



PHOTOCOUPLER PS8502L1, PS8502L2

HIGH SPEED ANALOG OUTPUT TYPE 8 mm CREEPAGE 8-PIN PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS8502L1 and PS8502L2 are 8-pin high speed photocouplers containing a GaAIAs LED on input side and a PN photodiode and a high speed amplifier transistor on output side on one chip. The PS8502 is in a plastic DIP (Dual In-line Package) with 8 mm creepage distance product.

The PS8502L1 is lead bending type for long creepage distance.

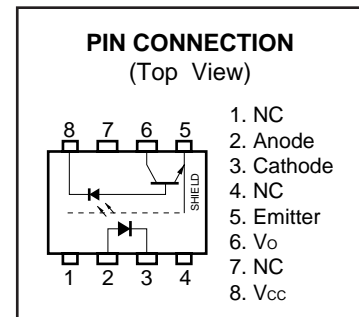
The PS8502L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

FEATURES

- High common mode transient immunity ($CM_H, CM_L = \pm 15 \text{ kV}/\mu\text{s}$ MIN.)
- High supply voltage ($V_{CC} = 35 \text{ V MAX.}$)
- High speed response ($t_{PHL}, t_{PLH} = 0.8 \mu\text{s MAX.}$)
- High isolation voltage ($BV = 5\,000 \text{ Vr.m.s.}$)
- TTL, CMOS compatible with a resistor
- Ordering number of tape product : PS8502L2-E3 : 1 000 pcs/reel
- Pb-Free product
- Safety standards
 - UL approved: File No. E72422
 - CSA approved: No. CA 101391
 - BSI approved: No. 8937, 8938
 - SEMKO approved: No. 611507
 - NEMKO approved: No. P06206685
 - DEMKO approved: No. 313935
 - FIMKO approved: No. FI 22827
 - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)

APPLICATIONS

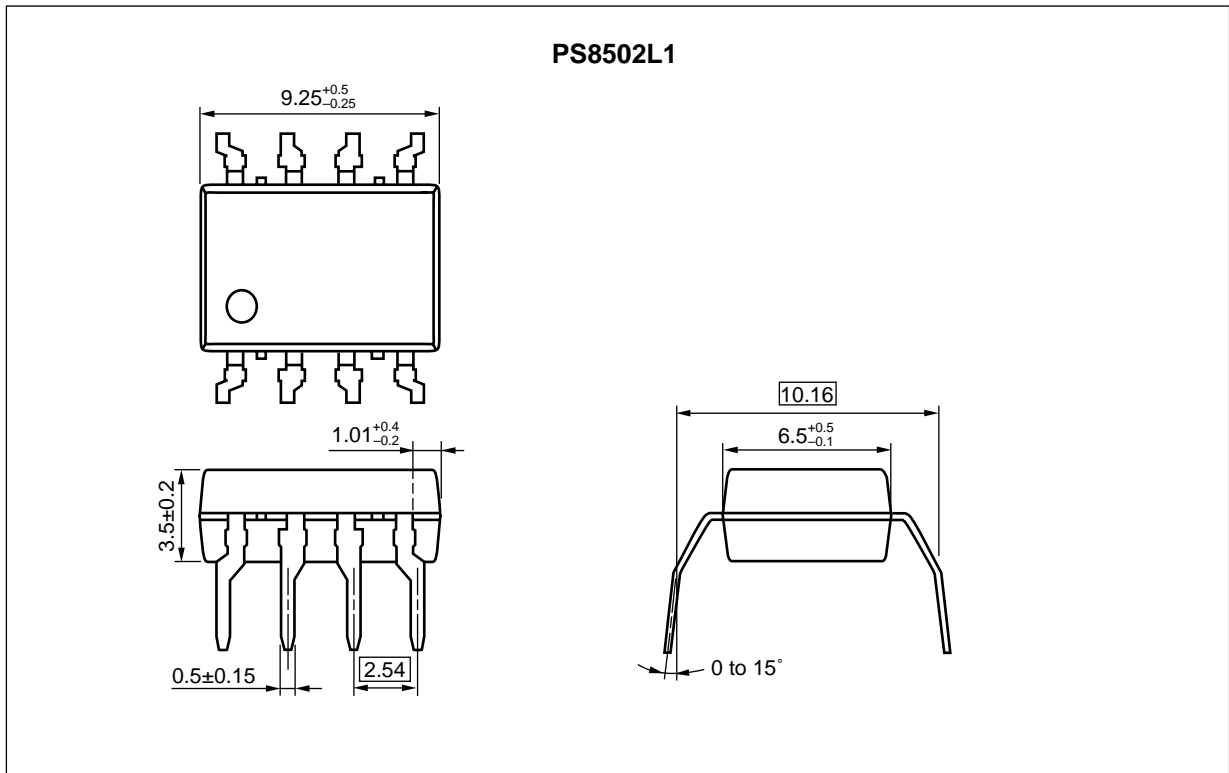
- Interface for measurement or control equipment
- Substitutions for relays and pulse transformers
- Modem, communications device
- General purpose inverter



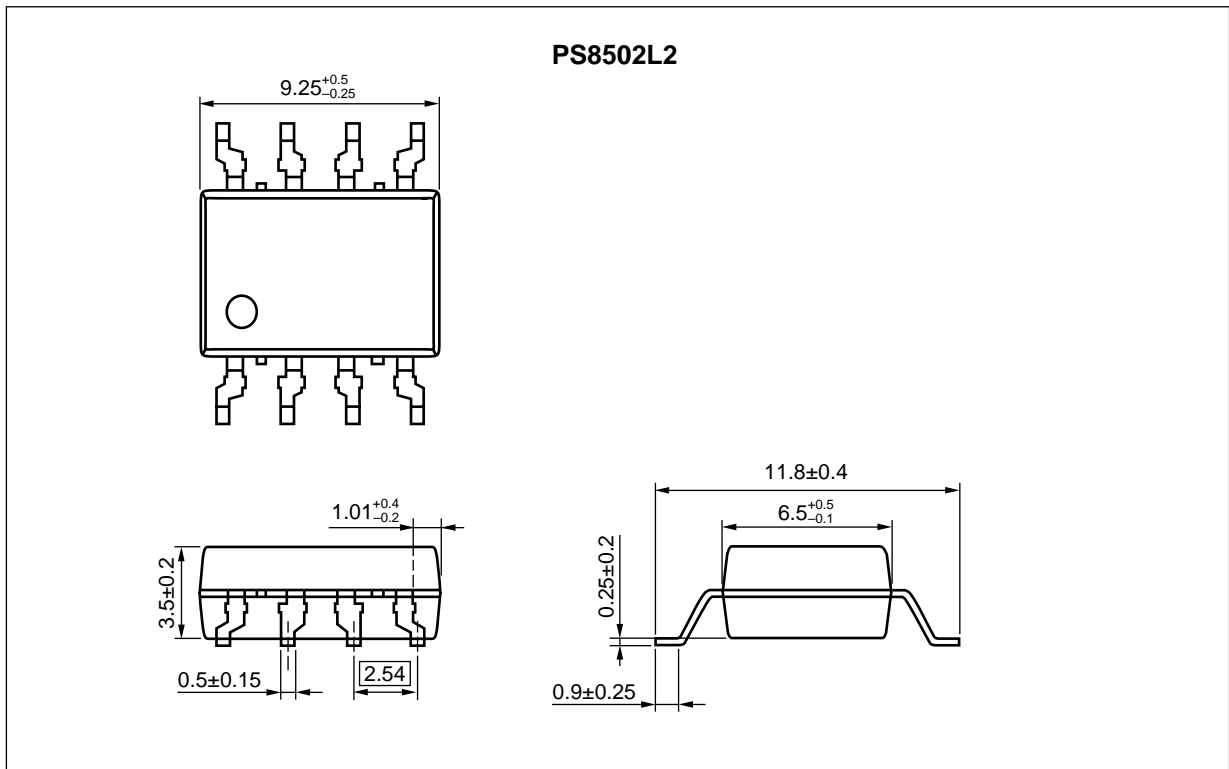
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PACKAGE DIMENSIONS (UNIT: mm)

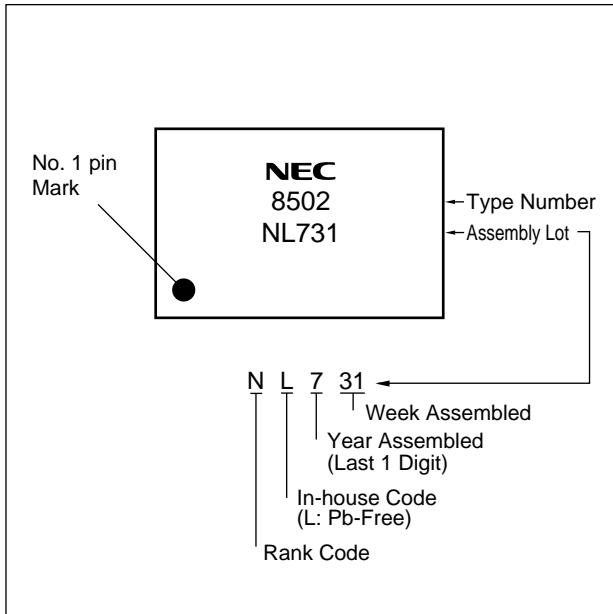
Lead Bending Type For Long Creepage Distance



Lead Bending Type For Long Creepage Distance (Gull-wing) For Surface Mount



MARKING EXAMPLE



PHOTOCOUPLER CONSTRUCTION

Parameter	Unit (MIN.)
Air Distance	8 mm
Outer Creepage Distance	8 mm
Isolation Distance	0.4 mm

ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number ^{*1}
PS8502L1	PS8502L1-AX-A	Pb-Free (Ni/Pd/Au)	Magazine case 50 pcs	Standard products (UL, CSA, BSI, SEMKO, NEMKO, DEMKO, FIMKO approved)	PS8502L1
PS8502L2	PS8502L2-AX-A		Embossed Tape 1 000 pcs/reel		
PS8502L2-E3	PS8502L2-E3-AX-A			Magazine case 50 pcs	
PS8502L1-V	PS8502L1-V-AX-A		Embossed Tape 1 000 pcs/reel		Approved (Option)
PS8502L2-V	PS8502L2-V-AX-A				
PS8502L2-V-E3	PS8502L2-V-E3-AX-A				

*1 For the application of the Safety Standard, following part number should be used.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current ^{*1}	I _F	25	mA
	Reverse Voltage	V _R	5	V
Detector	Supply Voltage	V _{CC}	35	V
	Output Voltage	V _O	35	V
	Output Current	I _O	8	mA
	Power Dissipation ^{*2}	P _C	100	mW
Isolation Voltage ^{*3}		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T _A	-55 to +100	°C
Storage Temperature		T _{stg}	-55 to +125	°C

*1 Reduced to 0.33 mA/°C at T_A = 70°C or more.

*2 Reduced to 2.0 mW/°C at T_A = 75°C or more.

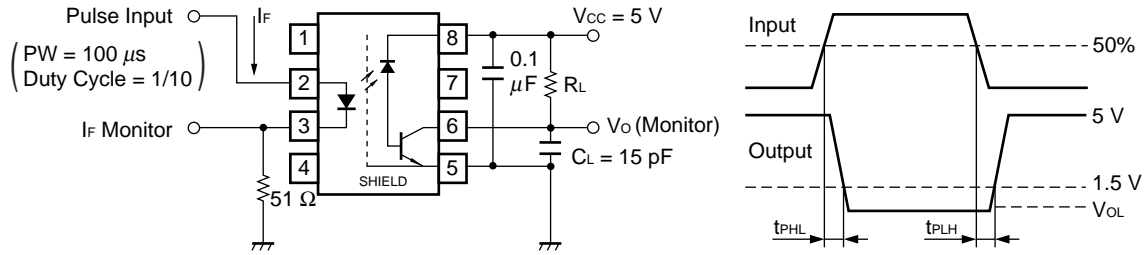
*3 AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output.
Pins 1-4 shorted together, 5-8 shorted together.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Parameter		Symbol	Conditions	MIN.	TYP. ^{*1}	MAX.	Unit
Diode	Forward Voltage	V _F	I _F = 16 mA		1.7	2.2	V
	Reverse Current	I _R	V _R = 3 V			10	μA
	Forward Voltage Temperature Coefficient	ΔV _F /ΔT _A	I _F = 16 mA		-2.1		mV/°C
	Terminal Capacitance	C _t	V = 0 V, f = 1 MHz		60		pF
Detector	High Level Output Current	I _{OH} (1)	I _F = 0 mA, V _{CC} = V _O = 5.5 V		3	500	nA
	High Level Output Current	I _{OH} (2)	I _F = 0 mA, V _{CC} = V _O = 35 V			100	μA
	Low Level Output Voltage	V _{OL}	I _F = 16 mA, V _{CC} = 4.5 V, I _O = 2.4 mA		0.15	0.4	V
	Low Level Supply Current	I _{CCL}	I _F = 16 mA, V _O = Open, V _{CC} = 35 V		150		μA
	High Level Supply Current	I _{CCH}	I _F = 0 mA, V _O = Open, V _{CC} = 35 V		0.01	1	μA
Coupled	Current Transfer Ratio	CTR	I _F = 16 mA, V _{CC} = 4.5 V, V _O = 0.4 V	15			%
	Isolation Resistance	R _{I-O}	V _{I-O} = 1 kV _{DC}	10 ¹¹			Ω
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1 MHz		0.7		pF
	Propagation Delay Time (H → L) ^{*2}	t _{PHL}	I _F = 16 mA, V _{CC} = 5 V, R _L = 1.9 kΩ		0.22	0.8	μs
	Propagation Delay Time (L → H) ^{*2}	t _{PLH}	I _F = 16 mA, V _{CC} = 5 V, R _L = 1.9 kΩ		0.35	0.8	μs
	Common Mode Transient Immunity at High Level Output ^{*3}	CM _H	I _F = 0 mA, V _{CC} = 5 V, V _{CM} = 1.5 kV, R _L = 4.1 kΩ	-15			kV/μs
	Common Mode Transient Immunity at Low Level Output ^{*3}	CM _L	I _F = 16 mA, V _{CC} = 5 V, V _{CM} = 1.5 kV, R _L = 4.1 kΩ	15			kV/μs

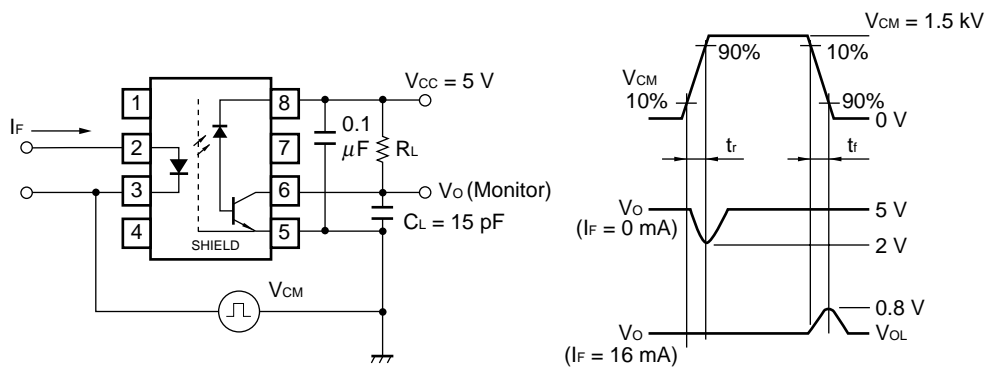
*1 Typical values at $T_A = 25^\circ\text{C}$

*2 Test circuit for propagation delay time



Remark C_L includes probe and stray wiring capacitance.

*3 Test circuit for common mode transient immunity

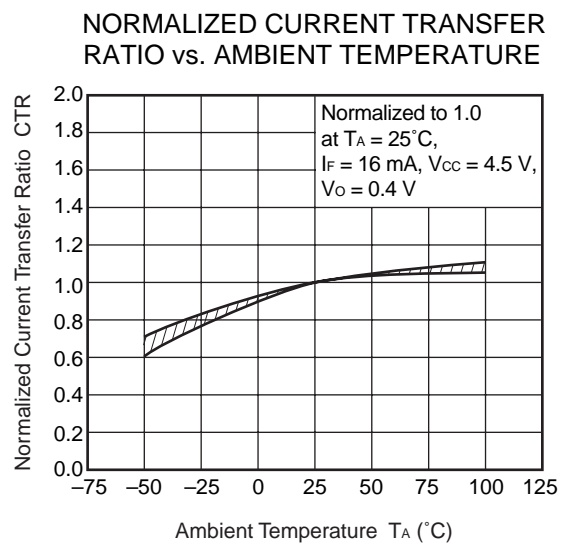
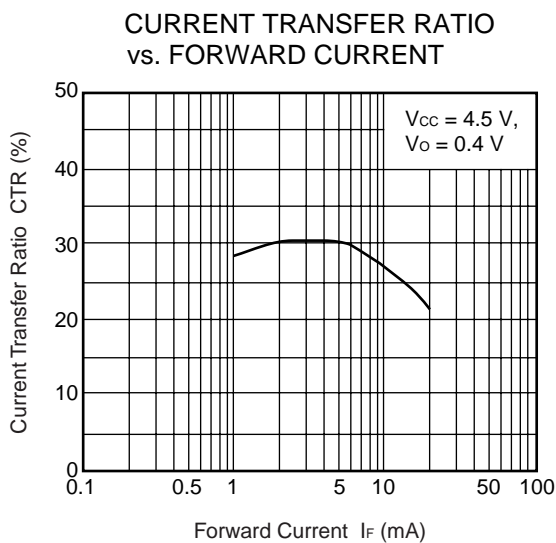
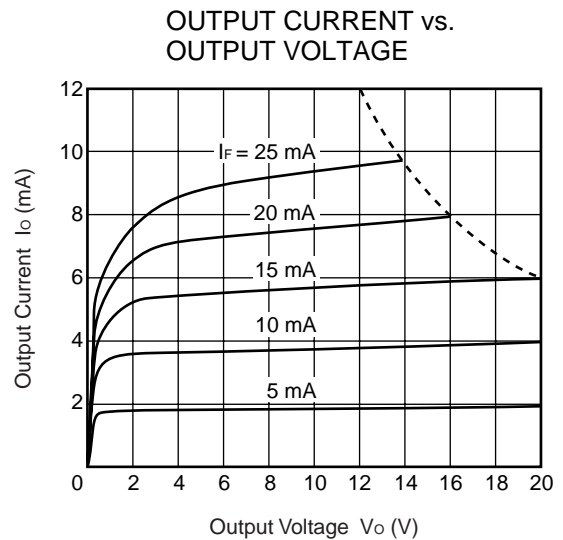
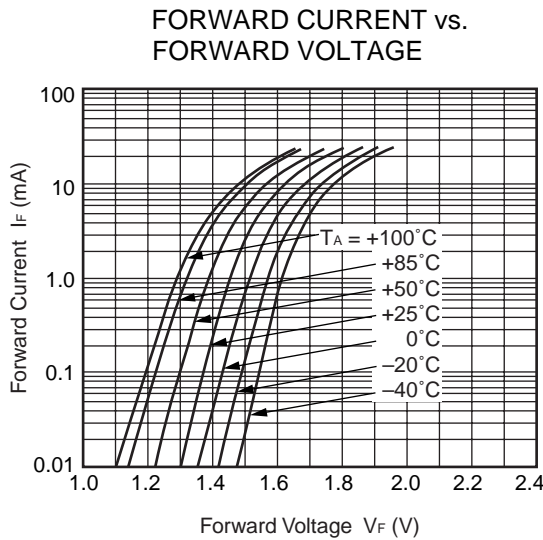
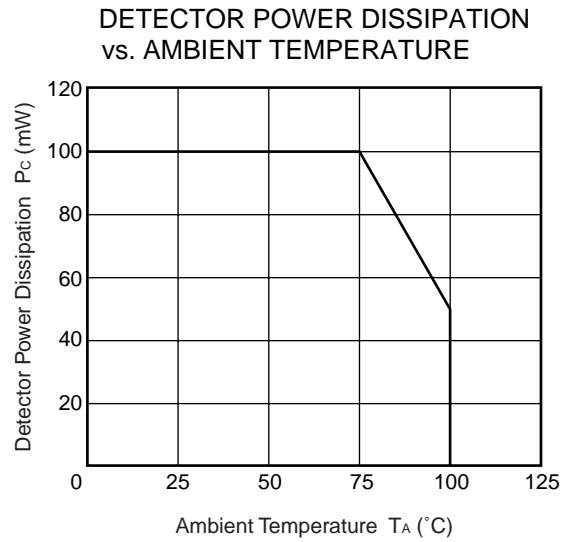
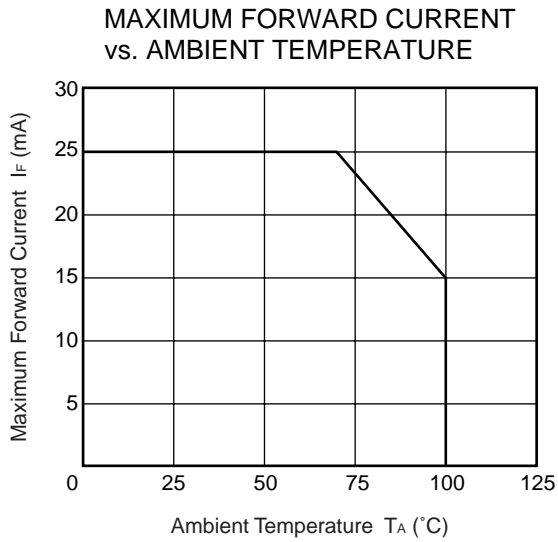


Remark C_L includes probe and stray wiring capacitance.

USAGE CAUTIONS

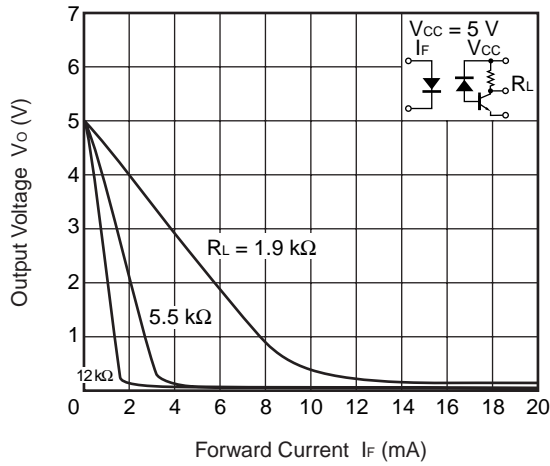
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than $0.1 \mu\text{F}$ is used between V_{cc} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Avoid storage at a high temperature and high humidity.

TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

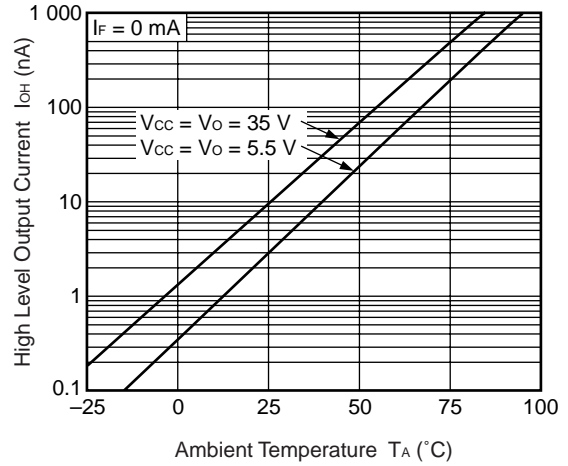


Remark The graphs indicate nominal characteristics.

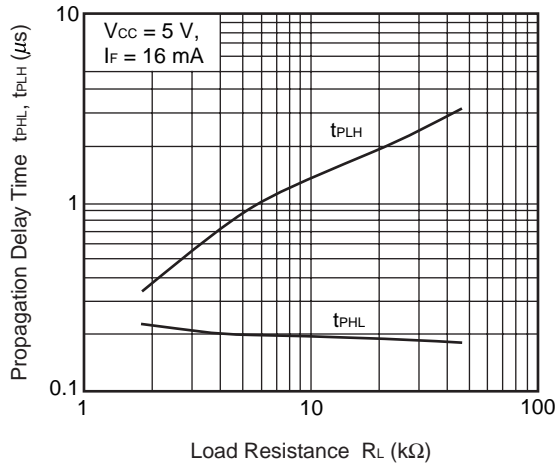
OUTPUT VOLTAGE vs. FORWARD CURRENT



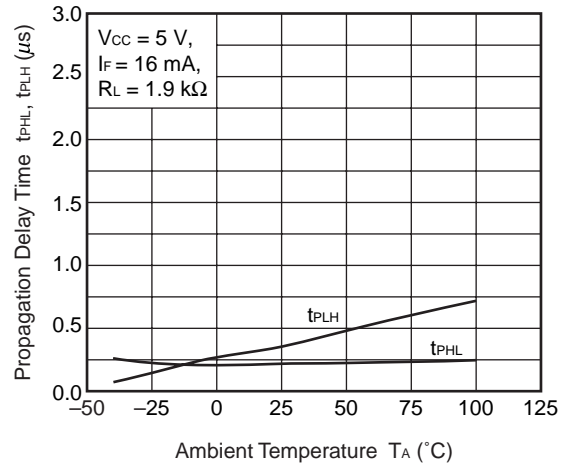
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



PROPAGATION DELAY TIME, vs. LOAD RESISTANCE



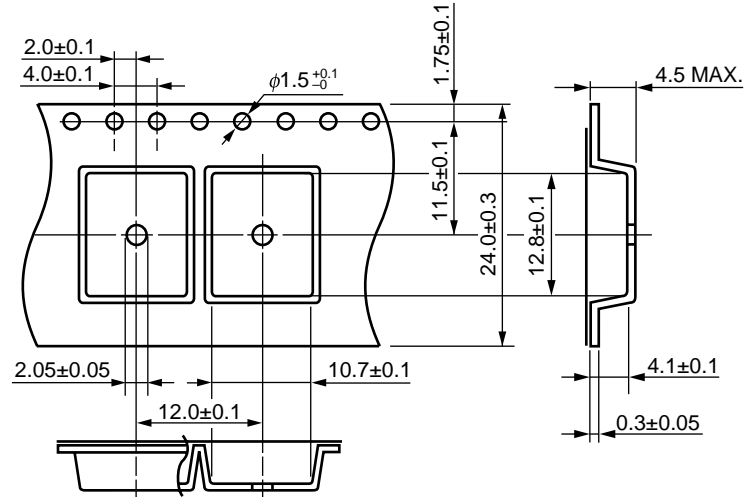
PROPAGATION DELAY TIME, vs. AMBIENT TEMPERATURE



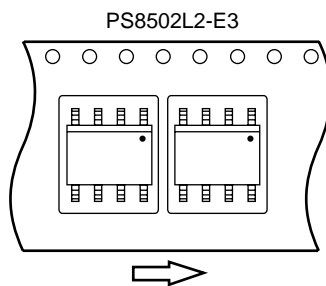
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

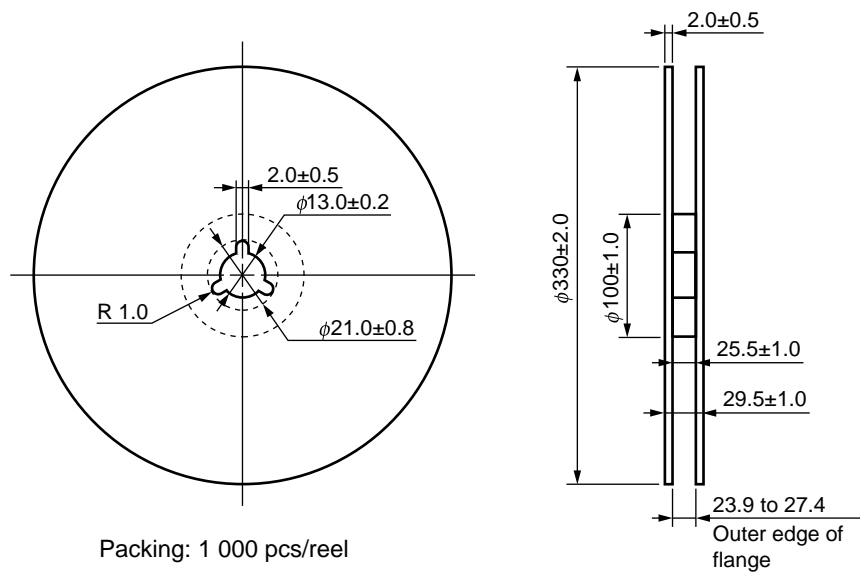
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



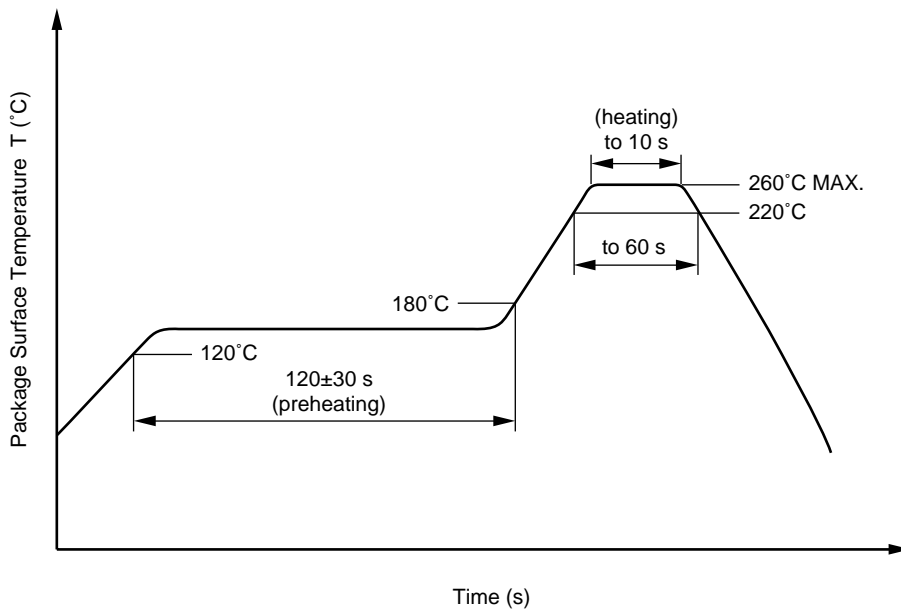
NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

- Peak reflow temperature 260°C or below (package surface temperature)
- Time of peak reflow temperature 10 seconds or less
- Time of temperature higher than 220°C 60 seconds or less
- Time to preheat temperature from 120 to 180°C 120±30 s
- Number of reflows Three
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

Recommended Temperature Profile of Infrared Reflow



(2) Wave soldering

- Temperature 260°C or below (molten solder temperature)
- Time 10 seconds or less
- Preheating conditions 120°C or below (package surface temperature)
- Number of times One (Allowed to be dipped in solder including plastic mold portion.)
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(3) Soldering by soldering iron

- Peak temperature (lead part temperature) 350°C or below
- Time (each pins) 3 seconds or less
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead.

(b) Please be sure that the temperature of the package would not be heated over 100°C.

(4) Cautions

- Fluxes

Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

2. Cautions regarding noise

Be aware that when voltage is applied suddenly between the photocoupler's input and output or between collector-emitters at startup, the output side may enter the on state, even if the voltage is within the absolute maximum ratings.

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Speck	Unit
Application classification (DIN EN 60664-1 VDE0110 Part 1) for rated line voltages ≤ 300 Vr.m.s. for rated line voltages ≤ 600 Vr.m.s.		IV III	
Climatic test class (DIN EN 60664-1 VDE0110)		55/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.5 \times U_{IORM}, P_d < 5$ pC	U_{IORM} U_{pr}	1 130 1 695	V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}, P_d < 5$ pC	U_{pr}	2 119	V_{peak}
Highest permissible overvoltage	U_{TR}	8 000	V_{peak}
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Clearance distance		>8.0	mm
Creepage distance		>8.0	mm
Comparative tracking index (DIN IEC 112/VDE 0303 Part 1)	CTI	175	
Material group (DIN EN 60664-1 VDE0110 Part 1)		III a	
Storage temperature range	T_{stg}	-55 to +125	°C
Operating temperature range	T_A	-55 to +100	°C
Isolation resistance, minimum value $V_{IO} = 500$ V dc at $T_A = 25^\circ\text{C}$ $V_{IO} = 500$ V dc at T_A MAX. at least 100°C	Ris MIN. Ris MIN.	10^{12} 10^{11}	Ω Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current I_F , $\Psi_i = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500$ V dc at $T_A = T_{si}$	T_{si} I_{si} Ψ_i Ris MIN.	175 400 700 10^9	°C mA mW Ω

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<p>Caution</p>	<p>GaAs Products</p>	<p>This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.</p> <ul style="list-style-type: none"> • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. <ol style="list-style-type: none"> 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.
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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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