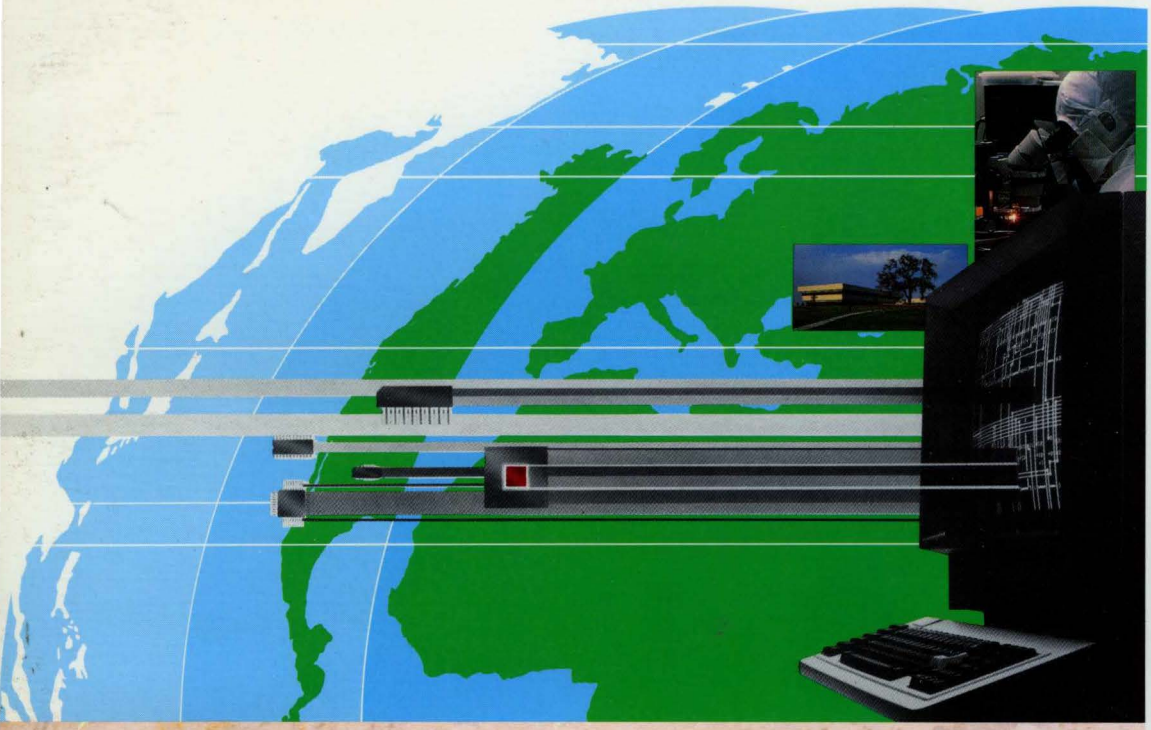

PRODUCT SELECTION GUIDE

NEC

NEC Electronics Inc.

NEC

1989–1990 PRODUCT SELECTION GUIDE

August 1989
Stock No. 900009

NEC

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Introduction

NEC, the world's largest semiconductor supplier, offers one of the most diversified product lines in the industry. This Selection Guide provides a major listing of all the following NEC products. Contact your local NEC sales representative, or use the toll-free number listed on the back cover of this book to order product literature.

Memory Products

NEC's memory product line features the industry's most comprehensive selection of device types, configurations, packaging options, and process technologies. Among our new application-specific products, for example, are high-performance devices for graphics, video/TV, communications, image processing, data processing, and other specialized applications. Five versions of the new 4M DRAM join our DRAM product line. Other new products include a 1M XRAM, a 1M SRAM, high-speed SRAMs, a 4M EPROM, a 16M mask-programmable ROM, some ECL RAMs, and EEPROMs too.

Single-Chip Microcomputers

NEC offers a wide variety of single-chip microcomputer products that include 4-bit, 8-bit, and 16-bit microcomputers in a variety of packages.

The 4-bit microcomputer series consists of low-cost, mini-microcomputers: 755X/756X, mid-range 75XX series, and high-end 75XXX series. The 75XX microcomputers have general-purpose I/Os, on-chip LCD controller/drivers, on-chip FIP controller/drivers, and on-chip A/D. The 75XXX microcomputers offer higher performance and a choice of many peripherals for a variety of applications.

The 8-bit microcomputer series consists of the 80XX, 78CIX, and 782XX families, which represent the low-end, mid-range, and high-end 8-bit microcontrollers, respectively. These products are designed for office automation, automotive, and general-purpose control environments. The 783XX devices of the 16-bit microcomputer series are designed for real-time control and automotive applications.

V-Series Microprocessors and Peripherals

The V-series is a family of CMOS microprocessors designed for high-performance and low-power consumption. The μPD70108/70116 (V20®/V30®) provide immediate performance gain over the 8088/86. The μPD70208/70216 (V40™/V50™) combine CPU and peripheral devices into a single device that gives great savings for a total system.

The μPD70136/70236 (V33™/V53™) are V30 compatible microprocessors. The V33 has hard-wired logic that replaces microcoded logic and produces extremely high performance. The V53 microprocessor integrates commonly used peripherals with the V33 for a high-integration, high-performance CPU. The μPD70616/70632/70832 (V60™/V70™/V80™) are designed with the new 32-bit architecture and memory management aimed at more sophisticated applications.

A wide family of 16-bit single-chip microcomputers, such as the V25™/V35™ products, are also part of the V-series family. These products are V20/V30 compatible and offer many peripherals typically used in control applications.

The V-series microprocessor peripherals include many I/O peripherals as well as a floating-point processor (μPD72291) and cache memory controller (μPD71641).

Intelligent Peripheral Devices

The intelligent peripheral devices family from NEC has multiprotocol serial communications controllers, floppy-disk and hard-disk controllers, graphics controllers, advanced compression/expansion engine controllers, and LCD display controllers.

DSP and Speech Products

NEC is a leading supplier of high-quality, leading-edge DSP and speech products. For DSP, NEC offers 16-bit fixed, 24-bit fixed, and 32-bit floating and integrated DSP chips. For speech products, NEC has the industry's best quality speech synthesizers backed by advanced development tools.

Development Tools for Microelectronic Products

A comprehensive line of development hareware and software tools support NEC's microcomputer, microprocessor, and DSP/speech products. This extraordinary selection provides greater design alternatives that truly fit your needs in data processing, communication, instrumentation, automotive, and consumer applications.

Telecom/ISDN Devices

NEC offers telecom ICs for telephone sets, terminals, pagers, mobile telephones, telephone exchanges, switching, and data communications along with a complete line of Integrated Services Digital Network (ISDN) components.

ASIC Products

NEC is committed to becoming the leading supplier of Application-Specific Integrated Circuits (ASICs). Our semiconductor technology is second to none, and we offer three fast-growing gate array families: high-density CMOS, exciting BiCMOS, and ultra high-speed ECL. Our comprehensive selection includes 1.0-micron CMOS gate arrays and the respective market leaders, BiCMOS-5, and ECL-4A gate arrays.

NEC's packaging technology is leading the way in the ASIC industry with advanced packages like 280-pin flat, 84-pin PLCC, 528-pin grid array, and Tape Automated Bonding (TAB).

ASIC product technology, coupled with state-of-the-art design tools and CAD systems, will give your products a leading edge.

Capacitors

NEC is an innovator in the capacitor market, offering high-volume, high-quality products. NEC's tantalum R Series molded chip capacitors and dipped radial capacitors offer advanced technological design and excellent performance characteristics for filtering, bypassing, coupling, decoupling, blocking, and RC timing circuits. These capacitors are used exclusively in industrial, commercial, entertainment, and medical electronic equipment. NEC's super capacitors (Supercaps™) are used for applications requiring battery back-up for CMOS SRAMs and microprocessors. NEC's new product line, multilayer ceramic capacitors, offers a high capacitance, resin dipped, multilayer capacitor for high-frequency switching power supplies.

Fluorescent Indicator Panel Displays [FIPs]

NEC offers vacuum fluorescent indicator panel (FIP®) displays for all major market applications. With low-voltage operation and large, bright characters in blue, green and all other visible colors, FIPs are a more effective and reliable display than most LEDs and gas discharge displays. NEC's FIPs are available in a wide variety of standard sizes, characters and number of digits.

NEC's FIP module line has recently been expanded to include the new Chip-in-Glass, which offers low-power, compact, and inexpensive display modules. A full character set, power supply, electronics to drive the FIP, and an on-board microprocessor are features of these modules. The mounting of the driver chips inside the glass envelope and the use of surface-mount technology make the NEC Chip-in-Glass modules one of the most compact and inexpensive vacuum fluorescent display modules available.

Optoelectronic Devices

Optoelectronics marks the forefront of today's technology. From optoisolators to DFB laser diodes, NEC offers state-of-the-art quality, reliability, and performance. Automated assembly provides low-cost, high-volume production capabilities. And our broad line makes one-stop shopping a reality at NEC.

Sample the wide variety of products available:

- Lasers, LEDs, and photodetectors
- Datalinks, optoisolators, and photointerrupters
- Fiber optic connectors, switches, and multiplexers

For telecommunications, information systems, industrial and consumer applications – we've got it all!

Supercaps is a trademark of NEC Corporation.
FIP is a registered trademark of NEC Corporation.

Consumer ICs

NEC offers a complete line of consumer ICs geared to the entertainment market which include: digital tuning systems (DTS); 4-bit application specific controllers (ASC); prescalers; phase-locked loops (PLLs); audio, radio, TV, CATV, VCR, compact disk, and clock ICs; infrared (IR) remote control circuits; display drivers; and monolithic broadband amplifiers.

The μPD1700 series (DTS) is a family of single-chip 4-bit CMOS microprocessors with built-in PLLs. PLLs employing a pulse swallowing method in frequency dividing allows higher frequency operation. The μPD1700 series is suitable for audio, video, automotive, and portable radio applications.

The μPD1700 series (ASC) Application Specific Controllers is a family of single-chip 4-bit CMOS microcontrollers for applications such as appliance control, audio/video system control and home bus control. They provide the flexibility of a core CPU architecture to adapt to various applications.

The infrared remote control family includes a wide variety of receivers, receiver pre-amplifiers, and transmitters. NEC's GaAs LEDs and PIN photo diode families complete the remote control circuit requirements.

NEC's CMOS display driver family includes clock, latch, and driver circuits for LCD, FIP (vacuum fluorescence), plasma, and electroluminescent displays. Available in surface mount packages, they simplify board design, improve quality and reliability, and operate at voltages as high as 250 V.

In addition, NEC offers a complete line of analog-to-digital (A/D) and digital-to-analog (D/A) converters and RS-232C line drivers/receivers for all interfacing needs between and within the analog and digital domains.

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MEMORY PRODUCTS

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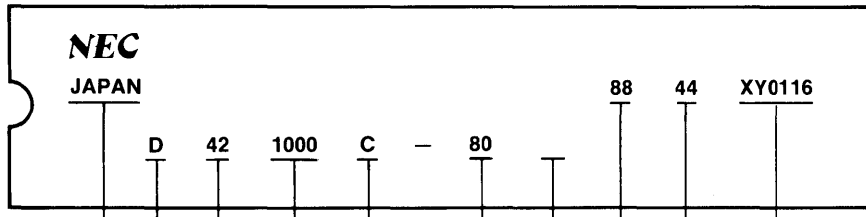
Monolithic Part Number Guide



Country of Origin

Device Type
B = Digital bipolar
D = Digital MOS

Product Class
10 = 10K ECL RAM
100 = 100K ECL RAM
21 = NMOS static RAM
23 = NMOS ROM
23C = CMOS ROM
27 = NMOS EPROM
27C = CMOS EPROM
28C = CMOS EEPROM
4 = Bipolar PROM
40 = NMOS static RAM
41 = NMOS dynamic RAM
42 = CMOS dynamic RAM
43 = CMOS static RAM
44 = CMOS static RAM (6-T cell)

Device Identifier

Package
B = Ceramic flatpack
C = Plastic DIP
CU = Plastic DIP
CX = Plastic DIP
CZ = Plastic DIP
D = Cerdip or ceramic DIP
DH = Cerdip or ceramic DIP
DZ = Cerdip or ceramic DIP
G = Plastic miniflat
GU = Plastic miniflat
GF = Quad flatpack
GX = Plastic TSOP
K = Ceramic LCC
L = PLCC
LA = Plastic SOJ
LB = Plastic SOJ
LE = Plastic SOJ
R = Ceramic PGA
V = Plastic ZIP

Speed Selection
-10 = 100 ns
-12 = 120 ns
-15 = 150 ns
-70 = 70 ns
-80 = 80 ns
-85 = 85 ns
-XX = Etc.

Low Power Indicator [optional]
L = Low power
LL = Very low power

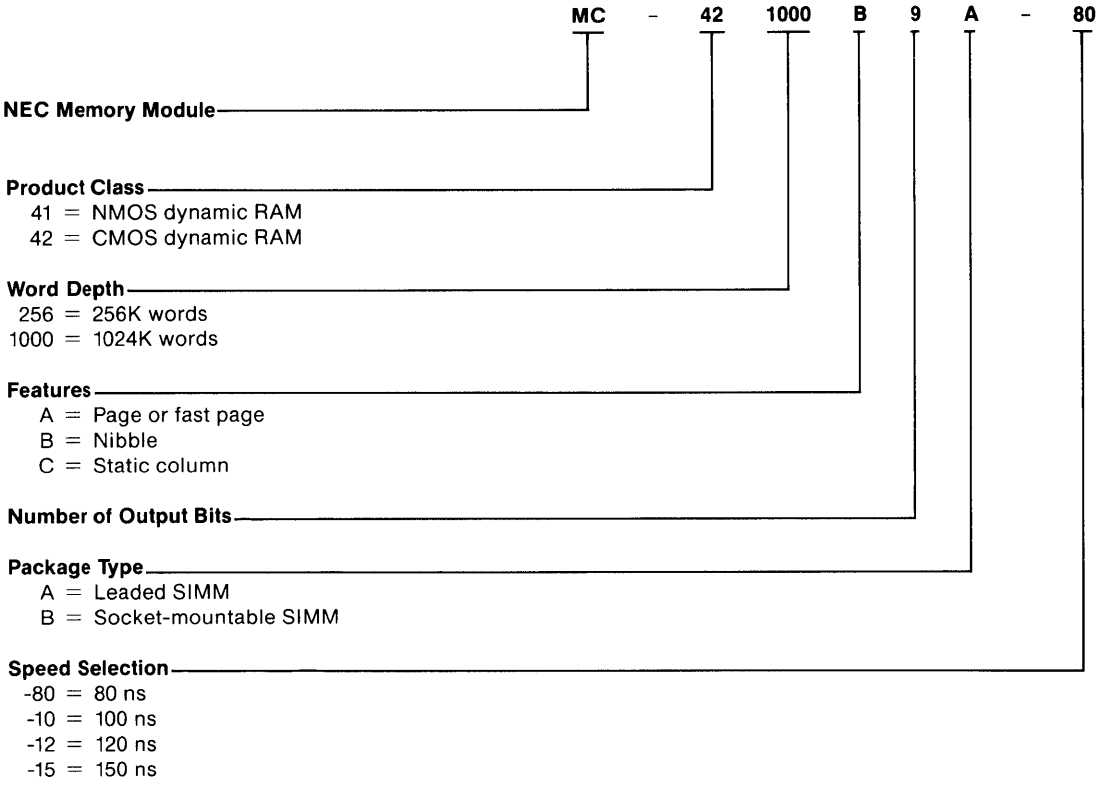
Year

Date Code
Week

NEC Control Code

Notes:
(1) The marking format may vary among package types.
(2) Regardless of the format, the device number does not change.
(3) The "μP" in NEC part numbers does not appear on the package.
(4) DIP = dual-inline package
(5) LCC = leadless chip carrier
(6) PLCC = plastic leaded chip carrier
(7) PGA = pin grid array
(8) SOJ = small-outline J-lead package
(9) ZIP = zig-zag inline package
(10) TSOP = thin small outline package

Module Part Number Guide



Product Line Overview

Density	Application Specific	RAM					EPROM	EEPROM	ROM
		Module	Dynamic	Pseudostatic	MOS Static	ECL			
1K						μPB10422 μPB100422			
4K						μPB10470 μPB10474 μPB10474A μPB100470 μPB100474 μPB100474A		μPD28C04 μPD28C05	
8K	μPD41101 μPD41102 μPD42101 μPD42102								
16K	μPD43501					μPB10480 μPB10484 μPB100480 μPB100484			
40K	μPD42505								
64K	μPD43608	MC-163		μPD4362 μPD4363	μPD4361			μPD28C64	
256K	μPD41264		μPD41256 μPD41464		μPD43251 μPD43254 μPD43256A μPD46251	μPD10500 μPD100500	μPD27C256A	μPD28C256	
512K							μPD27C512		
1M	μPD42270 μPD42601 μPD42273 μPD42274		μPD421000 μPD421001 μPD421002 μPD424256 μPD424258	μPD428128	μPD431000		μPD27C1000A μPD27C1001A μPD27C1024 μPD27C1024A		μPD23C1000A μPD23C1000EA μPD23C1001E μPD23C1010A μPD23C1024E
2M		MC-41256A8 MC-41256A9					μPD27C2001		μPD23C2000 μPD23C2001
4M			μPD424100 μPD424400				μPD27C4001		μPD23C4000 μPD23C4001E
8M		MC-421000A8 MC-421000B8 MC-421000C8 MC-421000A9 MC-421000B9 MC-421000C9							
16M									μPD23C16000

Application-Specific Devices

Device	Organization	Process	Access Time (ns)	Cycle Time (ns)	Supply Voltage	Maximum Power Dissipation (mW) Standby	Maximum Power Dissipation (mW) Active	Package (Note 1)	Pins
μPD41101-2	910 x 8	NMOS	27	34(R)/69(W)	+5	—	495	C/G	24
μPD41101-1			49	69					
μPD41102-1	1135 x 8	NMOS	40	56	+5	—	495	C/G	24
μPD41264-12	64K x 4 with	NMOS	120 Port A 40 Port B	220 Port A 40 Port B	+5	66	853	C/V	24
μPD41264-15	dual ports		150 Port A 60 Port B	270 Port A 60 Port B			715		
μPD42101-3	910 x 8	CMOS	27	34	+5	—	385	C/G	24
μPD42101-2			27	34(R)/69(W)			330		
μPD42101-1			49	69			193		
μPD42102-3	1135 x 8	CMOS	21	28	+5	—	440	C/G	24
μPD42102-2			21	28(R)/56(W)			385		
μPD42102-1			40	56			220		
μPD42270	910 x 263 x 4	CMOS	40	60	+5	—	440	C	28
μPD42273-10	256K x 4	CMOS	100 Port A 30 Port B	190 Port A 30 Port B	+5	17.5	550	LE/V	28
μPD42273-12			120 Port A 40 Port B	220 Port A 40 Port B		17.5	495		
μPD42274-10	256K x 4	CMOS	100 Port A 30 Port B	190 Port A 30 Port B	+5	17.5	550	LE/V	28
μPD42274-12			120 Port A 40 Port B	220 Port A 40 Port B		17.5	495		
μPD42505-50	5048 x 8	CMOS	40	50	+5	—	330	C	24
μPD42505-75			55	75					
μPD42601-60	1M x 1	CMOS	600 (Single) 100 (Page)	1000 (Single) 200 (Page)	+5	0.660	66	C/LA/V	C = 18 LA = 26/20
μPD42601-60A						0.330	66		V = 20
μPD42601-60L						0.165	66		
μPD43501	2 x 1K x 8	CMOS	60	61	+5	—	1485	R	132
μPD43608-3	512 x 32 x 4 or 1K x 16 x 4	CMOS	64	100	+5	—	1485	R	132
μPD43608-2			85	125					

Note:

(1) C = plastic DIP; CU = plastic shrink DIP; G = plastic miniflat; LA or LE = plastic SOJ; R = ceramic PGA; V = plastic ZIP.

Dynamic RAM Modules

Device	Organization	Process	Access Time (ns)	Cycle Time (ns)	Supply Voltage	Maximum Power Dissipation (mW) Standby	Maximum Power Dissipation (mW) Active	Package (Note 1)	Pins
MC-163	8K x 9	100K	11	13	−4.5	8000	8000	(Note 2)	42
MC-41256A8-10	256K x 8	NMOS	100	200	+5	220	3652	A/B	30
MC-41256A8-12	(page)		120	220			3080		
MC-41256A9-10	256K x 9	NMOS	100	200	+5	248	4109	A/B	30
MC-41256A9-12	(page)		120	220			3465		
MC-421000A8-80	1M x 8	CMOS	80	160	+5	44	3080	A/B	30
MC-421000A8-10	(fast page)		100	190			2640		
MC-421000A8-12			120	220			2200		
MC-421000B8-80	1M x 8	CMOS	80	160	+5	44	3080	A/B	30
MC-421000B8-10	(nibble)		100	190			2640		
MC-421000B8-12			120	220			2200		
MC-421000C8-80	1M x 8	CMOS	80	160	+5	44	3080	A/B	30
MC-421000C8-10	(static column)		100	190			2640		
MC-421000C8-12			120	220			2200		
MC-421000A9-80	1M x 9	CMOS	80	160	+5	49.5	3465	A/B	30
MC-421000A9-10	(fast page)		100	190			2970		
MC-421000A9-12			120	220			2475		
MC-421000B9-80	1M x 9	CMOS	80	160	+5	49.5	3465	A/B	30
MC-421000B9-10	(nibble)		100	190			2970		
MC-421000B9-12			120	220			2475		
MC-421000C9-80	1M x 9	CMOS	80	160	+5	49.5	3465	A/B	30
MC-421000C9-10	(static column)		100	190			2970		
MC-421000C9-12			120	220			2475		

Notes:

(1) A = leaded SIMM; B = socket-mountable SIMM.

(2) Custom package only.

Dynamic RAMs

Device	Organization	Process	Access Time (ns)	Cycle Time (ns)	Supply Voltage	Maximum Power Dissipation (mW)		Package (Note 1)	Pins
						Standby	Active		
μPD41256-10	256K x 1	NMOS	100	200	+5	28	440	C/L	C = 16
μPD41256-12	(page)		120	220			385		L = 18
μPD41464-10	64K x 4	NMOS	100	200	+5	28	440	C/L/V	C = 18
μPD41464-12			120	220			413		L = 18
									V = 20
μPD421000-70	1M x 1	CMOS	70	140	+5	5.5	440	C/LA/V	C = 18
μPD421000-80	(fast page)		80	160			385		LA = 26/20
μPD421000-10			100	190			330		V = 20
μPD421000-12			120	220			275		
μPD421001-70	1M x 1	CMOS	70	140	+5	5.5	440	C/LA/V	C = 18
μPD421001-80	(nibble)		80	160			385		LA = 26/20
μPD421001-10			100	190			330		V = 20
μPD421001-12			120	220			275		
μPD421002-70	1M x 1	CMOS	70	140	+5	5.5	440	C/LA/V	C = 18
μPD421002-80	(static column)		80	160			385		LA = 26/20
μPD421002-10			100	190			330		V = 20
μPD421002-12			120	220			275		
μPD424256-70	256K x 4	CMOS	70	140	+5	5.5	440	C/LA/V	C = 20
μPD424256-80	(fast page)		80	160			385		LA = 26/20
μPD424256-10			100	190			330		V = 20
μPD425256-12			120	220			275		
μPD424258-70	256K x 4	CMOS	70	140	+5	5.5	440	C/LA/V	C = 20
μPD424258-80	(static column)		80	160			385		LA = 26/20
μPD424258-10			100	190			330		V = 20
μPD425258-12			120	220			275		
μPD424100-80	4M x 1	CMOS	80	160	+5	5.5	550	V/LB	V = 20
μPD424100-10	(fast page)		100	190			495		LB = 26/20
μPD424100-12	(Note 2)		120	220			440		
μPD424400-80	1M x 4	CMOS	80	160	+5	5.5	550	V/LB	V = 20
μPD424400-10	(fast page)		100	190			495		LB = 26/20
μPD424400-12	(Note 2)		120	220			440		

Notes:

(1) C = plastic DIP; L = PLCC; LA or LB = plastic SOJ; V = plastic ZIP.

(2) The μPD424100-XX and μPD424400-XX will be available in the first calendar quarter of 1990.

XRAMs

Device	Organization	Process	Access Time (ns)	Cycle Time (ns)	Supply Voltage	Maximum Power Dissipation (mW)		Package (Note 1)	Pins
						Standby	Active		
μPD428128-80	128K x 8	CMOS	80	150	+5	2.8	413	C	32
μPD428128-10			100	180			358		
μPD428128-12			120	210			303		

Note:

(1) C = plastic DIP.

2

Static RAMs

Device	Organization	Process	Access Time (ns)	Cycle Time (ns)	Supply Voltage	Maximum Power Dissipation (mW) Standby	Maximum Power Dissipation (mW) Active	Package (Note 1)	Pins
μPD4311-35	16K x 1	CMOS	35	35	+5	11	440	C	20
μPD4311-45			45	45					
μPD4311-55			55	55					
μPD4314-35	4K x 4	CMOS	35	35	+5	11	440	C	20
μPD4314-45			45	45					
μPD4314-55			55	55					
μPD4361-40	64K x 1	CMOS	40	40	+5	11	660	K	22
μPD4361-45			45	45				C/K	
μPD4361-55			55	55				C/K	
μPD4361-70			70	70				C	
μPD4362-45	16K x 4	CMOS	45	45	+5	11	495	C	22
μPD4362-55	($\overline{CS}$ only)		55	55					
μPD4362-70			70	70					
μPD4363-45	16K x 4	CMOS	45	45	+5	11	495	C	24
μPD4363-55	($\overline{CS}$, $\overline{OE}$)		55	55					
μPD4363-70			70	70					
μPD4364-10	8K x 8	CMOS	100	100	+5	11/0.55/0.28	248	C/CX/G	28
μPD4364-12			120	120			220	C/CX/G	
μPD4364-15			150	150			220	C/CX/G	
μPD4364-20			200	200			193	C/G	
μPD4464-12	8K x 8	CMOS	120	120	+5	0.055	220	C/G	28
μPD4464-15		(6 - T cell)	150	150		(Note 2)	220		
μPD4464-20			200	200			193		
μPD43251-35	256K x 1	CMOS	35	35	+5	11	550	C/LA	24
μPD43251-45			45	45					
μPD43251-55			55	55					
μPD43254-35	64K x 4	CMOS	35	35	+5	11	660	C	24
μPD43254-45			45	45					
μPD43254-55			55	55					
μPD43256A-85	32K x 8	CMOS	85	85	+5	0.55	248	C/GU/GX	C = 28
μPD43256A-10			100	100			220	(Note 3)	GU = 28
μPD43256A-12			120	120			220		GX = 32
μPD43256A-15			150	150			193		
μPD46251-20	256K x 1	Bi-CMOS	20	20	+5	55	770	LA	24
μPD46251-25			25	25					

Notes:

(1) C = plastic DIP; CX = plastic slim DIP; G or GU = plastic miniflat; GX = plastic TSOP; K = ceramic LCC; LA = plastic SOJ.

(2) Lower power version available; refer to the data sheet for more detail.

(3) GX package will be available in the third quarter of 1989.

ECL RAMs

Device	Organization	Process	Address Access Time (ns)	Chip Select Access Time (ns)	Supply Voltage	Maximum Power Dissipation (mW)	Package (Note 1)	Pins
μPB10422-7	256 x 4	10K	7	5 (Note 2)	−5.2	1144	D	24
μPB10422-10			10					
μPB10470-10	4K x 1	10K	10	6	−5.2	1144	D	18
μPB10470-15			15	8				
μPB10474-8	1K x 4	10K	8	5	−5.2	1144	D	24
μPB10474-10			10	6				
μPB10474-15			15	8				
μPB10474A-5	1K x 4	10K	5	3	−5.2	1300	D	24
μPB10474A-7			7	5				
μPB10480-10	16K x 1	10K	10	5	−5.2	1352	B/D	20
μPB10480-15			15	8		1248		
μPB10484-10	4K x 4	10K	10	5	−5.2	1352	B/D	28
μPB10484-15			15	8		1248		
μPD10500-15	256K x 1	10K	15	(Note 3)	−5.2	(Note 3)	D	24
μPD10500-20			20					
μPB100422-7	256 x 4	100K	7	5 (Note 2)	−4.5	990	B/D	24
μPB100422-10			10					
μPB100470-10	4K x 1	100K	10	6	−4.5	990	D	18
μPB100470-15			15	8				
μPB100474-4.5	1K x 4	100K	4.5	4	−4.5	2025	K	24
μPB100474-6			6	4		2025	B/K	
μPB100474-8			8	5		990	B/D	
μPB100474-10			10	6		990	B/D	
μPB100474-15			15	8		990	B/D	
μPB100474A-5	1K x 4	100K	5	3	−4.5	1125	B/D	24
μPB100474A-7			7	5				
μPB100480-10	16K x 1	100K	10	5	−4.5	1170	B/D	20
μPB100480-15			15	8		1080		
μPB100484-10	4K x 4	100K	10	5	−4.5	1170	B/D	28
μPB100484-15			15	8		1080		
μPD100500-15	256K x 1	100K	15	(Note 3)	−5.2	(Note 3)	D	24
μPD100500-20			20					

Notes:

(1) B = ceramic flatpack; D = ceramic DIP and cerdip; K = ceramic LCC.

(2) Block select access time (ns).

(3) To be determined.

2

EPROMs

Device	Organization	Process	Access Time (ns)	Programming Option	Supply Voltage	Maximum Power Dissipation (mW)		Package (Note 1)	Pins
						Standby	Active		
μPD27C256A-12 μPD27C256A-15 μPD27C256A-20	32K x 8	CMOS	120 150 200	UV	+5 (Note 2)	0.55	165	D	28
μPD27C512-15 μPD27C512-20 μPD27C512-25	64K x 8	CMOS	150 200 250	UV	+5 (Note 2)	0.55	165	D	28
μPD27C1000A-12 μPD27C1000A-15 μPD27C1000A-20	128K x 8 (ROM Comp.)	CMOS	120 150 200	UV	+5 (Note 2)	0.55	220 165 138	D	32
μPD27C1001A-12 μPD27C1001A-15 μPD27C1001A-20	128K x 8 (JEDEC)	CMOS	120 150 200	UV	+5 (Note 2)	0.55	220 165 138	D	32
μPD27C1024-15 μPD27C1024-20 μPD27C1024-25	64K x 16	CMOS	150 200 250	UV	+5 (Note 2)	0.55	275	D	40
μPD27C1024A-12 μPD27C1024A-15 μPD27C1024A-20	64K x 16	CMOS	120 150 200	UV	+5 (Note 3)	0.55	275	D	40
μPD27C2001-15 μPD27C2001-17 μPD27C2001-20	256K x 8	CMOS	150 170 200	UV	+5 (Note 2)	0.55	165	D	32
μPD27C4001-15 μPD27C4001-17 μPD27C4001-20	512K x 8	CMOS	150 170 200	UV	+5 (Note 3)	0.55	165	DZ	32

Notes:

(1) D or DZ = ceramic DIP with quartz window.

(2) Programming voltage = 12.5 V ±0.3.

(3) Programming voltage = V_{CC} ±0.6 V.

EEPROMs

Device	Organization	Process	Access Time (ns)	Cycle Time (ns)	Supply Voltage	Maximum Power Dissipation (mW)		Package (Note 1)	Pins
						Standby	Active		
μPD28C04-20 μPD28C04-25	512 x 8	CMOS	200 250	200 250	+5	0.55	94	C/G	24
μPD28C05-20 μPD28C05-25	512 x 8	CMOS	200 250	200 250	+5	0.55	110	C/G	24
μPD28C64-20 μPD28C64-25	8K x 8	CMOS	200 250	200 250	+5	0.55	275	C	28
μPD28C256-20 μPD28C256-25	32K x 8	CMOS	200 250	200 250	+5	0.55	275	CZ	28

Notes:

(1) C or CZ = plastic DIP; G = plastic miniflat.

Mask-Programmable ROMs

Device	Organization	Process	Access Time (ns)	Cycle Time (ns)	Supply Voltage	Maximum Power Dissipation (mW)		Package (Note 1)	Pins
						Standby	Active		
μPD23C1000A	128K x 8 (CE)	CMOS	200	200	+5	0.55	220	C/G	28
μPD23C1000EA	128K x 8 (CE/OE)	CMOS	200	200	+5	0.55	220	C	32
μPD23C1001E	128K x 8	CMOS	200	200	+5	0.55	220	C	32
μPD23C1010A	128K x 8 (OE)	CMOS	200	200	+5	N/A	220	C	28
μPD23C1024E	64K x 16	CMOS	200	200	+5	0.55	220	C	40
μPD23C2000	128K x 16 or 256K x 8	CMOS	250	250	+5	0.55	220	C/G	40/52
μPD23C2001	256K x 8	CMOS	250	250	+5	0.55	220	C	32
μPD23C4000	256K x 16 or 512K x 8	CMOS	250	250	+5	0.55	220	C/GF	40/64
μPD23C4001E	512K x 8	CMOS	250	250	+5	0.55	220	C	32
μPD23C16000	1M x 16 or 2M x 8	CMOS	250	250	+5	0.55	275	CZ	42

Notes:

(1) C or CZ = plastic DIP; G or GF = plastic miniflat.

NEC

SINGLE-CHIP MICROCOMPUTERS

3

Section 3 – Single-Chip Microcomputers **Page**

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Part Numbering System

μPD78C10AL Typical microdevice part number

μP	NEC monolithic silicon integrated circuit
D	Device type (D = digital MOS)
78C10A	Device identifier (alphanumeric)
L	Package type (L = PLCC)

A part number may include an alphanumeric suffix that identifies special device characteristics.

4-Bit, Single-Chip CMOS Microcomputers

Device, μPD	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	# Package	Pins
7502	LCD controller/driver	0.4	2.5 to 6.0	2K	128	23	Miniflat	64
7503	LCD controller/driver	0.4	2.5 to 6.0	4K	224	23	Miniflat	64
7507	General-purpose	0.4	2.7 to 6.0	2K	128	32	DIP SDIP Miniflat	40 40 52
7508	General-purpose	0.4	2.7 to 6.0	4K	224	32	DIP SDIP Miniflat	40 40 52
75CG08	Piggyback EPROM	0.4	4.5 to 5.5	2K or 4K	224	32	Ceramic DIP	40
7514	LCD controller/driver	0.5	2.7 to 6.0	4K	256	31	Miniflat	80
7527A	FIP controller/driver	0.6	2.7 to 6.0	2K	128	35	DIP SDIP	42 42
7528A	FIP controller/driver	0.6	2.7 to 6.0	4K	160	35	DIP SDIP	42 42
75CG28	Piggyback EPROM; FIP controller/driver	0.5	4.5 to 5.5	4K	160	35	Ceramic DIP	42
7533	A/D converter	0.5	2.7 to 6.0	4K	160	30	DIP SDIP Miniflat	42 42 44
75CG33	Piggyback EPROM; A/D converter	0.5	4.5 to 5.5	4K	160	30	Ceramic DIP	42
7537A	FIP controller/driver	0.6	2.7 to 6.0	2K	128	35	DIP SDIP	42 42
7538A	FIP controller/driver	0.6	2.7 to 6.0	4K	160	35	DIP SDIP	42 42
75CG38	Piggyback EPROM; FIP controller/driver	0.5	4.5 to 5.5	4K	160	35	Ceramic DIP	42
7554	Serial I/O; external clock or RC oscillator	0.7	2.7 to 6.0	1K	64	16	SDIP SOP	20 20
75P54	Serial I/O; external clock or RC oscillator	0.7	4.5 to 6.0	1K OTPROM	64	16	SDIP SOP	20 20
7564	Serial I/O; ceramic oscillator	0.7	2.7 to 6.0	1K	64	16	SDIP SOP	20 20
75P64	Serial I/O; ceramic oscillator	0.7	4.5 to 6.0	1K OTPROM	64	16	SDIP SOP	20 20

Plastic unless ceramic (or cerdip) is specified.
* Under development; consult Microcontroller Marketing for availability.

4-Bit, Single-Chip CMOS Microcomputers (cont)

Device, μPD	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	# Package	Pins
7556	Comparator; external clock or RC oscillator	0.7	2.7 to 6.0	1K	64	20	SDIP SOP	24 24
75P56	Comparator; external clock or RC oscillator	0.7	4.5 to 6.0	1K OTPROM	64	20	SDIP SOP	24 24
7566	Comparator; ceramic oscillator	0.7	2.7 to 6.0	1K	64	19	SDIP SOP	24 24
75P66	Comparator; ceramic oscillator	0.7	4.5 to 6.0	1K OTPROM	64	19	SDIP SOP	24 24
75004	General-purpose	4.19	2.7 to 6.0	4K	512	34	SDIP Miniflat	42 44
75006	General-purpose	4.19	2.7 to 6.0	6K	512	34	SDIP Miniflat	42 44
75008	General-purpose	4.19	2.7 to 6.0	8K	512	34	SDIP Miniflat	42 44
75P008	General-purpose	4.19	4.5 to 5.5	8K OTPROM	512	34	SDIP Miniflat	42 44
75028 *	A/D converter	4.19	2.7 to 6.0	8K	512	40	SDIP Miniflat	64 64
75P028 *	A/D converter	4.19	4.5 to 6.0	8K	512	40	SDIP Miniflat	64 64
75048 *	A/D converter; 0.5K EEPROM	4.19	2.7 to 6.0	8K	512	40	SDIP Miniflat	64 64
75104	High-end with 8-bit instruction	4.19	2.7 to 6.0	4096	320	58	SDIP Miniflat	64 64
75106	High-end with 8-bit instruction	4.19	2.7 to 6.0	6016	320	58	SDIP Miniflat	64 64
75108	High-end with 8-bit instruction	4.19	2.7 to 6.0	8064	512	58	SDIP Miniflat	64 64
75P108	High-end with 8-bit instruction; on-chip OTPROM or UVEPROM	4.19	4.5 to 5.5	8064	512	58	DIP Miniflat Shrink cerdip	64 64 64
75112	High-end with 8-bit instruction	4.19	2.7 to 6.0	12,032	512	58	SDIP Miniflat	64 64
75116	High-end with 8-bit instruction	4.19	2.7 to 6.0	16,128	512	58	SDIP Miniflat	64 64
75P116	High-end with 8-bit instruction	4.19	4.5 to 5.5	16,128 OTPROM	512	58	DIP Miniflat	64 64
75206	FIP controller/driver	4.19	2.7 to 6.0	6016	369	32	SDIP Miniflat	64 64
75208	FIP controller/driver	4.19	2.7 to 6.0	8064	497	32	SDIP Miniflat	64 64
75CG208	FIP controller/driver; piggyback EPROM	4.19	4.5 to 5.5	8064	512	32	Ceramic SDIP Ceramic flatpack	64 64
75212A	FIP controller/driver	4.19	2.7 to 6.0	12,160	512	32	SDIP Miniflat	64 64
75216A	FIP controller/driver	4.19	2.7 to 6.0	16,256	512	32	SDIP Miniflat	64 64
75CG216A	FIP controller/driver; piggyback EPROM	4.19	4.5 to 5.5	16,256	512	32	Ceramic SDIP Ceramic miniflat	64 64
75P216A *	FIP controller/driver	4.19	4.5 to 5.5	16,256 OTPROM	512	32	SDIP	64
75268 *	FIP controller/driver	4.19	2.7 to 6.0	8064	512	20	SDIP Flatpack	64 64
75304	LCD controller/driver	4.19	2.7 to 6.0	4K	512	68	Miniflat	80
75306	LCD controller/driver	4.19	2.7 to 6.0	6K	512	68	Miniflat	80
75308	LCD controller/driver	4.19	2.7 to 6.0	8K	512	68	Miniflat	80

4-Bit, Single-Chip CMOS Microcomputers (cont)

Device, μPD	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	# Package	Pins
75P308	LCD controller/driver; on-chip OTPROM or UVEPROM	4.19	4.5 to 5.5	8K	512	68	Miniflat Ceramic LCC	80 80
75312	LCD controller/driver	4.19	2.7 to 6.0	12K	512	68	Miniflat	80
75316	LCD controller/driver	4.19	2.7 to 6.0	16K	512	68	Miniflat	80
75P316A *	LCD controller/driver; on-chip OTPROM or UVEPROM	4.19	2.7 to 6.0	16K	512	68	Miniflat Ceramic LCC	80 80
75328	LCD controller/driver; A/D converter	4.19	2.7 to 6.0	8064	512	24	Miniflat	80
75P328	LCD controller/driver; A/D converter	4.19	4.5 to 5.5	8064 OTPROM	512	24	Miniflat	80
75402	Low-end	4.19	2.7 to 6.0	1920	64	22	DIP SDIP Miniflat	28 28 44
75P402	Low-end	4.19	4.5 to 5.5	1920 OTPROM	64	22	DIP SDIP Miniflat	28 28 44
75516	High-end; A/D converter	4.19	2.7 to 6.0	16K	512	68	Miniflat	80
75P516	High-end; A/D converter	4.19	4.5 to 5.5	16K OTPROM	512	68	Miniflat LCC	80 80

8-Bit, Single-Chip NMOS/CMOS Microcomputers

Device, μPD	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X8)	I/O	# Package	Pins
7810H	NMOS; A/D converter	15	4.5 to 5.5	External	256	32	SDIP QUIP	64 64
7811H	NMOS; A/D converter	15	4.5 to 5.5	4K	256	44	SDIP QUIP	64 64
78PG11H	NMOS; A/D converter piggyback EPROM	15	4.5 to 5.5	4K	256	44	Ceramic QUIP	64
78C10/78C10A	CMOS; A/D converter	15	4.5 to 5.5	External	256	32	QUIP SDIP Miniflat PLCC	64 64 64 68
78C11/78C11A	CMOS; A/D converter	15	4.5 to 5.5	4K	256	44	QUIP SDIP Miniflat PLCC	64 64 64 68
78C12A	CMOS; A/D converter	15	4.5 to 5.5	8K	256	44	QUIP SDIP Miniflat PLCC	64 64 64 68
78C14	CMOS; A/D converter	15	4.5 to 5.5	16K	256	44	QUIP SDIP Miniflat PLCC	64 64 64 68
78CP14	CMOS; A/D converter	15	4.5 to 5.5	16K OTPROM	256	44	QUIP SDIP Miniflat PLCC	64 64 64 68
				16K UVEPROM	256	44	Ceramic QUIP Shrink cerdip	64 64
78213	CMOS; A/D converter; advanced peripherals	12	4.5 to 5.5	External	512	54	SDIP QUIP Miniflat PLCC	64 64 74 68

8-Bit, Single-Chip NMOS/CMOS Microcomputers (cont)

Device, μPD	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X8)	I/O	# Package	Pins
8214	CMOS; A/D converter; advanced peripherals	12	4.5 to 5.5	16K	512	54	SDIP QUIP Miniflat PLCC	64 64 74 68
78P214	CMOS; A/D converter; advanced peripherals	12	4.5 to 5.5	16K OTPROM	512	54	SDIP QUIP Miniflat PLCC	64 64 74 68
				16K UVEPROM	512	54	Shrink cerdip Ceramic QUIP	64 64
78220	CMOS; analog comparator; large I/O	12	4.5 to 5.5	External	640	71	PLCC Miniflat	84 94
78224	CMOS; analog comparator; large I/O	12	4.5 to 5.5	16K	640	71	PLCC Miniflat	84 94
78P224	CMOS; analog comparator; large I/O	12	4.5 to 5.5	16K OTPROM	640	71	PLCC Miniflat	84 94
78233 *	CMOS; real-time outputs; A/D and D/A converters	12	4.5 to 5.5	External	640	54	Miniflat Miniflat PLCC	80 94 84
78234 *	CMOS; real-time outputs; A/D and D/A converters	12	4.5 to 5.5	16K	640	54	Miniflat Miniflat PLCC	80 94 84
78P234 *	CMOS; real-time outputs; A/D and D/A converters	12	4.5 to 5.5	16K OTPROM	640	54	Miniflat Miniflat PLCC	80 94 84

16-Bit, Single-Chip CMOS Microcomputers

Device, μPD	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X8)	I/O	# Package	Pins
78310A	Real-time motor control	12	4.5 to 5.5	External	256	48	SDIP QUIP Miniflat PLCC	64 64 64 68
78312A	Real-time motor control	12	4.5 to 5.5	8K	256	48	SDIP QUIP Miniflat PLCC	64 64 64 68
78P312A	Real-time motor control	12	4.5 to 5.5	8K UVEPROM	256	48	Shrink cerdip Ceramic QUIP	64 64
				8K OTPROM	256	48	SDIP QUIP PLCC	64 64 68
78320	High-end; advanced analog and digital peripherals	16	4.5 to 5.5	External	640	55	Miniflat PLCC	64 68
78322	High-end; advanced analog and digital peripherals	16	4.5 to 5.5	16K	640	55	Miniflat PLCC	64 68
78P322	High-end; advanced analog and digital peripherals	16	4.5 to 5.5	16K OTPROM	640	55	PLCC	68
71P301	Port and memory extender used with 7832X microcomputer family; UVEPROM or OTPROM	–	4.5 to 5.5	16K	1K	16	PLCC Miniflat Ceramic QUIP	44 64 64

8-Bit, Single-Chip Microcomputers

Device, μPD	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X8)	I/O	# Package	Pins
8035HL	HMOS	6	4.5 to 5.5	External	64	27	DIP	40
8039HL	HMOS	11	4.5 to 5.5	External	128	27	DIP	40
80C39H	CMOS	12	2.5 to 6.0	External	128	27	DIP Miniflat	40 44
80C40H	CMOS	12	2.5 to 6.0	External	256	27	DIP	40
8041AH	NMOS; universal PPI	11	4.5 to 5.5	1K	64	18	DIP	40
80C42	CMOS; universal PPI	12	4.5 to 5.5	2K	128	18	DIP Miniflat	40 44
8048H	HMOS	6	4.5 to 5.5	1K	64	27	DIP	40
8049H	HMOS	11	4.5 to 5.5	2K	128	27	DIP	40
80C49H	CMOS	12	2.5 to 6.0	2K	128	27	DIP	40
49H	CMOS	12	2.5 to 6.0	2K	128	27	Miniflat	44
80C50H	CMOS	12	2.5 to 6.0	4K	256	27	DIP	40
50H	CMOS	12	2.5 to 6.0	4K	256	27	Miniflat	44
8741A	NMOS; universal PPI; UVEPROM	6	4.5 to 5.5	1K	64	18	Cerdip	40
8748H	NMOS; OTPROM or UVEPROM	11	4.5 to 5.5	1K	64	27	DIP Cerdip	40 40
8749H	HMOS; OTPROM or UVEPROM	11	4.5 to 5.5	2K	128	27	DIP Cerdip	40 40

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V-SERIES MICROPROCESSORS AND PERIPHERALS

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Part Numbering System

μPD70320L	Typical microdevice part number
μP	NEC monolithic silicon integrated circuit
D	Device type (D = digital MOS)
70320	Device identifier (alphanumeric)
L	Package type (L = PLCC)

A part number may include an alphanumeric suffix that identifies special device characteristics; for example, μPD70320L-8 has an 8-MHz CPU clock rating.

CMOS Microprocessors

Device, μPD	Features	Data Bits	Clock (MHz)	# Package	Pins
70008A	*Z80 microprocessor	8	8	DIP Miniflat PLCC	40 44 44
70108 (V20)	8088 compatible; enhanced	8/16	8 or 10	DIP Ceramic DIP Miniflat PLCC	40 40 52 44
70116 (V30)	8086 compatible; enhanced	16	8 or 10	DIP Ceramic DIP Miniflat PLCC	40 40 52 44
70208 (V40)	MS-DOS, V20 compatible CPU with peripherals	8/16	8 or 10	Ceramic PGA PLCC Miniflat	68 68 80
70216 (V50)	MS-DOS, V30 compatible CPU with peripherals	16/16	8 or 10	PGA PLCC Miniflat	68 68 80
70616 (V60)	32-bit; high-speed	16/32	16	PGA	68
70632 (V70)	32-bit; high-speed	32/32	20/25	PGA	132
70832 (V80)	32-bit; high-speed	32/32	25	Ceramic PGA	208
70136 (V33)	Hardwired, enhanced V30	16	12 or 16	PGA PLCC	68 68
70236 (V53)	V33 core-based; high-integration; DMA, serial I/O, interrupt controller, etc.	16	–	Ceramic PGA	132
70320 (V25)	MS-DOS compatible; high-integration; DMA, serial I/O, interrupt controller, etc.	8/16	5 or 8	PLCC Miniflat	84 94
70330 (V35)	MS-DOS compatible; high-integration; DMA, serial I/O, interrupt controller, etc.	16	8	PLCC Miniflat	84 94
70325 (V25+)	MS-DOS compatible; high-integration; high-speed DMA	8/16	8 or 10	PLCC Miniflat	84 94
70335 (V35+)	MS-DOS compatible; high-integration; high-speed DMA	16	8 or 10	PLCC Miniflat	84 94

Plastic unless ceramic (or cerdip) is specified.
* For additional information, refer to 1987 Microcomputer Data Book.

CMOS Microprocessors (cont)

Device, μPD	Features	Data Bits	Clock (MHz)	# Package	Pins
70327 (V25 Software Guard)	MS-DOS compatible; high-integration; software protection	8/16	8	PLCC Miniflat	84 94
70337 (V35 Software Guard)	MS-DOS compatible; high-integration; software protection	16	8	PLCC Miniflat	84 94
79011 (V25 RTOS)	MS-DOS compatible; high-integration; real-time operating system	8/16	8	PLCC Miniflat	84 94
79021 (V35 RTOS)	MS-DOS compatible; high-integration; real-time operating system	16	8	PLCC Miniflat	84 94
70322 (V25 ROM)	MS-DOS compatible; high-integration; 16K-byte ROM	8/16	8	PLCC	84
70P322	MS-DOS compatible; high-integration; 16K-byte UVEPROM; V25 or V35 mode	8/16	8	Ceramic LCC	84
70332 (V35 ROM)	MS-DOS compatible; high-integration; 16K-byte ROM	16	8	PLCC	84

NMOS/HMOS Microprocessors

Device, μPD	Features	Data Bits	Clock (MHz)	# Package	Pins
8085A	*8-bit microprocessor; NMOS or HMOS	8	5	DIP	40
8086	*16-bit microprocessor; HMOS	16	8	Cerdip	40
8088	*8-bit microprocessor; HMOS	8	8	Ceramic DIP	40

CMOS System Support Products

Device, μPD	Name	Data Bits	Clock (MHz)	# Package	Pins
71011	Clock Pulse Generator/Driver	–	20	DIP SOP	18 20
71037	Programmable DMA Controller	8	10	DIP Miniflat PLCC	40 40 44
71051	Serial Control Unit	8	8/10	DIP Miniflat PLCC	28 44 28
71054	Programmable Timer/Controller	8	8/10	DIP Miniflat PLCC	24 44 28
71055	Parallel Interface Unit	8	8/10	DIP Miniflat PLCC	40 44 44
71059	Interrupt Control Unit	8	8/10	DIP Miniflat PLCC	28 44 28
71071	DMA Controller	8/16	8/10	DIP Ceramic DIP Miniflat PLCC	48 48 52 52
71082	Transparent Latch	8	8	DIP SOP	20 20
71083	Transparent Latch	8	8	DIP SOP	20 20
71084	Clock Pulse Generator/Driver	–	25	DIP SOP	18 20

CMOS System Support Products (cont)

Device, μPD	Name	Data Bits	Clock (MHz)	# Package	Pins
71086	Bus Buffer/Driver	8	8	DIP	18
				SOP	20
71087	Bus Buffer/Driver	8	8	DIP	20
				SOP	20
71088	System Bus Controller	–	8/10	DIP	20
				SOP	20
82C43	*Input/Output Expander	–	5	DIP	24
				Skinny DIP	24

NMOS System Support Products

Device, μPD	Name	Data Bits	Clock (MHz)	# Package	Pins
8155H	*256 x 8 RAM; I/O ports and timer	8	3 or 5	DIP	40
8156H	*256 x 8 RAM; I/O ports and timer	8	3 or 5	DIP	40
8237A	*Programmable DMA Controller	8	5	DIP	40
8243	*Input/Output Expander	–	5	DIP	24
8251A	*Programmable Communications Interface	8	3/5	DIP	28
8253	*Programmable Internal Timer	8	5	DIP	24
8255A	*Programmable Peripheral Interface	8	5	DIP	40
8257	*Programmable DMA Controller	8	5	DIP	40
8259A	*Programmable Interrupt Controller	8	5	DIP	28
8279	*Programmable Keyboard/Display Interface	–	5	DIP	40

INTELLIGENT PERIPHERAL DEVICES (IPD)

Section 5 – Intelligent Peripheral Devices (IPD)

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Part Numbering System

μPD72001L	Typical microdevice part number
μP	NEC monolithic silicon integrated circuit
D	Device type (D = digital MOS)
72001	Device identifier (alphanumeric)
L	Package type (L = PLCC)

A part number may include an alphanumeric suffix that identifies special device characteristics; for example, μPD72001L-11 has an 11-MHz CPU clock rating.

Communications Controllers

Device, μPD	Name	Description	Data Rate	# Package	Pins
7201A	Multiprotocol Serial Communications Controller	Dual full-duplex serial channels; four DMA channels; programmable interrupt vectors; asychronous COP and BOP support; NMOS	1 Mb/s	DIP Ceramic DIP	40 40
72001	CMOS, Advanced Multiprotocol Serial Communications Controller	Functional superset of 8530; 8086/V30 interface; two full-duplex serial channels; two digital phase-locked loops; two baud-rate generators per channel; loopback test mode; short frame and mark idle detection	2.2 Mb/s	DIP Miniflat PLCC	40 52 52
72002	CMOS, Advanced Multiprotocol Serial Communications Controller	Low-cost, single-channel version of 72001; software compatible; direct interface to 8237 DMA. Not included in 1989-1990 IPD Data Book; refer to 72002 data sheet.	2.2 Mb/s	DIP Miniflat PLCC	40 44 44
72101	CMOS, HDLC Controller	Single full-duplex serial channel; on-chip DMA controller. Not included in 1989-1990 IPD Data Book; refer to 72101 data sheet.	4 Mb/s	DIP PLCC	40 68

Graphics Controllers

Device, μPD	Name	Description	Drawing Rate	# Package	Pins
7220A	High-Performance Graphics Display Controller	General-purpose, high-integration controller; hardwired support for lines, arc/circles, rectangles, and graphics characters; 1024x1024 pixel display with four planes	500 ns/dot	Ceramic DIP	40
72020	Graphics Display Controller	CMOS 7220A with 2M video memory; dual-port RAM control; write-masking on any bit; enhanced external synch	500 ns/dot	DIP Miniflat	40 52
72022	Intelligent Display Processor	Display and image processing for text and sprites; three display modes; four-way horizontal split-screen display; CMOS	500 ns/dot	PLCC Miniflat	68 80
72120	Advanced Graphics Display Controller	High-speed graphics operations including paint, area fill, slant, arbitrary angle rotate, up to 16x enlargement and reduction; dual-port RAM control; CMOS	500 ns/dot	PLCC Miniflat	84 94
72123	Advanced Graphics Display Controller II	Enhanced 72120; expanded command set; improved painting performance; laser printer interface controls; CMOS	400 ns/dot	PLCC Miniflat	84 94

Plastic unless ceramic (or cerdip) is specified.

Advanced Compression/Expansion Engine

Device, μPD	Name	Description	# Package	Pins
72185	Advanced Compression/ Expansion Engine	High-speed CCITT Group 3/4 bit-map image compression/expansion (A4 test chart, 400 PPI x 400 LPI in under 1 second); 32K-pixel line length; 32-megabyte image memory; on-chip DMA and refresh timing generator; CMOS	SDIP PLCC	64 68

Floppy-Disk Controllers

Device, μPD	Name	Description	Transfer Rate	# Package	Pins
765A/B	Floppy-Disk Controller	Industry-standard controller supporting IBM 3740 and IBM System 34 double-density format; enhanced 765B supports multitasking applications	500 kb/s	DIP	40
71065/66	Floppy-Disk Interface	Compatible with 765-family controllers and others; supports multiple data rates from 125 to 500 kb/s	500 kb/s	SOP SDIP	28 30
72065/65B	CMOS Floppy-Disk Controller	100% 765A/B microcode compatible; compatible with 808x microprocessor families	1 Mb/s	DIP PLCC Miniflat	40 44 52
72067	Floppy-Disk Controller	CMOS; 765A/B microcode compatible; clock generation/ switching circuitry; selectable write precompensation; digital phase-locked loop	500 kb/s	DIP Miniflat PLCC	48 52 52
72068	Floppy-Disk Controller	All features of the 72067 plus IBM-PC, PC/XT, PC/AT, or PS/2 style registers; 24-ma high-current drivers	500 kb/s	Miniflat PLCC	80 84
72069	Floppy-Disk Controller	All features of the 72067/68 with substitution of high-performance analog phase-locked loop for digital PLL	1 Mb/s	PLCC Miniflat	84 100

Hard-Disk Controllers

Device, μPD	Name	Description	Read/Write Clock	# Package	Pins
7261A/B	Hard-Disk Controller	Supports eight drives in SMD mode, four drives in ST506 mode; error correction and detection	23 MHz	Ceramic DIP	40
7262	Enhanced Small-Disk Interface (ESDI) Controller	Serial-mode ESDI compatible; controls up to seven drives; supports up to 80 heads; hard and soft-sector interfacing	18 MHz	Ceramic DIP	40
72061	CMOS Hard-Disk Controller	Supports SMD/SMD-E and ST506/412 type drives	24 MHz	DIP Miniflat PLCC	40 52 52
72111	Small Computer System Interface (SCSI) Controller	Selectable 8/16 data bus width; 16 high-level commands for reduced CPU load; single-command automatic execution; 4-Mb sync/async; CMOS	16 MHz	SDIP Miniflat PLCC	64 74 68

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DSP AND SPEECH PRODUCTS

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Part Numbering System

μPD77C20AL Typical microdevice part number

μP	NEC monolithic silicon integrated circuit
D	Device type (D = digital MOS)
77C20A	Device identifier (alphanumeric)
L	Package type (L = PLCC)

A part number may include an alphanumeric suffix that identifies special device characteristics.

Digital Signal Processors

Device, μPD	Description	Instruction Cycle (ns)	Instruction ROM (Bits)	Data ROM (Bits)	Data RAM (Bits)	# Package	Pins
7720A	16-bit, fixed-point DSP; NMOS	244	512 x 23	510 x 13	128 x 16	DIP PLCC	28 44
77C20A	16-bit, fixed-point DSP; CMOS	244	512 x 23	510 x 13	128 x 16	DIP PLCC PLCC	28 28 44
77P20	16-bit, fixed-point DSP; CMOS	244	512 x 23 UVEPROM	510 x 13 UVEPROM	128 x 16	Cerdip	28
77C25	16-bit, fixed-point DSP; CMOS	122	2048 x 24	1024 x 16	256 x 16	DIP PLCC	28 44
77P25	16-bit, fixed-point DSP; CMOS	122	2048 x 24 OTPROM	1024 x 16 OTPROM	256 x 16	DIP PLCC	28 44
			2048 x 24 UVEPROM	1024 x 16 UVEPROM	256 x 16	Cerdip	28
77220	24-bit, fixed-point DSP; CMOS	122	2048 x 32	1024 x 24	512 x 24	Ceramic PGA PLCC	68 68
77230AR	32-bit, floating-point DSP; CMOS	150	2048 x 32	1024 x 32	1024 x 32	Ceramic PGA	68
77230AR-003	32-bit, floating-point DSP; CMOS; standard library software	150	n/a	n/a	n/a	Ceramic PGA	68
77P230R	32-bit, floating-point DSP; CMOS	150	2048 x 32 UVEPROM	1024 x 32 UVEPROM	1024 x 32	Ceramic PGA	68
77810	16-bit fixed-point modem DSP; CMOS	181	2048 x 24	1024 x 16	256 x 16	Ceramic PGA PLCC	68 68
7281	Image pipelined processor; NMOS	5-MHz clock	n/a	n/a	512 x 18	Ceramic DIP	40
9305	Support device for μPD7281 processors; CMOS	10-MHz clock	n/a	n/a	n/a	Ceramic PGA	132

Plastic unless ceramic (or cerdip) is specified.

Speech Processors

Device, μPD	Name	Technology	Clock (MHz)	Data ROM (Bits)	# Package	Pins
7730	ADPCM Speech Encoder/Decoder	NMOS	8	–	DIP	28
77C30	ADPCM Speech Encoder/Decoder	NMOS	8	–	DIP PLCC	28 44
7755	ADPCM Speech Synthesizer	CMOS	0.7	96K	DIP SOP	18 24
7756	ADPCM Speech Synthesizer	CMOS	0.7	256K	DIP SOP	18 24
77P56	ADPCM Speech Synthesizer	CMOS	0.7	256K OTPROM	DIP SOP	20 24
7757	ADPCM Speech Synthesizer	CMOS	0.7	512K	DIP SOP	18 24
7759	ADPCM Speech Synthesizer	CMOS	0.7	1024K external	DIP Miniflat	40 52

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DEVELOPMENT TOOLS FOR MICRO PRODUCTS

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V-Series Development Tools

Part Number (Note 1)	Full Emulator	Full Emulator Probe	Mini-IE Emulator	Mini-IE Probe	Evaluation Boards	EPROM/OTP Device	Relocatable Assembler (Note 13)	C Compiler (Note 14)
μPD70136GJ-12	IE-70136-A016	EP-70136L-A (Note 2)	IE-70136-PC	EP-70136L-PC (Note 2)	DDK-70136	–	RA70136	CC70136
μPD70136GJ-16	IE-70136-A016	EP-70136L-A (Note 2)	IE-70136-PC	EP-70136L-PC (Note 2)	DDK-70136	–	RA70136	CC70136
μPD70136L-16	IE-70136-A016	EP-70136L-A	IE-70136-PC	EP-70136L-PC	DDK-70136	–	RA70136	CC70136
μPD70136L-12	IE-70136-A016	EP-70136L-A	IE-70136-PC	EP-70136L-PC	DDK-70136	–	RA70136	CC70136
μPD70136R-12	IE-70136-A016	EP-70136L-A (Note 3)	IE-70136-PC	EP-70136L-PC (Note 3)	DDK-70136	–	RA70136	CC70136
μPD70136R-16	IE-70136-A016	EP-70136L-A (Note 3)	IE-70136-PC	EP-70136L-PC (Note 3)	DDK-70136	–	RA70136	CC70136
μPD70208GF-8	IE-70208-A010	(Note 12)	EB-V40MINI-IE	–	EB-70208	–	RA70116	CC70116
μPD70208GF-10	IE-70208-A010	(Note 12)	EB-V40MINI-IE	–	EB-70208	–	RA70116	CC70116
μPD70208L-8	IE-70208-A010	IE-70000-2958	EB-V40MINI-IE	ADAPT68PGA 68PLCC (Note 4)	EB-70208	–	RA70116	CC70116
μPD70208L-10	IE-70208-A010	IE-70000-2958	EB-V40MINI-IE	ADAPT68PGA 68PLCC (Note 4)	EB-70208	–	RA70116	CC70116
μPD70208R-8	IE-70208-A010	IE-70000-2959	EB-V40MINI-IE	(Note 4)	EB-70208	–	RA70116	CC70116
μPD70208R-10	IE-70208-A010	IE-70000-2959	EB-V40MINI-IE	(Note 4)	EB-70208	–	RA70116	CC70116
μPD70216GF-8	IE-70216-A010	(Note 12)	EB-V50MINI-IE	–	EB70216	–	RA70116	CC70116
μPD70216GF-10	IE-70216-A010	(Note 12)	EB-V50MINI-IE	–	EB70216	–	RA70116	CC70116
μPD70216L-8	IE-70216-A010	IE-70000-2958	EB-V50MINI-IE	ADAPT68PGA 68PLCC (Note 4)	EB70216	–	RA70116	CC70116
μPD70216L-10	IE-70216-A010	IE-70000-2958	EB-V50MINI-IE	ADAPT68PGA 68PLCC (Note 4)	EB70216	–	RA70116	CC70116
μPD70216R-8	IE-70216-A010	IE-70000-2959	EB-V50MINI-IE	(Note 4)	EB70216	–	RA70116	CC70116
μPD70216R-10	IE-70216-A010	IE-70000-2959	EB-V50MINI-IE	(Note 4)	EB70216	–	RA70116	CC70116
μPD70320GJ	IE-70320-A008	EP-70320GJ (Note 5)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	DDK-70320	–	RA70320	CC70116
μPD70320GJ-8	IE-70320-A008	EP-70320GJ (Note 5)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	DDK-70320	–	RA70320	CC70116
μPD70320L	IE-70320-A008	EP-70320L	EB-V25MINI-IE-P	(Note 7)	DDK-70320	–	RA70320	CC70116
μPD70320L-8	IE-70320-A008	EP-70320L	EB-V25MINI-IE-P	(Note 7)	DDK-70320	–	RA70320	CC70116
μPD70322GJ	IE-70320-A008	EP-70320GJ (Note 5)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	DDK-70320	–	RA70320	CC70116
μPD70322GJ-8	IE-70320-A008	EP-70320GJ (Note 5)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	DDK-70320	–	RA70320	CC70116
μPD70322L	IE-70320-A008	EP-70320L	EB-V25MINI-IE-P	(Note 7)	DDK-70320	70P322K (Note 10)	RA70320	CC70116
μPD70322L-8	IE-70320-A008	EP-70320L	EB-V25MINI-IE-P	(Note 7)	DDK70320	70P322K (Note 10)	RA70320	CC70116
μPD70325GJ-8	IE-70325-A008	EP-70320GJ (Note 5)	(Note 12)	(Note 12)	DDK-70325	–	RA70320	CC70116

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V-Series Development Tools (cont)

Part Number (Note 1)	Full Emulator	Full Emulator Probe	Mini-IE Emulator	Mini-IE Probe	Evaluation Boards	EPROM/OTP Device	Relocatable Assembler (Note 13)	C Compiler (Note 14)
μPD70325GJ-10	IE-70325-A008 (Note 8)	EP-70320GJ (Note 5)	(Note 12)	(Note 12)	DDK-70325	–	RA70320	CC70116
μPD70325L-8	IE-70325-A008	EP-70320L	(Note 12)	(Note 12)	DDK-70325	–	RA70320	CC70116
μPD70325L-10	IE-70325-A008 (Note 8)	EP-70320L	(Note 12)	(Note 12)	DDK-70325	–	RA70320	CC70116
μPD70327GJ-8 (Note 9)	IE-70320-A008	EP-70320GJ (Note 5)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	–	–	RA70320	CC70116
μPD70327L-8 (Note 9)	IE-70320-A008	EP-70320L	EB-V25MINI-IE-P	(Note 7)	–	–	RA70320	CC70116
μPD70330GJ-8	IE-70330-A008	EP-70320GJ (Note 5)	EB-V35MINI-IE-P	EP-70320GJ (Note 6)	DDK-70330	–	RA70320	CC70116
μPD70330L-8	IE-70330-A008	EP-70320L	EB-V35MINI-IE-P	(Note 7)	DDK-70330	–	RA70320	CC70116
μPD70332GJ-8	IE-70330-A008	EP-70320GJ (Note 5)	EB-V35MINI-IE-P	EP-70320GJ (Note 6)	DDK-70330	–	RA70320	CC70116
μPD70332L-8	IE-70330-A008	EP-70320L	EB-V35MINI-IE-P	(Note 7)	DDK-70330	70P322K (Note 10)	RA70320	CC70116
μPD70335GJ-8	IE-70335-A008	EP-70320GJ (Note 5)	(Note 12)	(Note 12)	DDK-70330	–	RA70320	CC70116
μPD70335GJ-10	IE-70335-A008 (Note 8)	EP-70320GJ (Note 5)	(Note 12)	(Note 12)	DDK-70330	–	RA70320	CC70116
μPD70335L-8	IE-70335-A008	EP-70320L	(Note 12)	(Note 12)	DDK-70330	–	RA70320	CC70116
μPD70335L-10	IE-70335-A008 (Note 8)	EP-70320L	(Note 12)	(Note 12)	DDK-70330	–	RA70320	CC70116
μPD70337GJ-8 (Note 9)	IE-70330-A008	EP-70320GJ (Note 5)	EB-V35MINI-IE-P	EP-70320GJ (Note 6)	–	–	RA70320	CC70116
μPD70337L-8 (Note 9)	IE-70330-A008	EP-70320L	EB-V35MINI-IE-P	(Note 7)	–	–	RA70320	CC70116
μPD79011GJ-8 (Note 11)	IE-70320-A008	EP-70320GJ (Note 5)	(Note 12)	(Note 12)	–	–	RA70320	CC70116
μPD79011L-8 (Note 11)	+IE-70320-RTOS	EP-70320L	(Note 12)	(Note 12)	–	–	RA70320	CC70116
μPD79021L-8 (Note 11)	IE-70330-A008 +IE-70330-RTOS	EP-70320L	(Note 12)	(Note 12)	–	–	RA70320	CC70116

Notes:

(1) Packages:

Package	Description
GF	80-pin plastic miniflat
GJ	74-pin or 94-pin plastic miniflat
K	84-pin ceramic LCC with window
L	68-pin or 84-pin plastic LCC
R	68-pin PGA

(2) The EP-70136GL-A and EP-70136L-PC contain both a 68-pin PLCC probe and an adapter which converts the 68-pin PLCC probes to a 74-pin miniflat footprint.

(3) 68-pin PGA parts are supported by using the EP-70136L-A PLCC probe or EP-70136L-PC PLCC probe, plus a PLCC socket with a PGA-pinout. A PLCC socket of this type is supplied with the EP-70136L-A.

(4) The EB-V40 MINI-IE and EB-V50 MINI-IE support PGA packages directly; the ADAPT68PGA68PLCC adaptor converts the PGA-pinout on the MINI-IE to a PLCC footprint. This adaptor is supplied with the MINI-IE.

(5) The EP-70320GJ is an adaptor to the EP-70320L, which converts 84-pin PLCC probes to a 94-pin miniflat footprint. For GJ parts, both the PLCC probe and the adaptor are needed.

(6) The EP-70320GJ adaptor can be used to convert the supplied 84-pin PLCC cable of the EB-V25 MINI-IE-P or EB-V35 MINI-IE-P to a 94-pin miniflat.

(7) The EB-V25 MINI-IE-P and EB-V35 MINI-IE-P are supplied with an 84-pin PLCC cable.

(8) At the current time, the emulators for the μPD70325 and μPD70335 are specified to 8 MHz. Contact your local NEC Sales Office for the latest information on 10 MHz emulation.

(9) Development for the μPD70327 or μPD70337 can be done using the appropriate μPD70320 or μPD70330 tools; however, debugging of programs in the Software Guard mode is not supported at this time.

(10) The μPD70P322K EPROM device can be used for both μPD70322 and μPD70332 emulation. The μPD70P322K EPROM device can be programmed by using the PA-70P322L Programming Adapter and the PG-1500 EPROM Programmer.

(11) For emulation of μPD79011 or μPD79021, the base emulator (IE-70320 or IE-70330) plus Real-Time Operating System software IE-70320-RTOS or IE-70330-RTOS) is required.

(12) This emulation option is not currently supported, but may be available in the future. Contact your local NEC Sales Office for further information.

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(13) The following relocatable assemblers are available:

RA70116-D52	For V20®/V30®/	(VS-DOS®)
RA70116-VVT1	V40™/V50™	(VAX/VMS™)
RA70116-VXT1		(VAX/UNIX™ 4.2 BSD or Ultrix™)
RA70136-D52	For V33™	(MS-DOS)
RA70136-VVT1		(VAX/VMS)
RA70136-VXT1		(VAX/UNIX 4.2 BSD or Ultrix)
RA70320-D52	For V25™ and V35™	(MS-DOS)
RA70320-VVT1		(VAX/VMS)
RA70320-VXT1		(VAX/UNIX 4.2 BSD or Ultrix)

(14) The following C compilers are available:

CC70116-D52	For V20/V30/	(MS-DOS)
CC70116-VVT1	V40/V50 and	(VAX/VMS)
CC70116-VXT1	V25/V35	(VAX/UNIX 4.2 BSD or Ultrix)
CC70136-D52	For V33	(MS-DOS)
CC70136-VVT1		(VAX/VMS)
CC70136-VXT1		(VAX/UNIX 4.2 BSD or Ultrix)
CC70320-D52	For V25 and V35	(MS-DOS)
CC70320-VVT1		(VAX/VMS)
CC70320-VXT1		(VAX/UNIX 4.2 BSD or Ultrix)

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μPD75XX Series Development Tools

Part Number (Note 1)	Emulator*	Add-on Board*	System Evaluation Board	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Absolute Assembler (Note 3)
μPD7501G-12	EVAKIT-7500B	EV7514	SE-7514A	–	–	ASM75
μPD7502G-12	EVAKIT-7500B	EV7514	SE-7514A	–	–	ASM75
μPD7503G-12	EVAKIT-7500B	EV7514	SE-7514A	–	–	ASM75
μPD7506C	EVAKIT-7500B	–	SE-7508	–	–	ASM75
μPD7506CT	EVAKIT-7500B	–	–	–	–	ASM75
μPD7506G-00	EVAKIT-7500B	–	–	–	–	ASM75
μPD7507C	EVAKIT-7500B	–	–	μPD78CG08E	–	ASM75
μPD7507CU	EVAKIT-7500B	–	–	–	–	ASM75
μPD7507G-00	EVAKIT-7500B	–	–	–	–	ASM75
μPD7507HC	EVAKIT-7500B	EV7508H	–	μPD75CG08HE	–	ASM75
μPD7507HCU	EVAKIT-7500B	EV7508H	–	–	–	ASM75
μPD7507HG-22	EVAKIT-7500B	EV7508H	–	–	–	ASM75
μPD7507SC	EVAKIT-7500B	–	SE-7508	–	–	ASM75
μPD7507SCT	EVAKIT-7500B	–	–	–	–	ASM75
μPD7508C	EVAKIT-7500B	–	–	μPD78CG08E	–	ASM75
μPD7508CU	EVAKIT-7500B	–	–	–	–	ASM75
μPD7508G-00	EVAKIT-7500B	–	–	–	–	ASM75
μPD75CG08E	EVAKIT-7500B	–	–	–	–	ASM75
μPD7508AC	EVAKIT-7500B	–	SE-7508	–	–	ASM75
μPD7508HC	EVAKIT-7500B	EV7508H	–	μPD75CG08HE	–	ASM75
μPD7508HCU	EVAKIT-7500B	EV7508H	–	–	–	ASM75
μPD7508HG-22	EVAKIT-7500B	EV7508H	–	–	–	ASM75

μPD75XX Series Development Tools (cont)

Part Number (Note 1)	Emulator*	Add-on Board*	System Evaluation Board	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Absolute Assembler (Note 3)
μPD75CG08HE	EVAKIT-7500B	EV7508H	–	–	–	ASM75
μPD7514G-12	EVAKIT-7500B	EV7514	SE-7514A	–	–	ASM75
μPD7516HCW	EVAKIT-7500B	EV7500FIP	–	–	–	ASM75
μPD7516HG-12	EVAKIT-7500B	EV7500FIP	–	–	–	ASM75
μPD7516HG-36	EVAKIT-7500B	EV7500FIP	–	μPD75CG16HE	–	ASM75
μPD75CG16HE	EVAKIT-7500B	EV7500FIP	–	–	–	ASM75
μPD7519HCW	EVAKIT-7500B	EV7500FIP	–	–	–	ASM75
μPD7519HG-12	EVAKIT-7500B	EV7500FIP	–	–	–	ASM75
μPD7519HG-36	EVAKIT-7500B	EV7500FIP	–	μPD75CG19HE	–	ASM75
μPD75CG19HE	EVAKIT-7500B	EV7500FIP	–	–	–	ASM75
μPD7527AC	EVAKIT-7500B	EV7528	–	μPD75CG28E	–	ASM75
μPD7527ACU	EVAKIT-7500B	EV7528	–	–	–	ASM75
μPD7528AC	EVAKIT-7500B	EV7528	–	μPD75CG28E	–	ASM75
μPD7528ACU	EVAKIT-7500B	EV7528	–	–	–	ASM75
μPD75CG28E	EVAKIT-7500B	EV7528	–	–	–	ASM75
μPD7533C	EVAKIT-7500B	EV7533	–	μPD75CG33E	–	ASM75
μPD7533CU	EVAKIT-7500B	EV7533	–	–	–	ASM75
μPD7533G-22	EVAKIT-7500B	EV7533	–	–	–	ASM75
μPD75CG33E	EVAKIT-7500B	EV7533	–	–	–	ASM75
μPD7537AC	EVAKIT-7500B	EV7528	–	μPD75CG38E	–	ASM75
μPD7537ACU	EVAKIT-7500B	EV7528	–	–	–	ASM75
μPD7538AC	EVAKIT-7500B	EV7528	–	μPD75CG38E	–	ASM75
μPD7538ACU	EVAKIT-7500B	EV7528	–	–	–	ASM75
μPD75CG38E	EVAKIT-7500B	EV7528	–	–	–	ASM75
μPD7554CS	EVAKIT-7500B	EV7554A	SE-7554A	μPD75P54CS	PA-75P54CS	ASM75
μPD7554G	EVAKIT-7500B	EV7554A	SE-7554A	μPD75P54G	PA-75P54CS	ASM75
μPD75P54CS	EVAKIT-7500B	EV7554A	–	–	–	ASM75
μPD75P54G	EVAKIT-7500B	EV7554A	–	–	–	ASM75
μPD7556CS	EVAKIT-7500B	EV7554A	SE-7554A	μPD75P56CS	PA-75P56CS	ASM75
μPD7556G	EVAKIT-7500B	EV7554A	SE-7554A	μPD75P56G	PA-75P56CS	ASM75
μPD75P56CS	EVAKIT-7500B	EV7554A	–	–	–	ASM75
μPD75P56G	EVAKIT-7500B	EV7554A	–	–	–	ASM75
μPD7564CS	EVAKIT-7500B	EV7554A	SE-7554A	μPD75P64CS	PA-75P54CS	ASM75
μPD7564G	EVAKIT-7500B	EV7554A	SE-7554A	μPD75P64G	PA-75P54CS	ASM75
μPD75P64CS	EVAKIT-7500B	EV7554A	–	–	–	ASM75
μPD75P64G	EVAKIT-7500B	EV7554A	–	–	–	ASM75
μPD7566CS	EVAKIT-7500B	EV7554A	SE-7554A	μPD75P66CS	PA-75P56CS	ASM75
μPD7566G	EVAKIT-7500B	EV7554A	SE-7554A	μPD75P66G	PA-75P56CS	ASM75

μPD75XX Series Development Tools (cont)

Part Number (Note 1)	Emulator*	Add-on Board*	System Evaluation Board	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Absolute Assembler (Note 3)
μPD75P66CS	EVAKIT-7500B	EV7554A	–	–	–	ASM75
μPD75P66G	EVAKIT-7500B	EV7554A	–	–	–	ASM75

* Required tools

Notes:

(1) Packages:

Package	Description
C	28-pin plastic DIP (μPD7506/07S)
	40-pin plastic DIP (μPD7507/07H/08/08A/08H)
	42-pin plastic DIP (μPD7527A/28A/33/37A/38A)
CS	20-pin plastic shrink DIP (μPD7554/P54/64/P64)
	24-pin plastic shrink DIP (μPD7556/P56/66/P66)
CT	28-pin plastic shrink DIP
CU	40-pin plastic shrink DIP (μPD7507/07H/08/08H)
	42-pin plastic shrink DIP (μPD7527A/28A/33/37/37A/38A)
CW	64-pin plastic shrink DIP
E	40-pin ceramic piggy-back DIP (μPD75CG08/08H)
	42-pin ceramic piggy-back DIP (μPD75CG28/33/38)
	64-pin ceramic piggy-back QUIP (μPD75CG16H/19H)
G	20-pin plastic SO (μPD7554/P54/64/P64)
	24-pin plastic SO (μPD7556/P56/66/P66)
G-00	52-pin plastic miniflat
G-12	64-pin plastic miniflat (μPD7501/02/03/16H/19H)
	80-pin plastic miniflat (μPD7514)
G-22	44-pin plastic miniflat
G-36	64-pin plastic QUIP

(2) By using the specified adapter, the PG-1500 EPROM programmer can be used to program the OTP device.

(3) The ASM75 Absolute Assembler is provided to run under the MOS-DOS® operating system. (ASM75-D52).

MS-DOS is registered trademark of Microsoft Corporation.

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μPD75XXX Series Development Tools

Part Number (Note 7)	Main Board Emulator*	Add-on Board*	Emulation Probe*	Optional Socket Adapter (Note 1)	EPROM/OTP Device (Note 2)	Relocatable Assembler (Note 5)	Structured Assembler (Note 6)
μPD75004CU	EVAKIT-75X	EV-75008	(Note 3)	–	μPD75P008CU/DU	RA75X	ST75X
μPD75006GB	EVAKIT-75X	EV-75008	EP-75008GB	EV-9200G-44	μPD75P008GB	RA75X	ST75X
μPD75006CU	EVAKIT-75X	EV-75008	(Note 3)	–	μPD75P008CU/DU	RA75X	ST75X
μPD75006GB	EVAKIT-75X	EV-75008	EP-75008GB	EV-9200G-44	μPD75P008GB	RA75X	ST75X
μPD75008CU	EVAKIT-75X	EV-75008	(Note 3)	–	μPD75P008CU/DU	RA75X	ST75X
μPD75008GB	EVAKIT-75X	EV-75008	EP-75008GB	EV-9200G-44	μPD75P008GB	RA75X	ST75X
μPD75P008CU	EVAKIT-75X	EV-75008	(Note 3)	–	–	RA75X	ST75X
μPD75P008DU	EVAKIT-75X	EV-75008	(Note 3)	–	–	RA75X	ST75X
μPD75P008GB	EVAKIT-75X	EV-75008	EP-75008GB	EV-9200G-44	–	RA75X	ST75X
μPD75028CW	EVAKIT-75X	EV-75048	(Note 4)	(Note 4)	μPD75P028CW	RA75X	ST75X
μPD75028GC	EVAKIT-75X	EV-75048	(Note 4)	(Note 4)	μPD75P028GC	RA75X	ST75X
μPD75P028CW	EVAKIT-75X	EV-75048	(Note 4)	(Note 4)	–	RA75X	ST75X
μPD75P028GC	EVAKIT-75X	EV-75048	(Note 4)	(Note 4)	–	RA75X	ST75X
μPD75048CW	EVAKIT-75X	EV-75048	(Note 4)	(Note 4)	–	RA75X	ST75X
μPD75048GC	EVAKIT-75X	EV-75048	(Note 4)	(Note 4)	–	RA75X	ST75X
μPD75104CW	EVAKIT-75X	EV-75108	(Note 3)	–	μPD75P108CW/DW	RA75X	ST75X
μPD75104G	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	μPD75P108G/GF μPD75P116GF	RA75X	ST75X
μPD75104GF	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	μPD75P108G/GF μPD75P116GF	RA75X	ST75X
μPD75104AGC	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	–	RA75X	ST75X

μPD75XXX Series Development Tools (cont)

Part Number (Note 7)	Main Board Emulator*	Add-on Board*	Emulation Probe*	Optional Socket Adapter (Note 1)	EPROM/OTP Device (Note 2)	Relocatable Assembler (Note 5)	Structured Assembler (Note 6)
μPD75106CW	EVAKIT-75X	EV-75108	(Note 3)	–	μPD75P108CW/DW	RA75X	ST75X
μPD75106G	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	μPD75P108G/GF μPD75P116GF	RA75X	ST75X
μPD75106GF	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	μPD75P108G/GF μPD75P116GF	RA75X	ST75X
μPD75108AG	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	–	RA75X	ST75X
μPD75108AGC	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	–	RA75X	ST75X
μPD75108CW	EVAKIT-75X	EV-75108	(Note 3)	–	μPD75P108CW/DW	RA75X	ST75X
μPD75108G	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	μPD75P108G/GF μPD75P116GF	RA75X	ST75X
μPD75108GF	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	μPD75P108G/GF μPD75P116GF	RA75X	ST75X
μPD75P108BCW	EVAKIT-75X	EV-75108	(Note 3)	–	–	RA75X	ST75X
μPD75P108CW	EVAKIT-75X	EV-75108	(Note 3)	–	–	RA75X	ST75X
μPD75P108DW	EVAKIT-75X	EV-75108	(Note 3)	–	–	RA75X	ST75X
μPD75P108G	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	–	RA75X	ST75X
μPD75112CW	EVAKIT-75X	EV-75108	(Note 3)	–	μPD75P116CW	RA75X	ST75X
μPD75112GF	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	μPD75P116GF	RA75X	ST75X
μPD75116CW	EVAKIT-75X	EV-75108	(Note 3)	–	μPD75P116CW	RA75X	ST75X
μPD75116GF	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	μPD75P116GF	RA75X	ST75X
μPD75P116BGF	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	–	RA75X	ST75X
μPD75P116CW	EVAKIT-75X	EV-75108	(Note 3)	–	–	RA75X	ST75X
μPD75P116GF	EVAKIT-75X	EV-75108	EP-75108GF	EV-9200G-64	–	RA75X	ST75X
μPD75206CW	EVAKIT-75X	EV-75216A	(Note 3)	–	μPD75P216ACW	RA75X	ST75X
μPD75206G	EVAKIT-75X	EV-75216A	EP-75216AGF	EV-9200G-64	–	RA75X	ST75X
μPD75208CW	EVAKIT-75X	EV-75216A	(Note 3)	–	μPD75P216ACW	RA75X	ST75X
μPD75208G	EVAKIT-75X	EV-75216A	EP-75216AGF	EV-9200G-64	–	RA75X	ST75X
μPD75CG208AE	EVAKIT-75X	EV-75216A	(Note 3)	–	–	RA75X	ST75X
μPD75CG208AEA	EVAKIT-75X	EV-75216A	EP-75216AGF	EV-9200G-64	–	RA75X	ST75X
μPD75212ACW	EVAKIT-75X	EV-75216A	(Note 3)	–	μPD75P216ACW	RA75X	ST75X
μPD75212AGF	EVAKIT-75X	EV-75216A	EP-75216AGF	EV-9200G-64	–	RA75X	ST75X
μPD75216ACW	EVAKIT-75X	EV-75216A	(Note 3)	–	μPD75P216ACW	RA75X	ST75X
μPD75216AGF	EVAKIT-75X	EV-75216A	EP-75216AGF	EV-9200G-64	–	RA75X	ST75X
μPD75CG216AE	EVAKIT-75X	EV-75216A	(Note 3)	–	–	RA75X	ST75X
μPD75CG216AEA	EVAKIT-75X	EV-75216A	EP-75216AGF	EV-9200G-64	–	RA75X	ST75X
μPD75P216ACW	EVAKIT-75X	EV-75216A	(Note 3)	–	μPD75P216ACW	RA75X	ST75X
μPD75268CW	EVAKIT-75X	EV-75216A	(Note 3)	–	μPD75P216ACW	RA75X	ST75X
μPD75268GF	EVAKIT-75X	EV-75216A	EP-75216AGF	EV-9200G-64	–	RA75X	ST75X
μPD75304GF	EVAKIT-75X	EV-75308	(Note 3)	EV-9200G-80	μPD75P308GF/K	RA75X	ST75X
μPD75306GF	EVAKIT-75X	EV-75308	(Note 3)	EV-9200G-80	μPD75P308GF/K	RA75X	ST75X
μPD75308GF	EVAKIT-75X	EV-75308	(Note 3)	EV-9200G-80	μPD75P308GF/K	RA75X	ST75X

μPD75XXX Series Development Tools (cont)

Part Number (Note 7)	Main Board Emulator*	Add-on Board*	Emulation Probe*	Optional Socket Adapter (Note 1)	EPROM/OTP Device (Note 2)	Relocatable Assembler (Note 5)	Structured Assembler (Note 6)
μPD75P308GF	EVAKIT-75X	EV-75308	(Note 3)	EV-9200G-80	–	RA75X	ST75X
μPD75P308K	EVAKIT-75X	EV-75308	(Note 3)	EV-9200G-80	–	RA75X	ST75X
μPD75312GF	EVAKIT-75X	EV-75308	(Note 3)	EV-9200G-80	μPD75P316GF	RA75X	ST75X
μPD75P316GF	EVAKIT-75X	EV-75308	(Note 3)	EV-9200G-80	–	RA75X	ST75X
μPD75328GC	EVAKIT-75X	EV-75328	(Note 3)	–	μPD75P328GC	RA75X	ST75X
μPD75P328GC	EVAKIT-75X	EV-75328	(Note 3)	–	–	RA75X	ST75X
μPD75402C	EVAKIT-75X	EV-75402	(Note 3)	–	μPD75P402C	RA75X	ST75X
μPD75402CT	EVAKIT-75X	EV-75402	(Note 3)	–	μPD75P402CT	RA75X	ST75X
μPD75402GB	EVAKIT-75X	EV-75402	EP-75402GB	EV-9200G-44	μPD75P402GB	RA75X	ST75X
μPD75P402C	EVAKIT-75X	EV-75402	(Note 3)	–	–	RA75X	ST75X
μPD75P402CT	EVAKIT-75X	EV-75402	(Note 3)	–	–	RA75X	ST75X
μPD75P402GB	EVAKIT-75X	EV-75402	EP-75402GB	EV-9200G-44	–	RA75X	ST75X
μPD75516GF	EVAKIT-75X	EV-75516	(Note 3)	–	μPD75P516GF/K	RA75X	ST75X
μPD75P516GF	EVAKIT-75X	EV-75516	(Note 3)	–	–	RA75X	ST75X
μPD75P516K	EVAKIT-75X	EV-75516	(Note 3)	–	–		

Notes:

(1) The EV-9200G-XX is an LCC socket with the footprint of the flat package. One unit is supplied with the probe. Additional units are available as replacement parts in sets of five.

(2) All EPROM/OTP devices can be programmed using the NEC PG-1500. Refer to the PG-1500 Programming Socket Adapter Selection Guide for the appropriate socket adapter.

(3) The emulation probe is shipped with the add-on board.

(4) Preliminary information. Contact your NEC Sales Representative for further information and availability.

(5) The RA75X relocatable assembler package is provided for the following operating systems:
RA75X-D52 (MOS-DOS®)
RA75X-VVT1 (VAX/VMS™)

(6) The ST75X structures assembler preprocessor is provided with RA75X

(7) Packages:

Package	Description
C	28-pin plastic DIP
CT	28-pin plastic shrink DIP
CU	42-pin plastic shrink DIP
CW	64-pin plastic shrink DIP
DU	42-pin ceramic shrink DIP with window
DW	64-pin ceramic shrink DIP with window
E	64-pin ceramic piggy-back shrink DIP
EA	64-pin ceramic piggy-back miniflat
G	64-pin plastic miniflat
GB	44-pin plastic miniflat
GC	64 or 80-pin plastic miniflat
GF	64 or 80-pin plastic miniflat
K	80-pin plastic miniflat

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μPD78XX Series Development Tools**

Part Number (Note 1)	Emulator*	Emulation Probe*	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Relocatable Assembler (Note 10)	C Compiler (Note 10)
μPD7810HCW	IE-7811H-M	EV-9001-64 (Note 3)	–	–	RA87	CC87
μPD7810HG-36	IE-7811H-M	(Note 4)	–	–	RA87	CC87
μPD7811HCW	IE-7811H-M	EV-9001-64 (Note 3)	–	–	RA87	CC87
μPD7811HG-36	IE-7811H-M	(Note 4)	μPD78PG11HE (Note 6)	–	RA87	CC87
μPD78PG11HE	IE-7811H-M	(Note 4)	–	–	RA87	CC87
μPD78C10CW	IE-78C11-M	EV-9001-64 (Note 3)	–	–	RA87	CC87
μPD78C10G-36	IE-78C11-M	(Note 4)	–	–	RA87	CC87
μPD78C10G-1B	IE-78C11-M	(Note 5)	–	–	RA87	CC87
μPD78C10GF-3BE	IE-78C11-M	(Note 5)	–	–	RA87	CC87
μPD78C10L	IE-78C11-M	(Note 5)	–	–	RA87	CC87
μPD78C10ACW	IE-78C11-M (Note 8)	EV-9001-64 (Note 3)	–	–	RA87	CC87
μPD78C10AGQ-36	IE-78C11-M (Note 8)	(Note 4)	–	–	RA87	CC87
μPD78C10AGF-3BE	IE-78C11-M (Note 8)	(Note 5)	–	–	RA87	CC87
μPD78C10AL	IE-78C11-M (Note 8)	(Note 5)	–	–	RA87	CC87
μPD78C11CW	IE-78C11-M	EV-9001-64 (Note 3)	μPD78CP14CW/DW	PA-78CP14CW	RA87	CC87
μPD78C11G-36	IE-78C11-M	(Note 4)	μPD78CP14GQ-36/R μPD78CG14E	PA-78CP14GQ	RA87	CC87
μPD78C11G-1B	IE-78C11-M	(Note 5)	μPD78CP14GF-3BE	PA-78CP14GF	RA87	CC87
μPD78C11GF-3BE	IE-78C11-M	(Note 5)	μPD78CP14GF-3BE	PA-78CP14GF	RA87	CC87
μPD78C11L	IE-78C11-M	(Note 5)	μPD78CP14L	PA-78CP14L	RA87	CC87
μPD78C11ACW	IE-78C11-M (Note 8)	EV-9001-64 (Note 3)	μPD78CP14CW/DW (Note 7)	PA-78CP14CW	RA87	CC87
μPD78C11AGQ-36	IE-78C11-M (Note 8)	(Note 4)	μPD78CP14GQ-36/R (Note 7)	PA-78CP14GQ	RA87	CC87
μPD78C11AGF-3BE	IE-78C11-M (Note 8)	(Note 5)	μPD78CP14GF-3BE (Note 7)	PA-78CP14GF	RA87	CC87
μPD78C11AL	IE-78C11-M (Note 8)	(Note 5)	μPD78CP14L (Note 7)	PA-78CP14L	RA87	CC87
μPD78C12ACW	IE-78C11-M (Note 8)	EV-9001-64 (Note 3)	μPD78CP14CW/DW (Note 7)	PA-78CP14CW	RA87	CC87
μPD78C12AGQ-36	IE-78C11-M (Note 8)	(Note 4)	μPD78CP14GQ-36/R (Note 7)	PA-78CP14GQ	RA87	CC87

* Required Tools

** For all μPD78C1X devices, you may use the DDK-78C10 for evaluation purposes.

μPD78XX Series Development Tools** (cont)

Part Number (Note 1)	Emulator*	Emulation Probe*	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Relocatable Assembler (Note 10)	C Compiler (Note 10)
μPD78C12AGF-3BE	IE-78C11-M (Note 8)	(Note 5)	μPD78CP14GF-3BE (Note 7)	PA-78CP14GF	RA87	CC87
μPD78C12AL	IE-78C11-M (Note 8)	(Note 5)	μPD78CP14L (Note 7)	PA-78CP14L	RA87	CC87
μPD78C14CW	IE-78C11-M	EV-9001-64 (Note 3)	μPD78CP14CW/DW	PA-78CP14CW	RA87	CC87
μPD78C14G-36	IE-78C11-M	(Note 4)	μPD78CP14GQ-36/R μPD78CG14E	PA-78CP14GQ	RA87	CC87
μPD78C14G-1B	IE-78C11-M	(Note 5)	μPD78CP14GF	PA-78CP14GF	RA87	CC87
μPD78C14GF-3BE	IE-78C11-M	(Note 5)	μPD78CP14GF	PA-78CP14GF	RA87	CC87
μPD78C14L	IE-78C11-M	(Note 5)	μPD78CP14L	PA-78CP14L	RA87	CC87
μPD78C14AG-AB8	IE-78C11-M (Note 8)	(Note 5)	–	–	RA87	CC87
μPD78CG14E (Note 9)	IE-78C11-M	(Note 4)	–	–	RA87	CC87
μPD78CP14CW	IE-78C11-M	EV-9001-64 (Note 3)	–	PA-78CP14CW	RA87	CC87
μPD78CP14DW	IE-78C11-M	EV-9001-64 (Note 3)	–	PA-78CP14CW	RA87	CC87
μPD78CP14GQ-36	IE-78C11-M	(Note 4)	–	PA-78CP14GQ	RA87	CC87
μPD78CP14GF-3BE	IE-78C11-M	(Note 5)	–	PA-78CP14GF	RA87	CC87
μPD78CP14L	IE-78C11-M	(Note 5)	–	PA-78CP14L	RA87	CC87
μPD78CP14R	IE-78C11-M	(Note 4)	–	PA-78CP14GQ	RA87	CC87

* Required Tools

Notes:

(1) Packages

Package	Description
CW	64-pin plastic shrink DIP
DW	64-pin ceramic shrink DIP with window
E	64-pin ceramic piggyback QUIP
GF-1B	64-pin plastic miniflat (Resin Thickness: 2.05mm)
G-36	64-pin plastic QUIP
G-AB8	64-pin plastic miniflat (Interpin Pitch: 0.8mm)
GF-3BE	64-pin plastic miniflat (Resin Thickness: 2.7mm)
GQ-36	64-pin plastic QUIP
L	68-pin PLCC
R	64-pin ceramic QUIP with window

(2) By using the specified adapter, the PG-1500 EPROM programmer can be used to program the EPROM/OTP device.

(3) 64-pin shrink DIP adapter which plugs into the EP-7811HGQ emulation probe supplied with each IE.

(4) The emulation probe for the 64-pin QUIP package (EP-7811HGQ) is supplied with the IE.

(5) No emulation probe available.

(6) The μPD78PG11HE is a piggy-back EPROM device in a ceramic QUIP package. It accepts 2764 EPROMs.

(7) The μPD78CP14 EPROM/OTP devices do not have pull-up resistors on ports A, B, and C.

(8) The IE-78C11-M can be used by replacing the μPD78C10G-36 with a μPD78C10AGQ-36. However, it will not be able to emulate the optional pull-up resistors on ports A, B, and C.

(9) The μPD78CG14E is a piggy-back EPROM device in a ceramic QUIP package. It accepts 27C256 and 27C256A EPROMS.

(10) The following relocatable assemblers and C Compilers are available:

RA87-D52 RA87-VVT1	(MS-DOS®) (VAX/VMS™)	Relocatable assemblers for 78XX series
CCMSD-I5DD-87 CCVMS-OT16-87 CCUNX-OT16-87	(MS-DOS) (VAX/VMS) (VAX/UNIX™) 4.2 BSD or Ultrix™)	C Compilers for 78XX Series

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VAX, VMS and Ultrix are trademarks of Digital Equipment Corporation.
UNIX is a trademark of AT&T Bell Laboratories.

μPD78XXX Series Development Tools

Part Number (Note 1)	Emulator*	Emulation Probe*	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Relocatable Assembler (Notes 11)	Structured Assembler (Note 12)	C Compiler (Note 13)
μPD78213CW	IE-78210-R	EP-78210CW	–	–	RA78K2	ST78K2	CC782XX
μPD78213GC-3B8	IE-78210-R	EP-78210GC	–	–	RA78K2	ST78K2	CC782XX
μPD78213GJ-5BJ	IE-78210-R	EP-78210GJ (Note 3)	–	–	RA78K2	ST78K2	CC782XX
μPD78213GQ-36	IE-78210-R	EP-78210GQ	–	–	RA78K2	ST78K2	CC782XX
μPD78213L	IE-78210-R	EP-78210L	–	–	RA78K2	ST78K2	CC782XX
μPD78214CW	IE-78210-R	EP-78210CW	μPD78P214CW/DW	PA-78P214CW	RA78K2	ST78K2	CC782XX
μPD78214GC-3B8	IE-78210-R	EP-78210GC	μPD78P214GC	PA-78P214GC	RA78K2	ST78K2	CC782XX
μPD78214GJ-5BJ	IE-78210-R	EP-78210GJ (Note 3)	μPD78P214GJ	PA-78P214GJ	RA78K2	ST78K2	CC782XX
μPD78214GQ-36	IE-78210-R	EP-78210GQ	μPD78P214GQ	PA-78P214GQ	RA78K2	ST78K2	CC782XX
μPD78214L	IE-78210-R	EP-78210L	μPD78P214L	PA-78P214L	RA78K2	ST78K2	CC782XX
μPD78P214CW	IE-78210-R	EP-78210CW	–	PA-78P214CW	RA78K2	ST78K2	CC782XX
μPD78P214DW	IE-78210-R	EP-78210CW	–	PA-78P214CW	RA78K2	ST78K2	CC782XX
μPD78P214GC-3B8	IE-78210-R	EP-78210GC	–	PA-78P214GC	RA78K2	ST78K2	CC782XX
μPD78P214GJ-5BJ	IE-78210-R	EP-78210GJ (Note 3)	–	PA-78P214GJ	RA78K2	ST78K2	CC782XX
μPD78P214GQ-36	IE-78210-R	EP-78210GQ	–	PA-78P214GQ	RA78K2	ST78K2	CC782XX
μPD78P214L	IE-78210-R	EP-78210L	–	PA-78P214L	RA78K2	ST78K2	CC782XX
μPD78220GJ-5BG	IE-78220-R	EP-78220GJ (Note 4)	–	–	RA78K2	ST78K2	CC782XX
μPD78220L	IE-78220-R	EP-78220L	–	–	RA78K2	ST78K2	CC782XX
μPD78224GJ-5BG	IE-78220-R	EP-78220GJ (Note 4)	μPD78P224GJ	PA-78P224GJ	RA78K2	ST78K2	CC782XX
μPD78224L	IE-78220-R	EP-78220L	μPD78P224L	PA-78P224L	RA78K2	ST78K2	CC782XX
μPD78P224GJ-5BG	IE-78220-R	EP-78220GJ (Note 4)	–	PA-78P224GJ	RA78K2	ST78K2	CC782XX
μPD78P224L	IE-78220-R	EP-78220L	–	PA-78P224L	RA78K2	ST78K2	CC782XX
μPD78310ACW	IE-78310A-R	(Note 5)	μPD78P312ACW/DW	PA-78P312CW	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78310AGF-3BE	IE-78310A-R	EP-78310GF	μPD78P312AGF-3BE	PA-78P312GF	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78310AGQ	IE-78310A-R	(Note 6)	μPD78P312AGQ/RQ	PA-78P312GQ	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78310AL	IE-78310A-R	EP-78310L	μPD78P312AL	PA-78P312L	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78312ACW	IE-78310A-R	(Note 5)	μPD78P312ACW/DW	PA-78P312CW	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78312AGF-3BE	IE-78310A-R	EP-78310GF	μPD78P312AGF-3BE	PA-78P312GF	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78312AGQ	IE-78310A-R	(Note 6)	μPD78P312AGQ/RQ	PA-78P312GQ	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78312AL	IE-78310A-R	EP-78310L	μPD78P312AL	PA-78P312L	RA78K3	ST78K3	CC78K3 (Note 7)

μPD78XXX Series Development Tools (cont)

Part Number (Note 1)	Emulator*	Emulation Probe*	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Relocatable Assembler (Notes 11)	Structured Assembler (Note 12)	C Compiler (Note 13)
μPD78P312ACW	IE-78310A-R	(Note 5)	–	PA-78P312CW	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78P312ADW	IE-78310A-R	(Note 5)	–	PA-78P312CW	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78P312AGF-3BE	IE-78310A-R	EP-78310GF	–	PA-78P312GF	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78P312AGQ	IE-78310A-R	(Note 6)	–	PA-78P312GQ	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78P312AL	IE-78310A-R	EP-78310L	–	PA-78P312L	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78P312AR	IE-78310A-R	(Note 6)	–	PA-78P312GQ	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78320GJ-5BJ	IE-78320-R	(Note 8)	(Note 8)	(Note 8)	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78320L	IE-78320-R	(Note 8)	(Note 8)	(Note 8)	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78322GJ-5BJ	IE-78320-R	(Note 8)	(Note 8)	(Note 8)	RA78K3	ST78K3	CC78K3 (Note 7)
μPD78322L	IE-78320-R	(Note 8)	(Note 8)	(Note 8)	RA78K3	ST78K3	CC78K3 (Note 7)
μPD71P301GF-3BE	–	–	–	PA-71P301GF	–	–	–
μPD71P301GQ-36	–	–	–	PA-71P301GQ	–	–	–
μPD71P301KA (Note 9)	–	–	–	PA-71P301KA	–	–	–
μPD71P301KB (Note 10)	–	–	–	PA-71P301KB	–	–	–
μPD71P301L	–	–	–	PA-71P301L	–	–	–

* Required Tools

Notes:

(1) Packages:

Package	Description
CW	64-pin plastic shrink DIP
DW	64-pin ceramic shrink DIP with window
GC-3B8	64-pin ceramic plastic miniflat (14mm x 14mm
GF-3BE	64-pin plastic miniflat (Resin Thickness: 2.7mm)
GJ-5BG	94-pin plastic miniflat
GJ-5BJ	74-pin plastic miniflat (20mm x 20mm)
GQ	64-pin plastic QUIP
GQ-36	64-pin plastic QUIP
KA	44-pin ceramic LCC with window
KB	64-pin ceramic LCC with window
L	44-pin PLCC (μPD71P301L) 68-pin PLCC (μPD78213/214/P214L, μPD78320/322L) 84 pin PLCC (μPD78220L, μPD78224L)
RQ	64-pin ceramic QUIP with window

(2) By using the specified adapter, the PG-1500 EPROM programmer can be used to program the EPROM/OTP device.

(3) The EP-78210GJ is a 68-pin PLCC to 74-pin miniflat package adapter for use with the EP-78210L emulation probe.

(4) The EP-78220GJ is a 84-pin PLCC to 94-pin miniflat package adapter for use with the EP-78220L emulation probe.

(5) The emulation probe for the 64-pin shrink DIP package (EP-78310CW) is supplied with the IE.

(6) The emulation probe for the 64-pin QUIP package (EP-78310GQ) is supplied with the IE.

(7) There are two C Compilers for the μPD783XX devices: CC78K3 from NEC Electronics and one from Lattice Corporation. A source code debugger is included with CC78K3 package.

(8) Please contact your NEC Sales Representative for further information.

(9) Sockets for the μPD71P301KA (44-pin LCC package) are available from Yamaichi (IC61-0444-030).

(10) Sockets for the μPD71P301KB (64-pin LCC package) are available from NEC Electronics (EV-9200G-64) in sets of five.

μPD78XXX Series Evaluation Boards Selection Guide

Part Number	Design/Development Boards	Evaluation Boards
μPD7821X	EB-78210-PC	DDK-78K2
μPD7822X	EB-78220-PC	DDK-78K2
μPD7831X	—	DDK-78310A
μPD7832X	EB-78320-PC	—

Notes:

(1) The following relocatable packages are available:

RA78K2-D52 RA78K2-VVT1	(MS-DOS®) (VAX/VMS™)	Relocatable assembler for 78XX series
RA78K3-D52 RA78K3-VVT1	(MS-DOS) (VAX/VMS)	Relocatable assembler for 78XX series

(2) The ST78K2 structured assembler processor is provided with RA78K2. The ST78K3 structured assembler preprocessor is provided with RA78K3 and CC78K3.

(3) The following C Compiler packages are available:

CCMSD-I5DD-782XX CC78K3-D52 CC78K3-VVT1	(MS-DOS) (MS-DOS) (VAX/VMS)	For μPD783XX series

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DSP and Speech Development Tools

Part Number (Note 7)	Emulator	Evaluation Board	Assembler (Note 1)	Simulator (Note 2)	EPROM/OTP Device	PG-1500 Adapter (Note 3)
μPD7720AC	EVAKIT-7720B	—	ASM77	SIM77	μPD77P20D	(Note 5)
μPD7720AL	EVAKIT-7720B (Note 4)	—	ASM77	SIM77	—	—
μPD77P20D	EVAKIT-7720B	—	ASM77	SIM77	—	—
μPD77C20AC	EVAKIT-7720B	—	ASM77	SIM77	μPD77P20D	(Note 5)
μPD77C20AL	EVAKIT-7720B (Note 4)	—	ASM77	SIM77	—	—
μPD77C20ALK	EVAKIT-7720B (Note 4)	—	ASM77	SIM77	—	—
μPD77220L	EVAKIT-77220	—	RA77230	SM77230	—	—
μPD77220R	EVAKIT-77220	—	RA77230	SM772230	μPD77P220R	PA-77P230R
μPD77P220R	EVAKIT-77220	—	RA77230	SM77230	—	PA-77P230R
μPD77230AR	EVAKIT-77230	DDK-77230	RA77230	SM77230	μPD77P230R	PA-77P230R
μPD77P230R	EVAKIT-77230	DDK-77230	RA77230	SM77230	—	PA-77P230R
μPD77C25C	EVAKIT-77C25	—	RA77C25	—	μPD77P25C/D	PA-77P25C
μPD77C25L	EVAKIT-77C25 (Note 4)	—	RA77C25	—	μPD77P25L	—
μPD77P25C	EVAKIT-77C25	—	RA77C25	—	—	PA-77P25C
μPD77P25D	EVAKIT-77C25	—	RA77C25	—	—	PA-77P25C
μPD77P25L	EVAKIT-77C25 (Note 4)	—	RA77C25	—	—	—
μPD7755C	NV-300 System	EB-7759	—	—	μPD77P56C	PA-77P56C
μPD7755G	NV-300 System	EB-7759 (Note 6)	—	—	μPD77P56G	PA-77P56C
μPD7756C	NV-300 System	EB-7759	—	—	μPD77P56C	PA-77P56C
μPD7756G	NV-300 System	EB-7759 (Note 6)	—	—	μPD77P56G	PA-77P56C
μPD77P56C	NV-300 System	EB-7759	—	—	—	PA-77P56C
μPD77P56G	NV-300 System	EB-7759 (Note 6)	—	—	—	PA-77P56C
μPD7757C	NV-300 System	EB-7759	—	—	—	—
μPD7757G	NV-300 System	EB-7759 (Note 6)	—	—	—	—
μPD7759C	NV-300 System	EB-7759	—	—	—	—

DSP and Speech Development Tools (cont)

Part Number (Note 7)	Emulator	Evaluation Board	Assembler (Note 1)	Simulator (Note 2)	EPROM/OTP Device	PG-1500 Adapter (Note 3)
μPD7759GC	NV-300 System	EB-7759	—	—	—	—
μPD77810L	IE-77810	—	RA77810	—	—	—
μPD77810R	IE-77810	—	RA77810	—	—	—

Notes:

(1) The following assemblers are available:

Part Number	Description
ASM77-D52	Assembler for 7720 (MS-DOS®)
RA77C25-D52	Assembler for 77C25 (MS-DOS)
RA77C25-VVT1	Assembler for 77C25 (VAX/VMS™)
RA77230-D52	Assembler for 77230 (MS-DOS)
RA77230-VVT1	Assembler for 77230 (VAX/VMS)
RA77230-VXT1	Assembler for 77230 (VAX/UNIX ™) 4.2 BSD or Ultrix™)

(2) The following simulators are available:

Part Number	Description
SIM77-D52	Simulator for 7720 (MS-DOS)
SM77230-VVT1	Simulator for 77230 (VAX/UNIX)
SM77230-VXT1	Simulator for 77230 (VAX/UNIX 4.2 BSD or Ultrix)

(3) By using the specified adapter, the NEC PG-1500 EPROM programmer can be used to program the EPROM/OTP device.

(4) Please check with your NEC Sales Representative on the availability of a PLCC emulation probe.

(5) The μPD77P20D can be programmed using the EVAKIT-7720B.

(6) The EB-7759 comes with an emulation probe for only the 18-pin DIP.

(7) Packages:

Package	Description
C	18, 28, or 40-pin plastic DIP
D	28-pin ceramic DIP
G	24-pin plastic SOP
GC	52-pin plastic miniflat
L	44-or 68-pin PLCC
LK	28-pin PLCC
R	68-pin ceramic PGA

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Socket Adapters and Adapter Modules

Target Chip	Socket Adapter (Note 1)	Adapter Module (Note 2)
Standard 27XXX EPROM Devices		
μPD27256 (12.5 V)	–	027A Board
μPD27256 (21 V)	–	027A Board
μPD27C256	–	027A Board
μPD27C256A	–	027A Board
μPD27C512	–	027A Board
μPD27C1000	–	027A Board
μPD27C1001	–	027A Board
μPD27C1024	–	027A Board
μPD75XX Series Devices		
μPD75P54CS	PA-75P54CS	04A Board
μPD75P54G	PA-75P54CS	04A Board
μPD75P56CS	PA-75P56CS	04A Board
μPD75P56G	PA-75P56CS	04A Board
μPD75P64CS	PA-75P54CS	04A Board
μPD75P64G	PA-75P54CS	04A Board
μPD75P66CS	PA-75P56CS	04A Board
μPD75P66G	PA-75P56CS	04A Board

Target Chip	Socket Adapter (Note 1)	Adapter Module (Note 2)
μPD75XXX Series Devices		
μPD75P008CU	PA-75P008CU	04A Board
μPD75P008DU	PA-75P008CU	04A Board
μPD75P008GB	PA-75P008CU	04A Board
μPD75P028CW	PA-75P028CW	04A Board
μPD75P028GC	PA-75P028GC	04A Board
μPD75P108BCW	PA-75P108CW	04A Board
μPD75P108CW	PA-75P108CW	04A Board
μPD75P108DW	PA-75P108CW	04A Board
μPD75P108BGF	PA-75P116GF	04A Board
μPD75P108G	PA-75P116GF	04A Board
μPD75P116CW	PA-75P108CW	04A Board
μPD75P116GF	PA-75P116GF	04A Board
μPD75P216ACW	PA-75P216ACW	04A Board
μPD75P308GF	PA-75P308GF	04A Board
μPD75P308K	PA-75P308K	04A Board
μPD75P316GF	PA-75P308GF	04A Board
μPD75P328GC	PA-75P328GC	04A Board
μPD75P402C	(Note 3)	027A Board

Socket Adapters and Adapter Modules (cont)

Target Chip	Socket Adapter (Note 1)	Adapter Module (Note 2)
μPD75P402CT	PA-75P402CT	027A Board
μPD75P402GB	PA-75P402GB	027A Board
μPD75P516GF	PA-75P516GF	04A Board
μPD75P516K	PA-75P516K	04A Board
μPD78XX Series Devices		
μPD78CP14CW	PA-78CP14CW	027A Board
μPD78CP14DW	PA-78CP14CW	027A Board
μPD78CP14GQ	PA-78CP14GQ	027A Board
μPD78CP14GF	PA-78CP14GF	027A Board
μPD78CP14L	PA-78CP14L	027A Board
μPD78CP14R	PA-78CP14GQ	027A Board
μPD78XXX Series Devices		
μPD71P301GF	PA-71P301GF	027A Board
μPD71P301GQ	PA-71P301GQ	027A Board
μPD71P301KA	PA-71P301KA	027A Board
μPD71P301KB	PA-71P301KB	027A Board
μPD71P301L	PA-71P301L	027A Board
μPD78P214CW	PA-78P214CW	027A Board
μPD78P214GC	PA-78P214GC	027A Board
μPD78P214GJ	PA-78P214GJ	027A Board
μPD78P214GQ	PA-78P214GQ	027A Board
μPD78P214L	PA-78P214L	027A Board
μPD78P224GJ	PA-78P224GJ	027A Board
μPD78P224L	PA-78P224L	027A Board
μPD78P312ACW	PA-78P312CW	027A Board
μPD78P312ADW	PA-78P312CW	027A Board
μPD78P312AGF	PA-78P312GF	027A Board
μPD78P312AGQ	PA-78P312GQ	027A Board
μPD78P312AL	PA-78P312L	027A Board
μPD78P312AR	PA-78P312GQ	027A Board
V-Series Devices		
μPD70P322K	PA-70P322L	027A Board
Digital Signal Processors		
μPD77P56C	PA-77P56C	04A Board
μPD77P56G	PA-77P56C	04A Board
μPD77P25C	PA-77P25C	027A Board
μPD77P25D	PA-77P25C	027A Board
μPD77P230R	PA-77P230R	027A Board

Notes:

(1) All socket adapters must be purchased separately.

(2) The 27A and 04A Adapter Modules are shipped with the PG-1500.

(3) The μPD75P402C does not require a programming socket adapter. It can be plugged directly into the 027A Board.

NEC

TELECOM/ISDN DEVICES

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Section 8 – Telecom/ISDN Devices **Page**

CMOS Combos 8-3
SLICs 8-3
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CMOS Combos

Part No.	Description	Companding Law	Sync/Async Operation	Signaling	Capability	Package
μPD9513AD (Direct replacement for Intel 29C13/2913)	1 master clock; 1.536 or 1.544 or 2.048 MHz	A- or μ-law	Sync only	No	No	20-pin CERDIP
μPD9514AD (Direct replacement for Intel 29C14/2914)	Separate transmit/ receive clock	A- or μ-law	Both	Yes	Yes	24-pin CERDIP
μPD9516AD (Direct replacement for Intel 29C16/2916)	2.048 MHz master clock	μ-law	Sync only	No	No	16-pin CERDIP
μPD9517AD (Direct replacement for Intel 29C17/2917)	2.048 MHz master clock	A-law	Sync only	No	No	16-pin CERDIP
μPD9601AD (Compatible replacement for Hitachi 44233C/44237C)	On-chip PLL	A-law	Both	No	Yes	16-pin CERDIP
μPD9602AD (Compatible replacement for Hitachi 44234C/44238C)	On-chip PLL	μ-law	Both	No	Yes	16-pin CERDIP
μPD9604AD	Digital gain setting (Note 1)	μ-law	Both	No	Yes	16-pin CERDIP
μPD9605AD	Digital gain setting (Note 1)	A-law	Both	No	Yes	16-pin CERDIP
μPD9621L	PLCC version of μPD9601AD	A-law	Both	No	Yes	18-pin PLCC
μPD9622L	PLCC version of μPD9602AD	μ-law	Both	No	Yes	18-pin PLCC
μPD9624L	PLCC version of μPD9604AD	μ-law	Both	No	Yes	18-pin PLCC
μPD9625L	PLCC version of μPD9605AD	A-law	Both	No	Yes	18-pin PLCC

Notes:
(1) From 0 to 15 dB in 0.5 dB steps

SLICs

Part No.	Description	Key Features	Package
μPC7059K	–48 V SLIC; constant resistance feed	Battery feed, supervision, 2-wire to 4-wire conversion	28-pin LCC
μPC7062K	–24 V SLIC for key telephone	Battery feed, supervision, 2-wire to 4-wire conversion	28-pin LCC
μPC7069K	–48 V SLIC; constant current feed	Battery feed, supervision, 2-wire to 4-wire conversion	28-pin LCC
μPC7051L	PLCC version of μPC7059K	Battery feed, supervision, 2-wire to 4-wire conversion	32-pin PLCC
μPC7063L	PLCC version of μPC7062K	Battery feed, supervision, 2-wire to 4-wire conversion	32-pin PLCC
μPC7061L	PLCC version of μPC7069K	Battery feed, supervision, 2-wire to 4-wire conversion	32-pin PLCC

POTS

Part No.	Description	Key Features	Package
μPD9705GU	Repertory tone/pulse dialer	Switchable tone/pulse, one-touch dialing, abbreviated dailing, 32-digit redial, loudspeaker hearing mode function	28-pin miniflat
μPD9705CT	Repertory tone/pulse dialer	Switchable tone/pulse, one-touch dialing, abbreviated dialing, 32-digit redial, loudspeaker hearing mode function	28-pin shrink DIP

Crosspoint Switches

Part No.	Description	Key Features	Package
μP22100C	4 x 4 analog crosspoint switch	16 crosspoint switches with control memory	16-pin DIP
μPD22148CA	4 x 8 analog crosspoint switch	32 crosspoint switches with control memory	24-pin DIP

ISDN Devices

Part No.	Description	Key Features	Package
μPD98001CW/L	Digital line interface controller (DLIC)	2-wire TCM transceiver, AMI-line code, 2.6-km loop length, +5 V single supply voltage	64-pin shrink DIP (CW) or 68-pin PLCC (L)
μPD98201G	S/T interface transceiver	4-wire interface, conforms to CCITT 1.430 recommendations, multiframing capability, collision detection/priority control, loopback test modes, +5 V single supply voltage	64-pin flat
μPD72305CW/L	LAP-D controller	Performs all layer 2 processing, on-chip DMA, supports both basic and primary access rate	64-pin shrink DIP (CW) or 68-pin PLCC (L)
μPD72107CW/L	LAP-B controller	Fully implemented LAP-B protocol, on-chip DMA, NRZ/NRZI coding	
μPD72307CW/L	Signaling system #7 controller	Supports CCITT Q.703 recommendation, on-chip DMA, 4.8-64 kb/s serial baud rate	
μPD98221	Echo canceller	Modified bi-phase line code, 3-km loop length	72-pin PGA
To be announced	'U' interface	2-wire interface, 2B1Q line code, 2B + D plus 16 kb/s = 160 kb/s	To be announced

NEC

ASIC PRODUCTS

9

Section 9 – ASIC Products

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ECL-2, -3, -3A, -3B, -4, -4A

Device	Integration (Gate)	Delay Time: Gate (ns)	Delay Time: Output Buffer (ns)	Delay Time: Input Buffer (ns)	Number of Buffers: Output	Number of Buffers: Input	Power Dissipation
ECL-2 (100K) (Note 1)							
μPD6301 (Note 4)	300	0.5	0.8	0.5	28	56	5.4 mW
μPD6310 (Note 5)	1200	0.7	1	0.6	48	88	1.9 mW
μPD6320 (Note 5)	2000	0.7	1	0.6	48	108	
ECL-3 (10KH) (Note 2)							
μPD6311 (Note 5)	1200	1	1.7	1	48	88	1.1 mW
μPD6321 (Note 5)	2000	1	1.7	1	48	108	
μPD6330 (Note 5)	3000	1	1.7	1	80	180	
ECL-3A (100K, 10KH) (Note 1) (Note 2)							
μPD6340 (Note 6)	4000	0.7	1.6	0.7	72	156	1.9 mW
μPD6350 (Note 6)	5000	0.7	1.6	0.7	80	172	
ECL-3B (100K, 10KH, TTL) (Note 3)							
μPB6323 (Note 6)	2400	0.7	1.6 (ECL) 4.8 (TTL)	0.7 (ECL) 0.9 (TTL)	55	120	1.9 mW
μPB6341 (Note 6)	4000	0.7	1.6 (ECL) 4.8 (TTL)	0.7 (ECL) 0.9 (TTL)	72	156	
μPB6351 (Note 6)	5000	0.7	1.6 (ECL) 4.8 (TTL)	0.7 (ECL) 0.9 (TTL)	80	172	
ECL-4 (100K, 10KH) (Note 1) (Note 2)							
μPB6303 (Note 10)	600	0.22	0.77	0.23	48	88	3.2 mW/gate
μPB6312 (Note 10)	1200	0.22	0.77	0.23	48	108	
ECL-4A (100K, 10KH, TTL) (Note 3)							
μPB63020 (Note 10)	2400	.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	60	102	2.7 mW/gate
μPB63040 (Note 10)	4000	.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	84	140	
μPB63060 (Note 10)	6000	.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	90	174	
μPB63080 (Note 10)	8000	.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	108	200	
μPB63100 (Note 10)	10000	.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	120	236	

Notes:
(1) Power source: −4.5 V ±10% (100K)
(2) Power source: −5.2 V ±10% (10KH)
(3) Power source: −4.5 V ± 0.3 V (100K); −5.2 V ±5% (10KH); +5 V ±5% (TTL)
(4) Number of macros: 55
(5) Number of macros: 70
(6) Number of macros: 72
(7) Ambient temperature: 0 to 70°C
(8) Technology: advanced bipolar process
(9) Gate delay is under the loading of fan-out of 3 and wiring length of 3 mm, except ECL-4A: F/O = 1; L = 0 mm.
(10) Number of macros: 93; 173 (ECL-4A)

CMOS-2,-3

Device	Integration (Gate)	Delay Time: Gate (ns)	Delay Time: Output Buffer (ns)	Delay Time: Input Buffer (ns)	Number of Buffers: Output	Number of Buffers: Input	Power Dissipation
CMOS-2 (3-micron)							
μPD65003	400	3	12	5	36	38	30 μW/MHz/gate
μPD65002	800	3	12	5	48	48	
μPD65010	1300	3	12	5	64	64	
μPD65020	2100	3	12	5	78	78	
CMOS-3 (2-micron)							
μPD65004	888	2	10	3	60	60	20 μW/MHz/gate
μPD65011	1598	2	10	3	69	71	
μPD65021	2160	2	10	3	69	71	
μPD65030	3312	2	10	3	94	111	
μPD65040	4104	2	10	3	116	120	
μPD65060	6528	2	10	3	136	144	
μPD65080	8056	2	10	3	148	160	
μPD65100	11,250	2	10	3	168	188	

Notes: (1) Number of macros: 140
(2) Ambient temperature: -40 to +85 °C
(3) Power source: 5 V ±10% single (5 V ±5% for TTL interface)
(4) Input/output interface: TTL/CMOS compatible
(5) Technology: silicon-gate CMOS, two-layer Al metallization

CMOS-4

Device	Integration (Gate)	Delay Time: Gate (ns)	Delay Time: Output Buffer (ns)	Delay Time: Input Buffer (ns)	Number of Buffers: Output	Number of Buffers: Input	Power Dissipation
CMOS-4 (1.5-micron)							
μPD65022	2128	1.4	4.2	2	84	84	15 μW/MHz/gate
μPD65031	3575	1.4	4.2	2	108	108	
μPD65042	4727	1.4	4.2	2	124	124	
μPD65050	5742	1.4	4.2	2	142	142	
μPD65070	7164	1.4	4.2	2	152	152	
μPD65081	8510	1.4	4.2	2	180	180	
μPD65101	10,496	1.4	4.2	2	198	198	
μPD65150	14,943	1.4	4.2	2	234	234	
μPD65200	19,551	1.4	4.2	2	266	266	

Notes: (1) Number of macros: 180
(2) Ambient temperature: -40 to +85 °C
(3) Power source: 5 V ±10% (5 V ±5% for TTL interface)
(4) Input/output interface: TTL/CMOS compatible
(5) Technology: silicon-gate CMOS, two-layer Al metallization

CMOS-4A, -4L

Device	Integration (Gate)	Delay Time: Gate (ns)	Delay Time: Output Buffer (ns)	Delay Time: Input Buffer (ns)	Number of Buffers: Output	Number of Buffers: Input	Power Dissipation
CMOS-4A (1.5-micron)							
μPD65005	320	1.4	4	2	54	54	15 μW/gate
μPD65006	504	1.4	4	2	62	62	
μPD65012	1088	1.4	4	2	82	82	
μPD65013	1584	1.4	4	2	100	100	
μPD65024	2360	1.4	4	2	108	108	
CMOS-4L (1.5-micron) Low-Voltage Product (V_{DD} = 1.0 to 3.6 V)							
μPD65007	858	10	22	8	62	62	.3 μW/100KHz/gate
μPD65014	1656	10	22	8	82	82	
μPD65026	2457	10	22	8	100	100	
μPD65033	3360	10	22	8	106	106	
μPD65045	4320	10	22	8	120	120	
μPD65052	5632	10	22	8	138	138	

Notes: (1) Number of macros: 160
(2) Ambient temperature: 0 to 70 °C
(3) Power source: V_{DD} = 1.0 to 3.6 V (above ratings at 1.5 V)
(4) Input/output interface: CMOS compatible
(5) Technology: silicon-gate CMOS, two-layer Al metallization

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CMOS-4R

Device	Integration (Gate)	Delay Time: Gate (ns)	Delay Time: Output Buffer (ns)	Delay Time: Input Buffer (ns)	Number of Buffers: Output	Number of Buffers: Input	Power Dissipation	RAM (Bits)
CMOS-4R (1.5-micron)								
μPD65023	2240	1.4	4.2	2	120	120	15 μW/gate	2304
μPD65043	4440	1.4	4.2	2	180	180	15 μW/gate	4608

Notes: (1) Number of macros: 180
(2) Ambient temperature: −40 to +85 °C
(3) Power source: 5 V ±5% (TTL level); 5 V ±10% (CMOS level)
(4) Technology: silicon-gate CMOS, two-layer Al metallization

CMOS-5,-5A,-5V

Device	Integration (Gate)	Delay Time: Gate (ns)	Delay Time: Output Buffer (ns)	Delay Time: Input Buffer (ns)	Number of Buffers: Output	Number of Buffers: Input	Power Dissipation
CMOS-5 (1.2-micron) Two-Layer Metallization							
μPD65025	2016	1.0	2.5	2.0	88	88	12 μW/MHz/cell
μPD65032	3366	1.0	2.5	2.0	106	106	
μPD65044	4440	1.0	2.5	2.0	120	120	
μPD65051	5292	1.0	2.5	2.0	132	132	
μPD65061	6348	1.0	2.5	2.0	144	144	
μPD65071	7500	1.0	2.5	2.0	156	156	
μPD65082	8748	1.0	2.5	2.0	164	164	
μPD65103	10,800	1.0	2.5	2.0	180	180	
μPD65140	14,256	1.0	2.5	2.0	212	212	
μPD65180	18,144	1.0	2.5	2.0	244	244	
μPD65240	24,000	1.0	2.5	2.0	284	284	
CMOS-5A (1.2-micron) Three-Layer Metallization							
μPD65300	30,600	1.0	2.5	2.0	280	280	12 μW/MHz/cell
μPD65450	45,000	1.0	2.5	2.0	334	334	
CMOS-5V (1.2-micron) Two-Layer Metallization; High I/O Count							
μPD65027	2340	1.0	2.5	1.5	116	116	12 μW/MHz/cell
μPD65034	3366	1.0	2.5	1.5	128	128	
μPD65046	4440	1.0	2.5	1.5	142	142	
μPD65053	5292	1.0	2.5	1.5	142	142	
μPD65062	6348	1.0	2.5	1.5	142	142	
μPD65072	7500	1.0	2.5	1.5	142	142	

Notes: (1) Number of macros: 310
(2) Ambient temperature: −40 to +85 °C
(3) Power source: 5 V ±10% (5 V ±5% for TTL)
(4) Input/output interface: TTL/CMOS compatible
(5) Technology: silicon-gate CMOS

BiCMOS-4, -4A, -5

Device	Integration (Gate)	Delay Time: Gate (ns)	Delay Time: Output Buffer (ns)	Delay Time: Input Buffer (ns)	Number of Buffers: Output	Number of Buffers: Input	Power Dissipation
BiCMOS-4 (1.5-micron CMOS and Bipolar with f_T = 4 GHz)							
μPD67001	624	0.8	3	1.2	64	64	18 μW/MHz/cell (F/O = 3, L = 3 mm)
μPD67010	1124	0.8	3	1.2	84	84	
μPD67020	2248	0.8	3	1.2	120	120	
μPD67030	3140	0.8	3	1.2	140	140	
BiCMOS-4A (1.5-micron CMOS and Bipolar with f_T = 4 GHz)							
μPD67060	6372	0.8	3.0	1.2	180	180	18 μW/MHz/gate (F/O = 3, L = 3 mm)
μPD67100	10,348	0.8	3.0	1.2	228	228	
BiCMOS-5 (1.2-micron CMOS and Bipolar with f_T = 8 GHz)							
μPD67021	2208	0.3	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	80	80	48 μW/MHz/gate
μPD67031	3240	0.3	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	96	96	
μPD67050	5320	0.3	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	124	124	
μPD67070	7216	0.3	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	148	148	
μPD67101	10,152	0.3	1.3 (ECL) 1.9(TTL)	1.8 (ECL) 0.9 (TTL)	176	176	
μPD67240	24,528	0.3	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	272	272	

Notes: (1) Number of macros: 146; 180 (BiCMOS-5)
(2) Ambient temperature: 0 to 85°C; 0 to 70°C (BiCMOS-5)
(3) Power source: 5 V ±0.5 V; BiCMOS-5: 5 V ±5% CMOS/TTL; −5.2 V ±5% ECL-10KH; −4.5 V ± 0.3 V ECL-100K
(4) Input/output interface: CMOS, ALS-TTL (input/output) and ECL-10KH, −100K for BiCMOS-5

Standard Cell-4, -5

Device	Integration (Gate)	Delay Time: Gate (ns)	Delay Time: Output Buffer (ns)	Delay Time: Input Buffer (ns)	Number of Buffers Input/Output Total	Power Dissipation	RAM	ROM
SC-4 (1.5-micron CMOS)								
μPD91000	Up to 17,000	1.4	4	2	256	15 μW/gate	1 port: 64 Kb max; 2 port: 16 Kb max	None
μPD92000	Up to 17,000	1.4	4	2	256	15 μW/MHz/gate	1 port: 64 Kb max; 2 port: 16 Kb max	256 Kb max
SC-5 (1.2-micron CMOS)								
μPD93000	Up to 60,000	1.0	2.5	2.0	280	18 μW/MHz/gate	128 Kb max	1 Mb max

Notes: (1) Number of macros: 180
(2) Ambient temperature: −40 to +85°C
(3) Power source: 5 V ±10% for CMOS; 5 V ±5% for TTL
(4) Input/output interface: TTL, CMOS compatible
(5) Technology: silicon-gate CMOS, two-layer Al metallization

TTL-2A, -3

Device	Integration (Gate)	Delay Time			Number of Buffers		Power Dissipation
		Gate (ns)	Output Buffer (ns)	Input Buffer (ns)	Output	Input	
TTL-2A (Note 1)							
μPB6104	250	2.5	7	2.3	32	42	1 mW/gate
μPB6105	550	2.5	7	2.3	52	64	
μPB6106	850	2.5	7	2.3	52	64	
TTL-3 (Note 2)							
μPB6111	1000	2	7	2	48	100	1 mW/gate
μPB6120	2000	2	7	2	60	116	

Notes: (1) Number of macros: 30
(2) Number of macros: 109
(3) Ambient temperature: 0 to 85 °C
(4) Power source: 5 V ±10%
(5) Input/output interface: 74 ALS compatible

CAPACITORS 10

Section 10 – Capacitors

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Capacitors Cross Reference

AVX	NEC
TAP	D-Series (ND)
TAM	P-Series (NP)
TAR/TAJ	R-Series (NE)

Kemet	NEC
T350	D-Series (ND)
T360	D-Series (ND)
T491	R-Series (NR)

Mallory	NEC
TDC	D-Series (ND)
TDL	D-Series (ND)
TDM	Q-Series (NQ)

Matsuo	NEC
22IL	D-Series (ND)
202	D-Series (ND)
267	R-Series (NR)
268	R-Series (NR)

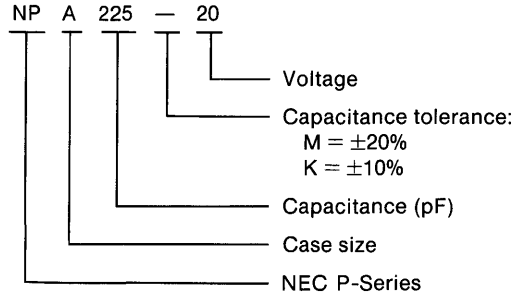
MEPCO	NEC
41DS	D-Series (ND)
41GS	D-Series (ND)
49BC	R-Series (NR)
49MC	R-Series (NR)

Panasonic	NEC
SQ	D-Series (ND)
TE	R-Series (NR)
YE	R-Series (NR)

Sprague	NEC
199D	D-Series (ND)
196D	Q-Series (NQ)
186D	P-Series (NP)
195D	R-Series (NR)
193D	R-Series (NR)
293D	R-Series (NR)

Part Numbering System

P-Series



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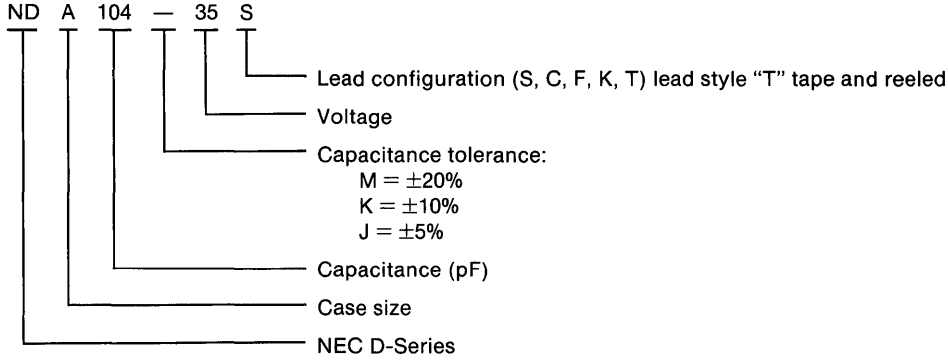
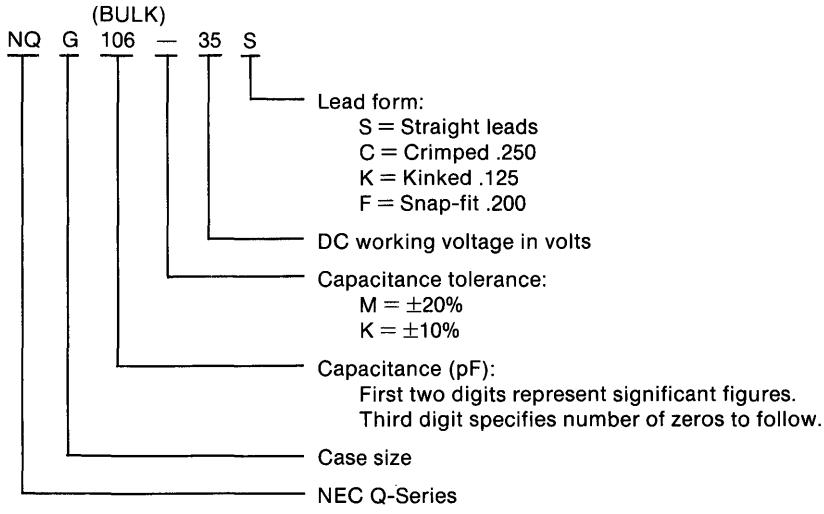
Part Numbering System

D-Series



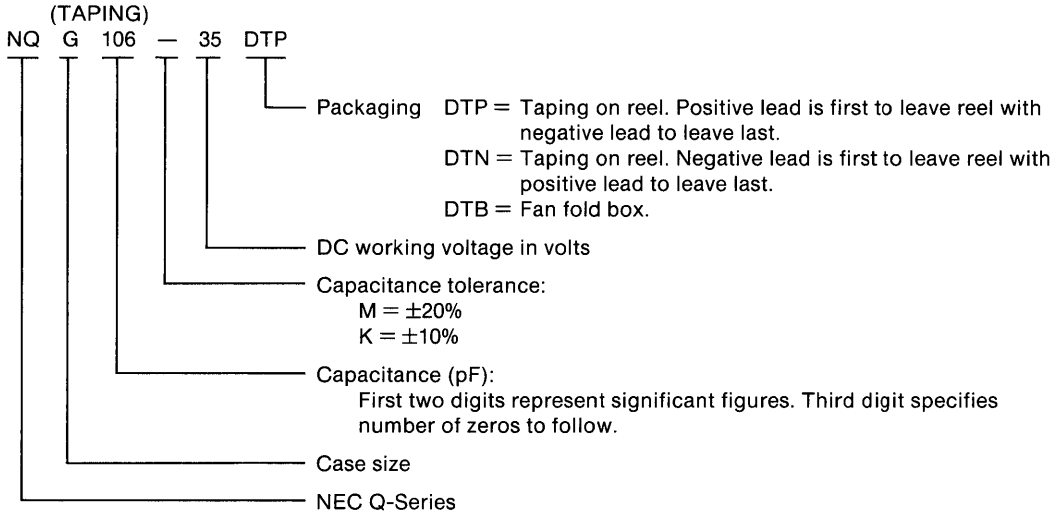
Q-Series



Note: Crimped, kinked, and snap-fit leads are available.

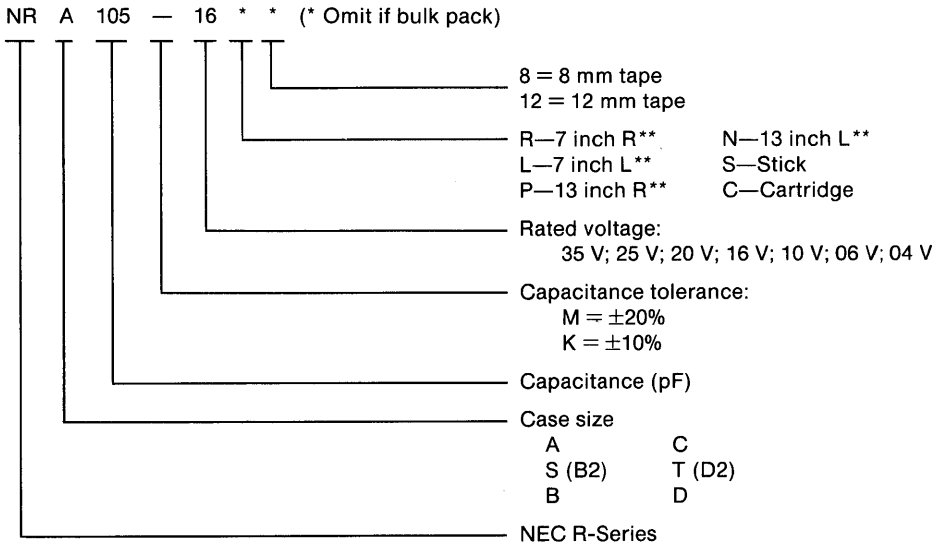
Part Numbering System

Q-Series (cont)



Note: Parts are taped per EIA standard RS-488.

R-Series



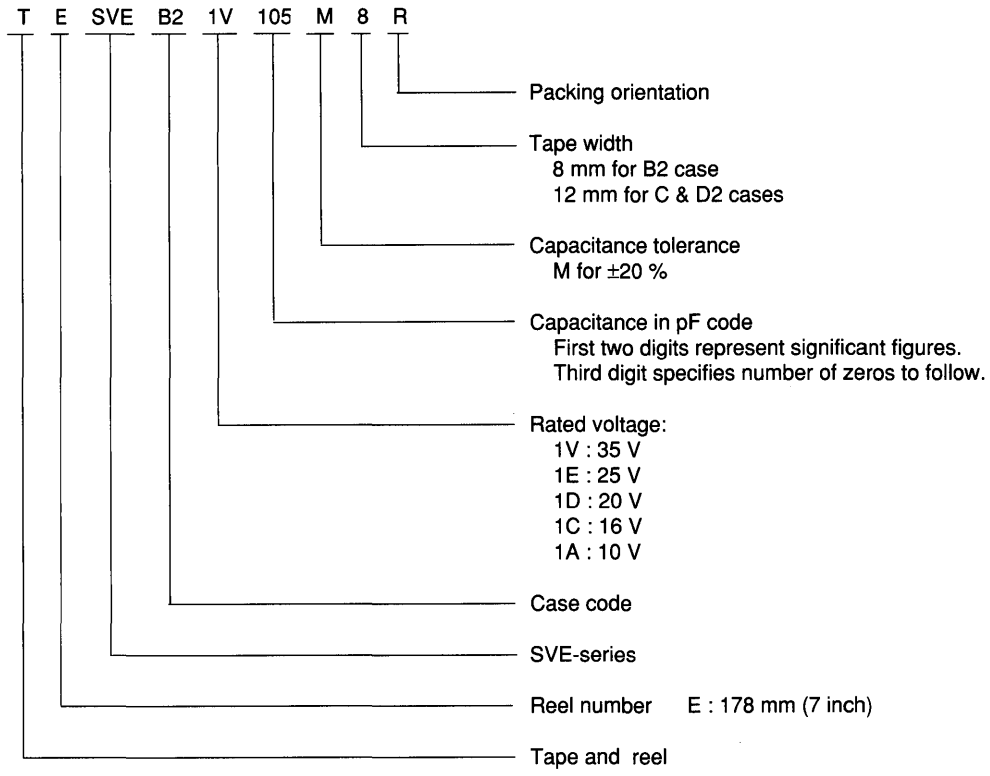
**Polarity direction in taping.

10

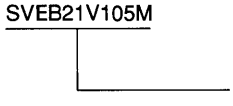
Part Numbering System

SVE-Series

Tape and Reel (Standard)



BULK (Packed in poly bag. Non-standard)



Part Numbering System

FA-Series

FA 0H 105 Z

- Capacitance tolerance:
  Z = +80%,
  −20%
- Capacitance:
  First two digits represent significant figures. Third digit specifies number of zeros to follow Microfarad code.
- Rated voltage:
  0H = 5.5 V DC
  1A = 11 V DC
- Supercap series

FE, FS, FYD, FYH, FR Series

FS 0H 473 Z

- Capacitance tolerance:
  Z = +80%,
  −20%
- Capacitance:
  First two digits represent significant figures. Third digit specifies number of zeros to follow Microfarad code.
- Rated voltage:
  0H = 5.5 V DC
- Supercap series

High-Capacitance, Resin Dipped

DB Y5V 1N 106 Z 1

- New design
- Capacitance tolerance:
  Z = +80%,
  −20%
- Capacitance (pF):
  First two digits represent significant figures. Third digit specifies number of zeros to follow.
- Working voltage:
  1N = 75 V DC
  1H = 50 V DC
  1E = 25 V DC
- Temperature characteristic
- Case size

D-Series Resin Dipped Radial, Solid Tantalum Capacitors

Standard Ratings

Part Number (Note 1, 2)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
50 V Rating				
NDA104 __ 50 __	0.1	A	0.5	4
NDA154 __ 50 __	0.15	A	0.5	4
NDA224 __ 50 __	0.22	A	0.5	4
NDB334 __ 50 __	0.33	B	0.5	4
NDB474 __ 50 __	0.47	B	0.5	4
NDC684 __ 50 __	0.68	C	0.5	4
NDD105 __ 50 __	1.0	D	0.5	4
NDE155 __ 50 __	1.5	E	0.7	6
NDF225 __ 50 __	2.2	F	1.1	6
NDG335 __ 50 __	3.3	G	1.6	6
35 V Rating				
NDA104 __ 35 __	0.1	A	0.5	4
NDA154 __ 35 __	0.15	A	0.5	4
NDA224 __ 35 __	0.22	A	0.5	4
NDA334 __ 35 __	0.33	A	0.5	4
NDA474 __ 35 __	0.47	A	0.5	4
NDA684 __ 35 __	0.68	A	0.5	4
NDA105 __ 35 __	1.0	A	0.5	4
NDB155 __ 35 __	1.5	B	0.5	6
NDC225 __ 35 __	2.2	C	0.7	6
NDD335 __ 35 __	3.3	D	1.1	6
NDE475 __ 35 __	4.7	E	1.6	6
NDF685 __ 35 __	6.8	F	2.3	6
NDG106 __ 35 __	10	G	3.5	8
NDK156 __ 35 __	15	K	5.0	8
NDL226 __ 35 __	22	L	7.0	8
NDN336 __ 35 __	33	N	10.0	8
NDP476 __ 35 __	47	P	10.0	8
25 V Rating				
NDA105 __ 25 __	1.0	A	0.5	4
NDA155 __ 25 __	1.5	A	0.5	6
NDB225 __ 25 __	2.2	B	0.5	6
NDC335 __ 25 __	3.3	C	0.8	6
NDD475 __ 25 __	4.7	D	1.1	6
NDE685 __ 25 __	6.8	E	1.7	6
NDF106 __ 25 __	10	F	2.5	8
NDJ156 __ 25 __	15	J	3.7	8
25 V Rating (cont)				
NDK226 __ 25 __	22	K	5.5	8
NDL336 __ 25 __	33	L	8.2	8
NDN476 __ 25 __	47	N	10.0	8
NDP686 __ 25 __	68	P	10.0	8
20 V Rating				
NDA155 __ 20 __	1.5	A	0.5	6
NDB225 __ 20 __	2.2	B	0.5	6
NDC335 __ 20 __	3.3	C	0.6	6
NDD475 __ 20 __	4.7	D	0.9	6
NDE685 __ 20 __	6.8	E	1.3	6
NDF106 __ 20 __	10	F	2.0	8
NDG156 __ 20 __	15	G	3.0	8
NDH226 __ 20 __	22	H	4.4	8
NDJ336 __ 20 __	33	J	6.6	8
NDK476 __ 20 __	47	K	9.4	8
NDL686 __ 20 __	68	L	10.0	8
NDN107 __ 20 __	100	N	10.0	10
16 V Rating				
NDA225 __ 16 __	2.2	A	0.5	6
NDB335 __ 16 __	3.3	B	0.5	6
NDC475 __ 16 __	4.7	C	0.7	6
NDD685 __ 16 __	6.8	D	1.0	6
NDE106 __ 16 __	10	E	1.6	8
NDF156 __ 16 __	15	F	2.4	8
NDG226 __ 16 __	22	G	3.5	8
NDH336 __ 16 __	33	H	5.0	8
NDJ476 __ 16 __	47	J	7.5	8
NDK686 __ 16 __	68	K	10.0	8
NDL107 __ 16 __	100	L	10.0	10
NDN157 __ 16 __	150	N	10.0	10

Notes:

(1) In the first dash to complete part number, insert capacitance tolerance symbol M = ±20%, K = ±10%, J = ±5%.

(2) In the second dash add lead type S, C, K, F, S/T for tape and reeling with negative lead coming off reel first and STP for positive lead coming off reel first. Use S/P for ammo pack.

D-Series Resin Dipped Radial, Solid Tantalum Capacitors

Standard Ratings [cont]

Part Number (Note 1, 2)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
10 V Rating				
NDA335 __ 10 __	3.3	A	0.5	6
NDB475 __ 10 __	4.7	B	0.5	6
NDC685 __ 10 __	6.8	C	0.6	6
NDD106 __ 10 __	10	D	1.0	8
NDE156 __ 10 __	15	E	1.5	8
NDF226 __ 10 __	22	F	2.2	8
NDG336 __ 10 __	33	G	3.3	8
NDH476 __ 10 __	47	H	4.7	8
NDJ686 __ 10 __	68	J	6.8	8
NDK107 __ 10 __	100	K	10.0	10
NDL157 __ 10 __	150	L	10.0	10
NDM227 __ 10 __	220	M	10.0	10
6.3 V Rating				
NDA475 __ 06 __	4.7	A	0.5	6
NDB685 __ 06 __	6.8	B	0.5	6
NDC106 __ 06 __	10	C	0.6	8
NDD156 __ 06 __	15	D	0.9	8
NDE226 __ 06 __	22	E	1.3	8
NDF336 __ 06 __	33	F	2.0	8
NDG476 __ 06 __	47	G	2.9	8
NDH686 __ 06 __	68	H	4.2	8
NDJ107 __ 06 __	100	J	6.3	10
NDK157 __ 06 __	150	K	9.4	10
NDL227 __ 06 __	220	L	10.0	10
NDM337 __ 06 __	330	M	10.0	10
4 V Rating				
NDA685 __ 04 __	6.8	A	0.5	6
NDA106 __ 04 __	10	A	0.5	8
NDB156 __ 04 __	15	B	0.6	8
NDC226 __ 04 __	22	C	0.8	8
NDD336 __ 04 __	33	D	1.3	8
NDE476 __ 04 __	47	E	1.8	8
NDF686 __ 04 __	68	F	2.7	8
NDG107 __ 04 __	100	G	4.0	10

Notes:

(1) In the first dash (—) to complete part number, insert capacitance tolerance symbol M = ±20%, K = ± 10%, J = ±5%.

(2) In the second dash, add lead type S, C, K, F, S/T for tape and reeling with negative lead coming off reel first and STP for positive lead coming off reel first. Use S/P for ammo pack.

Case Size Dimensions

Case	Diameter Maximum	Height Maximum H_1	H_2	H_3	H_4	Lead Spacing S ±0.020
A	4.5 (0.18)	7.0 (0.28)	10.5 (0.41)	9.0 (0.35)	10.5 (0.41)	2.5 (0.098)
B	5.0 (0.20)	7.5 (0.30)	11.0 (0.43)	9.5 (0.37)	11.0 (0.43)	2.5 (0.098)
C	5.5 (0.22)	8.0 (0.32)	11.5 (0.45)	10.0 (0.39)	11.5 (0.45)	2.5 (0.098)
D	5.5 (0.22)	8.5 (0.34)	12.0 (0.47)	10.5 (0.41)	12.0 (0.47)	2.5 (0.098)
E	5.5 (0.22)	9.0 (0.35)	12.5 (0.49)	11.0 (0.43)	12.5 (0.49)	2.5 (0.098)
F	6.5 (0.26)	9.5 (0.37)	13.0 (0.51)	11.5 (0.45)	13.0 (0.51)	2.5 (0.098)
G	7.0 (0.28)	10.0 (0.39)	13.5 (0.53)	12.0 (0.47)	13.5 (0.53)	2.5 (0.098)
H	7.5 (0.30)	11.0 (0.43)	14.5 (0.57)			2.5 (0.098)
J	7.5 (0.30)	11.0 (0.43)	14.5 (0.57)			2.5 (0.098)
K	9.0 (0.35)	14.5 (0.57)	18.0 (0.71)			5.0 (0.20)
L	10.0 (0.39)	14.5 (0.57)	18.0 (0.71)			5.0 (0.20)
M	11.0 (0.43)	17.0 (0.67)	20.5 (0.81)			5.0 (0.20)
N	11.0 (0.43)	17.0 (0.67)	20.5 (0.81)			5.0 (0.20)
P	11.0 (0.43)	17.0 (0.67)	20.5 (0.81)			5.0 (0.20)

Note

(1) Dimensions: mm (inch)

P-Series Miniature, Epoxy Dipped, Solid Tantalum Capacitors

Standard Ratings

Part Number (Note 1)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
35 V Rating				
NPA103 __ 35	0.01	A	0.5	4
NPA153 __ 35	0.015	A	0.5	4
NPA223 __ 35	0.022	A	0.5	4
NPA333 __ 35	0.033	A	0.5	4
NPA473 __ 35	0.047	A	0.5	4
NPA683 __ 35	0.068	A	0.5	4
NPA104 __ 35	0.10	A	0.5	4
NPB154 __ 35	0.15	B	0.5	4
NPB224 __ 35	0.22	B	0.5	4
NPC334 __ 35	0.33	C	0.5	4
NPD474 __ 35	0.47	D	0.5	4
NPE684 __ 35	0.68	E	0.5	4
NPF105 __ 35	1.0	F	0.5	4
25 V Rating				
NPC334 __ 25	0.33	C	0.5	4
NPC474 __ 25	0.47	C	0.5	4
NPD684 __ 25	0.68	D	0.5	4
NPE105 __ 25	1.0	E	0.5	4
NPF155 __ 25	1.5	F	0.5	6
20 V Rating				
NPC474 __ 20	0.47	C	0.5	4
NPD684 __ 20	0.68	D	0.5	4
NPE105 __ 20	1.0	E	0.5	4
NPF155 __ 20	1.5	F	0.5	6
NPG225 __ 20	2.2	G	0.5	6
16 V Rating				
NPC684 __ 16	0.68	C	0.5	4
NPD105 __ 16	1.0	D	0.5	4
NPE155 __ 16	1.5	E	0.5	6
NPF225 __ 16	2.2	F	0.5	6
NPG335 __ 16	3.3	G	0.5	6
NPH475 __ 16	4.7	H	0.7	6
NPJ685 __ 16	6.8	J	1.0	6
NPK106 __ 16	10	K	1.6	8
NPL156 __ 16	15	L	2.4	8
NPM226 __ 16	22	M	3.5	8

Part Number (Note 1)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
10 V Rating				
NPB105 __ 10	1.0	B	0.5	4
NPC155 __ 10	1.5	C	0.5	6
NPD225 __ 10	2.2	D	0.5	6
NPE335 __ 10	3.3	E	0.5	6
NPF475 __ 10	4.7	F	0.5	6
NPG685 __ 10	6.8	G	0.6	6
NPH106 __ 10	10	H	1.0	8
NPJ156 __ 10	15	J	1.5	8
NPK226 __ 10	22	K	2.2	8
NPL336 __ 10	33	L	3.3	8
NPM476 __ 10	47	M	4.7	8
6.3 V Rating				
NPB155 __ 06	1.5	B	0.5	6
NPC225 __ 06	2.2	C	0.5	6
NPD335 __ 06	3.3	D	0.5	6
NPE475 __ 06	4.7	E	0.5	6
NPF685 __ 06	6.8	F	0.5	6
NPG106 __ 06	10	G	0.6	8
NPH156 __ 06	15	H	0.9	8
NPJ226 __ 06	22	J	1.3	8
NPK336 __ 06	33	K	2.0	8
NPL476 __ 06	47	L	2.9	8
NPM686 __ 06	68	M	4.2	8
4 V Rating				
NPB225 __ 04	2.2	B	0.5	6
NPC335 __ 04	3.3	C	0.5	6
NPD475 __ 04	4.7	D	0.5	6
NPE685 __ 04	6.8	E	0.5	6
NPF106 __ 04	10	F	0.5	8
NPG156 __ 04	15	G	0.6	8
NPH226 __ 04	22	H	0.8	8
NPJ336 __ 04	33	J	1.3	8
NPK476 __ 04	47	K	1.8	8
NPL686 __ 04	68	L	2.7	8
NPM107 __ 04	100	M	4.0	10

Note:

(1) To complete part number, insert capacitance tolerance symbol M = ±20%, K = ±10%.

Case Size Dimensions

Case Code	D_1	D_2	H
A	2.0 (0.079)	3.0 (0.118)	4.3 (0.170)
B	2.3 (0.091)	3.0 (0.118)	4.5 (0.177)
C	2.3 (0.091)	3.2 (0.126)	4.8 (0.189)
D	2.5 (0.098)	3.2 (0.126)	5.0 (0.197)
E	2.6 (0.102)	3.2 (0.126)	5.0 (0.197)
F	2.8 (0.110)	3.2 (0.126)	5.1 (0.201)
G	3.0 (0.118)	3.4 (0.134)	5.2 (0.205)
H	3.4 (0.134)	3.8 (0.150)	5.4 (0.213)
J	3.7 (0.146)	4.1 (0.162)	5.6 (0.220)
K	4.0 (0.157)	4.3 (0.170)	6.2 (0.244)
L	4.5 (0.177)	4.5 0.177)	6.4 (0.252)
M	4.7 (0.185)	4.7 (0.185)	7.0 (0.276)

Note

(1) Dimensions: mm (inch)

Q-Series Resin
Solid Dipped, Tantalum Capacitors

Standard Ratings

Part Number (Note 1, 2)	Capacitance at 25°C, 120 Hz (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
35 V Rating at 85°C, 22 V Rating at 125°C				
NQA104 __ 35 __	0.1	A	0.3	4
NQA154 __ 35 __	0.15	A	0.3	4
NQA224 __ 35 __	0.22	A	0.3	4
NQA334 __ 35 __	0.33	A	0.3	4
NQA474 __ 35 __	0.47	A	0.3	4
NQA684 __ 35 __	0.68	A	0.3	4
NQA105 __ 35 __	1.0	A	0.3	4
NQB155 __ 35 __	1.5	B	0.3	6
NQC225 __ 35 __	2.2	C	0.3	6
NQD335 __ 35 __	3.3	D	0.5	6
NQE475 __ 35 __	4.7	E	0.8	6
NQF685 __ 35 __	6.8	F	1.1	6
NQG106 __ 35 __	10	G	1.7	6
25 V Rating at 85°C, 15 V Rating at 125°C				
NQA105 __ 25 __	1.0	A	0.3	4
NQA155 __ 25 __	1.5	A	0.3	6
NQB225 __ 25 __	2.2	B	0.3	6
NQC335 __ 25 __	3.3	C	0.4	6
NQD475 __ 25 __	4.7	D	0.5	6
NQE685 __ 25 __	6.8	E	0.8	6
NQF106 __ 25 __	10	F	1.2	6
20 V Rating at 85°C, 13 V Rating at 125°C				
NQA155 __ 20 __	1.5	A	0.3	6
NQB225 __ 20 __	2.2	B	0.3	6
NQC335 __ 20 __	3.3	C	0.3	6
NQD475 __ 20 __	4.7	D	0.4	6
NQE685 __ 20 __	6.8	E	0.6	6
NQF106 __ 20 __	10	F	1.0	6
NQG156 __ 20 __	15	G	1.5	6
16 V Rating at 85°C, 10 V Rating at 125°C				
NQA225 __ 16 __	2.2	A	0.3	6
NQB335 __ 16 __	3.3	B	0.3	6
NQC475 __ 16 __	4.7	C	0.3	6
NQD685 __ 16 __	6.8	D	0.5	6
NQE106 __ 16 __	10	E	0.8	6
NQF156 __ 16 __	15	F	1.1	6
NQG226 __ 16 __	22	G	1.7	6
NQH336 __ 16 __	33	H	2.6	6
10 V Rating at 85°C, 6.3 V Rating at 125°C				
NQA335 __ 10 __	3.3	A	0.3	6
NQB475 __ 10 __	4.7	B	0.3	6
NQC685 __ 10 __	6.8	C	0.3	6
NQD106 __ 10 __	10	D	0.5	6
NQE156 __ 10 __	15	E	0.7	6
NQF226 __ 10 __	22	F	1.1	6
NQG336 __ 10 __	33	G	1.6	6
6.3 V Rating at 85°C, 4 V Rating at 125°C				
NQA475 __ 06 __	4.7	A	0.3	6
NQB685 __ 06 __	6.8	B	0.3	6
NQC106 __ 06 __	10	C	0.3	6
NQD156 __ 06 __	15	D	0.4	6
NQE226 __ 06 __	22	E	0.6	6
NQF336 __ 06 __	33	F	1.0	6
NQG476 __ 06 __	47	G	1.4	6

Notes:

(1) In the first dash (—) to complete part number, insert capacitance tolerance symbol M = ±20%, K = ±10%.

(2) In the second dash (—), add lead type C, K, F, DTP, DTN, or DTB.

Case Size Dimensions

Case Code	φD	H
A	4.5 (0.177)	7.0 (0.276)
B	5.0 (0.197)	7.5 (0.295)
C	5.0 (0.197)	8.0 (0.315)
D	5.0 (0.197)	8.5 (0.335)
E	5.5 (0.217)	9.0 (0.354)
F	6.0 (0.236)	9.5 (0.374)
G	6.5 (0.258)	10.5 (0.413)
H	7.5 (0.295)	12.0 (0.472)

Note: Dimensions: mm (inch)

R-Series Miniature Encapsulated Chip, Solid Tantalum Capacitors

Standard Ratings

Part Number (Note 1,2)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @25°C, 120 Hz % Max
35 V Rating at 85°C, 22 V Rating at 125°C				
NRA103__35	0.01	A	0.5	4
NRA153__35	0.015	A	0.5	4
NRA223__35	0.022	A	0.5	4
NRA333__35	0.033	A	0.5	4
NRA473__35	0.047	A	0.5	4
NRA683__35	0.068	A	0.5	4
NRA104__35	0.10	A	0.5	4
NRA154__35	0.15	A	0.5	4
NRA224__35	0.22	A	0.5	4
NRB334__35	0.33	A,B	0.5	4
NRA474__35	0.47	A	0.5	6
NRB474__35	0.47	B	0.5	4
NRS474__35	0.47	B2	0.5	4
NRA684__35	0.68	A	0.5	6
NRB684__35	0.68	B	0.5	4
NRS684__35	0.68	B2	0.5	4
NRB105__35	1.0	B	0.5	4
NRS105__35	1.0	B2	0.5	4
NRB155__35	1.5	B	0.5	6
NRS155__35	1.5	B2(S)	0.5	6
NRC155__35	1.5	C	0.5	4
NRB225__35	2.2	B	0.7	6
NRS225__35	2.2	B2(S)	0.7	6
NRC225__35	2.2	C	0.7	4
NRD335__35	3.3	C,D	1.2	4
NRD475__35	4.7	D	1.6	4
NRT475__35	4.7	D2	1.6	4
NRD685__35	6.8	D	2.3	6
NRT685__35	6.8	D2	2.3	6
25 V Rating at 85°C, 16 V Rating at 125°C				
NRA334__25	0.33	A	0.5	4
NRA474__25	0.47	A	0.5	4
NRA105__25	1.0	A	0.5	6
NRB155__25	1.5	B	0.5	4
NRS155__25	1.5	B2	0.5	4
NRS225__25	2.2	B2(S)	0.5	6
NRB335__25	3.3	B	0.8	6
NRS335__25	3.3	B	0.8	6
NRC335__25	3.3	C	0.8	4
25 V Rating at 85°C, 16 V Rating at 125°C (cont.)				
NRC475__25	4.7	C	1.1	4
NRD685__25	6.8	D	1.7	6
NRT685__25	6.8	D2	1.7	6
NRD106__25	10.0	D	2.5	6
NRT106__25	10.0	D2	2.5	6
20 V Rating at 85°C, 13 V Rating at 125°C				
NRA474__20	0.47	A	0.5	4
NRA684__20	0.68	A	0.5	4
NRA155__20	1.5	A	0.5	6
NRB225__20	2.2	B	0.5	4
NRS225__20	2.2	B2	0.5	4
NRS335__20	3.3	B2(S)	0.6	6
NRB475__20	4.7	B	0.9	6
NRS475__20	4.7	B2(S)	0.9	6
NRC475__20	4.7	C	0.9	4
NRC685__20	6.8	C	1.4	6
NRC106__20	10.0	C	2.0	6
NRT106__20	10.0	D2	2.0	6
NRD156__20	15.0	D	3.0	6
NRT156__20	15.0	D2	3.0	6
NRD226__20	22.0	D	4.4	6
NRT226__20	22.0	D2	4.4	6
16 V Rating at 85°C, 10 V Rating at 125°C				
NRA684__16	0.68	A	0.5	4
NRA105__16	1.0	A	0.5	4
NRA155__16	1.5	A	2.4	4
NRA225__16	2.2	A	0.5	6
NRB225__16	2.2	B	0.5	4
NRB335__16	3.3	B	0.5	4
NRS335__16	3.3	B2	0.5	4
NRS475__16	4.7	B2(S)	0.7	6
NRC475__16	4.7	C	0.7	4
NRB685__16	6.8	B	1.0	6
NRS685__16	6.8	B2(S)	1.0	6
NRC685__16	6.8	C	1.0	6
NRD106__16	10.0	C,D	1.6	6
NRC156__16	15.0	C	2.4	6
NRT156__16	15.0	D2	2.4	6

Note: (1) To complete part number, insert capacitance tolerance symbol M = ±20%, K = ±10%.

R-Series Miniature Encapsulated Chip, Solid Tantalum Capacitors

Standard Ratings (cont.)

Part Number (Note 1,2)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @25°C, 120 Hz % Max
16 V Rating at 85°C, 10 V Rating at 125°C (cont.)				
NRD226__16	22.0	D	3.5	6
NRT226__16	22.0	D2	3.5	6
NRD336__16	33.0	D	5.2	6
NRT336__16	33.0	D2	5.2	6
10 V Rating at 85°C, 6.3 V Rating at 125°C				
NRA105__10	1.0	A	0.5	4
NRA155__10	1.5	A	0.5	4
NRA225__10	2.2	A	2.2	4
NRA335__10	3.3	A	0.5	8
NRB335__10	3.3	B	0.5	4
NRB475__10	4.7	B	0.5	4
NRS475__10	4.7	B2	0.5	4
NRS685__10	6.8	B2(S)	0.6	8
NRC685__10	6.8	C	0.7	6
NRB106__10	10.0	B	1.0	8
NRS106__10	10.0	B2(S)	1.0	8
NRC106__10	10.0	C	1.0	6
NRD156__10	15.0	C,D	1.5	6
NRC226__10	22.0	C	2.2	6
NRD226__10	22.0	D	2.2	6
NRT226__10	22.0	D2	2.2	6
NRD336__10	33.0	D2	3.3	6
NRT336__10	33.0	D2	3.3	6
NRD476__10	47.0	D	4.7	6
NRT476__10	47.0	D2	4.7	6
6.3 V Rating at 85°C, 4 V Rating at 125°C				
NRA155__06	1.5	A	0.5	4
NRA225__06	2.2	A	0.5	4
NRA335__06	3.3	A	2.1	4
NRA475__06	4.7	A	0.5	8
NRB475__06	4.7	B	0.5	4
NRB685__06	6.8	B	0.5	6
NRS685__06	6.8	B2	0.5	6
NRS106__06	10.0	B2(S)	0.6	8
NRC106__06	10.0	C	0.6	6
NRB156__06	15.0	B	0.9	8
NRS156__06	15.0	B2(S)	0.9	8
NRC156__06	15.0	C	0.9	6
NRC226__06	22.0	C	1.4	6
NRC336__06	33.0	C	2.0	8
NRD336__06	33.0	D	2.0	6
NRT336__06	33.0	D2	2.0	6
NRD476__06	47.0	D	3.0	6
NRT476__06	47.0	D2	3.0	6
NRD686__06	68.0	D	4.2	6
NRT686__06	68.0	D2	4.2	6
4 V Rating at 85°C, 2.5 V Rating at 125°C				
NRA225__04	2.2	A	0.5	4
NRA335__04	3.3	A	0.5	4
NRA475__04	4.7	A	1.9	4
NRA685__04	6.8	A	0.5	8
NRB685__04	6.8	B	0.5	6
NRB106__04	10.0	B	0.5	6
NRS106__04	10.0	B2	0.5	6
NRS156__04	15.0	B2(S)	0.6	8
NRC156__04	15.0	C	0.6	6
NRB226__04	22.0	B	0.8	8
NRS226__04	22.0	B2(S)	0.8	8
NRC226__04	22.0	C	0.6	6
NRC336__04	33.0	C	1.3	6
NRC476__04	47.0	C	1.8	8
NRD476__04	47.0	D	1.9	6
NRT476__04	47.0	D2	1.9	6
NRD686__04	68.0	D	2.7	6
NRT686__04	68.0	D2	2.7	6
NRD107__04	100.0	D	4.0	6
NRT107__04	100.0	D	4.0	6

Note: (1) To complete part number, insert capacitance tolerance symbol M = ±20%, K = ±10%.

R-Series Miniature Encapsulated Chip, Solid Tantalum Capacitors

Case Size Dimensions

Case Size	L	W_1	W_2	H	Z	Y	Taping
	3.2 ± 0.2	1.6 ± 0.2	1.2 ± 0.1	1.6 ± 0.2	0.8 ± 0.3	—	W 8mm
A	0.126 ± 0.008	0.063 ± 0.008	0.047 ± 0.004	0.063 ± 0.008	0.031 ± 0.012	—	Q 2000P
	3.5 ± 0.2	2.8 ± 0.2	2.3 ± 0.1	1.9 ± 0.2	0.8 ± 0.3	—	W 8mm
B_2 (S)	0.138 ± 0.008	0.110 ± 0.008	0.091 ± 0.004	0.075 ± 0.008	0.031 ± 0.012	—	Q 2000P
	4.7 ± 0.3	2.6 ± 0.3	1.4 ± 0.1	2.1 ± 0.3	0.8 ± 0.3	0.4C	W 12mm
B	0.185 ± 0.012	0.102 ± 0.012	0.055 ± 0.004	0.083 ± 0.012	0.031 ± 0.012	0.016C	Q 1500P
	6.0 ± 0.3	3.2 ± 0.3	1.8 ± 0.1	2.5 ± 0.3	1.3 ± 0.3	0.4C	W 12mm
C	0.236 ± 0.012	0.126 ± 0.012	0.071 ± 0.004	0.098 ± 0.012	0.051 ± 0.012	0.016C	Q 500P
	5.8 ± 0.3	4.6 ± 0.3	2.4 ± 0.1	3.2 ± 0.3	1.3 ± 0.3	—	W 12mm
D_2 (T)	0.228 ± 0.012	0.181 ± 0.012	0.095 ± 0.004	0.126 ± 0.012	0.051 ± 0.012	—	Q 500P
	7.3 ± 0.3	4.3 ± 0.3	2.4 ± 0.1	2.8 ± 0.3	1.3 ± 0.3	0.5C	W 12mm
D	0.287 ± 0.012	0.169 ± 0.012	0.095 ± 0.004	0.110 ± 0.012	0.051 ± 0.012	0.020C	Q 500P

Note:

(1) Dimensions: mm (inch)

10

SVE-Series Surface Mount Chip Tantalum With Built-In Fuse

Dimensions

(Unit: mm)

Case Code	L	W1	W2	H	Z	Y
B2	3.5 ± 0.2	2.8 ± 0.2	2.3 ± 0.1	1.9 ± 0.2	0.8 ± 0.3	—
C	6.0 ± 0.3	3.2 ± 0.3	1.8 ± 0.1	2.5 ± 0.3	1.3 ± 0.3	0.4C
D2	5.8 ± 0.3	4.6 ± 0.3	2.4 ± 0.1	3.2 ± 0.3	1.3 ± 0.3	—

Specifications

Part Number	Working Voltage (V.DC)	Capacitance (F)	Dissipation Factor	Leakage Current (μA)	Case Code
TESVEB21A475M8R	10	4.7	0.04	0.5	B2
TESVEC1A156M12R	10	15.0	0.06	1.5	C
TESVED21A156M12R	10	15.0	0.06	1.5	D2
TESVED21A336M12R	10	33.0	0.06	3.3	D2
TESVEB21C335M8R	16	3.3	0.04	0.5	B2
TESVEC1C475M12R	16	4.7	0.04	0.7	C
TESVEC1C685M12R	16	6.8	0.06	1.0	C
TESVEC1C106M12R	16	10.0	0.06	1.6	C
TESVED21C156M12R	16	15.0	0.06	2.4	D2
TESVED21C226M12R	16	22.0	0.06	3.5	D2
TESVEB21D225M8R	20	2.2	0.04	0.5	B2
TESVEC1D475M12R	20	4.7	0.04	0.9	C
TESVED21D106M12R	20	10.0	0.06	2.0	D2
TESVEB21E155M8R	25	1.5	0.04	0.5	B2
TESVEC1E335M12R	25	3.3	0.04	0.8	C
TESVED21E685M12R	25	6.8	0.06	1.7	D2
TESVEB21V105M8R	35	1.0	0.04	0.5	B2
TESVEC1V225M12R	35	2.2	0.04	0.7	C
TESVED21V475M12R	35	4.7	0.04	1.6	D2
TESVEC1H105M12R	50	1.0	0.04	0.5	C
TESVED21H335M12R	50	3.3	0.04	1.6	D2

FA-Series Supercap Electric Double Layer Capacitor

Specifications

Catalog	Capacitance	Rated V	Max WV	Max ESR	Dimensions mm (inches)						Weight
NBR	(Farads)	(VDC)	(VDC)	(Ω at 1 kHz)	D	H Max	P	d_1	d_2	l_1	g (oz.)
FA0H473Z	0.047	5	5.5	20	16.0 (0.630)	15.5 (0.610)	5 (0.197)	0.6 (0.024)	1.2 (0.047)	5.0 (0.197)	6.2 (0.219)
FA0H104Z	0.1	5	5.5	8	21.5 (0.846)	15.5 (0.610)	7.5 (0.295)	0.6 (0.024)	1.2 (0.047)	5.5 (0.217)	12 (0.423)
FA0H224Z	0.22	5	5.5	5	28.5 (1.122)	16.5 (0.650)	10 (0.394)	1.0 (0.039)	1.4 (0.055)	9.5 (0.374)	25 (0.882)
FA0H474Z	0.47	5	5.5	3.5	36.5 (1.437)	16.5 (0.650)	15 (0.591)	0.6 (0.024)	1.7 (0.067)	9.5 (0.374)	42 (1.482)
FA0H105Z	1.0	5	5.5	2.5	44.5 (1.752)	18.5 (0.728)	20 (0.787)	1.0 (0.039)	1.4 (0.055)	9.5 (0.374)	65 (2.293)
FA1A223Z	0.022	10	11	20	16.0 (0.630)	25.0 (0.984)	5 (0.197)	0.6 (0.024)	1.2 (0.047)	5.0 (0.197)	7.5 (0.265)
FA1A104Z	0.1	10	11	8	28.5 (1.122)	25.5 (1.004)	10 (0.394)	1.0 (0.039)	1.4 (0.055)	9.5 (0.374)	32 (1.129)
FA1A224Z	0.22	10	11	6	36.5 (1.437)	27.5 (1.083)	15 (0.591)	1.0 (0.039)	1.4 (0.055)	9.5 (0.374)	55 (1.940)
FA1A474Z	0.47	10	11	4	44.5 (1.752)	28.5 (1.122)	20 (0.787)	1.0 (0.039)	1.4 (0.055)	9.5 (0.374)	83 (2.928)

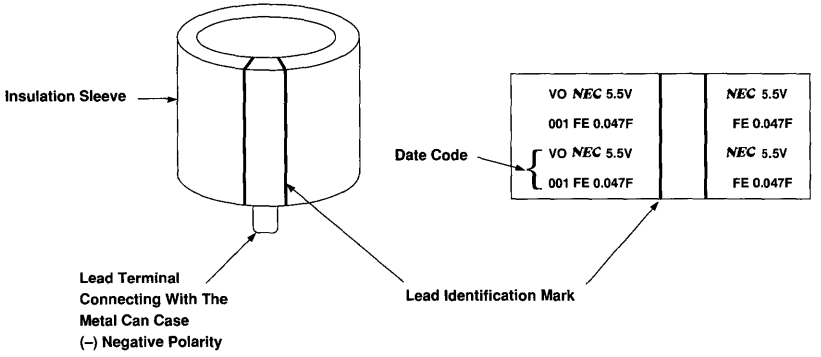
Notes:

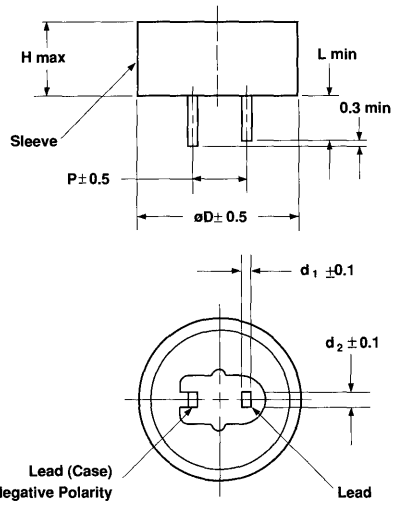
(1) Capacitance tolerance: +80%, −20%

(2) Weight is typical

10

FE-Series Supercap Electric Double Layer Capacitor





Dimensions

(Unit: mm)

Part no.	øD	H	P	L	d_1	d_2
FEOH473Z	14.5	14.0	5.1	2.2	0.4	1.2
FEOH104Z	16.5	14.0	5.1	2.7	0.4	1.2
FEOH224Z	21.5	15.5	7.6	3.0	0.6	1.2
FEOH474Z	28.5	16.5	10.2	6.1	0.6	1.4
FEOH105Z	36.5	18.5	15.0	6.1	0.6	1.7
FEOH155Z	44.5	18.5	20.0	6.1	1.0	1.4

Specifications

Part Number	Maximum Working Voltage (V)	Nominal Capacitance (F)	Max. Current (at 30 Min.) (mA)	Max. Equivalent Series Resistance (Ω)
FEOH473Z	5.5	0.047	0.071	14.0
FEOH104Z	5.5	0.10	0.15	6.5
FEOH224Z	5.5	0.22	0.33	3.5
FEOH474Z	5.5	0.47	0.71	1.8
FEOH105Z	5.5	1.0	1.5	1.0
FEOH155Z	5.5	1.5	2.3	0.6

FS-Series Supercap Electric Double Layer Capacitor

Specifications

Catalog	Capacitance	Rated V	Max WV	Max ESR	Dimensions mm (inches)						Weight
NBR	(Farads)	(VDC)	(VDC)	(Ω at 1 kHz)	D	H Max	P	d_1	d_2	l_1	g (oz.)
FS0H473Z	0.047	5	5.5	40	13.0 (0.512)	8.5 (0.335)	5.08 (0.200)	0.4 (0.016)	1.2 (0.047)	2.2 (0.087)	2.6 (0.092)
FS0H104Z	0.1	5	5.5	25	16.5 (0.650)	8.5 (0.335)	5.08 (0.200)	0.4 (0.016)	1.2 (0.047)	2.7 (0.106)	4.1 (0.145)
FS0H224Z	0.22	5	5.5	25	16.5 (0.650)	13.0 (0.512)	5.08 (0.200)	0.4 (0.016)	1.2 (0.047)	2.7 (0.106)	5.3 (0.187)
FS0H474Z	0.47	5	5.5	13	21.5 (0.846)	13.0 (0.512)	7.62 (0.300)	0.6 (0.024)	1.2 (0.047)	3.0 (0.118)	10 (0.353)
FS0H105Z	1	5	5.5	7	28.5 (1.122)	14.0 (0.551)	10.16 (0.400)	0.6 (0.024)	1.4 (0.055)	6.1 (0.240)	18 (0.635)

Notes:

(1) Capacitance tolerance: +80%, −20%

(2) Weight is typical

FZ-Series Supercap Electric Double Layer Capacitor

Specifications

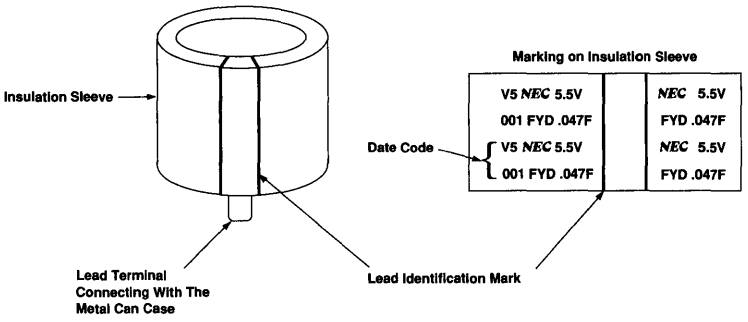
Catalog	Capacitance	Rated V	Max WV	Max ESR	Dimensions mm (inches)						Weight
NBR	(Farads)	(VDC)	(VDC)	(Ω at 1 kHz)	D	H Max	P	d_1	d_2	l_1	g (oz.)
FZ0H223Z	0.022	5	5.5	50	13.0 (0.512)	15 (0.591)	5.1 (0.201)	0.4 (0.016)	1.2 (0.047)	3.9 (0.154)	3.0 (0.106)
FZ0H473Z	0.047	5	5.5	40	14.0 (0.571)	15 (0.591)	5.1 (0.201)	0.4 (0.016)	1.2 (0.047)	4.2 (0.165)	3.5 (0.123)
FZ0H104Z	0.1	5	5.5	45	14.5 (0.571)	24 (0.945)	5.1 (0.201)	0.4 (0.016)	1.2 (0.047)	4.6 (0.181)	7.0 (0.247)
FZ0H224Z	0.22	5	5.5	25	16.5 (0.650)	25 (0.984)	5.1 (0.201)	0.4 (0.016)	1.2 (0.047)	5.2 (0.205)	8.0 (0.282)
FZ0H474Z	0.47	5	5.5	13	21.5 (0.846)	25 (0.984)	7.6 (0.299)	0.6 (0.024)	1.2 (0.047)	5.9 (0.232)	14.0 (0.494)
FZ0H105Z	1.0	5	5.5	7	28.5 (1.122)	25 (0.984)	10.2 (0.402)	0.6 (0.024)	1.4 (0.055)	9.5 (0.374)	24.0 (0.847)

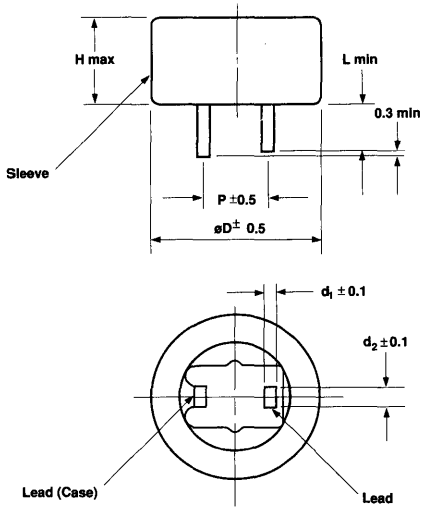
Notes

(1) Capacitance tolerance: +80%, −20%

(2) Weight is typical

FYD-Series Supercap Electric Double Layer Capacitor





Dimensions

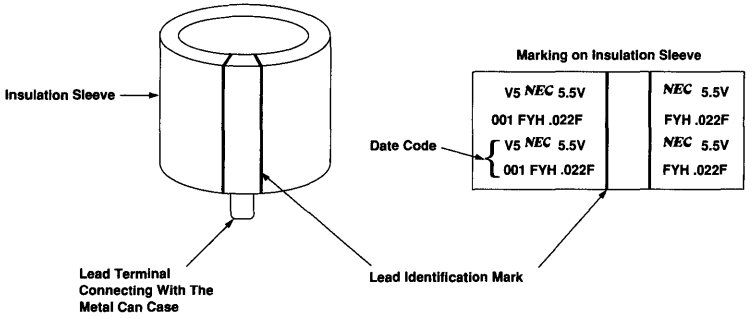
(Unit: mm)

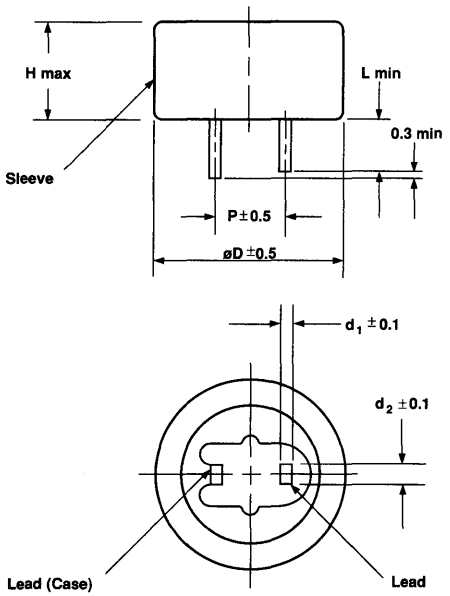
Part no.	øD	H	P	L	d1	d2
FYDOH473Z	11.5	8.5	5.08	2.7	0.4	1.2
FYDOH104Z	13.0	8.5	5.08	2.2	0.4	1.2
FYDOH224Z	14.5	15.0	5.08	2.4	0.4	1.2
FYDOH474Z	16.5	15.0	5.08	2.7	0.4	1.2
FYDOH105Z	21.5	16.0	7.62	3.0	0.6	1.2
FYDOH145Z	21.5	19.0	2.62	3.0	0.6	1.2
FYDOH225Z	28.5	22.0	10.16	3.0	0.6	1.2

Specifications

Part Number	Capacitance (F)	DC Working Voltage (V)	ESR (Ω)	Voltage Holding Characteristic (V)	Current (mA)
FYD0H473Z	0.047	5.5	220	4.2	0.071
FYD0H104Z	0.1	5.5	100	4.2	0.15
FYD0H224Z	0.22	5.5	120	4.2	0.33
FYD0H474Z	0.47	5.5	65	4.2	0.71
FYD0H105Z	1.0	5.5	35	4.2	1.5
FYD0H145Z	1.4	5.5	45	4.2	2.1
FYD0H225Z	2.2	5.5	35	4.2	3.3

FYH-Series Supercap Electric Double Layer Capacitor





Dimensions

(Unit: mm)

Part no.	øD	H	P	L	d1	d2
FYHOH223Z	11.5	7.0	5.08	2.7	0.4	1.2
FYHOH473Z	13.0	7.0	5.08	2.2	0.4	1.2
FYHOH104Z	16.5	7.5	5.08	2.7	0.4	1.2
FYHOH224Z	16.5	9.5	5.08	2.7	0.4	1.2
FYHOH474Z	21.5	10.0	7.62	3.0	0.6	1.2
FYHOH105Z	28.5	11.0	10.16	6.1	0.6	1.4

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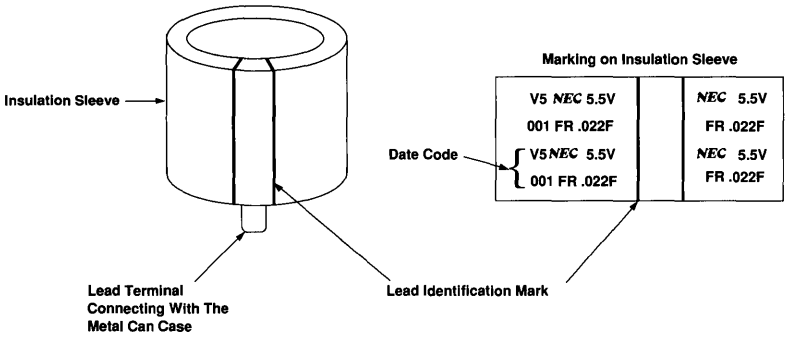
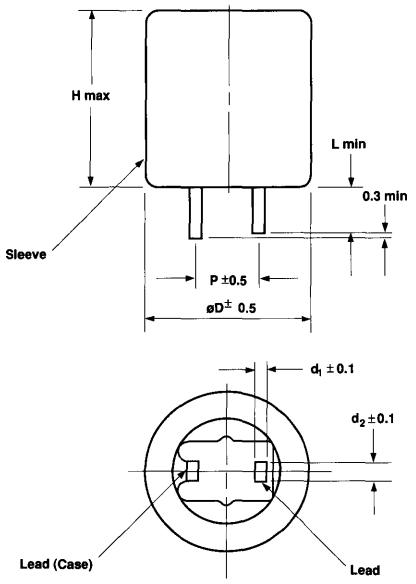
Specifications

Part Number	Maximum Working Voltage (V)	Nominal Capacitance (F)	ESR (Ω)	Current (30 MIN) (mA)	Voltage Holding Characteristic (V)
FYH0H223Z	5.5	0.022	20	0.033	4.2
FYH0H473Z	5.5	0.047	100	0.071	4.2
FYH0H104Z	5.5	0.10	50	0.15	4.2
FYH0H224Z	5.5	0.22	60	0.33	4.2
FYH0H474Z	5.5	0.47	35	0.71	4.2
FYH0H105Z	5.5	1.0	20	1.5	4.2

FR-Series Supercap Electric Double Layer Capacitor





Dimensions

(Unit: mm)

Part no.	øD	H	P	L	d1	d2
FROH223Z	11.5	14.0	5.08	2.7	0.4	1.2
FROH473Z	14.5	14.0	5.08	2.4	0.4	1.2
FROH104Z	14.5	15.5	5.08	2.4	0.4	1.2
FROH224Z	14.5	21.0	5.08	2.4	0.4	1.2
FROH474Z	16.5	21.5	5.08	2.7	0.4	1.2
FROH105Z	21.5	22.0	7.62	3.0	0.6	1.2

Operation Temperature -40°C to +85°C

Specifications

Part Number	Maximum Working Voltage (V)	Nominal Capacitance (F)	ESR (Ω)	Current (30 Min.) (mA)	Voltage Holding Characteristic (V)
FR0H223Z	5.5	0.022	220	0.033	4.2
FR0H473Z	5.5	0.047	110	0.071	4.2
FR0H104Z	5.5	0.10	150	0.15	4.2
FR0H224Z	5.5	0.22	180	0.33	4.2
FR0H474Z	5.5	0.47	100	0.71	4.2
FR0H105Z	5.5	1.0	60	1.5	4.2

High-Capacitance, Resin Dipped Multilayer Ceramic Capacitors

Standard Ratings

Part Number	Capacitance at 25 °C, 1 kHz (μF)	Case	Insulation Resistance (25 °C) MΩ Min	Dissipation Factor (25 °C, 1 kHz) % Max
75 V Rating				
DBY5V1N106Z1	10	DB	50	5
DBY5V1N156Z1	15	DB	33	5
DBY5V1N226Z1	22	DB	22	5
DCY5V1N336Z1	33	DC	15	5
DCY5V1N476Z1	47	DC	10	5
50 V Rating				
DAY5V1H106Z1	10	DA	50	5
DBY5V1H156Z1	15	DB	33	5
DBY5V1H226Z1	22	DB	22	5
DBY5V1H336Z1	33	DB	15	5
DBY5V1H476Z1	47	DB	10	5
DCY5V1H686Z1	68	DC	7	5
DCY5V1H107Z1	100	DC	5	5
25 V Rating				
DAY5V1E106Z1	10	DA	50	5
DAY5V1E156Z1	15	DA	33	5
DBY5V1E226Z1	22	DB	22	5
DBY5V1E336Z1	33	DB	15	5
DBY5V1E476Z1	47	DB	10	5
DBY5V1E686Z1	68	DB	7	5
DCY5V1E107Z1	100	DC	5	5

FLUORESCENT INDICATOR PANEL DISPLAYS (FIPs)

Section 11 – Fluorescent Indicator Panel Displays (FIPs)

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Part Numbering System

FIP 5 A — 15 A S

- S — Special classification: Use following alphabets according to the structure of the FIP
  - R = Alpha-numeric type
  - S = Static driving type
    Multiplex driving type of FIP has no letter
  - T = Graphic type
  - X = Dot-matrix type
  - Y = Bar-graphic type

  } Old numbering system
- A — Serial number of minor change:
  Use in alphabetical order from A to N (The original FIP has no letters.)
- 15 — Character height or pattern height:
  Use Arabic numerals with unit in mm
- — — Special classification:
  Use "M" only for multidisplay type of FIP
  Use "W" only for multidisplay (level meter) type of FIP
- A — Special number of development:
  Use in alphabetical order. (I, M, O, U, V, W and Z are not used.)
- 5 — Number of digits:
  Use Arabic numerals
- FIP — NEC's abbreviation for fluorescent indicator panel

FIP 20 X — 1 A A

- A — Serial number of minor change:
  Use in alphabetical order from B to N (The original FIP has A.)
- A — Special number of development:
  Use in alphabetical order (I, M, O, U, V, W and Z are not used.)
- 1 — Number of line:
  Use arabic numerals. (Use perpendicular dot numbers in case of graphic type.)
- — — Special classification: Use "M" only for multidisplay type of FIP
- X — Classification
  - X = Dot matrix type
  - GX = Graphic type
- 20 — Number of digits/line:
  Use arabic numerals for number of digits per one line.
  (Use horizontal dot numbers in case of graphic type.)
- FIP — NEC's abbreviation for fluorescent indicator panel

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Abbreviations used in these tables

Mode of Fil.	=	Mode of filament (AC or DC)
E_f	=	Filament voltage (AC: unit in V_{rms}, DC: unit in V_{dc})
I_f	=	Filament current (AC: unit in mA_{rms}, DC: unit in mA_{dc})
Mode of Oper.	=	Mode of operation (static driving or multiplex driving)
e_b, e_c	=	Peak anode voltage and peak grid voltage
E_b, E_c	=	DC anode voltage and DC grid voltage
Duty	=	Duty cycle or duty factor
E_k	=	Cathode bias voltage or cut-off bias voltage
i_b/dig.	=	Peak anode current per digit or per bar (in case of multiplex operation mode) DC anode current per digit or per bar (in case of static operation mode)
i_b/1seg	=	Peak anode current per segment (in case of multiplex operation mode) DC anode current per segment (in case of static operation mode)
i_c/dig.	=	Peak grid current per digit (in case of multiplex operation mode) DC grid current per panel (in case of static operation mode)
L	=	Brightness in cd/m^2 (SI unit) Bright value (cd/m^2) shown in the table is the calculated value according to the equation. 1 (ft. L) = 3.43 (cd/m^2)

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Data Terminal and Others (Dot Type and Graphic Type)

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Display Config Drawing (Note 2)	Outline Dimensions (in millimeters)						
				Character		Panel			Lead	
				Height	Width	Height	Length	Thickness	Pitch	Length
FIP16X1EA	16	5x7	A	3.95	2.3	26.0 $^{+0.8}_{-0.3}$	82.0 $^{+0.8}_{-0.3}$	7.4 max	2.54	14.0
FIP16X1CA	16	5x7	A	5.05	3.3	34.0 $^{+0.8}_{-0.3}$	100.0 $^{+0.8}_{-0.3}$	8.5 max	2.54	14.0
FIP16X1BA/FIP16B6X	16	5x7, DP	B	6.0	4.2	34.0 ±1.0	125.0 ±1.0	9.5 max	2.54	14.0
FIP16X1FA	16	5x7	A	9.1	6.28	41.0 $^{+0.8}_{-0.5}$	170.0 ±1.0	8.5 max	2.54	14.0
FIP16X1KA	16	5x7	A	5.0	3.22	19.5 ±0.5	96.7 ±0.5	6.5 ±0.5	2.54	6.2
FIP16XM1BA/FIP16B11X	16	5x7, DP, COMMA	C	11.3	7.25	41.0 $^{+0.8}_{-0.3}$	208.0 $^{+0.8}_{-0.3}$	9.85 max	2.54	14.0
FIP16XM1CA/FIP16C11X	16	5x7, DP, COMMA, CURSOR (▽)	D	11.3	7.25	43.2 max	208.0 $^{+0.8}_{-0.3}$	9.85 max	2.54	14.0
FIP16XM1DA/FIP16D11X	16	5x7, DP, COMMA, CURSOR (▽)	D	11.3	7.25	43.2 max	208.0 $^{+0.8}_{-0.3}$	9.9 max	2.54	14.0
FIP17X1AA	17	5x7	A	6.0	3.8	19.6 ±1.0	118.0 ±1.0	6.5 ±0.7	2.54	9.5
FIP10XM2AA	20	5x7, DP, COMMA, DCT	E	11.3	7.25	70.0 ±1.0	140.0 ±1.0	12.3 ±0.7	2.54	7.4
FIP20X1LB	20	5x7	A	5.0	3.5	20.5 $^{+0.7}_{-0.5}$	115.7 $^{+0.8}_{-0.5}$	6.1 ±0.7	2.54	6.2
FIP20X1AA/FIP20A5X	20	5x7, CURSOR	F	5.05	3.55	34.0 $^{+1.0}_{-0.5}$	138.0 ±0.7	8.5 max	2.54	14.0
FIP20X1EA/FIP20D9X	20	5x12	G	8.75	3.5	33.0 ±1.0	144.0 ±1.0	7.8 $^{+1.5}_{-0.5}$	2.54	5.5
FIP20X1CA/FIP20B9X	20	5x12	G	8.8	3.55	41.0 $^{+0.8}_{-0.3}$	138.0 $^{+0.6}_{-0.3}$	8.3 $^{+1.0}_{-0.8}$	2.54	7.4
FIP20X1DB	20	5x7	A	9.0	6.3	41.0 ±0.5	208.0 $^{+1.0}_{-0.5}$	8.0 ±0.7	2.54	14.0
FIP20X1KA	20	5x12	G	15.85	6.4	42.4 ±1.0	208.0 ±1.0	9.5 ±0.7	2.54	14.0
FIP20X1MA	20	5x7	A	8.99	6.3	41.0 ±0.5	202.5 $^{+0.8}_{-0.3}$	8.0 ±0.7	2.54	14.0
FIP20XM1AA	20	5x7, DP, DCT	H	11.3	7.25	49.0 ±1.0	244.0 ±1.0	11.3 ±0.7	2.54	14.0
FIP20XM1BA	20	5x7, DP, COMMA, DCT	D	11.3	7.25	42.4 ±1.0	244.0 ±1.0	9.2 ±0.7	2.54	14.0
FIP12XM2AA	24	5x7, DP, COMMA, DCT	I	8.15	5.25	58.0 ±1.0	130.0 ±1.0	11.3 ±0.7	2.54	14.0
FIP24X1AA/FIP24A7X	24	5x7	A	6.75	4.75	33.0 ±1.0	185.0 ±1.0	8.5 $^{+1.0}_{-0.7}$	2.54	13.0
FIP26X1AA/FIP26A9X	26	5x12	G	8.75	3.0	43.0 ±0.5	160.5 ±0.5	10.0 max	2.54	14.0
FIP16XM2AA/FIP32A11X	32 16x2 line	5x7, DP, COMMA, 2 line	J	11.3	7.25	60.0 ±1.0	208.0 ±1.0	13.0 max	2.54	14.0
FIP16X2BA	32 16x2 line	5x7	A	5.38	3.03	39.0 $^{+0.7}_{-0.5}$	98.0 $^{+0.8}_{-0.5}$	7.8 $^{+0.7}_{-0.5}$	2.0	10.0
FIP32X1BA/FIP32B5X	32	5x7, CURSOR	F	5.35	3.55	34.0 $^{+1.5}_{-0.5}$	185.0 ±0.5	10.0 max	2.54	14.0
FIP32X1CA/FIP32A9X	32	5x12	G	8.8	3.55	41.0 $^{+0.8}_{-0.3}$	208.0 ±1.0	10.2 max	2.54	14.0
FIP18X2AA	36 18x2 line	5x7, DP, COMMA, 2 line	J	9.1	6.4	60.0 ±1.0	208.0 ±1.0	11.3 ±0.7	2.54	14.0
FIP20X2AA/FIP40C5X	40 20x2 line	5x7, 2 line	A	5.05	3.55	41.0 $^{+0.8}_{-0.3}$	125.0 $^{+0.8}_{-0.3}$	7.8 ±0.7	2.54	14.0
FIP20X2CA	40 20x2 line	5x7, DP, COMMA, 2 line	J	11.3	7.25	60.0 ±1.0	252.0 ±1.0	12.0 max	2.54	16.0

Notes:

(1) These characteristics are given when the panels are turned on at the recommended electrical ratings and in case of AC filament mode when e_b or e_c is also supplied from the center tap of the filament transformer.

(2) See the display configuration drawing table that follows to match the example of the display with the letter codes in the display configuration drawing column.

Recommended Electrical Ratings										
Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper.	$e_b = e_c$ (V_{p-p}) *$E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) *i_b/1 seg	i_c/dig. (mA)	L (cd/m^2)	L (ft.L)
AC	4.2	22	dynamic	22	1/18	4.5	1.6	1.4	690	(200)
AC	5.2	23	dynamic	28	1/20	5	2.5	2.0	690	(200)
AC	4.3	78	dynamic	35	1/20	5	2.3	2.4	690	(200)
AC	4.8	120	dynamic	35	1/20	5.5	10.0	10.0	690	(200)
AC	5.2	34	dynamic	25	1/20	5.0	2.5	2.5	860	(250)
AC	8.3	106	dynamic	35	1/20	7	20.0	12.0	1030	(300)
AC	8.3	133	dynamic	43	1/38	8	28.0	20.0	1720	(500)
AC	8.3	133	dynamic	43	1/38	8	26.0	23.0	1720	(500)
AC	4.4	78	dynamic	50	1/20	7	6.0	7.0	2740	(800)
AC	5.0	260	dynamic	35	1/23	6	10.0	10.0	1200	(350)
AC	5.6	38	dynamic	27	1/25	6	2.7	2.9	690	(200)
AC	5.7	56	dynamic	35	1/24	5.5	3.5	3.5	1030	(300)
AC	5.0	78	dynamic	25	1/25	5.5	4.5	5.5	690	(200)
AC	5.1	78	dynamic	35	1/24	6	10.0	6.0	690	(200)
AC	6.4	120	dynamic	35	1/24	8.5	9.0	9.0	1030	(300)
AC	8.3	130	dynamic	35	1/24	9	16.0	14.0	690	(200)
AC	6.4	120	dynamic	45	1/76.8	10.0	21.0	15.0	860	(250)
AC	9.6	156	dynamic	45	1/25	10.0	20.0	25.0	1710	(500)
AC	9.6	130	dynamic	45	1/25	10.0	20.0	25.0	1710	(500)
AC	4.6	189	dynamic	45	1/26	6	15.0	22.0	1710	(500)
AC	6.5	75	dynamic	40	1/30	13	5.4	6.6	690	(200)
AC	5.7	78	dynamic	40	1/32	7	5.0	3.0	690	(200)
AC	8.3	212	dynamic	35	1/20	10	30.0	25.0	1030	(300)
AC	6.8	78	dynamic	45	1/35	7	3.0	2.4	690	(200)
AC	8.4	78	dynamic	42	1/40	8.5	8.0	7.0	690	(200)
AC	8.0	208	dynamic	45	1/45	9	14.0	15.0	690	(200)
AC	6.0	125	dynamic	50	1/45	5	4.0	4.0	860	(250)
AC	9.5	212	dynamic	35	1/24	10	30.0	25.0	860	(250)
AC	8.0	260	dynamic	45	1/50	9	20.0	18.0	690	(200)

Data Terminal and Others (Dot Type and Graphic Type)

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Display Config Drawing (Note 2)	Outline Dimensions (in millimeters)						
				Character		Panel			Lead	
				Height	Width	Height	Length	Thickness	Pitch	Length
FIP20X2BA	40 20x2 line	5x12, 2 line	G	15.85	6.4	68.0 ±1.0	208.0 ±1.0	12.3 ±0.7	2.54	14.0
FIP20X2EA	40 20x2 line	5x7, CURSOR	F	5.05	3.55	$49.0^{+0.7}_{-0.5}$	$142.0^{+0.8}_{-0.5}$	10.0 ±0.7	2.54	14.0
FIP40X1AA/FIP40A5X	40	5x7, CURSOR	K	5.05	3.55	$34.0^{+1.0}_{-0.5}$	220.0 ±0.7	10.0 max	2.54	7.0
FIP40X1DA/FIP40E5X	40	5x7	A	5.05	3.55	$34.0^{+1.0}_{-0.5}$	220.0 ±0.7	10.0 max	2.54	8.76
FIP40X1HB	40	5x7, CURSOR	F	5.05	3.55	$34.0^{+0.8}_{-0.5}$	220.0 ±0.7	8.0 ±0.7	2.54	14.0
FIP40X1FB/FIP40B9AX	40	5x12	G	8.8	3.55	$41.0^{+0.8}_{-0.3}$	$240.0^{+0.8}_{-0.3}$	$10.0^{+1.0}_{-0.8}$	2.54	14.0
FIP40X1GA/FIP40C9X	40	5x12, CURSOR (▽)	L	8.8	3.55	$41.0^{+0.8}_{-0.3}$	$240.0^{+0.8}_{-0.3}$	11.0 max	2.54	9.5
FIP24X2AA	48 24x2 line	5x7, CURSOR	F	4.51	2.5	$34.0^{+0.7}_{-0.5}$	$124.0^{+0.8}_{-0.5}$	$7.8^{+0.7}_{-0.5}$	2.0	14.0
FIP20X3AA/FIP60A5X	60 20x3 line	5x7, 3 line	A	5.05	3.55	49.0 ±1.0	138.0 ±1.0	11.0 max	2.0	10.2
FIP32X2AA	64 32x2 line	5x7, CURSOR, 2 line	F	5.35	3.55	$50.0^{+0.8}_{-0.3}$	185.0 ±0.7	10.3 ±0.7	2.54	14.0
FIP20X4AA	80 20x4 line	5x7, 4 line	A	11.3	7.25	90.0 ±1.0	240.0 ±1.0	13.3 ±0.7	2.54	10.0
FIP40X2CB	80 40x2 line	5x7, CURSOR, 2 line	F	5.35	3.55	$50.0^{+0.8}_{-0.3}$	220.0 ±0.7	12.2 max	2.54	14.0
FIP40X2CC	80 40x2 line	5x7, CURSOR	F	5.05	3.55	$49.0^{+0.8}_{-0.3}$	220.0 ±0.7	12.2 max	2.54	14.0
FIP40X2BA/FIP80A9X	80 40x2 line	5x12, 2 line	G	9.35	3.55	60.0 ±1.0	238.0 ±1.0	12.0 max	2.54	14.0
FIP42X2AA	80 42x2 line	5x7, CURSOR, 2 line	F	5.35	3.55	67.0 ±1.0	228.75 ±1.0	11.0 ±0.7	2.54	14.0
FIP80A6BX	80	5x12	G	6.29	1.8	$44.0^{+0.8}_{-0.3}$	$300.0^{+0.8}_{-0.3}$	10.0 ±0.5	2.54	5.5
FIP80X2AA/FIP160A4X	160 80x2 line	5x7, CURSOR, 2 line	F	3.55	2.05	$44.0^{+0.8}_{-0.3}$	$298.0^{+0.8}_{-0.3}$	10.0 ±0.7	2.54	7.0
FIP40X6AA	240 40x6 line	5x7, CURSOR, 6 line	A	5.0	3.5	90.0 max	250.0 ±1.0	14.0 max	2.0	20.0
FIP48GX7AA/FIP48A8XT	—	48x7, GRAPHIC	—	7.9	57.1	34.0 ±1.0	93.0 ±1.0	9.5 max	2.54	7.4
FIP72GX7AA	—	72x7, GRAPHIC	—	7.9	85.9	32.7 ±1.0	122.5 ±1.0	9.5 max	2.54	14.0
FIP128GX20AA/ FIP36A10XT	—	128x20, GRAPHIC	—	29.7	191.7	60.0 ±1.0	238.0 ±1.0	13.0 max	2.54	14.0
FIP180GX48BA	—	180x48, GRAPHIC	—	29.54	111.38	60.0 ±1.0	156.0 ±1.0	11.0 max	1.27	20.0
FIP280GX60AA/ FIP240A4XT	—	280x60, GRAPHIC	—	38.75	181.75	70.0 ±1.0	265.0 ±1.0	12.0 max	1.27	20.0

Notes:

(1) These characteristics are given when the panels are turned on at the recommended electrical ratings and in case of AC filament mode when e_b or e_c is also supplied from the center tap of the filament transformer.

(2) See the display configuration drawing table that follows to match the example of the display with the letter codes in the display configuration drawing column.

Recommended Electrical Ratings										
Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper.	$e_b = e_c$ (V_{p-p}) *$E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) *i_b/1 seg	i_c/dig. (mA)	L (cd/m^2)	L (ft.L)
AC	8.9	78	dynamic	45	1/50	8	4.4	3.5	690	(200)
AC	8.9	78	dynamic	45	1/50	10	7.0	6.0	690	(200)
AC	8.9	78	dynamic	45	1/50	8	4.4	3.5	690	(200)
AC	8.9	78	dynamic	45	1/50	10	7.0	6.0	690	(200)
AC	9.0	78	dynamic	45	1/50	7	7.5	7.0	690	(200)
AC	9.7	78	dynamic	45	1/50	9	15.0	10.0	690	(200)
AC	9.7	104	dynamic	43	1/50	9	15.0	12.0	690	(200)
AC	4.6	162	dynamic	36	1/26	5	10.0	7.5	1030	(200)
AC	4.8	156	dynamic	48	1/25	9	5.0	15.0	1270	(400)
AC	6.8	156	dynamic	45	1/40	8	15.0	15.0	860	(250)
AC	9.0	432	dynamic	35	1/24	10	14.0	60.0	600	(175)
AC	9.0	156	dynamic	45	1/50	8	15.0	15.0	860	(250)
AC	9.0	156	dynamic	45	1/45	8	8.0	15.0	690	(200)
AC	9.7	156	dynamic	45	1/50	8	15.0	15.0	860	(250)
AC	9.2	156	dynamic	45	1/50	10	6.0	22.0	690	(200)
AC	9.3	160	dynamic	55	1/113	15	10.0 max	5.0	690	(200)
AC	8.2	200	dynamic	48	1/100	10	7.0 max	11.0 max	510	(150)
AC	8.8	312	dynamic	50	1/50	10	4.5	27.0	690	(200)
AC	3.0	78	dynamic	35	1/18	5	0.2*	4.0	1030	(300)
AC	4.2	78	dynamic	36.2	1/24	6	4.8	4.3	820	(240)
AC	9.2	234	dynamic	60	1/75	12	0.7*	15.0	690	(200)
AC	5.3	312	dynamic	52	1/100	6	4.0	4.0	690	(200)
AC	8.9	450	dynamic	$e_b = 100$ $e_c = 50$	1/175	12	0.1*	6.0	690	(200)

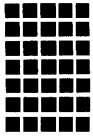
11

Display Configuration Table

A

FIP16X1EA
FIP16X2BA

FIP16X1CA

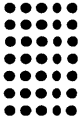


FIP16X1FA

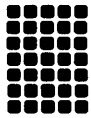
FIP16X1KA

FIP17X1AA

FIP20X1LB



FIP20X1DB



FIP20X1MA

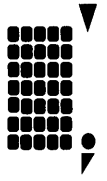
FIP24X1AA/FIP24A7X
FIP20X4AA

FIP20X2AA/FIP40C5X
FIP20X3AA/FIP60A5X
FIP40X1DA/FIP40E5X

B

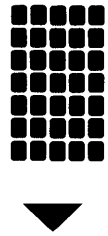
FIP16XM1BA/FIP16B6X

C



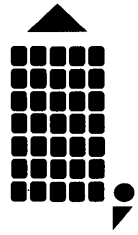
FIP16XM1BA/FIP16B11X

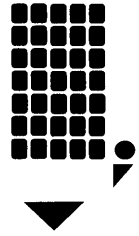
D



FIP16XM1CA/FIP16C11X
FIP16XM1DA/FIP16D11X/
FIP16D11AX
FIP20XM1BA

E





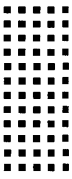
FIP10XM2AA

Display Configuration Table (cont)

F

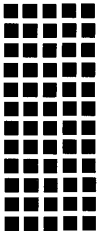
FIP20X1AA/FIP20A5X
FIP32X1BA/FIP32B5X
FIP40X1HB
FIP32X2AA
FIP40X2CB
FIP40X2CC
FIP80X2AA/FIP160A4X
FIP42X2AA
FIP40X6AA
FIP20X2EA
FIP24X2AA

G



FIP20X1EA/FIP20D9X
FIP20X1CA/FIP20B9X
FIP26X1AA
FIP26A9X
FIP32X1CA/FIP32A9X
FIP40X1FB/FIP40B9AX
FIP80A6BX

H



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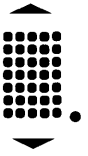
FIP20X2BA
FIP40X2BA/FIP80A9X

I

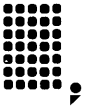
FIP80X1AA/FIP80A6X

J



FIP20XM1AA

K



FIP12XM2AA

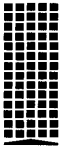
L

FIP16M2AA/FIP32A11X
FIP18X2AA
FIP20X2CA

M

FIP40X1AA/FIP40A5X
FIP40A5AX

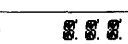
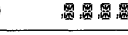
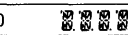
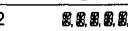
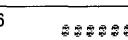
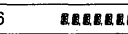
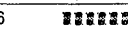
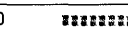
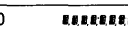
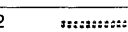
N



FIP40X1GA/FIP40C9X

11

Data Terminal and Others (Alphanumeric Type)

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Outline Dimensions (in millimeters)						
			Character		Panel			Lead	
			Height	Width	Height	Length	Thickness	Pitch	Length
FIP6A8R	6		8.15	4.4	28.0 ±1.0	78.0 ±1.0	7.5 ±0.7	2.54	20.0
FIP8A5R FIP8A5AR	8		5.0	3.0	24.5 $^{+0.5}_{-0.3}$	65.5 max	7.3 max	2.54	14.0 7.0
FIP8A6R	8		5.5	3.0	20.0 ±1.0	70.0. ±1.0	6.5 $^{+0.5}_{-1.0}$	2.54	9.2
FIP9A5AR	9		5.0	3.0	23.0 $^{+0.5}_{-0.3}$	71.5 max	7.5 max	2.54	7.0
FIP10A6R	10		6.0	3.0	22.8 ±1.0	75.2 ±0.7	7.2 max	2.54	24.0
FIP12A11R	12		10.7	6.35	31.0 ±1.0	160.0 ±1.5	10.0 max	2.54	14.0
FIP16A5R FIP16A5CR	16		5.0	3.0	20.0 ±1.0	110.0 ±1.5	8.0 max	2.54	10.0
FIP16A11R	16		10.7	6.35	31.0 ±1.0	200.0 ±1.5	8.0 ±0.7	2.54	7.4
FIP16B13R	16		12.5	7.0	33.0 ±1.0	205.0 ±1.0	10.0 max	5.08	10.0
FIP20B6R	20		6.0	3.0	22.8 ±1.0	134.0 ±1.0	9.2 max	2.54	14.0
FIP20B9AR	20		9.0	5.0	33.0 ±1.0	205.0 ±1.0	9.6 max	2.54	14.0
FIP32A6R	32		6.0	3.0	30.0 ±1.0	202.0 ±1.5	9.2 max	2.54	14.0
FIP32B6R	32		6.0	3.5	41.0 $^{+0.8}_{-0.3}$	208.0 $^{+0.8}_{-0.3}$	10.2 max	2.54	14.0
FIP32D6R	32		6.0	3.2	41.0 $^{+0.8}_{-0.3}$	208.0 $^{+0.8}_{-0.3}$	10.2 max	2.54	14.0
FIP80B5R	80 40x2 line	14 segment, CURSOR, COMMA, 2 line	5.0	3.0	39.0 ±1.0	250.0 ±1.0	9.7 ±0.7	2.54	10.0

Notes:

(1) These characteristics are given when the panels are turned on at the recommended electrical ratings and in case of AC filament mode when e_b or e_c is also supplied from the center tap of the filament transformer.

Recommended Electrical Ratings										
Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper.	$e_b = e_c$ (V_{p-p}) $*E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) $*i_b$/1 seg	I_c/dig. (mA)	L (cd/m^2)	L (ft.L)
AC	2.4	125	dynamic	26	1/20	4.0	4.5	9.8	620	(180)
AC	3.0	22	dynamic	24	1/20	3.0	2.5	2.5	690	(200)
AC	2.3	78	dynamic	30	1/20	3.5	0.3*	6.0	1370	(400)
AC	3.4	22	dynamic	24	1/12	3.5	3.0	3.0	690	(200)
AC	3.9	16.5	dynamic	26	1/16	5.0	2.5	2.5	860	(250)
AC	5.9	104	dynamic	28	1/20	6.0	1.5*	8.5	1200	(350)
AC	5.5 4.8	16.5 40.0	dynamic	24	1/20	6.0	2.5 3.0	3.0	690 1230	200 (360)
AC	8.0	104	dynamic	28	1/20	7.0	1.0*	8.5	1200	(350)
AC	7.2	75	dynamic	47	1/20	15.0	8.0	9.0	1030	(300)
AC	5.8	37	dynamic	32	1/24	7.0	3.5	3.5	1030	(300)
AC	7.2	130	dynamic	35	1/24	8.5	9.0	9.0	690	(200)
AC	7.5	50	dynamic	38	1/40	10.0	5.0	5.0	860	(250)
AC	6.8	80	dynamic	45	1/40	7.0	5.0	5.0	890	(260)
AC	8.4	78	dynamic	45	1/40	8.0	7.0	7.0	890	(260)
AC	9.5	162	dynamic	40	1/48	8.5	5.0	12.0	690	(200)

Automotive and Others

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Outline Dimensions (in millimeters)						
			Character		Panel			Lead	
			Height	Width	Height	Length	Thickness	Pitch	Length
FIP4C5	4	18:8.8	5.0	2.4	14.5 ±1.0	41.0 ±1.0	$6.0^{+0.5}_{-0.7}$	2.0	6.0
FIP4B6S	4	38:8.8	6.0	3.0	18.5 ±1.0	44.0 ±1.0	6.5 max	2.0	8.7
FIP4F6S	4	28:88	6.0	3.0	18.5 ±1.0	44.0 ±1.0	6.5 max	2.0	5.21
LD8164/FIP4A8S	4	88:88	7.6	4.0	24.5 ±1.0	55.4 ±1.0	$6.5^{+0.5}_{-1.0}$	2.54	8.7
FIP4B8	4	88:88	7.6	4.0	24.5 ±1.0	55.4 ±1.0	$6.5^{+0.5}_{-1.0}$	2.54	10.5
FIP4B8AS	4	88:88	7.6	4.3	24.5 ±1.0	55.4 ±1.0	$6.5^{+0.5}_{-1.0}$	2.54	8.7
FIP4E8S	4	18:88	7.6	4.0	20.0 ±1.0	48.0 ±1.0	$6.5^{+0.5}_{-1.0}$	2.54	8.7
FIP4E8BS	4	18:88	7.6	4.0	20.0 ±1.0	48.0 ±1.0	6.1 ±0.5	2.54	8.2
FIP4Y8S	4	18:88	7.6	4.0	20.0 ±1.0	48.0 ±1.0	6.5 ±0.7	2.54	8.7
FIP4S8S	4	H8:88 (Note 2)	7.6	4.0	24.5 ±1.0	55.4 ±1.0	$6.5^{+0.7}_{-1.0}$	2.54	8.2
FIP4Q8S FIP4Q8AS	4	18:88 (Note 2)	8.0	4.4	20.0 ±1.0	48.0 ±1.0	6.5 ±0.7	2.54	8.2 5.0
FIP4E13S	4	88:88	12.6	6.6	29.0 max	79.0 max	7.5 ±1.0	2.0	10.0
FIP5C8S	5	AM PM 88:88.	7.6	3.6	24.5 ±1.0	55.4 ±1.0	$6.5^{+0.5}_{-1.0}$	2.54	8.7
FIP6F6	6	AM FM 18:8.8 ME ST	6.0	2.7	17.0 ±1.0	62.5 ±1.0	6.5 max	2.54	8.0
FIP6F8	6	88:88.8.	7.6	4.0	22.8 ±1.0	75.2 ±1.0	7.7 ±1.0	2.54	10.5
FIP9B8Y	9	C H	7.6	28.2	24.5 ±1.0	55.4 ±1.0	$6.5^{+0.5}_{-1.0}$	2.54	12.5
LD8180/FIP14A8T	11	E F	7.6	28.4	24.5 ±1.0	55.4 ±1.0	$6.5^{+0.5}_{-1.0}$	2.54	12.5

Notes:

(1) These characteristics are given when the panels are turned on at the recommended electrical ratings and in case of AC filament mode when e_b or e_c is also supplied from the center tap of the filament transformer.

(2) White back

Recommended Electrical Ratings

Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper.	$e_b = e_c$ (V_{p-p}) *$E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) *i_b/1 seg	i_c/dig. (mA)	L (cd/m^2)	L (ft.L)
AC	1.2	52	dynamic	22	1/6	2	1.2	1.5	1710	(500)
DC	1.6	57	static	12*	—	—	0.7	4.0	2060	(600)
DC	1.3	90	static	10.5*	—	1	0.9	7.0	2740	(800)
DC	1.7	78	static	12*	—	—	0.8	6.0	1370	(400)
DC	1.7	78	dynamic	24	1/7.5	1	3.2	4.5	1440	(420)
AC	1.7	78	static	18*	—	—	1.5	8.5	2570	(750)
DC	1.4	78	static	12*	—	—	0.8	5.0	1370	(400)
DC	1.4	78	static	12*	—	—	0.8	5.0	2060	(600)
DC	1.5	110	static	12*	—	—	1.4	8.0	2740	(800)
DC	1.7	104	static	12*	—	—	1.4	7.5	2740	(800)
DC	1.5	110	static	12*	—	—	1.9	8.0	2740	(800)
AC	2.3	108	static	12*	—	—	1.0	13.0	1030	(300)
DC	1.7	78	static	12*	—	—	1.1	6.0	1370	(400)
DC	2.3	85	dynamic	21	1/7.5	3	1.6	2.0	1540	(450)
DC	2.3	78	dynamic	24	1/7.5	3	2.6	3.6	1710	(500)
DC	1.7	78	static	12*	—	—	0.26*	6.0	1370	(400)
DC	1.7	78	static	12*	—	—	0.26*	6.0	1370	(400)

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Audio, Analog Instrument, and Others

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Outline Dimensions (in millimeters)						
			Character		Panel			Lead	
			Height	Width	Height	Length	Thickness	Pitch	Length
FIP2A13	2		12.5	6.6	28.0 $^{\pm1.0}_{-0.5}$	50.0 ±1.0	7.5 ±1.0	2.54	10.0
FIP2A15S	2		15.0	8.0	33.0 ±1.0	55.0 ±1.0	8.0 $^{+1.5}_{-0.5}$	2.54	10.0
FIP4H5	4		5.0	2.5	14.5 ±1.0	41.0 ±1.0	6.5 ±0.7	2.54	8.0
FIP6A8B	6		7.62	3.8	22.8 ±1.0	75.2 ±1.0	7.7 ±1.0	2.54	10.0
FIP6A8S	6		8.0	4.8	28.0 ±1.0	78.0 ±1.0	7.5 ±1.0	2.0	7.5
FIP7A8S FIP7A8AS	7		8.0	4.8	28.0 ±1.0	78.0 ±1.0	7.5 ±1.0	2.0	7.5 3.5
FIP7B8S FIP7B8AS	7		8.0	4.8	28.0 ±1.0	78.0 ±1.0	7.5 ±1.0	2.0	7.5 3.5
FIP7D8 FIP7D8A FIP7D8F	7		8.0	4.6	28.0 ±1.0	78.0 ±1.0	7.5 ±1.0	2.54	7.5 2.7 3.2
FIP7E8S	7	 (Note 2)	8.0	4.5	24.5 ±1.0	85.0 ±1.0	7.5 ±0.7	2.0	7.7
FIP7F8S	7	 (Note 2)	8.0	4.5	24.5 ±1.0	85.0 ±1.0	7.5 ±0.7	2.0	7.7
FIP7G8 FIP7G8A FIP7G8D	7		8.0	4.6	28.0 ±1.0	78.0 ±1.0	7.5 ±1.0	2.54	7.5 3.2 3.2
FIP7P8 Series	7		8.0	4.6	24.5 ±1.0	76.0 ±1.0	6.1 ±0.7	2.54	15.0 to 3.2
FIP7Q8 Series	7		8.0	4.6	24.5 ±1.0	76.0 ±1.0	6.1 ±0.7	2.54	15.0 to 3.2
FIP9B6 FIP9B6A	9		5.5	2.65	20.0 ±1.0	70.0 ±1.0	6.5 ±0.5	2.54	3.5 9.0
FIP9LM6	9		5.0	2.5	24.5 ±1.0	76.0 ±1.0	6.1 ±0.7	2.54	7.5
FIP9BM12	9		7.0	3.0	28.0 ±1.0	98.0 ±1.0	7.5 ±0.7	2.54	13.7
FIP9G8	9		8.0	4.0	20.0 ±1.0	86.0 ±1.0	6.5 ±0.7	2.54	15.0
FIP10CW19Y FIP10CW19AY	10		18.5	70.0	33.0 ±1.0	98.0 ±1.0	8.0 ±0.7	2.54	9.5 7.0
FIP12AW7YS	12		7.0	71.05	20.0 ±1.0	98.0 ±1.0	7.5 ±0.7	2.54	7.5
FIP24BW15YS	24		15.0	72.0	28.0 ±1.0	98.0 ±1.0	7.5 ±0.7	2.54	12.2
FIP48AW14YS	48		14.0	71.3	28.0 ±1.0	102.0 ±1.0	8.0 ±0.7	2.54	13.5
FIP60B30T	60		35.0	50.0	55.0 ±1.0	91.0 ±1.0	12.0 max	2.0	4.5
FIP101B8AY	101		7.6	127.5	24.5 ±1.0	158.8 ±1.5	10.0 max	5.08	12.5

Notes:

(1) These characteristics are given when the panels are turned on at the recommended electrical ratings and in case of AC filament mode when e_b or e_c is also supplied from the center tap of the filament transformer.

(2) Green/amber

Recommended Electrical Ratings										
Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper	$e_b = e_c$ (V_{p-p}) *$E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) *i_b/1 seg	i_c/dig. (mA)	L (cd/m^2)	L (ft.L)
AC	1.7	58	dynamic	24	1/4	3	2.0	4.5	860	(250)
AC	1.5	75	static	18*	—	1	1.5	4.0	750	(220)
DC	1.5	40	dynamic	22	1/4	2	0.5	1.0	1030	(300)
AC	2.6	53	dynamic	24	1/7.5	3.3	3.2	4.5	690	(200)
AC	2.3	75	static	15*	—	—	0.4	6.0	860	(250)
AC	2.3	75	static	15*	—	—	0.4	6.0	860	(250)
AC	2.3	75	static	15*	—	—	0.4	6.0	860	(250)
AC	2.3	75	dynamic	26	1/7	4	1.8	3.0	690	(200)
AC	3.0	78	static	15*	—	—	0.7	10.0	2400/120	(700/35)
AC	3.0	78	static	15*	—	—	0.7	10.0	2400/120	(700/35)
AC	2.6	78	dynamic	24	1/9	3.5	1.5	2.5	690	(200)
AC	2.3	106	dynamic	26	1/7	4	2.5	4.5	1370	(400)
AC	2.3	106	dynamic	24	1/9	4	2.5	4.5	890	(260)
AC	4.4	14	dynamic	22	1/12.5	5	1.1	1.8	580	(170)
AC	2.8	106	dynamic	26	1/10	4	1.3	2.5	960	(280)
AC	3.6	135	dynamic	26.5	1/10	5.5	3.0	5.5	690	(200)
AC	3.7	82	dynamic	26.3	1/12.5	5.4	3.0	5.0	1030	(300)
AC	4.1	120	dynamic	28.5	1/11.4	5.8	2.0*	8.0	1030	(300)
AC	3.3	52	static	15*	—	1	0.4*	9.0	1030	(300)
AC	3.6	132	static	13*	—	—	0.28*	17.0	1300	(380)
AC	3.7	136	static	14*	—	—	0.75*	16.0	1370	(400)
AC	2.7	196	dynamic	$e_b = 30$ $e_c = 15$	1/3	3	0.9*	10.0	690	(200)
AC	5.4	78	dynamic	24	1/3	6	0.42*	4.2	1370	(400)

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Digital Clock, Timer, Measuring Meter, and Others

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Outline Dimensions (in millimeters)						
			Character		Panel			Lead	
			Height	Width	Height	Length	Thickness	Pitch	Length
FIP4A6	4		5.5	2.7	20.0 ±1.0	48.0 ±1.0	6.5 ±0.7	2.54	12.5
FIP4B8B	4		7.6	4.0	24.5 ±1.0	55.4 ±1.0	6.5 $^{+0.5}_{-1.0}$	2.54	6.7
FIP4F8S	4		7.6	3.6	24.5 ±1.0	55.4 ±1.0	6.5 $^{+0.5}_{-1.0}$	2.54	8.7
FIP4B9	4		8.5	5.0	28.5 ±1.0	78.2 ±1.0	7.5 ±0.7	2.54	20.0
FIP4C9	4		8.5	5.0	28.0 ±1.0	78.0 ±1.0	7.5 ±0.7	2.54	16.0
FIP4C9B	4		8.5	5.0	28.5 ±1.0	78.2 ±1.0	7.5 ±0.7	2.54	20.0
LD8213/FIP4A13S	4		12.6	6.6	29.0 max	79.0 max	7.5 ±1.0	2.0	10.0
LD8241/FIP4B13	4		12.6	6.6	28.0 ±1.0	78.0 ±1.0	7.5 ±1.0	2.54	10.0
FIP4C13A FIP4C13C	4		12.5	7.0	28.0 ±1.0	78.0 ±1.0	8.5 max	2.54	9.7 20.5
FIP4F13S	4		12.5	6.8	28.0 ±1.0	78.0 ±1.0	7.5 ±0.7	2.0	8.2
FIP4A15A	4		15.0	8.4	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	6.2
FIP4B15S	4		15.0	8.4	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	10.5
FIP4C15	4		15.0	8.4	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	10.5
FIP5A8B	5		7.6	3.6	24.5 ±1.0	55.4 ±1.0	6.5 $^{+0.5}_{-1.0}$	2.54	10.5
FIP5D8S	5		7.6	3.6	24.5 ±1.0	55.4 ±1.0	6.5 $^{+0.5}_{-1.0}$	2.54	8.7
FIP5D8	5		7.6	3.6	24.5 ±1.0	55.4 ±1.0	6.5 $^{+0.5}_{-1.0}$	2.54	10.8
FIP5F8S	5		7.6	3.6	24.5 ±1.0	55.4 ±1.0	6.5 $^{+0.5}_{-1.0}$	2.54	8.7
FIP5B13S	5		12.6	6.0	28.5 ±1.0	78.2 ±1.0	7.5 ±1.0	2.0	10.0
FIP5D13A	5		12.5	6.6	28.0 $^{+1.5}_{-0.8}$	78.0 $^{+1.2}_{-0.8}$	7.5 ±1.0	2.54	9.7
FIP5H13S	5		12.5	6.8	28.0 ±1.0	78.0 ±1.0	7.5 ±0.7	2.0	8.2
FIP5B15	5		15.0	8.0	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	5.2
FIP5D15S	5		15.0	8.4	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	10.5
FIP5D15AS	5		15.0	8.4	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	10.5
FIP5E15S	5		15.0	8.4	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	8.25
FIP5H15	5		15.0	8.0	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	4.0	10.5
FIP5K15S	5		15.0	8.0	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	10.5
FIP6F13	6		12.5	6.8	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	2.54	5.2
FIP6L13	6		12.5	6.8	33.0 ±1.0	98.0 ±1.0	7.8 $^{+1.0}_{-0.8}$	2.54	10.0
FIP6C15 FIP6C15A	6	(Note 2)	15.0	8.0	33.0 ±1.0	110.0 ±1.0	7.8 ±0.7	4.0	10.5
FIP6D15A FIP6D15B	6		15.0	7.5	33.0 ±1.0	98.0 ±1.0	8.3 ±0.7	2.54	15.0 6.5
FIP7B25	7		25.4	12.0	48.0 ±1.0	164.0 ±1.0	10.5 ±1.0	4.0	10.5
FIP9D7	9		6.5	3.4	20.0 ±1.0	86.0 ±1.0	6.1 ±0.7	2.54	6.5

Notes:

(1) These characteristics are given when the panels are turned on at the recommended electrical ratings and in case of AC filament mode when e_b or e_c is also supplied from the center tap of the filament transformer.

(2) Gray back

Recommended Electrical Ratings

Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper.	$e_b = e_c$ (V_{p-p}) *$E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) *i_b/1 seg	i_c/dig. (mA)	L (cd/m^2)	L (ft.L)
DC	1.5	52	dynamic	19	1/4	1	1.0	1.2	1030	(300)
AC	1.7	78	dynamic	24	1/8	5	3.2	4.5	1370	(400)
DC	1.7	78	static	12*	—	—	1.1	6.0	1370	(400)
AC	2.4	75	dynamic	26	1/8	4	2.6	5.0	620	(180)
AC	2.3	75	dynamic	24	1/6	4	3.0	4.5	620	(180)
AC	2.4	75	dynamic	24	1/8	3.5	2.6	4.9	620	(180)
AC	2.3	75	static	15*	—	—	1.0	7.0	690	(200)
AC	2.3	75	dynamic	30	1/5	6	4.5	6.6	860	(250)
AC	2.34 2.4	100	dynamic	26	1/6	5	3.0	4.5	690	(200)
AC	2.4	75	static	15*	—	2	1.3	10.0	690	(200)
AC	3.0	75	dynamic	30	1/5	4	4.0	7.0	690	(200)
AC	3.0	75	static	18*	—	1.5	1.5	10.0	750	(220)
AC	3.0	75	dynamic	25	1/7	4	5.7	7.0	620	(180)
DC	1.7	78	dynamic	24	1/5.33	2.5	3.0	4.0	2060	(600)
DC	1.7	78	static	12*	—	—	0.8	6.0	1370	(400)
AC	1.7	78	dynamic	30	1/12	5	3.2	4.0	1370	(400)
DC	1.7	78	static	12*	—	—	1.1	6.0	1370	(400)
AC	3.0	58	static	24*	—	—	1.2	12.0	860	(250)
AC	2.3	75	dynamic	26	1/6	4	3.0	4.0	620	(180)
AC	2.4	75	static	15*	—	2	1.3	10.0	690	(200)
AC	3.3	100	dynamic	43	1/28	4	8.0	15.0	620	(180)
AC	3.0	75	static	18*	—	1.5	1.5	10.0	750	(220)
AC	3.0	75	static	18*	—	1.5	1.5	10.0	750	(220)
AC	3.0	75	static	18*	—	1.5	1.5	15.0	750	(220)
AC	3.2	150	dynamic	30	1/7.5	5	20.0	20.0	2400	(700)
AC	3.0	75	static	18*	—	1.5	1.5	10.0	750	(220)
AC	3.2	100	dynamic	42	1/21	4	9.5	11.0	1230	(360)
AC	3.0	75	dynamic	26	1/7.5	6	3.8	4.2	690	(200)
AC	3.7	150	dynamic	30	1/7.5	5	10.0	13.0	2400	(700)
AC	3.3	100	dynamic	35	1/16	5	9.0	11.0	1030	(300)
AC	5.5	125	dynamic	34.5	1/7.5	8	17.5	14.0	690	(200)
AC	4.4	23	dynamic	22	1/12.5	5	2.9	2.9	580	(170)

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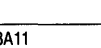
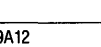
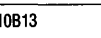
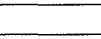
ECR and Others

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Outline Dimensions (in millimeters)						
			Character		Panel			Lead	
			Height	Width	Height	Length	Thickness	Pitch	Length
FIP6C13	6		12.5	6.8	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	4.0	10.5
FIP6A13	6		13.0	6.5	39.0 ±1.0	108.0 $^{+2.0}_{-0.5}$	10.0 max	2.54	10.0
FIP7B13	7		13.0	6.0	33.0 ±1.0	98.0 ±1.0	8.0 ±0.7	2.54	7.4
FIP8B11	8		10.5	5.0	33.0 ±1.0	98.0 ±1.0	7.8 $^{+1.2}_{-0.7}$	2.54	5.2
LD8217/FIP8A11	8		11.0	5.3	31.0 ±1.0	112.0 ±1.5	7.8 ±1.0	5.08	10.0
FIP9J5	9		5.0	2.4	20.0 ±1.0	65.8 ±1.0	6.5 max	2.54	10.0
FIP9K5A	9		5.0	2.4	21.0 max	66.0 max	6.5 max	2.54	14.0
FIP9B8 FIP9B8B	9		7.6	4.0	24.5 ±1.0	100.0 ±1.0	8.5 max	2.54	16.5 12.5
FIP9F8	9		7.6	4.0	26.0 ±1.0	93.0 $^{+1.5}_{-0.5}$	7.8 ±0.7	2.54	35.0
FIP9C10	9		9.5	4.0	38.0 $^{+0.8}_{-0.3}$	100.0 $^{+0.8}_{-0.3}$	7.8 ±0.7	2.54	14.0
FIP9B10	9		10.0	4.8	31.0 ±1.0	112.0 ±1.5	7.8 ±1.0	2.54	11.0
LD8185/FIP9A12 FIP9A12A	9		12.4	5.2	31.0 ±1.0	127.0 ±1.5	7.8 ±1.0	5.08	10.5 3.7
FIP9A13A	9		12.5	6.8	33.0 ±1.0	135.0 ±1.0	7.5 $^{+1.0}_{-0.5}$	4.0	10.0
FIP9C13	9		12.5	6.2	39.0 ±1.0	125.0 ±1.5	9.0 max	2.54	14.0
LD8221/FIP10B13 FIP10B13A	10		13.0	6.5	39.0 ±1.0	160.0 $^{+2.0}_{-0.5}$	10.0 max	5.08	10.0 5.0
FIP10E13	10		13.0	6.5	40.0 ±0.7	160.0 ±0.7	10.0 max	2.54	14.0
FIP10A20	10		20.0	10.0	48.0 ±1.0	196.0 ±1.5	14.0 max	4.0	10.0
FIP11F10	11		9.6	4.2	24.5 ±1.0	113.0 ±1.0	7.5 ±0.7	2.54	16.0
FIP11A13	11		12.5	6.1	33.0 ±1.0	147.0 ±1.0	8.5 max	4.0	10.0
FIP11B13	11		13.0	6.0	36.0 ±1.0	147.0 ±1.0	8.0 ±0.7	2.54	7.4
FIP11A15	11		15.0	8.0	39.0 ±1.0	185.0 ±1.0	10.0 ±1.5	4.0	15.0
FIP12A13	12		13.0	6.0	40.0 $^{+0.8}_{-0.3}$	160.0 $^{+0.8}_{-0.3}$	10.0 max	2.54	14.0
FIP13K10	13		9.5	4.3	39.0 ±1.0	138.0 $^{+2.0}_{-0.5}$	12.5 max	2.54	36.0
FIP13B13	13		13.0	6.5	39.0 ±1.0	166.0 ±1.5	10.0 max	25.4	5.2

Note:

(1) These characteristics are given when the panels are turned on at the recommended electrical ratings and in case of AC filament mode when e_b or e_c is also supplied from the center tap of the filament transformer.

Recommended Electrical Ratings

Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper.	$e_b = e_c$ (V_{p-p}) *$E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) *i_b/1 seg	i_c/dig. (mA)	L (cd/m²)	L (ft.L)
AC	3.0	100	dynamic	26	1/7	4	2.7	4.5	690	(200)
AC	3.2	120	dynamic	35	1/16	7	5.0	8.0	690	(200)
AC	3.3	104	dynamic	35	1/19	4	5.5	6.5	860	(250)
AC	3.0	100	dynamic	45	1/29	8	6.0	8.0	620	(180)
AC	3.5	78	dynamic	42	1/16.5	5	5.0	8.0	550	(160)
AC	2.4	38	dynamic	32	1/24	5	1.6	2.2	1030	(300)
AC	3.0	23	dynamic	24	1/16	3	1.1	2.0	690	(200)
AC	3.2	75	dynamic	25	1/18 1/14	5	2.3	4.0	620 1030	(180) (300)
AC	3.2	75	dynamic	25	1/14	5	3.5	4.5	1030	(300)
AC	3.8	58	dynamic	33	1/30	7	6.0	7.0	750	(220)
AC	3.5	75	dynamic	30	1/16	6	3.2	4.5	580	(170)
AC	4.6	54	dynamic	45	1/8	6	6.0	8.0	550 1230	(160) (360)
AC	4.6	75	dynamic	45	1/12.5	10	3.6	7.0	690	(200)
AC	3.9	140	dynamic	29	1/16	5	7.5	7.5	690	(200)
AC	5.0	120	dynamic	35	1/16	7	5.0	8.0	690	(200)
AC	5.0	120	dynamic	35	1/16	4.5	5.0	8.0	1200	(350)
AC	6.0	180	dynamic	43	1/16	9	12.0	16.0	860	(250)
AC	4.8	78	dynamic	25	1/15	9.5	4.0	4.0	690	(200)
AC	4.8	120	dynamic	35	1/16	7	5.0	7.0	690	(200)
AC	5.5	78	dynamic	35	1/19	7	5.5	6.5	860	(250)
AC	6.3	125	dynamic	45	1/29	8	11.5	15.5	620	(180)
AC	5.9	106	dynamic	28	1/16	6	6.5	8.0	1200	(350)
AC	5.5	55	dynamic	30	1/16	5.5	6.0	6.0	1200	(350)
AC	5.2	120	dynamic	42	1/16	7	6.0	12.0	1200	(350)

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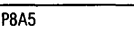
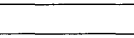
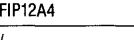
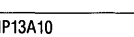
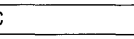
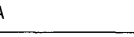
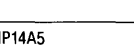
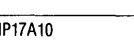
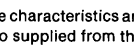
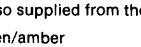
Calculator and Others

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Outline Dimensions (in millimeters)						
			Character		Panel			Lead	
			Height	Width	Height	Length	Thickness	Pitch	Length
LD8225/FIP8A5	8		4.5	2.3	17.0 ±1.0	58.0 ±1.0	6.5 max	2.54	6.2
LD8228/FIP8B5	8		5.0	2.0	19.0 ±1.0	55.3 $^{+0.8}_{-1.0}$	7.2 max	2.54	7.0
FIP9D5	9		4.5	2.3	17.0 ±1.0	62.5 ±1.0	6.5 max	2.54	6.2
LD8191/FIP9A5	9		5.0	2.4	20.0 ±1.0	65.8 ±1.0	6.5 max	2.54	10.0
LD8231/FIP9C5	9		5.0	2.4	21.0 max	66.0 max	6.5 max	2.54	15.0
FIP11A6A	11		5.5	2.45	22.8 ±1.0	75.2 ±0.7	7.2 max	2.54	25.0
FIP11D6A	11		6.01	2.4	20.0 ±1.0	76.0 ±1.0	6.1 ±0.5	2.54	16
FIP11F6	11		6.0	2.4	22.8 ±1.0	75.2 ±1.0	7.5 max	2.54	21.5
FIP11B8A	11		8.0	3.6	25.5 $^{+1.5}_{-1.0}$	93.0 $^{+1.5}_{-0.5}$	9.5 max	2.54	14.0
FIP11C8A/ FIP11C8B	11		8.0	3.6	25.5 $^{+1.5}_{-1.0}$	93.0 $^{+1.5}_{-0.5}$	9.5 max	2.54	14.0 36.0
FIP11B10A	11		9.5	4.0	39.0 ±1.0	138.0 $^{+2.0}_{-0.5}$	12.5 max	2.54	14.0
LD8197A/FIP12A4	12		4.2	2.08	17.0 ±1.0	70.0 ±1.0	6.5 max	2.54	5.8
FIP12A5A/ FIP12A5B	12		5.2	2.4	20.0 ±1.0	81.0 ±1.0	8.0 max	2.54	9.5 11.0
FIP13E5A	13		5.2	2.4	20.0 ±1.0	86.0 ±1.5	7.5 max	2.54	35.0
FIP13F5	13		5.3	2.4	20.0 $^{+1.2}_{-0.5}$	86.0 $^{+1.5}_{-0.5}$	7.5 max	2.54	34.0
FIP13A7B	13		6.5	3.0	24.5 ±1.0	113.0 ±1.5	8.5 max	2.54	24.0
FIP13C7	13		7.0	2.8	25.5 $^{+1.5}_{-1.0}$	93.0 $^{+1.5}_{-0.5}$	9.5 max	2.54	36.0
FIP13F7	13		6.5	2.9	25.0 $^{+0.5}_{-0.3}$	94.5 max	9.5 max	2.54	34.0
FIP13B8	13		8.0	3.3	25.5 $^{+1.5}_{-0.5}$	112.0 $^{+1.5}_{-1.0}$	9.5 max	2.54	34.0
FIP13C8/ FIP13C8A	13		8.0	3.3	25.5 $^{+1.5}_{-1.0}$	112.0 $^{+1.5}_{-1.0}$	7.6 ±1.0	2.54	36.0 14.0
FIP13E8	13		8.0	3.3	25.0 $^{+1.0}_{-0.3}$	112.0 $^{+1.5}_{-0.5}$	9.5 max	2.54	34.0
FIP13H8	13	 (Note 2)	7.6	3.55	24.5 ±1.0	114.4 ±1.0	6.5 ±1.0	2.54	15.5
LD8214/FIP13A10	13		9.5	4.3	31.0 ±1.0	138.0 ±1.0	7.8 ±1.0	2.54	11.0
FIP13C10C	13		9.5	4.2	31.0 ±1.0	138.0 ±1.0	7.8 ±0.7	2.54	24.0
FIP13D10A	13		9.5	4.0	39.0 ±1.0	138.0 $^{+2.0}_{-0.5}$	9.0 ±1.0	2.54	36.0
FIP13D10B	13		9.5	4.0	39.0 ±1.0	138.0 $^{+2.0}_{-0.5}$	9.0 ±1.0	2.54	36.0
FIP13H10	13		9.5	4.2	31.0 ±1.0	138.0 ±1.0	7.8 ±1.0	2.54	24.0
LD8232/FIP14A5	14		5.2	2.4	20.0 ±1.0	90.5 $^{+1.5}_{-1.0}$	7.0 $^{+0.5}_{-0.7}$	2.54	10.0
FIP15B7	15		6.5	2.9	25.0 $^{+1.0}_{-1.0}$	112.0 $^{+1.5}_{-0.5}$	9.5 max	2.54	34.0
FIP17A5	17		4.5	1.9	20.0 ±1.0	92.0 ±1.0	6.5 $^{+0.5}_{-1.0}$	2.54	16.0
LD8230/FIP17A10	17		9.5	4.0	30.0 ±1.0	164.0 ±2.0	11.0 max	2.54	10.0

Notes:

(1) These characteristics are given when the panels are turned on at the recommended electrical ratings and in case of AC filament mode when e_b or e_c is also supplied from the center tap of the filament transformer.

(2) Green/amber

Recommended Electrical Ratings										
Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper.	$e_b = e_c$ (V_{p-p}) *$E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) *i_b/1 seg	i_c/dig. (mA)	L (cd/m^2)	L (ft.L)
AC	2.8	12	dynamic	22	1/12	3	0.6	0.8	580	(170)
AC	3.0	12	dynamic	24	1/12	3	0.7	0.9	690	(200)
AC	3.2	16	dynamic	22	1/12	3	0.6	0.9	620	(180)
AC	3.4	12	dynamic	24	1/12	4	0.8	1.3	580	(170)
AC	3.3	13	dynamic	24	1/12	3	0.8	1.2	580	(170)
AC	3.9	16.5	dynamic	24	1/16	4	1.2	1.4	690	(200)
AC	4.0	18	dynamic	20	1/15	5	1.3	1.8	690	(200)
AC	3.5	22	dynamic	24	1/12	4	1.8	1.8	690	(200)
AC	4.5	22	dynamic	26	1/12	4.5	2.0	2.5	750	(220)
AC	4.5	22	dynamic	26	1/14	4	2.5	2.5	690 860	(200) (250)
AC	5.5	55	dynamic	30	1/16	5.5	2.8	3.6	690	(200)
AC	3.7	16	dynamic	24	1/14	4	0.6	0.9	690	(200)
AC	4.5	16	dynamic	22	1/14	4	0.7	1.5	690	(200)
AC	4.0	23	dynamic	24	1/14	4	1.0	2.0	690	(200)
AC	4.2	22	dynamic	24	1/16	4.5	1.5	2.0	860	(250)
AC	5.4	22	dynamic	26	1/16	6	2.0	3.0	580	(170)
AC	4.5	22	dynamic	26	1/14	4	2.0	2.5	860	(250)
AC	4.2	58	dynamic	18	1/16	3.5	2.1	2.0	860	(250)
AC	4.2	55	dynamic	26	1/16	4	3.0	3.0	690	(200)
AC	4.2	55	dynamic	26	1/16	4	3.0	3.0	690	(200)
AC	4.2	55	dynamic	26	1/16	3	3.0	3.0	690	(200)
AC	6.1	23	dynamic	21.5	1/17.5	6.5	3.5	3.5	580/60	(170/17)
AC	5.5	55	dynamic	30	1/16	5.5	2.8	3.8	580	(170)
AC	5.5	55	dynamic	30	1/16	5.5	3.0	4.0	860	(250)
AC	5.5	55	dynamic	26	1/16	5	4.0	4.0	690	(200)
AC	5.5	55	dynamic	26	1/16	5	4.0	4.0	690	(200)
AC	5.5	55	dynamic	30	1/16	5.5	3.0	4.0	860	(250)
AC	3.8	38	dynamic	24	1/17	4	0.7	1.5	580	(170)
AC	4.7	37	dynamic	26	1/18	5	2.0	2.5	690	(200)
AC	4.5	22.4	dynamic	22	1/20	7	1.3	1.8	690	(200)
AC	6.0	81	dynamic	38	1/23	6	2.8	5.6	580	(170)

Dot Type Fluorescent Indicator Modules

Mechanical Characteristics

Device	No of Character	Character Format	No of Display Dots Row x Column	Character Height x Width (mm)	Character Pitch Row x Column (mm)	Dot Pitch Vertical x Horizontal (mm)	Dot Size W x H (mm)	Outline Dimensions H x W x D (mm)	Weight (g)
Character Type Modules									
FM20X1AA-D	20 (20 char., 1 line)	5 x 7 dot, with cursor	—	5.05 x 3.55	— x 5.2	0.75 x 0.75	0.55 x 0.55	70 x 180 x 20 max	160 typ
FM20X1DB-AC	20 (20 char., 1 line)	5 x 7 dot	—	9.0 x 6.3	— x 8.3	1.35 x 1.35	ϕ0.9	73 x 240 x 20 max	250 typ
FM20X2AA-DA	40 (20 char., 2 line)	5 x 7 dot	—	5.05 x 3.55	12.62 x 4.75	0.75 x 0.75	0.55 x 0.55	55 x 146 x 37 max	200 typ
FM40X1AA-B	40 (40 char., 1 line)	5 x 7 dot, with cursor	—	5.05 x 3.55	— x 4.75	0.75 x 0.75	0.55 x 0.55	70 x 250 x 20 max	250 typ
FM40X1FB-B	40 (40 char., 1 line)	5 x 12 dot	—	8.80 x 3.55	— x 5.2	0.75 x 0.75	0.55 x 0.55	76.2 x 320 x 24 max	300 typ
FM40X2CB-AA	80 (40 char., 2 line)	5 x 7 dot, with cursor	—	5.35 x 3.55	11.94 x 4.75	0.8 x 0.75	0.55 x 0.55	76 x 294 x 37 max	360 typ
FM40X6AA-A	240 (40 char., 6 line)	5 x 7 dot, with cursor	—	5.0 x 3.5	8.0 x 4.75	0.75 x 0.75	0.5 x 0.5	110 x 264 x 45 max	880 typ
FM80X2AA-A	160 (80 char., 2 line)	5 x 7 dot, with cursor	—	3.5 x 2.05	5.25 x 3.2	0.55 x 0.45	0.25 x 0.25	66 x 388 x 43 max	520 typ
Graphic Type Module									
FM180GX48BA-A	—	—	48 x 180 (total dots 8640)	—	—	0.6	0.4	90 x 200 x 45 max	400 typ

General Characteristics

Device	Brightness BL cd/m^2 (ft•L)	Color (without filter)	Temperature Range Operation T_{OP} °C	Temperature Range Storage T_{STG} °C	Vibration (10-55 Hz) G	Shock G	Relative Humidity Operation RH_{OP} %	Relative Humidity Storage RH_{STG} %	Mating Connector Power	Mating Connector Signal
Character Type Modules										
FM20X1AA-D	1030 typ (300)	Blue-green	–5 to 60	–20 to 70	2	40	0 to 85	0 to 95	(Note 1)	172083-4
FM20X1DB-AC	1030 typ (300)	Blue-green	–5 to 60	–20 to 70	2	40	0 to 85	0 to 95	(Note 1)	172083-4
FM20X2AA-DA	856 typ (250)	Blue-green	–5 to 60	–20 to 70	2	40	0 to 85	0 to 95	(Note 1)	172083-4
FM40X1AA-B	685 typ (200)	Blue-green	–5 to 60	–20 to 70	2	40	0 to 85	0 to 95	(Note 1)	172083-4
FM40X1FB-B	685 typ (200)	Blue-green	–5 to 60	–20 to 70	2	40	0 to 85	0 to 95	(Note 1)	172083-5
FM40X2CB-AA	685 typ (200)	Blue-green	–5 to 60	–20 to 70	2	40	0 to 85	0 to 95	(Note 1)	172083-5
FM40X6AA-A	685 typ (200)	Blue-green	–5 to 60	–20 to 70	2	25	0 to 85	0 to 95	(Note 1)	172083-5
FM80X2AA-A	514 typ (150)	Blue-green	–5 to 60	–20 to 70	2	40	0 to 85	0 to 95	(Note 1)	172083-5
Graphic Type Modules										
FM180GX48BA-A	685 typ (200)	Blue-green	–5 to 60	–20 to 70	2	40	0 to 85	0 to 95	(Note 1)	172083-4

Note:

(1) Housing 171822-2, pin 170204-2

Dot Type Fluorescent Indicator Modules (cont)

Electrical Characteristics

	Display					
	Voltage			Current		
Device	Min	Typ	Max	Min	Typ	Max
Character Type Modules						
FM20X1AA-D	4.75	5.0	5.25	—	0.6	0.8
FM20X1DB-AC	4.75	5.0	5.25	—	0.8	1.0
FM20X2AA-DA	4.75	5.0	5.25	—	1.0	1.2
FM40X1AA-B (Note 1)	4.75	5.0	5.25	—	1.0	1.2
FM40X1FB-B	4.75	5.0	5.25	—	1.0	1.5
FM40X2CB-AA	4.75	5.0	5.25	—	1.3	1.5
FM40X6AA-A	4.75	5.0	5.25	—	2.5	3.5
FM80X2AA-A	4.75	5.0	5.25	—	1.3	1.5
Graphic Type Modules						
FM180GX48BA-A	4.75	5.0	5.25	—	1.2	1.8

Note:

(1) Power polarity is different from other modules.

Display Functions

Device	Data	Data Write	Command Write	Data Read	Reset	Display Blanking	Test Mode	Refresh Memory
Character Type Modules								
FM20X1AA-D	CPU data bus compatible, TTL level	•	•	•	—	—	•	—
FM20X1DB-AC	CPU data bus compatible, TTL level	•	•	•	—	—	•	—
FM20X2AA-DA	CPU data bus compatible, TTL level	•	•	•	—	—	•	—
FM40X1AA-B	CPU data bus compatible, TTL level	•	•	•	—	—	•	—
FM40X1FB-B	CPU data bus compatible, four kinds of serial input, TTL level	•	•	•	•	•	•	—
FM40X2CB-AA	CPU data bus compatible, TTL level	•	•	•	—	—	•	—
FM40X6AA-A	CPU data bus compatible, serial input 1200 baud, TTL level	•	•	•	•	•	•	—
FM80X2AA-A	CPU data bus compatible, serial input 1200 baud, TTL level	•	•	•	•	•	•	—
Graphic Type Modules								
FM180GX48BA-A	8-bit parallel, TTL level	•	—	—	—	•	—	with one frame memory (RAM)

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Chip-in-Glass FIP Modules

Mechanical Characteristics

Device	No of Character	Character Format	Character Height x Width (mm)	Character Pitch Row x Column (mm)	Dot Pitch Vertical x Horizontal (mm)	Dot Size W x H (mm)	Outline Dimensions H x W x D (mm)	Weight (g)
Character Type Modules								
FC20X1JA-AA/AB (Note 1)	20 (20 char., 1 line)	5 x 7 dot with cursor	5.05 x 3.55	– x 5.2	0.75 x 0.75	0.55 x 0.55	29 x 153 x 24	80 typ
FC20X1NA-AA/AB	20 (20 char., 1 line)	5 x 7 dot	9.0 x 6.3	– x 8.3	1.35 x 1.35	ϕ0.9	30 x 259 x 24	120 typ
FC20X2FA-AA/AB	40 (20 char., 2 line)	5 x 7 dot	5.05 x 3.55	12.62 x 4.75	0.75 x 0.75	0.55 x 0.55	34 x 194 x 24	100 typ
FC40X1KA-AA/AB	40 (40 char., 1 line)	5 x 7 dot with cursor	5.05 x 3.55	– x 4.75	0.75 x 0.75	0.55 x 0.55	29 x 280 x 29	150 typ
FC40X2DA-AA/AB	80 (40 char., 2 line)	5 x 7 dot with cursor	5.35 x 3.55	11.94 x 4.75	0.8 x 0.75	0.55 x 0.55	40 x 270 x 28	240 typ

General Characteristics

			Temperature Range		Vibration (10-55 Hz)		Relative Humidity		Mating Connector	
Device	Brightness BL cd/m^2 (ft•L)	Color (without filter)	Operation T_{OP} °C	Storage T_{STG} °C	Displacement (mm)	Shock (G)	Operation RH_{OP} %	Storage RH_{STG} %	Power	Signal (Note 3)
Character Type Modules										
FC20X1JA-AA/AB	(150)	Green	–5 to 60	–20 to +70	.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-26D-2.54R
FC20X1NA-AA/AB	(150)	Green	–5 to 60	–20 to +70	.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-26D-2.54R
FC20X2FA-AA/AB	(150)	Green	–5 to 60	–20 to +70	.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-26A-2.54R
FC40X1KA-AA/AB	(150)	Green	–5 to 60	–20 to +70	.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-26D-2.54R
FC40X2DA-AA/AB	(150)	Green	–5 to 60	–20 to +70	.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-34D-2.54R

Notes:

(1) AA ending is for English and Japanese characters. AB ending is for English and European characters.

(2) Housing AMP 171822-2, Pin AMP 170204-2

(3) Signal connectors: contact Hirose U.S.A.

Chip-in-Glass FIP Modules (cont)

Electrical Characteristics

	Display					
	Voltage			Current		
Device	Min	Typ	Max	Min	Typ	Max
Character Type Modules						
FC20X1JA-AA/AB	4.75	5.0	5.25	—	0.3	0.4
FC20X1NA-AA/AB	4.75	5.0	5.25	—	0.4	0.5
FC20X2FA-AA/AB	4.75	5.0	5.25	—	0.3	0.4
FC40X1KA-AA/AB	4.75	5.0	5.25	—	0.4	0.6
FC40X2DA-AA/AB	4.75	5.0	5.25	—	0.8	1.0

Display Functions

Device	Data Write	Command Write	Data Read	Reset	Display Blanking	Test Mode	Status Read
Character Type Modules							
FC20X1JA-AA/AB	•	•	•	•	—	•	•
FC20X1NA-AA/AB	•	•	•	•	—	•	•
FC20X2FA-AA/AB	•	•	•	•	—	•	•
FC40X1KA-AA/AB	•	•	•	•	—	•	•
FC40X2DA-AA/AB	•	•	•	•	•	•	—

NEC

OPTOELECTRONIC DEVICES

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Section 12 – Optoelectronic Devices

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Part Numbering System

Photo Detector

PH 3 02 B

- B: Revision(optional): The letters A~ are designed for changed parameter of production process.
- 02: Identification number
- 3: Output type:
  - 1 = Photo transistor
  - 3 = PIN photo diode
- PH: NEC photo detector device

Photo Interrupter

PS 4 0 01

- 01: Identification number
- 0: Size code:
  - 0 = Middle size
  - 5 = Small size
  - 6 = Ultra small size
- 4: Style code:
  - 4 = Interrupter
  - 6 = Reflective sensor
- PS: NEC photo interrupter device

Optoisolator

PS 25 01 L - 4 - KA

- KA: Optional:
  - Rank (KA, LA, MA)
- 4: Optional:
  - 1 = 1-Channel type
  - 2 = 2-Channel type
  - 3 = 3-Channel type
  - 4 = 4-Channel type
  - E3 or E4 = Taping
- L: Optional:
  - A, B, ... = Suffix for revision
  - L = Lead bending type
- 01: Identification type
- 25: Output type:
  - 10 = Can type
  - 20 = 6 pin standard, 6 pin or 8 pin highspeed
  - 24 = Multi type
  - 25 = Multi type
  - 26 = 6 pin
  - 27 = 4 pin surface mount
  - 3X = SCR
- PS: NEC photo coupler type

Infared Light Emitting Diodes

S E 3 03 A – C

- A – C: Revision
  - The letters A ~ are designated for changes in parameter or production process.
- 03: Identification Number
- 3: Material
  - 3 : GaAs (λ_P = 940 nm)
  - 10 : GaAlAs (λ_P = 950 nm)
- E: Color Code
  - E = Infrared
- S: Type Code

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Active Devices

Laser Diodes

Part Number	Absolute Maximum Ratings (T_a = 25°C) V_R (V)	I_F (mA)	P_o (mW)	T_c (°C)	T_{stg} (°C)	Typical Characteristics (T_a = 25°C) I_{th} (mA) Typ.	P_o, P_f (mW) I_{op} (mA)	P_o, P_f (mW) Typ.	λ_p (nm) Typ.	$\Delta\lambda$ (nm) Max.	t_r, t_f (ns) Typ.	Remarks	Package Style
NDL3200	2	—	4.0	-10 to +50	-40 to +85	90	100	3.0	670	—	—	With monitor PD	Can
NDL5003	2	—	10.0	-40 to +70	-55 to +125	20	I_{th}+30	8.0	1300	4.0	0.5/0.7		Can
NDL5003D	2	—	15.0	-40 to +70	-55 to +125	20	I_{th}+30	8.0	1300	4.0	0.5/0.7	Chip on carrier	Surface mount
NDL5004	2	—	10.0	-40 to +70	-55 to +125	20	I_{th}+30	8.0	1300	4.0	0.5/0.7		Can
NDL5004P	2	—	4.0	-20 to +60	-40 to +70	20	I_{th}+30	2.5	1300	4.0	0.5/0.7	With GI-50/125	Pigtail
NDL5008	2	—	10.0	-20 to +60	-55 to +125	20	I_{th}+30	7.0	1200	4.0	0.5/0.7		Can
NDL5009	2	—	15.0	-10 to +70	-55 to +125	20	I_{th}+30	8.0	1310	4.0	0.2	f_c = 1.2 GHz MIN.	Can
NDL5009D	2	—	15.0	-40 to +70	-55 to +125	20	I_{th}+30	8.0	1310	4.0	0.2	Chip on carrier	Surface mount
NDL5021	2	150	10.0	-40 to +60	-55 to +125	20	I_{th}+25	5.0*1	1300	4.0	0.5/0.7	With Ball Lens	Can
NDL5050A	2	—	10.0	-40 to +70	-55 to +125	40	I_{th}+30	5.0	1550	8.0	0.5/0.7	With Ball Lens	Can
NDL5060	2	400*3	—	-40 to +70	-55 to +125	20	250*3	50.0*1	1310	10.0	0.5/0.7	With Ball Lens	Can
NDL5061	2	600*3	—	-40 to +70	-55 to +125	20	400*3	90.0*1	1310	10.0	0.5/0.7	With Ball Lens	Can
NDL5070	2	400*3	—	-40 to +70	-55 to +125	40	250*3	30.0*1	1550	20.0	0.5/0.7	With Ball Lens	Can
NDL5071	2	600*3	—	-40 to +70	-55 to +125	40	400*3	50.0*1	1550	20.0	0.5/0.7	With Ball Lens	Can
NDL5080	2	—	5.0	-40 to +70	-55 to +125	20	—	3.0	1310	30.0	0.5/0.7	Small package	Can
NDL5600	2	—	15.0	-40 to +70	-55 to +100	15	I_{th}+30	8.0	1310	0.1	0.2		Can
NDL5600D	2	—	15.0	-40 to +70	-55 to +100	15	I_{th}+30	8.0	1310	0.1	0.2	Chip on carrier	Surface mount
NDL5604P	2	I_{th}+50	—	-20 to +65	-40 to +70	15	I_{th}+25	1.2	1310	0.1*2	0.3/0.4	With SMF	14-Pin DIP
NDL5650	2	—	10.0	-40 to +70	-55 to +100	20	I_{th}+30	5.0	1550	0.1	0.2		Can
NDL5650D	2	—	10.0	-40 to +70	-55 to +100	20	I_{th}+30	5.0	1550	0.1	0.2	Chip on carrier	Surface mount
NDL5654P	2	I_{th}+50	—	-20 to +65	-40 to +70	20	I_{th}+35	1.2	1550	0.1*2	0.3/0.4	With SMF	14-Pin DIP
NDL5707P	2	I_{th}+50	—	-20 to +65	-40 to +70	20	I_{th}+30	3.0	1300	2.0*2	0.5/0.7	With GI-50/125	14-Pin DIP
NDL5717P	2	I_{th}+50	—	-20 to +65	-40 to +70	20	I_{th}+30	2.0	1310	2.0*2	0.5/0.7	With SMF	14-Pin DIP
NDL5730P	2	I_{th}+50	—	-20 to +65	-40 to +70	20	I_{th}+30	2.0	1310	2.0*2	0.2/0.3	With SMF	14-Pin Butterfly
NDL5731P	2	I_{th}+50	—	-20 to +65	-40 to +70	20	I_{th}+30	2.0	1310	2.0*2	0.3/0.4	With SMF	14-Pin DIP
NDL5735P	2	I_{th}+50	—	0 to +65	-40 to +70	20	I_{th}+20	0.7	1300	6.0	0.5/0.7	With SMF, w/o TEC	14-Pin DIP
NDL5736P	2	I_{th}+50	—	0 to +65	-40 to +70	20	I_{th}+20	0.2	1300	6.0	0.5/0.7	With SMF, w/o TEC	14-Pin DIP
NDL5762P	2	600*3	—	0 to +60	-40 to +70	20	400*3	30.0	1310	20.0	0.5/0.7	With SMF, w/o PD	14-Pin DIP
NDL5772P	2	600*3	—	0 to +60	-40 to +70	40	400*3	15.0	1550	40.0	0.5/0.7	With SMF, w/o PD	14-Pin DIP
OD8325	2	100	1.6	-10 to +60	-40 to +80	20	I_{th}+20	1.3*4	850	2.0	0.5	With GI-47/125 other wavelengths available	Pigtail
OD8326	1.5	100	3.0	-10 to +60	-40 to +80	20	I_{th}+20	2.0*4	1300	5.0	0.5	With GI-50/125 other wavelengths available	Pigtail
OD8335	2	100	—	0 to +55	-20 to +70	30	I_{th}+45	2.0	1310	50 MHz	100/200ps	DFB With isolator	14-Pin Butterfly
OD8336	2	100	—	0 to +55	-20 to +70	30	I_{th}+45	1.5	1550	50 MHz	100/200ps	DFB With isolator	14-Pin Butterfly

*1 MIN. *2 TYP. *3 Pulse Drive (PW = 1 μs, Duty = 1%) *4 MAX.

Light Emitting Diodes

Fiber Optics

Part Number	Absolute Maximum Ratings (T_a = 25°C) V_R (V)	I_F (mA)	T_c (°C)	T_{stg} (°C)	Typical Characteristics (T_a = 25°C) P_o, P_f (mW) I_F (mA)	Typ.	λ_p (nm) Typ.	$\Delta\lambda$ (nm) Max.	t_r, t_f (ns) Typ.	Remarks	Package Style
NDL4103A	2	150	−40 to +80	−55 to +125	100	2.0	850	60	10		TO-18 Can
NDL4103P	2	150	−20 to +60	−40 to +70	100	50.0*4	850	60	10	With GI-50/125	Pigtail
NDL4105A	2	150	−40 to +70	−40 to +90	100	3.5	850	50	—	f_C = 35 MHz	TO-18 Can
NDL4105-78	2	150	−40 to +70	−40 to +90	100	3.5	780	50	—	f_C = 35 MHz	TO-18 Can
NDL4105-88	2	150	−40 to +70	−40 to +90	100	3.5	880	50	—	f_C = 35 MHz	TO-18 Can
NDL4105B	2	150	−40 to +70	−40 to +90	100	2.0	850	50	—	With Ball Lens f_C = 35 MHz	Header mount
NDL4201A	2	80	−40 to +70	−40 to +90	50	1.0	850	50	—	f_C = 35 MHz	Header mount
NDL4201B	2	80	−40 to +70	−40 to +90	50	0.7	850	50	—	With Ball Lens f_C = 35 MHz	Header mount
NDL5300	2	150	−40 to +80	−55 to +125	100	1.0	1300	140	12/18		TO-18 Can
NDL5300P	2	150	−20 to +60	−40 to +70	100	30.0*4	1300	140	12/18	With GI-50/125	Pigtail
NDL5302	1	150	−40 to +80	−55 to +125	100	0.8	1300	160	2/3		TO-18 Can
NDL5302P	1	150	−20 to +60	−40 to +70	100	25.0*4	1300	160	2/3	With GI-50/125	Pigtail
NDL5303P	1	150	−40 to +65	−40 to +70	100	25.0*4	1300	160	2/3	With GI-50/125	14-Pin DIP
NDL5310	2	120	−40 to +80	−55 to +125	80	1.5	1300	150	4/8		TO-18 Can
NDL5310P	2	120	−20 to +60	−40 to +70	80	40.0*4	1300	150	4/8	With GI-50/125	Pigtail
NDL5311P	2	120	−40 to +65	−40 to +70	80	40.0*4	1300	150	4/8	With GI-50/125	14-Pin DIP
NDL5312	2	120	−40 to +80	−55 to +125	80	1.0	1300	150*5	1/2		TO-18 Can
NDL5312P	2	120	−20 to +60	−40 to +70	80	30.0*4	1300	150*5	1/2	With GI-50/125	Pigtail
NDL5313P	2	120	−40 to +65	−40 to +70	80	30.0*4	1300	150*5	1/2	With GI-50/125	14-Pin DIP
NDL5314	2	120	−40 to +80	−55 to +125	80	0.8	1300	150*5	0.8/1.5		TO-18 Can
NDL5314P	2	120	−20 to +60	−40 to +70	80	25.0*4	1300	150*5	0.8/1.5	With GI-50/125	Pigtail
OD8358	2	150	−10 to +60	−40 to +80	100	80.0*4	850	60	15		Receptacle
OD8363	1.5	150	−10 to +60	−40 to +80	100	25.0*4	1300	140	12		Receptacle
OD8364	2	150	−10 to +60	−40 to +80	100	50.0*4	865	50*5	15		Plastic Receptacle
OD8365	2	150	−10 to +60	−40 to +80	100	100.0*4	850	50	15	With GI-50/125 other wavelengths available	Pigtail
OD8366	1.5	150	−10 to +60	−40 to +80	100	25.0*4	1300	140	12	With GI-50/125	Pigtail

*4 P_f (μW) *5 TYP.

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Light Emitting Diodes (cont.)
Remote Control

Part Number	Material	Features	Absolute Maximum Ratings (T_a = 25°C) P_d (mW)	I_F (mA)	T_{stg} (°C)	Typical Characteristics (T_a = 25°C) V_F TYP. (V) (I_F=30 mA)	I_R TYP. (μA) (V_R=3 V)	λ_p TYP. (nm) (I_F=30 mA)	P_O TYP. (mW) (I_F=30 mA)
SE301A	GaAs	High output High reliability	150	100	-65 to +125	1.2 (I_F=50 mA)	0.01	940 (I_F=50 mA)	6 (I_F=50 mA)
SE302A	GaAs	Mini size	75	50	-30 to +80	1.2	0.01	940	1.5
SE303A-C	GaAs	High output Wide radiation angle	150	100	-40 to +100	1.25 (I_F=50 mA)	0.01 (V_R=5 V)	940 (I_F=50 mA)	8 (I_F=50 mA)
SE304	GaAs	Lateral direction output	100	50	-40 to +100	1.2	0.01	940	1.5
SE306	GaAs	Lateral direction output with a lens	100	50	-40 to +100	1.1 (I_F=10 mA)	0.01	940 (I_F=10 mA)	0.5 mW/sr (I_F=10 mA)
SE307-C	GaAs	ULTRA High output Narrow radiation angle	150	100	-40 to +100	1.25 (I_F=50 mA)	0.01 (V_R=5 V)	940 (I_F=50 mA)	30 mW/sr (I_F=50 mA)
SE308	GaAs	Small package Lateral direction output	100	50	-40 to +100	1.14 (I_F=20 mA)	0.01	940 (I_F=20 mA)	0.85 mW/sr (I_F=20 mA)
SE310	GaAs	High output Small package	150	60	-40 to +100	1.25 (I_F=50 mA)	0.01 (V_R=5 V)	940 (I_F=50 mA)	11 mW/sr (I_F=50 mA)
SE313	GaAs	ULTRA High output Middle radiation angle	150	100	-40 to +100	1.25 (I_F=50 mA)	0.01 (V_R=5 V)	940 (I_F=50 mA)	25 mW/sr (I_F=50 mA)
SE1003-C	GaAlAs on GaAs	ULTRA High output Wide radiation angle	150	100	-40 to +100	1.27 (I_F=50 mA)	0.01 (V_R=5 V)	950 (I_F=50 mA)	20 mW/sr (I_F=50 mA)

Avalanche Photo Diodes

Part Number	Absolute Maximum Ratings (T_a = 25°C) I_F (mA)	I_R (mA)	T_{stg} (°C)	Typical Characteristics (T_a = 25°C) Detecting Area Size (μm) Typ.	$V_{(BR)R}$ (V) Typ.	I_D (nA) V_R (V)	Max.	M Typ.	η (%) λ (nm)	Typ.	t_r, t_f (ns) Typ.	Remarks	Package Style
NDL1102	100	—	-65 to +150	ϕ 240	120	$V_{(BR)R}$-1.0	1.0*6	150	630 850	65 65	0.5 10		TO-18 Can
NDL1202	100	—	-65 to +150	ϕ 240	200	$V_{(BR)R}$-2.0	1.0*6	150	850	70	1.0*6		TO-18 Can
NDL5100	50	0.5	-55 to +125	ϕ 100	29	$V_{(BR)R}$×0.9	200	40	1300	75	0.5		TO-18 Can
NDL5100C	50	0.5	-55 to +125	ϕ 100	29	$V_{(BR)R}$×0.9	200	40	1300	75	0.5	Chip on carrier	Surface mount
NDL5100P	50	0.5	-40 to +70	ϕ 100	29	$V_{(BR)R}$×0.9	200	40	1300	75	0.5	With GI-50/125	Pigtail
NDL5102	50	0.5	-55 to +125	ϕ 30	35	$V_{(BR)R}$×0.9	80	50	1300	75	0.3		TO-18 Can
NDL5102C	50	0.5	-55 to +125	ϕ 30	35	$V_{(BR)R}$×0.9	80	50	1300	75	0.3	Chip on carrier	Surface mount
NDL5102P	50	0.5	-30 to +70	ϕ 30	35	$V_{(BR)R}$×0.9	80	50	1300	75	0.3	With SMF	Pigtail
NDL5500	10	0.5	-55 to +100	ϕ 50	70	$V_{(BR)R}$×0.9	20	40	1300 1550	85 80	—	f_C = 1.0 GHz MIN.	TO-18 Can
NDL5500C	10	0.5	-55 to +100	ϕ 50	70	$V_{(BR)R}$×0.9	20	40	1300 1550	85 80	—	Chip on carrier f_C = 1.0 GHz MIN.	Surface mount
NDL5500P	10	0.5	-40 to +70	ϕ 50	70	$V_{(BR)R}$×0.9	20	40	1300 1550	85 80	—	With GI-50/125 f_C = 1.0 GHz MIN.	Pigtail
OD8406	1.0	—	-40 to +80	—	205	50	0.2	700	850	75	1.5		Receptacle
OD8409	0.5	—	-40 to +80	—	30	$V_{(BR)R}$×0.9	0.2	40	1300	75	0.5		Receptacle
OD8412	1.0	—	-40 to +80	—	205	50	0.2	700	850	75	1.5	With GI-62.5/125	Pigtail
OD8456	0.5	—	-40 to +80	—	30	$V_{(BR)R}$×0.9	0.2	40	1300	75	0.5	With GI-62.5/125	Pigtail

*6 MAX.

PIN Photo Diodes

Fiber Optics

Part Number	Absolute Maximum Ratings (T_a = 25°C) I_F (mA)	I_R (mA)	T_{stg} (°C)	Detecting Area Size (μm) Typ.	Typical Characteristics (T_a = 25°C) I_D (nA) V_R (V)	Typ.	C_t (pF) V_R (V)	Typ.	η (%) λ (nm)	Typ.	t_r, t_f (ns) Typ.	Remarks	Package Style
NDL2102	100	—	−65 to +150	ϕ 240	10	1.0*6	10	1.5	850	70	1.0		TO-18 Can
NDL2104	100	—	−65 to +150	ϕ 440	10	1.0*6	10	2.8	850	70	4.0		TO-18 Can
NDL2208	100	—	−65 to +150	ϕ 880	10	1.0*6	10	1.5	850	85	10		TO-18 Can
NDL5200	50	5.0	−55 to +125	ϕ 240	6	500	6	7.0	1300	75	3.0		TO-18 Can
NDL5405	10	0.5	−55 to +150	ϕ 80	5	0.1	5	1.0	1300 1550	85 80	0.3		TO-18 Can
NDL5405C	10	0.5	−55 to +150	ϕ 80	5	0.1	5	1.0	1300 1550	85 80	0.3	Chip on carrier	Surface mount
NDL5405P	10	0.5	−40 to +70	ϕ 80	5	0.1	5	1.0	1300 1550	85 80	0.3	With GI-50/125	Pigtail
NDL5406	10	0.5	−55 to +150	270×330	5	0.5	5	4.5	1300 1550	85 80	4.0		TO-18 Can
OD8454	100	100 μA	−40 to +80	—	10	0.1	10	3.0*6	850	75	3.0		Receptacle
OD8456	—	—	−40 to +80	—	10	1.0*6	10	5.0*6	850	85	10.0		Plastic Receptacle

*6MAX.

Remote Control

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C) V_R (V)	P_D (mW)	T_{stg} (°C)	Typical Characteristics (T_a = 25°C) S_{IR} TYP.* (μA) (V_R=5 V)	I_R (nA) (V_R=10 V)	t_r (ns) (R_L=1 kΩ) (V_R=5 V)
PH302	Low cost PIN photo diode	32	150	−40 to +80	6 (S=50 nA/lx)	to 30	50
PH302B	Low cost PIN photo diode PH302 with visible cut filter	32	150	−40 to +80	5 (S=32 nA/lx)	to 30	50
PH302C	Low cost PIN photo diode Built-in visible cut filter	32	150	−40 to +80	5 (S=32 nA/lx)	to 30	50
PH309	Low cost PIN photo diode Small Package with Lens Built-in visible cut filter	32	150	−40 to +80	5 (S=32 nA/lx)	to 10	30
PH310	Low cost PIN photo diode Ultra Small Package with Lens Built-in visible cut filter	32	150	−40 to +100	5 (S=32 nA/lx)	to 10	30
PH320	Low cost PIN photo diode Ultra Small Package with Lens Built-in visible cut filter	32	150	−40 to +100	4.3	to 10	30

*Measured with an infrared LED (λp = 940 nm).
**Measured with a tungsten filament lamp operated at a color temperature of 2 854 K.

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PIN Photo Diodes (cont.)

Optical Disk

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C)				Typical Characteristics (T_a = 25°C)							
						I_D (nA)		S(A/W)			t_r, t_f (ns)		
		V_R (V)	P (mW)	T_{opt} (°C)	T_{stg} (°C)	V_R (V)	Max.	V_R (V)	λ (nm)	Typ.	V_R (V)	R (kΩ)	Typ.
PH311	Small Package Multi Detecting Area	20	20	-20 to +80	-40 to +100	15	4	15	780	0.3	15	1	1
PH312	Small Package Multi Detecting Area	20	20	-20 to +80	-40 to +100	15	4	15	780	0.52	15	1	1
PH313	Small Package Multi Detecting Area	20	20	-20 to +80	-40 to +100	15	4	15	780	0.52	15	1	1
PH314	Small Package Multi Detecting Area	20	20	-20 to +80	-40 to +100	15	4	15	780	0.52	15	1	1

Photo Transistors

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C)				Typical Characteristics (T_a = 25°C)		
		P_C (mW)	I_C (mA)	V_{CEO} (V)	T_{stg} (°C)	I_{CEO} (nA) V_{CE}=10 V L=0	$V_{CE(sat)}$ (V) (L=1000 lx)	I_L (μA) V_{CE}=2 V (L=100 lx)
PH101	High sensitivity (Darlington Tr.)	100	50	20	-30 to +80	to 500 (V_{CE}=15 V)	to 1.5	10 mA to
PH102	High speed	100	40	20	-30 to +80	to 200	to 0.3	50 to
PH103	High sensitivity (Darlington Tr.)	100	50	30	-40 to +100	to 400	to 1.5	2 mA to
PH104	High speed	100	40	30	-40 to +100	to 100	to 0.3	20 to
PH105	High reliability	150	50	30	-40 to +100	to 200	to 0.3	500 to (V_{CE}=10 V)
PH106	High speed Built-in visible cut filter	100	40	30	-40 to +100	to 100	to 0.3	60 to
PH107	High sensitivity Built-in visible cut filter	100	50	30	-40 to +100	to 400	to 1.5	10 mA to
PH108	Small package High speed	100	40	30	-40 to +100	to 100	to 0.3 (I_C=0.5 mA) (H=5 mW/cm²)	0.3 mA to (V_{CE}=5 V) (H=0.5 mW/cm²)
PH110	Small package Built-in visible cut filter	100	40	30	-40 to +100	to 100	to 0.3 (I_C=200 μA) (H=500 μW/cm²)	200 μA to (V_{CE}=5 V) (H=500 μW/cm²)

Photo ICs

Photo Interrupter

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C) V_{CC} (V)	I_{OL} (mA)	T_{opt} (°C)	Typical Characteristics (T_a = 25°C) I_{CCL} (mA) (V_{CC}=5 V)	V_{OL} (V) (I_{OL}=16 mA) (V_{CC}=5 V)
PH502HR	Built-in Schmitt Trigger circuit Active "HIGH" Built-in pull up resistor	17	50	−30 to +85	to 5	to 0.4
PH502HC	Built-in Schmitt Trigger circuit Active "HIGH" Open collector output	17	50	−30 to +85	to 5	to 0.4 (R_L=280Ω)
PH502LR	Built-in Schmitt Trigger circuit Active "LOW" Built-in pull up resistor	17	50	−30 to +85	to 5	to 0.4
PH502LC	Built-in Schmitt Trigger circuit Active "LOW" Open collector output	17	50	−30 to +85	to 5	to 0.4 (R_L=280Ω)

Optical Disk

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C) V_R (V)	P (mW)	T_{opt} (°C)	T_{stg} (°C)	Typical Characteristics (T_a = 25°C) I_{CC} (nA) Typ.	V_{BIAS} R_1 (kΩ)	R_2 (kΩ)	(V)	f_T (MHz) Typ.	V_O (mV) I_{IN} (μA)	Min.	S (A/W) λ (nm)	Typ.
PH503	Built-in I-V Amplifiers Small transparent 16 pin plastic package	20	20	−20 to +80	−40 to +100	14.1	18	13	2.5±0.1	2	1.7	80	780	0.3

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Optoisolators

Can Type

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C) BV ($V_{r.m.s.}$)	I_F (mA)	I_C (mA)	Electrical Characteristics (T_a = 25°C) CTR (%)	t_r (μs) (Typ.)	t_f (μs) (Typ.)
PS1001	5 pin, Hermetic CAN	1 k (DC)	60	50	20 to	5	5

Multichannel Type

Part Number*	Features	Absolute Maximum Ratings (T_a = 25°C) BV ($V_{r.m.s.}$)	I_F (mA)	I_C (mA)	Electrical Characteristics (T_a = 25°C) CTR (%)	t_r (μs) (Typ.)	t_f (μs) (Typ.)
PS2501-1 PS2501L-1	4 pin DIP 1 channel	5 k	80	50	80 to 600	3	5
PS2501-2 PS2501L-2	8 pin DIP 2 channels						
PS2501-3 PS2501L-3	12 pin DIP 3 channels						
PS2501-4 PS2501L-4	16 pin DIP 4 channels						
PS2502-1 PS2502L-1	4 pin DIP 1 channel	5 k	80	200	200 to	100	100
PS2502-2 PS2502L-2	8 pin DIP 2 channels	5 k	80	160	200 to	100	100
PS2502-3 PS2502L-3	12 pin DIP 3 channels						
PS2502-4 PS2502L-4	16 pin DIP 4 channels						
PS2503-1 PS2503L-1	4 pin DIP 1 channel	5 k	50	30	100 to 400	8 (R_L=10 kΩ)	60 (R_L=10 kΩ)
PS2503-2 PS2503L-2	8 pin DIP 2 channels						
PS2503-3 PS2503L-3	12 pin DIP 3 channels						
PS2503-4 PS2503L-4	16 pin DIP 4 channels						
PS2505-1 PS2505L-1	4 pin DIP 1 channel	5 k	±80	50	80 to 600	3	5
PS2505a-2 PS2505aL-2	8 pin DIP 2 channels						
PS2505-3 PS2505L-3	12 pin DIP 3 channels						
PS2505-4 PS2505L-4	16 pin DIP 4 channels						
PS2506-1 PS2506L-1	4 pin DIP 1 channel	5 k	±80	200	200 to	100	100
PS2506-2 PS2506L-2	8 pin DIP 2 channels	5 k	±80	160	200 to	100	100
PS2506-3 PS2506L-3	12 pin DIP 3 channels						
PS2506-4 PS2506L-4	16 pin DIP 4 channels						

*L suffix designates lead formed (gullwing) package for surface mount applications.

Optoisolators (cont.)
Surface Mount Type

Part Number**	Features	Absolute Maximum Ratings (T_a = 25°C) BV ($V_{r.m.s.}$)	I_F (mA)	I_C (mA)	Electrical Characteristics (T_a = 25°C) CTR (%)	t_r (μs) (Typ.)	t_f (μs) (Typ.)
PS2701-1 PS2701-1-E3 PS2701-1-E4	Surface mount 1 channel	2.5 k	50	80	50 to 300	3	5
PS2701-2	Surface mount 2 channels						
PS2701-4	Surface mount 4 channels						
PS2702-1 PS2702-1-E3 PS2702-1-E4	Surface mount 1 channel	2.5 k	50	200	200 to	100	100
PS2702-2	Surface mount 2 channels	2.5 k	50	160	200 to	100	100
PS2702-4	Surface mount 4 channels						
PS2703-1 PS2703-1-E3 PS2703-1-E4	Surface mount 1 channel	2.5 k	50	30	50 to 400	10 (R_L=1 kΩ)	10 (R_L=1 kΩ)
PS2703-2	Surface mount 2 channels						
PS2703-4	Surface mount 4 channels						
PS2705-1 PS2705-1-E3 PS2705-1-E4	Surface mount 1 channel	2.5 k	±50	80	50 to 300	3	5
PS2705-2	Surface mount 2 channels						
PS2705-4	Surface mount 4 channels						
PS2706-1 PS2706-1-E3 PS2706-1-E4	Surface mount 1 channel	2.5 k	±50	200	200 to	100	100
PS2706-2	Surface mount 2 channels	2.5 k	±50	160	200 to	100	100
PS2706-4	Surface mount 4 channels						
PS2707-1 PS2707-1-E3 PS2707-1-E4	Surface mount 1 channel	2.5 k	±50	30	50 to 400	10 (R_L=1 kΩ)	10 (R_L=1 kΩ)
PS2707-2	Surface mount 2 channels						
PS2707-4	Surface mount 4 channels						

**E3, E4 suffix denote tape and reel versions. Please consult data book.

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Optoisolators (cont.)
6 Pin Type

Part Number*	Features	Absolute Maximum Ratings (T_a = 25°C) BV ($V_{r.m.s.}$)	I_F (mA)	I_C (mA)	Electrical Characteristics (T_a = 25°C) CTR (%)	t_r (μs) (Typ.)	t_f (μs) (Typ.)
PS2010 MCT2 4N25		2 k	80	100	20 to	4	4
PS2601 PS2601L	with base pin	5 k	80	50	80 to 600	3	5
PS2602 PS2602L							
PS2603 PS2603L	with base pin	5 k	80	200	200 to	100	100
PS2604 PS2604L							
PS2605 PS2605L	with base pin	5 k	±80	50	80 to 600	3	5
PS2606 PS2606L							
PS2607 PS2607L	with base pin	5 k	±80	200	200 to	100	100
PS2608 PS2608L							
PS2621 PS2621L	with base pin	5 k	150	50	20 to 50	3	5
PS2622 PS2622L							
PS2625 PS2625L	with base pin	5 k	±150	50	20 to 50	3	5
PS2626 PS2626L							
PS2633 PS2633L	with base pin	5 k	80	150	1000 to 15000	100	100
PS2634 PS2634L							
PS2651	with base pin	5 k	80	50	50 to 400	3	5
PS2652							
PS2653	with base pin	5 k	80	200	200 to	100	100
PS2654							

*L suffix designates lead formed (gullwing) package for surface mount applications.

Optoisolators (cont.)

High Speed Type

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C) BV ($V_{r.m.s.}$)	I_F (mA)	I_O (mA)	Electrical Characteristics (T_a = 25°C) CTR (%)	t_{PHL} (μs) (Typ.)	t_{PHL} (μs) (Typ.)
PS2006B (6N136)	8 pin DIP	3 k	25	8	15 to	0.3	0.8
PS2041	6 pin DIP	2.5 k	25	8	15 to	0.3	0.8
PS2043	8 pin DIP						
PS2044	8 pin DIP, (alternate pinout)						

Ultra High Speed Type

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C) BV ($V_{r.m.s.}$)	I_F (mA)	I_O (mA)	Electrical Characteristics (T_a = 25°C) CTR (%)	t_{PHL} (μs) (Typ.)	t_{PHL} (μs) (Typ.)
PS2007B (6N137)	8 pin DIP, logic output	2.5 k (DC)	10	50	600	50	50

Photo SCR Coupler

Part Number	Features	Absolute Maximum Ratings (T_a = 25°C) BV ($V_{r.m.s.}$)	V_{DRM} (V)	I_T (mA)	Electrical Characteristics (T_a = 25°C) I_{FT} (mA)	t_{on} (μs) (Typ.)
PS3001(1)	6 pin	2.5 k	200	300	to 12	20 I_{FT}=50 mA R_{GK}=27 kΩ V_D=6 V R_L=10 Ω
PS3002(1)	6 pin	2.5 k	400	300	to 12	
PS3603	6 pin	5 k	600	300	to 10	

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Photo Interrupters
Transistor Output Type

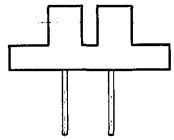
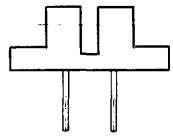
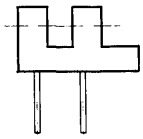
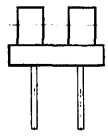
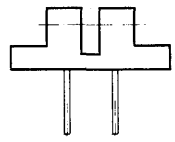
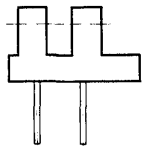
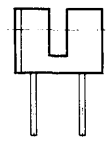
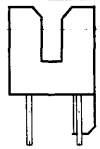
Part Number	Outline	Characteristics (T_a = 25°C) CTR (%)	I_F	V_{CE}	Features
PS4001		20 to	10 (mA)	2 (V)	Darlington Tr. Aperture: 1 mm□ 4 pin
PS4003		15 to	10	2	Darlington Tr. 4 pin
PS4005		20 to	10	2	Darlington Tr. 4 pin
PS4007		20 to	10	2	Darlington Tr. 4 pin
PS4008		0.5 to	10	2	Single Tr. High speed (t_r, t_f=5 μs) 4 pin
PS4009		20 to	10	2	Darlington Tr. 4 pin
PS4010		20 to	10	2	Darlington Tr. 4 pin
PS4011		20 to	10	2	Darlington Tr. Aperture: 1 mm□ 4 pin

Photo Interrupters (cont.)
Transistor Output Type (cont.)

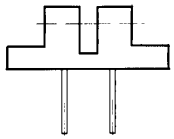
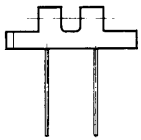
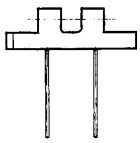
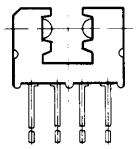
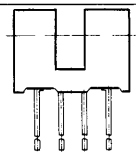
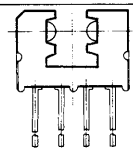
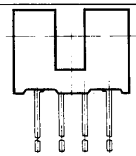
Part Number	Outline	Characteristics (T_a = 25°C) CTR (%)	I_F	V_{CE}	Features
PS4014		0.5 to	10	2	Single Tr. High speed (t_r, t_f=5 μs) 4 pin
PS4501		2.5 to	10	2	Single Tr. Aperture: 0.5 mm slit 4 pin
PS4502		200 to	5	2	Darlington Tr. Aperture: 0.5 mm slit High CTR 4 pin
PS4601		1.5 to	10	2	One-piece molded Single Tr. 4 pin in-line
PS4602		1.5 to	10	2	One-piece molded PS4601 with a light-shielded case Single Tr. 4 pin in-line
PS4651		40 to	5	2	One-piece molded Darlington Tr. 4 pin in-line
PS4652		40 to	5	2	One-piece molded PS4651 with a light-shielded case Darlington Tr. 4 pin in-line

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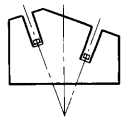
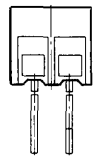
Photo Interrupters (cont.)

Transistor Output Type (cont.)

Part Number	Outline	Characteristics (T_a = 25°C) CTR (%)	I_F	V_{CE}	Features
PS6001A		100 (μA) to	≈30 speculum reflecting surface	5	Photo Reflective Sensor Single Tr. 4 pin
PS6002		400 (μA) Typ.	10 white reflecting surface	2	Photo Reflective Sensor Single Tr. High sensitivity 4 pin

IC Output Type

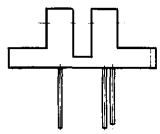
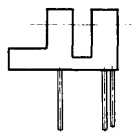
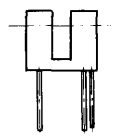
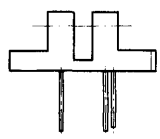
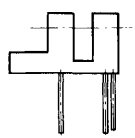
Part Number	Outline	Characteristics (T_a = 25°C) I_{FLH} (mA)	V_{CC} (V)	Features
PS5001HC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger circuit Active "HIGH" Open collector output Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5002HC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger circuit Active "HIGH" Open collector output Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5003HC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger circuit Active "HIGH" Open collector output Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5001HR		to 5	5	Built-in Schmitt Trigger circuit Active "HIGH" Built-in pull up resistor Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5002HR		to 5	5	Built-in Schmitt Trigger circuit Active "HIGH" Built-in pull up resistor Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin

Photo Interrupters (cont.)
IC Output Type (cont.)

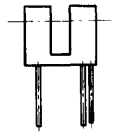
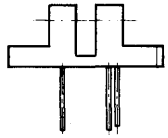
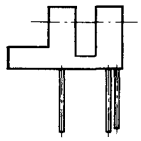
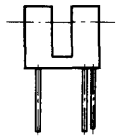
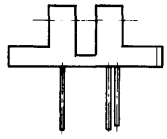
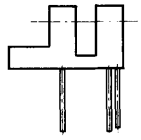
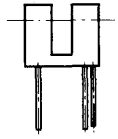
Part Number	Outline	Characteristics (T_a = 25°C) I_{FLH} (mA)	Characteristics (T_a = 25°C) V_{CC} (V)	Features
PS5003HR		to 5	5	Built-in Schmitt Trigger circuit Active "HIGH" Built-in pull up resistor Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5001LC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger circuit Active "LOW" Open collector output Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5002LC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger circuit Active "LOW" Open collector output Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5003LC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger circuit Active "LOW" Open collector output Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5001LR		to 5	5	Built-in Schmitt Trigger circuit Active "LOW" Built-in pull up resistor Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5002LR		to 5	5	Built-in Schmitt Trigger circuit Active "LOW" Built-in pull up resistor Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5003LR		to 5	5	Built-in Schmitt Trigger circuit Active "LOW" Built-in pull up resistor Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin

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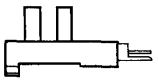
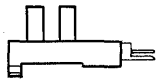
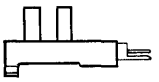
Photo Interrupters (cont.)
IC Output Type (cont.)

Part Number	Outline	Characteristics (T_a = 25°C) V_{OH} (mA)	Condition	Features
PS5501HC-1		V_{CC}×0.8 to	opened aperture R_L=47 kΩ	Built-in Schmitt Trigger circuit Housing with a connector** Active "HIGH" Open collector output Aperture: 0.5 mm slit 3 pin
PS5501HR-1		V_{CC}×0.8 to	opened aperture	Built-in Schmitt Trigger circuit Housing with a connector** Active "HIGH" Built-in pull up resistor Aperture: 0.5 mm slit 3 pin
PS5501LC-1		V_{CC}×0.8 to	closed aperture R_L=47 kΩ	Built-in Schmitt Trigger circuit Housing with a connector** Active "LOW" Open collector output Aperture: 0.5 mm slit 3 pin
PS5501LR-1		V_{CC}×0.8 to	closed aperture	Built-in Schmitt Trigger circuit Housing with a connector** Active "LOW" Built-in pull up resistor Aperture: 0.5 mm slit 3 pin

**CONNECTOR: EI 3 pin series 17825-3 made by AMP

Fiber Optic Datalinks

Part Number	Description
NEOLINK-0101R	Receiver, DC- 1MB/s, FC/D3, MM, TTL
NEOLINK-0101TD	Transmitter, DC- 1MB/s, FC/D3, MM, TTL
NEOLINK-0201	Transceiver, DC- 2MB/s, TTL, ODS109
NEOLINK-02B1CAD	Transceiver, RS232C, DCE, D4, MM, Async
NEOLINK-02B1CSD	Transceiver, RS232C, DCE, D4, MM, Sync
NEOLINK-02B1TAD	Transceiver, RS232C, DTE, D4, MM, Async
NEOLINK-02B1TSD	Transceiver, RS232C, DTE, D4, MM, Sync
NEOLINK-0301R	Receiver, DC- 3MB/s, SX, MM, TTL
NEOLINK-0301TFT	Transmitter, DC- 3MB/s, SX, MM, TTL
NEOLINK-1311R	Receiver, 10–130MB/s, SX, MM, ECL
NEOLINK-1312	Transceiver, 125MB/s, for FDDI
NEOLINK-2012RD	Receiver, 40–200MB/s, SX, MM, ECL
NEOLINK-2012TD	Transmitter, DC- 200MB/s, SX, MM, ECL
NEOLINK-3501R	Receiver, DC- 35MB/s, SX, MM, TTL
NEOLINK-3501T	Transmitter, DC- 35MB/s, SX, MM, TTL

Passive Devices

Acousto-Optic Modulators

Item/Specifications	OD8810	OD8811	OD8813	OD8823 (Integrated Driver)
Active aperture	2 mm	1 mm	1 mm	0.45 mm
Center carrier frequency	80 MHz		140 MHz	80 MHz
DC contrast ratio	>1000:1			
Rise time	<170 ns (beam waist 800 μm)	<40 ns (beam waist 150 μm)	<15 ns (beam waist 80 μm)	<5 ns (beam waist 150 μm)
Deflection efficiency	<80% (at 633 nm)			
Temperature stability	0.1%/°C			8% (5–50°C)
Input impedance	50 Ω			TTL
Weight	45g			60g

Acousto-Optic Modulator Drivers

Type	OD8802A	OD8802G	OD8802B	OD8802C	OD8802F	OD8802K
Carrier frequency	140 MHz				80 MHz	
RF output power	>1.3W		>0.8W		>0.6W	
Impedance	50 Ω					
Input interface*	TTL	A	TTL	A	TTL	A
Carrier leakage	<–25dB		<–30dB		<–30dB	
Rise time, Fall time	<15 ns					
Power Supply	AC100V <25VA		DC + 24V <0.5A		DC + 24V <0.5A	
Dimensions	W 148 H 100 D 230mm		W 67 H 30 D 87mm		W 67 H 30 D 87mm	
Weight	<2.5kg		<500g		<500g	
Input connector	BNC					
Output connector	BNC					
Recommended modulators	OD8813				OD8810 & OD8811	

*A: Analogue (0 ~ 5V) Input impedance 50Ω

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Fiber Optic Attenuators

Model	Type	Attenuation Range	Wavelength Region	Fiber Used	Connector Used	Dimensions (mm)
OD8511	Continuously Variable	0 ~ 64 dB or more (excluding insertion loss)	0.8 μm or 1.3 μm band	GI-50 SI-80	D4 or FC	100 (W) × 74 (H) × 42 (D)
			1.3 μm or 1.5 μm band	SI-10		115 (W) × 76 (H) × 62 (D)
OD8501	Step Variable	Combination of 3 dB, 7 dB and 17 dB elements	0.8 μm or 1.3 μm band	GI-50 SI-80	D4 or FC	20 (W) × 20 (H) × 40 (D)
OD8560	Fixed	5 ±1.5 dB, 10 ±1.5 dB, 15 ±2.0 dB, 20 ±2.0 dB	1.3 μm or 1.5 μm band	SI-10	D4 or FC	φ10 × 34 (FC) φ9 × 34 (D4)
OD8570	Fixed	3 ±0.5 dB, 5 ±1.0 dB, 10 ±1.5 dB, 15 ±1.5 dB, 20 ±2.0 dB, 30 ±2.5 dB	0.8 μm or 1.3 μm band	GI-50	FC	φ10 × 34
OD9701	Fixed	3 ±0.5 dB, 5 ±1.0 dB, 10 ±1.5 dB, 15 ±1.5 dB, 20 ±2.0 dB, 30 ±2.5 dB	0.8 μm or 1.3 μm band	GI-50 SI-80	D4	φ9 × 34
OD8565	Fixed	5 ±1.5 dB, 10 ±1.5 dB, 15 ±2.0 dB, 20 ±2.0 dB	1.3 μm or 1.5 μm band	SI-10	D4PC or FCPC	φ10 × 34 (FC) φ9 × 34 (D4)

Fiber Optic Cable Assemblies

Part Number	Description
OD9370B3B06Y	Patchcord, FC, MM, 6M
OD9370B3B06Y-M	Patchcord, FC, MM, 6M, Master
OD9370PCB3B06Y	Patchcord, FCPC, MM, 6M
OD9370PCB3B06Y-M	Patchcord, FCPC, MM, 6M, Master
OD9371B33B06Y	Patchcord, FC, SM, 6M
OD9371B33B06Y-M	Patchcord, FC, SM, 6M, Master
OD9371PCB3B06Y	Patchcord, FCPC, SM, 6M
OD9371PCB3B06Y-M	Patchcord, FCPC, SM, 6M, Master
OD9373B3B06Y	Patchcord, D3, MM, 6M
OD9373B3B06Y-M	Patchcord, D3, MM, 6M, Master
OD9373PCB3B06Y	Patchcord, D3PC, MM, 6M
OD9373PCB3B06Y-M	Patchcord, D3PC, MM, 6M, Master
OD9374B3B06Y	Patchcord, D3, SM, 6M
OD9374B3B06Y-M	Patchcord, D3, SM, 6M, Master
OD9374PCB3B06Y	Patchcord, D3PC, SM, 6M
OD9374PCB3B06Y-M	Patchcord, D3PC, SM, 6M, Master
OD9438B1B3B06Y	Patchcord, DX, MM, 6M, Plastic
OD9470B3B06Y	Patchcord, D4, MM, 6M
OD9470B3B06Y-M	Patchcord, D4, MM, 6M, Master

Part Number	Description
OD9470PCB3B06Y	Patchcord, D4PC, MM, 6M
OD9470PCB3B06Y-M	Patchcord, D4PC, MM, 6M, Master
OD9474B3B06Y	Patchcord, D4, SM, 6M
OD9474B3B06Y-M	Patchcord, D4, SM, 6M, Master
OD9474PCB3B06Y	Patchcord, D4PC, SM, 6M
OD9474PCB3B06Y-M	Patchcord, D4PC, SM, 6M, Master
OD9476B3B06Y	Patchcord, D4, MM, 6M, Plastic
OD9478B3B06Y	Patchcord, SX, MM, 6M, Plastic
ODS03506Y	Patchcord, FC/D4, SM, 6M
ODS035PC06Y	Patchcord, FCPC/D4PC, SM, 6M
ODSS05506Y	Patchcord, D3/D4, SM, 6M
ODS055PC06Y	Patchcord, D3PC/D4PC, SM, 6M
ODS05606Y	Patchcord, D3/D4, MM, 6M
ODS056PC06Y	Patchcord, D3PC/D4PC, MM, 6M
ODS07006Y	Patchcord, FC/D4, MM, 6M
ODS070PC06Y	Patchcord, FCPC/D4PC, MM, 6M
ODS10906Y	Patchcord, 6M, for NEOLINK ODN0201
ODS12106Y	Patchcord, SX/D4, MM, 6M
ODS148B106Y	Patchcord, SX/DX, MM, 6M, Plastic

Fiber Optic Connectors

Part Number	Description
OD9311BF	Ferrule, FC, MM, 125 μm (needs OD9321)
OD9312BE	Ferrule, D3, SM, 125 μm
OD9313BF	Ferrule, D3, MM, 125 μm
OD9314BE	Ferrule, FC, SM, 125 μm (needs OD9321)
OD9321	Housing, FC, MM or SM
OD9384	Through Adapter, D3 or FC, MM or SM
OD9390	Receptacle, D3 or FC, MM
OD9411BF	Ferrule, D4, MM, 125 μm (needs OD9420)
OD9414BE	Ferrule, D4, SM, 125 μm (needs OD9424)
OD9416B	Ferrule, D4, MM, 125 μm, Plastic
OD9416G	Ferrule, D4, MM, 140 μm, Plastic
OD9416H	Ferrule, D4, MM, 250 μm, Plastic
OD9418B	Ferrule, SX, MM, 125 μm, Plastic
OD9418G	Ferrule, SX, MM, 140 μm, Plastic
OD9418H	Ferrule, SX, MM, 250 μm, Plastic
OD9420	Housing, D4, MM
OD9421	Housing, D4, MM, Bulkhead Mount
OD9424	Housing, D4, SM
OD9428B1	Ferrule, DX, MM, 125 μm, Plastic
OD9428G1	Ferrule, DX, MM, 140 μm, Plastic
OD9428H1	Ferrule, DX, MM, 250 μm, Plastic
OD9430	Housing, Rackmount, D4, MM or SM, Male
OD9431	Housing, Rackmount, D4, MM, Female
OD9432	Housing, Rackmount, D4, SM, Female

Part Number	Description
OD9440-12	Housing, 12 Channel, D4, MM, Round, Male
OD9440-4	Housing, 4 Channel, D4, MM, Round, Male
OD9441-12	Housing, 12 Channel, D4, MM, Round, Female
OD9441-4	Housing, 4 Channel, D4, MM, Round, Female
OD9450-12	Housing, 12 Channel, D4, MM, Square, Male
OD9450-4	Housing, 4 Channel, D4, MM, Square, Male
OD9451-12	Housing, 12 Channel, D4, MM, Square, Female
OD9451-4	Housing, 4 Channel, D4, MM, Square, Female
OD9464PCBE	Ferrule, D4PC, SM, Quik Connect
OD9480	Through Adapter, D4, MM
OD9481	Through Adapter, FC, Female/D4 Male
OD9482	Through Adapter, FC Male/D4 Female
OD9483M	Through Adapter, FC Male/D4 Male, MM
OD9483S	Through Adapter, FC Male/D4 Male, SM
OD9484	Through Adapter, D4, SM
OD9485	Through Adapter, D4, MM, Plastic
OD9486	Through Adapter, DX, MM, Plastic
OD9487	Through Adapter, SX/DX, MM, Plastic
OD9488	Through Adapter, SX, MM, Plastic
OD9489D	Through Adapter, D4, MM, Hermetic
OD9490	Receptacle, D4, MM (for 11mm OD max)
OD9495	Receptacle, D4, MM, Plastic
OD9498	Receptacle, SX, MM, Plastic

Fiber Optic Couplers/Splitters/Line Monitors

Model	Type	Available Splitting Ratios	Excess Insertion Loss (dB)	Isolation (dB)	I/O Port Type	Dimensions (mm)
OD8601	3 ports	1:1, 10:1, 100:1	<2	>15*	Receptacle	20 × 16 × 20
OD8607	3 ports (for SMF)	1:1, 10:1	<2	>40	Pigtail	69 × 11 × 14
OD8650	3 ports Built-in detector	1:1, 10:1, 100:1 Monitor current: 0.2 A/W*	<2	—	Receptacle	20 × 16 × 20

*With 1:1 splitting ratio

Fiber Optic Switches

Type	Designation	I/O Port	Insertion Loss (dB)	Crosstalk (dB)	Switching Time (msec)	Switching	Rated Voltage/Current (V/mA)	Dimensions (mm)
1 × 2	OD8752	Receptacle	≦1.8	≦-60	≦20	Latching	12/60	50 × 40 × 20
2 × 2	OD8764	Receptacle	≦20	≦-60	≦40	Momentary	12/40	50 × 40 × 20
2 × 2	OD8781	Pigtail	≦20	≦-60	≦40	Momentary	5/40	40 × 30 × 9

Fiber Optic Termination Equipment and Supplies

Part Number	Description
OD9500B	Kit, Termination, D4, MM, 125 μm
OD9508B	Kit, Termination, SX/DX, MM, 125 μm
OD9508G	Kit, Termination, SX/DX, MM, 140 μm
OD9508H	Kit, Termination, SX/DX, MM, 250 μm
OD9510	Kit, Termination, D4PC, SM, Quik-Connect
OD9610CBB	Polish Machine, for D3
OD9610DBB	Polish Machine, for D4, SX, DX
OD9610FBB	Polish Machine, for FC
OD9620	Oven, Epoxy Curing, for FC, D3, D4, SX, DX
OD9640	Kit, Hand Polish, for FC, D3, D4, SX, DX
OD9641A	Kit, Machine Polish, for D3, D4, SX, DX
OD9641B	Kit, Machine Polish, for FC
OD9641E	Kit, Machine Polish, for D3PC, D4PC
ODS044	Collet Chuck, 2.5 mm, for FC, D3
ODS045	Tool, Hand Polish, for DX
ODS046	Assembly Jig, for plastic D4, SX
ODS047	Epoxy, for FC, D3, D4 Kevlar bonding
ODS048	Tool, Crimp, for plastic D4, SX
ODS050	Ferrule Selector, for FC, D3, D4
ODS058	Tool, Crimp, for DX (DIB cable only)
ODS059	Adapter, Polish Machine, for DX

Part Number	Description
ODS060	Assembly Jig, for SX housing
ODS061	Assembly Jig, for OD9430
ODS063	Assembly Jig, for D4 housing
ODS064	Assembly Jig, for D4 ferrule
ODS066	Collet Chuck, 2.0 mm, for D4, SX
ODS067	Tool, Hand Polish, for D4, SX
ODS068	Tool, Hand Polish, for D3
ODS069	Assembly Jig, for plastic D4 housing
ODS071	Assembly Jig, for OD9495, OD9498
ODS074	Epoxy, for FC, D3, D4, SX, DX fiber bond
ODS088	Disk, Polish Machine, for FC, D3, D4
ODS101	Assembly Jig, for D3 housing
ODS102	Assembly Jig, for D3 ferrule
ODS103	Powder, Buff, for D3PC, D4PC
ODS110	Film, Hand Polish, for D3, D4, SX, DX
ODS111	Film, Hand Buff, for D3, D4
ODS112	Powder, Buff, for D3, D4
ODS113	Film, Machine Polish, for FC
ODS114	Film, Machine Polish, for D3, D4, SX, DX
ODS115	Film, Machine Buff, for FC, D3, D4

Fiber Optic Wavelength Division Multiplexers/Bandpass Filters

				Specifications	
No. of Ch	Wavelength Allocation (nm)	Type	Bandwidth (nm)	Insertion Loss (dB)	Isolation (dB)
1	1300, etc.	OD8670	±10/±20	<3.5	—
	850/1300	OD8679A	850 ± 60 1300^{+50}_{-50}	<2	>30
	1200/1300	OD8679B,C	1200 ± 25 1300 ± 25	<2 <3	>25 >50
	780/880 (LED) 800/890 (LD)	OD8679D,E	780^{+30}_{-40} 880^{+50}_{-10}	<2 <3	>25 >60
	1310/1550 (for SMF)	OD8690A,B,C	1310^{+30}_{-40} 1550^{+30}_{-40}	<2.5	>60

Optical Isolators

Model Number	Wavelength (nm)	Insertion Loss (dB)	Isolation (dB)	Beam Dia. (mm)	Faraday Material	Dimensions (mm)
OD8312	850	≦1.5	≧25	Max. 2	Paramagnetic glass	24 × 23 × 35
OD8313B	1300	≦1.5	≧20	Max. 2	YIG crystal	10 × 14 × 13
OD8313C	1550	≦1.5	≧20	Max. 2	YIG crystal	10 × 14 × 13

Optoisolator Cross Reference

General Instruments

Type No.	NEC	Notes
CNY17-1	PS2601	2,3
CNY17-2	PS2601	2,3
CNY17-3	PS2601	2,3
CNY17-4	PS2601	2,3
CNY17-1Z	PS2621	2,3
CNY17-2Z	PS2621	2,3
CNY17-3Z	PS2621	2,3
CNY17-4Z	PS2621	2,3
CNX35	PS2601	1
GIC5102	PS2501-1	1
GIC5102-2	PS2501-2	1
GIC5102-3	PS2501-3	1
GIC5102-4	PS2501-4	1
H11A1Z	PS2601	1
H11AA1	PS2601	1
H11AA2	PS2606	1
H11AA3	PS2606	1
H11AA4	PS2606	1
H11D1/1Z	PS2621	2
H11D2/1Z	PS2621	2
H11D3/3Z	PS2621	2
H11G1	PS2633	2
H11G2	PS2633	1
H11G3	PS2633	1
MCA11G1	PS2633	2
MCA11G2	PS2633	1
MCA11G3	PS2633	1
MCA230	PS2603	2
MCA231	PS2603	2
MCA255	PS2603	2
MCL2501	PS2043	1
MCL2502	PS2043	1
MCL2503	PS2043	1
MCT2	PS2601	2
MCT2E	PS2601	2
MCT210	PS2601	2
MCT26	PS2601	1
MCT270	PS2621	2
MCT271	PS2601	2
MCT272	PS2601	2
MCT274	PS2601	2
MCT275	PS2601	2
MCT276	PS2621	2
MCT277	PS2601	2
MCT4	PS1001	4
MCT4R	PS1001	4
MCT6	PS2501-2	4
MCT61	PS2501-2	4
MCT62	PS2501-2	4
MCT66	PS2501-2	4

GE/RCA

Type No.	NEC	Notes
CNY17-I	PS2601	2
CNY17-II	PS2601	2
CNY17-III	PS2601	2
CNY17-IV	PS2601	2
CNY30	PS3001	1
CNY31	PS2502-1	1
CNY32	PS2501-1	1
CNY35	PS2605	1
CNY47	PS2010	1
CNY47A	PS2010	1
CNY48	PS2603	1
CNY51	PS2601	1
GEPS2001	PS2010	1
GFH600-I	PS2601	1
GFH600-II	PS2601	1
GFH600-III	PS2601	1
GFH601-I	PS2010	2
GFH601-II	PS2601	1
GFH601-III	PS2601	1
GFH601-IV	PS2601	1
H11A1	PS2601	1
H11A2	PS2010	1
H11A3	PS2010	2
H11A4	PS2010	1
H11A5	PS2010	1
H11A10	PS2010	1
H11A520	PS2601	2
H11A550	PS2601	2
H11A5100	PS2601	1
H1AA1	PS2605	2
H11AA2	PS2605	2
H11AA3	PS2605	1
H11AA4	PS2605	1
H11AG1	PS2601	2
H11AG2	PS2601	2
H11AG3	PS2601	2
H11AV1	PS2601	2
H11AV2	PS2601	2
H11AV3	PS2601	2
H11AV1A	PS2651	2
H11AV2A	PS2651	2
H11AV3A	PS2651	2
H11B1	PS2603	1
H11B2	PS2603	1
H11B3	PS2603	1
H11B255	PS2603	2
H11C1	PS3001(1)	2
H11C2	PS3001(1)	1
H11C3	PS3001(1)	2
H11C4	PS3002(1)	2
H11C5	PS3002(1)	1
H11C6	PS3002(1)	2
H11G1	PS2633	2
H11G2	PS2633	2
H11G3	PS2633	2
H11G45	PS2633	2
H11G46	PS2633	2
H11L1	PS2007B	4
H11L2	PS2007B	4
H11L3	PS2007B	4
H11N1	PS2007B	4
H11N2	PS2007B	4
H11N3	PS2007B	4
H24A1	PS2501-1	3
H24A2	PS2501-1	3
H24B1	PS2502-1	3
H24B2	PS2502-1	3
H74A1	PS2601	1
H74C1	PS3001(1)	1
H74C2	PS3002(1)	1

JEDEC

Type No.	NEC	Notes
4N25	PS2010	1
4N25A	PS2010	1
4N26	PS2010	1
4N27	PS2010	1
4N28	PS2010	1
4N29	PS2603	1
4N29A	PS2603	1
4N30	PS2603	1
4N31	PS2603	1
4N32	PS2603	1
4N32A	PS2603	1
4N33	PS2603	1
4N35	PS2601	1
4N36	PS2601	1
4N37	PS2601	1
4N38	PS2601	1
4N38A	PS2601	1
4N39	PS3001(1)	1
4N40	PS3002(1)	1
6N135	PS2043	1
6N136	PS2043	1
6N137	PS2007B	1

Motorola

Type No.	NEC	Notes
CNY17-1	PS2601	2
CNY17-2	PS2601	2
CNY17-3	PS2601	2
CNY17-4	PS2601	2
H11AA1	PS2603	2
H11AA2	PS2603	2
H11AA3	PS2603	2
H11AA4	PS2603	2
H11A1	PS2601	2
H11A2	PS2601	2
H11A3	PS2601	2
H11A4	PS2601	2
H11A5	PS2601	2
H11AV1,A	PS2651	2
H11AV2,A	PS2651	2
H11AV3,A	PS2651	2
H11B1	PS2653	2
H11B2	PS2653	2
H11B3	PS2653	2
H11C1	PS3001	2
H11C2	PS3001	2
H11C3	PS3001	2
H11C1	PS3002	2
H11C2	PS3002	2
H11C3	PS3002	2
H11L1	PS2007B	4
H11L2	PS2007B	4
MCT2	MCT2	1
MOC119	PS2604	1
MOC1005	PS2601	2,3
MOC1006	PS2601	2,3
MOC3000	PS3002	2
MOC3001	PS3002	2
MOC3002	PS3002	2
MOC3003	PS3002	2
MOC3007	PS3001	1
MOC5007	PS2007B	4
MOC5008	PS2007B	4
MOC5009	PS2007B	4
MOC8020	PS2604	2
MOC8021	PS2604	2
MOC8030	PS2604	2
MOC8050	PS2604	2
MOC8100	PS2601	1
MOC8111	PS2602	2
MOC8112	PS2602	2
MOC8113	PS2602	2

NOTES:
(1) Direct replacement.
(2) Equivalent (minor electrical difference).
(3) Equivalent (minor mechanical difference).
(4) Call NEC.

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Optoisolator Cross Reference (cont.)

Sharp

Type No.	NEC	Notes
PC3Q14	PS2705-4	1
PC3Q15	PS2702-4	1
PC3Q16	PS2701-4	1
PC3Q17	PS2703-4	1
PC4N25V	PS2010	1
PC4N26V	PS2010	1
PC4N27V	PS2010	1
PC4N28V	PS2010	1
PC4N29V	PS2604	1
PC4N30V	PS2604	1
PC4N32V	PS2603	1
PC4N33V	PS2603	1
PC4N35V	PS2601	1
PC4N36V	PS2601	1
PC4N37V	PS2601	1
PC110	PS2601	1
PC111	PS2602	1
PC112	PS2651	1
PC113	PS2652	1
PC511	PS2501L1	1
PC702V	PS2601	1
PC703V	PS2601	1
PC713V	PS2601	1
PC714V	PS2602	1
PC715V	PS2603	1
PC716V	PS2603	1
PC723V	PS2601	1
PC725	PS2633	1
PC733	PS2605	1
PC733H	PS2625	1
PC810	PS2403-1	2
PC812	PS2501-1	1
PC813	PS2505-1	1
PC814	PS2505-1	3
PC815	PS2502-1	1
PC816	PS2501-1	1
PC817	PS2501-1	1
PC818	PS2501-1	1
PC823	PS2505-2	1
PC824	PS2505-2	1
PC826	PS2501-2	1
PC827	PS2501-2	1
PC829	PS2501-2	1
PC835	PS2502-2	1
PC837	PS2501-3	1
PC843	PS2505-4	1
PC844	PS2505-4	1
PC845	PS2502-4	1
PC847	PS2501-4	1
PC849	PS2501-4	1
PC851	PS2501-1	1
PC910	PS2007B	1
S12MD1	PS3002	1
PC314Z	PS2705-1	1
PC315Z	PS2702-1	1
PC316Z	PS2701-1	1
PC317Z	PS2703-1	1
PC3D14	PS2705-2	1
PC3D15	PS2702-2	1
PC3D16	PS2701-2	1
PC3D17	PS2703-2	1

Siemens

Type No.	NEC	Notes
CNY17-1	PS2621	3
CNY17-2	PS2601	2,3
CNY17-3	PS2601	2,3
CNY17-4	PS2601	2,3
CNY17F-1	PS2622	3
CNY17F-2	PS2602	2,3
CNY17F-3	PS2602	2,3
H11C4	PS3603	2
H11C5	PS3603	2
H11C6	PS3602(1)	2
IL1	PS2621	3
IL2	PS2601	2,3
IL5	PS2621	2,3
IL30	PS2603	3
IL31	PS2603	3
IL55	PS2603	3
IL74	PS2601	3
IL101	PS2007B	3
IL201	PS2601	2
IL202	PS2601	2
IL203	PS2601	2
IL205	PS2703	4
IL206	PS2703	4
IL207	PS2703	4
IL211	PS2701	4
IL212	PS2701	4
IL213	PS2701	4
IL215	PS2701	4
IL216	PS2701	4
IL217	PS2701	4
IL221	PS2702	2,3
IL222	PS2702	2,3
IL223	PS2702	2,3
IL250	PS2606	2,3
IL251	PS2606	2,3
IL252	PS2606	2,3
IL400	PS3603	2,3
ILCT6	PS2505-2	2,3
ILD1	PS2505-2	2,3
ILD2	PS2505-2	2,3
ILD5	PS2505-2	2,3
ILD30	PS2506-2	2,3
ILD31	PS2506-2	2,3
ILD32	PS2506-2	2,3
ILD55	PS2506-2	2,3
ILD610-1	PS2506-2	2,3
ILD610-2	PS2505-2	2,3
ILD610-3	PS2505-2	2,3
ILD610-4	PS2505-2	2,3
ILD74	PS2505-2	2,3
ILQ1	PS2505-4	2,3
ILQ2	PS2505-4	2,3
ILQ5	PS2505-4	2,3
ILQ30	PS2506-4	2,3
ILQ32	PS2506-4	2,3
ILQ55	PS2506-4	2,3
ILQ74	PS2505-4	2,3
SFH600-0	PS2601	2
SFH600-1	PS2601	2
SFH600-2	PS2601	2
SFH600-3	PS2601	2
SFH601-1	PS2651	2
SFH601-2	PS2651	2
SFH601-3	PS2651	2
SFH601-4	PS2651	2
SFH601G-1	PS2651	2,3
SFH601G-2	PS2651	2,3
SFH601G-3	PS2651	2,3
SFH601G-4	PS2651	2,3
SFH609-1	PS2651	2
SFH609-2	PS2651	2
SFH609-3	PS2651	2
SFK610-1	PS2501	2
SFK610-2	PS2501	2
SFK610-3	PS2501	2
SFK610-4	PS2501	2
SFK611-1	PS2505	2
SFK611-2	PS2505	2
SFK611-3	PS2505	2
SFK611-4	PS2505	2

Toshiba

Type No.	NEC	Notes
TLP504A	PS2501-2	4
TLP520	PS2505-1	1
TLP520-2	PS2505-2	1
TLP520-4	PS2505-4	1
TLP521-1	PS2501-1	1
TLP521-2	PS2501-2	1
TLP521-4	PS2501-4	1
TLP523	PS2502-1	1
TLP523-2	PS2502-2	1
TLP523-4	PS2502-4	1
TLP530	PS2605	1
TLP531	PS2601	1
TLP532	PS2602	1
TLP535	PS2601	1
TLP541G	PS3002	1
TLP550	PS2044	1
TLP551	PS2043	1
TLP552	PS2007B	2
TLP570	PS2604	1
TLP571	PS2603	1
TLP572	PS2604	1
TLP575	PS2603	1
TLP580	PS2602	4
TLP581	PS2601	4
TLP620	PS2505-1	1
TLP620-2	PS2505-2	1
TLP620-4	PS2505-1	1
TLP621	PS2501-1	1
TLP621-2	PS2501-1	1
TLP621-4	PS2501-2	1
TLP630	PS2605	1
TLP631	PS2601	1
TLP641G	PS3002	1

NOTES:
(1) Direct replacement.
(2) Equivalent (minor electrical difference).
(3) Equivalent (minor mechanical difference).
(4) Call NEC.

Optoelectronics Cross Reference (cont.)

Sensors and IR Emitters

General Instrument	NEC	Notes
MEK730	SE303A	2, 3
MEK760	SE303A	2, 3
MTS360	PH108	2, 3
MTS460	PH108	2, 3
MTS361	PH108	2, 3
MTS461	PH108	2, 3
ME60	SE302A	2, 3
ME61	SE302A	2, 3
ME7161	SE302A	2, 3
Motorola	**NEC**	**Notes**
MLED60	SE302A	2, 3
MLED90	SE302A	2, 3
OKI	**NEC**	**Notes**
OLD122	SE301A	2, 3
OLD124	SE301A	2, 3
Sharp	**NEC**	**Notes**
GL503	SE301A	2, 3
GL504	SE301A	2, 3
GL50G	SE301A	2, 3
GLE503	SE301A	2, 3
GLE503F	SE301A	2, 3
Siemens	**NEC**	**Notes**
IRL-60	SE302A	2, 3
IRL-61	SE302A	2, 3
IRL-80	SE308	2, 3
IRL-81	SE308	4
LD-271	SE303A	2, 3
LD-274	SE307	2, 3
SFH-400	SE301A	2, 3
SFH-401	SE301A	2, 3
Telefunken	**NEC**	**Notes**
CQY32	SE301A	2, 3
CQY34	SE301A	2, 3
CQY35	SE301A	2, 3
CQY37	SE302A	2, 3
Texas Instruments	**NEC**	**Notes**
TIL38	SE313	2, 3
TIL39	SE307	2, 3
TIL40	PH302/PH302C	2, 3
TIL411	PH104	2, 3
TIL412	PH103	2, 3
TIL413	PH309	2, 3
TIL415	PH108	2, 3
TIL416	PH103	2, 3
Toshiba	**NEC**	**Notes**
TLN101	SE301A	2, 3
TLN103	SE301A	2, 3
TRW	**NEC**	**Notes**
OP135	SE301A	2, 3
OP135W	SE301A	2, 3
OP136	SE301A	2, 3
OP136W	SE301A	2, 3
OP140	SE308	2, 3
OP168F	SE308	2, 3
OP169	SE310	2, 3
OP240	SE312	2, 3
OP260	SE1003	2, 3
OP500	PH105	2, 3
OP501	PH108	2, 3
OP508	PH108	2, 3
OP509	PH110	2, 3
OP530	PH103	2, 3
OP538	PH108	2, 3
OP550	PH112	2, 3
OP556	PH108	2, 3

Notes: (1) Direct replacement.
(2) Equivalent (minor electrical difference).
(3) Equivalent (minor mechanical difference).
(4) Call NEC.

NEC

CONSUMER ICs

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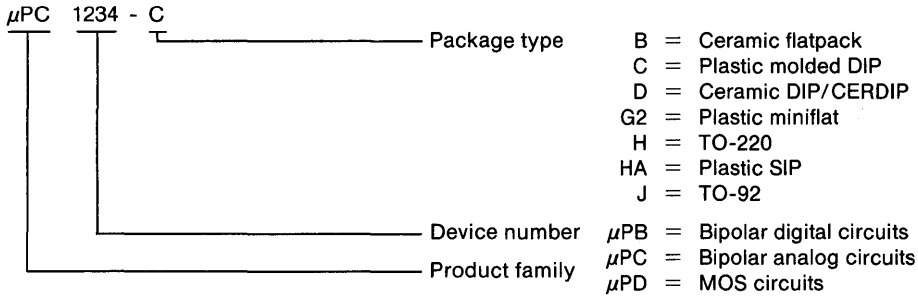
Part Numbering System



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Audio ICs

Radio/Cassette ICs

Number	Application	Description	Supply Voltage (V)	Package
μPC1245V	Car	FM-IF with Differential Peak Detector	7 to 15	19 V-DIP
μPC1265G	Car	One Chip FM Tuner	8 to 15	28 MF
μPC1276G	Car	FM Front End	7.5 to 10	20 MF
μPC1295C	Portable	Motor Speed Control	±9 to ±12	14 DIP
μPC1297CA	Portable	Dolby HX Pro System	8 to 18	18 S-DIP
μPC1322CA	Car	AM Radio Receiver	7.5 to 9	30 S-DIP
μPC1344GT	Car	AM Radio Receiver	7.5 to 8.5	28 MF
μPC1287G	Car	FM Stereo Demodulator with Noise Canceller	7.5 to 9.5	24 MF
μPC1252HA2	HiFi	VCA for dbx Noise Reduction	±4 to ±15	8 SIP
μPC1253HA2	HiFi	RMS Sensor for dbx Noise Reduction	±4 to ±15	8 SIP
μPC1275G	Portable	Dual Dolby B-Type Noise Reduction	1.8 to 3.6	24 MF
μPC1285CA	HiFi, Car	Dolby C-Type Noise Reduction	7.5 to 13	30 S-DIP

Power Amplifier Circuits

Number	Application	Description	Supply Voltage (V)	Package
μPC1228HA	Car	Dual Preamplifier	6 to 16	8 SIP
μPC1237HA	Car, HiFi	Protector	25 to 60	8 SIP
μPC1270H	Car, HiFi	30 to 50W Power Amplifier Driver	±18 to ±36	10 SIP
μPC1298V	Car, HiFi	50 to 80W Power Amplifier Driver	±20 to ±46	14 V-DIP
μPC1308V	Car	18W, Stand-by Switch	9 to 16	14 V-DIP
μPC1310V	Car	7W, Stand-by Switch	9 to 16	14 V-DIP
μPC1313HA	Portable	Dual Preamplifier with ALC	4 to 15	9 SIP
μPC1318AV	Car	23W, Stand-by Switch	9 to 16	14 V-DIP
μPC1335V	Home	20W Dual	6 to 20	14 V-DIP
μPC1342V	Car, HiFi	50 to 110W Power Amplifier Driver	±20 to ±52	14 V-DIP
μPC2002V	Car	5.4W	8 to 18	5 V-DIP
μPC2500H	Car	45W, 2Ω Load	9 to 16	12 SIP
μPC2502V	Car	19W, Dual, BTL	9 to 16	15 V-DIP

Audio ICs (cont)

Phase Locked Loops

Number	Description	Package
μPD2833C	Up to 900 MHz Frequency Synthesis	18 DIP
μPD2834C	Up to 500 MHz Frequency Synthesis	18 DIP
μPD2835/6C/G	PLL + Prescaler for Use with 1484/5/6/7	18 S-DIP/20 MF

Prescalers

Number	Description	Supply Voltage (V)	Package
μPB551C	÷10/11, ÷20/22, ÷40/44 (150 MHz)	4.5 to 5.5	8 DIP
μPB552C	÷10/11 (50 MHz), ÷20/22, ÷40/44 (150 MHz)	2.8 to 4.5	8 DIP
μPB553AC	÷16/17 (155 MHz)	4.5 to 5.5	8 DIP
μPB554C	÷10/11 (50 MHz), ÷20/22, ÷40/44 (150 MHz)	4.5 to 5.5	8 DIP
μPB555C	÷8/9, ÷16/17, ÷32/33 (150 MHz)	4.5 to 5.5	8 DIP
μPB556C	÷16/17 (150 MHz)	2.55 to 4.5	8 DIP
μPB562AC/HA	÷64/68 (500 MHz), ÷128/136 (1 GHz)	4.5 to 5.5	8 DIP
μPB564C	÷64, ÷128, ÷256 (1.3 GHz)	4.5 to 5.5	8 DIP
μPB565C	÷2 (500 MHz), ÷4, ÷8, ÷64 (1 GHz)	4.5 to 5.5	8 DIP
μPB566AC	÷64/65, ÷128/129 (980 MHz)	4.8 to 5.2	8 DIP
μPB567HA	÷8 (1 GHz)	4.5 to 5.5	7 SIP
μPB568C/HA/G	÷64/68 (500 MHz), ÷128/136 (1 GHz)	4.5 to 5.5	8 DIP/8 S-SIP/8 MF
μPB569C/G	÷32/33, ÷64/65 (550 MHz)	2.9 to 5.5	8 DIP/8 SOP
μPB571C	÷16/17, ÷32/33, ÷64/65 (500 MHz)	4.5 to 5.5	8 DIP
μPB572C	÷20/21, ÷40/41, ÷80/81 (500 MHz)	4.5 to 5.5	8 DIP

Digital Tuning Systems: μPD1700 Series

Type No.	μPD1701*	μPD1703*	μPD1704*	μPD1705*	μPD1706*	μPD1707	μPD1708
Main use	Radio, tuner	Radio, tuner	Radio, tuner	TV, CATV	Portable radio, radio cassette	Hi-Fi tuner, TV, CATV	Car radio tunder
Package	28-pin DIP (400 mil)	28-pin DIP (400 mil)	42-pin DIP (600 mil)	42-pin DIP (600 mil)	64-pin flatpack	52-pin flatpack	52-pin flatpack
Supply voltage	5 V ±10%	5 V ±10%	5 V ±10%	5 V ±10%	3 V ±10%	5 V ±10%	5 V ±10%
Supply current (CPU)	500 μA typ	500 μA typ	600 μA typ	600 μA typ	85 μA typ	500 μA typ	400 μA typ
ROM	760 steps x 16 bits	760 steps x 16 bits	1016 steps x 16 bits	1016 steps x 16 bits	1148 steps x 16 bits	2040 steps x 16 bits	1528 steps x 16 bits
RAM	64 words x 4 bits	64 words x 4 bits	128 words x 4 bits	64 words x 4 bits	80 words x 4 bits	128 words x 4 bits	96 words x 4 bits
No. of commands	55	55	78	77	71	85	77
Display	LED (FIP)	FIP (LED)	FIP (LED)	FIP (LED)	LCD (1/3 duty)	FIP (LED)	LCD (1/2 duty)
Segment	7 (CMOS)	7 (P-ch open drain)	7 (P-ch open drain)	7 (P-ch open drain)	LCD driver incorporated Segment: 20 Common: 3	7 (P-ch open drain)	LCD driver incorporated Segment: 23 Common: 2
Digit	6	6	7	6		6	
Input port	5 (SD, K_0 to K_3)	5 (SD, K_0 to K_3)	5 (SD, K_0 to K_3)	4 (K_0 to K_3)	5 (SD, K_0 to K_3)	4 (K_0 to K_3)	4 (K_0 to K_3)
Output port	0	0	0	0	16	11	8
I/O port	0	0	11	12	4	4 (Serial I/O incorporated)	4
VDP (D/A converter)	0	0	1	3	0	1	0
A/D converter	0	0	0	0	0	3	0
Crystal oscillator	4.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz	150 MHz	4.5 MHz	4.5 MHz
PLL reference frequency	1, 5, 9, 10, 25 kHz	1, 5, 9, 10, 25 kHz	1, 5, 9, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 25 kHz	1, 3, 5, 6.25, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz
Application prescaler	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB566A (130 MHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	Incorporated (50 MHz)
Support tool							
EVA-KIT	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700
SE board	SE-1701	SE-1701	SE-1704	SE-1705	SE-1706	SE-1700	SE-1700
Option board	—	—	—	—	—	EV-1707	EV1708
Assembler	Cross-assembler CP/M-80™ MP/M-86™						

CP/M-80, MP/M-86 are trademarks of Digital Research Inc., U.S.A.
*Not recommended for new designs.

Digital Tuning Systems: μPD1700 Series (cont)

Type No.	μPD1709	μPD1710	μPD1711	μPD1712	μPD1713	μPD1714	μPD1715
Main use	TV, CATV	Car radio	Radio, TV, CATV	Tuner, TV, CATV	Car radio, tuner	Hi-Fi tuner, car radio	Portable radio, radio cassette
Package	28-pin shrink DIP	52-pin flatpack	42-pin shrink DIP	42-pin shrink DIP	52-pin flatpack	64-pin flatpack	54-pin flatpack
Supply voltage	5 V ±10%	5 V ±10%	5 V ±10%	5 V ±10%	5 V ±10%	5 V ±10%	2.2 to 3.5 V
Supply current (CPU)	600 μA typ	600 μA typ	500 μA typ	500 μA typ	400 μA typ	500 μA typ	30 μA typ
ROM	1526 steps x 16 bits	1016 steps x 16 bits	1016 steps x 16 bits	2040 steps x 16 bits	1528 steps x 16 bits	2040 steps x 16 bits	1528 steps x 16 bits
RAM	64 words x 4 bits	128 words x 4 bits	128 words x 4 bits	128 words x 4 bits	96 words x 4 bits	128 words x 4 bits	96 words x 4 bits
No. of commands	82	78	84	84	79	94	76
Display	LED	LED (FIP)	FIP (LED)	FIP (LED)	LCD (1/2 duty)	LCD (1/2 duty)	LCD (1/3 duty)
Segment	7 (LED driver incorporated)	7 (CMOS output)	7 (P-ch open drain)	7 (P-ch open drain)	LCD driver incorporated Segment: 21 Common: 2	LCD driver incorporated Segment: 28 Common: 2	LCD driver incorporated Segment: 16 Common: 3
Digit	2	7	6	6			
Input port	0	5 (SD, K_0 to K_3)	4 (K_0 to K_3)	4 (K_0 to K_3)	4 (K_0 to K_3) +2	4 (K_0 to K_3)	4 (K_0 to K_3)
Output port	2	0	8	8	7	12	9
I/O port	6 (Serial I/O incorporated)	11	4 (Serial I/O incorporated)	4 (Serial I/O incorporated)	4	8 (Serial I/O incorporated)	4
VDP (D/A converter)	1	1	1	1	0	1	1
A/D converter	1	0	1	1	0	1	0
Crystal oscillator	4.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz	7.5 MHz
PLL reference frequency	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 5, 7, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 3, 5, 6.25, 12.5, 25 kHz
Application prescaler	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	Incorporated (150 MHz)	Incorporated (150 MHz)	Incorporated (130 MHz)
Support tool							
EVA-KIT	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700
SE board	SE-1700	SE-1704	SE-1700	SE-1700	SE-1700	SE-1700	SE-1700
Option board	EV-1709	—	EV-1707	EV-1707	EV1713	EV-1714	EV-1715
Assembler	Cross-assembler CP/M-80 MP/M-86						

Digital Tuning Systems: μPD1700 Series (cont)

Type No.	μPD1716	μPD1717*	μPD1719*	μPD1720	μPD1730
Main use	VTR, TV, car radio, Hi-fi tuner	TV, CATV	Hi-fi tuner, car radio	Car radio (AM only)	TV, VTR
Package	28-pin shrink DIP	40-pin shrink DIP	64-pin flatpack	52-pin flatpack	30-pin shrink DIP
Supply voltage	5 V ± 10%	5 V ± 10%	5 V ± 10%	5 V ± 10%	5 V ± 10%
Supply current (CPU)	500 μA typ.	500 μA typ.	500 μA typ.	400 μA typ.	500 μA typ.
ROM	1016 steps x 16 bits	2040 steps x 16 bits	2040 steps x 16 bits	1016 steps x 16 bits	1008 steps x 16 bits
RAM	64 words x 4 bits	64 words x 4 bits EEP ROM 64 x 8	256 words x 4 bits	64 words x 4 bits	48 words x 4 bits
Number of commands	82	87	94	78	67
Display	—	LED	LCD (1/3 duty)	LCD (1/3 duty)	LED
Segment	—	7	LCD driver incorporated Segment: 28 Common: 2	LCD driver incorporated Segment: 21 Common: 2	7 (LED driver incorporated)
Digit	—	3			2
Input port	0	0	4 (K_0 to K_3)	4 (K_0 to K_3)	0
Output port	5	4	12	7	8
I/O port	8	8	8 (Serial I/O incorporated)	4	5
VDP (D/A converter)	0	1	1	0	1
A/D converter	1	1	1	0	1
Crystal oscillator	4.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz (Ceramic oscillator)
PLL reference frequency	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz	1, 5, 6.25, 9, 10, 12.5, 25 kHz	Voltage synthesizer (13 bits D/A incorporated)
Application prescaler	Incorporated (150 MHz), μPB567HA (1 GHz)	Incorporated (150 MHz), μPB567HA (1 GHz)	Incorporated	—	—
Support tool					
EVA-KIT	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700	EVA-KIT 1700
SE board	SE-1700	SE-1700	SE-1700	SE-1700	SE-1700
Option board	EV-1709	EV-1717	EV-1714	EV-1713	EV-1730
Assembler	Cross-assembler under CP/M-80 and MP/M-86				

* Under development

NEC

Application Specific 4-Bit Micro Controllers and Peripherals

Type	Description	Supply Voltage (V)	Package
μPD17002CU	Frequency Synthesized TV, Image Display	5	48 S-DIP
μPD17003G	Car/Home Audio System, LCD Driver	5	80 QFP
μPD17051CU	Voltage Synthesized TV, Image Display	5	48 S-DIP
μPD17102G	Home Bus Controller, 6-bit A/D Conv., Timers, OP-Amps	3 to 6	52 QFP
μPD17103/104C/G	Home Bus Controllers, 11/16 I/O Ports	3 to 6	16 DIP/SOP 22 S-DIP
μPD17201G	Remote Control Carrier Generator, LCD Driver, 8-bit A/D Conv., 23 I/O Ports	2 to 6	80 QFP
μPD17202G	Remote Control Carrier Generator, LCD Driver, 16 I/O Ports	2 to 6	64 QFP
μPD17203G	Learning Remote Control, 24 I/O	2 to 6	64 QFP
μPD6252C/G	2K-bit EEPROM 256x8, 10 Year-Retention Period	5	8 DIP/16 SOP
μPD6316C/G	ADDB Interface 251, 12 MHz Ceramic Resonator	5	16 DIP/SOP

TV ICs

Number	Description	Package
μPC574J	Reference Voltage Regulator for Tuning	TO-92
μPC1405AG	Mix/OSC/IF Amp/Reg Down Converter FM Demos**	14 SOP
μPC1406HA	Dual DC Volume	14 SIP
μPC1488H	Vertical Output (14 to 21 Inch CRT Tube)	9 SIP
μPC1498H	Vertical Output (22 to 29 Inch CRT Tube)	8 SIP
μPC1605G	Revised Pinout: Version of UFC1405AG	
μPC1685G	Wide Band Mixer/Oscillator for TV/VTR Tuners (890 MHz)	8 SOP
μPC1686G	Wide Band Mixer/Oscillator/IF Amplifier for VHF Tuners	8 SOP
μPC1687G	Wide Band Mixer/Oscillator/IF Amplifier for UHF Tuners	8 SOP
μPC1694G	Wide Band Mixer/Oscillator/IF Amplifier for Tuners	14 SOP
μPC1800CA	IF, Video, Chroma, Deflection Signal Processor (PAL)	48 S-DIP
μPC1870CA	U.S. Multi Sound Decoder	48 S-DIP
μPC1820C	PIF Processor/PLL	30 DIP
μPC1821C	PIF/SIF Processor/PLL	30 DIP

*To be determined.
**Phase Detector + VCO

On Screen Display ICs

Number	Description	Package
μPD6140C/G	32 Characters, 2 Lines x 6 Columns (8 Colors-Screen by Screen)	16 DIP/SOP
μPD6141C/G	48 Characters, 2 Lines x 12 Columns (8 Colors-Screen by Screen)	16 DIP/SOP
μPD6142C/G	64 Characters, 12 Lines x 24 Columns (8 Colors-Screen by Screen)	16 DIP/SOP
μPD6143C/G	64 Characters, 2 Lines x 16 Columns Blinking (8 Colors-Character by Character)	16 DIP/SOP
μPD6144C/G	64 Characters, 6 Lines x 16 Columns Blinking (8 Colors-Character by Character)	16 DIP/SOP
μPD6145C/G	128 Characters, 12 Lines x 24 Columns Blinking (8 Colors-Character by Character)	16 DIP/SOP
μPD6450C/G	128 Characters, 12 Lines x 24 Columns, 12x18 Dot Matrix	18 DIP
μPD6451C/G	All 6450 Functions plus Double Scan TV Mode Adaptation	20 SOP

Infrared Remote Control ICs

Receiver Preamplifiers

Type	Description	Supply Voltage (V)	Package
μPC1473HA	Active "Low"	5.0	8 SIP
μPC1474HA	Active "Low," High Immunity to Ambient Light	5.0	9 SIP
μPC1475HA	Active "High," High Immunity to Ambient Light	5.0	9 SIP
μPC1490HA	Active "Low," On Board Band Pass Filter	5.0	8 SIP
μPC1491HA	Active "High," On Board Band Pass Filter	5.0	8 SIP

Transmitters

Type	Description	Supply Voltage (V)	Package
μPD6120C	16-bit Customer Code, 20 keys	2.0 to 3.3	16 DIP
μPD6121G	16-bit Customer Code, 32 keys	2.0 to 3.3	20 MF
μPD6122G	16-bit Customer Code, 64 keys	2.0 to 3.3	24 MF
μPD6123C/G	1K ROM, 32 Word RAM, 4-bit Parallel ALU	2 to 6.0	16 DIP/SOP
μPD6124CA/G	6123 Features with 8 I/O Pins instead of 5 I/O	2 to 6.0	20 S-DIP/SOP
μPD6125AG/ACA	Programmable	2.0 to 6.0	24 MF/S-DIP
μPD6126AG	Programmable	2.0 to 6.0	28 MF
μPD6130CA/G	Transmitter/Receiver MSK Signals with 32 Add Bits		28 DIP/SOP

Converters

Digital to Analog Converters

Part No.	Generic	Resolution	Non-Linearity	Conversion Speed	Supply Voltage	Features	Package
μPC603D	OP-01	6-bit	0.4%	3 μs	±15	Onboard V_{REF} —Output buffer	14 DIP
μPC610D	OP-02	10-bit	0.2%	6 μs	±15	Onboard V_{REF} —Output buffer	18 DIP
μPC624C	DAC-08	8-bit	0.19%	150 ns	±15	Current output	16 DIP
μPC6012C	AM-6012	12-bit	0.05%	400 ns	±15	Current output	20 DIP
μPD6355G	Orig	16-bit	—	3/5 MHz*	+5	Digital Audio	28 MF
μPD6372CX/GS	Orig	16-bit	—	10 MHz*	+5	Digital Audio	16 DIP/SOP
μPD6900C/G	Orig	8-bit	±1/2 LSB	20 MHz*	+5	Current output	22 DIP/24 SOP
μPD6901C/G	Orig	6-bit	±1/2 LSB	20 MHz*	+5	Current output	16 DIP/SOP
μPD6902C	Orig	8-bit	±1/2 LSB	50 MHz*	+5	Current output	22 DIP
μPD7011C	Orig	8-bit	0.4%	3 μs	+5	Current output	18 DIP

Analog to Digital Converters

Part No.	Generic	Resolution	Non-Linearity	Conversion Speed	Supply Voltage	Output	Package
μPC650D	Orig	12-bit	0.05%	45 μs	+5-15	Parallel	28 DIP
μPC659CA/G	Orig	8-bit	±1/2 LSB	20 MHz*	+5	Parallel	24 S-DIP/SOP
μPC661CA/G	Orig	6-bit	±1/4 LSB	20 MHz*	+5	Parallel	24 S-DIP/SOP
μPD6950C	Orig	8-bit	±1 1/2 LSB	15 MHz*	+5	Parallel	24 DIP
μPD6951C/G	Orig	6-bit	±1/2 LSB	20 MHz*	+5	Parallel	18 DIP/20 SOP
μPD7001C	Orig	8-bit	0.8%	140 μs	+5	Serial	16 DIP
μPD7002C	Orig	10-bit	0.2%	15 ms	+5	Three state	28 DIP
μPD7002C-1	Orig	10-bit	0.1%	15 ms	+5	Three state	28 DIP
μPD7003C	Orig	8-bit	0.49%	4 μs	+5	Three state	24 DIP
μPD7004C	Orig	10-bit	0.15%	104 μs	+5	Serial/parallel	28 DIP

*Clock Frequency

Display Driver ICs

Number	Drivers	Voltage (V)	Current (mA)	Type	Package
μPD16300GF	41	200	500	DC-PDP (Row)	80 QFP
μPD16301GF	64	−250	−3	DC-PDP (Column)	80 QFP
μPD16302GF	40	250	±100	EL (Row)	100 QFP
μPD16304GF	40	200	20	FIP (Row/Column)	80 QFP
μPD16305GF	40	200	400	AC-PDP (Row)	100 QFP
μPD16306GF	64	80	50	AC-PDP/EL/FIP (Column)	100 QFP
μPD6300C	20	40	5	FIP	28 S-DIP
μPD6307AG	32	20	—	LCD (Row)	54 QFP
μPD6308AG	40	20	—	LCD (Column)	54 QFP
μPD6320/6321G	(28 + 11)	18	±20	FIP/LCD, LED	52 QFP
μPD6323AC	21	40	5	FIP	28 DIP
μPD6332C	20	18	—	LCD	28 DIP
μPD6340G	20	80	25	FIP	52 QFP
μPD6700G	47	18	15	FIP/LED	56 QFP

RS232 Line Drivers/Receivers

Number	Description	Package
μPD4711ACX/AGS	2 Drivers, 2 Receivers*	20 DIP/20 SOP
μPD4712ACY/AGT	4 Drivers, 4 Receivers	28 DIP/28 SOP
μPD4713CX/GS	3 Drivers, 3 Receivers	24 DIP/24 SOP
μPD4714CY/GT	3 Drivers, 5 Receivers	28 DIP/28 SOP
μPD4715CY/GT	5 Drivers, 3 Receivers	28 DIP/28 SOP

*All ICs have stand-by feature.

Charge Coupled Devices (CCD Image Sensors)

Part No.	Description	Package
μPD3571D	5000 pixel line array	22-pin ceramic DIP
μPD3573D	2048 pixel line array	22-pin ceramic DIP
μPD3574D	2592 pixel line array	22-pin ceramic DIP
μPD3575D	1024 pixel line array	20-pin ceramic DIP

Clock ICs

Part No.	Description	Package
μPD848C	Automotive	42 DIP
μPD6529C	Automotive	42 DIP
μPD6537G	Automotive	54 QFP
μPD4990AC/AG	Serial I/O, Calendar and Clock	14 DIP/16 SOP
μPD4991C/G	4-Bit Parallel I/O RTC	18 DIP/20 SOP

NEC

FIELD SALES OFFICES AND ASIC DESIGN CENTERS

14

NEC

FIELD SALES OFFICES

NORTHEAST REGION

One Natick Executive Park
Natick, MA 01760
TEL: 508-655-8833
FAX: 508-655-1605

200 Perinton Hills
Office Park
Fairport, NY 14450
TEL: 716-425-4590
FAX: 716-425-4594

2 Jefferson St.
Suite 103
Poughkeepsie, NY 12601
TEL: 914-452-4747
FAX: 914-471-2853

Two Jericho Plaza
Jericho, NY 11753
TEL: 516-932-5700
FAX: 516-932-5710

Six Neshaminy Interplex
Suite 203
Trevose, PA 19047
TEL: 215-638-8989
FAX: 215-638-1794

SOUTH CENTRAL REGION

16475 Dallas Parkway
Suite 380
Dallas, TX 75248
TEL: 214-931-0641
FAX: 214-931-1182

SOUTHEAST REGION

6625 The Corners Parkway
Suite 210
Norcross, GA 30092
TEL: 404-447-4409
FAX: 404-447-8228

901 Lake Destiny Drive
Suite 320
Maitland, FL 32751
TEL: 407-875-1145
FAX: 407-875-0962

2525 Meridian Parkway
Suite 320
Durham, NC 27713
TEL: 919-544-4132
FAX: 919-544-4109

MIDWEST REGION

1500 West Shure Drive
Suite 250
Arlington Heights, IL 60004
TEL: 312-577-9090
FAX: 312-577-2147

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FAX: 503-245-3716

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Dallas, TX 75248
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FAX: 214-931-8680

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Suite 320
Durham, NC 27713
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FAX: 919-544-4109

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Suite 240
Arlington Heights, IL 60004
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