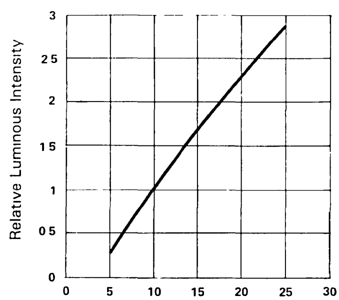


Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

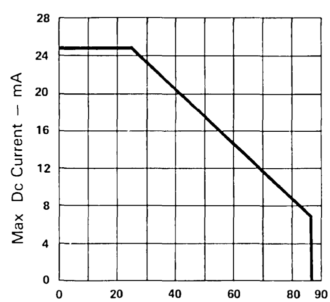


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

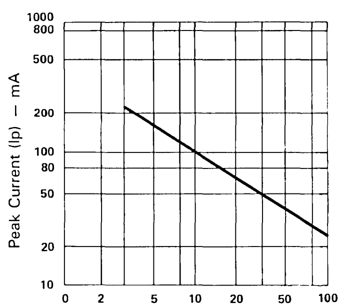


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

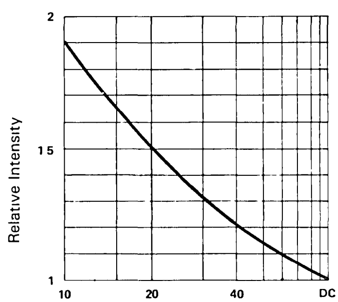


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-18088G/18188A (GREEN)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1000	3500		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I = 20 mA
Forward Voltage any Dot	V		2.1	2.8	V	I = 20 mA
Reverse Current any Dot	I			100	μA	V = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I = 20 mA

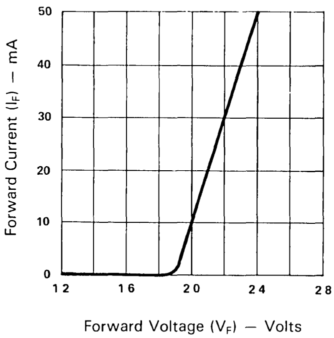


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

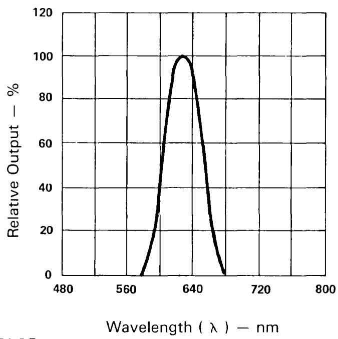


Fig 2 SPECTRAL RESPONSE

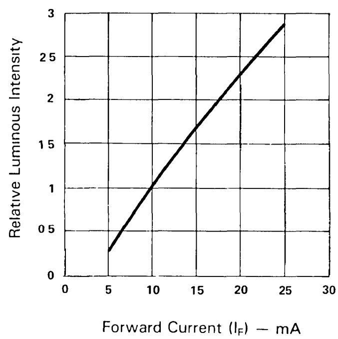


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

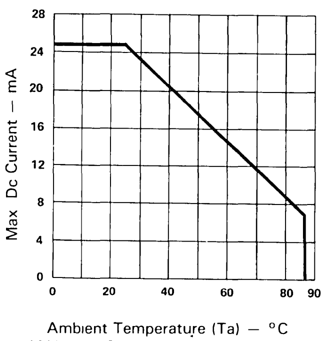


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

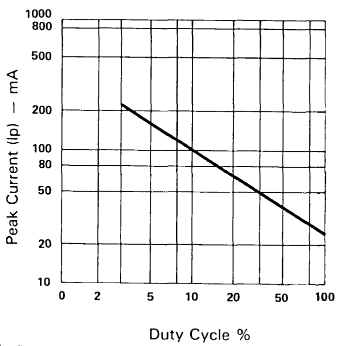


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

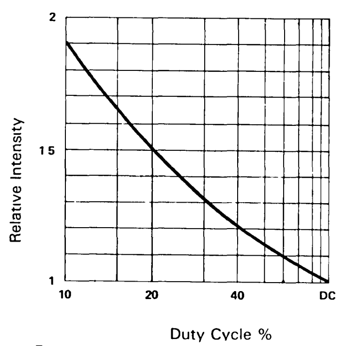
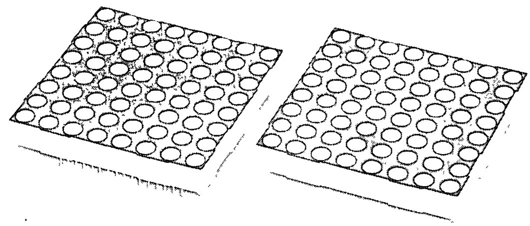


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LTP- 2088A / 2188AA SERIES

2.3" 8 x 8 SINGLE COLOR & MULTICOLOR DOT MATRIX DISPLAYS



FEATURES

- 2.3'' INCH (58.42mm) MATRIX HEIGHT.
- LOW POWER REQUIREMENT.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- 8 x 8 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE VERTICALLY AND HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION CATHODE ROW OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF FOUR BRIGHT COLORS-GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS: GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED)

DESCRIPTION

The LTP-2x88A series are 1.2 inch (30.48mm) matrix-height 5 x 7 dot matrix displays.
The LTP-2188AA are multicolor applicable displays. The multicolor displays have gray face and white dot color.
The LTP-2088A series are single color displays. The green, yellow and orange displays have gray face and white dot color. The high efficiency red displays have red face and red dot color.
The green series devices utilize LED chips which are made from GaP on a transparent GaP substrate.
The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

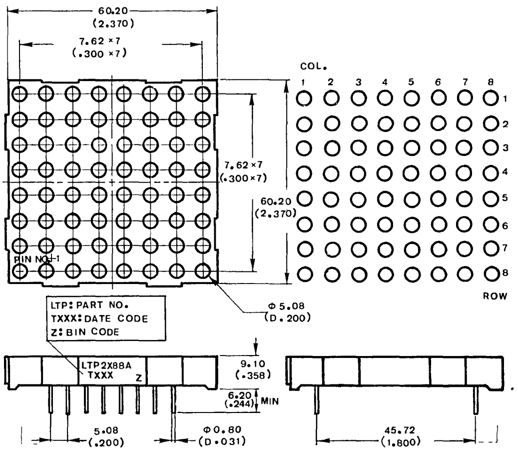
DEVICES

PART NO. LTP–					DESCRIPTION	PACKAGE DIMENSION	INTERNAL CIRCUIT DIAGRAM
GREEN	YELLOW	ORANGE	HI.-EFF. RED	MULTI-COLOR			
2088AG	2088AY	2088AE	2088AHR	—	Anode Column, Cathode Row	A	A
—	—	—	—	2188AA	Anode Column, Cathode Row	B	B

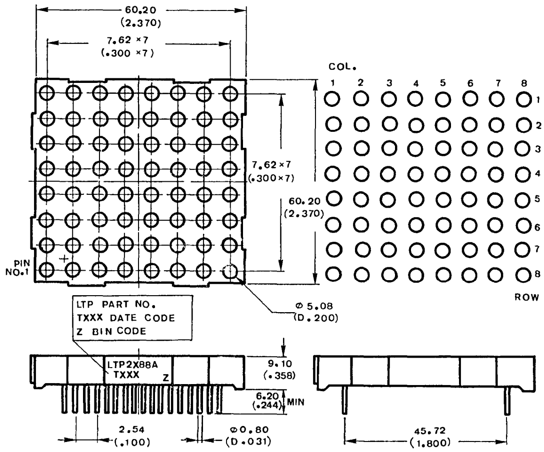
DOT MATRIX DISPLAYS

PACKAGE DIMENSIONS

A. LTP-2088A



B. LTP-2188AA

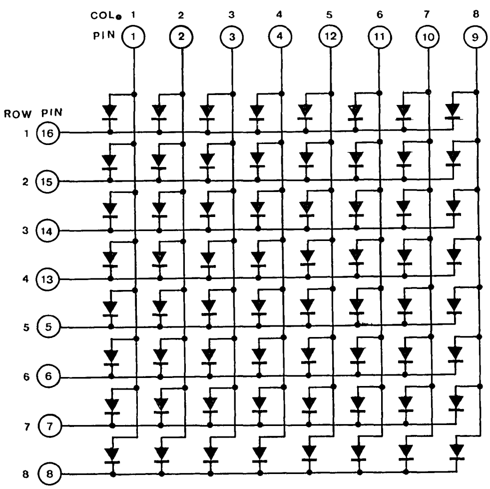


NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

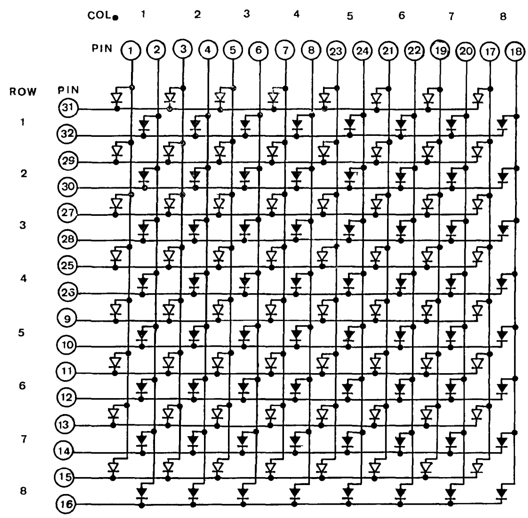
1. Lead length (from seating plane): minimum value $\frac{\substack{+1.00\\-0.000}\ \text{mm}}{\left(\substack{+0.040''\\-0.000''}\right)}$ 2. $\frac{\pm 0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

INTERNAL CIRCUIT DIAGRAM

A. LTP-2088A



B. LTP-2188AA



NOTES: 1. The Sign " –▷|– " stands for GREEN color dice.
2. The Sign " –▶|– " stands for ORANGE color dice.

PIN CONNECTION

PIN NO.	CONNECTION	
	A. LTP-2088A	B. LTP-2188AA
1	Anode Col 1	A , Col., 1, Green
2	Anode Col 2	A., Col. 1, Orange
3	Anode Col 3	A , Col. 2, Green
4	Anode Col. 4	A., Col. 2, Orange
5	Cathode Row 5	A., Col. 3, Green
6	Cathode Row 6	A , Col. 3. Orange
7	Cathode Row 7	A , Col. 4, Green
8	Cathode Row 8	A , Col 4. Orange
9	Anode Col. 8	C., Row 5, Green
10	Anode Col. 7	C., Row 5, Orange
11	Anode Col. 6	C., Row 6. Green
12	Anode Col. 5	C., Row 6, Orange
13	Cathode Row 4	C., Row 7, Green
14	Cathode Row 3	C., Row 7, Orange
15	Cathode Row 2	C., Row 8, Green
16	Cathode Row 1	C., Row 8, Orange
17		A., Col. 8, Green
18		A., Col. 8, Orange
19		A., Col. 7, Green
20		A., Col. 6, Green
21		A., Col. 6, Green
22		A., Col. 6, Orange
23		A., Col. 5, Green
24		A , Col. 5, Orange
25		C., Row 4, Green
26		C., Row 4, Orange
27		C., Row 3, Green
28		C., Row 3, Orange
29		C., Row 2, Green
30		C., Row 2, Orange
31		C., Row 1, Green
32		C., Row 1, Orange

DOT MATRIX DISPLAYS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

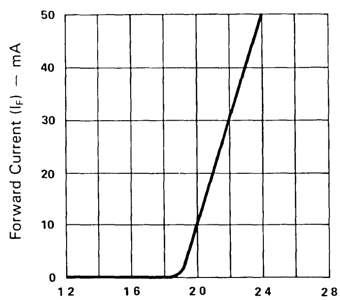
PARAMETER	GREEN	YELLOW	ORANGE	HI-EFF RED	UNIT
Power Dissipation Per Segment	75	60	75	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1mS Pulse Width)	100	80	100	100	mA
Continuous Forward Current Per Segment	25	20	25	25	mA
Derating Linear From 25°C Per Segment	0.3	0 24	0.3	0.3	mA/°C
Reverse Voltage Per Segment	5	5	5	5	V
Operating Temperature Range	−25°C to + 85°C				
Storage Temperature Range	−25°C to + 85°C				
Solder Temperature 1/16 inch Below Seating Plane for 3 Sec. at 260°C					

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2088AG/2188AA (GREEN)

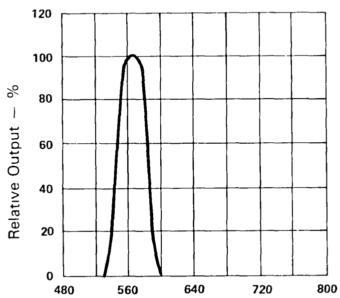
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1500	4000		μcd	Ip = 48 mA 1/8 DUTY
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

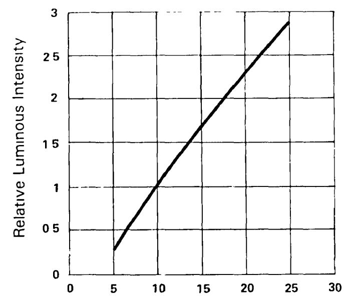
(25° C Ambient Temperature Unless Otherwise Noted)



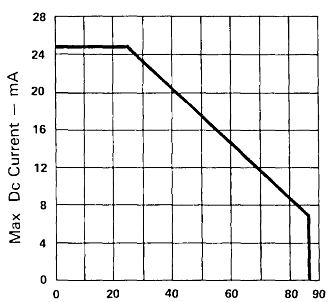
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE



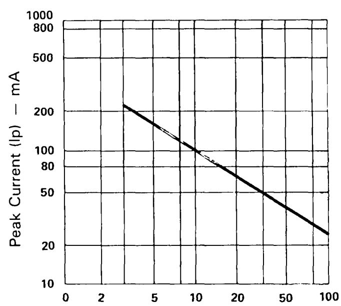
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



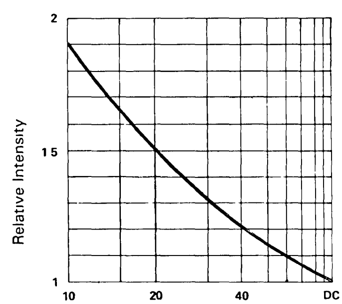
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

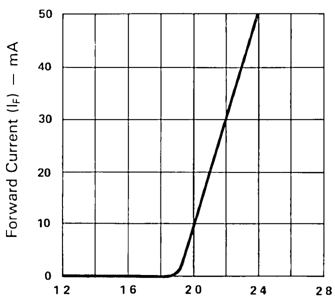


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

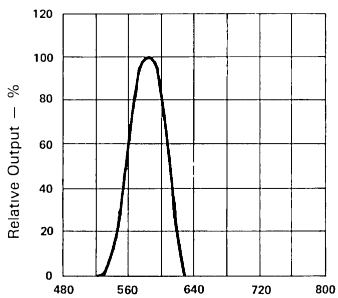
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2088AY

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	900	4000		μcd	IP = 160 mA 1/16 DUTY
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

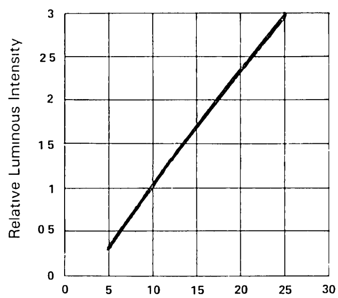
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



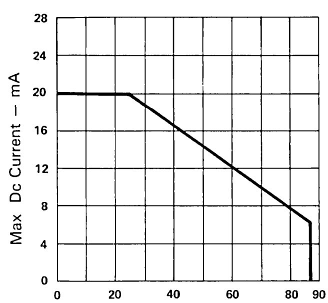
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



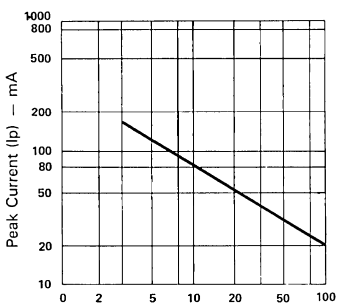
Wavelength (λ) — nm
Fig 2 SPECTRAL RESPONSE



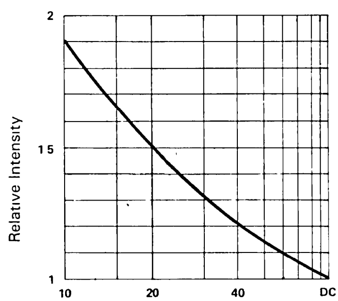
Forward Current (I_F) — mA
Fig 3 RELATIVE LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2088AE/2188AA (ORANGE)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1500	4000		μcd	Ip = 160 mA 1/16 DUTY
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

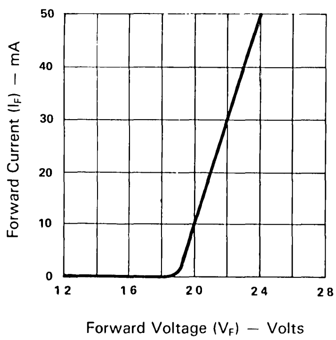


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE

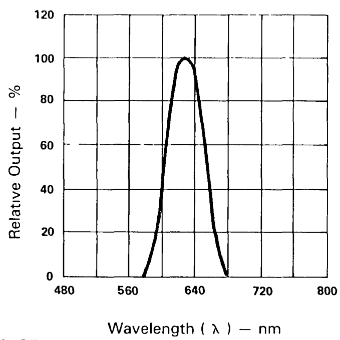


Fig 2 SPECTRAL RESPONSE

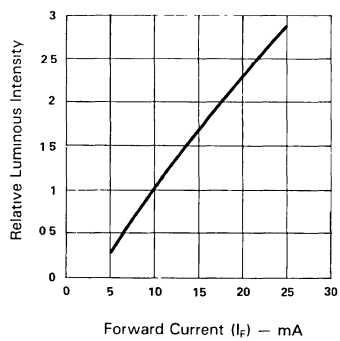


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

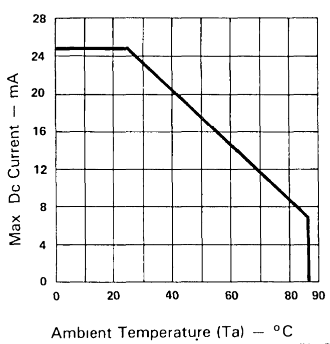


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

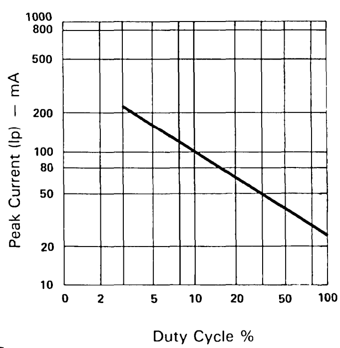


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

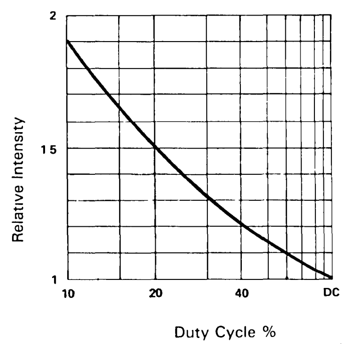


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTP-2088AHR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	1500	4000		μcd	Ip = 160 mA 1/16 DUTY
Peak Emission Wavelength	λp		635		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage, any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

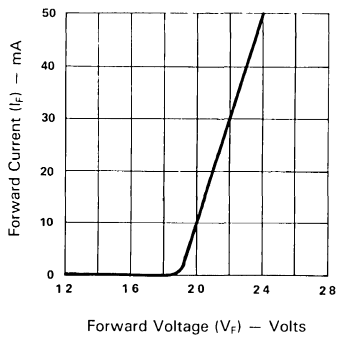


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE

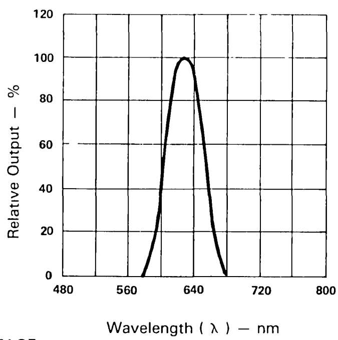


Fig 2 SPECTRAL RESPONSE

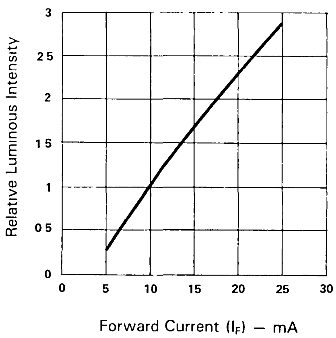


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

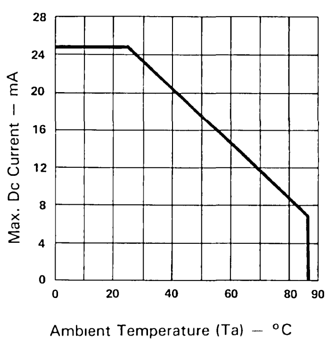


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

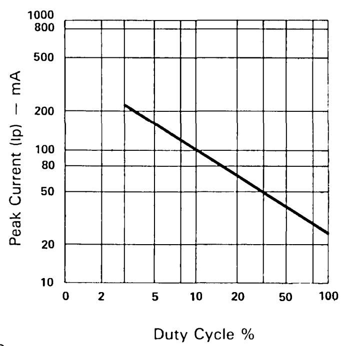


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

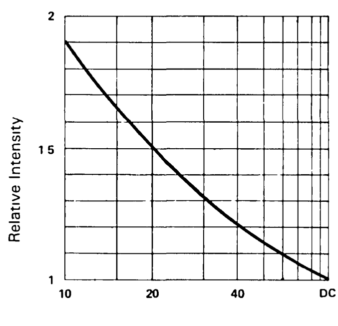
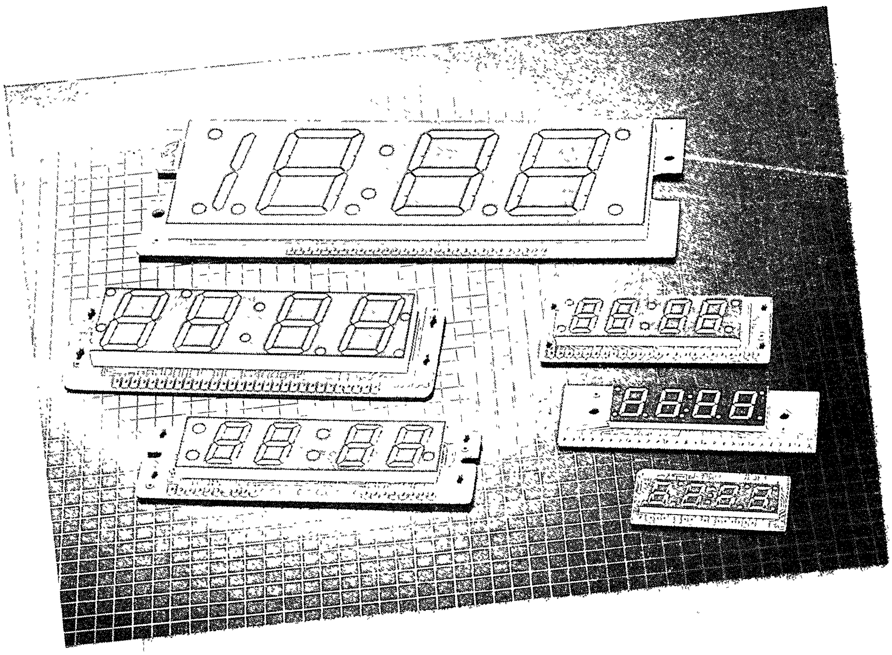


Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

7. LED Clock & Frequency Displays

- SELECTION GUIDE
- CLOCK & FREQUENCY DISPLAYS



SELECTION GUIDE

CLOCK & FREQUENCY DISPLAYS

DIGIT SIZE	BRIGHT RED		GREEN		DESCRIPTION				
	PART NUMBER	TYP. Iv/SEG. @10mA	PART NUMBER	TYP. Iv/SEG. @10mA	DRIVE MODE		DISPLAY MODE (HOUR)	DISPLAY FONT	PAGE NO.
0.3" EPOXY TYPE	LTC-3710P	350μcd	LTC-3710G	1000μcd	MULTIPLEX	C.C.	FF	.8.8:8.8:	7-2
	LTC-3718P		LTC-3718G		MULTIPLEX	C.C.	FF	:18:8.8.	
0.3"	LTC-3137A1P-12	155μcd	LTC-3137A1G-12	220μcd	DUPLEX	C.C.	12	:18.8.8.	7-18
	LTC-3137A1P-24		LTC-3137A1G-24		DUPLEX	C.C.	24	8888	
	LTC-3137A3P				DUPLEX	C.C.	12		
	LTC-3702SP		LTC-3702SG		MULTIPLEX	C.C.	FF	:88:8.8:	
	LTC-3708SP		LTC-3708SG		MULTIPLEX	C.C.	FF	:88:88 5	
	LTC-3808SP		LTC-3808SG		DIRECT	C.A.	FF	:18:8.8.	
	LTC-3730PMA-1		LTC-3730GLY-1		MULTIPLEX	C.C.	FF	88:88 8	
	LTC-3614MSJ				MULTIPLEX	C.A.	FF		
0.4"	LTC-14401A1P-2	145μcd	LTC-14401A1G-2	210μcd	DIRECT	C.A.	12	.1888	7-26
	LTC-14403A1P-2		LTC-14403A1G-2		DIRECT	C.A.	12	:18.8.8:	
	LTC-4401PAA2				DUPLEX	C.A.	FF	:88.88	
0.5"	LTC-5502A1P-12S	350μcd	LTC-5502A1G-12S	610μcd	DUPLEX	C.C.	12	'188.8.	7-31
	LTC-5612ELM	600μcd			MULTIPLEX	C.A.	FF	8:*:88	
0.6"	LTC-612D1P	350μcd	LTC-612D1G	600μcd	MULTIPLEX	C.A.	FF	.8.8:8.8:	7-36
	LTC-617D1P		LTC-617D1G		MULTIPLEX	C.A.	FF	:8888	
	LTC-627D1P		LTC-627D1G		MULTIPLEX	C.C.	FF	:888.8.	
	LTC-637C1P-12		LTC-637C1G-12		DUPLEX	C.C.	12	:18:88.	
	LTC-637C1P		LTC-637C1G		DUPLEX	C.C.	FF	:88:88.	
	LTC-637D1P-12		LTC-637D1G-12		DUPLEX	C.C.	12	:18:88.	
	LTC-637D1P		LTC-637D1G		DUPLEX	C.C.	FF	'88:88.	
	LTC-637D1P-12S		LTC-637D1G-12S		DUPLEX	C.C.	12	:18:88	
	LTC-637D1P-S		LTC-637D1G-S		DUPLEX	C.C.	FF	:88:88.	
	LTC-637D1P-W				DUPLEX	C.C.	FF	:88:88.	
	LTC-674D1P-12		LTC-674D1G-12		DIRECT	C.A.	12	:18.8.8	
	LTC-674D1P		LTC-674D1G		DIRECT	C.A.	FF	:88:8.8	
0.9"	LTC-937S1P	340μcd	LTC-937S1G	600μcd	DUPLEX	C.C.	FF	'88:88.	7-44
	LTC-937S1P-12		LTC-937S1G-12		DUPLEX	C.C.	12	:18:8.8	
1.4"	LTC-14501A1P-2	600μcd	LTC-14501A1G-2	1100μcd	DUPLEX	C.C.	12	.18:88	7-48
1.8"	LTC-18501A1P-2	670μcd	LTC-18501A1G-2	1200μcd	DUPLEX	C.C.	12	.18:88.	7-52
	LTC-18501A1P		LTC-18501A1G		DUPLEX	C.C.	FF	:88:88.	
	LTC-1867A1P-2		LTC-1867A1G-2		DIRECT	C.C.	12	'18:88.	
	LTC-18501A1P-4		LTC-18501A1G-4		DIRECT	C.C.	FF	88:8.8:	
25"	LTC-25501PAK	670μcd			DUPLEX	C.C.	FF	:88:88.	7-57
	LTC-25601PAK				MULTIPLEX	C.A.	FF	.88:88.	

Notes. C.C.: COMMON CATHODE C.A.: COMMON ANODE FF. FULL FEATURE

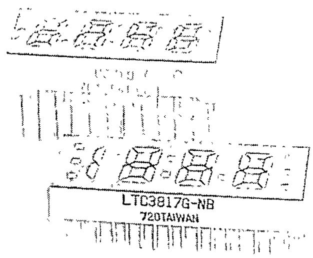
LITEON

LTC-3710 SERIES

0.3" FOUR LED CLOCK FREQUENCY DISPLAYS

FEATURES

- 0.3 INCH (7.62mm) DIGIT HEIGHT.
- CONTINUOUS UNIFORM SEGMENTS.
- CHOICE OF SIX BRIGHT COLORS RED/BRIGHT RED/GREEN/YELLOW/ORANGE/HIGH EFFICIENCY RED.
- LOW POWER REQUIREMENT.
- EXCELLENT CHARACTERS APPEARANCE.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- WIDE VEIWING ANGLE.
- SOLID STATE RELIABILITY.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- I.C. COMPATIBLE.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



DESCRIPTION

The LTC-3710 series devices are 0.3 inch (7.62mm) height four digit displays.
The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and green series devices utilize LED chips which are made from GaP on a transparent GaP substrate. The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate. Red and bright red displays have black face and red segment color. Green, and orange displays have black face and white segment color, Yellow displays have black face and yellow segment color. High efficiency red displays have red face and red segment color.

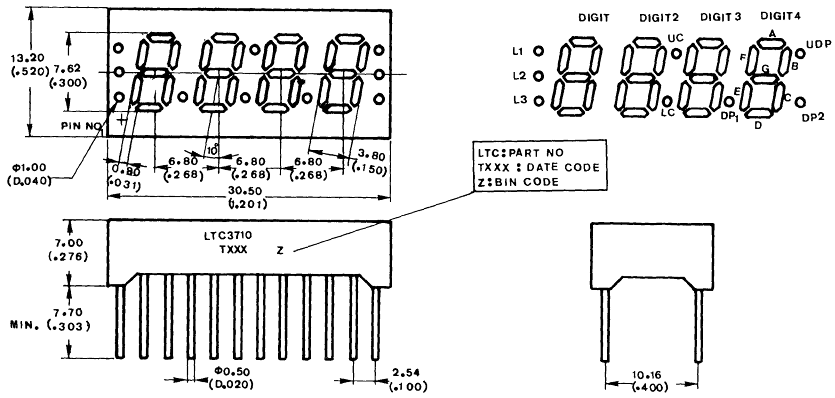
DEVICES

PART NO. LTC–						DESCRIPTION
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	
3710R	3710P	3710G	3710Y	3710E	3710HR	Multiplex, Common Cathode
3718R	3718P	3718G	3718Y	3718E	3718HR	Multiplex, Common Cathode

LED CLOCK & FREQUENCY DISPLAYS

PACKAGE DIMENSIONS

A. LTC-3710 Series



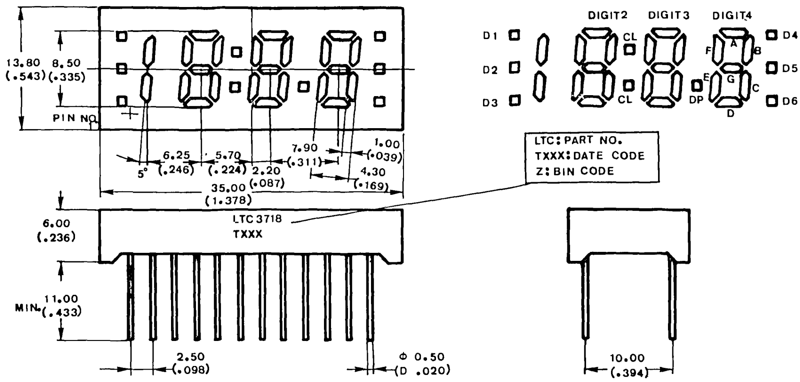
NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are: $\frac{+1.00}{-0.00}$ mm

1. Lead length (from setting plane) MINIMUM VALUM $\frac{-0.00}{}$ $\left(\frac{+0.040^{n}}{-0.000^{n}}\right)$ 2. $\frac{\pm 0.25\text{mm}}{(0.010^{n})}$ unless otherwise noted.

PIN NO.	CONNECTION	PIN NO.	CONNECTION
1	Anode L3	13	Cathode U.D.P.
2	Common Cathode Digit 1	14	Cathode D.P. 2.
3	Anode D, Digit 1, 2, 3, 4	15	Anode U.D.P.
4	Anode L2	16	Cathode D.P.I.
5	Common Cathode, Digit 2	17	Anode A, Digit 1, 2, 3, 4
6	Cathode UC, LC	18	Anode F, Digit 1, 2, 3, 4
7	Anode UC, LC	19	Anode B, Digit 1, 2, 3, 4
8	Common Cathode, Digit 3	20	Anode C, Digit 1, 2, 3, 4
9	Anode D.P.I.	21	Anode E, Digit 1
10	Common Cathode, Digit 4	22	Anode G, Digit 1, 2, 3, 4
11	Anode E, Digit 2, 3, 4	23	Anode L1
12	Anode D.P.2	24	Cathode L1, L2, L3

PACKAGE DIMENSIONS

B. LTC-3718 Series



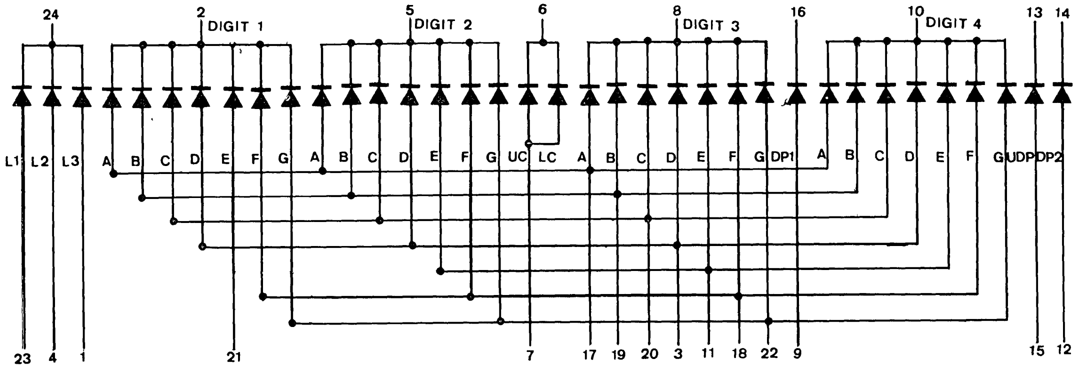
NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from setting plane): MINIMUM VALUM $\frac{+1.00}{-0.00}$ mm $\left(\frac{+0.040''}{-0.000''}\right)$ 2. $\frac{\pm 0.25 \text{ mm}}{(0.010'')}$ unless otherwise noted.

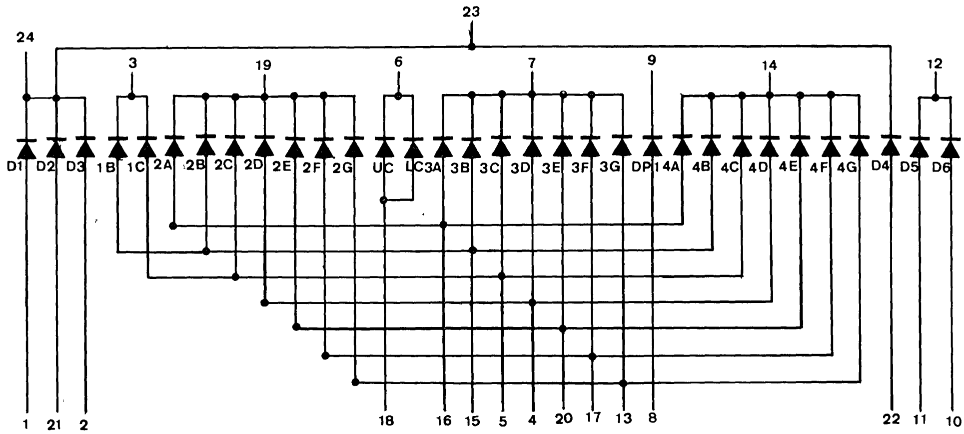
PIN NO.	CONNECTION	PIN NO.	CONNECTION
1	ANODE D1	13	ANODE G
2	ANODE D3	14	COMMON CATHODE DIGIT 4
3	COMMON CATHODE DIGIT 1	15	ANODE B
4	ANODE D	16	ANODE A
5	ANODE 3	17	ANODE F
6	CATHODE UC, LC	18	ANODE UC, LC
7	COMMON CATHODE DIGIT 3	19	COMMON CATHODE DIGIT 2
8	ANODE D.P.	20	ANODE E
9	CATHODE D.P.	21	ANODE D2
10	ANODE D6	22	ANODE 4
11	ANODE D5	23	CATHODE D2, D4
12	CATHODE D5, D6	24	CATHODE D1, D3

INTERNAL CIRCUIT DIAGRAM

LTC-3710 Series



LTC-3718 Series



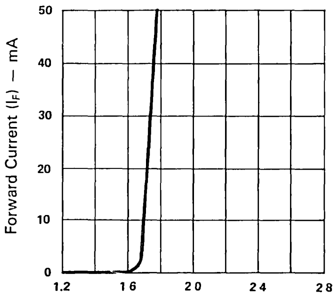
ABSOLUTE MAXIMUM RATINGS

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED	UNIT
Power Dissipation Per Segment	45	30	60	50	60	60	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	120	40	80	60	80	80	mA
Continuous Forward Current Per Segment	20	12	20	16	20	20	mA
Derating Linear From 25°C Per Segment	0.24	0.14	0.24	0.2	0.24	0.24	mA/°C
Reverse Voltage Per Segment	5	5	5	5	5	5	V
Operating Temperature Range	–25°C to + 85°C						
Storage Temperature Range	–25°C to +85°C						
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C							

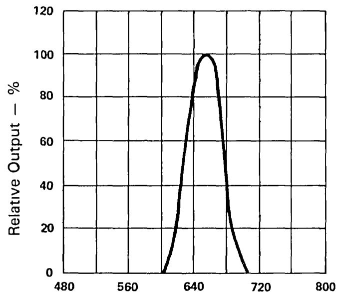
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3710R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	450		µcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		24		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	µA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

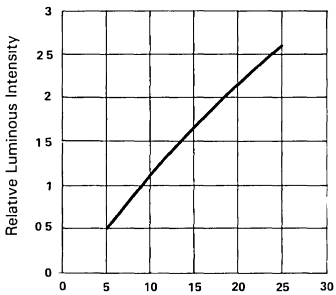
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



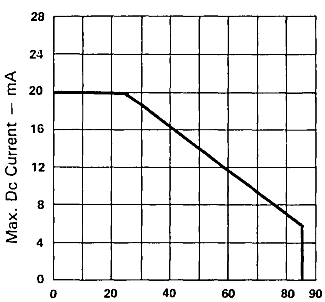
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



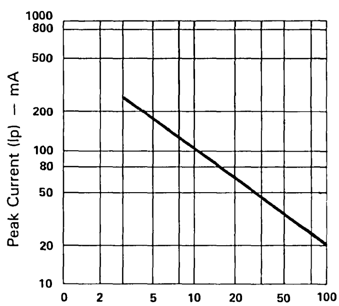
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE.



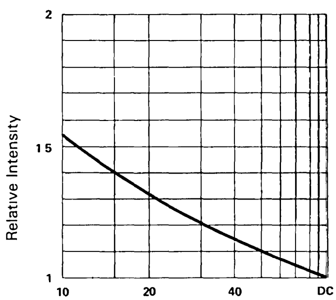
Forward Current (I_F) — mA
Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig. 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

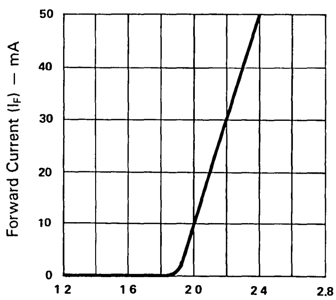


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

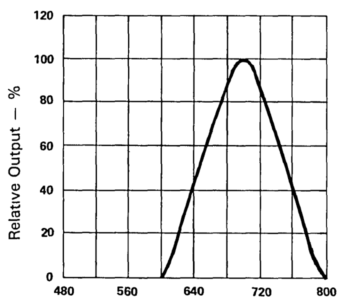
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3710P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	250	600		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m		2:1			I_F = 20 mA

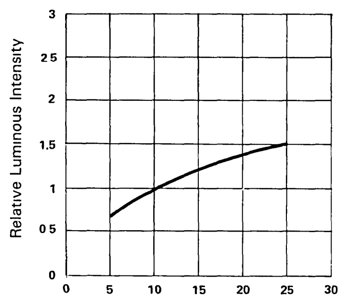
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



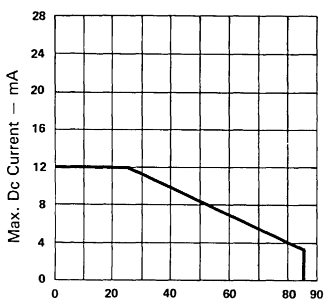
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.



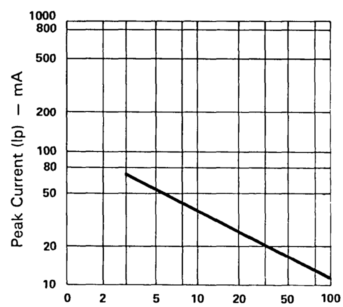
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE.



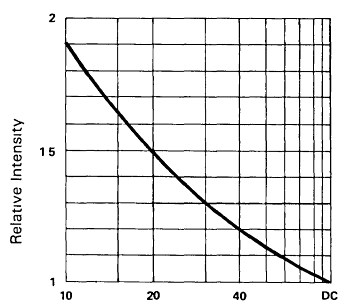
Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)

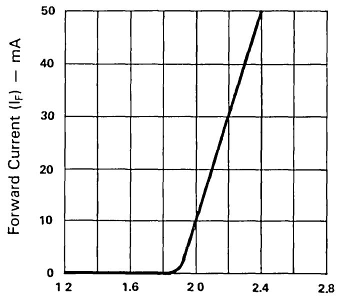


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

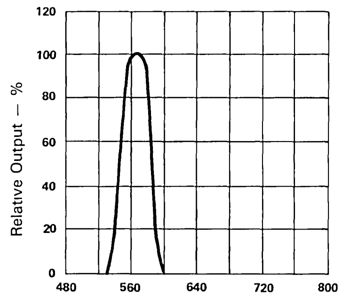
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3710G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	750	1800		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		565		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		30		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

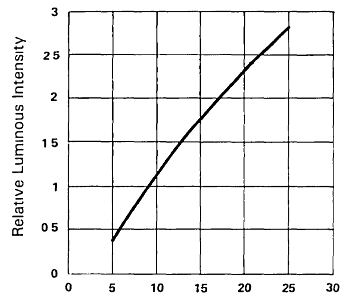
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



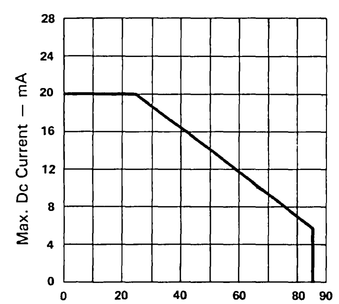
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.



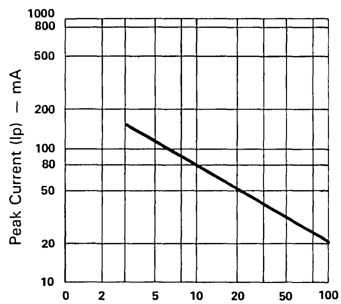
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE.



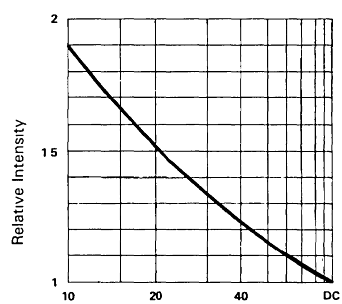
Forward Current (I_F) — mA
Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

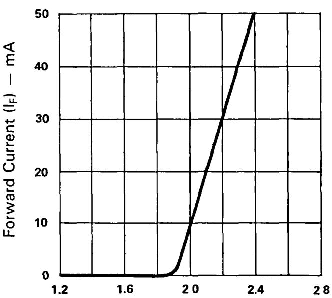


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG.)

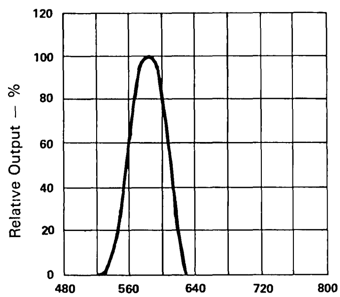
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3710Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	600	1300		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

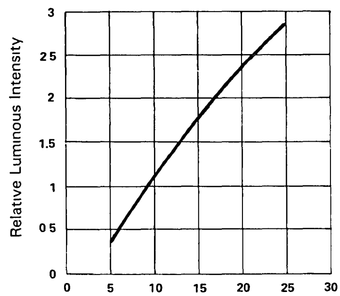
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



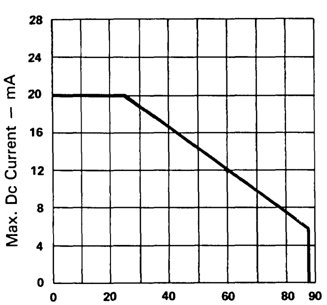
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.



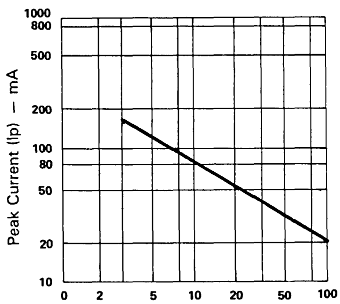
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE.



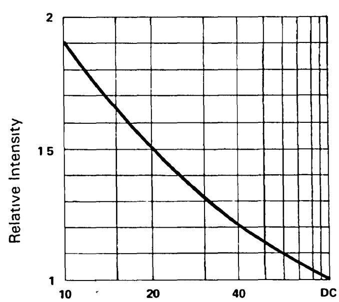
Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3710E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	750	1800		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

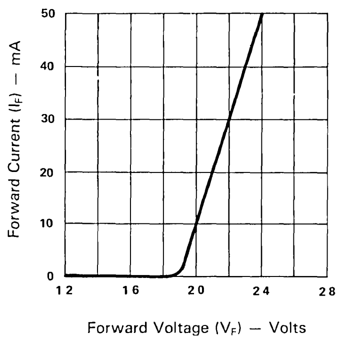


Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE.

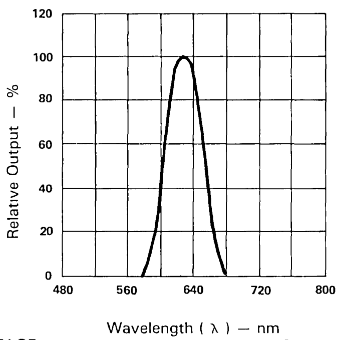


Fig 2 SPECTRAL RESPONSE

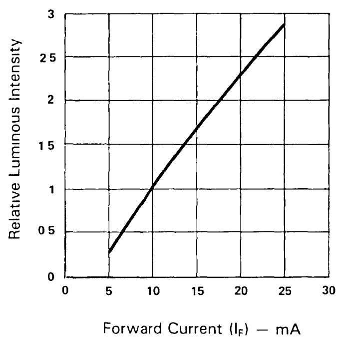


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

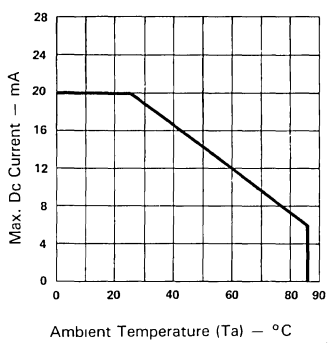


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

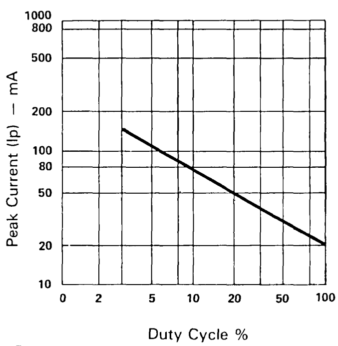


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

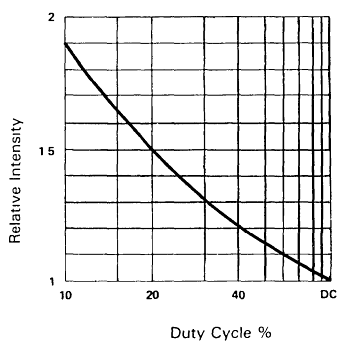


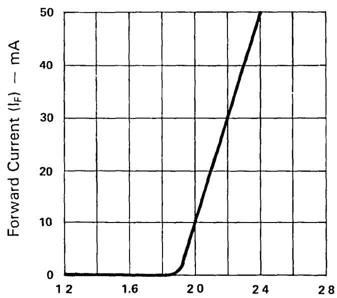
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

LED CLOCK & FREQUENCY DISPLAYS

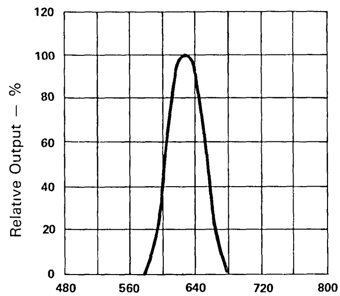
ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTC-3710HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	750	1800		μcd	I_F = 10 mA
Peak Emission Wavelength	λ_p		635		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		I_F = 20 mA

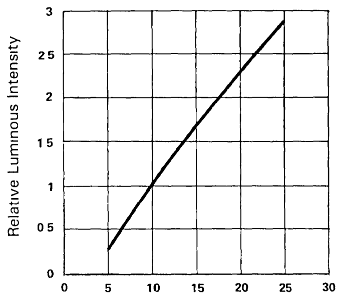
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)



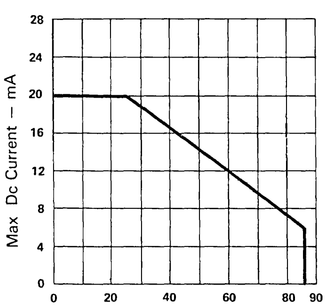
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



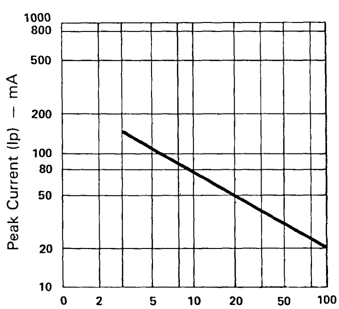
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE



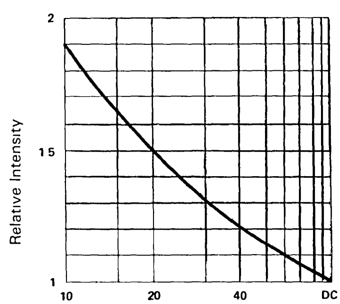
Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

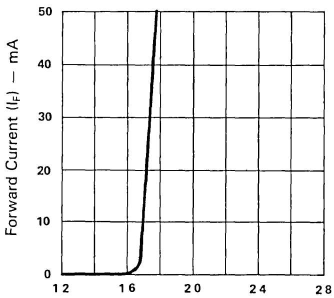


Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

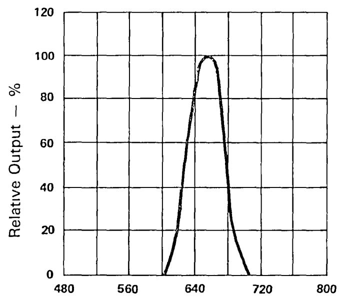
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3718R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	200	450		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		655		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		24		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		1.7	2.0	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

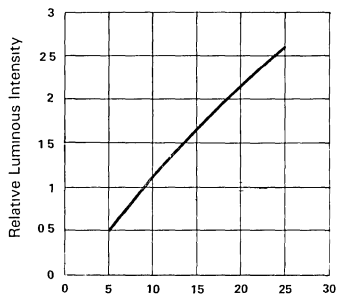
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



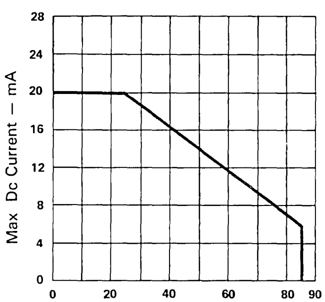
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



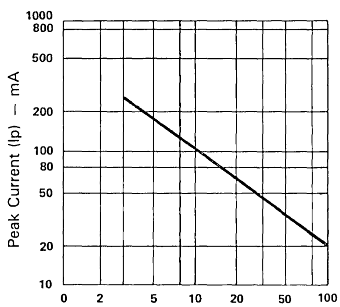
Wavelength (λ) — nm.
Fig 2 SPECTRAL RESPONSE



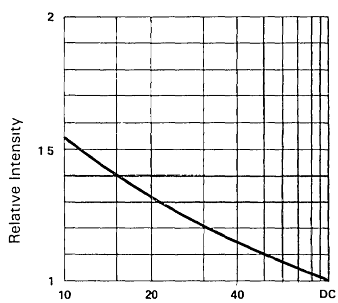
Forward Current (I_F) — mA
Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig. 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE — F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C
LTC-3718P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	250	600		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

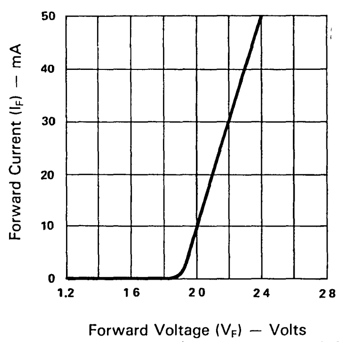


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

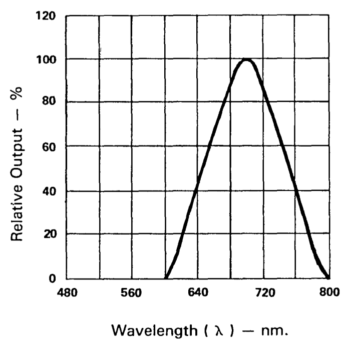


Fig 2 SPECTRAL RESPONSE

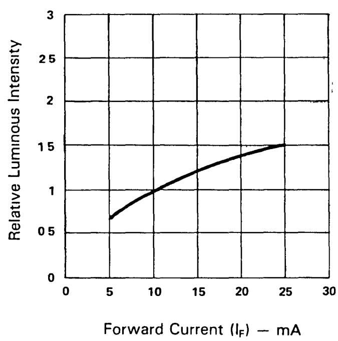


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

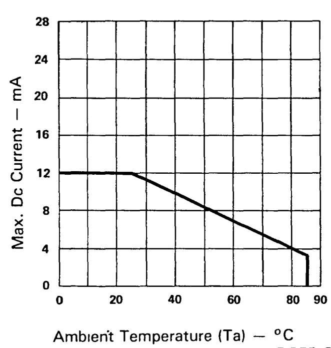


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.

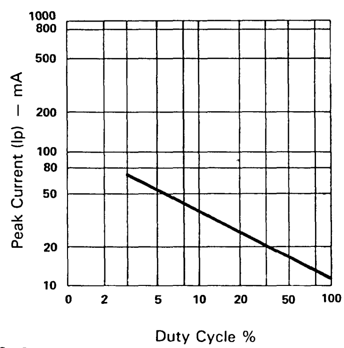


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

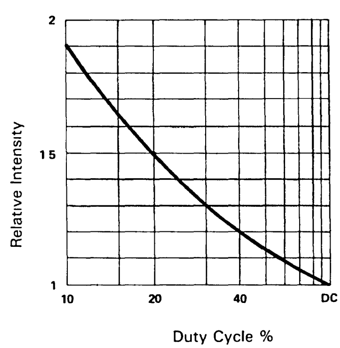


Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG.)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3718G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	750	1800		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λp		565		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		30		nm	$I_F = 20$ mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	μA	$V_R = 5$ V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		$I_F = 20$ mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)

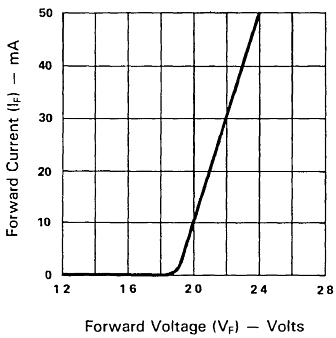


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

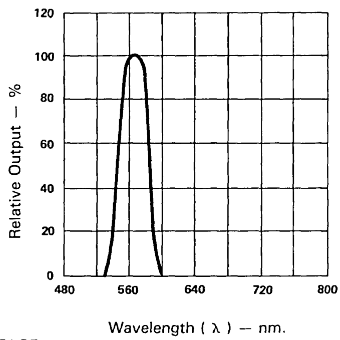


Fig. 2 SPECTRAL RESPONSE.

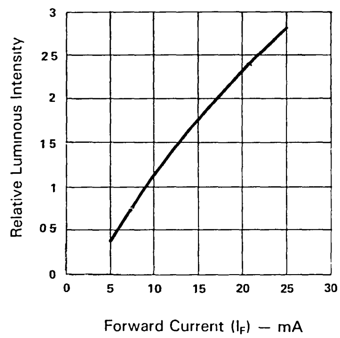


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

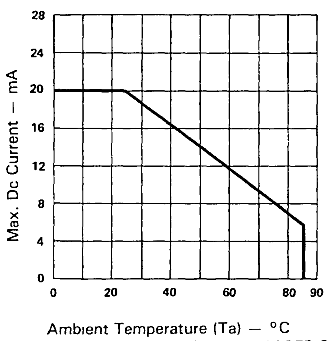


Fig 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.

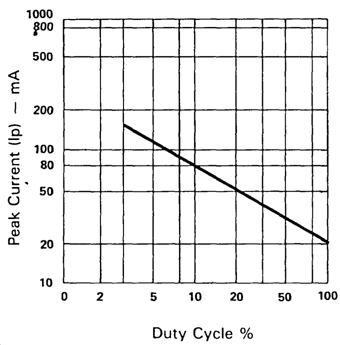


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

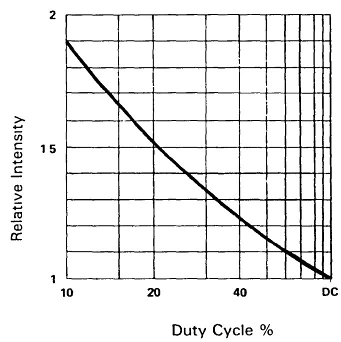
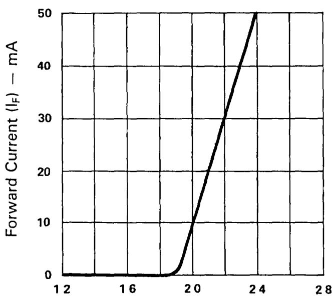


Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

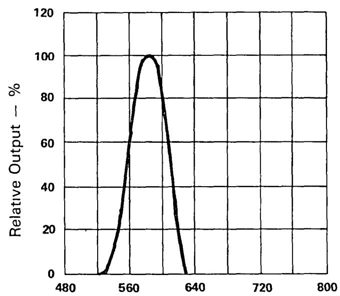
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3718Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	600	1300		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		585		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		35		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	μA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

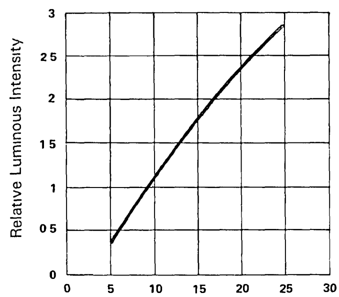
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25° C Ambient Temperature Unless Otherwise Noted)



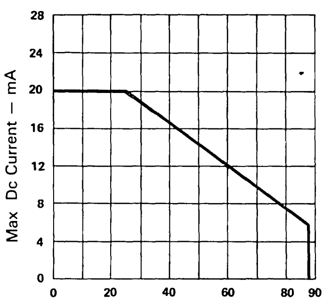
Forward Voltage (V_F) — Volts
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.



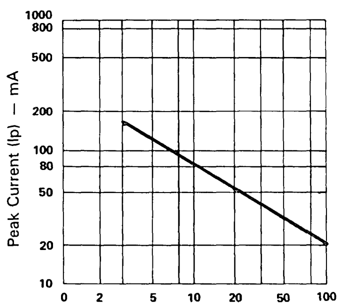
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE.



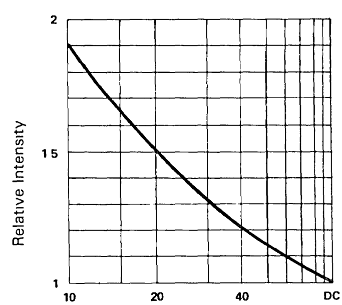
Forward Current (I_F) — mA
Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).



Ambient Temperature (Ta) — °C
Fig 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG.)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3718E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	750	1800		µcd	I_F = 10 mA
Peak Emission Wavelength	λp		630		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		40		nm	I_F = 20 mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current, any Segment or D.P.	I_R			100	µA	V_R = 5 V
Luminous Intensity Matching Ratio	Iv-m			2:1		I_F = 20 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES
(25°C Ambient Temperature Unless Otherwise Noted)

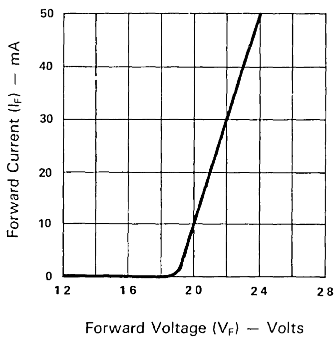


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE

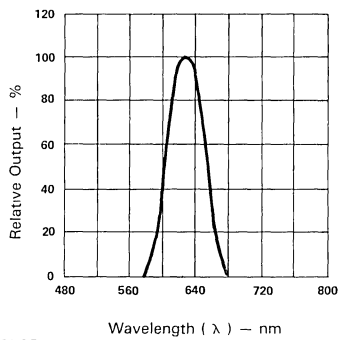


Fig 2 SPECTRAL RESPONSE

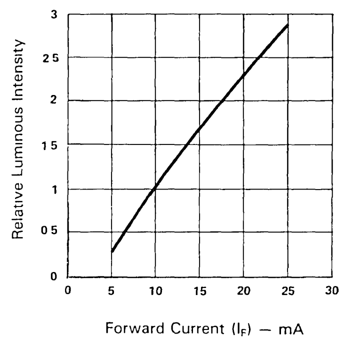


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)

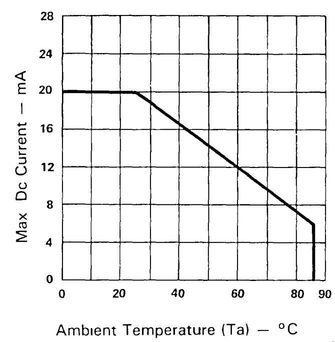


Fig 4 MAX ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE

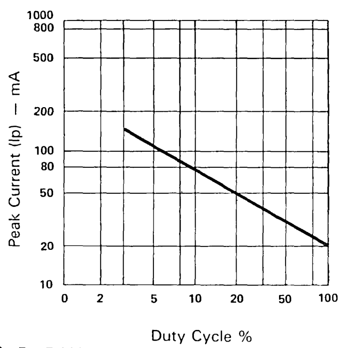


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

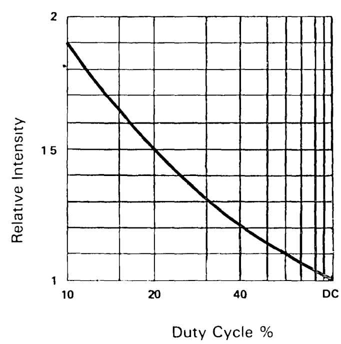


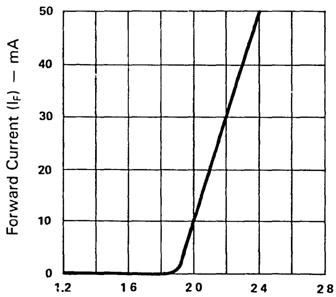
Fig 6 LUMINOUS INTENSITY Vs DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$
LTC-3718HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_V	750	1800		μcd	$I_F = 10$ mA
Peak Emission Wavelength	λ_p		635		nm	$I_F = 20$ mA
Spectral Line Half-Width	$\Delta\lambda$		40		nm	$I_F = 20$ mA
Forward Voltage any Segment or D.P.	V_F		2.1	2.8	V	$I_F = 20$ mA
Reverse Current, any Segment or D.P.	I_R			100	μA	$V_R = 5$ V
Luminous Intensity Matching Ratio	I_{V-m}			2:1		$I_F = 20$ mA

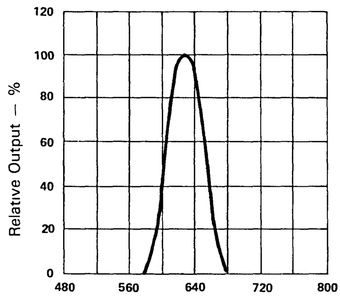
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)



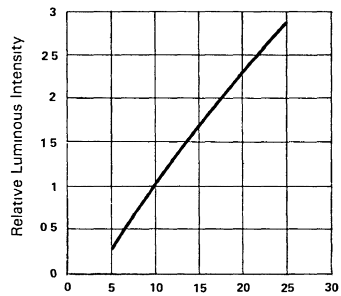
Forward Voltage (V_F) — Volts

Fig. 1 FORWARD CURRENT Vs FORWARD VOLTAGE



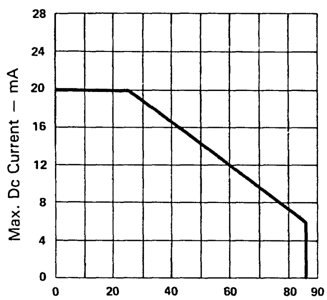
Wavelength (λ) — nm.

Fig 2 SPECTRAL RESPONSE.



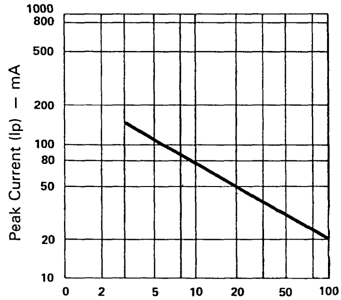
Forward Current (I_F) — mA

Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).



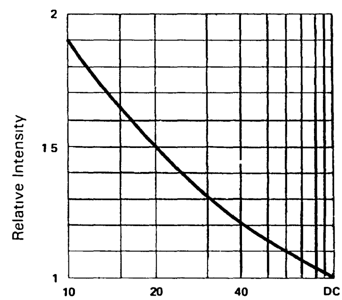
Ambient Temperature (Ta) — °C

Fig 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.



Duty Cycle %

Fig 5 MAX. PEAK CURRENT Vs. DUTY CYCLE % (REFRESH RATE – F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE I_F = 10mA PER SEG)

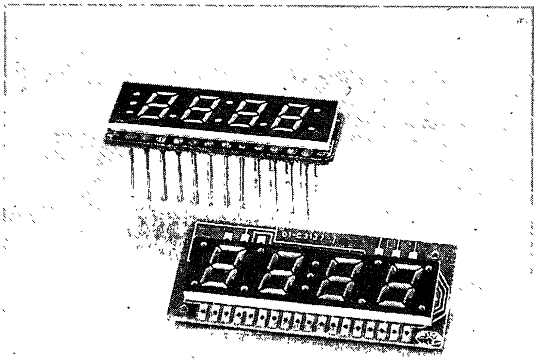
LITEON

LTC-3000 SERIES

0.3" FOUR DIGIT LED CLOCK FREQUENCY DISPLAYS

FEATURES

- 0.3 INCH (7.62 mm) HEIGHT CHARACTER RED OR GREEN COLOR.
- COMMON CATHODE, COMMON ANODE; DIRECT, DUPLEX AND MULTIPLEX PIN OUT ARE AVAILABLE.
- FLEXIBLE TO SELECT BOTH 12/24 HOURS AND FULL FEATURE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST.
- LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- PRACTICAL BRIGHTNESS ARE OBTAINED AT ABOUT 8MA/SEGMENT DIRECT DRIVE; 20MA (WITH ½ DUTY RATIO) FOR DUPLEX DRIVE; 50MA (WITH 1/6 DUTY RATIO) FOR MULTIPLEX DRIVE.
- RED (GaASP) 4 DIGIT LED COLOCK DISPLAY VERSION STANDARD [GREEN (GaP) DISPLAY SUFFIX G, BRIGHT RED (GaP) DISPLAY-SUFFIX P ARE AVAILABLE].



DESCRIPTION

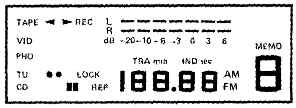
The LTC-3000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, micro processor . . . etc.

1. CLOCK DISPLAY

PART NO. LTC.	DESCRIPTION				PIN OUT				INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION	REMARK
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM / PM			
	FORM	CIRCUIT	BRIGHT RED	GREEN		UP	LOW				
3137A1P-12	C C.	DPX	V		NO		V	V/V	A	A	
3137A1G-12	C.C.	DPX		V	NO		V	V/V	A	A	
3137A1P-24	C C.	DPX	V		A.G.D.E.		V		A	A	
3137A1G-24	C.C.	DPX		V	A G.D.E.		V		A	A	
3137A3P	C.C.	DPX		V	A.G.D.E.		V		A	A	BLACK FACE WHITE SEGS.
3702SP	C.C.	MPX	V		A.G.D.E.F.	V	V	V/V	B	B	
3702SG	C.C.	MPX		V	A.G.D E F.	V	V	V/V	B	B	
3708SP	C.C.	MPX	V		A.G.D.E.F.	V		V/V	C	C	
3708SG	C.C.	MPX		V	A.G.D.E.F.	V		V/V	C	C	
3808SP	C.A.	D.D.		V	NO	V	V	V/V	D	D	
3808SG	C.A.	D.D.		V	NO	V	V	V/V	D	D	

LED CLOCK & FREQUENCY DISPLAYS

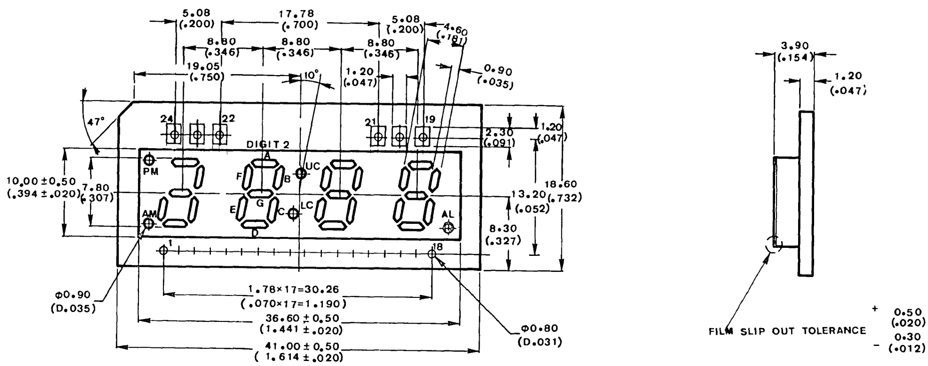
2. MULTI – FUNCTION DISPLAY (Customer design is acceptable)

PART NO. LTC-	DESCRIPTION						INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION
	DRIVE		COLOR			DISPLAY FONT		
	FROM	CIRCUIT	BRIGHT RED	GREEN	YELLOW			
3614 MSJ	C.A.	MPX.	V	V	V		H	H
3730PMA-1	C.C.	MPX	V			88·88 g	I	I
3730GLY-1	C.C.	MPX.		V		88·88 g	I	I

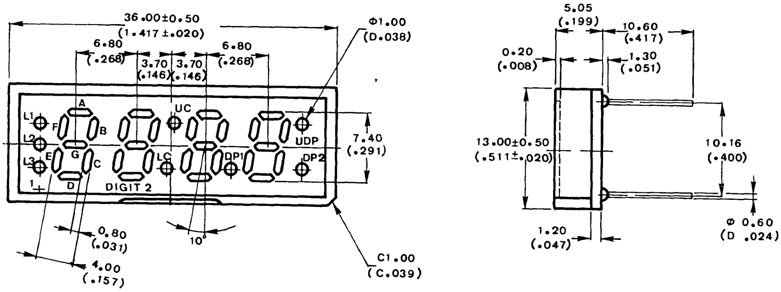
NOTES. 1. C.A . common anode, C C . common cathode
2 MPX multiplex, DPX. duplex, D D direct drive

PACKAGE DIMENSIONS

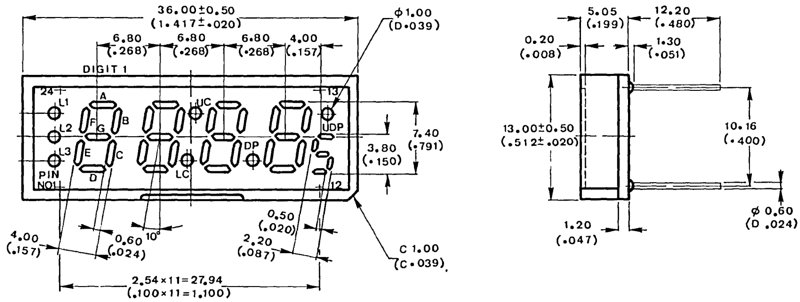
A. LTC-3137A1 x Series



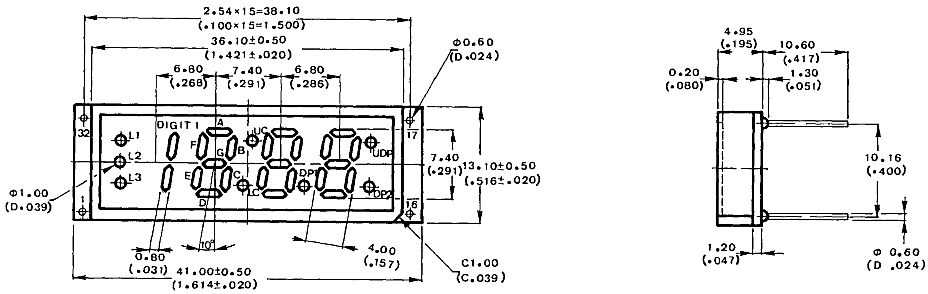
B. LTC-3702S x Series



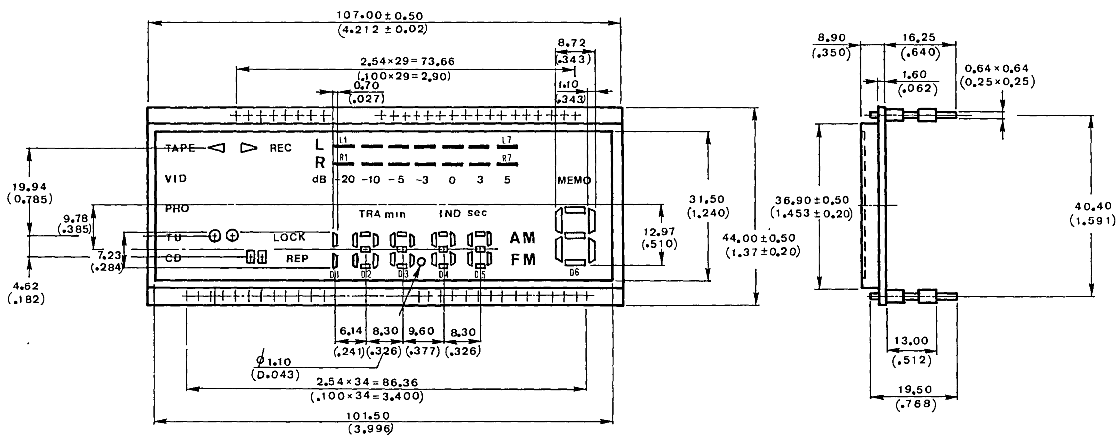
C. LTC-3708S x Series



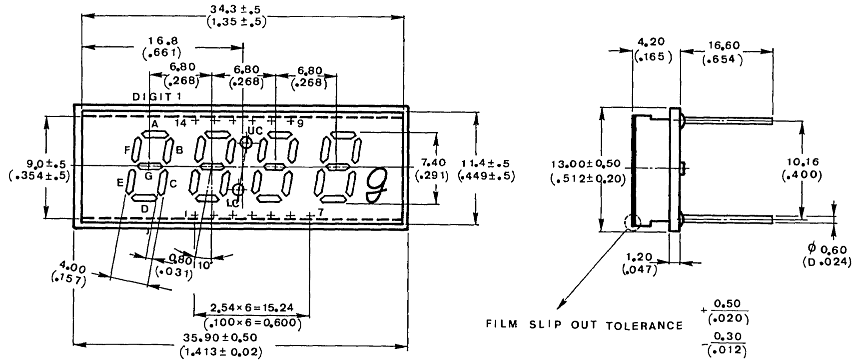
D. LTC-3808S x Series



E. LTC-3614 MSJ



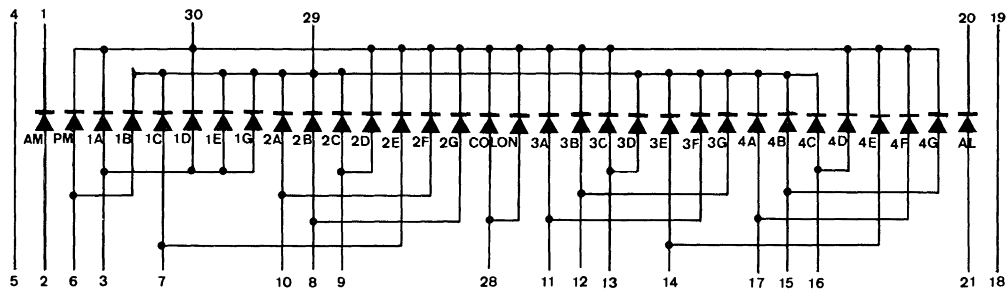
F. LTC-3730 Series



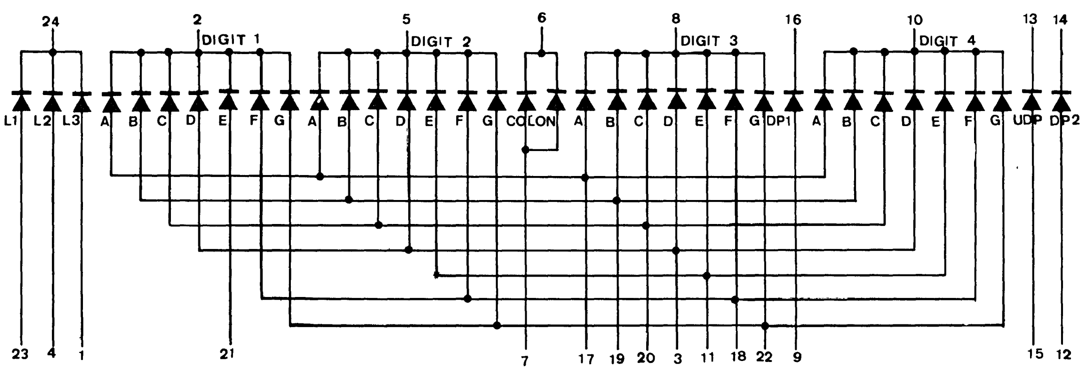
NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

INTERNAL CIRCUIT DIAGRAM

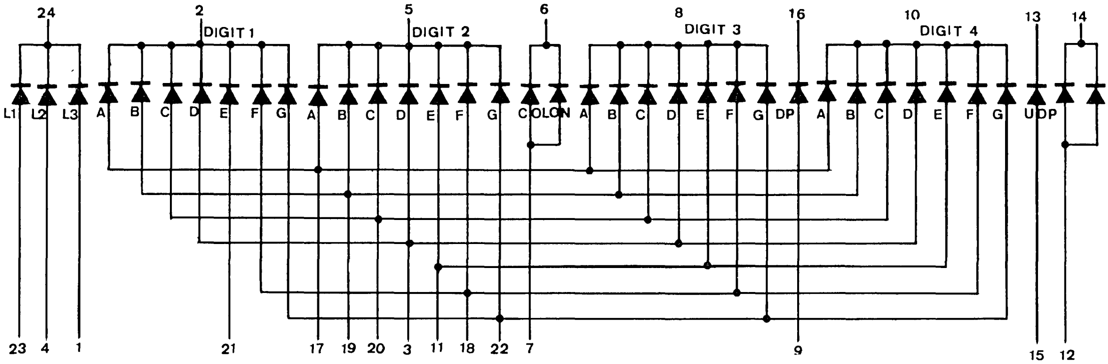
A. LTC-3137



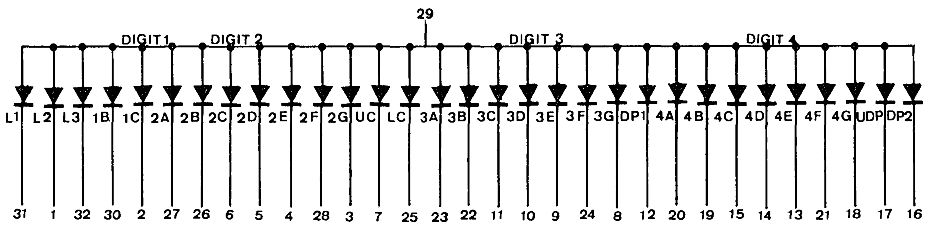
B. LTC-3702



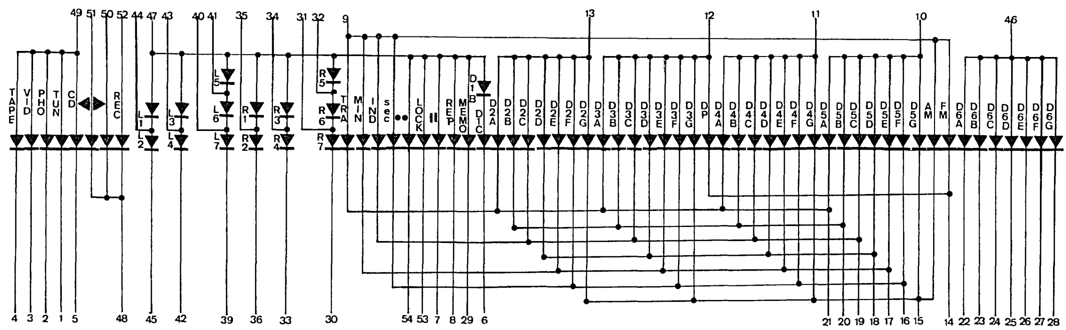
C. LTC-3708



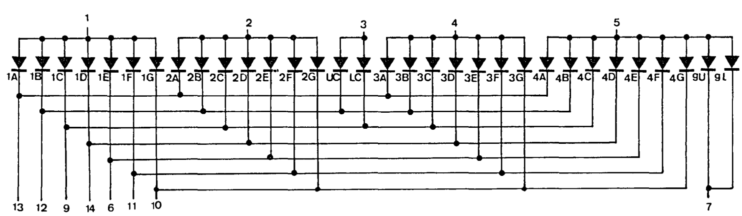
D. LTC-3808S x Series



E. LTC-3614 MSJ



F. LTC-3730 Series



CONTINUOUS NEXT PAGE

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	SYMBOL	RED	BRIGHT RED	GREEN	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	25	20	20	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	200	150	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F /pulse	30	30	30	mA
Reverse Voltage (Segment of Decimal Point)	V_R	5	5	5	V
Operating Temperature Range	Topr	–25°C to 60°C			
Storage Temperature Range	Tstg	–25°C to 70°C			
Derating Linear From 25°C	P_D	2.4	2.4	2.4	W
Derating Linear From 25°C		0.35	0.42	0.42	mA/°C
Max. Solder Temperature 260°C For 3 Seconds at 2 mm From The Case Or Rellector Edge					

NOTE: Caution

Please be careful of the following.

1) Avoid washing the LED DISPLAY in water.
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY

Freon TE or TF
Methyl or Ethyl Alcohol
Daiflon Solvent S3 or S3-E

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	DEVICES	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	RED	35	80		μcd	I_F = 10 mA
		BRIGHT RED	65	155			
		GREEN	90	220			
Peak Emission Wavelength	λp	RED	630	655	680	nm	I_F = 20 mA
		BRIGHT RED		697			
		GREEN		565			
Spectral Line Half-Width	Δλ	RED		24		nm	I_F = 20 mA
		BRIGHT RED		90			
		GREEN		30			
Forward Voltage	V_F	RED		1.7	2.2	V	I_F = 20 mA
		BRIGHT RED		2.1	2.8		
		GREEN		2.1	2.8		
Reverse Current	I_R	RED			100	μA	V_R = 5V
		BRIGHT RED			100		
		GREEN			100		
Luminous Intensity Matching Ratio	Ivm	All Model			2:1		I_F = 10 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

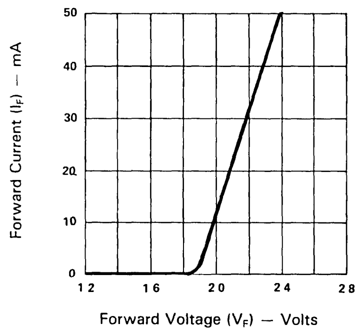


Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

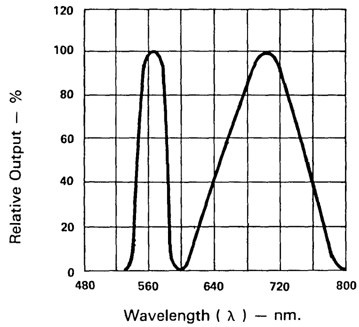


Fig. 2 SPECTRAL RESPONSE

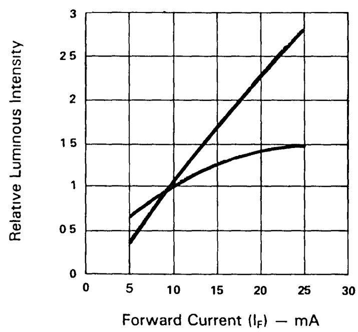


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).

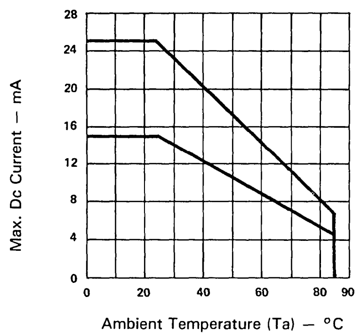
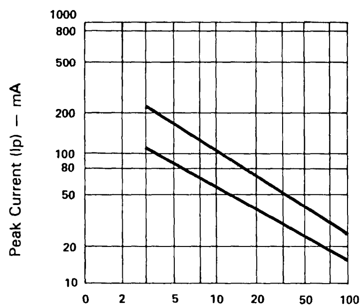


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.



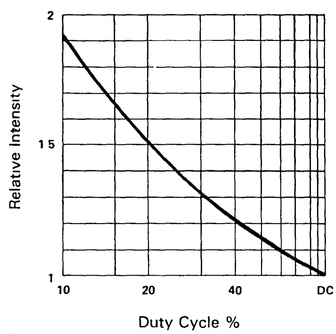


Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE % (AVERAGE I_F = 10mA PER SEG)

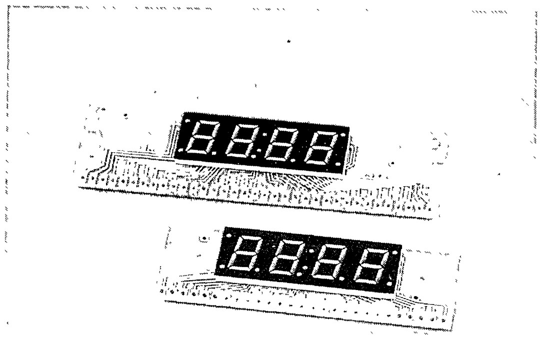
LITEON

LTC-4000 SERIES

0.4" FOUR DIGIT LED CLOCK FREQUENCY DISPLAYS

FEATURES

- 0.4 INCH (10.16mm) HEIGHT CHARACTER RED OR GREEN COLOR.
- COMMON CATHODE, COMMON ANODE; DIRECT, DUPLEX AND MULTIPLEX PIN OUT ARE AVAILABLE.
- FLEXIBLE TO SELECT BOTH 12/24 HOURS AND FULL FEATURE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST.
- LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- PRACTICAL BRIGHTNESS ARE OBTAINED AT ABOUT 8MA/SEGMENT DIRECT DRIVE; 20MA (WITH ½ DUTY RATIO) FOR DUPLEX DRIVE; 50MA (WITH $^1/_6$ DUTY RATIO) FOR MULTIPLEX DRIVE.
- RED (GaASP) 4 DIGIT LED COLOCK DISPLAY VERSION STANDARD [BRIGHT RED (GaP) DISPLAY-SUFFIX P ARE AVAILABLE.



DESCRIPTION

The LTC-4000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, micro processor . . . etc.

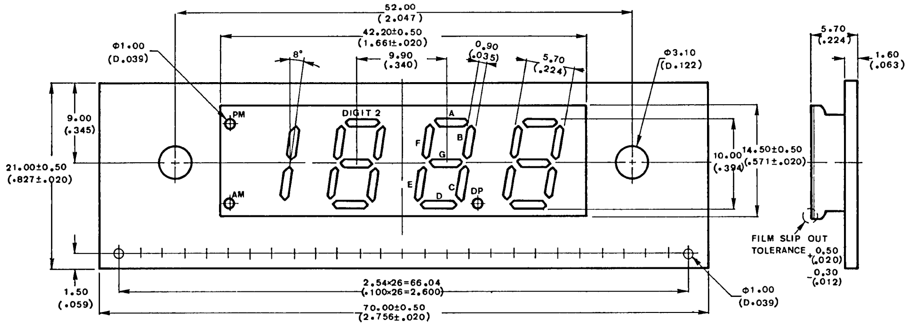
LED CLOCK & FREQUENCY DISPLAYS

DEVICES

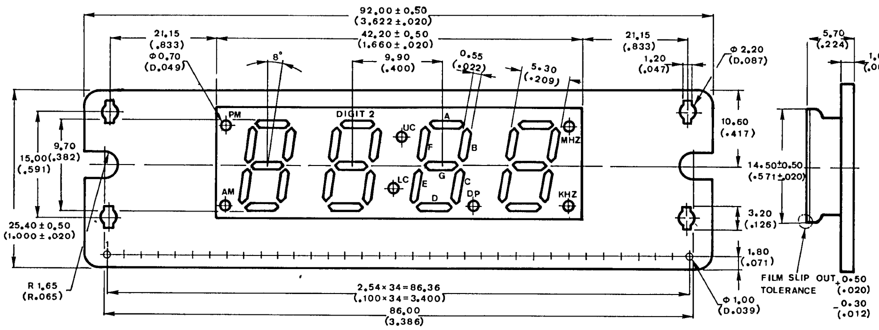
PART NO. LTC-	DESCRIPTION				PIN OUT				INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM / PM		
	FORM	CIRCUIT	BRIGHT RED	GREEN		UP	LOW			
14401A1P-2	C.A.	D.D.	V		NO			V/V	A	A
14401A1G-2	C.A.	D.D.		V	NO			V/V	A	A
14403A1P-2	C.A.	D.D.	V		NO	V	V	V/V	B	B
14403A1G-2	C.A.	D.D.		V	NO	V	V	V/V	B	B
4401PAA2	C.A.	DPX	V		A.G.D.E.		V	V/V	C	C

PACKAGE DIMENSIONS

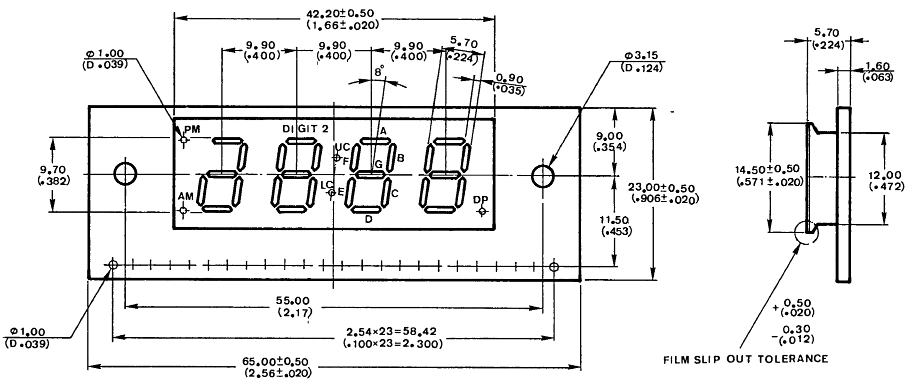
A. LTC-14401A1 x Series



B. LTC-14403A1 x Series



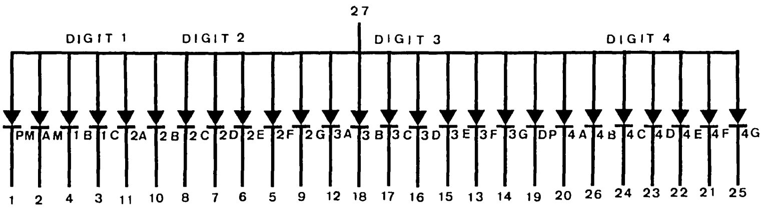
C. LTC-4401 PAA2



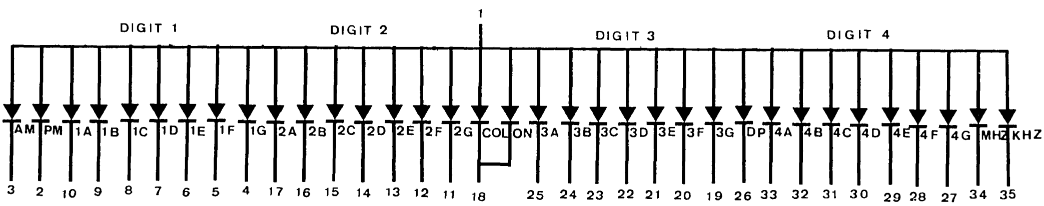
NOTE: All dimensions are in $\frac{\text{millimeters}}{(\text{inches})}$ tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

INTERNAL CIRCUIT DIAGRAM

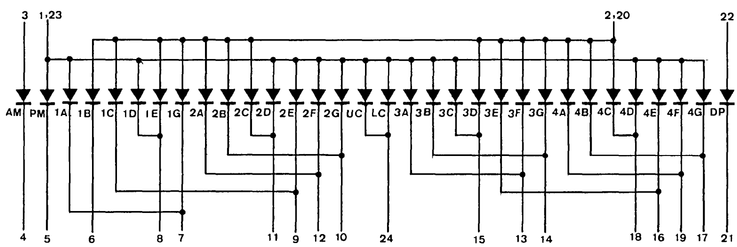
A. LTC-14401A



B. LTC-14403A



C. LTC-4401 PAA2



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	SYMBOL	RED	GREEN	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	25	20	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	200	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F/pulse	30	30	A
Reverse Voltage (Segment of Decimal Point)	V_R	5	5	V
Operating Temperature Range	Topr	–25°C to 60°C		
Storage Temperature Range	Tstg	–25°C to 70°C		
Derating Linear From 250°C	P_D	2.4	2.4	W
Derating Linear From 25°C		0.35	0.42	mA/°C
Max. Solder Temperature 260°C For 3 Seconds at 2 mm From The Case Or Rellector Edge				

NOTE: Caution

Please be careful of the following.

1) Avoid washing the LED DISPLAY in water.
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY

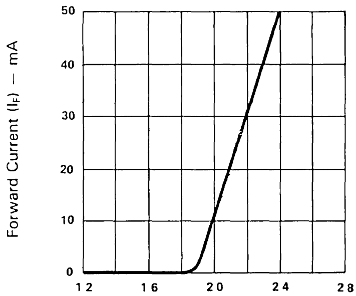
Freon TE or TF
Methyl or Ethyl Alcohol
Dai-From Solvent S3 or S3-E

ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C

PARAMETER	SYMBOL	DEVICES	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	RED	35	80		μcd	I_F = 10 mA
		BRIGHT RED	60	145			
Peak Emission Wavelength	λP	RED	630	655	680	nm	I_F = 20 mA
		BRIGHT RED		697			
Spectral Line Half-Width	Δλ	RED		24		nm	I_F = 20 mA
		BRIGHT RED		90			
Forward Voltage	V_F	RED		1.7	2.2	V	I_F = 20 mA
		BRIGHT RED		2.1	2.8		
Reverse Current	I_R	RED			100	μA	V_R = 5V
		BRIGHT RED			100		
Luminous Intensity Matching Ratio	Ivm	All Model			2:1		I_F = 10 mA

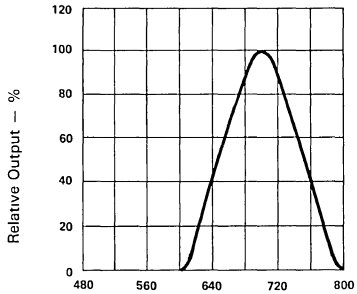
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25° C Ambient Temperature Unless Otherwise Noted)



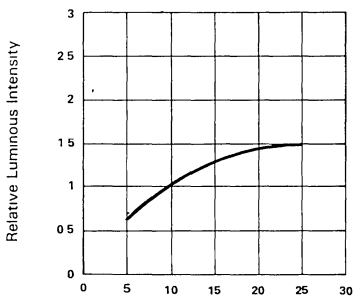
Forward Voltage (V_F) — Volts

Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



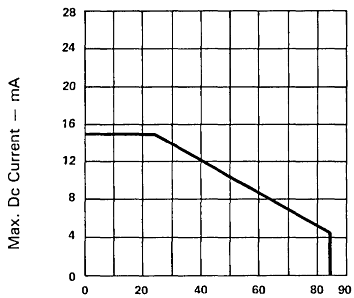
Wavelength (λ) — nm.

Fig. 2 SPECTRAL RESPONSE



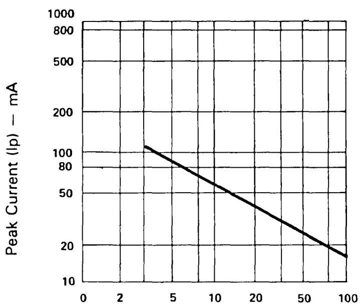
Forward Current (I_F) — mA

Fig 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C

Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE.



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

LED CLOCK & FREQUENCY DISPLAYS

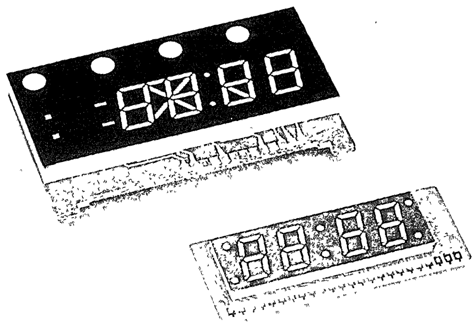
LITEON

LTC-5000 SERIES

0.5" FOUR DIGIT LED CLOCK FREQUENCY DISPLAY

FEATURES

- 0.5 INCH (12.7mm) HEIGHT CHARACTER RED OR GREEN COLOR.
- COMMON CATHODE, COMMON ANODE; DIRECT, DUPLEX AND MULTIPLEX PIN OUT ARE AVAILABLE.
- FLEXIBLE TO SELECT BOTH 12/24 HOURS AND FULL FEATURE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST.
- LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- PRACTICAL BRIGHTNESS ARE OBTAINED AT ABOUT 8MA/SEGMENT DIRECT DRIVE; 20MA (WITH ½ DUTY RATIO) FOR DUPLEX DRIVE; 50MA (WITH $^1/_6$ DUTY RATIO) FOR MULTIPLEX DRIVE.
- BRIGHT RED (GaP) 4 DIGIT LED COLOCK DISPLAY VERSION STANDARD [GREEN (GaP) DISPLAY SUFFIX G.].



DESCRIPTION

The LTC-5000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, micro processor . . . etc.

DEVICES

1. CLOCK DISPLAY

PART NO. LTC-	DESCRIPTION				PIN OUT				INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM/PM		
	FORM	CIRCUIT	BRIGHT RED	GREEN		UP	LOW			
5502A1P-12S	C.C.	DPX	V		NO		V	V/V	D	G
5502A1G-12S	C.C.	DPX		V	NO		V	V/V	D	G

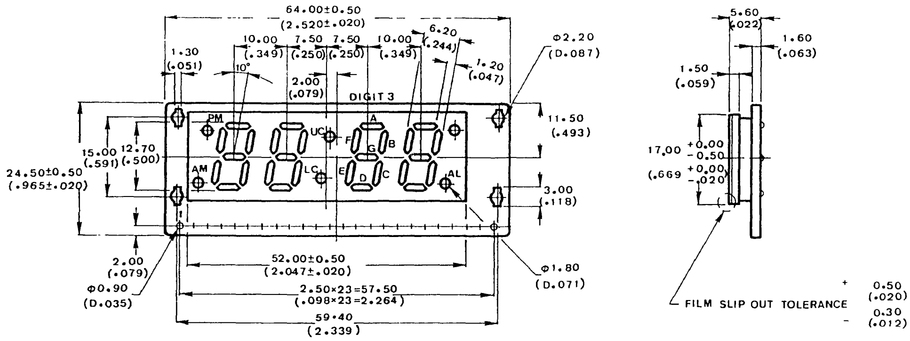
2. MULTI – FUNCTION DISPLAY (Customer design is acceptable)

PART NO. LTC-	DESCRIPTION				INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION
	DRIVE		COLOR	DISPLAY FONT		
	FORM	CIRCUIT	ORANGE			
5612ELM	C.A.	MPX	V		H	L

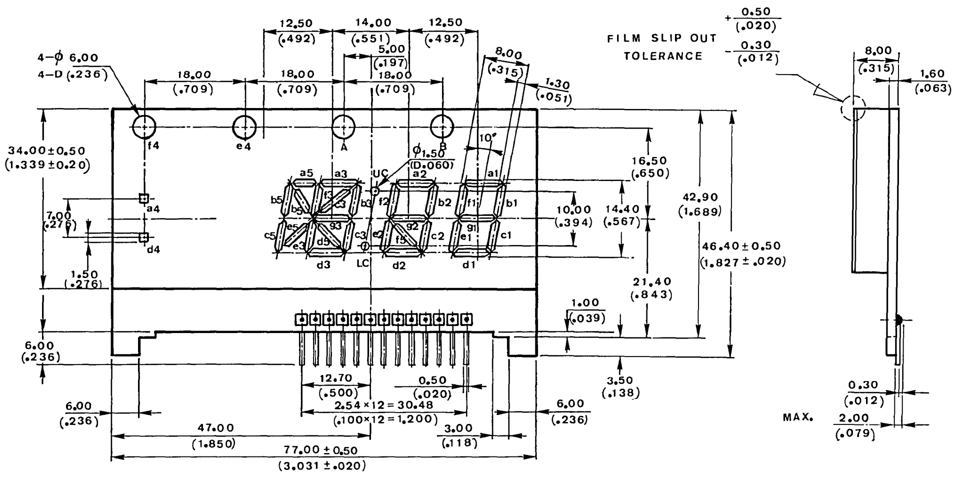
NOTES: 1. C.A . common anode C.C.. common cathod
2. MPX multiplex DPX: duplex D.D . direct drive

PACKAGE DIMENSIONS

A. LTC-5502A1 x Series



B. LTC-5612 ELM

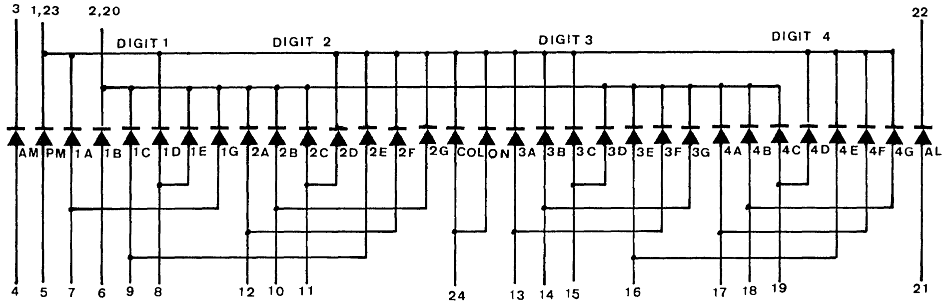


NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$, tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

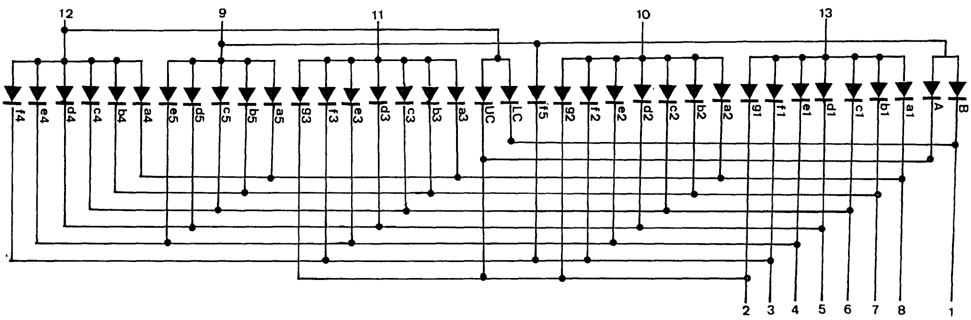
LED CLOCK & FREQUENCY DISPLAYS

INTERNAL CIRCUIT DIAGRAM

A. LTC-5502



B. LTC-5612 ELM



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	SYMBOL	RED	GREEN	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	25	20	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	200	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F /pulse	30	30	A
Reverse Voltage (Segment of Decimal Point)	V_R	5	5	V
Operating Temperature Range	Topr	–25°C to 60°C		
Storage Temperature Range	Tstg	–25°C to 70°C		
Derating Linear From 25°C	P_D	2.4	2.4	W
Derating Linear From 25°C		0.42	0.42	mA/°C
Max. Solder Temperature 260°C For 3 Seconds at 2 mm From The Case Or Rellector Edge				

NOTE: Caution
Please be careful of the following.
1) Avoid washing the LED DISPLAY in water.
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY
Freon TE or TF
Methyl or Ethyl Alcohol
Dai-From Solvent S3 or S3-E

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	DEVICES	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intersity	Iv	BRIGHT RED	140	350		μcd	I_F = 10 mA
		GREEN	245	610			
Edge Peak Emission Wavelength	λp	BRIGHT RED		697		nm	I_F = 20 mA
		GREEN		565			
Spectral Line Half-Width	Δλ	BRIGHT RED		90		nm	I_F = 20 mA
		GREEN		30			
Forward Voltage	V_F	BRIGHT RED		2.1	2.8	V	I_F = 20 mA
		GREEN		2.1	2.8		
Reverse Current	I_R	BRIGHT RED			100	μA	V_R = 5V
		GREEN			100		
Luminous Intensity Matching Ratio	Ivm	All Model			2.1		I_F = 10 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

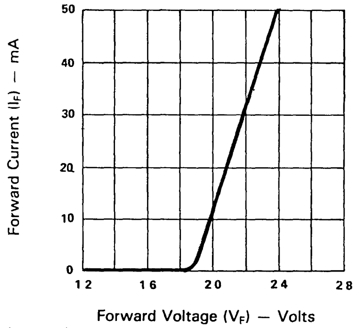


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

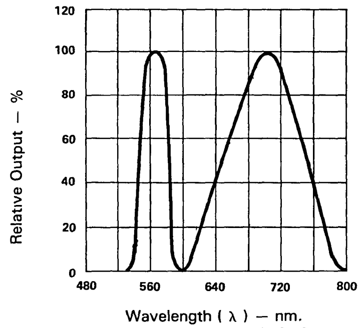


Fig. 2 SPECTRAL RESPONSE.

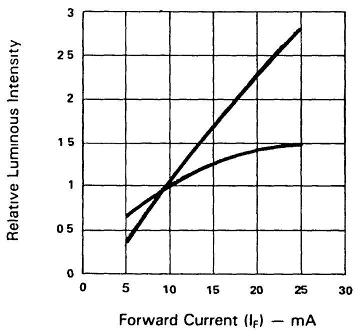


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).

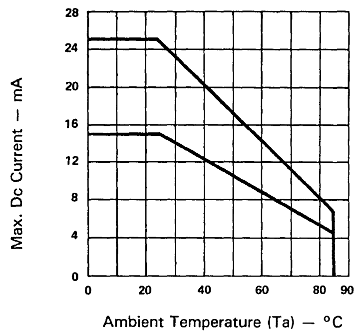


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

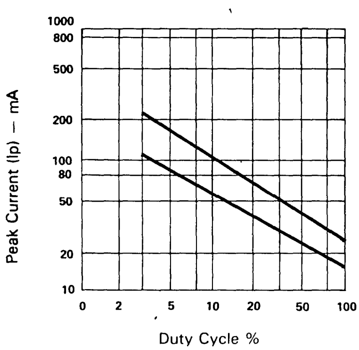


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE %
(REFRESH RATE – F = 1 KHz)

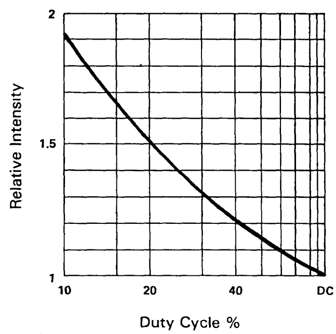


Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE %
(AVERAGE I_F = 10mA PER SEG.)

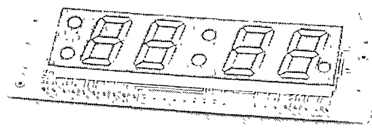
LITEON

LTC-6000 SERIES

0.6" FOUR DIGIT LED CLOCK FREQUENCY DISPLAYS

FEATURES

- 0.6 INCH (15.24mm) HEIGHT CHARACTER RED OR GREEN COLOR.
- COMMON CATHODE, COMMON ANODE; DIRECT, DUPLEX AND MULTIPLEX PIN OUT ARE AVAILABLE.
- FLEXIBLE TO SELECT BOTH 12/24 HOURS AND FULL FEATURE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST.
- LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- PRACTICAL BRIGHTNESS ARE OBTAINED AT ABOUT 8MA/SEGMENT DIRECT DRIVE; 20MA (WITH ½ DUTY RATIO) FOR DUPLEX DRIVE; 50MA (WITH $^1/_6$ DUTY RATIO) FOR MULTIPLEX DRIVE.
- BRIGHT RED (GaP) 4 DIGIT LED COLOCK DISPLAY VERSION STANDARD [GREEN (GaP) DISPLAY SUFFIX G.].



DESCRIPTION

The LTC-6000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, micro processor . . . etc.

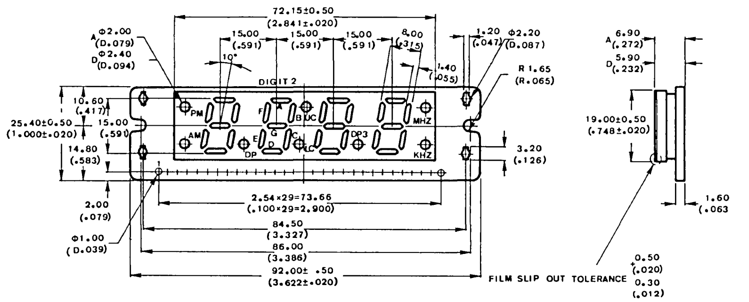
DEVICES

PART NO. LTC-	DESCRIPTION				PIN OUT				INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM / PM		
	FORM	CIRCUIT	BRIGHT RED	GREEN		UP	LOW			
612D1P	C.A.	MPX	V		YES	V	V	V/V	A	A
612D1G	C.A.	MPX		V	YES	V	V	V/V	A	A
617D1P	C.A.	MPX	V		YES		V	V/V	B	B
617D1G	C.A.	MPX		V	YES		V	V/V	B	B
627D1P	C.C	MPX	V		YES		V	V/V	C	C
627D1G	C.C.	MPX		V	YES		V	V/V	C	C

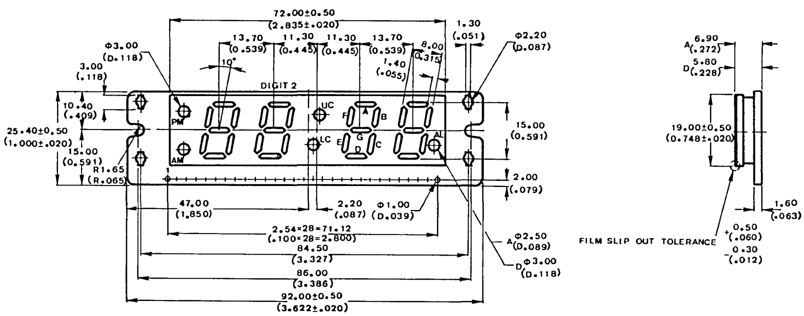
PART NO. LTC-	DESCRIPTION				PIN OUT				INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM / PM		
	FORM	IRCUIT	BRIGHT RED	GREEN		UP	LOW			
637C1P	C.C.	DPX	V		A.G.D.E.		V	V/V	D	D
637C1P-12	C.C.	DPX	V		NO		V	V/V	D	D
637C1G-12	C.C.	DPX		V	NO		V	V/V	D	D
637C1G	C.C.	DPX		V	A.G.D.E.		V	V/V	D	D
637D1P-12	C.C.	DPX	V		NO		V	V/V	D	E
637D1G-12	C.C.	DPX		V	NO		V	V/V	D	E
637D1G	C.C.	DPX		V	A.G.D.E.		V	V/V	D	E
637D1G-12S	C.C.	DPX		V	NO		V	V/V	D	E
637D1G-S	C.C.	DPX		V	A.G.D.E.		V	V/V	D	E
637D1P	C.C.	DPX	V		A.G.D.E.		V	V/V	D	E
637D1P-12S	C.C.	DPX	V		NO		V	V/V	D	E
637D1P-S	C.C.	DPX	V		A.G.D.E.		V	V/V	D	E
637DIP-W	C.C.	DPX	V		A.G.D.E.		V	V/V	D	E
674D1G-12	C.A.	D.D.		V	NO	V		V/V	I	K
674D1P-12	C.A.	D.D.	V		NO	V		V/V	I	K
674D1G	C.A.	D.D.		V	YES	V		V/V	I	K
674D1P	C.A.	D.D.	V		YES	V		V/V	I	K

PACKAGE DIMENSIONS

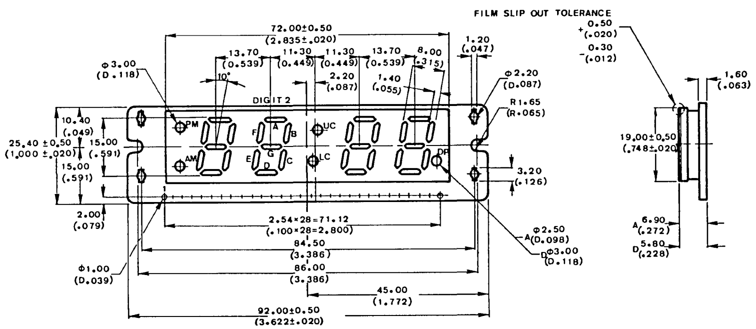
A. LTC-612 D1 x Series



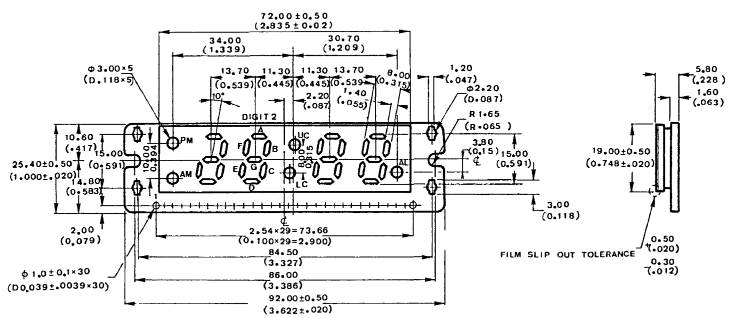
B. LTC-617 D1 x Series



C. LTC-627 D1 x Series

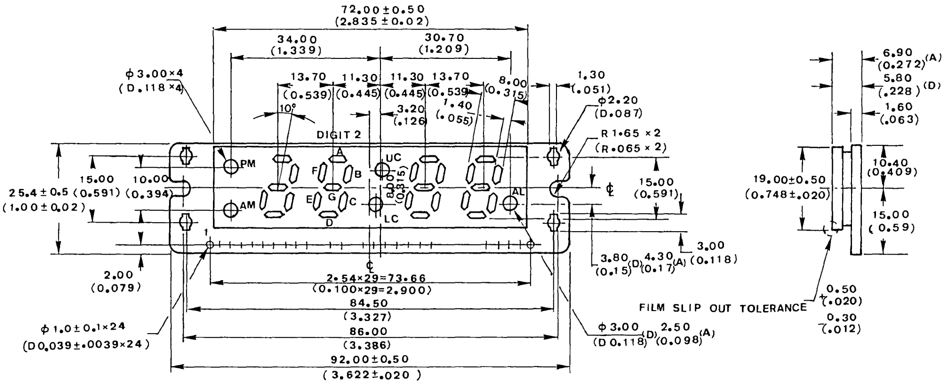


D. LTC-637C1 x Series

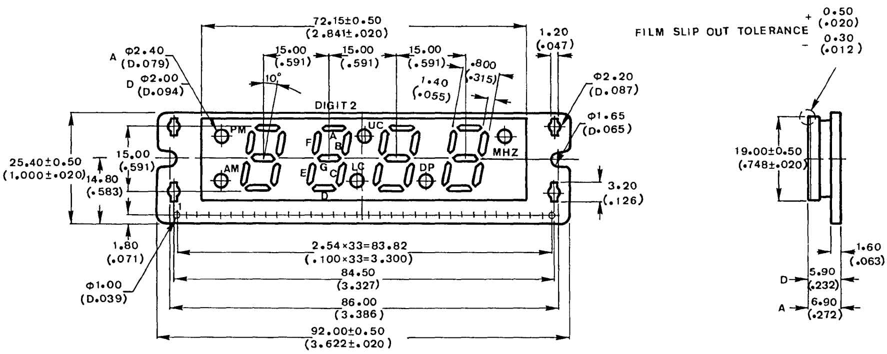


LED CLOCK & FREQUENCY DISPLAYS

E. LTC-637 D1 x Series



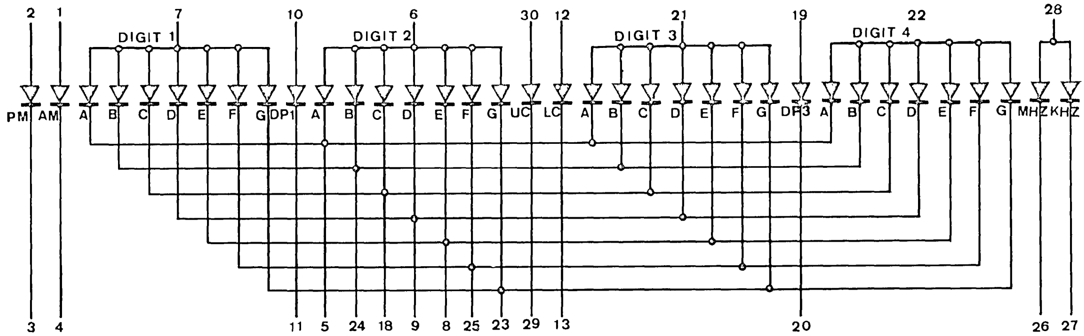
F. LTC-674 D1 x Series



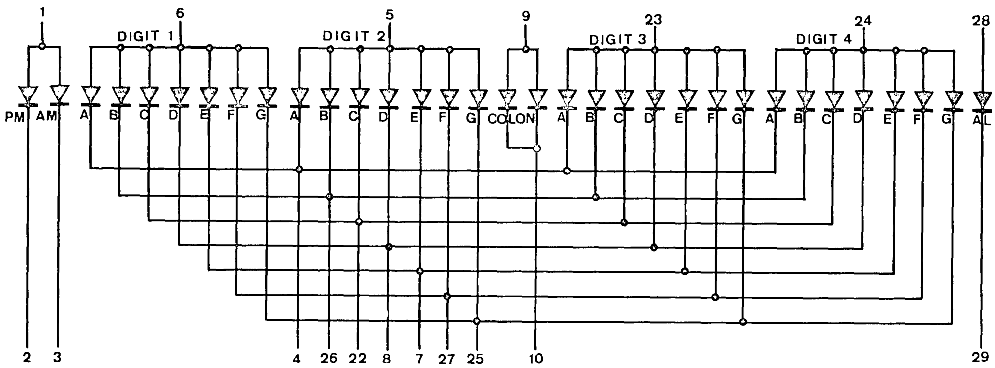
NOTE: All dimensions are in $\frac{\text{millimeters'}}{\text{(inches),}}$ tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

INTERNAL CIRCUIT DIAGRAM

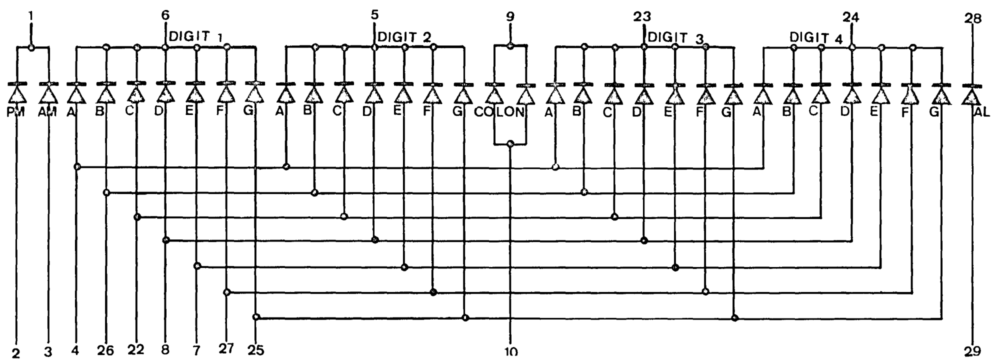
A. LTC-612



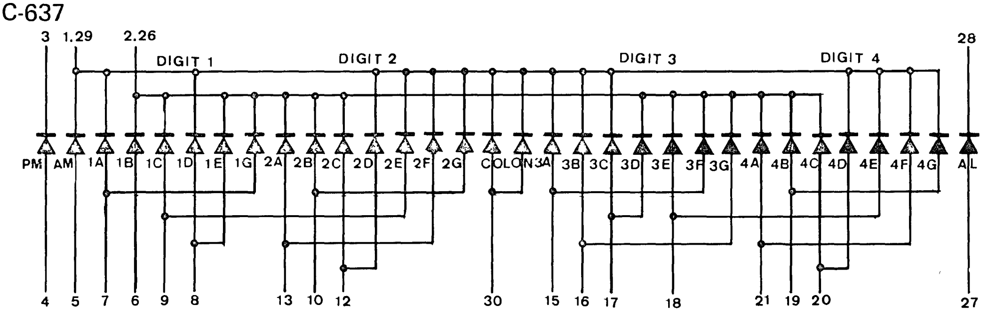
B. LTC-617



C. LTC-627

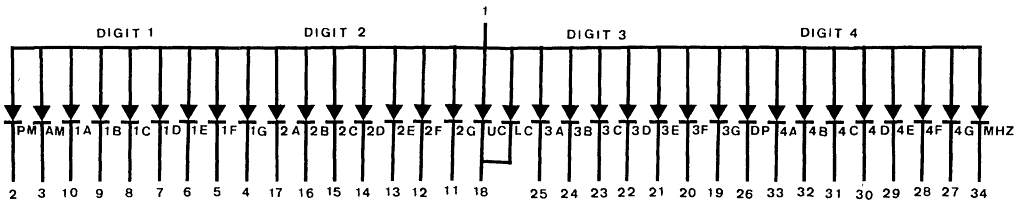


D. LTC-637



LED CLOCK & FREQUENCY DISPLAYS

E. LTC-674


1
DIGIT 1
DIGIT 2
DIGIT 3
DIGIT 4
PM AM 1A 1B 1C 1D 1E 1F 1G 2A 2B 2C 2D 2E 2F 2G UC LC 3A 3B 3C 3D 3E 3F 3G DP 4A 4B 4C 4D 4E 4F 4G MHZ
2 3 10 9 8 7 6 5 4 17 16 15 14 13 12 11 18 25 24 23 22 21 20 19 26 33 32 31 30 29 28 27 34

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	SYMBOL	BRIGHT RED	GREEN	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	20	20	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	150	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F /pulse	30	30	A
Reverse Voltage (Segment of Decimal Point)	V_R	5	5	V
Operating Temperature Range	Topr	−25°C to 60°C		
Storage Temperature Range	Tstg	−25°C to 70°C		
Derating Linear From 25°C	P_D	2.4	2.4	W
Derating Linear From 25°C		0.42	0.42	mA/°C
Max. Solder Temperature 260°C For 3 Seconds at 2 mm From The Case Or Reflector Edge				

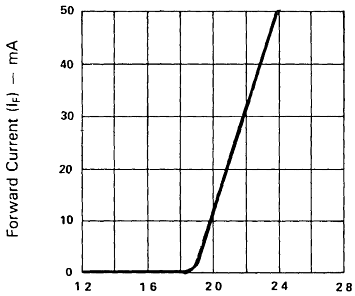
NOTE: Caution
Please be careful of the following.
1) Avoid washing the LED DISPLAY in water.
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY
Freon TE or TF
Methyl or Ethyl Alcohol
Dai-From Solvent S3 or S3-E

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	DEVICES	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intersity	Iv	BRIGHT RED	140	350		μcd	I_F = 10 mA
		GREEN	245	600			
Edge Peak Emission Wavelength	λp	BRIGHT RED		697		nm	I_F = 20 mA
		GREEN		565			
Spectral Line Half-Width	Δλ	BRIGHT RED		90		nm	I_F = 20 mA
		GREEN		30			
Forward Voltage	V_F	BRIGHT RED		2.1	2.8	V	I_F = 20 mA
		GREEN		2.1	2.8		
Reverse Current	I_R	BRIGHT RED			100	μA	V_R = 5V
		GREEN			100		
Luminous Intensity Matching Ratio	Ivm	All Model			2.1		I_F = 10 mA

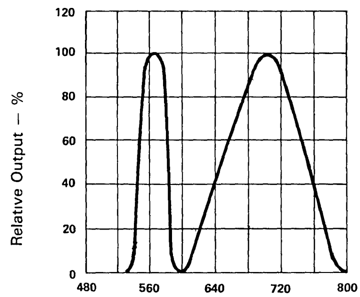
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)



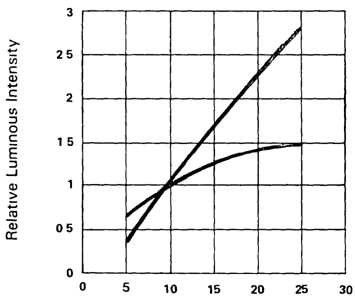
Forward Voltage (V_F) — Volts

Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



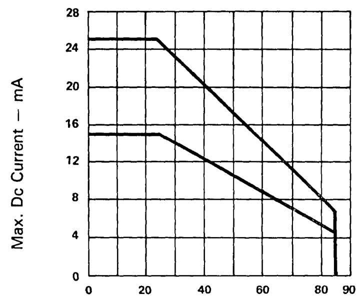
Wavelength (λ) — nm

Fig. 2 SPECTRAL RESPONSE.



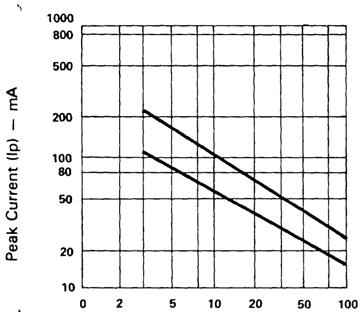
Forward Current (I_F) — mA

Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).



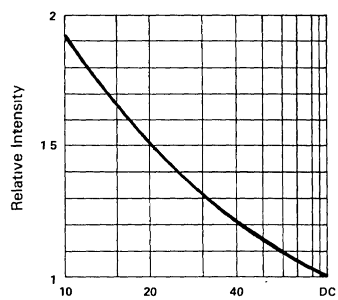
Ambient Temperature (Ta) — °C

Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG Vs AMBIENT TEMPERATURE



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE %
(REFRESH RATE – F = 1 KHz)



Duty Cycle %

Fig 6 LUMINOUS INTENSITY Vs. DUTY CYCLE %
(AVERAGE I_F = 10mA PER SEG.)

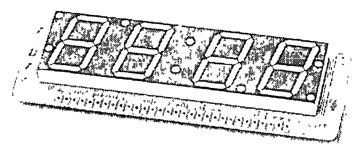
LITEON

LTC-9000 SERIES

0.9" FOUR DIGIT LED CLOCK FREQUENCY DISPLAYS

FEATURES

- 0.9 INCH (22.86mm) HEIGHT CHARACTER RED OR GREEN COLOR.
- COMMON CATHODE, COMMON ANODE; DIRECT, DUPLEX AND MULTIPLEX PIN OUT ARE AVAILABLE.
- FLEXIBLE TO SELECT BOTH 12/24 HOURS AND FULL FEATURE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST.
- LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- PRACTICAL BRIGHTNESS ARE OBTAINED AT ABOUT 8MA/SEGMENT DIRECT DRIVE· 20MA (WITH ½ DUTY RATIO) FOR DUPLEX DRIVE; 50MA (WITH 1/6 DUTY RATIO) FOR MULTIPLEX DRIVE.
- BRIGHT RED (GaP) 4 DIGIT LED COLOCK DISPLAY VERSION STANDARD SUFFIX P.



DESCRIPTION

The LTC-9000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, micro processor . . . etc.

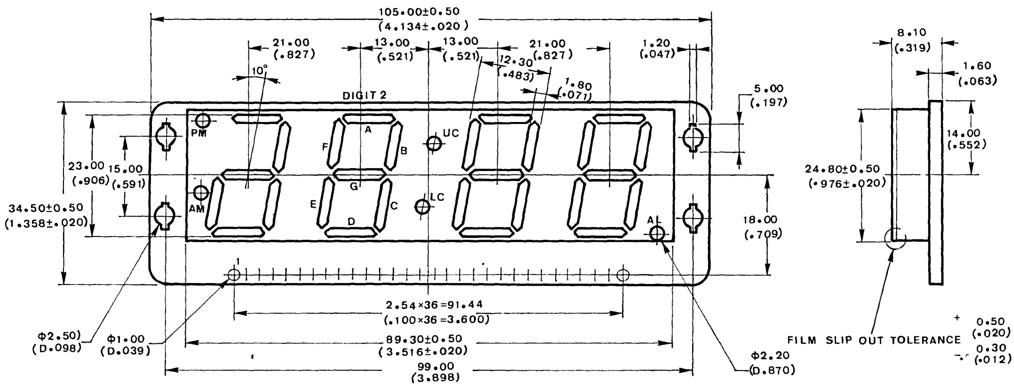
DEVICES

PART NO. LTC-	DESCRIPTION				PIN OUT				INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM/PM		
	FORM	CIRCUIT	BRIGHT RED	GREEN		UP	LOW			
937S1P-12	C.C.	DPX	V		NO		V	V/V	C	C
937S1G-12	C.C.	DPX		V	NO		V	V/V	C	C
937S1P	C.C.	DPX	V		A.G.D.E.		V	V/V	C	C
937S1G	C.C.	DPX		V	A.G.D.E.		V	V/V	C	C

NOTES 1. C.A.. common anode C.C . common cathode 2 MPX multiplex DPX. duplex D D.. direct drive

PACKAGE DIMENSIONS

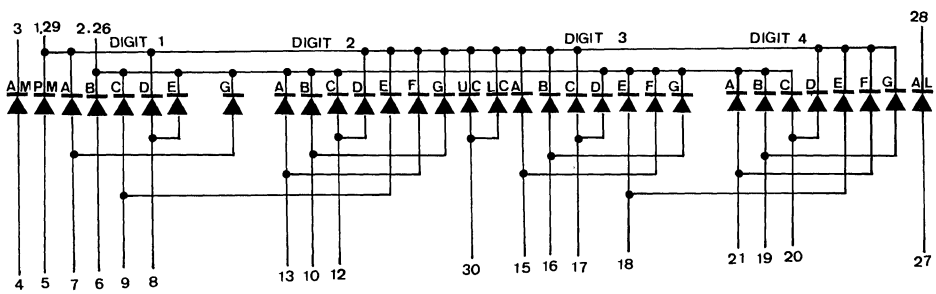
A. LTC-937S1 x Series



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

INTERNAL CIRCUIT DIAGRAM

A. LTC-937S



ABSOLUTE MAXIMUM RATINGS AT T_A = 25°C

PARAMETER	SYMBOL	MAXIMUM RATING	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	20	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F /pulse	30	mA
Reverse Voltage (Segment of Decimal Point)	V_R	5	V
Operating Temperature Range	Topr	–25°C to 60°C	
Storage Temperature Range	Tstg	–25°C to 70°C	
Derating Linear From 25°C	P_D	2.4	mW
Derating Linear From 25°C		0.42	mA/°C
Max. Solder Temperature 260°C For 3 Seconds at 2 mm From The Case Or Reflector Edge			

NOTE: Caution

Please be careful of the following.

1) Avoid washing the LED DISPLAY in water.
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY

Freon TE or TF
Methyl or Ethyl Alcohol
Dai-From Solvent S3 or S3-E

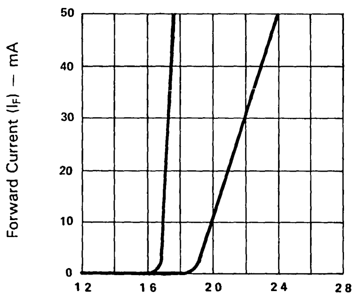
ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	135	340		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	I_F = 20 mA
Forward Voltage	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R			100	μA	V_R = 5V
Luminous Intensity Matching Ratio	Ivm			2:1		I_F = 10 mA

LED CLOCK & FREQUENCY DISPLAYS

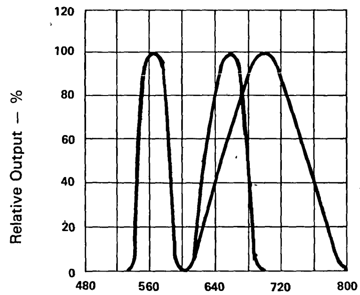
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)



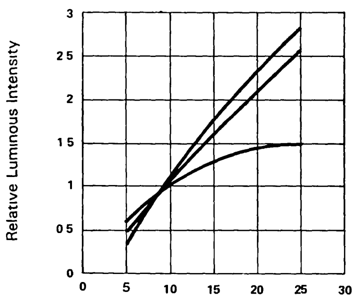
Forward Voltage (V_F) — Volts

Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.



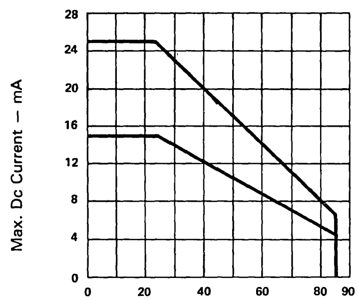
Wavelength (λ) — nm

Fig. 2 SPECTRAL RESPONSE.



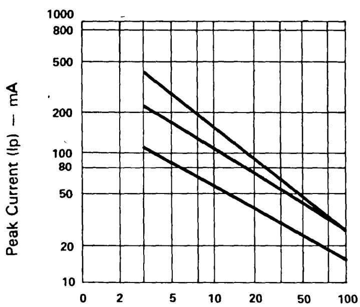
Forward Current (I_F) — mA

Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).



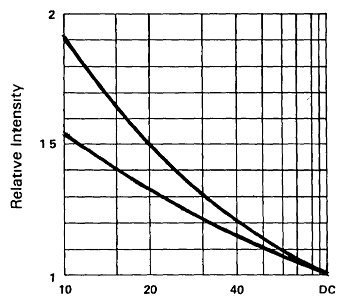
Ambient Temperature (Ta) — °C

Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.



Duty Cycle %

Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE %
(REFRESH RATE – F = 1 KHz)



Duty Cycle %

Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE %
(AVERAGE I_F = 10mA PER SEG)

LITEON

LTC-14000 SERIES

1.4" FOUR DIGIT LED CLOCK FREQUENCY DISPLAY

FEATURES

- 1.4 INCH (35.56mm) HEIGHT CHARACTER RED OR GREEN COLOR.
- COMMON CATHODE, COMMON ANODE; DIRECT, DUPLEX AND MULTIPLEX PIN OUT ARE AVAILABLE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST. LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- PRACTICAL BRIGHTNESS ARE OBTAINED AT ABOUT 8MA/SEGMENT DIRECT DRIVE; 20MA (WITH ½ DUTY RATIO) FOR DUPLEX DRIVE; 50MA (WITH $^1/_6$ DUTY RATIO) FOR MULTIPLEX DRIVE.
- BRIGHT RED (GaASP) 4 DIGIT LED CLOCK DISPLAY VERSION STANDARD.

DESCRIPTION

The LTC-14000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, micro processor . . . etc.

LED CLOCK & FREQUENCY DISPLAYS

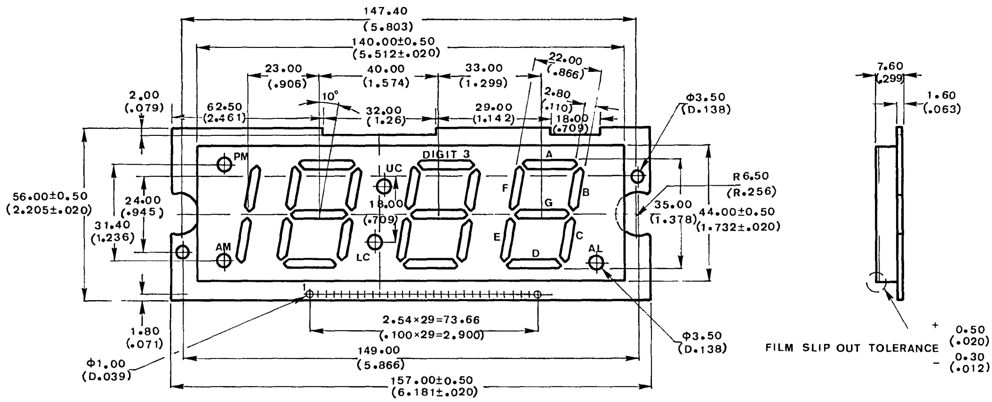
DEVICES

PART NO. LTC—	DESCRIPTION				PIN OUT			
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM/PM
	FORM	CIRCUIT	BRIGHT RED	GREEN		UP	LOW	
14501A1P-2	C.C.	DPX.	V		NO		V	V/V
14501A1G-2	C.C.	DPX		V	NO		V	V/V

NOTES: 1. C.C.: common cathode 2. DPX: d; uplex D.D.: direct drive

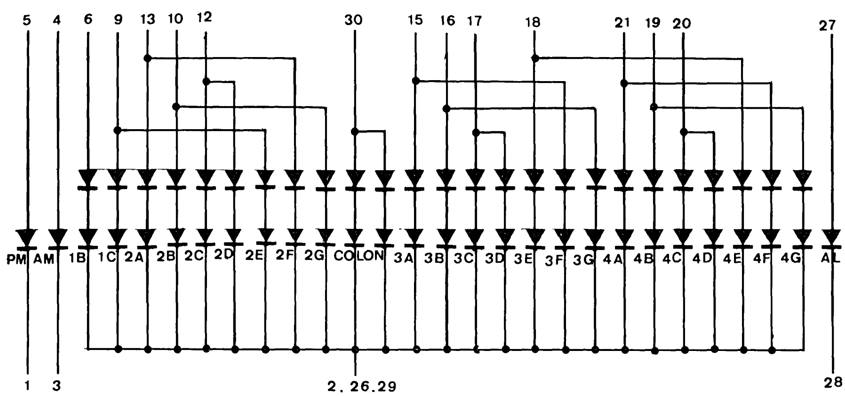
PACKAGE DIMENSIONS

LTC-14501A1 x Series



NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

INTERNAL CIRCUIT DIAGRAM



ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	SYMBOL	MAXIMUM RATING	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I	20	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F/pulse	30	mA
Reverse Voltage (Segment of Decimal Point)	V_R	5	V
Operating Temperature Range	Topr	–25°C to 60°C	
Storage Temperature Range	Tstg Tstg	–25°C to 70°C	
Derating Linear From 250°C	P_D	2.4	W
Derating Linear From 25°C		0.42	mA/°C
Max. Solder Temperature 260°C From 3 Seconds at 2mm From the Case or Rellector Edge			

NOTE: Caution

Please be careful of the following.

1) Avoid washing the LED DISPLAY in water.
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY

Freon TE or TF
Methyl or Ethyl Alcohol
Dai-Fron Solvent S3 or S3-E

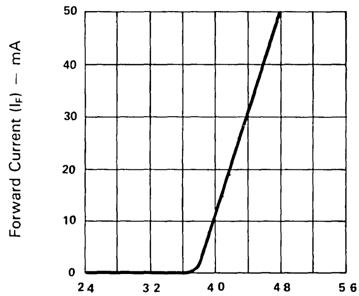
ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	245	600		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R			100	μA	V_R = 5V
Liminous Intensity Matching Ratio	Ivm			2·1		I_F = 10 mA

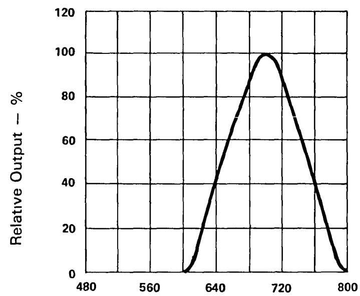
LED CLOCK & FREQUENCY DISPLAYS

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

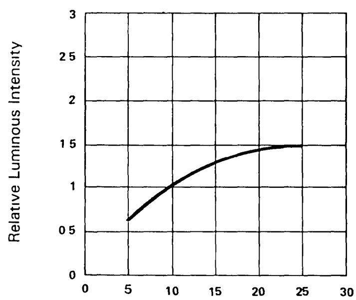
(25°C Ambient Temperature Unless Otherwise Noted)



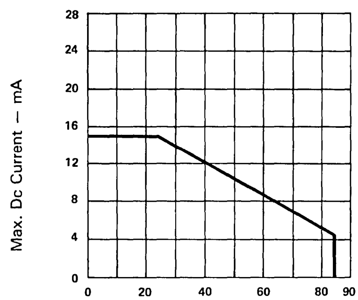
Forward Voltage (V_F) — Volts
Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE



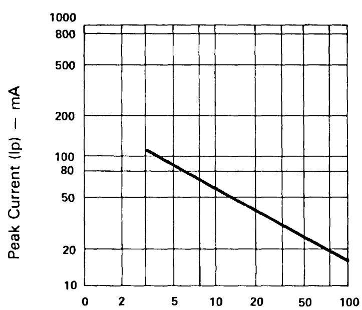
Wavelength (λ) — nm.
Fig. 2 SPECTRAL RESPONSE.



Forward Current (I_F) — mA
Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT)



Ambient Temperature (Ta) — °C
Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.



Duty Cycle %
Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE %
(REFRESH RATE – F = 1 KHz)

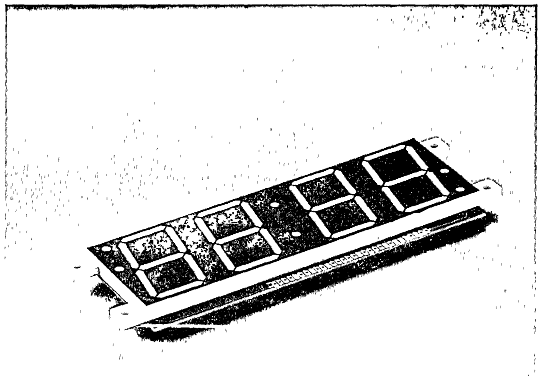
LITEON

LTC-18000 SERIES

1.8" FOUR DIGIT LED CLOCK FREQUENCY DISPLAY

FEATURES

- 1.8 INCH (45.72mm) HEIGHT CHARACTER RED OR GREEN OR GREEN COLOR.
- COMMON CATHODE, COMMON ANODE; DIRECT, DUPLEX AND MULTIPLEX PIN OUT ARE AVAILABLE.
- FLEXIBLE TO SELECT BOTH 12/24 HOURS AND FULL FEATURE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST. LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- PRACTICAL BRIGHTNESS ARE OBTAINED AT ABOUT 8MA/SEGMENT DIRECT DRIVE; 20MA (WITH ½ DUTY RATIO) FOR DUPLEX DRIVE; 50MA (WITH 1/6 DUTY RATIO) FOR MULTIPLEX DRIVE.
- BRIGHT RED (GaP) 4 DIGIT LED COLOCK DISPLAY VERSION STANDARD SUFFIX P.



DESCRIPTION

The LTC-18000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, micro processor . . . etc.

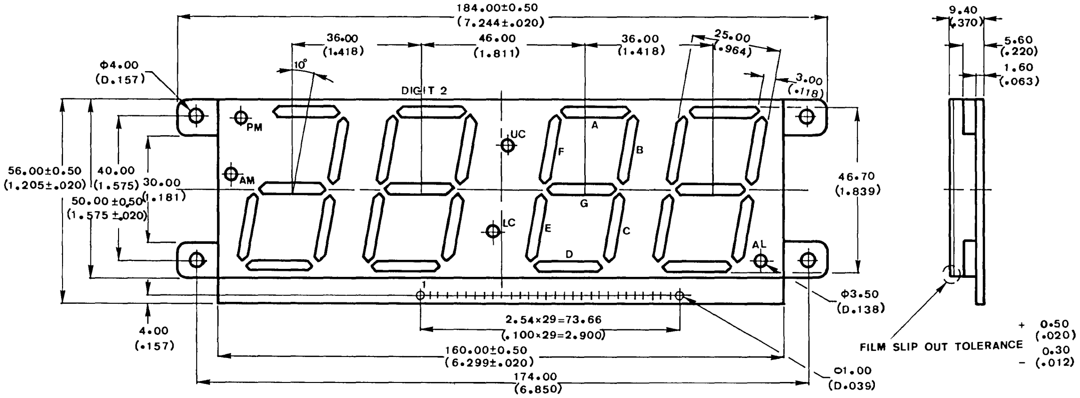
DEVICES

PART NO. LTC–	DESCRIPTION				PIN OUT				INTERNAL CIRCUIT DIAGRAM	PACKAGE DIMENSION
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM/PM		
	FORM	CIRCUIT	BRIGHT RED	GREEN		UP	LOW			
18501A1P	C.C	DPX	V		A G D E.		V	V/V	A	A
18501A1G	C C.	DPX		V	A G D.E		V	V/V	A	A
18501A1P-2	C C	DPX	V		NO		V	V/V	A	A
18501A1G-2	C.C	DPX		V	NO		V	V/V	A	A
18501A1P-4	C.C.	DPX	V		A.G.D.E.		V		A	A
18501A1G-4	C C	DPX		V	A.G.D.E.		V		A	A
1867TA1P-2	C.C.	D.D.	V		NO		V	/V	B	B
1867TA1G-2	C.C	D.D.		V	NO		V	/V	B	B

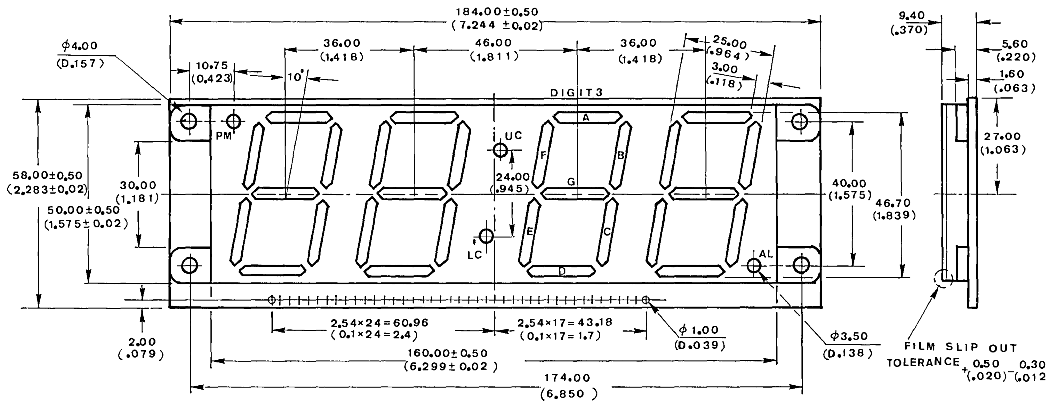
NOTES· 1. C.C · common cathode 2. DPX. duplex D.D. direct drive

PACKAGE DIMENSION

LTC-18501A1 x Series



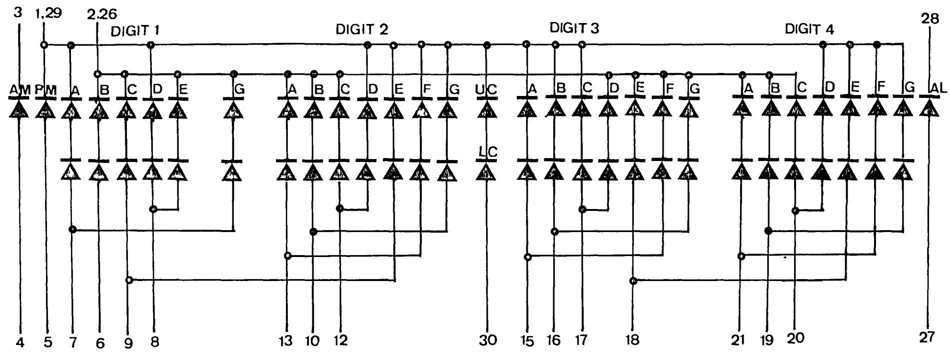
LTC-1867A1 x Series



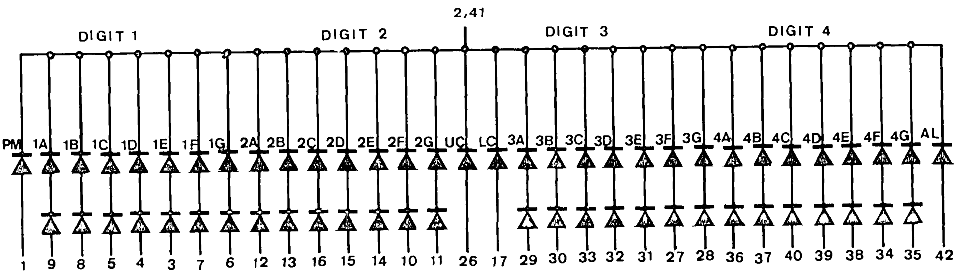
NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance is $\frac{0.25\text{mm}}{0.010''}$ unless otherwise noted.

INTERNAL CIRCUIT DIAGRAM

A. LTC-18501A



B. LTC-1867T



LED CLOCK & FREQUENCY DISPLAYS

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	SYMBOL	MAXIMUM RATING	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	20	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F/pulse	30	mA
Reverse Voltage (Segment of Decimal Point)	V_R	5	V
Operating Temperature Range	Topr	–25°C to 60°C	
Storage Temperature Range	Tstg	–25°C to 70°C	
Derating Linear From 250°C	P_D	2.4	W
Derating Linear From 25°C		0.42	mA/°C
Max. Solder Temperature 260°C for 3 Seconds at 2 mm From The Case or Rellector Edge			

NOTE: Caution

Please be careful of the following.

1) Avoid washing the LED DISPLAY in water.
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY

From TE or TF
Methyl or Ethyl Alcohol
Dai-From Solvent S3 or S3-E

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	270	670		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	$\Delta\lambda$		90		nm	I_F = 20 mA
Forward Voltage	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R			100	μA	V_R = 5V
Liminous Intensity Matching Ratio	Ivm			2:1		I_F = 10 mA

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

(25°C Ambient Temperature Unless Otherwise Noted)

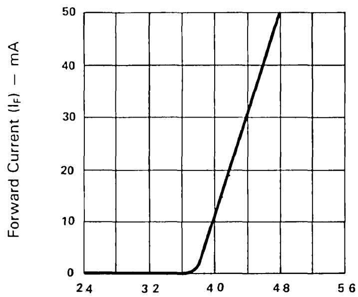


Fig 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

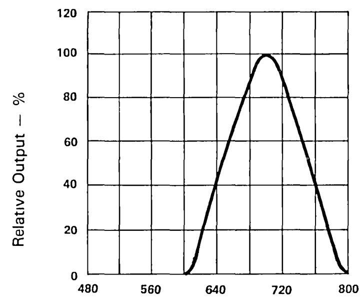


Fig. 2 SPECTRAL RESPONSE

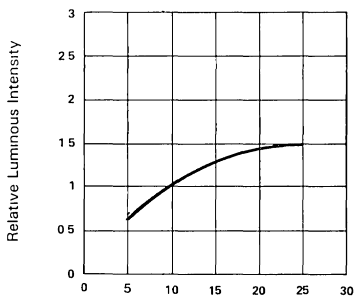


Fig 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).

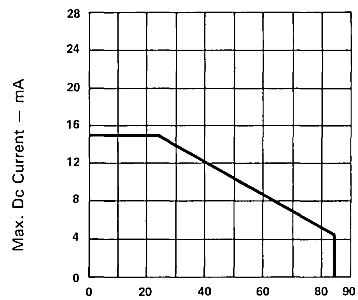


Fig. 4 MAX ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE

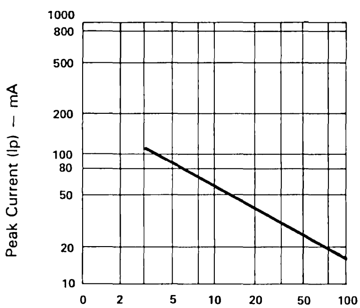


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE % (REFRESH RATE – F = 1 KHz)

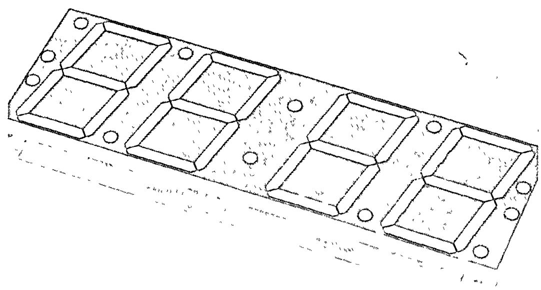
LITEON

LTC-25000 SERIES

2.5" FOUR DIGIT LED CLOCK FREQUENCY DISPLAY

FEATURES

- 2.5 INCH (63.5mm) HEIGHT CHARACTER RED OR GREEN OR GREEN COLOR.
- COMMON CATHODE, COMMON ANODE; DIRECT, DUPLEX AND MULTIPLEX PIN OUT ARE AVAILABLE.
- CONTINUOUS UNIFORM SEGMENTS.
- WIDE ANGLE, LONG DISTANCE VIEWING.
- COLOR FILTER PROVIDES HIGH CONTRAST. LOW POWER REQUIREMENTS, HIGH RELIABILITY AND LONG LIFE.
- PRACTICAL BRIGHTNESS ARE OBTAINED AT ABOUT 8MA/SEGMENT DIRECT DRIVE; 20MA (WITH 1/2 DUTY RATIO) FOR DUPLEX DRIVE; 50MA (WITH 1/6 DUTY RATIO) FOR MULTIPLEX DRIVE.
- BRIGHT RED (GaP) 4 DIGIT LED COLOCK DISPLAY VERSION STANDARD SUFFIX P.



DESCRIPTION

The LTC-25000 Series devices are designed for viewing distance of up to two meters and for using in instrument, test equipment, communication equipment, business machines, computers, micro processor . . . etc.

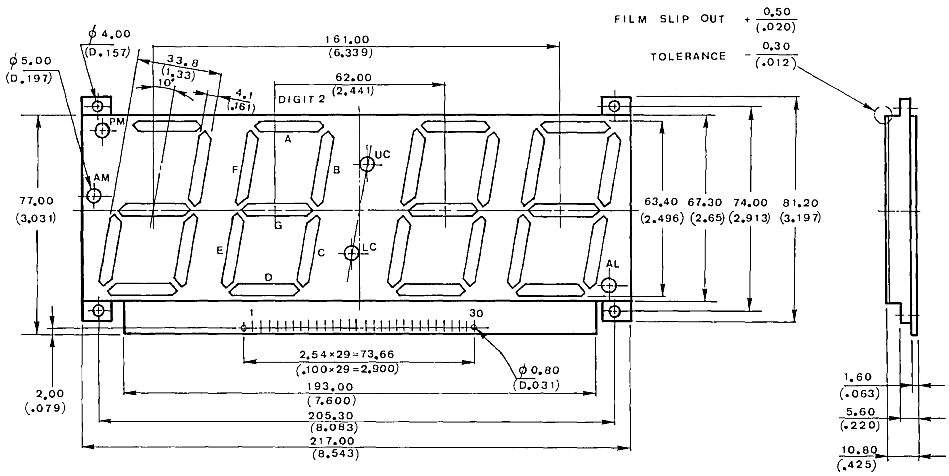
DEVICES

PART NO. LTF-	DESCRIPTION				PIN OUT			
	DRIVE		COLOR		SEG A.G.D. E.F. OF 1ST DIGIT	ALARM		AM / PM
	FORM	CIRCUIT	BRIGHT RED	GREEN		UP	LOW	
LTC-25501PAK	C.C	DPX	V		A.G.D.E.		V	V/V
LTC-25601PAK	C.A.	MPX	V		YES		V	V

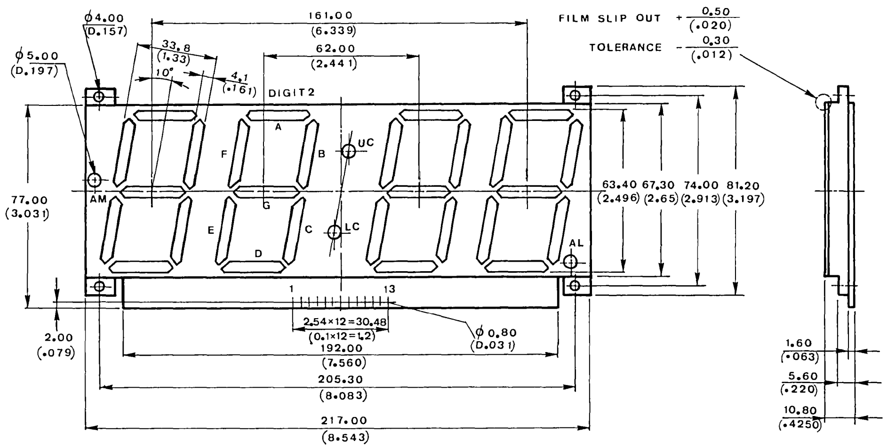
NOTES. 1 C.C common cathode C A . common anode 2 MPX multiplex DPX. duplex

PACKAGE DIMENSIONS

A. LTC-25501 Series



B. LTC-25601 Series

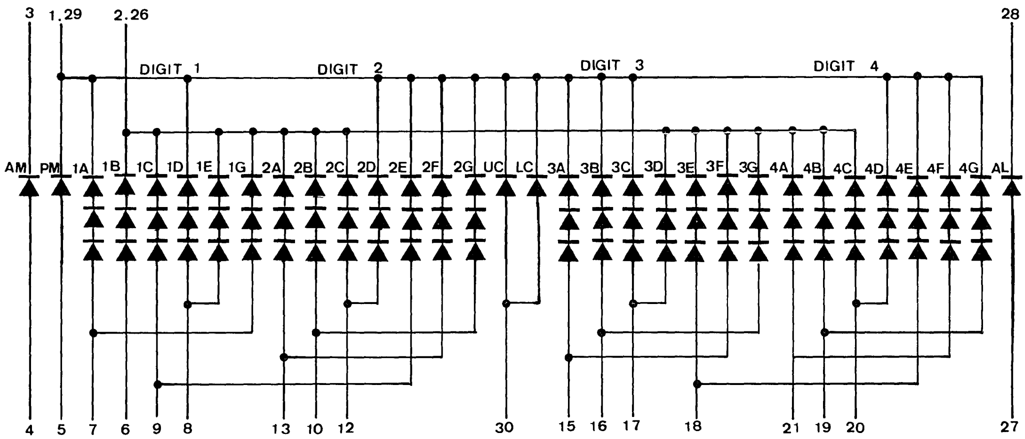


NOTE: All dimensions are in $\frac{\text{millimeters'}}{\text{(inches)}}$ tolerance is $\frac{0.25\text{mm}}{(0.010'')}$ unless otherwise noted.

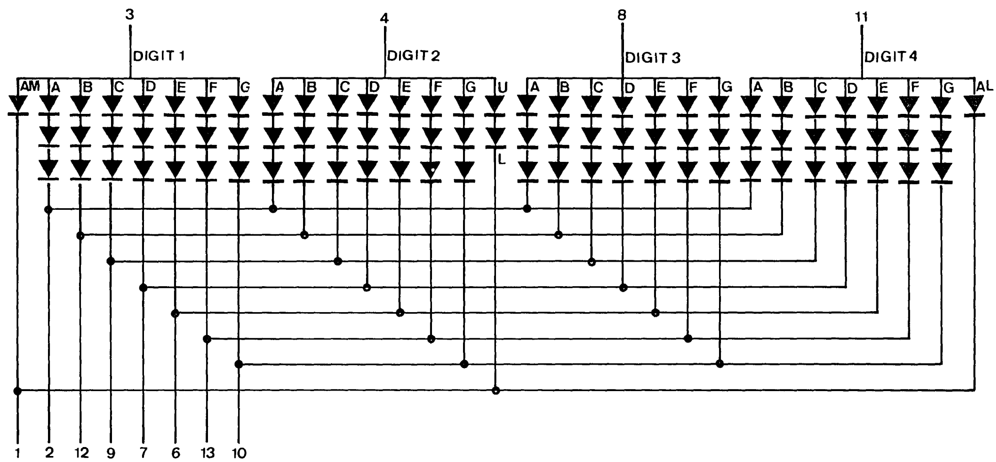
LED CLOCK & FREQUENCY DISPLAYS

INTERNAL CIRCUIT DIAGRAM

A. LTC-25501 Series



B. LTC-25601 Series



NOTES: All dimensions are in $\frac{\text{millimeters}}{\text{(inches.)}}$, Tolerance is $\frac{\pm 0.25\text{mm}}{(.010'')}$ unless otherwise noted.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25°C$

PARAMETER	SYMBOL	MAXIMUM RATING	UNIT
Average Forward Current Per Segment/D.P. Direct Drive Current	I_{CF}	20	mA
Peak Forward Current Per Segment/D.P. (Duty 1/10 1 KHz)	I_{PF}	150	mA
Continuous Forward Current Duplex Circuit (Duty 1/2)	I_F /pulse	30	mA
Reverse Voltage (Segment of Decimal Point)	V_R	5	V
Operating Temperature Range	Topr	−25°C to 60°C	
Storage Temperature Range	Tstg	−25°C to 70°C	
Derating Linear From 25°C	P_D	2.4	mW
Derating Linear From 25°C		0.42	mA/°C
Max. Solder Temperature 260°C for 3 Seconds at 2 mm From The Case or Reflector Edge			

NOTE. Caution

Please be careful of the following.

1) Avoid washing the LED DISPLAY in water
2) Except for the printed wiring board, Avoid heating the LED DISPLAY over MAXIMUM RATING.
3) Avoid using chemicals except for the following, when washing off flux and wiping off stain on surface of the LED DISPLAY

From TE or TF
Methyl or Ethyl Alcohol
Dai-From Solvent S3 or S3-E

ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25°C$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	Iv	270	670		μcd	I_F = 10 mA
Peak Emission Wavelength	λp		697		nm	I_F = 20 mA
Spectral Line Half-Width	Δλ		90		nm	I_F = 20 mA
Forward Voltage	V_F		2.1	2.8	V	I_F = 20 mA
Reverse Current	I_R			100	μA	V_R = 5V
Liminous Intensity Matching Ratio	Ivm			2.1		I_F = 10 mA

TYPICAL ELECTRICAL CHARACTERISTIC CURVES

25°C Ambient Temperature Unless Otherwise Noted)

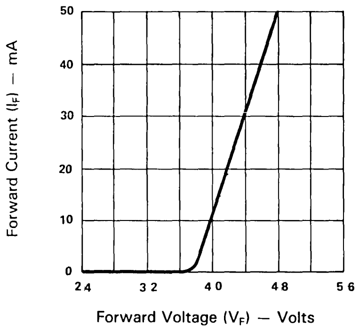


Fig 1 FORWARD CURRENT Vs FORWARD VOLTAGE.

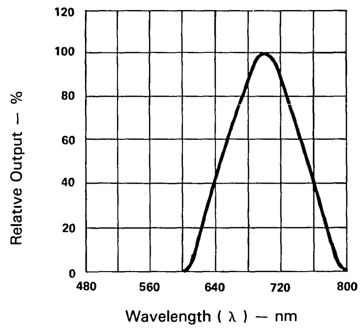


Fig. 2 SPECTRAL RESPONSE

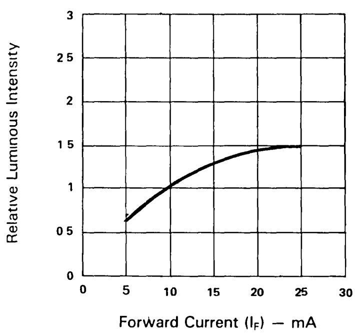


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs FORWARD CURRENT (PER SEGMENT).

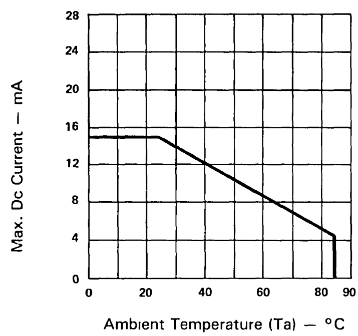


Fig 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

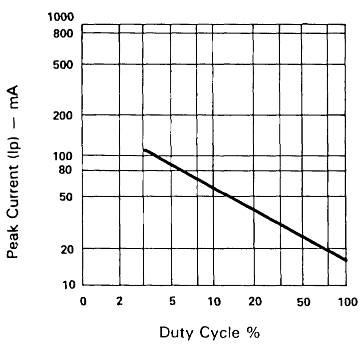
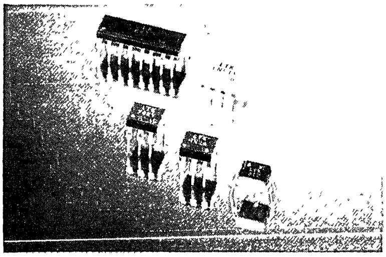


Fig 5 MAX PEAK CURRENT Vs DUTY CYCLE.% (REFRESH RATE – F = 1 KHz)

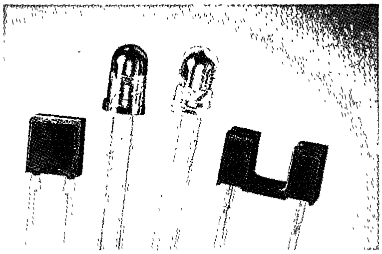
Y: Yellow R: Red P: Bright Red G: Green O: Orange

LITON'S PRODUCTS

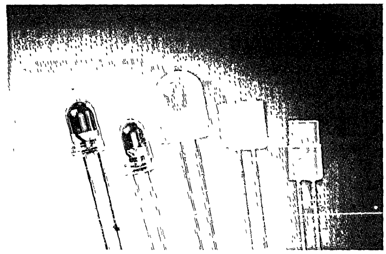
OPTO DIVISION



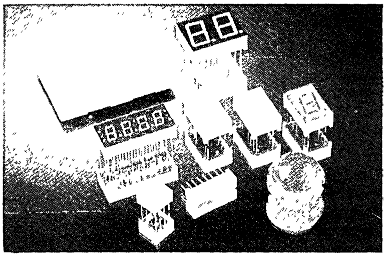
PHOTOCOUPLERS



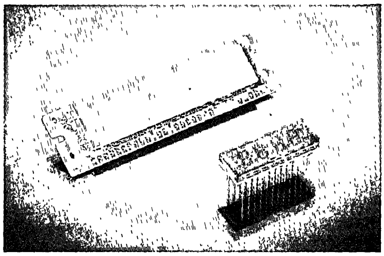
INFRARED PRODUCT



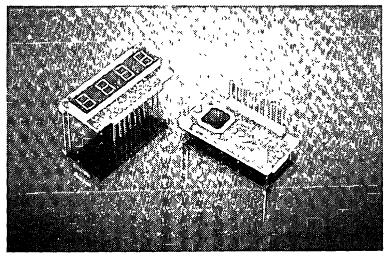
LED LAMP



NUMERIC & SPECIAL DISPLAY

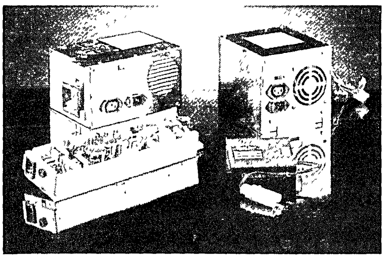


CLOCK DISPLAY

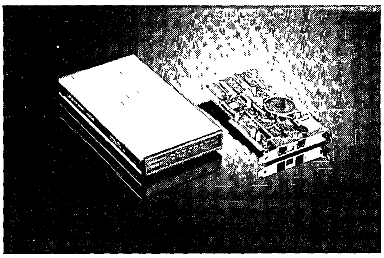


NUMERIC DISPLAY WITH DRIVER IC BUILT-IN

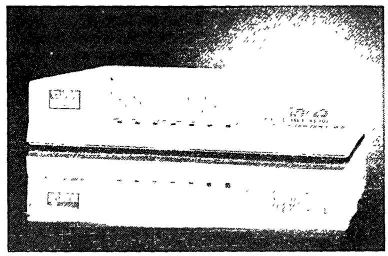
MICOM DIVISION



SWITCHING POWER SUPPLY

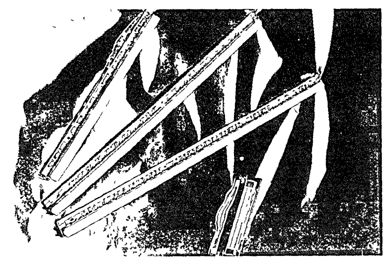


MODEM

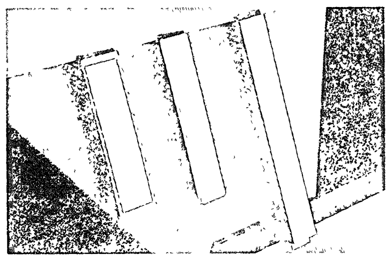


CLOCK MODULE

MOVING SIGN



LIGHT SOURCE



LCD BACK LIGHT

THE LITON GROUP

SILITEK CORP.

- Rubber products: rubber keypad, zebra connector, heat sink insulator
- Connector products: slot, computer, parts, cable assembly
- Precision components: precision, mechanical parts
- Plastic products: reflector, chip tray, electronic parts
- Electronic products: music module, panel assembly
- C & C products: keyboard, mouse
- Semiconductor products: silicon wafer, rectifier, bridge rectifier

ARTEK CORP.

- Home Stereo
- Audio Appliance
- Answer Machine
- Pager
- Facsimile
- Laptop PC

KO SHENG ENTERPRISES CO., LTD.

- Double-Sided PCB
- Multi-Layer PCB (Up to 10 layer capability)

LITE-ON INC.

- Importer/Exporter Electronic/Electronic Parts
- Off-Shore Production Service
- Manufacturer & Exporter Office Communication Systems
- Processor & Software
- Fax Card
- FP-20 Fax Box.
- Modem

LITE-ON TECHNOLOGY CORP.

- VGA Color Monitor

ALABAMA

Beacon Electronic Association
7501 Memorial Parkway
Suite 105
Huntsville, AL 35802
Tel 205-881-5031
Fax 205-883-9516

ARIZONA

System Sales of Arizona
540 West Iron Suite 106
Mesa, AZ 85210
Tel 602-464-9989
Fax 602-464-9701

ARKANSAS

Ram Electronics Sales Inc.
400 Chisolm Place Suite 418
Plano, TX 75075
Tel 214-424-4455
Fax 214-424-7078

CALIFORNIA

Quadrep Inc.
2713 N First Street
San Jose, CA 95134
Tel 408-432-3300
Fax 408-432-3428

Quadrep Southern
28720 Roadside Drive
Suite 227
Agoura, CA 91301
Tel 818-597-0222
Fax 818-597-1116

CALIFORNIA (CONT)

Quadrep Southern
4 Jenner Street #120
Irvine, CA 92718
Tel 714-727-4222
Fax 714-727-4033

Quadrep Southern
7585 Ronson Road
Suite 100
San Diego, CA 92111
Tel 619-560-8330
Fax 619-560-9156

CANADA

Blakewood Associates
1A-12880 Bathgate Way
Richmond, B C V6V 1Z4
Tel 604-273-9910
Fax 604-273-1403

Designtronics
5-B Zalois Bay Suite 3
Pointe Claire, Quebec, H9S 5H3
Tel 514-695-3124
Fax. 514-695-5823

Designtronics
5 Edvac Drive Unit 1
Brampton, Ontario L6S 5P3
Tel 416-793-5155
Fax 416-793-5170

COLORADO

Candal, Inc.
7500 W Mississippi Avenue
A-2
Lakewood, CO 80226
Tel 303-935-7128
Fax 303-935-7310

CONNECTICUT

Gerber Sales
399 Farm Hill Road
Middletown, CT 06457
Tel 203-347-3000

DELAWARE

Tech. Sales Associates
Executive Mews Ste. J-52
2300 Computer Avenue
Willow Grove, PA 19090
Tel 215-784-0170
Fax 215-784-9201

FLORIDA

Beacon Electronic Association
1843 State Road 434
Suite 215
Longwood, FL 32750
Tel 407-332-1940
Fax 407-332-1786

Beacon Electronic Association
6401 Congress Avenue
Suite 245
Boca Raton, FL 33487
Tel 407-997-5740
Fax 305-994-4518

GEORGIA

Beacon Electronic Association
5881 Glenridge Drive
Suite 230
Atlanta, GA 30328
Tel 404-256-9640
Fax 404-256-1398

IDAHO

QR/Crown Inc.
375 118th Ave Ste 110
Bellevue, WA 98007
Tel 206-453-5100
Fax. 206-646-8775

ILLINOIS

Circuit Sales Inc.
650 E Devon Avenue
Itasca, IL 60143
Tel. 312-773-0200
Fax: 312-773-2721

INDIANA

Corrao Marsh, Inc.
6211 Stoney Creek Drive
Fort Wayne, IN 46825
Tel 219-482-2725
Fax. 219-484-7491

Corrao Marsh, Inc.
3117 West U S 40
Greenfield, IN 46140
Tel. 317-462-4446
Fax 317-462-6568

IOWA

Hitec Central Inc.
1644 26th Street NW
Cedar Rapids, IA 52405
Tel 319-396-3228
Fax 319-396-8025

KANSAS

Hi-tec Central, Inc.
803 Choctaw
Independence, MO 64056
Tel 816-796-6684
Fax 816-796-6562

KENTUCKY

Corrao Marsh, Inc.
6211 Stoney Creek Drive
Fort Wayne, IN 46825
Tel 219-482-2725
Fax 219-484-7491

LOUSIANA

Ram Electronic Sales
400 Chisolm Place Suite 418
Plano, TX 75075
Tel 214-424-4455
Fax 214-424-7078

MAINE

Gerber Sales
28 Blanchard Road
Burlington, MA 01803
Tel 617-229-1150
Fax 617-272-0203

MARYLAND

Third Wave Solutions
8335 H Guilford Road
Glen Burnie, MD 21046
Tel 301-290-5990

MASSCHUSSETTS

Gerber Sales
28 Blanchard Road
Burlington, MA 01803
Tel 617-229-1150
Fax 617-272-0230

MICHIGAN

AP Associates
810 E Grand River Road
Brighton, MI 48116
Tel 313-229-6550
Fax 313-229-9256

MINNESOTA

Comstrand
2852 Anthony Lane South
Minneapolis, MN 55418
Tel 612-788-9234
Twx 901-629-5337
Fax 612-788-7218

MISSOURI

Hi-tec Central Inc.
3466 Bridgeland Drive
Bridgeton, Mo 63044
Tel 314-291-5920
Fax 314-291-5713

Hi-tec Central, Inc.
803 Choctaw
Independence, MO 64056
Tel 816-796-6684
Fax 816-796-6562

MONTANA

QR/Crown, Inc.
375 118th Ave Ste 110
Bellevue, WA 98007
Tel 206-453-5100
Fax 206-646-8775

NEBRASKA

Hi-tec Central, Inc.
803 Choctaw
Independence, MO 64056
Tel 816-796-6684
Fax 816-796-6562

NEVADA/NORTH

Quadrep Inc.
2613 N First Street
San Jose, CA 95134
Tel 408-432-3300
Fax 408-432-3428

NEVADA/SOUTH

System Sales of Arizona
540 West Iron Ste 106
Mesa, AZ 85210
Tel 602-464-9989
Fax 602-464-9701

NEW HAMPSHIRE

Gerber Sales
28 Blanchard Road
Burlington, MA 01803
Tel 617-229-1150
Fax 617-272-0203

NEW JERSEY

R.O.I. Sales Company
1 Route 46 West
Totowa, NJ 07512
Tel 201-812-9606
Fax 201-812-9058

NEW MEXICO

System Sales of Arizona
2403 San Mateo, NE Suite-W5
Albuquerque, NM 87110
Tel 505-889-2901
Fax 505-889-2749

NEW YORK

Mullahy-Welch Sales
98 Fairview Crescent
Rochester, NY 14617
Tel 716-244-1100
Fax 716-266-7126

Mullahy-Welch Sales
37A South Street
Marcellus, NY 13108
Tel 315-673-1009
Fax 315-673-4428

R.O.I. Sales
1 Route 46 West
Totowa, NJ 07512
Tel 201-812-9606
Fax 201-812-9058

NORTH CAROLINA

Beacon Electronic Association
2100 Wycliffe Ste 204
Raleigh, NC 27607
Tel 919-787-0330
Fax 919-781-8431

NORTH DAKOTA

Comstrand
2852 Anthony Lane South
Minneapolis, MN 55418
Tel 612-788-9234
Twx 901-629-5337
Fax 612-788-7218

OHIO

Sales Plus
7575 Tyler
Mentor, OH 44060
Tel 216-942-7811
Fax 216-942-7643

LITE-ON REPRESENTATIVES

Sales Plus
8458 Invergordon
Dublin, OH 43017
Tel 614-889-8362
Fax 614-889-8362

OKLAHOMA

Ram Electronic Sales
400 Chisolm Place Suite 418
Plano, TX 75075
Tel 214-424-4455
Fax 214-424-7078

OREGON

QR/Crown Inc.
17020 SW Upper Boones Ferry
Suite 202
Portland, OR 97224
Te, 503-620-8320
Fax 503-639-4023

PENNSYLVANIA

Tech Sales Association
Executive Mews Suite J-52
2300 Computer Avenue
Willow Grove, PA 19090
Tel 215-784-0170
Fax 215-784-9201

PUERTO RICO

Beach Electronic Associates, Inc.
Airlines Building
Avenue de Diego
Suite 500
Santurce, Puerto Rico
Tel 809-728-5040
Fax 809-728-5180

RHODE ISLAND

Gerber Sales
28 Blanchard Road
Burlington, MA 01803
Tel 617-229-1150
Fax 617-272-0203

SOUTH CAROLINA

Beacon Electronic Assoc.
2100 Wycliffe Ste 204
Raleigh, NC 27607
Tel. 919-787-0330
Fax 919-781-8431

SOUTH DAKOTA

Comstrand
2852 Anthony Lane South
Minneapolis, MN 55418
Tel 612-788-9234
Twx 901-629-5337
Fax 612-788-7218

TENNESSEE

Beacon Electronic Assoc.
701 Cedar Lane Ste 77
Knoxville, TN 37912
Tel 615-689-2141
FaX 615-689-2153

TEXAS

Ram Electronics Sales Inc.
400 Chisolm Place Suite 418
Plano, TX 75075
Tel 214-424-4455
Fax 214-424-7078

TEXAS (CONT)

Ram Electronic Sales
11044 Research Blvd
Building B, Suite 280
Austin, TX 78759
Tel· 512-345-2982
Fax 512-345-1948

Ram Electronic Sales
17314 FM249 Suite 232B
Houston, TX 77060
Tel 713-855-0768
Fax 713-444-3563

UTAH

Taylor Marketing
1405 S 7500 W
Ogden, UT 84404
Tel 801-546-9570
Fax 801-546-9590

VERMONT

Gerber Sales
28 Blanchard Road
Burlington, MA 01803
Tel 617-229-1150
Fax 617-272-0203

VIRGINIA

Third Wave Solutions
8335 H Guilford Road
Glen Burnie, MD 21046
Tel 301-290-5590

WASHINGTON

QR/Crown, Inc.
375 118th Ave Ste 110
Bellevue, WA 98007
Tel 206-435-5100
Fax 206-646-8775

WEST VIRGINIA

Sales Plus
7575 Tyler
Mentor, OH 44060
Tel 216-942-7811
Fax 216-942-7643

WISCONSIN

Circuit Sales
16535 W Bluemound Road #208
Brookfield, WI 53005
Tel 414-784-7773
Fax 414-784-4529

LITE-ON INC.

Semiconductor Division
720 S. Hillview Drive
Milpitas, CA 95035
Tel : (408) 946-4873
Fax: (408) 942-1527

First Edition, July, 1990