

SONY[®]

Sony Semiconductor

PRODUCT LIST

96.10



Sony Semiconductor

Product List '96 – 10

TABLE OF CONTENTS

MEMORY

CMOS/Bi-CMOS SRAM	1
• LINEUP	1
• LOW POWER CONSUMPTION SRAM	2
• EXTENDED OPERATING TEMPERATURE RANGE SRAM	2
• LOW VOLTAGE SRAM	3
• HIGH-SPEED SYNCHRONOUS SRAM	3
• HIGH-SPEED ASYNCHRONOUS SRAM	3

MICROCOMPUTER

CMOS 4-BIT MICROCOMPUTER SPC500 SERIES	4
• MASK	4
• PIGGYBACK/EVALUATION	4
• ONE-TIME PROM	4
CMOS 8-BIT MICROCOMPUTER SPC700 SERIES	5
• SOFTWARE SERVO	5
• GENERAL-PURPOSE CONTROLLER/ HIGH-PRECISION GENERAL-PURPOSE CONTROLLER	6
• ON-CHIP OSD CONTROLLER/I ² C-BUS	7
• ON-CHIP FDP CONTROLLER/DRIVER	7
• ON-CHIP LCD CONTROLLER/DRIVER	8
• ON-CHIP MOTOR CONTROLLER/UART	8
• PIGGYBACK/EVALUATION	9
• ONE-TIME PROM	10
• FLASH EEPROM	10

CCD

CCD AREA IMAGE SENSOR	11
• COLOR VIDEO CAMERA CCD IMAGE SENSOR	11
• B/W VIDEO CAMERA CCD IMAGE SENSOR	12
• PROGRESSIVE SCAN CCD IMAGE SENSOR	12
CCD DELAY LINE	13
CCD LINEAR SENSOR	14
CCD LINEAR SENSOR PERIPHERAL IC	14

LCD

SMALL-SIZE, HIGH-RESOLUTION COLOR LCD	15
WIDE SCREEN COMPATIBLE COLOR LCD	15
WIDE AV PROJECTOR LCD	15
LOW-TEMPERATURE Poly-Si TFT-LCD	15
VGA DATA PROJECTOR LCD	16
SVGA DATA PROJECTOR LCD	16
RGB DRIVER	16
RGB DECODER/DRIVER	16
TIMING GENERATOR	17
DOUBLE SCAN CONVERTER	17
SAMPLE AND HOLD	17



VIDEO CAMERA

• CCD IMAGE SENSOR AND CAMERA SIGNAL PROCESSING IC	18
SCANNING SYSTEM IC FOR VIDEO CAMERA	19
• SYNC SIGNAL GENERATOR	19
• CCD TIMING PULSE GENERATOR	19
• CCD TIMING CONTROLLER	19
• PROGRESSIVE SCAN CCD TIMING GENERATOR	19
• CCD CLOCK DRIVER IC	19
SIGNAL PROCESSING IC FOR VIDEO CAMERA	20
• SIGNAL PROCESSING IC FOR COLOR VIDEO CAMERA	20
• SIGNAL PROCESSING IC FOR B/W VIDEO CAMERA	20
• SINGLE-FUNCTION IC FOR CCD CAMERA	20

TV

VIF/SIF IC	21
Y/CHROMA SYNC SIGNAL PROCESSOR IC	21
I ² C-BUS CONTROLLED AUDIO/VIDEO SWITCH	21
SOUND MPX DECODER IC/SOUND PROCESSOR	22
• EIAJ SYSTEM SOUND MPX DECODER	22
• ZENITH SYSTEM SOUND MPX DECODER	22
• SOUND PROCESSOR	22
ENCODER/DECODER IC	23
DISPLAY IC	23
• RGB PREDRIVER IC	23
• SYNC/DEFLECTION IC	23
DIGITAL IMAGE SIGNAL PROCESSING IC	24
• DIGITAL COMB FILTER IC	24
MISCELLANEOUS FUNCTION IC	24
REMOTE CONTROL IC	24

VIDEO

8 mm VCR IC	25
• VIDEO SYSTEM	25
• 3-PHASE BRUSHLESS MOTOR DRIVE IC	26
• FG/PG AMPLIFIER	26
• ATF	26
• PCM AUDIO SYSTEM	27
• FM AUDIO SYSTEM	27
WIDE-BAND AMPLIFIER	27
ENCODER/DECODER IC	27

RF DEVICE

GaAs MES FET	28
VARIABLE CAPACITANCE DIODE	28
TUNER IC	29
• UHF/VHF TUNER	29
• SATELLITE BROADCASTING TUNER	29
RF MODULATOR IC	29

OPTICAL DISC

COMPACT DISC IC	30
• RF AMPLIFIER IC	30
• SERVO SIGNAL PROCESSING IC	30
• RF AMPLIFIER + SERVO SIGNAL PROCESSING IC	30
• DIGITAL SIGNAL PROCESSING IC	31
• CD GRAPHICS DECODER	31
• SYSTEM CONTROLLER IC	31
CD-ROM IC	32
• CD-ROM DECODER	32
• SUBCODE DECODER	32
• SCSI CONTROLLER	32



DIGITAL AUDIO

1-BIT A/D, D/A CONVERTER	33
ADSP (Audio Digital Signal Processor)	33
AUDIO RELATED IC	33
• INTERFACE IC	33
• MPEG1 DECODER	33

ANALOG AUDIO

DOLBY IC	34
• DOLBY B TYPE NOISE REDUCTION SYSTEM IC	34
• DOLBY B-C TYPE NOISE REDUCTION SYSTEM IC	34
• DOLBY S TYPE NOISE REDUCTION SYSTEM IC	34
• DOLBY NOISE REDUCTION SYSTEM IC WITH PLAYBACK EQUALIZER ...	35
• DOLBY NOISE REDUCTION SYSTEM IC WITH RECORDING/ PLAYBACK EQUALIZER	35
TAPE RECORDER IC	36
• RECORDING EQUALIZER AMPLIFIER	36
• RECORDING PLAYBACK EQUALIZER AMPLIFIER	36
• SINGLE CHIP CASSETTE DECK	36
• HEADPHONE STEREO PRE-POWER AMPLIFIER	36
RADIO IC	37
ACCESSORY IC	37

FDD/HDD

FLOPPY DISK DRIVE IC	38
HARD DISK DRIVE IC	38

MOBILE COMMUNICATION

ANALOG CELLULAR IC	39
• IF AMPLIFIER IC	39
• MODEM IC	39
• PLL IC	39
GPS IC	39
• NAVIGATION IC	39
CDMA CELLULAR IC	39
• CDMA CELLULAR IC	39
• CDMA ANTENNA SWITCH	39
PDC IC	40
• PDC TRANSMISSION SINGLE CHIP IC	40
• PDC MMIC	40
GSM RF IC	40
PHS IC	41
• PHS ANALOG IC	41
• PHS MMIC	41
PAGER IC	41
GENERAL-PURPOSE DEVICE	42
• PLL IC	42
• GaAS MES FET FOR RF RECEIVING	42
• ANALOG CORDLESS PHONE IC	42
• CT2 IC	42

A/D, D/A CONVERTER

VIDEO SIGNAL PROCESSING	43
• A/D CONVERTER	43
• D/A CONVERTER	44
INDUSTRIAL INSTRUMENTS	44
• A/D CONVERTER	44
• D/A CONVERTER	44
SAMPLE AND HOLD	44



OPTICAL COMMUNICATION

OPTICAL COMMUNICATION IC	45
• TRANSMITTER IC	45
• RECEIVER IC	45
• FIBRE CHANNEL IC	46
• ATM LAN IC	46
• ETHERNET IC	46

LASER DIODE

INFRARED/RED LASER DIODE	47
LASER DIODE MODULE	47

PHOTO DEVICE

PHOTO DIODE	48
PHOTO IC	48

DISCRETE

SDME (Magneto-resistive element)	49
--	----

ORDERING INFORMATION	50
-----------------------------------	-----------

PACKAGE	52
----------------------	-----------

INDEX	55
--------------------	-----------

Abbreviation of package

DIP : Dual Inline Package	LQFP : Low Profile Quad Flat L-Leaded Package (EIAJ)
SIP : Single Inline Package	TQFP : Thin Quad Flat Package
ZIP : Zigzag Inline Package	SSOP : Shrink Small Outline L-Leaded Package (EIAJ)
PGA : Pin Grid Array	TSOP : Thin Small Outline Package
PIGGY BACK : Piggy Back Package	QFJ : Quad Flat J-Leaded Package (PLCC)
SDIP : Shrink Dual Inline Package	QFN : Quad Flat Non-Leaded Package (LCC)
SZIP : Shrink Zigzag Inline Package	BGA : Ball Grid Array
QFP : Quad Flat Package	
SOP : Small Outline Package	
SOJ : Small Outline J-lead Package	

Colored stripes show the added types from last edition.

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MEMORY

☆ Under development

CMOS/Bi-CMOS SRAM

● LINEUP

Product name	Category	Density	Organization	Package										Pins			
				P	M	J	TM	YM	TN	YN	Q	R	GB				
☆ CXXK58257B (55/70/100 ns)	5.0 V STD SRAM	256K	32K × 8	○	○	—	○	○	—	—	—	—	—	—	28		
CXXK58257C (55/70 ns)				○	○	—	○	○	—	—	—	—	—				
CXXK58512 (70/100 ns)		512K	64K × 8	—	○	—	○	—	—	—	—	—	—	32			
CXXK581000A (55/70/100 ns)				○	○	—	○	○	—	—	—	—	—				
☆ CXXK581000B (55/70/100 ns)		1M	128K × 8	○	○	—	○	○	—	—	—	—	—	32			
CXXK581020A (20/25 ns)				—	—	○	—	—	—	—	—	—	—				
☆ CXXK581120A (12/15 ns)		1M	256K × 4	—	—	○	—	—	—	—	—	—	—	28			
CXXK541020 (20/25 ns)				—	—	○	—	—	—	—	—	—	—				
CXXK516100 (70 ns)		1.1M	64K × 16	—	—	—	○	—	—	—	—	—	—	44			
CXXK591000 (70/100 ns)				—	○	—	○	○	—	—	—	—	—				
CXXK582000 (85/100 ns)		2M	256K × 8	—	○	—	○	○	—	—	—	—	—	32			
CXXK584000 (55/70/100 ns)				○	○	—	○	○	—	—	—	—	—				
CXXK5V8257B (70/85/100 ns)*		3.3 V STD SRAM	256K	32K × 8	—	○	—	○	○	—	—	—	—	—	28		
CXXK5V8512 (85/100 ns)					512K	64K × 8	—	—	—	○	—	—	—	—		—	
CXXK5V81000A (85/100 ns)			1M	128K × 8	—	—	—	○	—	—	—	—	—	—	32		
CXXK5V16100 (85/100 ns)	64K × 16	—			—	—	○	—	—	—	—	—	—				
☆ CXXK5T8257B (100/120 ns)	3.0/3.3 V STD SRAM	256K	32K × 8	—	○	—	○	○	—	—	—	—	—	28			
☆ CXXK5T8512 (100/120 ns)				512K	64K × 8	—	—	—	○	—	○	—	—		—		
☆ CXXK5T81000A (100/120 ns)		1M	128K × 8	—	○	—	○	○	○	—	—	—	—	32			
☆ CXXK5T16100 (120 ns)	64K × 16			—	—	—	○	—	—	—	—	—	—				
CXXK5B41020 (12 ns)	3.3 V Bi-CMOS HIGH-SPEED SRAM	1M	256K × 4	—	—	—	○	—	—	—	—	—	—	44			
CXXK5B81020 (12 ns)				128K × 8	—	—	○	○	—	—	—	—	—				
CXXK5B16120 (12 ns)		64K × 16	—	—	○	○	—	—	—	—	—	—					
CXXK5B18120 (12 ns)	1.1M	64K × 18	64K × 18	—	—	—	○	—	—	—	—	—	—	44			
CXXK77910A (10/12.5/17 ns)			128K × 9	—	—	—	○	○	—	—	—	—	—				
CXXK77920 (11/12.5/15 ns)	2M	256K × 9	Synchronous	—	—	—	○	○	—	—	—	—	—				
CXXK77V3210Q (11/12/14 ns)	1M	32K × 32	Synchronous burst	—	—	—	—	—	—	—	—	○	—	—	100		
CXXK77V3211Q (12/14 ns)				—	—	—	—	—	—	—	—	—	○	—			
CXXK77V3211R (14 ns)				—	—	—	—	—	—	—	—	—	—	○		—	
☆ CXXK77V1810TM/GB (10/12 ns)	3.3 V ASM	1.1M	64K × 18	Synchronous	—	—	—	○	—	—	—	—	—	○	50		
☆ CXXK77B1810GB (6/7 ns)					—	—	—	—	—	—	—	—	—	—		○	
CXXK77B1810AGB (5/6 ns)					—	—	—	—	—	—	—	—	—	—		○	
CXXK77B1811AGB (5/6 ns)					—	—	—	—	—	—	—	—	—	—		○	
CXXK77B3610GB (6/7 ns)					—	—	—	—	—	—	—	—	—	—		○	
CXXK77B3610AGB (5/6 ns)		32K × 36	Synchronous	—	—	—	—	—	—	—	—	—	—	○	119		
☆ CXXK77B3611GB (6/7 ns)				—	—	—	—	—	—	—	—	—	—	○			
CXXK77B3611AGB (5/6 ns)				—	—	—	—	—	—	—	—	—	—	○			
CXXK77V940GB (8/10/12 ns)				4.4M	512K × 9	Synchronous	—	—	—	—	—	—	—	—		—	○
CXXK77V1840GB (8/10/12 ns)							256K × 18	Synchronous	—	—	—	—	—	—		—	—

* CXXK5V8257BM: 70/100 ns, CXXK5V8257BTM/BYM: 70/85/100 ns

P : Dual In-line Package

M : Small Outline Package

J : Small Outline J-leaded Package

TM : Thin Small Outline Package (Normal)

YM : Thin Small Outline Package (Reverse)

TN : Slim Type Thin Small Outline Package (Normal)

YN : Slim Type Thin Small Outline Package (Reverse)

Q : Quad Flat L-leaded Package

R : Low-profile Quad Flat L-leaded Package

GB : Ball Grid Array

MEMORY

☆ Under development

● LOW POWER CONSUMPTION SRAM

Product name	Density	Organiza- tion	Access time Max. (ns)	Supply current Max.			Supply voltage (V)	Package (mil)	Pins
				Operating current	Standby current	Data retention current			
CXK58257BP/BM/ BTM/BYM	256K	32K × 8	55/70/100	70/50/50 mA	5 μA (LL version)	3 μA (LL version)	DIP (600) SOP (450) TSOP I	28	
☆ CXK58257CP/CM/ CTM/CYM			55/70	70/50 mA					
CXK58512M/TM	512K	64K × 8	70/100	70/60 mA	10 μA	6 μA	SOP (525) TSOP I	32	
CXK581000AP/AM/ ATM/AYM	1M	128K × 8	55/70/100	90/70/60 mA	20 μA (LL version)	12 μA (LL version)	DIP (600) SOP (525) TSOP I		
☆ CXK581000BP/BM/ BTM/BYM					12 μA (SL version)	4 μA (SL version)			
CXK516100TM		64K × 16	70	120 mA	20 μA (LL version)	12 μA (LL version)	TSOP II (400)	44	
CXK591000M/TM/YM	1.1M	128K × 9	70/100	80/70 mA	24 μA (LL version)	14 μA (LL version)	SOP (525)	32	
CXK582000M/TM/YM	2M	256K × 8	85/100		40 μA	24 μA	TSOP I		
CXK584000P/M/TM/YM	4M	512K × 8	55/70/100	100 mA	100 μA (L version)	50 μA (L version)	DIP (600) SOP (525) TSOP II (400)		

● EXTENDED OPERATING TEMPERATURE RANGE SRAM

Product name	Density	Organiza- tion	Access time Max. (ns)	Operating temperature range	Supply current Max.		Supply voltage (V)	Package (mil)	Pins
					Standby current	Data retention current			
CXK58257BTM/BYM -70LLX/10LLX	256K	32K × 8	70/100	-25 to +85°C	10 μA	6 μA	5 ± 10%	TSOP I	28
☆ CXK58257CP/CM/ CTM/CYM -70LLX			70					DIP (600) SOP (450) TSOP I	
CXK581000AP/AM/ ATM/AYM -70LLX/10LLX	1M	128K × 8	70/100	-25 to +85°C	40 μA	24 μA	5 ± 10%	DIP (600) SOP (525) TSOP I	32
☆ CXK581000BP/BM/ BTM/BYM -70LLX/10LLX									
CXK5V8257BM -70LLX/10LLX	256K	32K × 8	70/85	-25 to +85°C	7 μA	6 μA	3.3 ± 0.3 V Series	SOP (450)	28
CXK5V8257BTM/BYM -70LLX/85LLX									
CXK5V8512TM -85LLX/10LLX	512K	64K × 8	85/100	-25 to +85°C	14 μA	12 μA	3.3 ± 0.3 V Series	TSOP I	32
CXK5V81000ATM -85LLX/10LLX	1M	128K × 8			28 μA	24 μA			
CXK5V16100TM -85LLX/10LLX			64K × 16			40 μA			TSOP II (400)
☆ CXK5T8257BM/BTM/BYM -10LLX/12LLX	256K	32K × 8	100/120	-25 to +85°C	7 μA	6 μA	2.7 to 3.6 T Series	SOP (450) TSOP I	28
☆ CXK5T8512TM/TN -10LLX/12LLX	512K	64K × 8			14 μA	12 μA			
☆ CXK5T81000AM/ATM/AYM/ ATN/AYN -10LLX/12LLX	1M	128K × 8	100/120	-25 to +85°C	28 μA	24 μA	2.7 to 3.6 T Series	SOP (525) TSOP I TSOP I (Slim)	32
☆ CXK5T16100TM -12LLX								64K × 16	

TSOP I : Small outline package with overall height under 1.27 mm:
outer pins placed in two directions on the shorter sides of the package body.

TSOP II : Small outline package with overall height under 1.27 mm:
outer pins placed in two directions on the longer sides of the package body.

TSOP I (Slim) [TN/YN] 32 pins: Same body size with TSOP I 28 pins (8.0 mm × 13.4 mm)

MEMORY

☆ Under development

● LOW VOLTAGE SRAM

Product name	Density	Organization	Access time Max. (ns)	Operating temperature range	Supply current Max.		Supply voltage (V)	Package (mil)	Pins
					Standby current	Data retention current			
CXK5V8257BM/BTM/BYM -70LL/10LL	256K	32K × 8	70/100	0 to +70°C	3.5 μA	3 μA	3.3 ± 0.3	SOP (450) TSOP I	28
CXK58257BM/BTM -70LLB/10LLB			70/100 @4.5 to 5.5 V 120/150 @2.7 to 3.3 V		5 μA (at 5 V) 3.3 μA (at 3 V)		2.7 to 5.5 B Version		
CXK581000AM/ATM/AYM -10LLB	1M	128K × 8	100 @4.5 to 5.5 V 150 @2.7 to 3.3 V		20 μA (at 5 V) 14 μA (at 3 V)	12 μA	SOP (525) TSOP I	32	

● HIGH-SPEED SYNCHRONOUS SRAM

Product name	Organization	Cycle time Max. (ns)	Frequency (MHz)	Supply voltage (V)	Package (mil)	Pins
CXK77910ATM/AYM	128K × 9	10/12.5/17	100/80/60	5 ± 5%	TSOP II (400)	44
CXK77920TM/YM	256K × 9	11/12.5/15	90/80/66			
☆ CXK77V1810TM/GB	64K × 18	10/12	100/80	3.3 ± 5%	TSOP II (400) BGA	50 119T
☆ CXK77B1810GB		6/7	167/143	3.3 ± 0.15	BGA	119T
CXK77B1810AGB		5/6	200/167			
CXK77B1811AGB						
CXK77V3210Q	32K × 32	10/13.3/15	100/75/66	3.3 ^{+10%} _{-5%}	QFP	100
CXK77V3211Q		13.3/15	100/75/60	3.3 ± 5%		
CXK77V3211R		15	66		LQFP	
CXK77B3610GB	32K × 36	6/7	167/143	3.3 ± 0.15	BGA	119T
CXK77B3610AGB		5/6	200/167			
☆ CXK77B3611GB		6/7	167/143			
CXK77B3611AGB		5/6	200/167			
CXK77V940GB	512K × 9	8/10/12	125/100/83	3.3 ± 5%		
CXK77V1840GB	256K × 18					

● HIGH-SPEED ASYNCHRONOUS SRAM

Product name	Organization	Access time Max. (ns)	Supply current Max.		Supply voltage (V)	Package (mil)	Pins
			Operating current	Standby current			
CXK5B41020TM	256K × 4	12	220 mA	10 mA	3.3 ± 0.15	TSOP II (400)	32
CXK5B81020J/TM	128K × 8		240 mA			SOJ (400)	
CXK5B16120J/TM	64K × 16		270 mA			TSOP II	44
CXK5B18120TM	64K × 18		310 mA			TSOP II (400)	
CXK581020AJ	128K × 8	20/25	180/170 mA (Write Cyc.) 125/115 mA (Read Cyc.)	35/30 mA (TTL) 2 mA (CMOS)	5.0 ± 10%	SOJ (400)	32
☆ CXK581120AJ		12/15	250/220 mA (Write Cyc.) 180/150 mA (Read Cyc.)	40 mA (TTL) 10 mA (CMOS)	5.0 ± 5% (12) 5.0 ± 10% (15)		
CXK541020J	256K × 4	20/25	160/150 mA (Write Cyc.) 110/100 mA (Read Cyc.)	35/30 mA (TTL) 2 mA (CMOS)	5.0 ± 10%		

TSOP I : Small outline package with overall height under 1.27 mm:

leads placed in two directions on the shorter sides of the package body.

TSOP II : Small outline package with overall height under 1.27 mm:

leads placed in two directions on the longer sides of the package body.

Note) For I²C-bus

Buyers who purchase parts designed for the Sony I²C-bus receive the right to use them carrying the Philips Corporation's patent in systems which conform to the I²C-bus standard specification set by Philips Corporation.

CMOS 4-BIT MICROCOMPUTER SPC500 SERIES

● MASK

Product name	Functions	ROM (8-bit)	RAM (4-bit)	Peripheral I/O					Package	Pins	Remarks
				Timer/counter 8-bit × 2 18-bit × 1	8-bit serial I/O	Remote control receive circuit	3-bit A/D converter	PWM output			
CXP5014/5016	FDP controller/driver	4K/6K	288	○	○	○	—	○	SDIP/QFP	64	Displays up to 144 segments
CXP5056/5058		6K/8K	384	○	○	○	○	○	QFP	80	Displays up to 256 segments
CXP5076/5078	448		○	○	○	○	○	SDIP/QFP			64
CXP5084/5086	LCD controller/driver	4K/6K	400	○	○	—	—		—	SDIP/QFP	
CXP508L4/508L6				○	○	—	—	—	Low-voltage operation (2.6 to 3.5 V)		
CXP5116/5118	Microcomputer for programmable remote control	6K/8K	560	○	○	○	—	—	QFP	80	Upgraded version of CXP5056/5058
CXP50112/50116	FDP controller/driver	12K/16K	544	○	○	○	○	○			QFP
CXP50120/50124		20K/24K		○	○	○	○	○	SDIP	64	
CXP50212/50216		12K/16K		○	○	○	○	○			QFP
CXP50712/50716	LCD controller/driver			○	○	○	○	○			

● PIGGYBACK/EVALUATION

Product name	Mask	One-time
CXP5010	CXP5014/5016	
CXP5050	CXP5056/5058	
CXP5070	CXP5076/5078	
CXP5080	CXP5084/5086, CXP508L4/508L6	
CXP5110	CXP5116/5118	
CXP50100	CXP50112/50116/50120/50124	CXP50P116
CXP50200	CXP50212/50216	
CXP50700	CXP50712/50716	

● ONE-TIME PROM

Product name	Functions	ROM (8-bit)	RAM (4-bit)	Peripheral I/O					Package	Pins	Remarks
				Timer/counter 8-bit × 2 18-bit × 1	8-bit serial I/O	Remote control receive circuit	3-bit A/D converter	PWM output			
CXP50P116	FDP controller/driver	OTP16K	544	○	○	○	○	○	QFP	80	One-time PROM version of CXP50116

CMOS 8-BIT MICROCOMPUTER SPC700 SERIES

● SOFTWARE SERVO

Product name	ROM (8-bit)	RAM (8-bit)	Oscillation frequency (Hz)	Peripheral I/O					One-time PROM	Supply voltage (V)	Package	Pins				
				Timer	Serial interface	A/D converter	PWM	Remote control receive circuit								
CXP80116	16K	352	8M	3	8-level 2-ch serial I/O	8-bit 8-ch	12-bit 2-ch	—	CXP80P116	4.5 to 5.5	QFP	80				
CXP80520/ 80524	20K	576	9.4M		96-byte 2-ch serial I/O		8-bit 3-ch 12-bit 2-ch		CXP80P524							
CXP80620A/ 80624A	24K	800	12M		8-level 2-ch serial I/O	8-bit 12-ch	12-bit 2-ch 14-bit 1-ch		○	CXP80P624A	3.5 to 5.5	QFP/ LQFP	100			
CXP80712B/ 80716B/ 80720B/ 80724B/ 80732A/ 80740A	12K 16K 20K 24K 32K 40K		16M 32k	4	8-level 1-ch serial I/O 1-ch serial I/O			CXP877P48A		2.7 to 5.5						
CXP87132/ 87140	32K 40K	1312	16M 12M	3	CXP871P40											
CXP87240A/ 87248A	40K 48K	1376	16M 12M 32k	4	32-byte 1-ch serial I/O 8-level 1-ch serial I/O			○			CXP872P48A					
CXP87352/ 87360	52K		2048		3			CXP873P60								
CXP87452/ 87460	60K	1568	16M 12M	3	—			CXP874P60								
CXP87532/ 87540	32K 40K	1344	12.3M	3	128-byte 2-ch serial I/O			8-bit 8-ch		8-bit 3-ch 12-bit 2-ch	—			CXP875P40	4.5 to 5.5	
CXP87740A/ 87748A	40K 48K		16M/12M 32k		4			8-level 1-ch serial I/O 1-ch serial I/O		8-bit 12-ch	12-bit 2-ch 14-bit 1-ch			○	CXP877P48A	2.7 to 5.5
CXP88132/ 88140/ 88152/ 88160	32K 40K 52K 60K	1296	16M 32k	CXP881P60												
CXP88216/ 88220/ 88224	16K 20K 24K	880	QFP													
CXP88616/ 88624	16K 24K	672		16M		3	8-level 1-ch serial I/O		12-bit 2-ch			○	CXP888P60		3.5 to 5.5	
CXP88740/ 88748	40K 48K	1344		16M		4	8-level 1-ch serial I/O 1-ch serial I/O		8-bit 14-ch			12-bit 2-ch 14-bit 1-ch	○		CXP888P60	
CXP88852/ 88860	52K 60K	1472	32k													

● GENERAL-PURPOSE CONTROLLER/HIGH-PRECISION GENERAL-PURPOSE CONTROLLER

Product name	ROM (8-bit)	RAM (8-bit)	Oscillation frequency (Hz)	Peripheral I/O					One-time PROM	Supply voltage (V)	Package	Pins	
				Timer	Serial interface	A/D converter	PWM	Remote control receive circuit					
CXP80316	16K	352	8M	3	8-level 1-ch serial I/O	—	—	—	—	4.5 to 5.5	SDIP/QFP	64	
CXP81120/ 81124	20K 24K	832	16M 12M		32-byte 1-ch serial I/O 8-level 1-ch serial I/O	8-bit 8-ch	12-bit 2-ch		—	CXP811P24	2.7 to 5.5		QFP/LQFP
CXP84120/ 84124		624	10M 32k		5					8-level 1-ch serial I/O 1-ch serial I/O			CXP841P24
CXP84220/ 84224	10M		4	8-level 1-ch serial I/O				CXP842P24			3.5 to 5.5	SDIP	64
CXP84332/ 84340	32K 40K	1120	10M 32k	5	8-level 1-ch serial I/O 1-ch serial I/O	8-bit 8-ch	14-bit 1-ch	○	CXP843P40	2.7 to 5.5	QFP	80	
CXP84332M/ 84340M			20M 32k						4				8-level 2-ch serial I/O 8-level 1-ch serial I/O 1-ch serial I/O
CXP84412/ 84416	12K 16K	448	10M 32k	CXP844P16	3.3 to 5.5	CXP845P60 CXP845F60*							
CXP84540/ 84548	40K 48K	1472	28M	4	8-level 1-ch serial I/O 1-ch serial I/O	8-bit 2-ch	—	—	3.3 to 5.5	QFP	80		
CXP84632/ 84640/ 84648	32K 40K 48K	2048	16M 12M 32k	5	32-byte 1-ch serial I/O 10-level 1-ch serial I/O 1-ch serial I/O 1-ch UART 2-ch I ² C-bus	12-bit 2-ch	○	—	2.7 to 5.5				
CXP81312/ 81316	12K 16K	352	8M	3	8-level 2-ch serial I/O	8-bit 8-ch	12-bit 2-ch	—	CXP813P16	3.5 to 5.5	QFP	80	
CXP81516/ 81520/ 81524	16K 20K 24K	576			96-byte 2-ch serial I/O		8-bit 3-ch 12-bit 2-ch		CXP815P24	4.5 to 5.5			
CXP81720A/ 81724A/ 81732A/ 81740A	20K 24K 32K 40K	800	16M 32k	4	8-level 1-ch serial I/O 1-ch serial I/O	8-bit 12-ch	12-bit 2-ch 14-bit 1-ch	○	CXP818P48A	2.7 to 5.5	QFP/ LQFP	100	
CXP81840A/ 81848A	40K 48K	1344	16M 12M 32k		32-byte 1-ch serial I/O 8-level 1-ch serial I/O				CXP819P60				
CXP81952/ 81960	52K 60K	2048											

* Flash EEPROM version

● ON-CHIP OSD CONTROLLER/I²C-BUS

Product name	ROM (8-bit)	RAM (8-bit)	Oscillation frequency (Hz)	Peripheral I/O					One-time PROM	Supply voltage (V)	Package	Pins
				Timer	Serial interface	A/D converter	PWM	Remote control receive circuit				
CXP85112B/ 85116B	12K 16K	352	4M	3	1-ch serial I/O 2-ch I ² C-bus	4-bit 4-ch	6-bit 8-ch 14-bit 1-ch	○	CXP852P32A	3.5 to 5.5	SDIP/ QFP	64
CXP85220A/ 85224A/ 85228A/ 85232A	20K 24K 28K 32K	448										
CXP85324A/ 85332A/ 85340A	24K 32K 40K	576										
CXP85452/ 85460	52K 60K	960										
CXP85632/ 85640	32K 40K	1888										

● ON-CHIP FDP CONTROLLER/DRIVER

Product name	ROM (8-bit)	RAM (8-bit)	Oscillation frequency (Hz)	Peripheral I/O					One-time PROM	Supply voltage (V)	Package	Pins
				Timer	Serial interface	A/D converter	PWM	Remote control receive circuit				
CXP82220/ 82224	20K 24K	704	10M 32k	5	8-level 1-ch serial I/O 1-ch serial I/O	8-bit 8-ch	14-bit 1-ch	○	CXP822P24	2.7 to 5.5	QFP	100
CXP82316/ 82320/ 82324	16K 20K 24K		10M	4			—		CXP823P24	3.5 to 5.5		80
CXP82432A/ 82440A	32K 40K		1120	10M 32k			5		14-bit 1-ch	CXP824P40A		2.7 to 5.5
CXP82532/ 82540			10M			—		CXP825P40	3.5 to 5.5		80	
CXP82612/ 82616	12K 16K	448	10M 32k	4	8-level 2-ch serial I/O	8-bit 8-ch	—	○	CXP826P16	2.7 to 5.5	SDIP	64
CXP82712/ 82716							8-bit 1-ch		CXP827P16			
CXP82832/ 82840/ 82852/ 82860	32K 40K 52K 60K	1536		5	8-level 1-ch serial I/O 1-ch serial I/O		14-bit 1-ch		CXP828P60		QFP	100
CXP82940/ 82948/ 82952/ 82960	40K 48K 52K 60K	2048	16M 32k	4	32-byte 1-ch serial I/O 8-level 1-ch serial I/O 2-ch I ² C-bus		—		CXP829P60		QFP	80

● ON-CHIP LCD CONTROLLER/DRIVER

Product name	ROM (8-bit)	RAM (8-bit)	Oscillation frequency (Hz)	Peripheral I/O					One-time PROM	Supply voltage (V)	Package	Pins
				Timer	Serial interface	A/D converter	PWM	Remote control receive circuit				
CXP83120A/ 83124A	20K 24K	644	10M 500k 32k	5	8-level 1-ch serial I/O 1-ch serial I/O	8-bit 8-ch	14-bit 1-ch	○	CXP832P40A	2.7 to 5.5	QFP/ LQFP	100
CXP83232A/ 83240A	32K 40K	1120									QFP/ LQFP	
CXP83412/ 83416	12K 16K	448	10M 32k	4	8-level 2-ch serial I/O	8-bit 8-ch	14-bit 1-ch 8-bit 1-ch	○	CXP834P16	2.7 to 5.5	QFP*	80
CXP83413/ 83417									CXP834P17		QFP*	

* CXP83413/83417 for 0.65 mm-pitch QFP

● ON-CHIP MOTOR CONTROLLER/UART

Product name	ROM (8-bit)	RAM (8-bit)	Oscillation frequency (Hz)	Peripheral I/O					One-time PROM	Supply voltage (V)	Package	Pins
				Timer	Serial interface	A/D converter	PWM	Remote control receive circuit				
CXP86112/ 86116	12K 16K	576	10M	5	1-ch serial I/O 1-ch UART	8-bit 8-ch	12-bit 2-ch	—	CXP861P16	3.5 to 5.5	QFP	80

● PIGGYBACK/EVALUATION

Product name	Mask	One-time
CXP80100	CXP80116	CXP80P116
CXP80300	CXP80316	
CXP80500	CXP80520/80524	CXP80P524
CXP80600A	CXP80620A/80624A	CXP80P624A
CXP81100	CXP81120/81124	CXP811P24
CXP81300	CXP81312/81316/81312L/81316L	CXP813P16
CXP81500	CXP81516/81520/81524	CXP815P24
CXP81800	CXP81720A/81724A/81732A/81740A, CXP81840A/81848A	CXP818P48A
CXP81900	CXP81952/81960	CXP819P60
CXP82200	CXP82220/82224	CXP822P24
CXP82300	CXP82316/82320/82324	CXP823P24
CXP82400A	CXP82432A/82440A	CXP824P40A
CXP82500	CXP82532/82540	CXP825P40
CXP82600	CXP82612/82616	CXP826P16
CXP82700	CXP82712/82716	CXP827P16
CXP82800	CXP82832/82840/82852/82860	CXP828P60
CXP82900	CXP82940/82948/82952/82960	CXP829P60
CXP83200A	CXP83120A/83124A, CXP83232A/83240A	CXP832P40A
CXP83400	CXP83412/83416	CXP834P16
CXP84100	CXP84120/84124	CXP841P24
CXP84200	CXP84220/84224	CXP842P24
CXP84300	CXP84332/84340	CXP843P40
CXP84400	CXP84412/84416	CXP844P16
CXP84500	CXP84540/84548	CXP845P60 CXP845F60*
CXP84600	CXP84632/84640/84648	CXP846P48
CXP85200A/ 85290A	CXP85112B/85116B, CXP85220A/85224A/85228A/85232A	CXP852P32A
CXP85300A/ 85390A	CXP85324A/85332A/85340A	CXP853P40A
CXP85400/85490	CXP85452/85460	CXP854P60
CXP85690	CXP85632/85640	CXP856P40
CXP86100	CXP86112/86116	CXP861P16
CXP87100	CXP87132/87140	CXP871P40
CXP87200A	CXP87240A/87248A	CXP872P48A
CXP87300	CXP87352/87360	CXP873P60
CXP87400	CXP87452/87460	CXP874P60
CXP87500	CXP87532/87540	CXP875P40
CXP87700	CXP80712B/80716B/80720B/80724B/80732A/80740A/87740A/87748A	CXP877P48A
CXP88100A	CXP88132/88140/88152/88160, CXP88216/88220/88224	CXP881P60
CXP88800	CXP88616/88624, CXP88740/88748, CXP88852/88860	CXP888P60

* Flash EEPROM version

● ONE-TIME PROM

Product name	Functions	ROM (8-bit)	RAM (8-bit)	Piggyback/ Evaluation chip	Package	Pins
CXP80P116	Supports CXP80116	OTP 16K	352	CXP80100	QFP	80
CXP80P524	Supports CXP80520/80524	OTP 24K	576	CXP80500		
CXP80P624A	Supports CXP80620A/80624A		800	CXP80600A	QFP/LQFP	100
CXP811P24	Supports CXP81120/81124		832	CXP81100	LQFP	64
CXP813P16	Supports CXP81312/81316	OTP 16K	352	CXP81300	QFP	80
CXP815P24	Supports CXP81516/81520/81524	OTP 24K	576	CXP81500		
CXP818P48A	Supports CXP81720A/81724A/81732A/81740A, CXP81840A/81848A	OTP 48K	1344	CXP81800	QFP/LQFP	100
CXP819P60	Supports CXP81952/81960	OTP 60K	2048	CXP81900		
CXP822P24	Supports CXP82220/82224	OTP 24K	704	CXP82200	QFP	80
CXP823P24	Supports CXP82316/82320/82324			CXP82300		
CXP824P40A	Supports CXP82432A/82440A	OTP 40K	1120	CXP82400A		
CXP825P40	Supports CXP82532/82540			CXP82500	80	
CXP826P16	Supports CXP82612/82616	OTP 16K	448	CXP82600	SDIP	64
CXP827P16	Supports CXP82712/82716			CXP82700		
CXP828P60	Supports CXP82832/82840/82852/82860	OTP 60K	1536	CXP82800	QFP	100
CXP829P60	Supports CXP82940/82948/82952/82960		2048	CXP82900	80	
CXP832P40A	Supports CXP83120A/83124A/83232A/83240A	OTP 40K	1120	CXP83200A	QFP/LQFP	100
CXP834P16	Supports CXP83412/83416	OTP 16K	448	CXP83400	QFP	80
CXP834P17	Supports CXP83413/83417				(0.65 mm-pitch)	
CXP841P24	Supports CXP84120/84124	OTP 24K	624	CXP84100	QFP	64
CXP842P24	Supports CXP84220/84224			CXP84200	SDIP	
CXP843P40	Supports CXP84332/84340	OTP 40K	1120	CXP84300	QFP	80
CXP844P16	Supports CXP84412/84416	OTP 16K	448	CXP84400		
CXP845P60	Supports CXP84540/84548	OTP 60K	1472	CXP84500		
CXP846P48	Supports CXP84632/84640/84648	OTP 48K	2048	CXP84600		
CXP852P32A	Supports CXP85112B/85116B, CXP85220A/85224A/85228A/85232A	OTP 32K	448	CXP85200A CXP85290A	SDIP/QFP	64
CXP853P40A	Supports CXP85324A/85332A/85340A	OTP 40K	576	CXP85300A CXP85390A		
CXP854P60	Supports CXP85452/85460	OTP 60K	960	CXP85400A CXP85490A		
CXP856P40	Supports CXP85632/85640	OTP 40K	1888	CXP85690	QFP	80
CXP861P16	Supports CXP86112/86116	OTP 16K	576	CXP86100	QFP/LQFP	100
CXP871P40	Supports CXP87132/87140	OTP 40K	1312	CXP87100		
CXP872P48A	Supports CXP87240A/87248A	OTP 48K	1376	CXP87200A		
CXP873P60	Supports CXP87352/87360	OTP 60K	2048	CXP87300		
CXP874P60	Supports CXP87452/87460		1568	CXP87400		
CXP875P40	Supports CXP87532/87540	OTP 40K	1344	CXP87500		
CXP877P48A	Supports CXP80712B/80716B/80720B/80724B/80732A/80740A, CXP87740A/87748A	OTP 48K		CXP87700		
CXP881P60	Supports CXP88132/88140/88152/88160, CXP88216/88220/88224	OTP 60K	1296	CXP88100A	QFP	
CXP888P60	Supports CXP88616/88624, CXP88740/88748, CXP88852/88860		1472	CXP88800		

● FLASH EEPROM

Product name	Functions	ROM (8-bit)	RAM (8-bit)	Piggyback/ Evaluation chip	Package	Pins
CXP845F60	Supports CXP84540/84548	Flash 60K	1472	CXP84500	QFP	80

CCD AREA IMAGE SENSOR

● COLOR VIDEO CAMERA CCD IMAGE SENSOR

Product name	Optical format (inch)	TV system	Effective pixels (H × V)	Sensitivity Typ. (mV)	Package	Pins	Recommended timing pulse generator		
ICX026CKA	1/2	NTSC	510 × 492	340	Cer-DIP	20	CXD1257AR		
ICX027CKA		PAL	500 × 582	320					
ICX038BNA		NTSC	768 × 494	440					
ICX038DNA				660					
ICX039BNA		PAL	752 × 582	400					
ICX039DNA				660					
ICX038BNB		NTSC	768 × 494	440	Small-size round type ceramic	16	CXD1265R		
ICX038DNB				660					
ICX039BNB				PAL				752 × 582	400
ICX039DNB									660
ICX054AK	1/3	NTSC	510 × 492	700			Plastic DIP	16	CXD1257AR
ICX055AK		PAL	500 × 582	630					
ICX058AK		NTSC	768 × 494	340					
ICX059AK				330					
ICX080AK		PAL	962 × 659	300					
ICX081AK				962 × 774					
ICX058AKB		NTSC	768 × 494	340	Small-size round type ceramic	14	CXD1265R		
ICX059AKB				PAL				752 × 582	330
ICX086AK		1/4	NTSC	510 × 492	550	Plastic DIP	14	CXD1257AR	
ICX087AK			PAL	500 × 582	450				
ICX068AK	NTSC		768 × 494	290					
ICX069AK				280					
ICX086AKB	PAL		752 × 582	550					
ICX087AKB				450					
ICX068AKB	NTSC		768 × 494	290	Small-size round type ceramic	13	CXD1257AR		
ICX069AKB				280					
ICX076AK				360					
ICX077AK	PAL		358 × 583	300			Plastic DIP	14	—
ICX077AK		300							

● B/W VIDEO CAMERA CCD IMAGE SENSOR

Product name	Optical format (inch)	TV system	Effective pixels (H × V)	Sensitivity Typ. (mV)	Package	Pins	Recommended timing pulse generator			
ICX082AL	2/3	EIA	768 × 494	700	Ceramic DIP	20	CXD1265R CXD1261AR			
ICX083AL		CCIR	752 × 582							
ICX062AL		EIA	980 × 494							
ICX063AL	1/2	CCIR	980 × 582	450	Cer-DIP	20	CXD1156Q/R			
ICX026BLA		EIA	510 × 492	320						
ICX027BLA		CCIR	500 × 582	300						
ICX038BLA		EIA	768 × 494	380						
ICX038DLA				600						
ICX039BLA		CCIR	752 × 582	360						
ICX039DLA				600						
ICX038BLB		EIA	768 × 494	380				Small-size round type ceramic	16	CXD1265R CXD1261AR
ICX038DLB				600						
ICX039BLB		CCIR	752 × 582	360						
ICX039DLB	600									
ICX054AL	1/3	EIA	510 × 492	560	Plastic DIP	16	CXD2400R			
ICX055AL		CCIR	500 × 582	500						
ICX058AL		EIA	768 × 494	300						
ICX059AL		CCIR	752 × 582							
ICX058ALB		EIA	768 × 494							
ICX059ALB		CCIR	752 × 582							
ICX086AL	1/4	EIA	510 × 492	550	Small-size round type ceramic	14	CXD2400R			
ICX087AL		CCIR	500 × 582	450						
ICX068AL		EIA	768 × 494	290						
☆ ICX069AL		CCIR	752 × 582	280						
ICX076AL	1/5	EIA	362 × 492	360	Plastic DIP	14	CXD1265R CXD1261AR			
ICX077AL		CCIR	358 × 583	300						

● PROGRESSIVE SCAN CCD IMAGE SENSOR

Product name	Optical format (inch)	Filter mounted	Scanned channel	Effective pixels (H × V)	Package	Pins	Recommended timing pulse generator
ICX085AK	2/3	Primary color mosaic	1-ch	1300 × 1030	Ceramic DIP	20	CXD2437TQ
ICX085AL		Monochrome					
ICX074AK	1/2	Primary color mosaic	Selection of 1- or 2-ch	659 × 494	Cer-DIP	22	CXD2408R
ICX074AL		Monochrome					
ICX075AK		Primary color mosaic					
ICX075AL		Monochrome					
ICX084AK	1/3	Primary color mosaic	1-ch	659 × 494	Plastic DIP	16	CXD2434TQ
ICX084AL		Monochrome					
☆ ICX098AK	1/4	Primary color mosaic				14	CXD2452R

CCD DELAY LINE

Product name	Functions	Power consumption (mW)	Supply voltage (V)	Package	Pins	
CXL5001M/P	3fsc, NTSC, 1H	80	5, 9	SOP/DIP	8	
CXL5002M/P	3fsc, NTSC, 1/2H	70				
CXL5003M/P	3fsc, PAL, 1H	110				
CXL5005M/P	3fsc, NTSC, 1H, triple PLL circuit	90				
CXL5502M/P	4fsc, NTSC, 1H, quadruple PLL circuit	95	5	SOP/DIP	14	
CXL5502N				SSOP	16	
CXL5504M/P	4fsc, NTSC, 1H	90		SOP/DIP	8	
CXL5505M/P	4fsc, PAL, 1H, quadruple PLL circuit	105			14	
CXL5506M/P	4fsc, PAL, 1H	100			8	
CXL5507M/P	2fsc, NTSC, 1H	50				
CXL5508M/P	2fsc, PAL, 1H	60		16		
CXL5509M/P	1 input and 2 outputs (1H delay, 2H delay), 4fsc, NTSC, quadruple PLL circuit	130				
CXL5512M/P	3fsc, NTSC, 1H, sync tip clamp mode, triple PLL circuit	60			SOP/DIP	8
CXL5513M/P	3fsc, NTSC, 1H, center bias mode, triple PLL circuit					
CXL5514M/P	3fsc, PAL, 1H, sync tip clamp mode, triple PLL circuit					
CXL5515M/P	3fsc, PAL, 1H, center bias mode, triple PLL circuit					
CXL1009P	TBC, 15.2 to 27.2 MHz drive, 680-bit × 2	163		5, 9	DIP	20
CXL1008M/P	Skew correction (3fsc, 1/2H), 359-bit, 20-bit	105			SOP/DIP	28
CXL1501M	4fsc, NTSC comb filter	225	5	SOP	30	
CXL1502M	3fsc, PAL comb filter	300				
CXL1506M/N	3fsc, PAL 1H/2H output, triple PLL circuit	145		SOP/SSOP	16/20	
CXL1503M	301.5-bit × 4 (4/3fsc, 1H)	100		SOP	24	
CXL1504M	905.5-bit × 1 (4fsc, 1H)	160			20	
CXL1505M	453.5-bit × 4 (2fsc, 1H)	150			24	
CXL1517M/N	452.5-bit × 2 (2fsc, 1H), 453.5-bit × 1	120		SOP/SSOP	20/24	
CXL1518M/N	300.5-bit × 2 (4/3fsc, 1H), 301.5-bit × 1	75				
☆ CXL5520M/P	TV signal base-band processor	100		SOP/DIP	16	

CCD LINEAR SENSOR

Product name	Classification	Effective pixels	Pixel size (μm)	Sensitivity (V/(lx • s))	Maximum data rate (MHz)	Resolution (DPI)	Package	Pins	
ILX503A	B/W	2048	14 × 14	30	5	B4 200	Cer-DIP	22	
ILX505A		2592	11 × 11	21		A3 200			
ILX703A*		2048	14 × 14	30		B4 200			
ILX514		3918	7 × 7	10.8		A4 400			
☆ ILX523A		2700	11 × 11	84		A4 300			
ILX506		5000	7 × 7	10.8	12.5	A3 400	DIP	24	
ILX510		5150		12	40	A4 600/A3 400	Cer-DIP		
☆ ILX531A		7926		10.8	12.5	A3 600	DIP		
ILX508		7500		12	40				
☆ ILX512		Color (RGB)	2048	14 × 200	200	2	—	Cer-DIP	22
☆ ILX526A*			3000	7 × 200	300	1		SDIP	12
☆ ILX521A			256	14 × 14	18	2			
☆ ILX527K			566 × 3	9 × 33 (11 μm pitch)	R 32 G 64 B 32	5		Cer-DIP	22
ILX522K		2048, 1024 × 2	G 14 × 14 R, B 12 × 14 (14 μm pitch)	R 8.0 G 10.0 B 4.3	7	B4 200			
ILX524K	2700 × 3	8 × 8 (8 μm pitch)	R 2.0 G 3.2 B 2.5	15	A4 300				
ILX724K*	3648 × 3				A4 400				
ILX516K	5363 × 3				A4 600				
ILX716K*	7078 × 3				A3 600				
ILX518K	10500 × 3				A4 1200				
ILX718K*	5000 × 3				DIP	24			
☆ ILX520K	7200 × 3								
☆ ILX734K*	5000 × 3	Cer-DIP	22						
☆ ILX528K	7200 × 3	DIP	24						
☆ ILX530K	—	40	A4 600	Cer-DIP	22				
			A3 600	DIP	24				

* Provided with shutter function

CCD LINEAR SENSOR PERIPHERAL IC

Product name	Functions	Package	Pins
CXA1439M	Analog signal processor with a built-in CDS, 6 dB amplifier and 9.5 dB amplifier	SOP	8
CXA2027Q	Analog signal processor with a built-in bit clamp, sample and hold, gain control amplifier and multiplexer	QFP	48
CXD1175AM/AP	8-bit, 20MSPS, built-in sample and hold, A/D converter	SOP	24
CXD2311AR	10-bit, 20MSPS, A/D converter	LQFP	48

LCD

☆ Under development

SMALL-SIZE, HIGH-RESOLUTION COLOR LCD

Product name	Screen size	Displayed dots	Horizontal resolution	Optical transmittance (%)	Contrast ratio	Supply voltage (V)	System IC
LCX005BK/BKB	1.4 cm (0.55-inch)	113,000 (521H × 218V)	260 TV lines	3.4	200	13.5	Decoder/driver CXA1785AR Timing generator CXD2411AR or CXA1854AR
LCX009AK/AKB	1.8 cm (0.7-inch)	180,000 (800H × 225V)	400 TV lines	3.5			

WIDE SCREEN COMPATIBLE COLOR LCD

Product name	Screen size	Displayed dots	Horizontal resolution	Optical transmittance (%)	Contrast ratio	Supply voltage (V)	System IC
LCX007BK/BKA	3.4 cm (1.35-inch)	16 : 9 510,000 (1068.5H × 480V) 4 : 3 380,000 (799.5H × 480V)	400 TV lines	4.0	200	15.7	RGB driver CXA1853Q Sample and hold CXA2504N Timing generator CXD2412AQ

WIDE AV PROJECTOR LCD

Product name	Screen size	Displayed dots	Horizontal resolution	Optical transmittance (%)	Contrast ratio	Supply voltage (V)	System IC
LCX007BNB	3.4 cm (1.35-inch)	16 : 9 510,000 (1068.5H × 480V) 4 : 3 380,000 (799.5H × 480V)	600 TV lines	16.5	200	15.7	RGB driver CXA1853Q Sample and hold CXA2504N Timing generator CXD2412AQ
LCX007CL							
LCX007CN							
LCX011AM	3.6 cm (1.43-inch)	16 : 9 768,000 (1600H × 480V) 4 : 3 576,000 (1200H × 480V)	600 TV lines	24	200	13.5 15.5	RGB driver CXA1853Q Sample and hold CXA2504N Timing generator CXD2443Q
LCX019AM	3.3 cm (1.32-inch)	4 : 3 576,000 (1200H × 480V)					

LOW-TEMPERATURE Poly-Si TFT-LCD

Product name	Screen size	Applications	Displayed dots	Horizontal resolution	Optical transmittance (%)	Contrast ratio	System IC
☆ DCX500AK	14 cm (5.6-inch)	VGA NTSC/PAL	920,000 (640H × 3 × 480V)	480 TV lines	7.5	100	RGB driver CXA1853Q Sample and hold CXA2504N Timing generator CXD2441R
☆ DCX501AK	6.2 cm (2.5-inch)	NTSC/PAL	180,000 (800H × 225V)	400 TV lines	5.5		CXA1854AR

VGA DATA PROJECTOR LCD

Product name	Screen size	Displayed dots	Horizontal resolution	Optical transmittance (%)	Contrast ratio	Supply voltage (V)	System IC
LCX012BL	3.3 cm (1.3-inch)	310,000 (644H × 484V)	480 TV lines	25	250	15.5	RGB driver CXA1853Q Sample and hold CXA2504N Timing generator CXD2436Q/CXD2442Q

SVGA DATA PROJECTOR LCD

Product name	Screen size	Displayed dots	Horizontal resolution	Optical transmittance (%)	Contrast ratio	Supply voltage (V)	System IC
LCX016AL	3.3 cm (1.3-inch)	520,000 (832H × 624V)	600 TV lines	20	200	15.5	RGB predriver CXA1779P Sample and hold CXA2504N Timing generator CXD2442Q
LCX016AM				30			

RGB DRIVER

Product name	TV system	Corresponding LCD panel	Gamma control	Supply voltage (V)	Package	Pins
CXA1819Q	NTSC/PAL HD	LCX007BK/BKA LCX007CL/CN	1	4.6 to 5.25 12.2 to 13.3	QFP	48
CXA1853Q	NTSC/PAL HD VGA	LCX007BK/BKA LCX007CL/CN LCX011AM/019AM LCX012BL LCX016AL/AM DCX500AK	2	4.75 to 5.25 11.0 to 14.0		80

Note) Sold on a kit basis with panels

RGB DECODER/DRIVER

Product name	Functions	TV system	Corresponding LCD panel	Wide display functions	Supply voltage (V)	Package	Pins
CXA1785AR	RGB decoder/driver	NTSC/PAL	LCX005BK/BKB LCX009AK/AKB	Existent (Used with CXD2411AR)	4.25 to 5.25 11.25 to 14.0	LQFP	48
CXA1854AR	RGB decoder/driver/TG		LCX005BK/BKB LCX009AK/AKB DCX501AK	Non-existent	4.7 to 5.3 11.0 to 13.0 4.5 to 5.5		64

Note) Sold on a kit basis with panels

TIMING GENERATOR

Product name	TV system	Corresponding LCD panel	Functions	Supply voltage (V)	Package	Pins	
CXD2411AR	NTSC/PAL	LCX005BK/BKB LCX009AK/AKB	Compatible with wide displays when used with CXA1785AR Compatible with the separate SYNC input	3.0 to 5.5	LQFP	48	
CXD2412AQ	NTSC NTSC-WIDE	LCX007BK/BKA LCX007CL/CN	WIDE compatible, HD compatible 3-panel/single panel projectors compatible	4.5 to 5.5	QFP	100	
CXD2436Q	VGA NTSC PAL	LCX012BL	Various VGA signals compatible (Non-interlace mode) 3-panel projectors compatible				
CXD2441R	VGA NTSC/PAL	DCX500AK	Various VGA signals compatible (Non-interlace mode)		LQFP		
CXD2442Q	SVGA/VGA NTSC/PAL	LCX012BL LCX016AL/AM	Various SVGA/VGA signals compatible (Non-interlace mode) 3-panel projectors compatible		QFP		80
CXD2443Q	NTSC/NTSC-WIDE PAL	LCX011AM LCX019AM	Single panel color projectors compatible				100

Note) Sold on a kit basis with panels

DOUBLE SCAN CONVERTER

Product name	Corresponding LCD panel	Functions	Supply voltage (V)	Package	Pins
CXD2428Q	LCX007BK/BKA LCX007CL/CN LCX011AM/019AM LCX012BL LCX016AL/AM	Double scan converter	4.5 to 5.5	QFP	100

Note) Sold on a kit basis with panels

SAMPLE AND HOLD

Product name	Corresponding LCD panel	Functions	Supply voltage (V)	Package	Pins
CXA2504N	LCX007CL/CN LCX011AM/019AM LCX012BL/016AL/016AM DCX500AK	Built-in sample-and-hold circuits for phase-adjustment of 6-ch and driver for driving LCD directly	5 ± 0.5 15.5 ± 0.8	SSOP	40

Note) Sold on a kit basis with panels

VIDEO CAMERA

☆ Under development

● CCD IMAGE SENSOR AND CAMERA SIGNAL PROCESSING IC

Color (NTSC, PAL)

Classification							
CCD image sensor	NTSC	ICX026CKA	ICX038BNA ICX038BNB ICX038DNA ICX038DNB	ICX054AK	ICX058AK ICX058AKB	ICX086AK ICX086AKB	ICX068AK ICX068AKB
	PAL	ICX027CKA	ICX039BNA ICX039BNB ICX039DNA ICX039DNB	ICX055AK	ICX059AK ICX059AKB	ICX087AK ICX087AKB	ICX069AK ICX069AKB
	Optical size (inch)	1/2		1/3		1/4	
	Effective pixels (H × V)	NTSC	510 × 492	768 × 494	510 × 492	768 × 494	510 × 492
PAL		500 × 582	752 × 582	500 × 582	752 × 582	500 × 582	752 × 582
Timing/Driver system	Vertical driver	CXD1250M/N, CXD1267AN					
	Horizontal driver	Built into timing generator					
	Timing generator	CXD1257AR CXD2401R	CXD1265R	CXD1257AR CXD2401R	CXD1265R	CXD1257AR	CXD1265R
	Sync signal generator	CXD1030M, CXD1159Q, CXD1217M/Q					
Signal processing system	Sample-and-hold AGC	CXA1390AQ/AR					
	Matrix Process	CXA1391Q/R					
	Encoder	CXA1392Q/R, CXA1592Q/R					
	CCD delay line for chroma	CXL1518M/N	CXL1517M/N	CXL1518M/N	CXL1517M/N	CXL1518M/N	CXL1517M/N
	CCD delay line for Y	CXL5504M					

B/W (EIA, CCIR)

Classification									
CCD image sensor	EIA	ICX082AL	ICX026BLA	ICX038BLA ICX038BLB ICX038DLA ICX038DLB	ICX054AL	ICX058AL ICX058ALB	ICX086AL	ICX068AL	ICX076AL
	CCIR	ICX083AL	ICX027BLA	ICX039BLA ICX039BLB ICX039DLA ICX039DLB	ICX055AL	ICX059AL ICX059ALB	ICX087AL	☆ICX069AL	ICX077AL
	Optical size (inch)	2/3	1/2		1/3		1/4		1/5
	Effective pixels (H × V)	EIA	768 × 494	510 × 492	768 × 494	510 × 492	768 × 494	510 × 492	768 × 494
CCIR		752 × 582	500 × 582	752 × 582	500 × 582	752 × 582	500 × 582	752 × 582	358 × 583
Timing/Driver system	Vertical driver	—	CXD1250M/N, CXD1267AN						
	Horizontal driver	—	Built into timing generator						
	Timing generator	CXD1265R CXD1261AR	CXD1156Q/R	CXD1265R CXD1261AR	CXD2400R	CXD1265R CXD1261AR	CXD2400R	CXD1265R CXD1261AR	CXD2409R
	Sync signal generator	CXD1030M, CXD1159Q, CXD1217M/Q, CXD1158M							
Signal processing system	Sample-and-hold AGC Process	CXA1310AQ							

Note) CXD1261AR, CXD2400R, CXD2409R: Built-in sync signal generator

SCANNING SYSTEM IC FOR VIDEO CAMERA

● SYNC SIGNAL GENERATOR

Product name	TV system				Functions	Supply voltage (V)	Package	Pins
	NTSC	PAL	PALM	SECAM				
CXD1030M	○	○	—	—	14/18 MHz countdown	5	SOP	28
CXD1158M	○	○	—	—	14/18 MHz countdown, sub carrier output × 3			30
CXD1159Q	○	○	—	—	14/18 MHz countdown, window pulse output		QFP	32
CXD1217M/Q	○	○	○	○	Output synchronized with 910 fH or 908 fH clock, color framing for NTSC/PAL/PALM		SOP/QFP	28/32

● CCD TIMING PULSE GENERATOR

Product name	TV system				Compatible pixels (H × V)	Shutter control		Supply voltage (V)	Package	Pins	Remarks
	NTSC	PAL	EIA	CCIR		High speed	Low speed				
CXD1156Q/R	—	—	○	○	510 × 492 500 × 582	○	—	5	QFP/ LQFP	48	—
CXD1254AQ/AR	○	—	○	○		○	△		LQFP	64	Built-in SG
CXD1257AR	○	○	—	—	○	○	64			—	
CXD1261AR	—	—	○	○	768 × 494	○	△		Built-in SG		
CXD1265R	○	○	○	○	752 × 582	○	○		—		
CXD2422R	—	—	○	○	980 × 494 980 × 582	○	—		QFP	44	Signal generator for PLL
CXD8302Q	—	—	—	—		—	—				

● CCD TIMING CONTROLLER

Product name	TV system				Compatible pixels (H × V)	Functions	Supply voltage (V)	Package	Pins
	NTSC	PAL	EIA	CCIR					
CXD2400R	—	—	○	○	510 × 492 500 × 582	Electronic iris, 1/100,000s high-speed shutter, external sync, non interlace	5	LQFP	48
CXD2401R	○*	○*	—	—		Electronic iris, 1/100,000s high-speed shutter			
CXD2409R	—	—	○	○	362 × 492 358 × 583	Electronic iris, 1/100,000s high-speed shutter, backlight correction			64

* Supports ICX026CKA/027CKA, ICX054AK/055AK

● PROGRESSIVE SCAN CCD TIMING GENERATOR

Product name	Compatible pixels (H × V)	Internal synchronous signal generator	Functions	Supply voltage (V)	Package	Pins
CXD2408R	659 × 494	EIA	High-speed/low-speed electronic shutter, random trigger shutter, external synchronization	5	LQFP	64
CXD2424R	782 × 582	CCIR				
CXD2434TQ	659 × 494	—	High-speed/low-speed electronic shutter, external trigger shutter function		TQFP	48
CXD2437TQ	1,300 × 1,030	—		64		
☆ CXD2452R	659 × 494	—*	High-speed/low-speed electronic shutter	3.3	LQFP	48

* Generates only H. sync. and V. sync.

● CCD CLOCK DRIVER IC

Product name	Functions	Supply voltage (V)					Package	Pins
		V _L *	V _{DD}	V _M	V _H	V _{HH}		
CXD1250M/N	Built-in 4-ch vertical clock driver, 1-ch shutter pulse driver	-9	5	0	15	15	SOP/ SSOP	20
CXD1267AN	Built-in 4-ch vertical clock driver, 1-ch shutter pulse driver, charge pump circuit for sub voltage	-8.5	—			—	SSOP	
CXD1268M	Built-in 4-ch vertical clock driver	-9	5			SOP		

* V_L is CCD dependent

VIDEO CAMERA

☆ Under development

SIGNAL PROCESSING IC FOR VIDEO CAMERA

● SIGNAL PROCESSING IC FOR COLOR VIDEO CAMERA

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1390AQ/AR	CDS for CCD color camera, color separation	CDS, AGC, color separation	5	QFP/ LQFP	48
CXA1391Q/R	Processing for CCD color camera	Primary color separation, white balance, γ correction, sharpness control			64
CXA1392Q/R	Encoder for CCD color camera	Aperture correction (Top to bottom ratio 1 : 3), composite video, Y/C separation output			48
CXA1592Q/R		Aperture correction (Top to bottom ratio 1.5 : 1.5), composite video, Y/C separation output			
CXL1517M/N	1H delay line for 768H chroma	452.5 bits \times 2, 453.5 bits \times 1, 1H delay line, overflow preventing circuit		SOP/ SSOP	20/24
CXL1518M/N	1H delay line for 510H chroma	300.5 bits \times 2, 301.5 bits \times 1, 1H delay line, overflow preventing circuit			
CXL5504M	General-purpose 1H delay line	1H for Y_H , 1H for modulated chroma (NTSC only)		SOP	8
CX20095A	Video output	6 dB amplifier, 75 Ω line driver			14
CX20186					SSOP

● SIGNAL PROCESSING IC FOR B/W VIDEO CAMERA

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1310AQ	Processing for CCD black/white camera	CDS, AGC amplifier, γ correction, 75 Ω video output	5	QFP	32

● SINGLE-FUNCTION IC FOR CCD CAMERA

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1439M	CDS for CCD color and black/white camera	Built-in CDS and amplifier (6 dB, 9.5 dB)	4.8	SOP	8
CXA1690Q	Pre-amplifier for video camera A/D converter	CDS, AGC, A/D converter S/H, reference output	4.75	QFP	32
CXA2006Q					

Note) For I²C-bus

Buyers who purchase parts designed for the Sony I²C-bus receive the right to use them carrying the Philips Corporation's patent in systems which conform to the I²C-bus standard specification set by Philips Corporation.

VIF/SIF IC

Product name	PLL sync detection	Pseudo sync detection	Built-in sync separator	Supply voltage (V)	Package	Pins	Remarks
CXA1446S	○	—	—	9	SDIP	30	For general TVs/VCRs

Y/CHROMA SYNC SIGNAL PROCESSOR IC

Product name	I ² C-bus	Broadcasting system			Functions						Supply voltage (V)	Package	Pins
		NTSC	PAL	SECAM	Y/C signal processor	Sync processor	Distortion compensation	Deflection processor for WIDE	Identify PAL	Identify SECAM			
CXA1870S	○	○	—	—	○	○	○	—	—	—	9	SDIP	42
CXA1871S	○	○	○	—	○	○	○	—	○	—			48
CXA2025AS	○	○	—	—	○	○	○	○	—	—		QFP	64
CXA2000Q	○	○	○	(○)	○	○	○	○	○	—			
CXA2050S	○	○	○	(○)	○	○	○	○	○	—			

I²C-BUS CONTROLLED AUDIO/VIDEO SWITCH

Product name	Switch		Features		Supply voltage (V)	Package	Pins
	Number of inputs	Number of outputs	Frequency characteristics	Others			
CXA1114M/P	4	4	15 MHz (-3 dB)	Audio/video switch	9	SOP/DIP	28
CXA1434P				Video switch		DIP	16
CXA1314P	3	2	20 MHz (-3 dB)	S-terminal compatible, TV audio/video switch		QFP/SDIP	48
CXA1414P						QFP	64
CXA1855Q/S				5		3	20 MHz (-0.5 dB)
CXA1845Q	7						
CXA2040Q	5						

SOUND MPX DECODER IC/SOUND PROCESSOR

● EIAJ SYSTEM SOUND MPX DECODER

Product name	I ² C-bus	Sound multiplex demodulation	Digital facsimile distortion elimination	Sound processor	Supply voltage (V)	Package	Pins
CXA1518Q/S	—	○	○	—	5	QFP/ SDIP	32/ 22
CXA2020M/S	—	○	○	—	9	SOP/ SDIP	28/ 22

● ZENITH SYSTEM SOUND MPX DECODER

Product name	I ² C-bus	Sound multiplex demodulation	Sound processor	MONO 100% input level (mVrms)	Supply voltage (V)	Package	Pins	Remarks
CXA1124BQ/BS	—	○	—	245	4.7 to 10	QFP/ SDIP	48/ 42	The CXA1124BS and CXA1534S have the same pin configuration
CXA1534Q/S	—	○	—	100				
CXA1734S	○	○	—	245	9	SDIP	30	—
CXA1784AS	○	○	○	100/245/490			42	
CXA2074S	○	○	○	245				

● SOUND PROCESSOR

Product name	Functions	Supply voltage (V)	Package	Pins
CXA2021S	Volume, bus, treble, surround, AGC	12	SDIP	22
CXA2022S	Volume, bus, treble, 3-mode surround, AGC			30

ENCODER/DECODER IC

Product name	Functions		Features		Supply voltage (V)	Package	Pins		
	Input	Output	TV system	Others					
CXA1645M/P	Encoder	R. G. B	Composite video	NTSC/PAL	5	SOP/DIP	28		
CXA1229M/P		Y • color difference (TV • VCR)					Built-in BPF, DL, 75Ω driver, Y/C output 75Ω driver (R. G. B output composite video output composite sync output) audio buffer amplifier	24	
CXD1910AQ*	Digital encoder	Y, Cb, Cr	Composite video S-video				Built-in 10-bit 3-ch D/A converter, closed caption encode, macrovision Pay-Per-View copy protection system	QFP	64
☆ CXA1790Q/R	Decoder with A/D	Composite Y/C	YUV 8-bit				Fully adjustment-free, low power consumption, A/D CLK variable frequency, I ² C-bus control	QFP/LQFP	
CXA1585Q	Decoder	Y/C separate	R. G. B				Composite sync sub carrier burst flag } Sharpness function with output	QFP	32
CXA1950Q			R. G. B Y • color difference						

* When using the CXD1910AQ, the license contract for the macrovision Pay-Per-View copy protection system is required.

DISPLAY IC

● RGB PREDRIVER IC

Product name	Frequency Typ.	Channel	Clamp pulse width	Resolution	Supply voltage (V)	Current consumption Typ. (mA)	Package	Pins
CXA1779P	150 MHz, -3 dB	3	—	1280 dots × 1024 lines (Ultra-high resolution)	12	80	DIP	28
CXA1799P								16
CXA1709P	250 MHz, -3 dB	1		—		33		

● SYNC/DEFLECTION IC

Product name	Functions	Supply voltage (V)	Package	Pins
CXA2016S	Sync discrimination for computer display	5	SDIP	22
CXA1726AM/AS	Deflection compensation, analog multiplier	±5	SOP/SDIP	30
CXD2343S	10-bit synchronized binary counter	5	SDIP	28

DIGITAL IMAGE SIGNAL PROCESSING IC

● DIGITAL COMB FILTER IC

Product name	Features	Supply voltage (V)	Package	Pins
CXD2043Q	For NTSC, high precision of Y/C field separation is achieved with a single chip, built-in 4fsc PLL	5	QFP	80
CXD2044Q	For NTSC and PAL, high precision of Y/C field separation is achieved with a single chip			

MISCELLANEOUS FUNCTION IC

Product name	Functions	Features	Supply voltage (V)	Current consumption (mA)	Package	Pins
CXL5520M/P	1H delay line	1H delay line for PAL (Used with the CXA2000 together)	5	75 mW	SOP/DIP	16
CXA1315M/P	I ² C-bus compatible 8-bit	5-ch 8-bit D/A converters, 4 general-purpose I/O ports	9	11		
CXA1875AM/AP	D/A converter			9		
CXD2131Q	Video aspect ratio identification signal encoder/decoder	Addition/detection of aspect ratio identification signal in the vertical blanking interval of NTSC video signal	5	15	QFP	32
CXD2053AS/AM	Auto wide identification EDTV-II, ID detection, ID-1 identification	I ² C-bus compatible		29	SDIP/ SOP	28

REMOTE CONTROL IC

Product name	Functions	Features	Supply voltage (V)	Current consumption (mA)	Package	Pins
CXA1511L/M	Remote control receiving amplifier	All external capacitors are ceramic type, pull-up resistor	5	1.8	SIP/SOP	8

8 mm VCR IC

● VIDEO SYSTEM

Product name	Functions	Features	Supply voltage (V)	Package	Pins	
CXA1201Q	Video I/O	Video input, AGC, sync separation	5	QFP	32	
CXA1812Q		Dual-input switch for Y and C systems, 75Ω driver for Y and C systems (with power save function), video output circuit specially designed for VF (viewfinder), title insertion function (white or black characters)	4.75			
CXA1047M	Y/chroma signal processor	Y/C signal REC processing (REC only)	5	SOP	30	
CXA1810AQ/AR		REC/PB signal processor for Hi8 and standard 8 mm, on-chip automatic adjustment filter, supports power save mode: (140 mW for composite signal input 250 mW for separate signal input)	4.75	QFP/ LQFP	64	
CXA1700AQ/AR		REC/PB signal processor for simple Hi8 and standard 8 mm, software and pin layout compatible with CXA1810Q/R, other functions same as for CXA1810Q/R				
CXA1207AQ/AR	Y signal processor	REC/PB signal processor for Hi8 and standard 8 mm, video I/O, Y-correlated detector, BUS LINE supported, NTSC/PAL compatible	5			SOP/ SSOP
CXA1208Q/R	Chroma signal processor	Improved S/N due to on-chip chroma feedback comb filter, NTSC/PAL compatible				
CXA1203M/N	PAL variable speed playback signal processor	Color alignment compensation which requires no delay line (1H)	3.0 to 5.0	SOP/ SSOP	24	
CXA2003N	Supports PAL variable speed mode, chroma signal processor (3 V version)	Built-in BPF, REC path		SSOP	30	
CXL5502M/P/N	CCD 1H delay line (NTSC)	4fsc clock frequency, on-chip quadruple PLL circuit, low power consumption (95 mW)	5	SOP/ DIP/ SSOP	14/ 14/ 16	
CXL5504M/P		4fsc clock frequency, low power consumption (90 mW)		SOP/DIP	8	
CXL1506M/N	CCD 1H • 2H delay line (PAL)	3fsc clock frequency, on-chip triple PLL circuit, low power consumption (135 mW)	5	SOP/ SSOP	16/20	
CXL1510M	CCD delay line comb filter	Multi system		4fsc clock frequency, on-chip quadruple PLL circuit, low power consumption (175 mW)	SOP	24
CXL1502M		PAL		1H/2H CCD comb filter		30
CXL1511M				3fsc clock frequency, on-chip triple PLL circuit, low power consumption (175 mW)		24
CXL1501M		NTSC		1H CCD comb filter		30
CXL1512M				4fsc clock frequency, on-chip quadruple PLL circuit, low power consumption (175 mW)		24
CXA1211M		Electronic volume		2-ch wide-band GCA (Gain Control Amp.), gain control range -5 to +5 dB		8
CXA1452N			Carrier/deviation/IR (filter) adjustment of CXA1207AR/AQ	4.75		SSOP
CXA1202Q-Z/R	REC/PB amplifier	2-ch REC amplifier, 2-ch PB head amplifier	5	QFP/ LQFP	48	
CXA1702AR		4-ch REC/PB amplifier for Hi8, high C/N, RF AGC and dropout detector	4.75	LQFP	64	
CXA1704R		2-ch REC/PB amplifier for Hi8, high C/N, RF AGC and dropout detector				
CXA1234AR		2-ch REC/PB amplifier,	5	QFP	48	
CX20034		wide-band characteristic suitable for Hi8				
CXA2032Q		2-ch REC/PB head amplifier	4.75 ^{+0.5} _{-0.25}	LQFP	32	
CXA2002R		Built-in 2-ch REC/PB amplifier and middle tune, supports EVR 3 V				
CXD2107M	Hi-band detector (Hi8 detector)	Counts the number of RF signal waves in the sync interval, no adjustment, can be used for both 8 mm and VHS	5	SOP	16	

● 3-PHASE BRUSHLESS MOTOR DRIVE IC

Product name	Applications	Output current Max.	Conducting current phase	Position detector	Overlap amount	Supply voltage (V)	Package	Pins
CX20036	Capstan motor driver	0.85 A	Switching	Required	—	4 to 9	SOP	28

● FG/PG AMPLIFIER

Product name	Features	Supply voltage (V)	Package	Pins
CXA1512M/N	Drum/capstan FG/PG amplifier, variable threshold comparator efficient against noise, LPF for drum FG	5	SOP/SSOP	14

● ATF

Product name		CXA1204Q	CXA1449Q	CXA1481AQ/AR	CXA1814N
Functions	REC pilot signal generation circuit	○	○	— On-chip system controller/ software servo microcomputers CXP80620A/CXP80624A, etc.	— On-chip system controller/ software servo microcomputers CXP87132/CXP87140/ CXP87452/CXP87460, etc.
	BPF for f _H • 3 f _H	○	○	○	○
	PCM after-recording supported	—	○	○	○
	SP/LP discrimination for special PB	—	—	○	○
	Clog detection	—	—	○	○
	LPF for REC/PB pilot	—	—	○	○
Characteristics	Current consumption Typ. (mA)	REC : 8 PB : 22		REC : 7.5 PB : 16	REC : 3.5 PB : 6
	Subtractor DC offset (mV)	±80		±30	±40
Other	System controller/ software servo microcomputers can be combined	CXP80116/80620A/80624A/87632/87640 CXP87132/87140/87452/87460 CXP80720A/80724A/80732A/80740A/87740A/87748A CXP87240A/87248A/87352/87360 CXP88132/88140/88216/88220/88224		CXP80620A/CXP80624A CXP87632/CXP87640 CXP87132/CXP87140 CXP87452/CXP87460	CXP87132/CXP87140 (3 V/8-bit) CXP87452/CXP87460 (3 V/8-bit) CXP911016 (3 V/16-bit) CXP80620A/CXP80624A (5 V/8-bit)
	Supply voltage (V)	5		4.75	3 to 5.5
	Package	QFP		QFP/LQFP	SSOP
	Pins	Pin compatible 44		48	30

VIDEO

☆ Under development

● PCM AUDIO SYSTEM

Product name	Functions	Features	Supply voltage (V)	Package	Pins	
CXD1208Q	PCM stereo main signal processor	Smaller set size realized through large-scale integration, modulation/demodulation, 8/10-bit compression/expansion, H sync generation for after-recording, RF signal processing and master clock generation functions	5	QFP	100	
CX20102	RF signal processor	PCM RF signal equalizer, PLL		SOP	20	
CX20099	Noise reduction	Logarithmic compression/expansion compandor, noise modulation reduction due to fixed pre-emphasis		DIP		28
CX20148						

● FM AUDIO SYSTEM

Product name	Functions	Features	Supply voltage (V)	Package	Pins
CX20037A	FM modulation/demodulation, noise reduction	FM modulation/demodulation and noise reduction functions on a single chip, broad power supply voltage range with built-in regulator	5	QFP	48
CXA1237AR				LQFP	
CXA1488R	AFM main signal processor	Playback BPF (1.5 MHz), PLL used in FM modulation circuit	4.75	QFP	36
CXA1536Q	AFM stereo matrix	Bilingual and stereo/monaural discrimination	3.0 to 5.25		
CXA2038R	AFM monaural (3 V version)	Built-in RF BPF		LQFP	64

WIDE-BAND AMPLIFIER

Product name	Functions	Supply voltage (V)	Package	Pins
CXA1077M	2-ch wide-band differential amplifier (DC to 180 MHz)	4.5 to 5.5	SOP	14
CXA1777N			SSOP	16
CXA1103AM	High-speed, low noise amplifier for photo detector	5 to 9	SOP	8

ENCODER/DECODER IC

Product name	Functions			Features		Supply voltage (V)	Package	Pins
	Input	Output	TV system	Others				
CXD1910AQ*	Digital encoder	Y, Cb, Cr	Composite video S-video	NTSC/PAL	Built-in 10-bit 3-ch D/A converter, closed caption encode, macrovision Pay-Per-View copy protection system	5	QFP	64
CXD1913Q					Built-in 10-bit 3-ch D/A converter, closed caption encode			

* When using the CXD1910AQ, the license contract for the macrovision Pay-Per-View copy protection system is required.

RF DEVICE

☆ Under development

GaAs MES FET

Product name	Applications	Features	Recommended operating conditions*		Package	Pins
			V _{DS} (V)	I _D (mA)		
SGM2014M	UHF RF amplifier, mixer, oscillator	Low cross modulation, built-in gate protection diode, low noise NF = 1.5 dB (Typ.) @f = 900 MHz	5	10	Mini mold	4
☆ SGM2014AM		Low noise NF = 1.2 dB (Typ.) @f = 900 MHz, built-in gate protection diode				
☆ SGM2016M/P						
☆ SGM2016AM/AP						
3SK165	UHF RF amplifier, mixer	Low noise, low input capacity 0.5 pF (Typ.)				
☆ 3SK165A						
☆ 3SK166	UHF RF amplifier, oscillator	Low noise, high gm 40 mS (Typ.)				
☆ 3SK166A						

* V_{G2S} = 1.5 V

VARIABLE CAPACITANCE DIODE

Product name		Applications	Capacitance ratio Typ.	Series resistance Max. (Ω)	Capacitance deviation (%)	Supply voltage (V)	Pins	
SMVC	SSVC							
1T362/A	1T402	UHF tuning	6.5 (C ₂ /C ₂₅)	0.65	<2/<3 (1T362)	2 to 25	2	
1T363/A	1T403		15.0 (C ₁ /C ₂₈)	0.80	<2/<3 (1T363)	1 to 28		
1T368	1T404	VHF/CATV tuning	11.5 (C ₂ /C ₂₅)	0.75	<2	2 to 25		
1T369	1T406		15.5 (C ₂ /C ₂₅)	1.00				
1T378	1T405		12.5 (C ₂ /C ₂₅)	0.85				
1T397	1T407		15.5 (C ₂ /C ₂₅)	1.10				
☆ 1T399	1T408		17.4 (C ₁ /C ₂₈)	0.64 (Typ.)				1 to 28
1T365	1T412		BS/CS tuning	5.7 (C ₂ /C ₂₅)				1.80
1T379	1T410	12.0 (C ₁ /C ₂₅)		1.50	<6	1 to 25		
1T367	1T409	VCO for cordless telephone		2.5 (C ₂ /C ₁₀)	0.40	—		2 to 10
1T411	—	VCO for analog cellular	6.5 (C ₂ /C ₂₅)	<3		2 to 25		
☆ —	1T413	VCO for digital cellular	2.85 (C ₁ /C ₄)	0.25 (Typ.)	—	1 to 4		

SMVC : Super-Mini Vari-Cap

SSVC : Super-Small-mini Vari-Cap

RF DEVICE

☆ Under development

TUNER IC

● UHF/VHF TUNER

Product name	Functions	Supply voltage (V)	Package	Pins
CXA1594L/L-S	2-band OSC/mixer, IF amplifier	9	SZIP	16
CXA1664M			SOP	
CXA1665M/AM/AM-S			SZIP	
CXA1695L			SSOP*	24
CXA1696L/L-S				
CXA3025N	2-band OSC/mixer, IF amplifier, OSC output buffer	5	SSOP	20
CXA3095N	3-band OSC/mixer, IF amplifier, OSC output buffer			
☆ CXA3075N	2-band OSC/mixer, IF amplifier, PLL (3-wire BUS controlled), band switch			30
☆ CXA3084N				
☆ CXA3085N				
☆ CXA3134N	2-band OSC/mixer, IF amplifier, PLL (I ² C-bus controlled), band switch	30		
☆ CXA3135N				

* 0.8 mm-pitch SSOP (other SSOP: 0.65 mm-pitch)

● SATELLITE BROADCASTING TUNER

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA3008N-1/2	L-band down converter	1.3 to 2.53 GHz OSC, mixer, IF amplifier	5	SSOP	16
CXA3068N		1.3 to 2.63 GHz OSC, mixer, IF amplifier			
☆ CXA3108Q		1.3 to 2.63 GHz OSC, mixer, IF AGC amplifier, PLL		QFP	40
CXA3018R	FM demodulation, video signal processing	AGC amplifier, FM detection, video amplifier, clamp, dispersal elimination		LQFP	48
☆ CXA3038N	I/Q detection	AGC amplifier, I/Q detection, PLL, PLL frequency divider data		SSOP	24
CXD2027R	Audio QPSK demodulation, audio PCM demodulation	PCM demodulation, QPSK demodulation, built-in digital filter, D/A converter	LQFP	80	
CXD2917Q	Digital audio data modulation/transmission	Digital audio data transmission	QFP	32	
☆ CXD1961Q	Digital satellite broadcasting, QPSK demodulation, error correction	QPSK demodulation, Viterbi decoding, Reed Solomon decoding		3.3	100

RF MODULATOR IC

Product name	VHF	UHF	OSC	Antenna switch driver	Test pattern signal generator	Supply voltage (V)	Package	Pins
CXA1122AM/AP	○	—	○	○	—	5 to 9	SOP/DIP	16
CXA1733M/N	—	○	○	—	○	5	SOP/SSOP	20
CXA1929M	○	○	○	ATT driver	○		SOP	24
CXA3050M	○	○	○	NICAM mixer	○			

OPTICAL DISC

☆ Under development

COMPACT DISC IC

● RF AMPLIFIER IC

Product name	Error amplifier	I-V amplifier	Laser APC	Power supply		Package	Pins	Remarks
				Dual	Single			
CXA1571M/N/S	○	○	○	○	○	SOP/ SSOP/ SDIP	20/ 20/ 22	—
CXA1791M/N	○	○	○	○	○	SOP/ SSOP	20	Suitable for double-speed applications
CXA1821M	○	—	○	—	○	SOP		Suitable for laser coupler system optical pickup, supports double-speed applications
CXA2521AQ	○	—	○	—	○	QFP	32	Suitable for quadruple-speed applications
CXA1841AQ	○	—	○	—	○		48	
☆ CXA2515AM/AN	○	—	○	—	○	SOP/ SSOP	20	Suitable for sextuple-speed applications
☆ CXA2525AM/AN	○	—	○	—	○			
CXA2555Q	○	—	○	—	○	QFP	32	Suitable for laser coupler system pickup, supports ×16 speed applications
CXA2556Q	○	—	○	—	○			Supports ×16 speed applications

● SERVO SIGNAL PROCESSING IC

Product name	Focus servo	Tracking servo	Sled servo	Defect detection, mirror circuit	Defect countermeasure circuit	Power supply		Package	Pins
						Dual	Single		
CXA1372BQ/BS	○	○	○	○	○	○	○	QFP/ SDIP	48

● RF AMPLIFIER + SERVO SIGNAL PROCESSING IC

Product name	CXA1782BQ/BR	CXA1782CQ/CR	CXA1992R
Error amplifier	○	○	○
I-V amplifier	○	○	○
Laser APC	○	○	○
AGC	—	—	○
Automatic focus/tracking adjustment	Tracking only	Tracking only	○
Focus servo	○	○	○
Tracking servo	○	○	○
Sled servo	○	○	○
Defect detection, mirror circuit	○	○	○
Defect countermeasure circuit	○	○	○
Power supply	Dual	—	—
	Single	○	○
Low voltage	3.0 V OK	3.0 V OK	3.0 V OK
Package	QFP/LQFP		LQFP
Pins	48		52

● DIGITAL SIGNAL PROCESSING IC

	Product name	Data demodulation	Error correction	RAM	Digital servo	Digital PLL	Fine search	Digital out	Double-speed available	Digital filter	D/A converter	Low voltage	Package	Pins	Remarks				
☆	CDL500 series	CXD2507AQ	○	○	16K ○	—	○	—	○	○	—	—	3.0 V OK	QFP	64	Digital PLL, error correction based on SEC strategy, digital spindle servo, auto sequencer			
		CXD2529Q	○	○	16K ○	—	○	—	○	○	Built-in post filter	○	Built-in post filter		100	Wide capture function, level meter function			
		CXD2589Q	○	○	16K ○	—	○	—	○	○	Built-in post filter	○	Built-in post filter		80				
		CDL600 series	CXD2548R	○	○	16K ○	○	○	—	○	○	Built-in post filter	○	Built-in post filter	100	Error correction based on SEC strategy			
		CDL40 series	CXD2500BQ/BQZ	○	○	32K ○	○	○	—	○	○	—	—	3.4 V OK	80	Error correction (C ₁ = double, C ₂ = quadruple), variable pitch, level meter, auto sequencer			
			CXD2510Q	○	○	32K ○	○	○	○	○	○	—	—						
			CXD2540Q-2*	○	○	32K ○	○	○	○	○	○	Quadruple-speed available	—				—		
		CDL60 series	CXD2586R-1	○	○	32K ○	○	○	○	○	○	Octuple-speed available	○	Built-in post filter	○	Built-in post filter	LQFP	144	Wide capture function
			CXD3000R	○	○	32K ○	○	○	○	○	○	Twelve times speed available	○	Built-in post filter	○	Built-in post filter			
	CDL50 series	CXD2545Q	○	○	32K ○	○	○	○	○	○	Quadruple-speed available	—	—	QFP	100	Error correction (C ₁ = double, C ₂ = quadruple), variable pitch, level meter, auto sequencer			

* Built-in variable speed PB

Note) Fine search: Increases the precision of track jump.

● CD GRAPHICS DECODER

Product name	Functions	Supply voltage (V)	Package	Pins
CXD1807Q	CD-G command decoder, subcode decoder, RGB 4-bit D/A converter	4.5 to 5.5	QFP	80

● SYSTEM CONTROLLER IC

	Product name	Functions	Supply voltage (V)	Package	Pins
CDL40 series	CXP1021Q	System controller, built-in LCD driver	4.5 to 5.5	QFP	80
CDL500 series	CXP1042Q		3.5 to 5.5		64

CD-ROM IC

● CD-ROM DECODER

Product name	Functions						Applications	Supply voltage (V)	Package	Pins
	Double-speed PB	Host CPU (Interface)	ADPCM decoder	Digital filter	Digital attenuator/mixer	Subcode interface				
CXD1186CQ/CR	○	Intel general purpose*1	—	—	—	—	CD-ROM decoder for general purpose	4.5 to 5.5	QFP/LQFP	80
CXD1196AR	○ (For 5 V)	—	○	○	—	—	Suitable for portable CD-ROM type with ADPCM	3.5 to 5.5	LQFP	
CXD1197AQ	○	Motorola	○	○	○	—	Suitable for CD-I type with Motorola I/F	4.5 to 5.5	QFP	100
CXD1199AQ	○*2	Intel	○	○	○	—	Suitable for CD-ROM XA type with Intel I/F	3.5 to 5.5		
CXD1803AQ/AR	○*2	General purpose*1	○	○	○	—	Suitable for CD-ROM XA type for SCSI I/F type		4.5 to 5.5	
CXD1812Q/R	○*2	ATAPI	—	—	—	○	Built-in ATAPI I/F CD-ROM decoder, quadruple-speed CD-ROM supported	QFP/LQFP		
☆ CXD1804AR	○*3	SCSI	—	—	—	○*4	Built-in SCSI I/F CD-ROM decoder, twelve times speed CD-ROM supported	LQFP	144	
CXD1806AQ	○*2	General purpose	—	—	—	—	CD-ROM decoder for general purpose	QFP	100	
CXD1808AQ	○*2	General purpose	—	—	—	○*4				

*1: Various interfaces (SCSI, ATAPI, etc.) can be achieved by combining with the interface LSI.

*2: Supports the quadruple-speed playback.

*3: Supports the twelve times speed playback.

*4: Supports the subcode real-time correction.

● SUBCODE DECODER

Product name	Functions	Supply voltage (V)	Package	Pins
CXD1198AQ	Real-time correction of subcode, pointer transfer, buffer controller (connection with DRAM up to 1 MB)	4.5 to 5.5	QFP	100

● SCSI CONTROLLER

Product name	Functions	Supply voltage (V)	Package	Pins
CXD1185CQ/CR	SCSI controller, asynchronous/synchronous transfer, 48 mA open drain output	4.5 to 5.5	QFP/LQFP	64

1-BIT A/D, D/A CONVERTER

Product name	Oversampling rate	Order	Attenuation	S/N ratio Min. (dB)	Distortion Max. (%)	Package	Pins	Remarks
CXD2559Q	4fs	51 + 15	○	96	0.012	QFP	32	Selection of output contents possible (L/R/L+R/MUTE)
CXD2555Q		63 + 15 51 + 15	—	80 (A/D) 92 (D/A)	0.018 (A/D) 0.012 (D/A)		48	Single chip AD/DA Fs = 32 to 48 kHz
CXD2570Q			—	74 (A/D) 84 (D/A)	0.03 (A/D) 0.03 (D/A)			Single chip AD/DA Fs = 8 to 32 kHz
CXD2564AM	8fs	99 + 19 + 11	○	100	0.003	SOP	28	Multi function, middle class version
CXD2565M			○	96	0.004			

ADSP (Audio Digital Signal Processor)

Product name	Functions	Supply voltage (V)	Package	Pins
CXD2720Q	3-ch A/D converter, 2-ch D/A converter, Karaoke DSP with built-in 128K-bit DRAM, key control, digital echo, realizes voice cancellation, etc. on a single chip	4.5 to 5.5	QFP	100

AUDIO RELATED IC

● INTERFACE IC

Product name	Functions	Supply voltage (V)	Package	Pins
CXD2917Q	Digital audio data modulation, transmission	4.75 to 5.25	QFP	32

● MPEG1 DECODER

Product name	Functions	Supply voltage (V)	Package	Pins
CXD1852Q	Decodable for system, video, and audio layers of MPEG1, built-in CD-ROM decoder	3.3 ± 0.3	QFP	120

DOLBY IC

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● DOLBY B TYPE NOISE REDUCTION SYSTEM IC

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1100P	Tape deck, car stereo	Dolby B type noise reduction, stereo recording/playback	11.5 to 16	DIP	16
CXA1101M/P			8.5 to 16	SOP/DIP	
CXA1102M/P			6.5 to 16		
CXA1163M/P			5 to 16		
CXA1550P		Dolby B type noise reduction, stereo recording/playback, double-speed use	11.5 to 16	DIP	
CXA1551M/P			8.5 to 16	SOP/DIP	
CXA1552M/P			6.5 to 16		
CXA1553M/P			5 to 16		

● DOLBY B-C TYPE NOISE REDUCTION SYSTEM IC

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CX20188	Tape deck, car stereo	Dolby B-C type noise reduction, stereo recording/playback	8 to 21	SDIP	42
CXA1098Q				QFP	48
CXA1330S			11.5 to 16	SDIP	30
CXA1331M/S			8.5 to 16	SOP/	
CXA1332M/S			7 to 16	SDIP	
CXA1560S			11.5 to 16	SDIP	22
CXA1561M/S		8.5 to 16	SOP/	24/22	
CXA1562M/S		7 to 16			SDIP
CXA1563M/S			Dolby B-C type noise reduction, stereo recording/playback, switch to Dolby S type noise reduction		

● DOLBY S TYPE NOISE REDUCTION SYSTEM IC

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1917AM/AS	Tape deck, car stereo	Dolby S type noise reduction, monaural encoder (Decoding possible using an operational amplifier)	9.5 to 16 ±4.75 to ±8	SOP/ SDIP	48

● DOLBY NOISE REDUCTION SYSTEM IC WITH PLAYBACK EQUALIZER

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1580Q	Car stereo	Dolby B type noise reduction system with PB equalizer amplifier	6.5 to 11	QFP	40
CXA1980Q					32
CXA1910Q		New version for the CXA1580Q which allows the music sensor LPF time constant to be adjusted by varying the external capacitor value	7.8 to 11		40
CXA1911Q		Dolby B-C type noise reduction version of CXA1910Q			
☆ CXA2509AQ		Stereo PB, PB preamplifier, AMS			
☆ CXA2510AQ		Dolby B type noise reduction, stereo PB, PB preamplifier, AMS			
☆ CXA2511AQ	Dolby B-C type noise reduction, stereo PB, PB preamplifier, AMS				

● DOLBY NOISE REDUCTION SYSTEM IC WITH RECORDING/PLAYBACK EQUALIZER

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1897Q	Radio and cassette tape deck	Dolby B type noise reduction system with REC/PB equalizer	6.5 to 10	QFP	48
CXA1797Q	Cassette tape deck	REC equalizer, serial control, Dolby B-C type noise reduction system	± 5.25 to ± 6		64
☆ CXA1878Q		REC/PB equalizer, calibration, Dolby B-C type noise reduction system, REC EVR	± 6.5 to ± 8		

TAPE RECORDER IC

● RECORDING EQUALIZER AMPLIFIER

Product name	Features	Recording	Stereo	Supply voltage (V)	Package	Pins
CXA1198AP	Recording equalizer (Variable equalizer characteristics without inductor)	○	○	±4 to ±7.5 8 to 15	DIP	16
CXA1598M/S		○	○	±6.5 to ±8 10 to 16	SOP/ SDIP	24/ 22
CXA1298AP	Recording equalizer (with fixed characteristics) (Inductor not required)	○	○	±1.8 to ±7.5 3.5 to 15	DIP	16
CXA1398M/P	Recording equalizer (with fixed characteristics), with calibration (Note) Equalizer characteristic curve varies according to product (Inductor not required)	○	○	±4.5 to ±8 9 to 16	SOP/ DIP	
CXA1597M/P		○	○	±5 to ±8		
CXA1495M/P		○	○	10 to 16		
CXA1578M/P		○	○	±4.5 to ±8		
CXA1579M/P		○	○	9 to 16		

● RECORDING PLAYBACK EQUALIZER AMPLIFIER

Product name	Applications		Functions			Supply voltage (V)	Package	Pins
			Recording	Playback preamplifier	Stereo			
CXA1498M/S	For double cassette use, recording/playback, single-chip	3-tape positions, inductor not required	○	○	○	4.5 to 10	SOP/ SDIP	30
CXA1898Q		3-tape positions, inductor not required,	○	○	○	6.5 to 10	QFP	48
CXA1998AQ		serial control	○	○	○			

● SINGLE CHIP CASSETTE DECK

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1599Q	Double cassette deck	Analog signal processing for double cassette deck except Dolby noise reduction	10 to 16 ±5 to ±8	QFP	48

● HEADPHONE STEREO PRE-POWER AMPLIFIER

Product name	Features	Playback preamplifier	Playback power amplifier	Stereo	Motor controller	Supply voltage (V)	Package	Pins
CXA1634M/P	Electronic volume, bass boost, headphone stereo	○	○	○	—	1.8 to 6.5	SOP/ DIP	16
CXA1635M/S	CXA1634P/M features an on-chip motor controller	○	○	○	○	1.8 to 4.5	SOP/ SDIP	24/ 22
CXA2500N	REC/PB amplifier	○	—	○	—	1.6 to 3.5 (REC) 1.2 to 3.5 (PB)	SSOP	24

ANALOG AUDIO

☆ Under development

RADIO IC

Applications	Functions	Product name	Recommended supply voltage (V)	AM front-end	AM IF amplifier	FM front-end	FM IF amplifier	Power amplifier	FM stereo	Major applications and functions	Package	Pins
On-chip power amplifier AM radio		CXA1600M/P	1.8 to 4.5	○	○			○		Thin radio, pocket radio	SOP/DIP	8
FM/AM radio	FM monaural	On-chip power amplifier	CXA1619M	2 to 7.5	○	○	○	○	○		SOP	28
		CXA1619S	2 to 8.5	○	○	○	○	○		Clock radio, pocket radio	SDIP	30
		CXA1691M	2 to 7.5	○	○	○	○	○		Thin radio, pocket radio	SOP	28
		CXA1691S	2 to 8.5	○	○	○	○	○		Clock radio, pocket radio	SDIP	30
		CXA1611M	2 to 9	○	○	○	○			Radio and cassette tape recorder, headphone stereo	SOP	24
	CXA1611P	○		○	○	○			Pocket radio	DIP		
CXA1611N	○	○		○	○			Headphone stereo	SSOP			
FM stereo	CXA1538M/N/S		○	○	○	○		○	Home radio, headphone stereo, thin stereo radio	SOP/SSOP/SDIP	30	
Stereo power amplifier		CXA1622M/P	1.8 to 4.5 1.8 to 7					○		Radio power amplifier	SOP/DIP	16

ACCESSORY IC

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1262N	Headphone stereo	Max. output power 220 mW, for monaural tape recorder	1.8 to 4.2	SSOP	24
CX20172		Low voltage (drive on 8Ω load with one dry battery)	0.9 to 2.2	SOP	14
CXA1352AS	2-ch 5-band graphic equalizer	Electronic volume, pseudo loudness function	4 to 10	SDIP	22
CXA1792S		Electronic volume			
CXA1642M/P	Vocal cancel for Karaoke	Suppresses center position vocals and compensates bass from stereo source (monaural output)	1.8 to 10	SOP/DIP	8
CXA1644P	Echo effect	Delay time 100 ms (Typ.)	4 to 6	DIP	16
CXA1673M/P	Surround effect	Surround and bass boost effects	1.8 to 10	SOP/DIP	
CXA1568M/S	Function switch	Selects one output system from four input systems, mixing microphone amplifier	4.5 to 10	SOP/SDIP	24/ 22
CXA1842S	3-mode surround vocal cancel	3-surround modes including pseudo stereo mode and vocal cancellation function	5 to 12	SDIP	22
CXA1279AS	Sound processor	Volume, balance and tone control	9 to 12		
CXA1646Q	Electronic volume	Control for volume, tone (BASS, TREBLE), fader, and switching among four input source lines through serial data control	6 to 12	QFP	48
CXA1767Q				QFP/LQFP	48
CXA1946AQ/AR		SOP/SSOP		20	
CXA1846M/N		Volume control through serial data control			
CXA1746Q		Control for volume, tone (BASS, MID, TREBLE), fader, and switching among four input source lines through serial data control		QFP	48

FLOPPY DISK DRIVE IC

Product name	Functions	Features	Supply voltage (V)	Package	Pins
CX20185	Read/Write amplifier	5/12 V supply voltage	12, 5	QFP	44
CXA1073M/Q		Low power consumption	5 or 12, 5	SOP/QFP	30/32
CXA1173Q		Power save function, low power consumption			
CXA1360Q		Built-in filter, low power consumption	5	QFP	32
CXA1362Q		Built-in filter, low power consumption, write circuit reset function			
CXA1720Q		Built-in filter, low power consumption, write circuit reset function, reduction of external parts			
CXA3010Q		Built-in filter, low power consumption, write circuit reset function, reduction of external parts			
CXA3031Q		Built-in filter, low power consumption, write circuit reset function, reduction of external parts, logic-modified product of CXA3010Q			
CXA3071N	1 MB/1.6 MB/2 MB applicable, no external part except one resistor, write circuit reset function, low power consumption, ultra-small package		SSOP	20	

HARD DISK DRIVE IC

Product name	Functions	Features	Supply voltage (V)	Package	Pins
CXA1445M	Equalizer	Variable delay time/K1 and K2 mix ratio	5	SOP	16
CXA1554N	Read/Write amplifier (4-ch)	Low noise, low power consumption			24
CXA1940N	Read/Write amplifier for thin film/MIG head (4-ch)	Low noise, low power consumption, C _{IN} = 14 pF, damping resistance (310Ω)			20
CXA1829N	Read/Write amplifier for thin film/MIG head (8-ch)	C _{IN} = 14 pF, damping resistance (310Ω), 4-ch servo write function			30
CXA3090N	Read/Write amplifier for thin film/MIG head (6-ch)	Low input capacity (6 pF), low noise (0.47 nV)			24
CXA3092N	Read/Write amplifier for thin film/MIG head (4-ch)				20
☆ CXA3081R	Read/Write amplifier for MR-inductive head (4-ch)	Single-ended input, bias current 10 to 20 mA, built-in T-FF			LQFP

ANALOG CELLULAR IC

● IF AMPLIFIER IC

Product name	Functions, Features	Supply voltage (V)	Package	Pins
CXA1002M/N	Low power FM IF amplifier (except mixer)	4.5 to 9.5	SOP/ SSOP	16
CXA1003BM/BN	Low power FM IF amplifier (with second mixer)			24
CXA1293M/N	Low power FM IF amplifier (with second mixer for handy)	3.0 to 6.0		24
CXA1343M/N	Low power FM IF amplifier (with gain control audio amplifier)	4.5 to 9.5		24
CXA1402M/N	Super low power FM IF amplifier (except mixer)	3.0 to 6.0		16
CXA1741Q	FM IF amplifier with filter for TACS, NTACS	2.7 to 3.6	QFP	40
CXA1742Q	FM IF amplifier with filter for AMPS			40
☆ CXA3114N	FM IF amplifier with filter for NAMPS, AMPS		SSOP	24

● MODEM IC

Product name	Functions, Features	Supply voltage (V)	Package	Pins
CXD1272Q/R	Base band LSI with compandor	4.5 to 5.5	QFP/ LQFP	80

● PLL IC

Product name	Functions, Features	Supply voltage (V)	Package	Pins
CXA1786N	1 GHz-band single chip PLL for radio communication, power saving mode	2.7 to 5.5	SSOP	20

GPS IC

● NAVIGATION IC

Product name	Functions, Features	Supply voltage (V)	Package	Pins
CXA1951Q	Down converter, LNA, mixer, IF amplifier, PLL, oscillator	2.7 to 5.5	QFP	40

CDMA CELLULAR IC

● CDMA CELLULAR IC

Product name	Functions, Features	Supply voltage (V)	Package	Pins
CXA3001N	Reception AGC amplifier, dynamic range: ± 45 dB or more	3.1 to 3.8	SSOP	24
CXA3002N	Transmission AGC amplifier, dynamic range: ± 40 dB or more			
CXA3003R	Analog base-band for CDMA, FM with I/Q demodulator, I/Q modulator, PLL, AD, DA, etc.	3.3	LQFP	80

● CDMA ANTENNA SWITCH

High frequency switch

Product name	Insertion loss (dB)	Isolation (dB)	@Frequency (GHz)	Control voltage (V)	Package	Pins
CXG1012N	0.5	23	2.0	0/3	SSOP	8

PDC IC

● PDC TRANSMISSION SINGLE CHIP IC

Product name	Functions, Features	Supply voltage (V)	Package	Pins
CXA3022R	Transmission mixer, I/Q modulator, PLL, TX power controller	2.7 to 3.3	LQFP	64

● PDC MMIC

Antenna switch

Product name	Functions	Insertion loss (dB)	Isolation (dB)	@Frequency (GHz)	Control voltage (V)	Package	Pins
CXG1006N	SPDT	0.4	32	1.5	0/4	SSOP	8
CXG1016N		0.45	20				
CXG1017N	DPDT	0.5	18				
CXG1024N	2 × 4 switches	0.4 (800 MHz) 0.5 (1.5 GHz)	23 (800 MHz) 20 (1.5 GHz)	0.8/1.5			

Low noise converter

Product name	Functions	Noise figure (dB)	Gain (dB)	@Frequency (GHz)	Supply voltage (V)	Package	Pins
CXG1014N	LNA	1.85	16	1.49	3.0	SSOP	16
	Mixer	8.5	8	1.49 (flo: 1.62)			

Predriver

Product name	Gain (dB)	Output level Min. (dBm)	ACP Max. (dB)	Number of stages	Supply voltage (V)	Package	Pins
☆ CXG1027TM	27	10	-60	2	3.0	TSSOP	10
☆ CXG1019N	25	20				SSOP	8

GSM RF IC

Product name	Functions, Features	Power consumption (at 3 V)	Supply voltage (V)	Package	Pins
CXA3021R	LNC, I/Q demodulator, I/Q modulator, PLL, TX mixer, RX AGC	RX: 90 mW TX: 150 mW	2.7 to 5.5	LQFP	64

PHS IC

● PHS ANALOG IC

Product name	Functions, Features	Supply voltage (V)	Package	Pins
☆ CXA3120R	RX IF amplifier, PLL, I/Q modulator, TX mixer, etc.	2.6 to 3.6	LQFP	48

● PHS MMIC

High frequency switch

Product name	Insertion loss (dB)	Isolation (dB)	@Frequency (GHz)	Control voltage (V)	Package	Pins
CXG1008N	0.8	43	2.0	0/3	SOP	8
CXG1012N	0.5	23			TSSOP	10
CXG1022TM	0.4	26				

For reception

Product name	Functions	Noise figure (dB)	Gain (dB)	@Frequency (GHz)	Supply voltage (V)	Package	Pins
CXG1003N	LNA	2.9	14	1.9	2.5	SOP	8
CXG1004N	Mixer	10	8	1.9 (flo: 1.66)			
CXG1013N	LNA	1.8	14.5	1.9	3.0	SSOP	16
	Mixer	7.2	9	1.9 (flo: 1.66)			

Power amplifier

Product name	Gain (dB)	Output power (dBm)	ACP Max. (dB) @600 kHz	Number of stages	Supply voltage (V)	Package	Pins
CXG1010N	40	21.5	-54	3	3.4	SSOP	16
CXG1020N	30	21		2	3.0		8
CXG1030N	40			3			16

PAGER IC

Product name	Structure	Functions, Features	Supply voltage (V)	Package	Pins
CXA1474AM/AN	Single conversion	Low power FM IF amplifier, quick charge circuit	1.0 to 4.0	SOP/ SSOP	16
CXA1850N		Low power FM IF amplifier with 4-level FSK comparator		SSOP	
CXA3099N		Low power FM IF amplifier with 4-level FSK comparator, bit rate filter selection switch			
CXA3107N	Double conversion	Low power FM IF amplifier		SOP/ SSOP	20
CXA1184M/N		Low power FM IF amplifier, quick charge circuit			
CXA1484AM/AN		Low power FM IF amplifier with 4-level FSK comparator			
CXA1999N		Low power FM IF amplifier with 4-level FSK comparator, bit rate filter selection switch		SSOP	24
CXA3097N		Low power FM IF amplifier with I/Q demodulator, IF mixer, IF amplifier, filter			30
CXA1995N	Direct conversion	4-level FSK comparator		SOP	8
CXA1994M	—	AM/FM reception, front-end, IF amplifier, detector		1.8 to 4.5	SSOP
CXA1994AM/BM	Single conversion, AM/FM multiplexer				

GENERAL-PURPOSE DEVICE

● PLL IC

Product name	Functions, Features	Supply voltage (V)	Package	Pins
CXA1356N	1.5 GHz-band single chip PLL for radio communication	4.5 to 5.5	SSOP	16
CXA1541M	1.1 GHz, 2-modulus prescaler		SOP	8
CXA1786N	1 GHz-band single chip PLL for radio communication, power saving mode	2.7 to 5.5	SSOP	20
CXA1787N	2 GHz-band single chip PLL for radio communication, power saving mode			

● GaAS MES FET FOR RF RECEIVING

	Product name	Applications	Features	Recommended operating conditions*		Package	Pins
				V _{ds} (V)	I _d (mA)		
	SGM2014M	UHF RF amplifier, mixer, oscillator	Low cross modulation, built-in gate protection diode, low noise NF = 1.5 dB (Typ.) @f = 900 MHz	5	10	Mini mold	4
☆	SGM2014AM						
☆	SGM2016M/P						
☆	SGM2016AM/AP		Low noise NF = 1.2 dB (Typ.) @f = 900 MHz, built-in gate protection diode				
	3SK165	UHF RF amplifier, mixer	Low noise, low input capacity 0.5 pF (Typ.)	5	10	Mini mold	4
☆	3SK165A						
☆	3SK166	UHF RF amplifier, oscillator	Low noise, high gm 40 mS (Typ.)	5	10	Mini mold	4
☆	3SK166A						

* V_{G2S} = 1.5 V

● ANALOG CORDLESS PHONE IC

	Product name	Functions, Features	Supply voltage (V)	Package	Pins
	CXA1493AM/AN	Low power FM IF amplifier (with LPF)	2.7 to 6.0	SOP/	20
	CXA1683M/N		1.8 to 6.0	SSOP	
☆	CXA3113N	RF amplifier with IF mixer, IF amplifier, filter, discriminator	1.8 to 5.0	SSOP	24

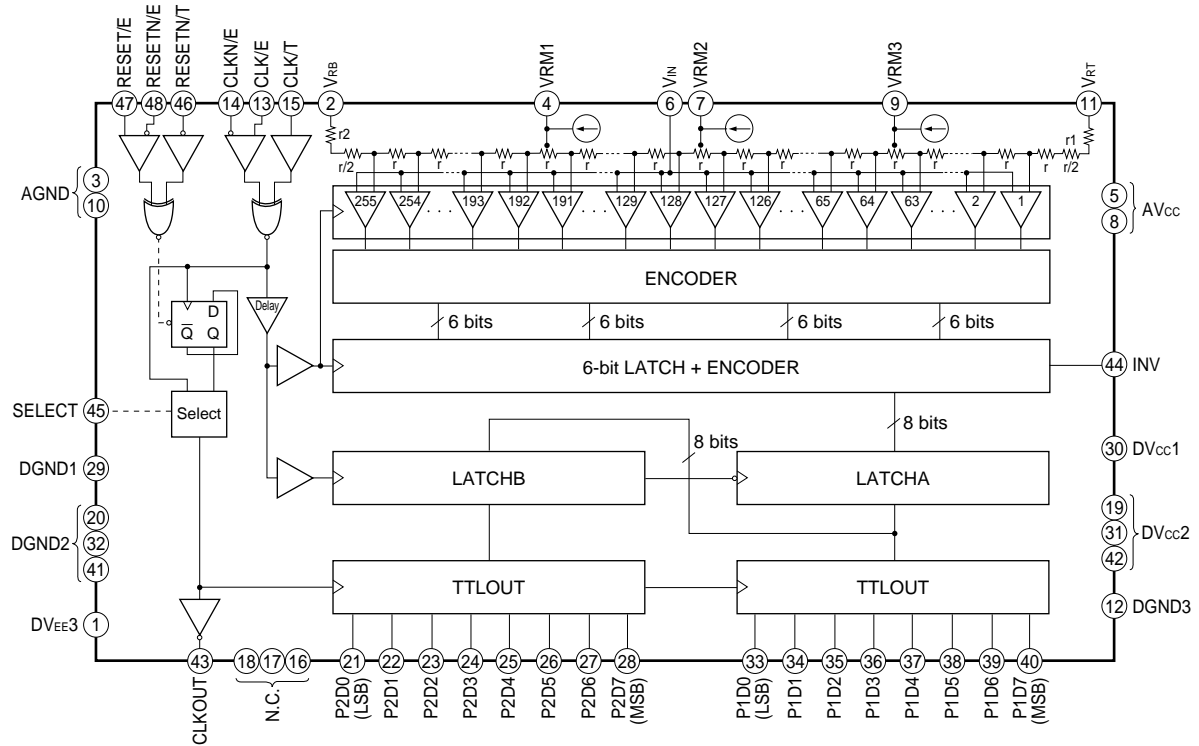
● CT2 IC

	Product name	Functions, Features	Supply voltage (V)	Package	Pins
	CXA1744AR	Low power FM IF amplifier (with 2nd mixer, OSC quad detector)	2.7 to 5.5	LQFP	48
	CXA1851N	Up/Down converter	2.7 to 4.5	SSOP	20
	CXA1852N	I/Q orthogonal modulator	2.7 to 5.0		

A/D, D/A CONVERTER

☆ Under development

CXA3026Q BLOCK DIAGRAM



VIDEO SIGNAL PROCESSING

● A/D CONVERTER

Product name	Bits	Rate (MSPS)	Pd (mW)	Features	Supply voltage (V)	Package	Pins
CXA1844Q	10	33	320	2-step type conversion, TTL I/O	±4.75 to ±5.25	QFP	48
CXA1977R			160	2-step type conversion, TTL I/O, low power consumption	4.6 to 5.25		
CXD2310AR		20	150	2-step type conversion, CMOS, built-in auto calibration, sample and hold	Analog 4.75 to 5.25	LQFP	
CXD2311AR				2-step type conversion, CMOS, built-in auto calibration, no sample and hold	Digital 3.0 to 5.25		
CXD2312R			9	130	2-step type conversion, CMOS, built-in auto calibration, no sample and hold		
☆ CXD2303Q	8	50	125	2-step type conversion, CMOS, 3-ch, built-in sample and hold, digital clamp circuit	4.75 to 5.25	QFP	80
CXD2302Q				2-step type conversion, CMOS, built-in sample and hold, clamp circuit			
CXD1179Q		35	80	2-step type conversion, CMOS, built-in sample and hold, clamp circuit, amplifier selector	Analog 4.75 to 5.25 Digital 3.0 to 5.25	32	
CXD2301Q		30	120	2-step type conversion, CMOS, built-in sample and hold	4.75 to 5.25		
CXD1175AM/AP	20	20	60	2-step type conversion, CMOS, built-in sample and hold	4.75 to 5.25	SOP/DIP	24
CXD1176Q				2-step type conversion, CMOS, built-in sample and hold, clamp circuit		QFP	32
CXD2300Q				18			
CXD1172AM/AP	6	20	35	2-step type conversion, CMOS, built-in sample and hold	4.75 to 5.25	SOP/DIP	16
CXD2314R	9			150	2-step type conversion, CMOS, built-in auto calibration, sample and hold	Analog 4.75 to 5.25 Digital 3.0 to 5.25	LQFP
☆ CXD3300R	10		30		3.0		

A/D, D/A CONVERTER

☆ Under development

● D/A CONVERTER

Product name	Bits	Rate (MSPS)	P _D (mW)	Features	Supply voltage (V)	Package	Pins
CX20206	8	35	360	TTL input, 3-ch	4.5 to 5.5	SDIP	42
CXA1260Q-Z						QFP	48
CXA1106M/P	8	35	200 or 400	TTL input, 1-ch	4.75 to 5.25 or ±4.75 to ±5.25	SOP/DIP	24
CXD2306Q	10	80	100	CMOS, 1-ch, current output system (200Ω load, 2 V _{p-p} output)	4.75 to 5.25	QFP	32
CXD2315Q				CMOS, 1-ch, low glitch, current output system (200Ω load, 2 V _{p-p} output)			
CXD2308Q	10	50	500	CMOS, 3-ch, current output system (75Ω load, 2 V _{p-p} output)	4.75 to 5.25	LQFP	64
CXD2307R				CMOS, 3-ch, current output system (200Ω load, 2 V _{p-p} output)			
CXD2309Q	8	40	240	CMOS, 3-ch, current output system (200Ω load, 2 V _{p-p} output)	3.0 to 3.6	QFP	48
CXD1178Q							
CXD1177Q	8	40	160	CMOS, 2-ch, current output system (200Ω load, 2 V _{p-p} output)	3.0 to 3.6	SOP	24
CXD1171M							
CXD2304R	8	20	50	CMOS, 3-ch, current output system (330Ω load, 1.2 V _{p-p} output)	3.0 to 3.6	LQFP	48
CXD1170M	6	40	80	CMOS, 1-ch, current output system (200Ω load, 2 V _{p-p} output)	4.75 to 5.25	SOP	24

INDUSTRIAL INSTRUMENTS

● A/D CONVERTER

Product name	Bits	Rate (MSPS)	P _D (mW)	Features	Supply voltage (V)	Package	Pins	
CXA1276K	8	500	2800	Flash type conversion, ECL I/O	-4.95 to -5.5	LCC	68	
CXA1166K		250	1400			LCC/ CDIP	68/ 42	
CXA1396K/D*		125	870			LCC/DIP	44/28	
CXA1386K/P		75	580					
CXA3026Q	6	140	760	1 : 2 de-multiplex TTL output	4.75 to 5.25 or ±4.75 to ±5.25 ±4.75 to ±5.25	QFP	48	
CXA3026AQ								790
CXA3086Q								358
CXA1866Q								325
CXA1826Q	6	200	200	Flash type conversion, ECL I/O	-4.95 to -5.5		32	

* CXA1396D package: Ceramic 42-pin DIP (CDIP)

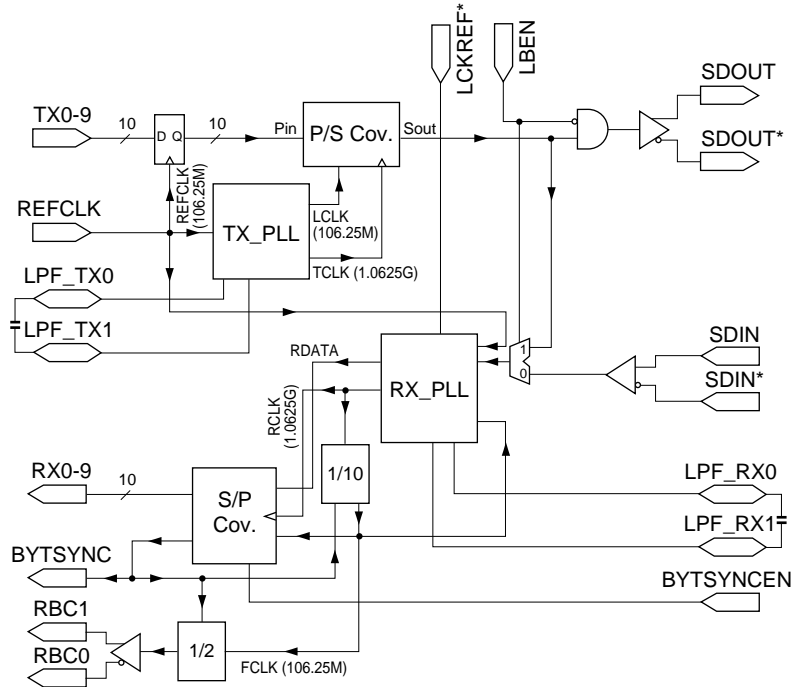
● D/A CONVERTER

Product name	Bits	Rate (MSPS)	P _D (mW)	Features	Supply voltage (V)	Package	Pins
CX20201A-1	10	160	420	ECL input, 1-ch	-4.75 to -5.45	SOP	28
CX20201A-2	9						
CX20201A-3	8						
CX20202A-1	10					DIP	
CX20202A-2	9						
CX20202A-3	8						

SAMPLE AND HOLD

Product name	Features	Supply voltage (V)	Package	Pins
CXA1843Q	33MSPS, accuracy 10 bits	±4.75 to ±5.25	QFP	32

CXB1586R BLOCK DIAGRAM



OPTICAL COMMUNICATION IC

● TRANSMITTER IC

Product name	Functions	Operating frequency Typ.	Power* consumption Typ. (mW)	Supply voltage (V)	Package	Pins
CXB1108AQ	Laser driver (bias current = 60 mA + modulation current = 60 mA (Max.))	2.0 Gbps	175	-4.5	MQFP	16
CXB1118AQ	Laser driver (bias current = 100 mA + modulation current = 100 mA (Max.))	1.5 Gbps	380	-5.2		24
CXB1128AQ	Laser driver (bias current = 100 mA + modulation current = 60 mA (Max.))		350			
CXB1548Q-Y	Laser driver (built-in operational amplifier) (bias current = 60 mA + modulation current = 60 mA (Max.))	2.0 Gbps	360	5.0, -5.2	CQFP	32
CXB1558Q-Y	Laser driver (built-in D-F.F.) (bias current = 60 mA + modulation current = 60 mA (Max.))					

* bias current = modulation current = 0 mA

● RECEIVER IC

Product name	Functions	Operating frequency Typ.	Power* consumption Typ. (mW)	Supply voltage (V)	Package	Pins
CXA1684M	Transimpedance amplifier	600 MHz	50	5.0	SOP	8
CXA1685M		140 MHz	35			
CXB1561Q-Y	Clock recovery & Data retiming (SAW)	155/622 Mbps	580		CQFP	32
☆ CXB1565R	Clock recovery & Data retiming with PLL	622 Mbps	475	3.3	LQFP	64
☆ CXB1575Q		155 Mbps	215			
☆ CXB1562AQ	Post amplifier	155/266 Mbps	185	5.0	QFP	32
☆ CXB1572Q			132	3.3		
☆ CXB1563Q		622 Mbps	185	5.0		
☆ CXB1567Q		622 M/1.06 Gbps	370			
☆ CXB1577Q		1.06/1.25 Gbps	165, 250			

* When I/O is open

QFP : Plastic Flat Package

MQFP : Metal Flat Package

CQFP : Ceramic Flat Package

LQFP : Low Profile Quad Flat L-leaded Package

● FIBRE CHANNEL IC

Product name	Functions	Operating frequency Typ.	Power consumption Typ. (mW)	Supply voltage (V)	Package	Pins
CXB1581Q	20-bit, 10-bit transmitter with PLL	531 M/1.06 Gbps	830	3.3	QFP	80
			850	3.3/5.0		
CXB1582Q	20-bit, 10-bit receiver with PLL		910	3.3		
			1100	3.3/5.0		
CXB1583Q	10-bit transceiver with PLL	266 Mbps	900	3.3	LQFP	64
☆ CXB1586R	10-bit transceiver with PLL	1.06 Gbps	800			
CXB1585N	Repeater		400			

LQFP : Low Profile Quad Flat L-leaded Package

SSOP : Shrink Small Outline L-leaded Package

● ATM LAN IC

Product name	Functions	Operating frequency Typ.	Power consumption Typ. (mW)	Supply voltage (V)	Package	Pins
☆ CXB1590Q	Transceiver with PLL	622 Mbps	950	3.3	QFP	80

QFP : Quad Flat Package

● ETHERNET IC

Product name	Functions	Operating frequency Typ.	Power consumption Typ. (mW)	Supply voltage (V)	Package	Pins
☆ CXB1584Q	10-bit transceiver with PLL	1.06/1.25 Gbps	1000	3.3	QFP	80

LASER DIODE

☆ Under development

INFRARED/RED LASER DIODE

Product name	Package lineup										Absolute maximum ratings		Electrical and optical characteristics (Tc = 25°C)*									
											Operating temperature	Optical power output	Optical power output	Threshold current	Operating current	Operating voltage	Wavelength	Parallel radiation angle	Perpendicular radiation angle	Astigmatism () U package	Stripe width	Monitor current (except B package)
Symbol	B	U/UL	V/VL	VS	WT	XT	YT	ZT	S	°C	mW	mW	mA	mA	V	nm	deg	deg	μm	μm	mA	
SLD104		U									-10 to +75											
SLD104A		U	V								-10 to +60	5	3	45	50	1.9	780	17	32	(0) 25	4	0.15
SLD105		UL	VL									4	2.5	30	35			790	12			39
SLD131		UL	VL									4	2.5	16	20		790	13	39			0.11
SLD114				○								5	3	20	30		780	10	38	10	4	0.50
SLD201		U	V									20	15		95			15		(4) 40		
SLD201-3		U	V									50	40	80	120	2.1	780	14		(10) 40	4	0.24
SLD202		U	V									25	20		100	1.9		15		(4) 40		
SLD202-3		U	V									50	40		120	2.1	820	14		(10) 40		0.24
☆ SLD231			VL									40	35	40	55	2.0	785	10	25	3		0.02
SLD301		○	V		○	○						100	90		300	1.9	770 to 840	12	28	—	50	0.15
SLD302		○	V		○	○						200	180	150	400						13	
SLD303		○	V		○	○						500	450	450	1100						200	0.80
SLD304		○	V		○	○						1000	900	550	1400	2.1					200	1.50
SLD322			V		○							550	500	180	800	3.0 Max.	790 to 840	10	30	—	50	0.40
SLD323			V		○							1100	1000	300	1400							
SLD324								○				2200	2000	600	2600						200	0.80
☆ SLD326							○					4400	4000	1000	5500	2.4	795 to 840	15			400	2.5
☆ SLD327							○					3300	3000	600	4000							
☆ SLD402									○			16000	15000	15000	35000	2.1	790 to 840	13	28		—	—
SLD1121				○																		
SLD1122				○																		
SLD1123			UL																			
SLD1131				○																		
SLD1132				○																		
SLD1133			VL																			
☆ SLD1231			VL																			
☆ SLD1324								○														

* Tc = 15°C for SLD304V, thermistor temperature Tth specifies for Topr and measurement condition for packages WT, XT, ZT and YT.

LASER DIODE MODULE

Product name	Package lineup		Absolute maximum ratings		Electrical and optical characteristics (Tc = 25°C)*									
			Operating temperature	Optical power output	Optical power output	Threshold current	Operating current	Operating voltage	Stripe width	Monitor current	Fiber			Radiation angle
											Core diameter	Clad diameter	NA	
Symbol	VR	XR	Topr	Po	Po	Ith	Iop	Vop	Ws	Im	—	—	—	—
Unit			°C	mW	mW	mA	mA	V	μm	mA	μm	μm	—	deg
SLU301	○	○	-10 to +50	70/80	63/72	150	300	1.9	50	0.15	100/200	140/250	0.2	10 × 15
SLU302	○	○		140/160	126/144		400							
SLU303	○	○	-10 to +30	350/400	315/360	450	1100	2.1	200	1.50	230/400	250/500	0.3/0.2	12 × 28/10 × 15
SLU304	○	○		700/800	630/720	550	1400							

* Tc = 15°C for SLU304VR, thermistor temperature Tth specifies for Topr and measurement condition for package XR.

PHOTO DEVICE

☆ Under development

PHOTO DIODE

Product name	Applications	Split elements	Absolute maximum rating	Dark current	Light sensitivity	Package	Pins
			V_R (V)	I_D (nA)	S (A/W) = 780 nm		
PHD003	CD/LD	6	30	4.0	0.4 Min. 0.5 Typ.	SOP	8
PHD010	MO	8			0.48 Min.		12
PHD011		10					
PHD016	MD	8					

Note) MO: Magneto-optical

Pin Configuration

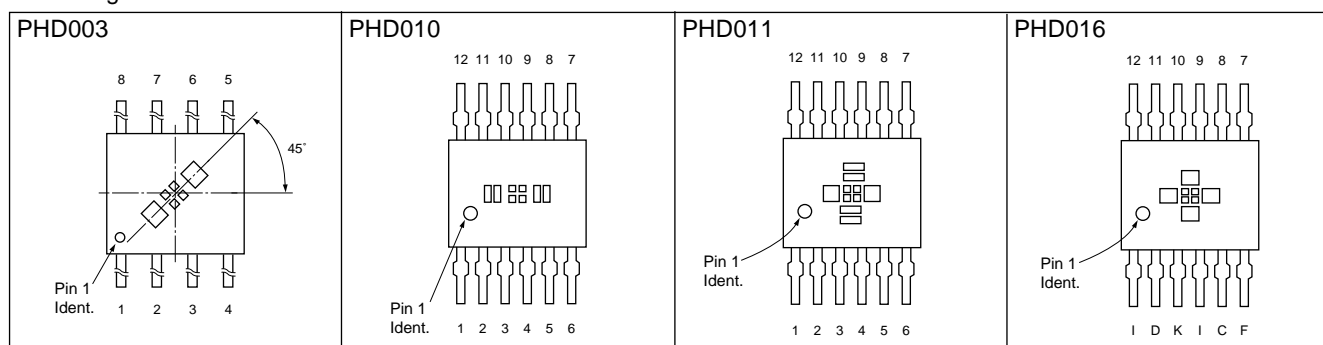
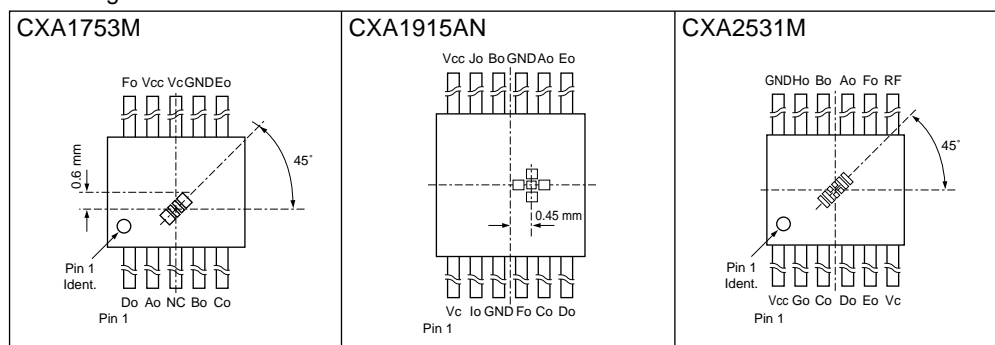


PHOTO IC

Product name	Applications	Functions	Supply voltage (V)	Package	Pins
CXA1753M	CD optical pickup	Built-in I-V amplifier, pattern layout can be customized (Max. 6 split elements)	2.8 to 11.0	SOP	10
CXA1915AN	MD optical pickup	Built-in I-V amplifier, (I, J signal) pattern layout can be customized (Max. 8 split elements)	2.5 to 5.5	SSOP	12
☆ CXA2531M	DVD optical pickup	Built-in I-V amplifier, summing amplifier (RF = A + B + C + D), pattern layout can be customized (Max. 8 split elements)	4.5 to 5.5	SOP	

Pin Configuration



DISCRETE

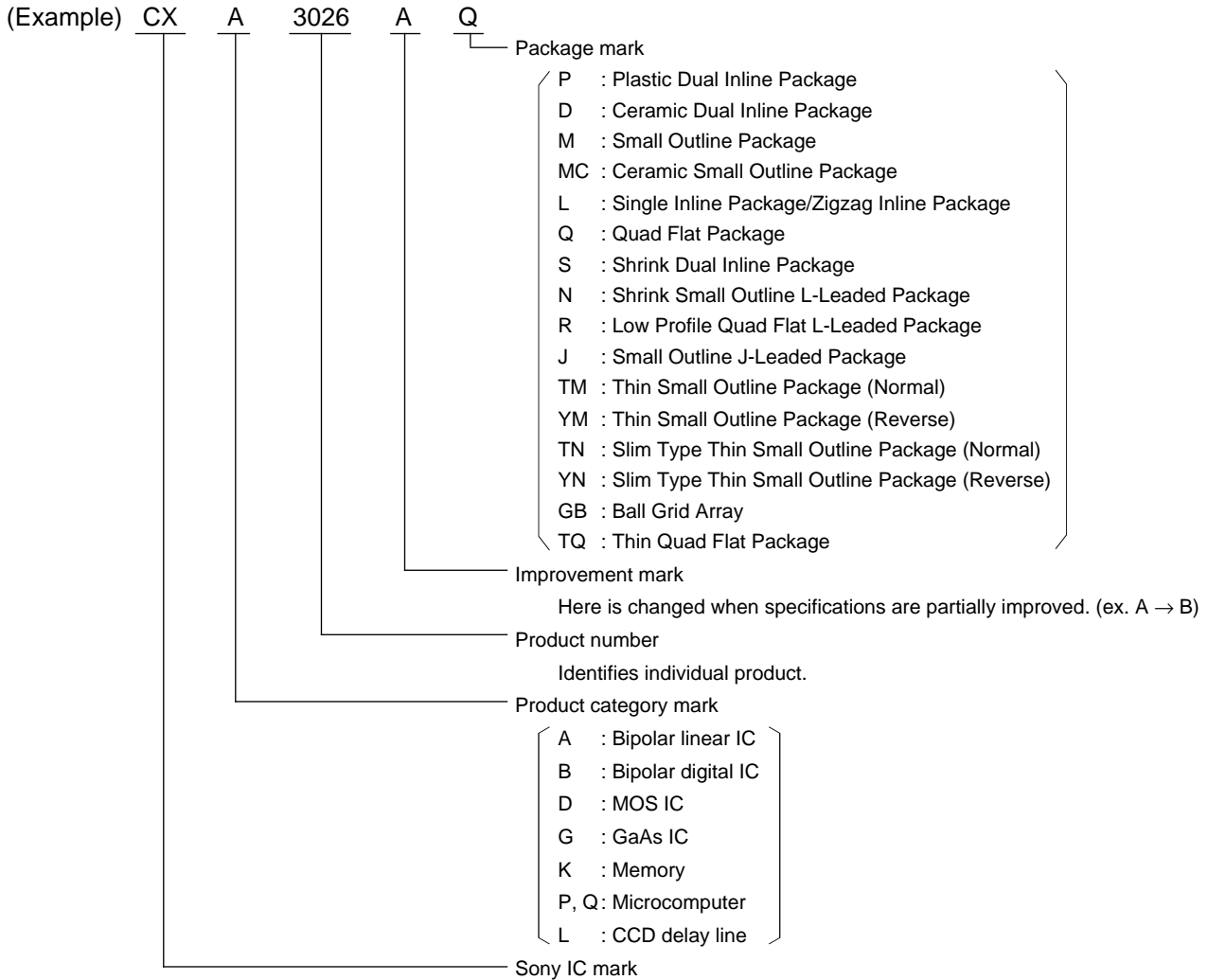
☆ Under development

SDME (Magneto-resistive element)

Product name	Applications	Features	Package	Pins
DM-106B	rpm detection, general purpose	Small package, standard model (2.3 kΩ Typ.)	mold	3
DM-111A	rpm detection, detection of position, battery operated telemeter	High resistance (650 kΩ Typ.)		
DM-211A	Detection of rotation speed for digital servo	Matching with multi-pole ring magnet ($\lambda = 4.52$ mm) (2.3 kΩ Typ.)		
DM-218A		Matching with multi-pole ring magnet ($\lambda = 7.08$ mm) (2.3 kΩ Typ.)		
DM-230	Non-contact angle of rotation detection, number of rotation detection	Without bias magnet (650Ω Typ.)	Special mold	4
DM-231	Non-contact angle of rotation detection, contactless potentiometer	Bias magnet adhered $\theta = 90^\circ$ (650Ω Typ.)		
DM-232		Bias magnet adhered $\theta = 0^\circ$ (650Ω Typ.)		
DM-233		Ferrite without magnetic field adhered (650Ω Typ.)		

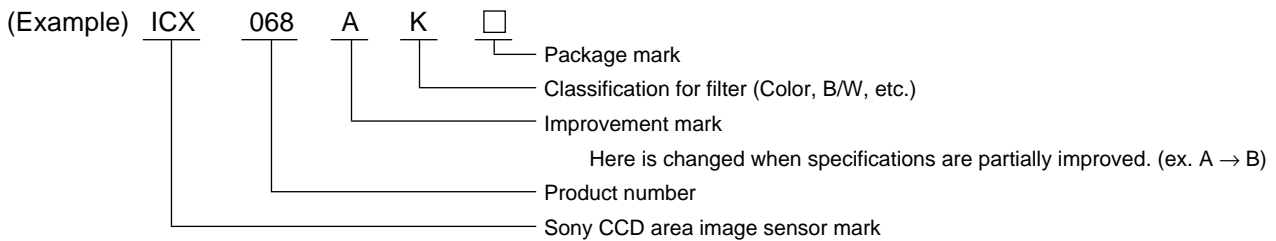
ORDERING INFORMATION

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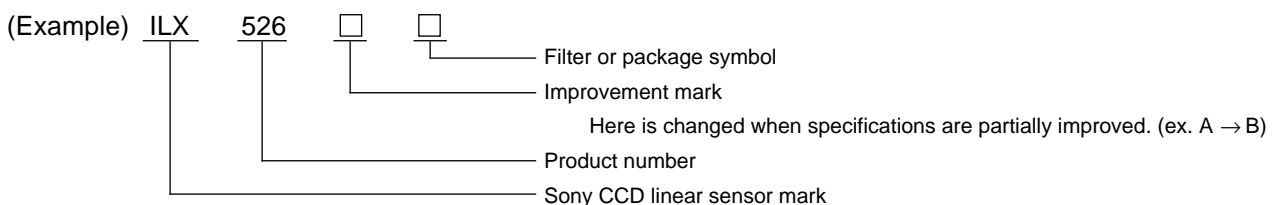


2) CCD

(1) Area image sensor



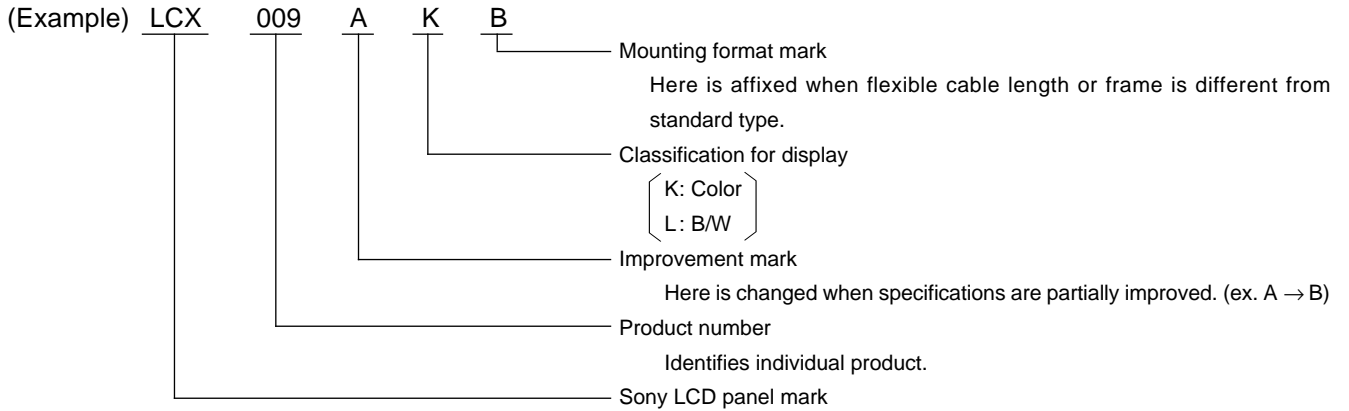
(2) Linear sensor



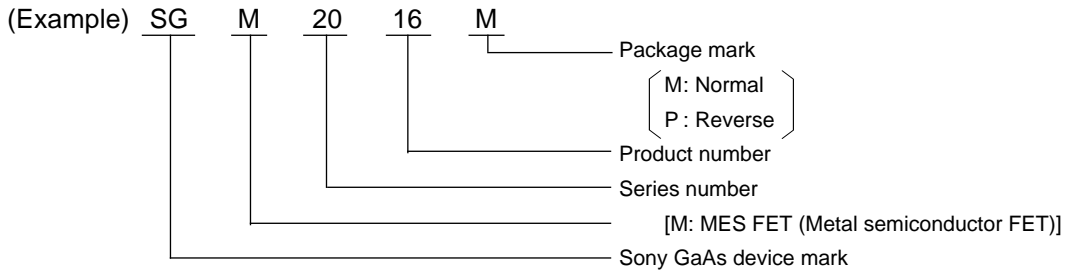
For details on products please refer to Sony Semiconductor Data Books and similar documentation.

ORDERING INFORMATION

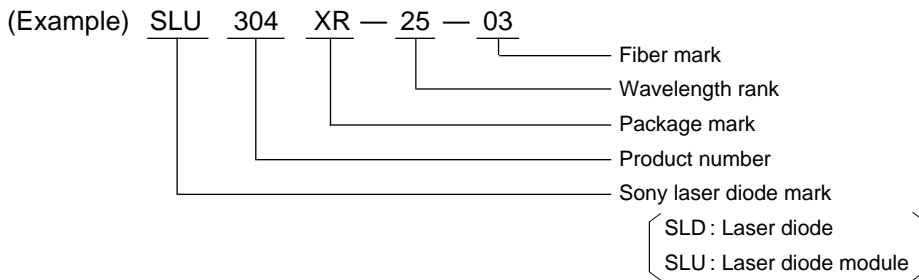
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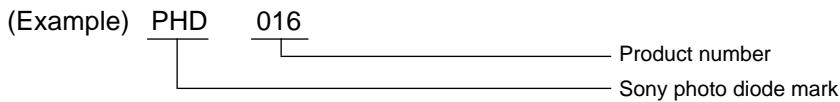
4) GaAs MES FET



5) Laser diode

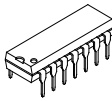
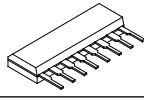
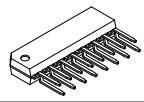
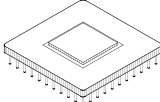
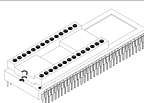
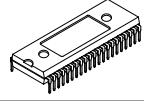
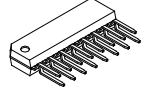


6) Photo diode



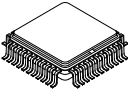
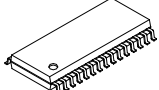
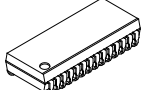
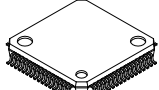

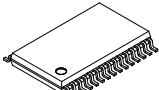
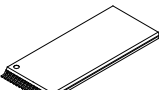
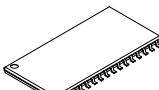
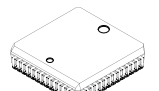
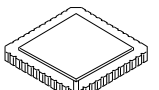
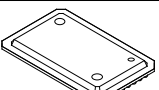
For details on products please refer to Sony Semiconductor Data Books and similar documentation.

PACKAGE

Type		Package name		Package	Material*1	Lead pitch	Lead shape	Lead pull-out direction	Sony Package mark
		Symbol	Description						
Inserted	Standard	DIP	DUAL IN-LINE PACKAGE		P C	2.54 mm (100 mil)	Through Hole Lead	2-direction	P D
		SIP	SINGLE IN-LINE PACKAGE		P			2.54 mm (100 mil) Zigzag in-line	1-direction
		ZIP	ZIG-ZAG IN-LINE PACKAGE			C			2.54 mm (100 mil)
		PGA	PIN GRID ARRAY		2-direction			—	
		PIGGY BACK	PIGGY BACK					P	
	Shrink	SDIP	SHRINK DUAL IN-LINE PACKAGE		1-direction	L			
		SZIP	SHRINK ZIG-ZAG IN-LINE PACKAGE						

*1: P..... Plastic, C..... Ceramic *2: TN, YN..... Slim TSOP

PACKAGE

Type	Package name		Package	Material ¹	Lead pitch	Lead shape	Lead pull-out direction	Sony Package mark		
	Symbol	Description								
Surface mounted	Standard flat package	QFP	QUAD FLAT PACKAGE		P	1.0 mm 0.8 mm 0.65 mm	Gull-Wing	4-direction	Q	
		SOP	SMALL OUTLINE PACKAGE			1.27 mm (50 mil)		2-direction	M	
	Standard 2-direction chip carrier	SOJ	SMALL OUTLINE J-LEADED PACKAGE				J-Lead		J	
	Shrink flat package	LQFP	LOW PROFILE QUAD FLAT L-LEADED PACKAGE			0.5 mm	Gull-Wing	4-direction	R	
		TQFP	THIN QUAD FLAT PACKAGE			0.5 mm 0.65 mm			TQ	
		SSOP	SHRINK SMALL OUTLINE L-LEADED PACKAGE			0.65 mm		2-direction	TM YM TN* ² YN* ²	
		TSOP	THIN SMALL OUTLINE PACKAGE	I						0.5 mm (0.55 mm)
				II						1.27 mm
	Standard chip carrier	QFJ (PLCC)	QUAD FLAT J-LEADED PACKAGE			C	1.27 mm (50 mil)	J-Lead	4-direction	J
		QFN (LCC)	QUAD FLAT NON-LEADED PACKAGE					Leadless	Package side	K
	Ball grid array	BGA	BALL GRID ARRAY			P	1.27 mm (50 mil) Array	Leadless Ball	Package bottom	GB

*1: P..... Plastic, C..... Ceramic *2: TN, YN..... Slim TSOP

PACKAGE

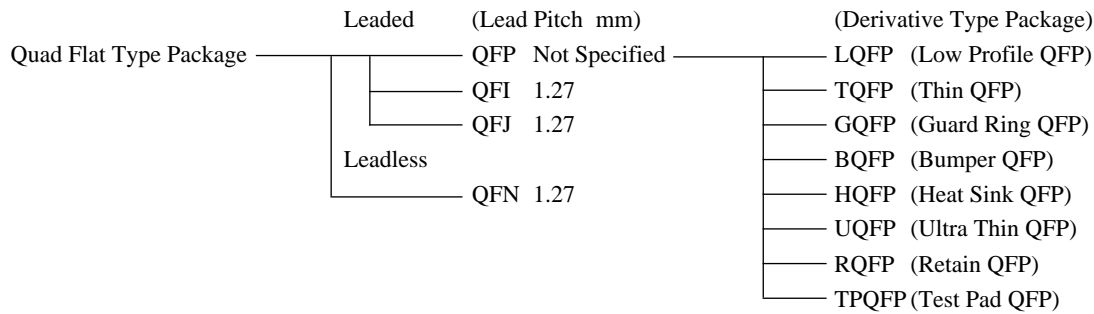
Packages and Classification of Semiconductor ICs

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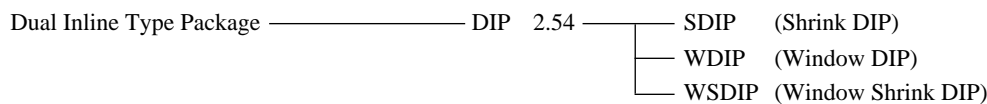
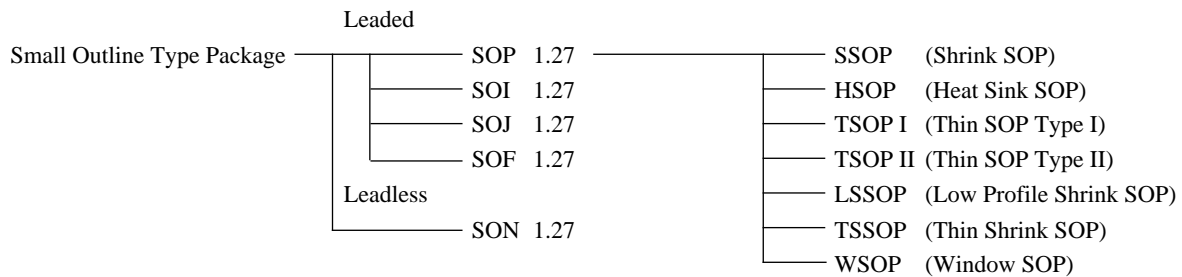
Specify large forms with EIAJ ED-7401A, and classify medium forms as basic type package and small forms as derivative type package.

Basic Type Package

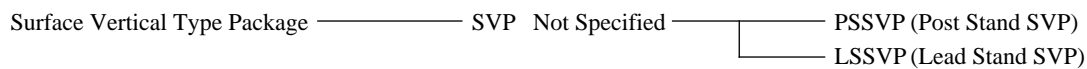
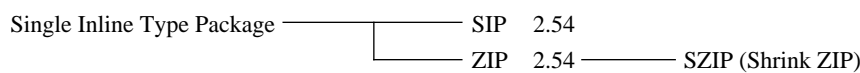
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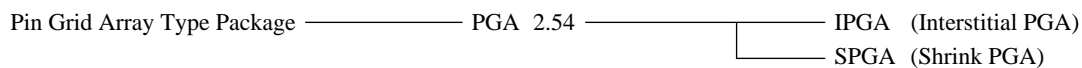
(b) FORM-B



(c) FORM-C



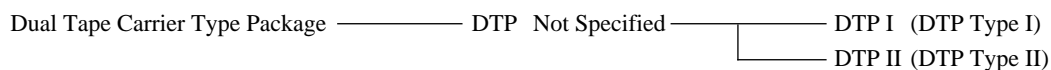
(d) FORM-D



Land Grid Array Type Package — LGA Not Specified

Ball Grid Array Type Package — BGA Not Specified

(e) FORM-E



Dual Tape Carrier Type Package — QTP Not Specified

INDEX

Product name	Page	Product name	Page	Product name	Page
1T362/A	28	CXA1198AP	36	CXA1560S	34
1T363/A	28	CXA1201Q	25	CXA1561M/S	34
1T365	28	CXA1202Q-Z/R	25	CXA1562M/S	34
1T367	28	CXA1203M/N	25	CXA1563M/S	34
1T368	28	CXA1204Q	26	CXA1568M/S	37
1T369	28	CXA1207AQ/AR	25	CXA1571M/N/S	30
1T378	28	CXA1208Q/R	25	CXA1578M/P	36
1T379	28	CXA1211M	25	CXA1579M/P	36
1T397	28	CXA1229M/P	23	CXA1580Q	35
1T399	28	CXA1234AR	25	CXA1585Q	23
1T402	28	CXA1237AR	27	CXA1592Q/R	18, 20
1T403	28	CXA1260Q-Z	44	CXA1594L/L-S	29
1T404	28	CXA1262N	37	CXA1597M/P	36
1T405	28	CXA1276K	44	CXA1598M/S	36
1T406	28	CXA1279AS	37	CXA1599Q	36
1T407	28	CXA1293M/N	39	CXA1600M/P	37
1T408	28	CXA1298AP	36	CXA1611M	37
1T409	28	CXA1310AQ	18, 20	CXA1611N	37
1T410	28	CXA1314P	21	CXA1611P	37
1T411	28	CXA1315M/P	24	CXA1619M	37
1T412	28	CXA1330S	34	CXA1619S	37
1T413	28	CXA1331M/S	34	CXA1622M/P	37
3SK165	28, 42	CXA1332M/S	34	CXA1634M/P	36
3SK165A	28, 42	CXA1343M/N	39	CXA1635M/S	36
3SK166	28, 42	CXA1352AS	37	CXA1642M/P	37
3SK166A	28, 42	CXA1356N	42	CXA1644P	37
CX20034	25	CXA1360Q	38	CXA1645M/P	23
CX20036	26	CXA1362Q	38	CXA1646Q	37
CX20037A	27	CXA1372BQ/BS	30	CXA1664M	29
CX20095A	20	CXA1386K/P	44	CXA1665M/AM/AM-S	29
CX20099	27	CXA1390AQ/AR	18, 20	CXA1673M/P	37
CX20102	27	CXA1391Q/R	18, 20	CXA1683M/N	42
CX20148	27	CXA1392Q/R	18, 20	CXA1684M	45
CX20172	37	CXA1396K/D	44	CXA1685M	45
CX20185	38	CXA1398M/P	36	CXA1690Q	20
CX20186	20	CXA1402M/N	39	CXA1691M	37
CX20188	34	CXA1414P	21	CXA1691S	37
CX20201A-1	44	CXA1434P	21	CXA1695L	29
CX20201A-2	44	CXA1439M	14, 20	CXA1696L/L-S	29
CX20201A-3	44	CXA1445M	38	CXA1700AQ/AR	25
CX20202A-1	44	CXA1446S	21	CXA1702AR	25
CX20202A-2	44	CXA1449Q	26	CXA1704R	25
CX20202A-3	44	CXA1452N	25	CXA1709P	23
CX20206	44	CXA1474AM/AN	41	CXA1720Q	38
CXA1002M/N	39	CXA1481AQ/AR	26	CXA1726AM/AS	23
CXA1003BM/BN	39	CXA1484AM/AN	41	CXA1733M/N	29
CXA1047M	25	CXA1488R	27	CXA1734S	22
CXA1073M/Q	38	CXA1493AM/AN	42	CXA1741Q	39
CXA1077M	27	CXA1495M/P	36	CXA1742Q	39
CXA1098Q	34	CXA1498M/S	36	CXA1744AR	42
CXA1100P	34	CXA1511L/M	24	CXA1746Q	37
CXA1101M/P	34	CXA1512M/N	26	CXA1753M	48
CXA1102M/P	34	CXA1518Q/S	22	CXA1767Q	37
CXA1103AM	27	CXA1534Q/S	22	CXA1777N	27
CXA1106M/P	44	CXA1536Q	27	CXA1779P	23
CXA1114M/P	21	CXA1538M/N/S	37	CXA1782BQ/BR	30
CXA1122AM/AP	29	CXA1541M	42	CXA1782CQ/CR	30
CXA1124BQ/BS	22	CXA1550P	34	CXA1784AS	22
CXA1163M/P	34	CXA1551M/P	34	CXA1785AR	16
CXA1166K	44	CXA1552M/P	34	CXA1786N	39, 42
CXA1173Q	38	CXA1553M/P	34	CXA1787N	42
CXA1184M/N	41	CXA1554N	38	CXA1790Q/R	23

INDEX

Product name	Page	Product name	Page	Product name	Page
CXA1791M/N	30	CXA2074S	22	CXB1584Q	46
CXA1792S	37	CXA2500N	36	CXB1585N	46
CXA1797Q	35	CXA2504N	17	CXB1586R	46
CXA1799P	23	CXA2509AQ	35	CXB1590Q	46
CXA1810AQ/AR	25	CXA2510AQ	35	CXD1030M	18, 19
CXA1812Q	25	CXA2511AQ	35	CXD1156Q/R	18, 19
CXA1814N	26	CXA2515AM/AN	30	CXD1158M	18, 19
CXA1819Q	16	CXA2521AQ	30	CXD1159Q	18, 19
CXA1821M	30	CXA2525AM/AN	30	CXD1170M	44
CXA1826Q	44	CXA2531M	48	CXD1171M	44
CXA1829N	38	CXA2555Q	30	CXD1172AM/AP	43
CXA1841AQ	30	CXA2556Q	30	CXD1175AM/AP	14, 43
CXA1842S	37	CXA3001N	39	CXD1176Q	43
CXA1843Q	44	CXA3002N	39	CXD1177Q	44
CXA1844Q	43	CXA3003R	39	CXD1178Q	44
CXA1845Q	21	CXA3008N-1/2	29	CXD1179Q	43
CXA1846M/N	37	CXA3010Q	38	CXD1185CQ/CR	32
CXA1850N	41	CXA3018R	29	CXD1186CQ/CR	32
CXA1851N	42	CXA3021R	40	CXD1196AR	32
CXA1852N	42	CXA3022R	40	CXD1197AQ	32
CXA1853Q	16	CXA3025N	29	CXD1198AQ	32
CXA1854AR	16	CXA3026AQ	44	CXD1199AQ	32
CXA1855Q/S	21	CXA3026Q	44	CXD1208Q	27
CXA1866Q	44	CXA3031Q	38	CXD1217M/Q	18, 19
CXA1870S	21	CXA3038N	29	CXD1250M/N	18, 19
CXA1871S	21	CXA3050M	29	CXD1254AQ/AR	19
CXA1875AM/AP	24	CXA3068N	29	CXD1257AR	18, 19
CXA1878Q	35	CXA3071N	38	CXD1261AR	18, 19
CXA1897Q	35	CXA3075N	29	CXD1265R	18, 19
CXA1898Q	36	CXA3081R	38	CXD1267AN	18, 19
CXA1910Q	35	CXA3084N	29	CXD1268M	19
CXA1911Q	35	CXA3085N	29	CXD1272Q/R	39
CXA1915AN	48	CXA3086Q	44	CXD1803AQ/AR	32
CXA1917AM/AS	34	CXA3090N	38	CXD1804AR	32
CXA1929M	29	CXA3092N	38	CXD1806AQ	32
CXA1940N	38	CXA3095N	29	CXD1807Q	31
CXA1946AQ/AR	37	CXA3097N	41	CXD1808AQ	32
CXA1950Q	23	CXA3099N	41	CXD1812Q/R	32
CXA1951Q	39	CXA3107N	41	CXD1852Q	33
CXA1977R	43	CXA3108Q	29	CXD1910AQ	23, 27
CXA1980Q	35	CXA3113N	42	CXD1913Q	27
CXA1991N	41	CXA3114N	39	CXD1961Q	29
CXA1992R	30	CXA3117N	41	CXD2027R	29
CXA1994AM/BM	41	CXA3120R	41	CXD2043Q	24
CXA1994M	41	CXA3134N	29	CXD2044Q	24
CXA1995N	41	CXA3135N	29	CXD2053AS/AM	24
CXA1998AQ	36	CXB1108AQ	45	CXD2107M	25
CXA1999N	41	CXB1118AQ	45	CXD2131Q	24
CXA2000Q	21	CXB1128AQ	45	CXD2300Q	43
CXA2002R	25	CXB1548Q-Y	45	CXD2301Q	43
CXA2003N	25	CXB1558Q-Y	45	CXD2302Q	43
CXA2006Q	20	CXB1561Q-Y	45	CXD2303Q	43
CXA2016S	23	CXB1562AQ	45	CXD2304R	44
CXA2020M/S	22	CXB1563Q	45	CXD2306Q	44
CXA2021S	22	CXB1565R	45	CXD2307R	44
CXA2022S	22	CXB1567Q	45	CXD2308Q	44
CXA2025AS	21	CXB1572Q	45	CXD2309Q	44
CXA2027Q	14	CXB1575Q	45	CXD2310AR	43
CXA2032Q	25	CXB1577Q	45	CXD2311AR	14, 43
CXA2038R	27	CXB1581Q	46	CXD2312R	43
CXA2040Q	21	CXB1582Q	46	CXD2314R	43
CXA2050S	21	CXB1583Q	46	CXD2315Q	44

INDEX

Product name	Page	Product name	Page	Product name	Page
CXD2343S	23	CXK58512	1, 2	CXP1042Q	31
CXD2400R	18, 19	CXK591000	1, 2	CXP5010	4
CXD2401R	18, 19	CXK5B16120	1, 3	CXP50100	4
CXD2408R	19	CXK5B18120	1, 3	CXP50112/50116	4
CXD2409R	18, 19	CXK5B41020	1, 3	CXP50120/50124	4
CXD2411AR	17	CXK5B81020	1, 3	CXP5014/5016	4
CXD2412AQ	17	CXK5T16100	1, 2	CXP50200	4
CXD2422R	19	CXK5T81000A	1, 2	CXP50212/50216	4
CXD2424R	19	CXK5T8257B	1, 2	CXP5050	4
CXD2428Q	17	CXK5T8512	1, 2	CXP5056/5058	4
CXD2434TQ	19	CXK5V16100	1, 2	CXP5070	4
CXD2436Q	17	CXK5V81000A	1, 2	CXP50700	4
CXD2437TQ	19	CXK5V8257B	1, 2, 3	CXP50712/50716	4
CXD2441R	17	CXK5V8512	1, 2	CXP5076/5078	4
CXD2442Q	17	CXK77910A	1, 3	CXP5080	4
CXD2443Q	17	CXK77920	1, 3	CXP5084/5086	4
CXD2452R	19	CXK77B1810AGB	1, 3	CXP508L4/508L6	4
CXD2500BQ/BQZ	31	CXK77B1810GB	1, 3	CXP50P116	4
CXD2507AQ	31	CXK77B1811AGB	1, 3	CXP5110	4
CXD2510Q	31	CXK77B3610AGB	1, 3	CXP5116/5118	4
CXD2529Q	31	CXK77B3610GB	1, 3	CXP80100	9
CXD2540Q-2	31	CXK77B3611AGB	1, 3	CXP80116	5
CXD2545Q	31	CXK77B3611GB	1, 3	CXP80300	9
CXD2548R	31	CXK77V1810TM/GB	1, 3	CXP80316	6
CXD2555Q	33	CXK77V1840GB	1, 3	CXP80500	9
CXD2559Q	33	CXK77V3210Q	1, 3	CXP80520/80524	5
CXD2564AM	33	CXK77V3211Q	1, 3	CXP80600A	9
CXD2565M	33	CXK77V3211R	1, 3	CXP80620A/80624A	5
CXD2570Q	33	CXK77V940GB	1, 3	CXP80712B/80716B/80720B/80724B/80732A/80740A	5
CXD2586R-1	31	CXL1008M/P	13	CXP80P116	10
CXD2589Q	31	CXL1009P	13	CXP80P524	10
CXD2720Q	33	CXL1501M	13, 25	CXP80P624A	10
CXD2917Q	29, 33	CXL1502M	13, 25	CXP81100	9
CXD3000R	31	CXL1503M	13	CXP81120/81124	6
CXD3300R	43	CXL1504M	13	CXP811P24	10
CXD8302Q	19	CXL1505M	13	CXP81300	9
CXG1003N	41	CXL1506M/N	13, 25	CXP81312/81316	6
CXG1004N	41	CXL1510M	25	CXP813P16	10
CXG1006N	40	CXL1511M	25	CXP81500	9
CXG1008N	41	CXL1512M	25	CXP81516/81520/81524	6
CXG1010N	41	CXL1517M/N	13, 18, 20	CXP815P24	10
CXG1012N	39, 41	CXL1518M/N	13, 18, 20	CXP81720A/81724A/81732A/81740A	6
CXG1013N	41	CXL5001M/P	13	CXP81800	9
CXG1014N	40	CXL5002M/P	13	CXP81840A/81848A	6
CXG1016N	40	CXL5003M/P	13	CXP818P48A	10
CXG1017N	40	CXL5005M/P	13	CXP81900	9
CXG1019N	40	CXL5502M/P	13	CXP81952/81960	6
CXG1020N	41	CXL5502M/P/N	25	CXP819P60	10
CXG1022TM	41	CXL5502N	13	CXP82200	9
CXG1024N	40	CXL5504M	18, 20	CXP82220/82224	7
CXG1027TM	40	CXL5504M/P	13, 25	CXP822P24	10
CXG1030N	41	CXL5505M/P	13	CXP82300	9
CXK516100	1, 2	CXL5506M/P	13	CXP82316/82320/82324	7
CXK541020	1, 3	CXL5507M/P	13	CXP823P24	10
CXK581000A	1, 2, 3	CXL5508M/P	13	CXP82400A	9
CXK581000B	1, 2	CXL5509M/P	13	CXP82432A/82440A	7
CXK581020A	1, 3	CXL5512M/P	13	CXP824P40A	10
CXK581120A	1, 3	CXL5513M/P	13	CXP82500	9
CXK582000	1, 2	CXL5514M/P	13	CXP82532/82540	7
CXK58257B	1, 2, 3	CXL5515M/P	13	CXP825P40	10
CXK58257C	1, 2	CXL5520M/P	13, 24	CXP82600	9
CXK584000	1, 2	CXP1021Q	31	CXP82612/82616	7

INDEX

Product name	Page	Product name	Page	Product name	Page
CXP826P16	10	CXP87352/87360	5	ICX062AL	12
CXP82700	9	CXP873P60	10	ICX063AL	12
CXP82712/82716	7	CXP87400	9	ICX068AK	11, 18
CXP827P16	10	CXP87452/87460	5	ICX068AKB	11, 18
CXP82800	9	CXP874P60	10	ICX068AL	12, 18
CXP82832/82840/82852/82860	7	CXP87500	9	ICX069AK	11, 18
CXP828P60	10	CXP87532/87540	5	ICX069AKB	11, 18
CXP82900	9	CXP875P40	10	ICX069AL	12, 18
CXP82940/82948/82952/82960	7	CXP87700	9	ICX074AK	12
CXP829P60	10	CXP87740A/87748A	5	ICX074AL	12
CXP83120A/83124A	8	CXP877P48A	10	ICX075AK	12
CXP83200A	9	CXP88100A	9	ICX075AL	12
CXP83232A/83240A	8	CXP88132/88140/88152/88160	5	ICX076AK	11
CXP832P40A	10	CXP881P60	10	ICX076AL	12, 18
CXP83400	9	CXP88216/88220/88224	5	ICX077AK	11
CXP83412/83416	8	CXP88616/88624	5	ICX077AL	12, 18
CXP83413/83417	8	CXP88740/88748	5	ICX080AK	11
CXP834P16	10	CXP88800	9	ICX081AK	11
CXP834P17	10	CXP88852/88860	5	ICX082AL	12, 18
CXP84100	9	CXP888P60	10	ICX083AL	12, 18
CXP84120/84124	6	DCX500AK	15	ICX084AK	12
CXP841P24	10	DCX501AK	15	ICX084AL	12
CXP84200	9	DM-106B	49	ICX085AK	12
CXP84220/84224	6	DM-111A	49	ICX085AL	12
CXP842P24	10	DM-211A	49	ICX086AK	11, 18
CXP84300	9	DM-218A	49	ICX086AKB	11, 18
CXP84332/84340	6	DM-230	49	ICX086AL	12, 18
CXP84332M/84340M	6	DM-231	49	ICX087AK	11, 18
CXP843P40	10	DM-232	49	ICX087AKB	11, 18
CXP84400	9	DM-233	49	ICX087AL	12, 18
CXP84412/84416	6	ICX026BLA	12, 18	ICX098AK	12
CXP844P16	10	ICX026CKA	11, 18	ILX503A	14
CXP84500	9	ICX027BLA	12, 18	ILX505A	14
CXP84540/84548	6	ICX027CKA	11, 18	ILX506	14
CXP845F60	10	ICX038BLA	12, 18	ILX508	14
CXP845P60	10	ICX038BLB	12, 18	ILX510	14
CXP84600	9	ICX038BNA	11, 18	ILX511	14
CXP84632/84640/84648	6	ICX038BNB	11, 18	ILX512	14
CXP846P48	10	ICX038DLA	12, 18	ILX514	14
CXP85112B/85116B	7	ICX038DLB	12, 18	ILX516K	14
CXP85200A/85290A	9	ICX038DNA	11, 18	ILX518K	14
CXP85220A/85224A/85228A/85232A	7	ICX038DNB	11, 18	ILX520K	14
CXP852P32A	10	ICX039BLA	12, 18	ILX521A	14
CXP85300A/85390A	9	ICX039BLB	12, 18	ILX522K	14
CXP85324A/85332A/85340A	7	ICX039BNA	11, 18	ILX523A	14
CXP853P40A	10	ICX039BNB	11, 18	ILX524K	14
CXP85400/85490	9	ICX039DLA	12, 18	ILX526A	14
CXP85452/85460	7	ICX039DLB	12, 18	ILX527K	14
CXP854P60	10	ICX039DNA	11, 18	ILX528K	14
CXP85632/85640	7	ICX039DNB	11, 18	ILX530K	14
CXP85690	9	ICX054AK	11, 18	ILX531A	14
CXP856P40	10	ICX054AL	12, 18	ILX532A	14
CXP86100	9	ICX055AK	11, 18	ILX703A	14
CXP86112/86116	8	ICX055AL	12, 18	ILX716K	14
CXP861P16	10	ICX058AK	11, 18	ILX718K	14
CXP87100	9	ICX058AKB	11, 18	ILX724K	14
CXP87132/87140	5	ICX058AL	12, 18	ILX734K	14
CXP871P40	10	ICX058ALB	12, 18	LCX005BK/BKB	15
CXP87200A	9	ICX059AK	11, 18	LCX007BK/BKA	15
CXP87240A/87248A	5	ICX059AKB	11, 18	LCX007BNB	15
CXP872P48A	10	ICX059AL	12, 18	LCX007CL	15
CXP87300	9	ICX059ALB	12, 18	LCX007CN	15

