Product Selection Guide 1991

PRODUCT SELECTION GUIDE

NEC

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NEC Electronics Inc.

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PRODUCT SELECTION GUIDE

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NEC

Section 1. Introduction

NEC, the world's largest semiconductor supplier, offers one of the most diversified product lines in the industry. This product selection guide lists major NEC products in the categories described below. To order product literature, contact your local NEC sales representative or call the toll-free number shown on the back cover of this guide.

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 by-8 and by-16 DRAMs, 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 several series of 4-bit, 8-bit, and 16-bit microcomputers. Except for some 4-bit devices, all products are available in OTP and EPROM versions for quick turnaround time. Each product also comes in a variety of packages, including SDIP, PLCC, and plastic QFP.

The 4-bit microcomputer series are 75xx for low-end, low-cost applications and 75xxx for high-performance applications. Each series offers a selection of on-board peripherals, such as LCD controller/drivers, FIP controller/drivers, analog-to-digital converters, serial ports, etc. In addition, the 75xxx series has a selection of ROMs up to 32K bytes.

NEC continues to enhance the popular 78xx series. The new members, 78C18 and 78CP18, are now available with 32K bytes of ROM, UVEPROM, or OTPROM.

The newly introduced K-series are families of 8-bit (K2) and 8/16-bit (K3) microcomputers. What sets the K-series apart from conventional microcomputers is the peripheral management unit. The PMU™ allows the peripherals to operate with minimal CPU intervention, improving microcomputer throughput by a factor of 2 to 4.

4-Bit Microcontrollers

The 17K family of 4-bit digital microcontrollers comprises four device groups: digital tuning (μPD170xx), general-purpose (μPD171xx), remote control (μPD172xx), and home automation (μPD173xx). All the devices have the same CPU core but different on-chip peripherals according to the target application. The 4-bit microcomputer on each device has a maximum ROM address space of 16K 16-bit words.

V-Series Microprocessors and Peripherals

The V-series is a CMOS microprocessor family designed for high performance, high integration, and low power consumption. The product line consists of two groups, each designed for high-speed data processing in embedded system environments.

(1) The microprocessor group contains the V20-V50 devices and their H-series versions as well as the V33 and V53 devices.

(2) The microcontroller group contains the V25 and V55 families.

Every V-series device supports an instruction superset of the μPD8088/8086, which provides code transportability within the V-series as well as extremely efficient software development in standard IBM-PC and compatible computers.

V20-V50. The μPD70108/70116 (V20®/V30®) provide pin compatibility and significant performance improvement over the μPD8088/8086 devices. The V20H and V30H target low-power 16-MHz system solutions with fully static internal circuits. The μPD70208/70216 (V40™/V50™) combine the V20/V30 cores with traditional PC style peripherals and target high-bandwidth, multichannel designs such as data controllers and host system interfaces. The V40 and V50 also have fully static 16-MHz cousins in the V40H and V50H.

V33 and V53. The μPD70136/70236 (V33™/V53™) are V30-compatible microprocessors using hard-wired logic implementations, raising their performance several levels above the V20/V30. The V53 uses the V33 core and again adds common PC-style peripherals. These devices target designs requiring extremely high performance combined with high-bandwidth data transfer capability and large (16 megabyte) addressing capacity. Both the V33 and V53 are supported by the μPD72291 hardware numeric coprocessor (for performance) or the standard Intel i80287 (for compatibility).

V25 and V55. The V25™ family comprises V20/V30 instruction set compatible microcontrollers that integrate event and data control peripherals as well as

internal memory and parallel I/O port capability. The members of this family include versions for SRAM interfaces, DRAM interfaces, software secure operation, and built-in real-time executives. The extension of the V25 family is with the V55 family, which boosts performance and integration with multiple parallel external buses and synchronous serial port capability.

Peripherals. The V-series microprocessor peripherals include many I/O peripherals in the PC-style tradition as well as an advanced cache memory controller (μPD71641) and high-integration devices like the μPD71101.

RISC Microprocessors

The V_R series is a family of high-performance, 32-bit RISC microprocessors targeted for workstation and high-end embedded controller markets. It comprises the following devices.

(1) μPD30310 CPU. This V_R3000A device includes a full 32-bit RISC CPU and a system control coprocessor. The latter contains a translation lookaside buffer and control registers to support a virtual memory subsystem and separate instruction and data cache controllers. System clock frequency options are 25, 33, and 40 MHz.

(2) μPD30311 FPP. This V_R3010A device operates as a coprocessor to the CPU for floating-point arithmetic operations.

(3) μPD31311 Bus Interface Unit. The BIU contains a four-stage write buffer and a one-stage read buffer. Frequency options are 25 and 33 MHz.

(4) μPD30360 RISC Microprocessor. This V_R3600 device integrates a CPU and FPU on the same chip. Frequency options are 25 and 33 MHz.

(5) μPD46710 and μPD46741 SRAM. Memory is organized as two cores, each 16K x 10 bits (46710) or 8K x 20 bits (46741).

Intelligent Peripheral Devices (IPD)

The IPD family from NEC supports various functions such as communication, graphics, and data storage requested by a CPU. To provide customers a wide choice of protocols, communication devices include serial communication controllers (7201, 72001, 72002) and an HDLC frame controller (72013).

For data storage, floppy-disk controllers 765B and 72064/65/67/68/69 are widely used in IBM PC; hard-disk controllers 7261/62 and 72061 and SCSI controller 72111 are provided for magnetic media storage.

Graphics display controllers 7220 and the advanced 72120/72123 meet various customer requirements. The advanced 72185 is the latest compression/expansion controller for image processing applications.

DSP and Speech Products

NEC is a leading supplier of high-speed DSP and speech products that excel in quality and performance. DSPs cover the full spectrum. From the 16-bit fixed-point 77C20A to the enhanced 32-bit fixed-point 77C25, NEC provides a low-cost, high-performance solution to customers' high-volume applications.

For advanced system designs, customers have a choice of the 24-bit fixed-point 77220 to the 32-bit floating-point 77230 (and the advanced 77240). For the 2400-b/s modem area, there are the application-specific 77810, 77811, and 77812 devices.

The 775x speech encoder/decoders are the industry's best quality. Further, NEC has the 77501 and 7730 in the real-time recorder and playback devices.

All DSP and speech products are backed by user-friendly, advanced development tools.

Development Tools for Micro Products

A comprehensive line of development hardware 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 communication 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) 0.8-micron CMOS cell-based ASICs with compilable RAM and ROM and CPU/peripheral megafunctions; (2) 0.8-micron CMOS gate arrays; and (3) the gate array market leaders, BiCMOS-5 and ECL-4A.

NEC's packaging technology is leading the way in the ASIC industry with advanced packages like 280-pin flat, 84-pin PLCC, 528-pin PGA, 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 multilayer ceramic capacitors offer a high-capacitance, resin dipped, multilayer capacitor for high-frequency switching power supplies.

The SVE Series tantalum chip capacitor features a built-in fuse to minimize circuit damage from reverse current.

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. They are available in a variety of standard sizes, characters, and number of digits.

The FIP module line has recently been expanded to include the new chip-in-glass FIP (CIG-FIP), which offers low-power, compact, 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 CIG-FIP module 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.

Consumer ICs

NEC's line of consumer ICs includes digital tuning systems (DTS); prescalers; phase-locked loops (PLLs); audio, radio, TV, EDTV, CATV, VCR, compact disk, and clock ICs; display drivers; monolithic broadband amplifiers; A/D and D/A converters; RS-232C line drivers/receivers; and amplifiers and spindle motor drivers for hard-disk drives.

Digital tuning systems of the μPD1700 series are single-chip, 4-bit CMOS microcontrollers with built-in PLLs. The PLLs employ a pulse swallowing method of frequency dividing that enables higher frequency operation. The μPD1700 series is suitable for audio, video, automotive, and portable radio applications.

Note: Coverage of the 17K family of 4-bit digital microcontrollers in Section 4 is repeated in Section 14 (Consumer ICs) following the μPD1700 series.

The infrared remote control family includes a wide variety of receivers, receiver preamplifiers, and transmitters. NEC's GaAs LEDs and PIN photodiode families complete the remote control circuit requirements.

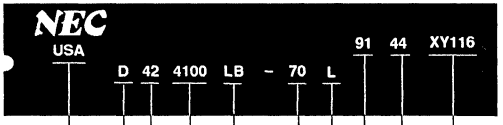
NEC's CMOS display driver family includes clock, latch, and driver circuits for LCD, FIP (vacuum fluorescence), plasma, and electroluminescent displays. Available in surface mount packages, these circuits simplify board design, improve quality and reliability, and operate at voltages as high as 250 V.

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

NEC

Section 2. Memory Products

Device Numbering Guide



Country of Origin

Device Type

B = Digital bipolar
D = Digital MOS

Product Class

10 = 10K ECL RAM
100 = 100K ECL RAM
23(H)C = CMOS ROM
27(H)C = CMOS EPROM
28C = CMOS EEPROM
41 = NMOS dynamic RAM
42 = CMOS dynamic RAM
43 = CMOS static RAM
44 = CMOS static RAM (6-T cell)
46 = BiCMOS static RAM

Device Identifier

Package

B or BH = Ceramic flatpack, with a quartz window if appropriate
C, CR or CZ = Plastic DIP
D, DH, DX or DZ = Cerdip or ceramic DIP, with a quartz window if appropriate
G (≤ 40 pins), GU or GW = Plastic miniflat
G (> 40 pins) or GF = Plastic QFP
G5,GS, GX or GZ = Plastic TSOP
K = Ceramic LCC
L = PLCC
LA, LB or LE = Plastic SOJ
R = Ceramic PGA
V = Plastic ZIP

Speed Selection

-10 = 100 ns or 10 ns
-12 = 120 ns or 12 ns
-15 = 150 ns or 15 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 Lot 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
(11) QFP = quad flatpack

83SL-7321B

Product Line Overview

Bit Density	Application Specific	RAM				EPROM	EEPROM	ROM
		Module	Dynamic	MOS Static	ECL			
1K					μPB10422 μPB100422			
4K					μPB10470 μPB10474 μPB10474A μPB10474E μPB100470 μPB100474 μPB100474A μPB100474E		μPD28C04 μPD28C05	
8K	μPD42101 μPD42102							
16K	μPD43501				μPB10480 μPB10484 μPB10484A μPB10A484 μPB100480 μPB100484 μPB100484A μPB100A484			
40K	μPD42505							
64K	μPD43608			μPD4361 μPD4362		μPD27HC65	μPD28C64	
133K	μPD42271 μPD42272							
256K	μPD41264 μPD42264 μPD42532		μPD41256 μPD41464	μPD43251 μPD43254 μPD43256A μPD43256B μPD43258 μPD46251	μPD10500 μPD10504 μPD100500 μPD100504		μPD28C256	
320K				μPD46710 μPD46741				
1M	μPD42270 μPD42273 μPD42274 μPD42275 μPD42601	MC-174	μPD421000 μPD421001 μPD421002 μPD421660 μPD421661 μPD421664 μPD421665 μPD424256 μPD424258 μPD424266 μPD424268	μPD431000 μPD431000A μPD431001 μPD431004		μPD27C1000A μPD27C1001A μPD27C1024A		μPD23C1000A μPD23C1000B μPD23C1000EA μPD23C1001E μPD23C1001EA μPD23C1010A μPD23C1024E
2M		MC-41256A9 MC-157				μPD27C2001		μPD23C2000 μPD23C2000A μPD23C2001 μPD23C200IE

Product Line Overview (cont)

Bit Density	Application Specific	RAM				EPROM	EEPROM	ROM
		Module	Dynamic	MOS Static	ECL			
4M	μPD42641 μPD42644	MC-176	μPD424100 μPD424101 μPD424102 μPD42417xx μPD42419xx μPD42426xx μPD42428xx μPD424400 μPD424402 μPD424410 μPD424412 μPD4248xx μPD4249xx			μPD27C4000 μPD27C4001 μPD27C4096		μPD23C4000B μPD23C4000J μPD23HC4000 μPD23C4001E μPD23C4001EA μPD23C4001EB μPD23HC400IE μPD23HC4096E
8M	MC-42601EA9B	MC-173 MC-421000A8 MC-421000A9 MC-42256A36 MC-424256A36				μPD27C8000 μPD27C8001		μPD23C8000 μPD23C8000B μPD23C8001E μPD23C8001EA
16M		MC-424512A36 MC-42512A36						μPD23C16000
32M		MC-421000A32 MC-421000A36 MC-421000AA40 MC-424000A8 MC-424000A9 MC-424100A8 MC-424100A9						μPD23C32000
64M		MC-422000A32 MC-422000A36 MC-422000AA40						

Application-Specific Devices

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPD41264-12	64K x 4 with two ports	120 Port A 40 Port B	C/V	24
μPD41264-15		150 Port A 60 Port B		
μPD42264-10	64K x 4 with two ports	100 Port A 25 Port B	C/LA/V	24
μPD42273-80	256K x 4 with two ports	80 Port A 25 Port B	LE/V	28
μPD42273-10		100 Port A 30 Port B		
μPD42273-12		120 Port A 40 Port B		
μPD42274-80	256K x 4 with two ports	80 Port A 25 Port B	LE/V	28
μPD42274-10		100 Port A 30 Port B		
μPD42274-12		120 Port A 40 Port B		
μPD42275-80	128K x 8 with two ports	80 Port A 25 Port B	LE	40
μPD42275-10		100 Port A 30 Port B		
μPD42275-12		120 Port A 40 Port B		
μPD42101-3	910 x 8	27	C/G	24
μPD42101-2		27		
μPD42101-1		49		
μPD42102-5	1135 x 8	18	C/G	24
μPD42102-3		21		
μPD42102-2		21		
μPD42102-1		40		
μPD42505-50	5048 x 8	40	C	24
μPD42505-50H		40		
μPD42505-75		55		
μPD42505-75H		55		
μPD42270	910 x 263 x 4	40	C	28
μPD42271	7568 x 18	6 MHz (input sampling)	GF	64
μPD42272				
μPD42532-10	32K x 8	50	C	40
μPD42601-60	1M x 1	600 (Single) 100 (Page)	C/LA/V	C = 18 LA = 26/20 V = 20
μPD42601-60L				
μPD42641	4M x 1	80	LA	26/20
μPD42644	1M x 4	80	LA	26/20
μPD43501	2 x 1K x 8	60	R	132
μPD43608-3	512 x 32 x 4 or 1K x 16 x 4	64	R	132
μPD43608-2		85		
MC-42601EA9B-60L	1M x 9	600	B	30

Notes:

(1) B = socket-mountable SIMM; C = plastic DIP; G = plastic miniflat; GF = plastic QFP; LA or LE = plastic SOJ; R = ceramic PGA; V = plastic ZIP.

Memory Cards

Device	Organization	Access Time (ns)	Package	Pins
MC-174	128K x 8 (static RAM)	250	Memory card	60
MC-176	512K x 8 (static RAM)	250	Memory card	60

Dynamic RAM Modules

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
MC-157-80A	256K x 8 (fast-page)	80	B	30
MC-157-10		100		
MC-41256A8-80	256K x 8 (page)	80	A/B	30
MC-41256A8-10		100		
MC-173	1M x 8 (fast-page)	70	B	64
MC-421000A8-60		60	A/B	30
MC-421000A8-70		70	A/B/AA/AB/BA/BB	
MC-421000A8-80		80		
MC-421000A8-10		100		
MC-424000A8-60	4M x 8 (fast page, 0.8" high)	60	AA/BA	30
MC-424000A8-70		70		
MC-424000A8-80		80		
MC-424100A8-70	4M x 8 (fast-page)	70	A/B	30
MC-424100A8-80		80		
MC-424100A8-10		100		
MC-41256A9-80	256K x 9 (page)	80	A/B	30
MC-41256A9-10		100		
MC-421000A9-60	1M x 9 (fast-page)	60	A/B	30
MC-421000A9-70		70	A/B/AA/AB/BA/BB	
MC-421000A9-80		80		
MC-421000A9-10		100		
MC-424000A9-60	4M x 9 (fast-page, 0.8" high)	60	AA/BA	30
MC-424000A9-70		70		
MC-424000A9-80		80		
MC-424100A9-70	4M x 9 (fast-page)	70	A/B	30
MC-424100A9-80		80		
MC-424100A9-10		100		
MC-42256A36-60	256K x 36 (fast-page)	60	B/F	72
MC-42256A36-70		70		
MC-42256A36-80		80		
MC-42256A36-85		85		
MC-42256A36-10		100		
MC-424256A36-80	256K x 36 (page)	80	B/F	72
MC-424256A36-85		85		
MC-424256A36-10		100		
MC-424256A36BH/FH-70	256K x 36 (fast-page)	70	BH/FH	72
MC-424256A36BH/FH-80		80		
MC-424256A36BH/FH-10		100		
MC-424512A36-80	512K x 36 (page)	80	B/F	72
MC-424512A36-85		85		
MC-424512A36-10		100		
MC-424512A36BH/FH-70	512K x 36 (fast-page)	70	BH/FH	72
MC-424512A36BH/FH-80		80		
MC-424512A36BH/FH-10		100		

Dynamic RAM Modules (cont)

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
MC-42512A36-60	512K x 36 (fast-page)	60	B/F	72
MC-42512A36-70		70		
MC-42512A36-80		80		
MC-42512A36-85		85		
MC-42512A36-10		100		
MC-421000A32-70	1M x 32 (fast-page)	70	B/F/BH/FH	72
MC-421000A32-80		80		
MC-421000A32-10		100		
MC-421000A36BH/FH-70	1M x 36 (fast-page)	70	B/F/BD/FD/BH/FH	72
MC-421000A36BH/FH-80		80		
MC-421000A36BH/FH-10		100		
MC-421000AA40-70	1M x 40 (fast-page)	70	B/F	72
MC-421000AA40-80		80		
MC-421000AA40-10		100		
MC-422000A32-70	2M x 32 (fast-page)	70	B/F/BH/FH	72
MC-422000A32-80		80		
MC-422000A32-10		100		
MC-422000A36BH/FH-70	2M x 36 (fast-page)	70	B/F/BD/FD/BH/FH	72
MC-422000A36BH/FH-80		80		
MC-422000A36BH/FH-10		100		
MC-422000AA40-70	2M x 40 (fast-page)	70	B/F	72
MC-422000AA40-80		80		
MC-422000AA40-10		100		

Notes:

(1) A Leaded SIMM
B Socket-mountable SIMM
BH Special-height, socket-mountable SIMM

F Socket-mountable SIMM with gold-plated contacts
FH Special-height, socket-mountable SIMM with gold-plated contacts.

AA Leaded SIMM, 2- or 3-piece solution using 300-mil SOJ
AB Leaded SIMM, 2- or 3-piece solution using 350-mil SOJ

BA Socket-mountable SIMM, 2- or 3-piece solution using 300-mil SOJ
BB Socket-mountable SIMM, 2- or 3-piece solution using 350-mil SOJ

BD Socket-mountable SIMM, 1.0" high, double-sided
FD Socket-mountable SIMM, 1.0" high, double-sided, with gold-plated contacts.

Dynamic RAMs

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPD41256-80	256K x 1 (page)	80	C/L	C = 16
μPD41256-10		100		L = 18
μPD41464-80	64K x 4	80	C/L/V	C = 18
μPD41464-10		100		L = 18
μPD41464-12		120		V = 20
μPD421000-60	1M x 1 (fast-page)	60	C/LA/V	C = 18
μPD421000-70		70		LA = 26/20
μPD421000-80		80		V = 20
μPD421000-10		100		
μPD421001-60	1M x 1 (nibble)	60	C/LA/V	C = 18
μPD421001-70		70		LA = 26/20
μPD421001-80		80		V = 20
μPD421001-10		100		
μPD421002-60	1M x 1 (static-column)	60	C/LA/V	C = 18
μPD421002-70		70		LA = 26/20
μPD421002-80		80		V = 20
μPD421002-10		100		
μPD424256-60	256K x 4 (fast-page)	60	C/LA/V	C = 20
μPD424256-70		70		LA = 26/20
μPD424256-80		80		V = 20
μPD424256-10		100		
μPD424258-60	256K x 4 (static-column)	60	C/LA/V	C = 20
μPD424258-70		70		LA = 26/20
μPD424258-80		80		V = 20
μPD424258-10		100		
μPD424266-60	256K x 4 (fast-page, write-per-bit)	60	C/LA/V	C = 20
μPD424266-70		70		LA = 26/20
μPD424266-80		80		V = 20
μPD424266-10		100		
μPD424268-60	256K x 4 (static-column, write-per-bit)	60	C/LA/V	C = 20
μPD424268-70		70		LA = 26/20
μPD424268-80		80		V = 20
μPD424268-10		100		
μPD421660-80	64K x 16 (static-column with byte write)	80	V/LE	40
μPD421660-10		100		
μPD421661-80	64K x 16 (static-column with word write	80	V/LE	40
μPD421661-10	and write-per-bit)	100		
μPD421664-80	64K x 16 (fast-page with byte write)	80	V/LE	40
μPD421664-10		100		
μPD421665-80	64K x 16 (fast-page with word write and	80	V/LE	40
μPD421665-10	write-per-bit)	100		
μPD424100-60	4M x 1 (fast-page)	60	LA/LB/GS/V	V = 20
μPD424100-70		70		LA/LB = 26/20
μPD424100-80		80		GS = 26/20
μPD424100-10		100		
μPD424101-60	4M x 1 (nibble)	60	LA/LB/GS/V	V = 20
μPD424101-70		70		LA/LB = 26/20
μPD424101-80		80		GS = 26/20
μPD424101-10		100		
μPD424102-60	4M x 1 (static-column)	60	LA/LB/GS/V	V = 20
μPD424102-70		70		LA/LB = 26/20
μPD424102-80		80		GS = 26/20
μPD424102-10		100		

Dynamic RAMs (cont)

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPD424400-60	1M x 4 (fast-page)	60	LA/LB/GS/V	V = 20
μPD424400-70		70		LA/LB = 26/20
μPD424400-80		80		GS = 26/20
μPD424400-10		100		
μPD424402-60	1M x 4 (static-column)	60	LA/LB/GS/V	V = 20
μPD424402-70		70		LA/LB = 26/20
μPD424402-80		80		GS = 26/20
μPD424402-10		100		
μPD424410-60	1M x 4 (fast-page, write-per-bit)	60	LA/LB/GS/V	V = 20
μPD424410-70		70		LA/LB = 26/20
μPD424410-80		80		GS = 26/20
μPD424410-10		100		
μPD424412-60	1M x 4 (static-column, write-per-bit)	60	LA/LB/GS/V	V = 20
μPD424412-70		70		LA/LB = 26/20
μPD424412-80		80		GS = 26/20
μPD424412-10		100		
μPD4248xx-70	512K x 8	70	LE/V/G5	28
μPD4248xx-80		80		
μPD4248xx-10		100		
μPD42417xx-70	256K x 16 (one $\overline{CAS}$, two $\overline{WE}$ inputs)	70	LE/V/GX	LE = 40
μPD42417xx-80		80		V = 40
μPD42417xx-10		100		GX = 44
μPD42426xx-70	256K x 16 (two $\overline{CAS}$ inputs, one $\overline{WE}$)	70	LE/V/GX	LE = 40
μPD42426xx-80		80		V = 40
μPD42426xx-10		100		GX = 44
μPD42419xx-70	256K x 18 (one $\overline{CAS}$, two $\overline{WE}$ inputs)	70	LE/V/GX	LE = 40
μPD42419xx-80		80		V = 40
μPD42419xx-10		100		GX = 44
μPD42428xx-70	256K x 18 (two $\overline{CAS}$ inputs, one $\overline{WE}$)	70	LE/V/GX	LE = 40
μPD42428xx-80		80		V = 40
μPD42428xx-10		100		GX = 44

Notes:

(1) C = plastic DIP; L = PLCC; LA, LB or LE = plastic SOJ;
V = plastic ZIP; GS, G5 or GX = plastic TSOP.

Static RAMs

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPD46710-15	16K x 10 x 2	15	LN	52
μPD46710-20		20		
μPD46741-15	8K x 20 x 2	15	LP	68
μPD46741-20		20		
μPD4361-45	64K x 1	45	C/K/LA	22
μPD4361-55		55	C/K/LA	
μPD4361-70		70	C	
μPD4362-45	16K x 4 ($\overline{CS}$ only)	45	C	22
μPD4362-55		55		
μPD4362-70		70		
μPD43251-35	256K x 1	35	C/LA	24
μPD43251-45		45		
μPD43254-35	64K x 4	35	C	24
μPD43254-45		45		

Static RAMs (cont)

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPD43256A-85	32K x 8	85	C/GU/GX	C = 28
μPD43256A-10		100		GU = 28
μPD43256A-12		120		GX = 32
μPD43256A-15		150		
μPD43256B-55	32K x 8	55	C/GU/GX	C = 28
μPD43256B-70		70		GU = 28
μPD43256B-85		85		GX = 32
μPD43258-35	32K x 8	35	CR/LA	28
μPD43258-45		45		
μPD431000-85	128K x 8	85	CZ/GW	32
μPD431000-10		100		
μPD431000-12		120		
μPD431000A-70	128K x 8	70	CZ/GW/GZ	32
μPD431000A-85		85		
μPD431001-20	1M x 1	20	LE	28
μPD431001-25		25		
μPD431001-35		35		
μPD431004-20	256K x 4	20	LE	28
μPD431004-25		25		
μPD431004-35		35		

Notes:

(1) C, CR or CZ = plastic DIP; GU or GW = plastic miniflat;
GX or GZ = plastic TSOP; K = ceramic LCC;
LA or LE = plastic SOJ; LN or LP = PLCC.

ECL RAMs

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPB10422-7	256 x 4	7	D	24
μPB10470-10	4K x 1	10	D	18
μPB10470-15		15		
μPB10474-8	1K x 4	8	D	24
μPB10474-10		10		
μPB10474-15		15		
μPB10474A-5	1K x 4	5	D	24
μPB10474A-6		6		
μPB10474E-3	1K x 4	3	D	24
μPB10474E-4		4		
μPB10480-10	16K x 1	10	B/D	20
μPB10480-15		15		
μPB10484-10	4K x 4	10	B/D	28
μPB10484-15		15		
μPB10484A-5	4K x 4	5	B/D	28
μPB10484A-7		7		
μPB10A484-5	4K x 4	5	BH/D	28
μPB10A484-7		7		
μPD10500-15	256K x 1	15	D	24
μPD10500-20		20		
μPD10504-15	64K x 4	15	D	32
μPB100422-7	256 x 4	7	B/DH	24
μPB100470-10	4K x 1	10	D	18
μPB100470-15		15		
μPB100474-4.5	1K x 4	4.5	K	24
μPB100474-6		6	B/K	
μPB100474-8		8	B/D	
μPB100474-10		10	B/D	
μPB100474-15		15	B/D	
μPB100474A-5	1K x 4	5	BH/D	24
μPB100474A-6		6		
μPB100474E-3	1K x 4	3	B/D	24
μPB100474E-4		4		
μPB100480-10	16K x 1	10	B/D	20
μPB100480-15		15		
μPB100484-10	4K x 4	10	B/D	28
μPB100484-15		15		
μPB100484A-5	4K x 4	5	B/D	28
μPB100484A-7		7		
μPB100A484-5	4K x 4	5	B/D	28
μPB100A484-7		7		
μPD100500-15	256K x 1	15	D	24
μPD100500-20		20		
μPD100504-15	64K x 4	15	D	32

Notes:

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

EPROMs

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPD27HC65-25	8K x 8	25	DX	24
μPD27HC65-30		30		
μPD27HC65-35		35		
μPD27C1000A-12	128K x 8 (ROM compatible)	120	D	32
μPD27C1000A-15		150		
μPD27C1000A-20		200		
μPD27C1001A-12	128K x 8 (JEDEC)	120	D	32
μPD27C1001A-15		150		
μPD27C1001A-20		200		
μPD27C1024A-12	64K x 16	120	D	40
μPD27C1024A-15		150		
μPD27C1024A-20		200		
μPD27C2001-15	256K x 8 (JEDEC)	150	D	32
μPD27C2001-17		170		
μPD27C2001-20		200		
μPD27C4000-15	256K x 16 or 512K x 8	150	DZ	40
μPD27C4000-17		170		
μPD27C4000-20		200		
μPD27C4001-15	512K x 8 (JEDEC)	150	DZ	32
μPD27C4001-17		170		
μPD27C4001-20		200		
μPD27C4096-12	256K x 16 (JEDEC)	120	DZ	40
μPD27C4096-15		150		
μPD27C4096-20		200		
μPD27C8000-12	512K x 16 or 1M x 8	120	DZ	42
μPD27C8000-15		150		
μPD27C8000-17		170		
μPD27C8001-12	1M x 8 (JEDEC)	120	DZ	32
μPD27C8001-15		150		
μPD27C8001-17		170		

Notes:

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

EEPROMs

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPD28C04-20	512 x 8	200	C/G	24
μPD28C04-25		250		
μPD28C05-20	512 x 8	200	C/G	24
μPD28C05-25		250		
μPD28C64-20	8K x 8	200	C/GX	28
μPD28C64-25		250		
μPD28C256-20	32K x 8	200	CZ	28
μPD28C256-25		250		

Notes:

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

Mask-Programmable ROMs

Device	Organization	Access Time (ns)	Package (Note 1)	Pins
μPD23C1000A	128K x 8 ($\overline{CE}$)	200	C/G	28
μPD23C1000B	128K x 8	150	C	28
μPD23C1000EA	128K x 8 ($\overline{CE}$/$\overline{OE}$)	200	C	32
μPD23C1001E	128K x 8 (JEDEC)	200	C/G	32
μPD23C1001EA	128K x 8 (JEDEC)	150	C/G	32
μPD23C1010A	128K x 8 ($\overline{OE}$)	200	C	28
μPD23C1024E	64K x 16 (JEDEC)	200	C	40
μPD23C2000	128K x 16 or 256K x 8	250	C/GC	40/52
μPD23C2000A	128K x 16 or 256K x 8	175/200	C	40
μPD23C2001	256K x 8 (JEDEC)	250	C/G	32
μPD23C2001E	256K x 8 (JEDEC)	200	C/G	32
μPD23C4000B	256K x 16 or 512K x 8	200	C/GF	40/64
μPD23C4001EB	512K x 8 (JEDEC)	150	C/G	32
μPD23HC4000	512K x 8 or 256K x 16	100	C	40
μPD23C4001E	512K x 8 (JEDEC)	250	C/GW	32
μPD23C4001EA	512K x 8 (JEDEC)	200	C/G	32
μPD23C4000J	256K x 16 or 512K x 8	150	C	40
μPD23HC4001E	512K x 8 (JEDEC)	100	C/G	32
μPD23HC4096E	256K x 16 (JEDEC)	85	C	40
μPD23C8000	512K x 16 or 1M x 8	200	CZ/G	42/64
μPD23C8000B	512K x 16 or 1M x 8	150	C	42
μPD23C8001EA	1M x 8	150	C/G	32
μPD23C8001E	1M x 8 (JEDEC)	200	CZ/G	32
μPD23C16000	1M x 16 or 2M x 8	250	CZ/G	42
μPD23C32000	4M x 8 or 2M x 16	200	C	42

Notes:

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

NEC

Section 3. Single-Chip Microcomputers

Note: Section 4 covers the 17K family of 4-bit microcontrollers and related development tools.

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; 75xx Series

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
7502/7502A	LCD controller/driver	0.41	2.5 to 6.0	2K	128	23	QFP	64
7503/7503A	LCD controller/driver	0.41	2.5 to 6.0	4K	224	23	QFP	64
7507	General-purpose	0.41	2.5 to 6.0	2K	128	32	DIP SDIP QFP	40 40 52
7507B	General-purpose	0.5	2.2 to 6.0	2K	128	32	SDIP QFP	40 44
7507H	General-purpose	4.19	2.7 to 6.0	2K	128	32	DIP SDIP QFP	40 40 52
7508	General-purpose	0.41	2.5 to 6.0	4K	224	32	DIP SDIP QFP	40 40 52
7508B	General-purpose	0.5	2.2 to 6.0	4K	224	32	SDIP QFP	40 44
7508H	General-purpose	4.19	2.7 to 6.0	4K	224	32	DIP SDIP QFP	40 40 52
75CG08	Piggyback EPROM	0.41	4.5 to 5.5	2K or 4K	224	32	Ceramic DIP	40
75CG08H	Piggyback EPROM	4.19	4.5 to 5.5	2K or 4K	224	32	Ceramic DIP	40
7527A	FIP controller/driver	0.61	2.7 to 6.0	2K	128	35	DIP SDIP	42 42
7528A	FIP controller/driver	0.61	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	0.51	2.7 to 6.0	4K	160	30	DIP SDIP QFP	42 42 44
75CG33	Piggyback EPROM; A/D converter	0.51	4.5 to 5.5	4K	160	30	Ceramic DIP	42
7537A	FIP controller/driver	0.61	2.7 to 6.0	2K	128	35	DIP SDIP	42 42
7538A	FIP controller/driver	0.61	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	0.71	2.5 to 6.0	1K	64	16	SDIP SOP	20 20
7554A	Serial I/O; external clock or RC oscillator	0.71	2.0 to 6.0	1K	64	16	SDIP SOP	20 20
75P54	Serial I/O; external clock or RC oscillator	0.71	4.5 to 6.0	1K OTPROM	64	16	SDIP SOP	20 20

† Plastic unless ceramic (or cerdip) is specified.

4-Bit, Single-Chip CMOS Microcomputers; 75xx Series (cont)

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
7564/7564A	Serial I/O; ceramic oscillator	0.71	2.7 to 6.0	1K	64	15	SDIP SOP	20 20
75P64	Serial I/O; ceramic oscillator	0.71	4.5 to 6.0	1K OTPROM	64	15	SDIP SOP	20 20
7556	Comparator; external clock or RC oscillator	0.71	2.5 to 6.0	1K	64	20	SDIP SOP	24 24
7556A	Comparator; external clock or RC oscillator	0.71	2.0 to 6.0	1K	64	20	SDIP SOP	24 24
75P56	Comparator; external clock or RC oscillator	0.71	4.5 to 6.0	1K OTPROM	64	20	SDIP SOP	24 24
7566/7566A	Comparator; ceramic oscillator	0.71	2.7 to 6.0	1K	64	19	SDIP SOP	24 24
75P66	Comparator; ceramic oscillator	0.71	4.5 to 6.0	1K OTPROM	64	19	SDIP SOP	24 24

† Plastic unless ceramic (or cerdip) is specified.

4-Bit, Single-Chip CMOS Microcomputers; 75xxx Series

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
75004	General-purpose	4.19	2.7 to 6.0	4K	512	34	SDIP QFP	42 44
75006	General-purpose	4.19	2.7 to 6.0	6K	512	34	SDIP QFP	42 44
75008	General-purpose	4.19	2.7 to 6.0	8K	512	34	SDIP QFP	42 44
75P008	General-purpose; on-chip OTPROM	4.19	4.5 to 5.5	8K OTPROM	512	34	SDIP QFP	42 44
75028	A/D converter	4.19	2.7 to 6.0	8K	512	48	SDIP QFP	64 64
75P036	A/D converter; on-chip OTPROM	4.19	2.7 to 6.0	16K OTPROM	1024	48	SDIP QFP	64 64
75048	A/D converter; 1K x 4 EEPROM	4.19	2.7 to 6.0	8K	512	48	SDIP QFP	64 64
75P056 *	A/D converter; 1K x 4 EEPROM; on-chip OTPROM	4.19	2.7 to 6.0	16K OTPROM	1024	48	SDIP QFP	64 64
* Under development; consult your NEC Sales Office for availability.								
75104	High-end with 8-bit instruction	4.19	2.7 to 6.0	4K	320	52	SDIP QFP	64 64
75104A	High-end with 8-bit instruction	4.19	2.7 to 6.0	4K	320	52	QFP	64
75106	High-end with 8-bit instruction	4.19	2.7 to 6.0	6K	320	52	SDIP QFP	64 64
75108	High-end with 8-bit instruction	4.19	2.7 to 6.0	8K	512	52	SDIP QFP	64 64
75108A	High-end with 8-bit instruction	4.19	2.7 to 6.0	8K	512	52	QFP	64

4-Bit, Single-Chip CMOS Microcomputers; 75xxx Series (cont)

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
75P108	High-end with 8-bit instruction; on-chip OTPROM or UVEPROM	4.19	4.5 to 5.5	8K OTPROM	512	52	SDIP QFP	64 64
				8K UVEPROM	512	52	Shrink cerdip	64
75P108B	High-end with 8-bit instruction; on-chip OTPROM	4.19	2.7 to 6.0	8K OTPROM	512	52	SDIP QFP	64 64
75112	High-end with 8-bit instruction	4.19	2.7 to 6.0	12K	512	52	SDIP QFP	64 64
75116	High-end with 8-bit instruction	4.19	2.7 to 6.0	16K	512	52	SDIP QFP	64 64
75P116	High-end with 8-bit instruction; on-chip OTPROM	4.19	4.5 to 5.5	16K OTPROM	512	52	SDIP QFP	64 64
75206	FIP controller/driver	4.19	2.7 to 6.0	6K	369	28	SDIP QFP	64 64
75208	FIP controller/driver	4.19	2.7 to 6.0	8K	497	28	SDIP QFP	64 64
75CG208	FIP controller/driver; piggyback EPROM	4.19	4.5 to 5.5	8K	512	28	Ceramic SDIP Ceramic QFP	64 64
75212A	FIP controller/driver	4.19	2.7 to 6.0	12K	512	28	SDIP QFP	64 64
75216A	FIP controller/driver; on-chip OTPROM	4.19	2.7 to 6.0	16K	512	28	SDIP QFP	64 64
75CG216A	FIP controller/driver; piggyback EPROM	4.19	4.5 to 5.5	16K	512	28	Ceramic SDIP Ceramic QFP	64 64
75P216A	FIP controller/driver; on-chip OTPROM	4.19	4.5 to 5.5	16K OTPROM	512	28	SDIP	64
75217	FIP controller/driver	4.19	2.7 to 6.0	24K	768	28	SDIP QFP	64 64
75P218	FIP controller/driver; on-chip OTPROM or UVEPROM	4.19	2.7 to 6.0	32K OTPROM	1024	28	SDIP QFP	64 64
				32K UVEPROM	1024	28	Ceramic LCC	64
75268	FIP controller/driver	4.19	2.7 to 6.0	8K	512	28	SDIP QFP	64 64
75304	LCD controller/driver	4.19	2.7 to 6.0	4K	512	32	QFP	80
75306	LCD controller/driver	4.19	2.7 to 6.0	6K	512	32	QFP	80
75308	LCD controller/driver	4.19	2.7 to 6.0	8K	512	32	QFP	80
75P308	LCD controller/driver; on-chip OTPROM or UVEPROM	4.19	4.75 to 5.25	8K OTPROM	512	32	QFP	80
				8K UVEPROM	512	32	Ceramic LCC	80
75312	LCD controller/driver	4.19	2.7 to 6.0	12K	512	32	QFP	80
75316	LCD controller/driver	4.19	2.7 to 6.0	16K	512	32	QFP	80
75P316	LCD controller/driver; on-chip OTPROM	4.19	4.75 to 5.25	16K OTPROM	512	32	QFP	80
75P316A	LCD controller/driver; on-chip OTPROM or UVEPROM	4.19	2.7 to 6.0	16K OTPROM	512	32	QFP	80
				16K UVEPROM	512	32	Ceramic LCC	80

4-Bit, Single-Chip CMOS Microcomputers; 75xxx Series (cont)

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
75328	LCD controller/driver; A/D converter	4.19	2.7 to 6.0	8K	512	36	QFP	80
75P328	LCD controller/driver; A/D converter; on-chip OTPROM	4.19	4.5 to 5.5	8K OTPROM	512	36	QFP	80
75402A	Low-end	4.19	2.7 to 6.0	2K	64	22	DIP SDIP QFP	28 28 44
75P402	Low-end; on-chip OTPROM	4.19	4.5 to 5.5	2K OTPROM	64	22	DIP SDIP QFP	28 28 44
75512	High-end; A/D converter	4.19	2.7 to 6.0	12K	512	64	QFP	80
75516	High-end; A/D converter	4.19	2.7 to 6.0	16K	512	64	QFP	80
75P516	High-end; A/D converter; on-chip OTPROM or UVEPROM	4.19	4.75 to 5.5	16K OTPROM	512	64	QFP	80
				16K UVEPROM	512	64	Ceramic LCC	80

† Plastic unless ceramic (or cerdip) is specified.

8-Bit, Single-Chip CMOS Microcomputers; 78xx Series

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
78C10/78C10A	CMOS; A/D converter	15	4.5 to 5.5	External	256	32	QUIP SDIP QFP PLCC	64 64 64 68
78C11/78C11A	CMOS; A/D converter	15	4.5 to 5.5	4K	256	40	QUIP SDIP QFP PLCC	64 64 64 68
78C12A	CMOS; A/D converter	15	4.5 to 5.5	8K	256	40	QUIP SDIP QFP PLCC	64 64 64 68
78C14/78C14A	CMOS; A/D converter	15	4.5 to 5.5	16K	256	40	QUIP SDIP QFP PLCC	64 64 64 68
78CP14	CMOS; A/D converter; on-chip OTPROM or UVEPROM	15	4.75 to 5.25	16K OTPROM	256	40	QUIP SDIP QFP PLCC	64 64 64 68
				16K UVEPROM	256	40	Ceramic QUIP Shrink cerdip	64 64
78CG14	CMOS; A/D converter; piggyback EPROM	15	4.5 to 5.5	4K, 8K, or 16K	256	40	Ceramic QUIP	64
78C17	CMOS; A/D converter	15	4.5 to 5.5	External	1024	40	QUIP SDIP QFP	64 64 64

8-Bit, Single-Chip CMOS Microcomputers; 78xx Series (cont)

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
78C18	CMOS; A/D converter	15	4.5 to 5.5	32K	1024	40	QUIP	64
							SDIP	64
							QFP	64
78CP18	CMOS; A/D converter; on-chip OTPROM or UVEPROM	15	4.75 to 5.25	32K OTPROM	1024	40	QUIP	64
							SDIP	64
							QFP	64
				32K UVEPROM	1024	40	Ceramic LCC	64

† Plastic unless ceramic (or cerdip) is specified.

3

8-Bit, Single-Chip CMOS Microcomputers; 782xx (K2) Series

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
78212	CMOS; A/D converter; advanced peripherals	12	4.5 to 5.5	8K	384	54	SDIP	64
							QUIP	64
							QFP	64
							QFP	74
							PLCC	68
78213	CMOS; A/D converter; advanced peripherals	12	4.5 to 5.5	External	512	54	SDIP	64
							QUIP	64
							QFP	64
							QFP	74
							PLCC	68
78214	CMOS; A/D converter; advanced peripherals	12	4.5 to 5.5	16K	512	54	SDIP	64
							QUIP	64
							QFP	64
							QFP	74
							PLCC	68
78P214	CMOS; A/D converter; advanced peripherals	12	4.5 to 5.5	16K OTPROM	512	54	SDIP	64
							QUIP	64
							QFP	64
							QFP	74
							PLCC	68
				16K UVEPROM	512	54	Shrink cerdip	64
78220	CMOS; analog comparator; large I/O	12	4.5 to 5.5	External	640	71	PLCC	84
							QFP	94
78224	CMOS; analog comparator; large I/O	12	4.5 to 5.5	16K	640	71	PLCC	84
							QFP	94
78P224	CMOS; analog comparator; large I/O	12	4.5 to 5.5	16K OTPROM	640	71	PLCC	84
							QFP	94
78233	CMOS; real-time outputs; A/D and D/A converters	12	4.5 to 5.5	External	640	64	QFP	80
							QFP	94
							PLCC	84
78234	CMOS; real-time outputs; A/D and D/A converters	12	4.5 to 5.5	16K	640	64	QFP	80
							QFP	94
							PLCC	84
78237	CMOS; real-time outputs; A/D and D/A converters	12	4.5 to 5.5	External	1024	64	QFP	80
							QFP	94
							PLCC	84
78238	CMOS; real-time outputs; A/D and D/A converters	12	4.5 to 5.5	32K	1024	64	QFP	80
							QFP	94
							PLCC	84

8-Bit, Single-Chip CMOS Microcomputers; 782xx (K2) Series (cont)

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
78P238	CMOS; real-time outputs; A/D and D/A converters	12	4.5 to 5.5	32K OTPROM	1024	64	QFP QFP PLCC	80 94 84
				32K UVEPROM	1024	64	Ceramic LCC	94
78243	CMOS; A/D converter; EEPROM	12	4.5 to 5.5	External	512 512 EEPROM	54	SDIP QFP PLCC	64 64 68
78244	CMOS; A/D converter; EEPROM	12	4.5 to 5.5	16K	512 512 EEPROM	54	SDIP QFP PLCC	64 64 68

† Plastic unless ceramic (or cerdip) is specified.

8/16-Bit, Single-Chip CMOS Microcomputers; 783xx (K3) Series

Device (μPD)	Features	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package †	Pins
78310A	Real-time motor control	12	4.5 to 5.5	External	256	48	SDIP QUIP QFP PLCC	64 64 64 68
78312A	Real-time motor control	12	4.5 to 5.5	8K	256	48	SDIP QUIP QFP 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 QFP PLCC	64 64 64 68
78320	High-end; advanced analog and digital peripherals	16	4.5 to 5.5	External	640	55	QFP PLCC	74 68
78322	High-end; advanced analog and digital peripherals	16	4.5 to 5.5	16K	640	55	QFP PLCC	74 68
78P322	High-end; advanced analog and digital peripherals	16	4.5 to 5.5	16K OTPROM	640	55	QFP PLCC	74 68
				16K UVEPROM	640	55	Ceramic LCC Ceramic LCC	68 74
78330	CMOS; real-time pulse unit	16	4.5 to 5.5	External	768	70	QFP PLCC	94 84
78334	CMOS; real-time pulse unit	16	4.5 to 5.5	32K	768	70	QFP PLCC	94 84
78P334	CMOS; real-time pulse unit	16	4.5 to 5.5	32K OTPROM	768	70	QFP PLCC	94 84
				32K UVEPROM	768	70	Ceramic LCC	84

NEC

Section 4. 4-Bit Microcontrollers

Note: Section 3 covers single-chip CMOS microcomputers, including the 4-bit 75xx and 75xxx series.

Part Numbering System

μPD17001Xyy-zzz	Typical microcontroller part number
μP	NEC monolithic silicon integrated circuit
D	Digital MOS
17001	Device identifier. An inserted letter "P" indicates a programmable device, as in "17P001"
X	Indicates the position of suffix letter A or L, if applicable. A = Upgraded version L = Low voltage
yy	Package code (CT, GH, and GS are examples)
zzz	Mask version serial number

17K Family of 4-Bit Microcontrollers

Device (μPD)	OTP Device (μPD)	Features †	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package ‡	Package Code
Digital Tuning Systems, 170xx									
17001	17P001	Serial communication, A/D and D/A converters, PLL	4.5	4.4 to 5.5	8K	224	32	48-pin QFP	GH
17002	—	Serial communication, image display controller, A/D and D/A converters, PLL	8	4.5 to 5.5	8K	336	27	48-pin SDIP 64-pin QFP	CU GF
17003A	17P005	Serial communication, A/D and D/A converters, LCD, PLL	4.5	4.5 to 5.5	8K	320	63	80-pin QFP	GF
17005	17P005	Serial communication, A/D and D/A converters, LCD, PLL	4.5	4.5 to 5.5	16K	432	63	80-pin QFP	GF
17006	17P006	Serial communication, A/D and D/A converters, PLL	4.5	4.5 to 5.5	24K	896	61	80-pin QFP	GF
17008	17P008	Serial communication, image display controller, timer, A/D and D/A converters, PLL	8	4.5 to 5.5	32K	672	45	64-pin SDIP	CW
17010	17P010	Serial communication, A/D and D/A converters, LCD, PLL	4.5	4.5 to 5.5	16K	432	61	80-pin QFP	GF
17051	—	Serial communication, image display controller, timer, A/D and D/A converters	8	4.5 to 5.5	16K	4CU	31	48-pin SDIP	CU
17052	—	Serial communication, image display controller, timer, A/D and D/A converters	8	4.5 to 5.5	16K	4CU	44	64-pin SDIP	CW
17053	—	Serial communication, timer, A/D and D/A converters, PLL	8	4.5 to 5.5	24K	672	44	64-pin SDIP	CW
17401	17P401	Serial communication, image display controller, timer, A/D converter, LCD	10	4.5 to 5.5	24K	524	36	80-pin QFP	GF
General-Purpose Devices, 171xx									
17102	—	Serial communication, timer, A/D and D/A converters, LCD	8	4.5 to 6.6	4K	222	38	52-pin QFP	G
17103	17P103	General purpose	8	2.7 to 6.0	1K	16	11	16-pin SDIP 16-pin SOP	CX GS
17103L	17P103	General purpose, low voltage	8	1.8 to 3.6	1K	16	11	16-pin DIP 16-pin SOP	CX GS
17104	17P104	General purpose	8	2.7 to 6.0	1K	16	16	22-pin SDIP 24-pin SOP	CS GS

17K Family of 4-Bit Microcontrollers (cont)

Device (μPD)	OTP Device (μPD)	Features †	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package ‡	Package Code
17104L	17P104	General purpose, low voltage	8	1.8 to 3.6	1K	16	16	22-pin SDIP 24-pin SOP	CS GS
17106	17P106	Serial communication, timer, LCD, front-panel control	4.5	4.5 to 5.5	8K	178	25	64-pin QFP	GC
17107	17P107	General purpose	1	2.5 to 6.0	1K	16	11	16-pin SDIP 16-pin SOP	CX GS
17107L	17P107	General purpose, low voltage	1	1.5 to 3.6	1K	16	11	16-pin SDIP 16-pin SOP	CX GS
17108	17P108	General purpose	1	2.5 to 6.0	1K	16	16	22-pin SDIP 24-pin SOP	CS GS
17108L	17P108	General purpose, low voltage	1	1.5 to 3.6	1K	16	16	22-pin SDIP 24-pin SOP	CS GS
17134A	17P136	Serial communication, timer, A/D converter	2	2.7 to 5.5	2K	112	21	28-pin SDIP 28-pin SOP	CT GT
17135A	17P137	Serial communication, timer, A/D converter	8	2.7 to 5.5	2K	112	21	28-pin SDIP 28-pin SOP	CT GT
17136A	17P136	Serial communication, timer, A/D converter	2	2.7 to 5.5	4K	112	21	28-pin SDIP 28-pin SOP	CT GT
17137A	17P137	Serial communication, timer, A/D converter	8	2.7 to 5.5	4K	112	21	28-pin SDIP 28-pin SOP	CT GT
Remote Control Devices, 172xx									
17201A	17P201	Serial communication, timer, A/D converter, LCD	4	2.0 to 6.0	6K	336	19	80-pin QFP	GF
17202A	17P201	Timer, LCD	4	2.0 to 6.0	4K	112	16	64-pin QFP	GF
17203A	17P203A	Serial communication, learning remote controller, timer, LCD, 16K bits of SRAM	4	2.0 to 6.0	8K	336	27	52-pin QFP	GC
17204	—	Serial communication, learning remote controller, timer, LCD, 8K bits of SRAM	4	2.0 to 6.0	16K	336	27	52-pin QFP	GC
17207	—	Serial communication, timer, A/D converter, LCD	4	2.0 to 6.0	8K	336	19	80-pin QFP	GF
Home Automation Devices, 173xx									
17301	17P301	Serial communication, timer, A/D converter, DTMF generator/ receiver	3.58	2.0 to 5.5	16K	336	48	64-pin QFP	GF

† DTMF: Dual-tone multifrequency
LCD: Liquid crystal display
PLL: Phase-locked loop
‡ Plastic

Development Tools for 17K Family of 4-Bit Microcontrollers

Device (μPD)	Full Emulator	Mini Emulator	Probe	Evaluation Board	Assembler	Device File	Debugger
17001	IE-17K	IE-17K-ET	EP-17001	SE-17001	AS17K	AS17001	Simplehost
17002	IE-17K	IE-17K-ET	EP-17002	SE-17002	AS17K	AS17002	Simplehost
17003A	IE-17K	IE-17K-ET	EP-17003	SE-17003	AS17K	AS17003	Simplehost
17005	IE-17K	IE-17K-ET	EP-17003	SE-17003	AS17K	AS17005	Simplehost
17006	IE-17K	IE-17K-ET	EP-17201	SE-17001	AS17K	AS17006	Simplehost
17008	IE-17K	IE-17K-ET	EP-17008	SE-17008	AS17K	AS17008	Simplehost
17010	IE-17K	IE-17K-ET	EP-17003	SE-17003	AS17K	AS17010	Simplehost
17051	IE-17K	IE-17K-ET	EP-17051	SE-17051	AS17K	AS17051	Simplehost
17052	IE-17K	IE-17K-ET	EP-17052	SE-17052	AS17K	AS17052	Simplehost
17053	IE-17K	IE-17K-ET	EP-17053	SE-17053	AS17K	AS17053	Simplehost
17102	IE-17K	IE-17K-ET	EP-17102	SE-17102	AS17K	AS17102	Simplehost
17103	IE-17K	IE-17K-ET	EP-17103	SE-17103	AS17K	AS17103	Simplehost
17103L	IE-17K	IE-17K-ET	EP-17103	SE-17103	AS17K	AS17103	Simplehost
17104	IE-17K	IE-17K-ET	EP-17104	SE-17104	AS17K	AS17104	Simplehost
17104L	IE-17K	IE-17K-ET	EP-17104	SE-17104	AS17K	AS17104	Simplehost
17106	IE-17K	IE-17K-ET	EP-17106	SE-17106	AS17K	AS17106	Simplehost
17107	IE-17K	IE-17K-ET	EP-17103	SE-17107	AS17K	AS17107	Simplehost
17107L	IE-17K	IE-17K-ET	EP-17103	SE-17107	AS17K	AS17107	Simplehost
17108	IE-17K	IE-17K-ET	EP-17104	SE-17108	AS17K	AS17108	Simplehost
17108L	IE-17K	IE-17K-ET	EP-17104	SE-17108	AS17K	AS17108	Simplehost
17134A	IE-17K	IE-17K-ET	EP-17134	SE-17134	AS17K	AS17134	Simplehost
17135A	IE-17K	IE-17K-ET	EP-17134	SE-17134	AS17K	AS17135	Simplehost
17136A	IE-17K	IE-17K-ET	EP-17134	SE-17134	AS17K	AS17136	Simplehost
17137A	IE-17K	IE-17K-ET	EP-17134	SE-17134	AS17K	AS17137	Simplehost
17201A	IE-17K	IE-17K-ET	EP-17201	SE-17207	AS17K	AS17201	Simplehost
17202A	IE-17K	IE-17K-ET	EP-17202	SE-17202	AS17K	AS17202	Simplehost
17203A	IE-17K	IE-17K-ET	EP-17203	SE-17203	AS17K	AS17203	Simplehost
17204	IE-17K	IE-17K-ET	EP-17203	SE-17204	AS17K	AS17204	Simplehost
17207	IE-17K	IE-17K-ET	EP-17201	SE-17207	AS17K	AS17201	Simplehost
17301	IE-17K	IE-17K-ET	EP-17301	SE-17301	AS17K	AS17301	Simplehost
17401	IE-17K	IE-17K-ET	EP-17401	SE-17401	AS17K	AS17401	Simplehost

NEC

Section 5. V-Series and RISC Microprocessors and Peripherals

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.

V-Series CMOS Microprocessors

Device, μPD	Features	Data Bits	Clock (MHz)	Package †	Pins
70108 (V20)	8088 compatible; enhanced	8/16	8 or 10	DIP Ceramic DIP QFP PLCC	40 40 52 44
70108H (V20H)	Fully static; pin compatible with 80C88 enhanced microprocessor	8/16	10, 12, 16	DIP QFP PLCC	40 52 44
70116 (V30)	8086 compatible; enhanced	16	8 or 10	DIP Ceramic DIP QFP PLCC	40 40 52 44
70116H (V30H)	Fully static; pin compatible with 80C86 enhanced microprocessor	16	10, 12, 16	DIP QFP PLCC	40 52 44
70208 (V40)	MS-DOS, V20 compatible CPU with peripherals	8/16	8 or 10	Ceramic PGA PLCC QFP	68 68 80
70208H (V40H)	Fully static; low power; 80C88 compatible CPU plus peripherals	8/16	10, 12, 16	Ceramic PGA PLCC QFP	68 68 80
70216 (V50)	MS-DOS, V30 compatible CPU with peripherals	16/16	8 or 10	PGA PLCC QFP	68 68 80
70216H (V50H)	Fully static; low power; 80C88 compatible CPU plus peripherals	16	10, 12, 16	Ceramic PGA PLCC QFP	68 68 80
70136 (V33)	Hardwired, enhanced V30	8 and 16 dynamic	12 or 16	PGA PLCC	68 68
70236 (V53)	V33 core-based; high-integration; DMA, serial I/O, interrupt controller, etc.	8 and 16 dynamic	10, 12, 16	Ceramic PGA QFP	132 120
70320 (V25)	MS-DOS compatible microcontroller; high-integration; DMA, serial I/O, interrupt controller, etc.	8/16	5 or 8	PLCC QFP	84 94
70330 (V35)	MS-DOS compatible microcontroller; high-integration; DMA, serial I/O, interrupt controller, etc.	16	8	PLCC QFP	84 94
70325 (V25 Plus)	MS-DOS compatible microcontroller; high-integration; high-speed DMA	8/16	8 or 10	PLCC QFP	84 94
70335 (V35 Plus)	MS-DOS compatible microcontroller; high-integration; high-speed DMA	16	8 or 10	PLCC QFP	84 94
70327 (V25 Software Guard)	MS-DOS compatible microcontroller; high-integration; software protection	8/16	8	PLCC QFP	84 94
70337 (V35 Software Guard)	MS-DOS compatible microcontroller; high-integration; software protection	16	8	PLCC QFP	84 94
70423 (V55 SC)	V25 upward-compatible, high-integration microcontroller with full synchronous serial support and buffer management	8 and 16 dynamic	12.5	Ceramic PGA PPGA QFP	132 132 120

† Plastic unless ceramic (or cerdip) is specified.

V-Series CMOS System Support Products

Device, μPD	Features	Data Bits	Clock (MHz)	Package †	Pins
71011	Clock Pulse Generator/Driver	—	20	DIP SOP	18 20
71037	Programmable DMA Controller	8	10	DIP QFP PLCC	40 40 44
71051	Serial Control Unit	8	8/10	DIP QFP PLCC	28 44 28
71054	Programmable Timer/Controller	8	8/10	DIP QFP PLCC	24 44 28
71055	Parallel Interface Unit	8	8/10	DIP QFP PLCC	40 44 44
71059	Interrupt Control Unit	8	8/10	DIP QFP PLCC	28 44 28
71071	DMA Controller	8/16	8/10	DIP Ceramic DIP QFP 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
71086	Bus Buffer/Driver	8	8	DIP SOP	18 20
71087	Bus Buffer/Driver	8	8	DIP SOP	20 20
71088	System Bus Controller	—	8/10	DIP SOP	20 20
71101	Complex Peripheral Unit; serial, parallel, timer, interrupt	8	10	QFP	120
71641	Cache Memory Controller	8/16/32	25	PGA	132
72291	Floating Point Coprocessor for V33/V53	16	16	PGA	68
9335	Numeric Interface Adapter for V40/V50 ↔ i8087	—	8	DIP	20

† Plastic unless ceramic (or cerdip) is specified.

RISC Microprocessors and Peripherals

Device	Name	Clock	Package	Pins
μPD30310 (V_R3000A)	RISC Microprocessor	25, 33, 40 MHz	PGA	175
μPD30311 (V_R3010A)	Floating-Point Processor	25, 33, 40 MHz	PGA	84
μPD31311	Bus Interface Unit	25, 33 MHz	PGA	208
μPD46710	16K x 10-Bit x 2 SRAM	Access time: 12, 15 20 ns	PLCC	52
μPD46741	8K x 20-Bit x 2 SRAM	Access time: 12, 15, 20 ns	PLCC	68
μPD30360 (V_R3600)	RISC Microprocessor	25, 33 MHz	PGA	189

NEC

Section 6. Intelligent Peripheral Devices (IPD)

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	Maximum 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	40
72001-11	CMOS, Advanced Multiprotocol Serial Communications Controller	Functional superset of 8530; 8086/V30 interface; two full-duplex serial channels; two DPLLs; two baud-rate generators per channel; loopback test mode; short frame and mark idle detection; 12.5-MHz max clock	2.5 Mb/s	DIP QFP PLCC	40 52 52
72002	CMOS, Advanced Multiprotocol Serial Communications Controller	Low-cost, single-channel version of 72001; software compatible; direct interface to 71071/ 8237 DMA controllers; 12.5-MHz max clock	2.5 Mb/s	DIP QFP PLCC	40 44 44
72103	CMOS, HDLC Controller	Single full-duplex serial channel; on-chip DMA controller	4 Mb/s	SDIP PLCC QFP	64 68 80

Graphics Controllers

Device, μPD	Name	Description	Maximum 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 sync	500 ns/dot	DIP QFP	40 52
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 QFP	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 QFP	84 94

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 QFP	64 68 80

† Plastic unless ceramic (or cerdip) is specified.

Floppy-Disk Controllers

Device, μPD	Name	Description	Maximum 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
72064	Floppy-Disk Controller	CMOS. All features of 72068 with complete AT register set and 48-mA drivers. Pin compatible with WD 37C65/A/B but with higher performance DPLL and reliable multitasking operation	500 kb/s	PLCC QFP	44 52
72065/65B	CMOS Floppy-Disk Controller	100% 765A/B microcode compatible; compatible with 808x microprocessor families	500 kb/s	DIP PLCC QFP	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 PLCC QFP	48 52 52
72068	Floppy-Disk Controller	All features of the 72067 plus IBM-PC, PC/XT, PC/AT, or PS/2 style registers; high-current drivers	600 kb/s	QFP 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 QFP	84 100

Hard-Disk Controllers

Device, μPD	Name	Description	Maximum 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 QFP PLCC	40 52 52
72111	Small Computer System Interface (SCSI) Controller	Selectable 8/16 data bus width; 16 high-level commands including multiphase commands for reduced CPU load; 5-Mb sync/async; CMOS	16 MHz	SDIP PLCC QFP	64 68 74

NEC

Section 7. DSP and Speech Products

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
77C20A	16-bit, fixed-point DSP; CMOS	244	512 x 23	510 x 13	128 x 16	DIP PLCC SOP PLCC	28 28 32 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	122/100	2048 x 24	1024 x 16	256 x 16	DIP PLCC SOP PLCC	28 28 32 44
77P25	16-bit, fixed-point DSP; CMOS	122/100	2048 x 24 OTPROM	1024 x 16 OTPROM	256 x 16	DIP SOP PLCC	28 32 44
			2048 x 24 UVEPROM	1024 x 16 UVEPROM	256 x 16	Cerdip	28
77220	24-bit, fixed-point DSP; CMOS	122/100	2048 x 32	1024 x 24	512 x 24	Ceramic PGA PLCC	68 68
77P220L	24-bit, fixed-point DSP; CMOS	122/100	2048 x 32 OTPROM	1024 x 24 OTPROM	512 x 24	PLCC	68
77P220R	24-bit, fixed-point DSP; CMOS	122/100	2048 x 32 UVEPROM	1024 x 24 UVEPROM	512 x 24	Ceramic PGA	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
77240	32-bit, advanced, floating-point DSP; CMOS	90	64K x 32 external	n/a	16M x 32 external	PGA	132
77810	16-bit fixed-point modem DSP; CMOS	181	2048 x 24	1024 x 16	256 x 16	Ceramic PGA PLCC	68 68
77811	Analog front end for 2400-b/s full-duplex modem	n/a	n/a	n/a	n/a	PLCC	44
77812	2400-b/s full-duplex modem controller	181	n/a	n/a	256 x 16	PLCC QFP	68 74
7281	Image pipelined processor; NMOS	5-MHz clock	n/a	n/a	512 x 18	Ceramic DIP	40
72181	Image pipelined processor; CMOS	10-MHz clock	n/a	n/a	512 x 18	DIP QFP	40 68
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	Bit Rate (kb/s)	Data ROM (Bits)	Package †	Pins
77C30	ADPCM Speech Encoder/Decoder	NMOS	32	—	DIP PLCC	28 44
7755	ADPCM Speech Synthesizer	CMOS	16, 20, 24, 32	96K	DIP SOP	18 24
7756	ADPCM Speech Synthesizer	CMOS	16, 20, 24, 32	256K	DIP SOP	18 24
77P56	ADPCM Speech Synthesizer	CMOS	16, 20, 24, 32	256K OTPROM	DIP SOP	20 24
7757	ADPCM Speech Synthesizer	CMOS	16, 20, 24, 32	512K	DIP SOP	18 24
7759	ADPCM Speech Synthesizer	CMOS	16, 20, 24, 32	1024K external RAM	DIP QFP	40 52
77501	Speech Recording and Reproducing LSI	CMOS	12, 18, 24	16M external RAM	QFP	80

† Plastic unless ceramic (or cerdip) is specified.

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Section 8. Development Tools for Micro Products

Note: Section 4 covers the 17K family of 4-bit microcontrollers and related development tools.

V-Series Microprocessors

Device (Note 1)	Full Emulator	Full Emulator Probe	Mini-IE Emulator	Mini-IE Probe	Evaluation Boards	EPROM 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	EP-70320J (Note 12)	EB-V50MINI-IE	—	EB70216	—	RA70116	CC70116
μPD70216GF-10	IE-70216-A010	EP-70320J (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
μPD70236GD-10	IE-70236-BX	EV-9500GD-120 (Note 18)	—	—	DDK-70236	—	RA70136	CC70136
μPD70236GD-12	IE-70236-BX	EV-9500GD-120 (Note 18)	—	—	DDK-70236	—	RA70136	CC70136
μPD70236GD-16	IE-70236-BX	EV-9500GD-120 (Note 18)	—	—	DDK-70236	—	RA70136	CC70136

V-Series Microprocessors (cont)

Device (Note 1)	Full Emulator	Full Emulator Probe	Mini-IE Emulator	Mini-IE Probe	Evaluation Boards	EPROM Device	Relocatable Assembler (Note 13)	C Compiler (Note 14)
μPD70236R-10	IE-70236-BX	(Note 17)	—	—	DDK-70236	—	RA70136	CC70136
μPD70236R-12	IE-70236-BX	(Note 17)	—	—	DDK-70236	—	RA70136	CC70136
μPD70236R-16	IE-70236-BX	(Note 17)	—	—	DDK-70236	—	RA70136	CC70136
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	EV-9500GJ-94 (Note 16)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	DDK-70320	—	RA70320	CC70116
μPD70322GJ-8	IE-70320-A008	EP-70320GJ	EB-V25MINI-IE-P	EP-70320GJ	DDK-70320	—	RA70320	CC70116
μPD70322L	IE-70320-A008	(Note 15)	EB-V25MINI-IE-P	(Note 7)	DDK-70320	70P322K (Note 10)	RA70320	CC70116
μPD70322L-8	IE-70320-A008	(Note 15)	EB-V25MINI-IE-P	(Note 7)	DDK-70320	70P322K (Note 10)	RA70320	CC70116
μPD70325GJ-8	IE-70325-BX	EV-9500GJ-94 (Note 16)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	DDK-70325	—	RA70320	CC70116
μPD70325GJ-10	IE-70325-BX (Note 8)	EV-9500GJ-94 (Note 16)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	DDK-70325	—	RA70320	CC70116
μPD70325L-8	IE-70325-BX	(Note 15)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	DDK-70325	—	RA70320	CC70116
μPD70325L-10	IE-70325-BX (Note 8)	(Note 15)	EB-V25MINI-IE-P	EP-70320GJ (Note 6)	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-70230-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-BX	EV-9500GJ-94 (Note 16)	EB-V35MINI-IE-P	EP-70320GJ (Note 6)	DDK-70330	—	RA70320	CC70116

V-Series Microprocessors (cont)

Device (Note 1)	Full Emulator	Full Emulator Probe	Mini-IE Emulator	Mini-IE Probe	Evaluation Boards	EPROM Device	Relocatable Assembler (Note 13)	C Compiler (Note 14)
μPD70335GJ-10	IE-70335-BX (Note 8)EV-9500GJ-94 (Note 16)	EV-9500GJ-94 (Note 16)	EP-V35MINI-IE-P	EP-70320GJ (Note 6)	DDK-70330	—	RA70320	CC70116
μPD70335L-8	IE-70335-BX	(Note 15)	EB-V35MINI-IE-P	EP-70320GJ (Note 6)	DDK-70330	—	RA70320	CC70116
μPD70335L-10	IE-70335-BX (Note 8)	(Note 15)	EB-V35MINI-IE-P	EP-70320GJ (Note 6)	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-A008 + 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:
- GF 80-pin plastic QFP
- GJ 74-pin or 94-pin plastic QFP
- 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 QFP 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 adapter converts the PGA-pinout on the MINI-IE to a PLCC footprint. This adapter is supplied with the MINI-IE.

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

(6) The EP-70320GJ adapter 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 QFP.

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

(8) 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 the 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.

(13) The following relocatable assemblers are available:

RA70116-D52	For V20®/V30®/	(MS-DOS®)
RA70116-VVT1	V40™/V50™	(VAX/VMS™)
RA70116-VXT1		(VAX/UNIX™ 4.2 BSD or Ultrix™)
RA70136-D52	For V33™/V53™	(MS-DOS)
RA70136-VVT1		(VAX/VMS)
RA70136-VXT1		(VAX/UNIX 4.2 BSD or Ultrix)
RA70320-D52	For V25™/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™	(VAX/VMS)
CC70116-VXT1		(VAX/UNIX 4.2 BSD or Ultrix)
CC70136-D52	For V33™/V53™	(MS-DOS)
CC70136-VVT1		(VAX/VMS)
CC70136-VXT1		(VAX/UNIX 4.2 BSD or Ultrix)

(15) 84-pin PLCC probe shipped with IE-70325-BX and IE-70335-BX.

(16) The EV-9500GJ-94 is an adapter that converts the 84-pin PLCC probe to a 94-pin QFP. Target sockets must also be purchased to mate to this adapter. Target sockets are sold in packs of five as part number EV-92006-94x5.

(17) The IE-70236-BX is shipped with the 132-pin PGA probe.

(18) The EV-9500GD-120 is an adapter that converts the 132-pin PGA probe to a 120-pin QFP. Target sockets must also be purchased to mate to this adapter. Target sockets are sold in packs of five as part number EV-9200GD-120.

75xx Series Single-Chip Microcomputers

Device (Note 1)	Emulator*	Add-on Board*	System Evaluation Board	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Absolute Assembler (Note 3)
μPD7502G-12	EVAKIT-7500B	EV-7514	SE-7514-A	—	—	ASM75
μPD7502AGF-3B8	EVAKIT-7500B	EV-7514	SE-7514-A	—	—	ASM75
μPD7503G-12	EVAKIT-7500B	EV-7514	SE-7514-A	—	—	ASM75
μPD7503AGF-3B8	EVAKIT-7500B	EV-7514	SE-7514-A	—	—	ASM75
μPD7507C	EVAKIT-7500B	—	—	μPD78CG08E	—	ASM75
μPD7507CU	EVAKIT-7500B	—	—	—	—	ASM75
μPD7507G-00	EVAKIT-7500B	—	—	—	—	ASM75
μPD7507BCU	EVAKIT-7500B	—	—	—	—	ASM75
μPD7507BGB-3B4	EVAKIT-7500B	—	—	—	—	ASM75
μPD7507HC	EVAKIT-7500B	EV-7508H	—	μPD75CG08HE	—	ASM75
μPD7507HCU	EVAKIT-7500B	EV-7508H	—	—	—	ASM75
μPD7507HG-22	EVAKIT-7500B	EV-7508H	—	—	—	ASM75
μPD7508C	EVAKIT-7500B	—	—	μPD78CG08E	—	ASM75
μPD7508CU	EVAKIT-7500B	—	—	—	—	ASM75
μPD7508G-00	EVAKIT-7500B	—	—	—	—	ASM75
μPD7508BCU	EVAKIT-7500B	—	—	—	—	ASM75
μPD7508BGB-3B4	EVAKIT-7500B	—	—	—	—	ASM75
μPD75CG08E	EVAKIT-7500B	—	—	—	—	ASM75
μPD7508HC	EVAKIT-7500B	EV-7508H	—	μPD78CG08HE	—	ASM75
μPD7508HCU	EVAKIT-7500B	EV-7508H	—	—	—	ASM75
μPD7508HG-22	EVAKIT-7500B	EV-7508H	—	—	—	ASM75
μPD75CG08HE	EVAKIT-7500B	EV-7508H	—	—	—	ASM75
μPD7527AC	EVAKIT-7500B	EV-7528	—	μPD78CG28E	—	ASM75
μPD7527ACU	EVAKIT-7500B	EV-7528	—	—	—	ASM75
μPD7528AC	EVAKIT-7500B	EV-7528	—	μPD78CG28E	—	ASM75
μPD7528ACU	EVAKIT-7500B	EV-7528	—	—	—	ASM75
μPD75CG28E	EVAKIT-7500B	EV-7528	—	—	—	ASM75
μPD7533C	EVAKIT-7500B	EV-7533	—	μPD75CG33E	—	ASM75
μPD7533CU	EVAKIT-7500B	EV-7533	—	—	—	ASM75
μPD7533G-22	EVAKIT-7500B	EV-7533	—	—	—	ASM75
μPD75CG33E	EVAKIT-7500B	EV-7533	—	—	—	ASM75
μPD7537AC	EVAKIT-7500B	EV-7528	—	μPD75CG38E	—	ASM75
μPD7537ACU	EVAKIT-7500B	EV-7528	—	—	—	ASM75
μPD7538AC	EVAKIT-7500B	EV-7528	—	μPD75CG38E	—	ASM75
μPD7538ACU	EVAKIT-7500B	EV-7528	—	—	—	ASM75
μPD75CG38E	EVAKIT-7500B	EV-7528	—	—	—	ASM75

* Required tools

75xx Series Single-Chip Microcomputers (cont)

Device (Note 1)	Emulator*	Add-on Board*	System Evaluation Board	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Absolute Assembler (Note 3)
μPD7554CS	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P54CS	PA-75P54CS	ASM75
μPD7554G	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P54G	PA-75P54CS	ASM75
μPD7554ACS	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P54CS	PA-75P54CS	ASM75
μPD7554AG	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P54G	PA-75P54CS	ASM75
μPD75P54CS	EVAKIT-7500B	EV-7554A	—	—	—	ASM75
μPD75P54G	EVAKIT-7500B	EV-7554A	—	—	—	ASM75
μPD7556CS	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P56CS	PA-75P56CS	ASM75
μPD7556G	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P56G	PA-75P56CS	ASM75
μPD7556ACS	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P56CS	PA-75P56CS	ASM75
μPD7556AG	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P56G	PA-75P56CS	ASM75
μPD75P56CS	EVAKIT-7500B	EV-7554A	—	—	—	ASM75
μPD75P56G	EVAKIT-7500B	EV-7554A	—	—	—	ASM75
μPD7564CS	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P64CS	PA-75P54CS	ASM75
μPD7564G	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P64G	PA-75P54CS	ASM75
μPD7564ACS	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P64CS	PA-75P54CS	ASM75
μPD7564AG	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P64G	PA-75P54CS	ASM75
μPD75P64CS	EVAKIT-7500B	EV-7554A	—	—	—	ASM75
μPD75P64G	EVAKIT-7500B	EV-7554A	—	—	—	ASM75
μPD7566CS	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P66CS	PA-75P56CS	ASM75
μPD7566G	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P66G	PA-75P56CS	ASM75
μPD7566ACS	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P66CS	PA-75P56CS	ASM75
μPD7566AG	EVAKIT-7500B	EV-7554A	SE-7554-A	μPD75P66G	PA-75P56CS	ASM75
μPD75P66CS	EVAKIT-7500B	EV-7554A	—	—	—	ASM75
μPD75P66G	EVAKIT-7500B	EV-7554A	—	—	—	ASM75

Notes:

(1) Packages:

C	40-pin plastic DIP (μPD7507/07H/08/08H)
	42-pin plastic DIP (μPD7527A/28A/33/37A/38A)
CS	20-pin plastic shrink DIP (μPD7554/54A/P54/64/64A/P64)
	24-pin plastic shrink DIP (μPD7556/56A/P56/66/66A/P66)
CU	40-pin plastic shrink DIP (μPD7507/07B/07H/08/08B/08H)
	42-pin plastic shrink DIP (μPD7527A/28A/33/37A/38A)
E	40-pin ceramic piggy-back DIP (μPD75CG08/08H)
	42-pin ceramic piggy-back DIP (μPD75CG28/33/38)
G	20-pin plastic SO (μPD7554/54A/P54/64/64A/P64)
	24-pin plastic SO (μPD7556/56A/P56/66/66A/P66)
G-00	52-pin plastic QFP
G-12	64-pin plastic QFP (2.05 mm thick) (μPD7502/03)
G-22	44-pin plastic QFP (1.45 mm thick)
GB-3B4	44-pin plastic QFP (2.7 mm thick)
GF-3B8	64-pin plastic QFP (2.7 mm thick)

(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 MS-DOS® operating system. (ASM75-D52).

75xxx Series Single-Chip Microcomputers

Device (Note 5)	Emulator*	Emulation Probe*	Optional Socket Adapter (Note 1)	EPROM/OTP Device (Note 2)	Relocatable Assembler (Note 3)	Structured Assembler (Note 4)
μPD75004CU	IE-75000-R	EP-75008CU-R	—	μPD75P008CU	RA75X	ST75X
μPD75004GB-3B4	IE-75000-R	EP-75008GB-R	EV-9200G-44	μPD75P008GB	RA75X	ST75X
μPD75006CU	IE-75000-R	EP-75008CU-R	—	μPD75P008CU	RA75X	ST75X
μPD75006GB-3B4	IE-75000-R	EP-75008GB-R	EV-9200G-44	μPD75P008GB	RA75X	ST75X
μPD75008CU	IE-75000-R	EP-75008CU-R	—	μPD75P008CU	RA75X	ST75X
μPD75008GB-3B4	IE-75000-R	EP-75008GB-R	EV-9200G-44	μPD75P008GB	RA75X	ST75X
μPD75P008CU	IE-75000-R	EP-75008CU-R	—	—	RA75X	ST75X
μPD75P008GB	IE-75000-R	EP-75008GB-R	EV-9200G-44	—	RA75X	ST75X
μPD75028CW	IE-75000-R	EP-75028CW-R	—	μPD75P036CW	RA75X	ST75X
μPD75028GC-AB8	IE-75000-R	EP-75028GC-R	EV-9200GC-64	μPD75P036GC	RA75X	ST75X
μPD75P036CW	IE-75000-R	EP-75028CW-R	—	—	RA75X	ST75X
μPD75P036GC-AB8	IE-75000-R	EP-75028GC-R	EV-9200GC-64	—	RA75X	ST75X
μPD75048CW	IE-75000-R	EP-75028CW-R	—	μPD75P056CW	RA75X	ST75X
μPD75048GC-AB8	IE-75000-R	EP-75028GC-R	EV-9200GC-64	μPD75P056GC	RA75X	ST75X
μPD75P056CW	IE-75000-R	EP-75028CW-R	—	—	RA75X	ST75X
μPD75P056GC-AB8	IE-75000-R	EP-75028GC-R	EV-9200GC-64	—	RA75X	ST75X
μPD75104CW	IE-75000-R	EP-75108CW-R	—	μPD75P108CW/ DW/BCW μPD75P116CW	RA75X	ST75X
μPD75104G-1B	IE-75000-R	EP-75108GF-R	EV-9200G-64	μPD75P108G μPD75P116GF	RA75X	ST75X
μPD75104GF-3BE	IE-75000-R	EP-75108GF-R	EV-9200G-64	μPD75P108G/ BGF μPD75P116GF	RA75X	ST75X
μPD75104AGC-AB8	IE-75000-R	EP-75108AGC-R	EV-9200GC-64	—	RA75X	ST75X
μPD75106CW	IE-75000-R	EP-75108CW-R	—	μPD75P108CW/ DW/BCW μPD75P116CW	RA75X	ST75X
μPD75106G-1B	IE-75000-R	EP-75108GF-R	EV-9200G-64	μPD75P108G μPD75P116GF	RA75X	ST75X
μPD75106GF-3BE	E-75000-R	EP-75108GF-R	EV-9200G-64	μPD75P108G/ BGF μPD75P116GF	RA75X	ST75X
μPD75108AG-22	IE-75000-R	EP-75108AGC-R	EV-9200GC-64	—	RA75X	ST75X
μPD75108AGC-AB8	IE-75000-R	EP-75108AGC-R	EV-9200GC-64	—	RA75X	ST75X
μPD75108CW	IE-75000-R	EP-75108CW-R	—	μPD75P108CW/ DW/BCW μPD75P116CW	RA75X	ST75X
μPD75108G-1B	IE-75000-R	EP-75108GF-R	EV-9200G-64	μPD75P108G μPD75P116GF	RA75X	ST75X
μPD75108GF-3BE	IE-75000-R	EP-75108GF-R	EV-9200G-64	μPD75P108G/ BGF μPD75P116GF	RA75X	ST75X
μPD75P108BCW	IE-75000-R	EP-75108CW-R	—	—	RA75X	ST75X
μPD75P108BGF	IE-75000-R	EP-75108GF-R	EV-9200G-64	—	RA75X	ST75X

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75xxx Series Single-Chip Microcomputers (cont)

Device (Note 5)	Emulator*	Emulation Probe*	Optional Socket Adapter (Note 1)	EPROM/OTP Device (Note 2)	Relocatable Assembler (Note 3)	Structured Assembler (Note 4)
μPD75P108CW	IE-75000-R	EP-75108CW-R	—	—	RA75X	ST75X
μPD75P108DW	IE-75000-R	EP-75108CW-R	—	—	RA75X	ST75X
μPD75P108G-1B	IE-75000-R	EP-75108GF-R	EV-9200G-64	—	RA75X	ST75X
μPD75112CW	IE-75000-R	EP-75108CW-R	—	μPD75P116CW	RA75X	ST75X
μPD75112GF-3BE	IE-75000-R	EP-75108GF-R	EV-9200G-64	μPD75P116GF	RA75X	ST75X
μPD75116CW	IE-75000-R	EP-75108CW-R	—	μPD75P116CW	RA75X	ST75X
μPD75116GF-3BE	IE-75000-R	EP-75108GF-R	EV-9200G-64	μPD75P116GF	RA75X	ST75X
μPD75P116CW	IE-75000-R	EP-75108CW-R	—	—	RA75X	ST75X
μPD75P116GF	IE-75000-R	EP-75108GF-R	EV-9200G-64	—	RA75X	ST75X
μPD75206CW	IE-75000-R	EP-75216ACW-R	—	μPD75P216ACW	RA75X	ST75X
μPD75206G-1B	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75206GF-3BE	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75208CW	IE-75000-R	EP-75216ACW-R	—	μPD75P216ACW	RA75X	ST75X
μPD75208G-1B	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75208GF-3BE	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75CG208E	IE-75000-R	EP-75216ACW-R	—	—	RA75X	ST75X
μPD75CG208EA	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75212ACW	IE-75000-R	EP-75216ACW-R	—	μPD75P216ACW	RA75X	ST75X
μPD75212AGF-3BE	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75216ACW	IE-75000-R	EP-75216ACW-R	—	μPD75P216ACW	RA75X	ST75X
μPD75216AGF	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75CG216AE	IE-75000-R	EP-75216ACW-R	—	—	RA75X	ST75X
μPD75CG216AEA	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75P216ACW	IE-75000-R	EP-75216ACW-R	—	μPD75P216ACW	RA75X	ST75X
μPD75217CW	IE-75000-R	EP-75216ACW-R	—	μPD75P218CW	RA75X	ST75X
μPD75217GF-3BE	IE-75000-R	EP-75216AGF-R	EV-9200G-64	μPD75P218GF/KB	RA75X	ST75X
μPD75P218CW	IE-75000-R	EP-75216ACW-R	—	—	RA75X	ST75X
μPD75P218GF-3BE	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75P218KB	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75268CW	IE-75000-R	EP-75216ACW-R	—	μPD75P216ACW	RA75X	ST75X
μPD75268GF-3BE	IE-75000-R	EP-75216AGF-R	EV-9200G-64	—	RA75X	ST75X
μPD75304GF-3B9	IE-75000-R	EP-75308GF-R	EV-9200G-80	μPD75P308GF/K	RA75X	ST75X
μPD75306GF-3B9	IE-75000-R	EP-75308GF-R	EV-9200G-80	μPD75P308GF/K	RA75X	ST75X
μPD75308GF-3B9	IE-75000-R	EP-75308GF-R	EV-9200G-80	μPD75P308GF/K	RA75X	ST75X
μPD75P308GF	IE-75000-R	EP-75308GF-R	EV-9200G-80	—	RA75X	ST75X
μPD75P308K	IE-75000-R	EP-75308GF-R	EV-9200G-80	—	RA75X	ST75X
μPD75312GF-3B9	IE-75000-R	EP-75308GF-R	EV-9200G-80	μPD75P316GF/ AGF/AK	RA75X	ST75X
μPD75316GF-3B9	IE-75000-R	EP-75308GF-R	EV-9200G-80	μPD75P316GF/ AGF/AK	RA75X	ST75X

75xxx Series Single-Chip Microcomputers (cont)

Device (Note 5)	Emulator*	Emulation Probe*	Optional Socket Adapter (Note 1)	EPROM/OTP Device (Note 2)	Relocatable Assembler (Note 3)	Structured Assembler (Note 4)
μPD75P316GF	IE-75000-R	EP-75308GF-R	EV-9200G-80	—	RA75X	ST75X
μPD75P316AGF	IE-75000-R	EP-75308GF-R	EV-9200G-80	—	RA75X	ST75X
μPD75P316AK	IE-75000-R	EP-75308GF-R	EV-9200G-80	—	RA75X	ST75X
μPD75328GC-3B9	IE-75000-R	EP-75328GC-R	EV-9200GC-80	μPD75P328GC	RA75X	ST75X
μPD75P328GC-3B9	IE-75000-R	EP-75328GC-R	EV-9200GC-80	—	RA75X	ST75X
μPD75402AC	IE-75000-R	EP-75402C-R	—	μPD75P402C	RA75X	ST75X
μPD75402ACT	IE-75000-R	EP-75402C-R	—	μPD75P402CT	RA75X	ST75X
μPD75402AGB-3B4	IE-75000-R	EP-75402GB-R	EV-9200G-44	μPD75P402GB	RA75X	ST75X
μPD75P402C	IE-75000-R	EP-75402C-R	—	—	RA75X	ST75X
μPD75P402CT	IE-75000-R	EP-75402C-R	—	—	RA75X	ST75X
μPD75P402GB-3B4	IE-75000-R	EP-75402GB-R	EV-9200G-44	—	RA75X	ST75X
μPD75512GF-3B9	IE-75000-R	EP-75516GF-R	EV-9200G-80	μPD75P516GF/K	RA75X	ST75X
μPD75516GF-3B9	IE-75000-R	EP-75516GF-R	EV-9200G-80	μPD75P516GF/K	RA75X	ST75X
μPD75P516GF	IE-75000-R	EP-75516GF-R	EV-9200G-80	—	RA75X	ST75X
μPD75P516K	IE-75000-R	EP-75516GF-R	EV-9200G-80	—	—	—

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 RA75X relocatable assembler package is provided for the following operating system:
RA75X-D52 (MS-DOS®)

(4) The ST75X structured assembler preprocessor is provided with RA75X.

(5) Packages:

C	28-pin plastic DIP
CT	28-pin plastic shrink DIP
CU	42-pin plastic shrink DIP
CW	64-pin plastic shrink DIP
DW	64-pin ceramic shrink DIP with window
E	64-pin ceramic piggy-back shrink DIP
EA	64-pin ceramic piggy-back QFP
G-1B	64-pin plastic QFP (2.05 mm thick)
G-22	64-pin plastic QFP (1.55 mm thick)
GB-3B4	44-pin plastic QFP
GC-AB8	64-pin plastic QFP (2.55 mm thick)
GC-3B9	80-pin plastic QFP
GF-3BE	64-pin plastic QFP (2.77 mm thick)
GF-3B9	80-pin plastic QFP
K	80-pin ceramic LCC
KB	64-pin ceramic LCC

* Required tools.

78xx Series Single-Chip Microcomputers

Device (Note 1) †	Emulator*	Emulation Probe*	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Relocatable Assembler (Note 9)	C Compiler (Note 9)
μPD78C10CW	IE-78C11-M	EV-9001-64 (Note 3)	—	—	RA87	CC87
μPD78C10G1B	IE-78C11-M	(Note 5)	—	—	RA87	CC87
μPD78C10GF-3BE	IE-78C11-M	(Note 5)	—	—	RA87	CC87
μPD78C10L	IE-78C11-M	(Note 7)	—	—	RA87	CC87
μPD78C10ACW	IE-78C11-M	EV-9001-64 (Note 3)	—	—	RA87	CC87
μPD78C10AGQ36	IE-78C11-M	(Note 4)	—	—	RA87	CC87
μPD78C10AGF	IE-78C11-M	(Note 5)	—	—	RA87	CC87
μPD78C10AL	IE-78C11-M	(Note 7)	—	—	RA87	CC87
μPD78C11CW	IE-78C11-M	EV-9001-64 (Note 3)	μPD78CP14CW/DW	PA-78CP14CW	RA87	CC87
μPD78C11G-36	IE-78C11-M	(Note 4)	μPD78CP14G36/R μPD78CP14E	PA-78CP14GQ	RA87	CC87
μPD78C11G-1B	IE-78C11-M	(Note 5)	μPD78CP14GF	PA-78CP14GF	RA87	CC87
μPD78C11GF-3BE	IE-78C11-M	(Note 5)	μPD78CP14GF	PA-78CP14GF	RA87	CC87
μPD78C11L	IE-78C11-M	(Note 7)	μPD78CP14L	PA-78CP14L	RA87	CC87
μPD78C11ACW	IE-78C11-M	EV-9001-64 (Note 3)	μPD78CP14CW/DW (Note 6)	PA-78CP14CW	RA87	CC87
μPD78C11AGQ-36	IE-78C11-M	(Note 4)	μPD78CP14G36/R (Note 6)	PA-78CP14GQ	RA87	CC87
μPD78C11AGF-3BE	IE-78C11-M	(Note 5)	μPD78CP14GF (Note 6)	PA-78CP14GF	RA87	CC87
μPD78C11AL	IE-78C11-M	(Note 7)	μPD78CP14L (Note 6)	PA-78CP14L	RA87	CC87
μPD78C12ACW	IE-78C11-M	EV-9001-64 (Note 3)	μPD78CP14CW/DW (Note 6)	PA-78CP14CW	RA87	CC87
μPD78C12AGQ	IE-78C11-M	(Note 4)	μPD78CP14G36/R (Note 6)	PA-78CP14GQ	RA87	CC87
μPD78C12AGF	IE-78C11-M	(Note 5)	μPD78CP14GF (Note 6)	PA-78CP14GF	RA87	CC87
μPD78C12AL	IE-78C11-M	(Note 7)	μPD78CP14L (Note 6)	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)	μPD78CP14G36/R μPD78CG14E	PA-78CP14GQ —	RA87	CC87
μPD78C14G-1B	IE-78C11-M	(Note 5)	μPD78CP14GF	PA-78CP14GF	RA87	CC87
μPD78C14GF	IE-78C11-M	(Note 5)	μPD78CP14GF	PA-78CP14GF	RA87	CC87
μPD78C14L	IE-78C11-M	(Note 7)	μPD78CP14L	PA-78CP14L	RA87	CC87
μPD78C14AG-AB8	IE-78C11-M	(Note 5)	—	—	RA87	CC87
μPD78CG14E (Note 8)	IE-78C11-M	(Note 4)	—	—	RA87	CC87

78xx Series Single-Chip Microcomputers (cont)

Device (Note 1) †	Emulator*	Emulation Probe*	EPROM/OTP Device	PG-1500 Adapter (Note 2)	Relocatable Assembler (Note 9)	C Compiler (Note 9)
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
μPD78CP14G36	IE-78C11-M	(Note 4)	—	PA-78CP14GQ	RA87	CC87
μPD78CP14GF	IE-78C11-M	(Note 5)	—	PA-78CP14GF	RA87	CC87
μPD78CP14L	IE-78C11-M	(Note 7)	—	PA-78CP14L	RA87	CC87
μPD78CP14R	IE-78C11-M	(Note 4)	—	PA-78CP14GQ	RA87	CC87
μPD78C17CW	IE-78C11-M	EV-9001-64 (Note 3)	—	—	RA87	CC87
μPD78C17GQ36	IE-78C11-M	(Note 4)	—	—	RA87	CC87
μPD78C17GF	IE-78C11-M	(Note 5)	—	—	RA87	CC87
μPD78C18CW	IE-78C11-M	EV-9001-64 (Note 3)	μPD78CP18CW (Note 6)	PA-78CP14CW	RA87	CC87
μPD78C18GQ	IE-78C11-M	(Note 4)	μPD78CP18GQ (Note 6)	PA-78CP14GQ	RA87	CC87
μPD78C18GF	IE-78C11-M	(Note 5)	μPD78CP18GF (Note 6)	PA-78CP14GF	RA87	CC87
			μPD78CP18KB (Note 6)	PA-78CP14KB		
μPD78CP18CW	IE-78C11-M	EV-9001-64 (Note 3)	—	PA-78CP14CW	RA87	CC87
μPD78CP18GQ	IE-78C11-M	(Note 4)	—	PA-78CP14GQ	RA87	CC87
μPD78CP18GF	IE-78C11-M	(Note 5)	—	PA-78CP14GF	RA87	CC87
μPD78CP18KB	IE-78C11-M	(Note 5)	—	PA-78CP14KB	RA87	CC87

* Required tools

† For all μPDC1X devices, you may use the DDK-78C10 for evaluation purposes.

Notes:

(1) Packages:

CW	64-pin plastic shrink DIP
DW	64-pin ceramic shrink DIP with window
E	64-pin ceramic piggyback QUIP
G-1B	64-pin plastic QFP (resin thickness 2.05 mm)
G-36	64-pin plastic QUIP
G-AB8	64-pin plastic QFP (interpin pitch 0.8 mm)
GF-3BE	64-pin plastic QFP (resin thickness 2.7 mm)
GQ-36	64-pin plastic QUIP
KB	64-pin ceramic LCC with window
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 μPD78CP14/CP18 EPROM/OTP devices do not have pull-up resistors on ports A, B, and C.

(7) The optional AS-QIP-PCC-D781X QUIP-to-PLCC adapter can be used with the EP-7811HGQ emulation probe supplied with each IE.

(8) The μPD78CG14E is a piggyback EPROM device in a ceramic QUIP package. It accepts 27C256 and 27C256A EPROMs.

(9) The following relocatable assemblers and C compilers are available:

RA87-D52	(MS-DOS®)	Relocatable assemblers for 78XX series
RA87-VVT1	(VAX/VMS®)	
CCMSD-I5DD-87	(MS-DOS)	C Compilers for 78XX Series
CCMSD-I5DD-87-16	(MS-DOS; extended memory)	
CCVMS-0T16-87	(VAX/VMS)	
CCUNX-0T16-87	(VAX/UNIX™; 4.2 BSD or Ultrix®)	

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782xx Series Single-Chip Microcomputers

Device (Notes 1, 2)	Evaluation Kit (Note 3)	Designer Kit (Note 4)	Emulator Kit (Note 5)	Low-End Emulator	Emulation System	Emulation Probe	EPROM/OTP Device (Note 6)
μPD78212CW	EK-78K2-21X	DK-78K2-21XCW	IK-78K2-21XCW	EB-78210-PC	IE-78240-R	EP-78240CW-R	μPD78P214CW/DW
μPD78212GC	EK-78K2-21X	DK-78K2-21XGC	IK-78K2-21XGC	EB-78210-PC	IE-78240-R	EP-78240GC-R (Note 9)	μPD78P214GC
μPD78212GJ	EK-78K2-21X	DK-78K2-21XGJ	IK-78K2-21XGJ	EB-78210-PC	IE-78240-R	EP-78240GJ-R (Note 7)	μPD78P214GJ
μPD78212GQ	EK-78K2-21X	DK-78K2-21XGQ	IK-78K2-21XGQ	EB-78210-PC	IE-78240-R	EP-78240GQ-R	μPD78P214GQ
μPD78212L	EK-78K2-21X	DK-78K2-21XL	IK-78K2-21XL	EB-78210-PC	IE-78240-R	EP-78240LP-R	μPD78P214L
μPD78213CW	EK-78K2-21X	DK-78K2-21XCW	IK-78K2-21XCW	EB-78210-PC	IE-78240-R	EP-78240CW-R	—
μPD78213GC	EK-78K2-21X	DK-78K2-21XGC	IK-78K2-21XGC	EB-78210-PC	IE-78240-R	EP-78240GC-R (Note 9)	—
μPD78213GJ	EK-78K2-21X	DK-78K2-21XGJ	IK-78K2-21XGJ	EB-78210-PC	IE-78240-R	EP-78240GJ-R (Note 7)	—
μPD78213G36	EK-78K2-21X	DK-78K2-21XGQ	IK-78K2-21XGQ	EB-78210-PC	IE-78240-R	EP-78240GQ-R	—
μPD78213L	EK-78K2-21X	DK-78K2-21XL	IK-78K2-21XL	EB-78210-PC	IE-78240-R	EP-78240LP-R	—
μPD78214CW	EK-78K2-21X	DK-78K2-21XCW	IK-78K2-21XCW	EB-78210-PC	IE-78240-R	EP-78240CW-R	μPD78P214CW/DW
μPD78214GC	EK-78K2-21X	DK-78K2-21XGC	IK-78K2-21XGC	EB-78210-PC	IE-78240-R	EP-78240GC-R (Note 9)	μPD78P214GC
μPD78214GJ	EK-78K2-21X	DK-78K2-21XGJ	IK-78K2-21XGJ	EB-78210-PC	IE-78240-R	EP-78240GJ-R (Note 7)	μPD78P214GJ
μPD78214G36	EK-78K2-21X	DK-78K2-21XGQ	IK-78K2-21XGQ	EB-78210-PC	IE-78240-R	EP-78240GQ-R	μPD78P214GQ
μPD78214L	EK-78K2-21X	DK-78K2-21XL	IK-78K2-21XL	EB-78210-PC	IE-78240-R	EP-78240LP-R	μPD78P214L
μPD78P214CW	EK-78K2-21X	DK-78K2-21XCW	IK-78K2-21XCW	EB-78210-PC	IE-78240-R	EP-78240CW-R	—
μPD78P214DW	EK-78K2-21X	DK-78K2-21XCW	IK-78K2-21XCW	EB-78210-PC	IE-78240-R	EP-78240CW-R	—
μPD78P214GC	EK-78K2-21X	DK-78K2-21XGC	IK-78K2-21XGC	EB-78210-PC	IE-78240-R	EP-78240GC-R (Note 9)	—
μPD78P214GJ	EK-78K2-21X	DK-78K2-21XGJ	IK-78K2-21XGJ	EB-78210-PC	IE-78240-R	EP-78240GJ-R (Note 7)	—
μPD78P214GQ	EK-78K2-21X	DK-78K2-21XGQ	IK-78K2-21XGQ	EB-78210-PC	IE-78240-R	EP-78240GQ-R	—
μPD78P214L	EK-78K2-21X	DK-78K2-21XL	IK-78K2-21XL	EB-78210-PC	IE-78240-R	EP-78240LP-R	—
μPD78220GJ	EK-78K2-22X	DK-78K2-22XGJ	IK-78K2-22XGJ	EB-78220-PC	IE-78230-R	EP-78230GJ-R (Note 8)	—
μPD78220L	EK-78K2-22X	DK-78K2-22XL	IK-78K2-22XL	EB-78220-PC	IE-78230-R	EP-78230LQ-R	—
μPD78224GJ	EK-78K2-22X	DK-78K2-22XGJ	IK-78K2-22XGJ	EB-78220-PC	IE-78230-R	EP-78230GJ-R (Note 8)	μPD78P224GJ

782xx Series Single-Chip Microcomputers (cont)

Device (Notes 1, 2)	Evaluation Kit (Note 3)	Designer Kit (Note 4)	Emulator Kit (Note 5)	Low-End Emulator	Emulation System	Emulation Probe	EPROM/OTP Device (Note 6)
μPD78224L	EK-78K2-22X	DK-78K2-22XL	IK-78K2-22XL	EB-78220-PC	IE-78230-R	EP-78230LQ-R	μPD78P224L
μPD78P224GJ	EK-78K2-22X	DK-78K2-22XGJ	IK-78K2-22XGJ	EB-78220-PC	IE-78230-R	EP-78230GJ-R (Note 8)	—
μPD78P224L	EK-78K2-22X	DK-78K2-22XL	IK-78K2-22XL	EB-78220-PC	IE-78230-R	EP-78230LQ-R	—
μPD78233GC	EK-78K2-23X	DK-78K2-23XGC	IK-78K2-23XGC	EB-78230-PC	IE-78230-R	EP-78230GC-R (Note 10)	—
μPD78233GJ	EK-78K2-23X	DK-78K2-23XGJ	IK-78K2-23XGJ	EB-78230-PC	IE-78230-R	EP-78230GJ-R (Note 8)	—
μPD78233LQ	EK-78K2-23X	DK-78K2-23XL	IK-78K2-23XL	EB-78230-PC	IE-78230-R	EP-78230LQ-R	—
μPD78234GC	EK-78K2-23X	DK-78K2-23XGC	IK-78K2-23XGC	EB-78230-PC	IE-78230-R	EP-78230GC-R (Note 10)	μPD78P238GC
μPD78234GJ	EK-78K2-23X	DK-78K2-23XGJ	IK-78K2-23XGJ	EB-78230-PC	IE-78230-R	EP-78230GJ-R (Note 8)	μPD78P238GJ/KF
μPD78234LQ	EK-78K2-23X	DK-78K2-23XL	IK-78K2-23XL	EB-78230-PC	IE-78230-R	EP-78230LQ-R	μPD78P238LQ
μPD78237GC	EK-78K2-23X	DK-78K2-23XGC	IK-78K2-23XGC	EB-78230-PC	IE-78230-R	EP-78230GC-R (Note 10)	—
μPD78237GJ	EK-78K2-23X	DK-78K2-23XGJ	IK-78K2-23XGJ	EB-78230-PC	IE-78230-R	EP-78230GJ-R (Note 8)	—
μPD78237LQ	EK-78K2-23X	DK-78K2-23XLQ	IK-78K2-23XLQ	EB-78230-PC	IE-78230-R	EP-78230LQ-R	—
μPD78238GC	EK-78K2-23X	DK-78K2-23XGC	IK-78K2-23XGC	EB-78230-PC	IE-78230-R	EP-78230GC-R (Note 10)	μPD78P238GC
μPD78238GJ	EK-78K2-23X	DK-78K2-23XGJ	IK-78K2-23XGJ	EB-78230-PC	IE-78230-R	EP-78230GJ-R (Note 8)	μPD78P238GJ/KF
μPD78238LQ	EK-78K2-23X	DK-78K2-23XLQ	IK-78K2-23XLQ	EB-78230-PC	IE-78230-R	EP-78230LQ-R	μPD78P238LQ
μPD78P238GC	EK-78K2-23X	DK-78K2-23XGC	IK-78K2-23XGC	EB-78230-PC	IE-78230-R	EP-78230GC-R (Note 10)	—
μPD78P238GJ	EK-78K2-23X	DK-78K2-23XGJ	IK-78K2-23XGJ	EB-78230-PC	IE-78230-R	EP-78230GJ-R (Note 8)	—
μPD78P238KF	EK-78K2-23X	DK-78K2-23XGJ	IK-78K2-23XGJ	EB-78230-PC	IE-78230-R	EP-78230GJ-R (Note 8)	—
μPD78P238LQ	EK-78K2-23X	DK-78K2-23XL	IK-78K2-23XL	EB-78230-PC	IE-78230-R	EP-78230LQ-R	—
μPD78243CW	EK-78K2-24X	DK-78K2-24XCW	IK-78K2-24XCW	EB-78240-PC	IE-78240-R	EP-78240CW-R	—
μPD78243GC-AB8	EK-78K2-24X	DK-78K2-24XGC	IK-78K2-24XGC	EB-78240-PC	IE-78240-R	EP-78240GC-R (Note 9)	—
μPD78243LP	EK-78K2-24X	DK-78K2-24XLP	IK-78K2-24XLP	EB-78240-PC	IE-78240-R	EP-78240LP-R	—
μPD78244CW	EK-78K2-24X	DK-78K2-24XCW	IK-78K2-24XCW	EB-78240-PC	IE-78240-R	EP-78240CW-R	—
μPD78244GC	EK-78K2-24X	DK-78K2-24XGC	IK-78K2-24XGC	EB-78240-PC	IE-78240-R	EP-78240GC-R (Note 9)	—

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782xx Series Single-Chip Microcomputers (cont)

Device (Notes 1, 2)	Evaluation Kit (Note 3)	Designer Kit (Note 4)	Emulator Kit (Note 5)	Low-End Emulator	Emulation System	Emulation Probe	EPROM/OTP Device (Note 6)
μPD78244L	EK-78K2-24X	DK-78K2-24XLP	IK-78K2-24XLP	EB-78240-PC	IE-78240-R	EP-78240LP-R	—

Notes:

(1) The following software packages are available for the 782xx Series.
RA78K2 Relocatable Assembler Package: RA78K2-D52 (MS-DOS®)
ST78K2 Structured Assembler Preprocessor: provided with RA78K2
CC78K2 C-Compiler package: CC78K2-D52 (MS-DOS)

(2) Packages:
CW 64-pin plastic shrink DIP
DW 64-pin ceramic shrink DIP with window
G36 64-pin plastic QUIP (μPD78213/214)
GC 64-pin plastic QFP (μPD78212/213/214/P214/244)
GC 80-pin plastic QFP (μPD78233/234/237/238/P238)
GC-AB8 64-pin plastic QFP
GJ 94-pin plastic QFP (μPD78220/224/P224/233/234/237/238/P238)
GJ 74-pin plastic QFP (μPD78212/213/214/P214)
GQ 64-pin plastic QUIP (μPD78212/P214)
KF 94-pin ceramic LCC with window
L 68-pin PLCC (μPD78213/214/P214L)
84-pin PLCC (μPD78220/224/P224L)
LP 68-pin PLCC
LQ 84-pin PLCC

(3) The μPD782xx Evaluation Kit contains the appropriate DDB-78K2-2xx Evaluation Board for the part selected, the RA78K2 Relocatable Assembler Package, and the ST78K2 Structured Assembler Preprocessor.

(4) The μPD782xx Designer Kit contains the appropriate EB-782xx-PC low-end emulator and emulation probe for the part selected, the RA78K2 Relocatable Assembler Package, and the ST78K2 Structured Assembler Preprocessor.

(5) The μPD782xx Emulator Kit contains the appropriate IE-782xx system and emulation probe for the part selected, the RA78K2 Relocatable Assembler Package, and the ST78K2 Structured Assembler Preprocessor.

(6) 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 programming adapter.

(7) The EP-78240GJ-R Emulation Probe is shipped with one EV-9200G-74, a 74-pin LCC socket with the footprint of the QFP package. Additional sockets are available as replacement parts in sets of five.

(8) The EP-78230GJ-R Emulation Probe is shipped with one EV-9200G-94, a 94-pin LCC socket with the footprint of the QFP package. Additional sockets are available as replacement parts in sets of five.

(9) The EP-78240GC-R Emulation Probe is shipped with one EV-9200GC-64, a 64-pin LCC socket with the footprint of the QFP package. Additional sockets are available as replacement parts in sets of five.

(10) The EP-78230GC-R Emulation Probe is shipped with one EV-9200GC-80, an 80-pin LCC socket with the footprint of the QFP package. Additional sockets are available as replacement parts in sets of five.

783xx Series Single-Chip Microcomputers

Device (Notes 1, 2)	Evaluation Kit (Note 3)	Emulator Kit (Note 4)	Evaluation Board	Emulation System	Emulation Probe	EPROM/OTP Device (Note 5)
μPD78310ACW	—	IK-78K3-31XACW (Note 6)	DDK-78310A	IE-78310A-R	EP-78310CW (Note 7)	—
μPD78310AGF3BE	—	IK-78K3-31XAGF	DDK-78310A	IE-78310A-R	EP-78310GF (Note 8)	—
μPD78310AGQ-36	—	IK-78K3-31XACW (Note 6)	DDK-78310A	IE-78310A-R	EP-78310GQ (Note 9)	—
μPD78310AL	—	IK-78K3-31XAL	DDK-78310A	IE-78310A-R	EP-78310L	—
μPD78312ACW	—	IK-78K3-31XACW (Note 6)	DDK-78310A	IE-78310A-R	EP-78310CW (Note 7)	μPD78P312ACW/DW
μPD78312AGF	—	IK-78K3-31XAGF	DDK-78310A	IE-78310A-R	EP-78310GF (Note 8)	μPD78P312AGF
μPD78312AGQ	—	IK-78K3-31XACW (Note 6)	DDK-78310A	IE-78310A-R	EP-78310GQ (Note 9)	μPD78P312AGQ/RQ
μPD78312AL	—	IK-78K3-31XAL	DDK-78310A	IE-78310A-R	EP-78310L	μPD78P312AL
μPD78P312ACW	—	IK-78K3-31XACW (Note 6)	DDK-78310A	IE-78310A-R	EP-78310CW (Note 7)	—
μPD78P312ADW	—	IK-78K3-31XACW (Note 6)	DDK-78310A	IE-78310A-R	EP-78310CW (Note 7)	—

783xx Series Single-Chip Microcomputers (cont)

Device (Notes 1, 2)	Evaluation Kit (Note 3)	Emulator Kit (Note 4)	Evaluation Board	Emulation System	Emulation Probe	EPROM/OTP Device (Note 5)
μPD78P312AGF	—	IK-78K3-31XAGF	DDK-78310A	IE-78310A-R	EP-78310GF (Note 8)	—
μPD78P312AGQ-36	—	IK-78K3-31XACW (Note 6)	DDK-78310A	IE-78310A-R	EP-78310GQ (Note 9)	—
μPD78P312AL	—	IK-78K3-31XAL	DDK-78310A	IE-78310A-R	EP-78310L	—
μPD78P312ARQ	—	IK-78K3-31XACW (Note 6)	DDK-78310A	IE-78310A-R	EP-78310GQ (Note 9)	—
μPD78320GJ	EK-78K3-32X	IK-78K3-32XGJ	EB-78320-PC	IE-78327-R	EP-78320GJ-R (Note 10)	—
μPD78320L	EK-78K3-32X	IK-78K3-32XL	EB-78320-PC	IE-78327-R	EP-78320L-R	—
μPD78322GJ	EK-78K3-32X	IK-78K3-32XGJ	EB-78320-PC	IE-78327-R	EP-78320GJ-R (Note 10)	μPD78P322GJ/KD
μPD78322L	EK-78K3-32X	IK-78K3-32XL	EB-78320-PC	IE-78327-R	EP-78320L-R	μPD78P322L/KC
μPD78P322GJ	EK-78K3-32X	IK-78K3-32XGJ	EB-78320-PC	IE-78327-R	EP-78320GJ-R (Note 10)	—
μPD78P322KC	EK-78K3-32X	IK-78K3-32XL	EB-78320-PC	IE-78327-R	EP-78320L-R	—
μPD783P322KD	EK-78K3-32X	IK-78K3-32XGJ	EB-78320-PC	IE-78327-R	EP-78320GJ-R (Note 10)	—
μPD78P322L	EK-78K3-32X	IK-78K3-32XL	EB-78320-PC	IE-78327-R	EP-78320L-R	—
μPD78330GJ	EK-78K3-33X	IK-78K3-33XGJ	EB-78330-PC	IE-78330-R	EP-78330GJ-R (Note 11)	—
μPD78330LQ	EK-78K3-33X	IK-78K3-33XLQ	EB-78330-PC	IE-78330-R	EP-78330LQ-R	—
μPD78334GJ	EK-78K3-33X	IK-78K3-33XGJ	EB-78330-PC	IE-78330-R	EP-78330GJ-R (Note 11)	μPD78P334GJ
μPD78334LQ	EK-78K3-33X	IK-78K3-33XLQ	EB-78330-PC	IE-78330-R	EP-78330LQ-R	μPD78P334LQ/KE
μPD78P334GJ	EK-78K3-33X	IK-78K3-33XGJ	EB-78330-PC	IE-78330-R	EP-78330GJ-R (Note 11)	—
μPD78P334KE	EK-78K3-33X	IK-78K3-33XLQ	EB-78330-PC	IE-78330-R	EP-78330LQ-R	—
μPD78P334LQ	EK-78K3-33X	IK-78K3-33XLQ	EB-78330-PC	IE-78330-R	EP-78330LQ-R	—

Notes:

(1) The following software packages are available for the μPD783xx series:
RA78K3 Relocatable Assembler Package: RA78K3-D52 (MS-DOS®)
ST78K3 Structured Assembler Preprocessor: provided with RA78K3
CC78K3 C-Compiler Package: CC78K3-D52 (MS-DOS)

(2) Packages:

CW	64-pin plastic shrink DIP
DW	64-pin ceramic shrink DIP with window
GF-3BE	64-pin plastic QFP (resin thickness 2.7 mm)
GJ-5BG	94-pin plastic QFP
GJ-5BJ	74-pin plastic QFP (20 mm x 20 mm)
GQ-36	64-pin plastic QUIP
KC	68-pin ceramic LCC with window
KD	74-pin ceramic LCC with window
KE	84-pin ceramic LCC with window
L	44-pin PLCC (μPD71P301L) 68-pin PLCC (μPD78310A/312A/P312AL, μPD78320/322L)
LQ	84-pin PLCC
R	64-pin ceramic QUIP with window

(3) The μPD783xx Evaluation Kit contains the appropriate EB-783xx-PC evaluation board for the part selected, the RA78K3 Relocatable Assembler Package, and the ST78K3 Structured Assembler Preprocessor.

(4) The μPD783xx Emulator Kit contains the appropriate IE-783xx and Emulation Probe for the part selected, the RA78K3 Relocatable Assembler Package, and the ST78K3 Structured Assembler Preprocessor.

(5) 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 programming adapter.

(6) The IK-78K3-31XACW is shipped with the emulation probes for both the 64-pin shrink DIP and 64-pin QUIP packages.

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

(8) The EP-78310GF Emulation Probe is shipped with one EV-9200G-64, a 64-pin LCC socket with the footprint of the QFP package. Additional sockets are available as replacement parts in sets of five.

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

(10) The EP-78320GJ-R Emulation Probe is shipped with one EV-9200G-74, a 74-pin LCC socket with the footprint of the QFP package. Additional sockets are available as replacement parts in sets of five.

(11) The EP-78330GJ-R Emulation Probe is shipped with one EV-9200G-94, a 94-pin LCC socket with the footprint of the QFP package. Additional sockets are available as replacement parts in sets of five.

DSP and Speech Products

Device (Note 7)	Emulator	Evaluation Board	Assembler (Note 1)	Simulator (Note 2)	EPROM/OTP Device	PG-1500 Adapter (Note 3)
μPD77P20D	EVAKIT-7720B	—	ASM77	SM77C25	—	—
μPD77C20AC	EVAKIT-7720B	—	ASM77	SM77C25	μPD77P20D	(Note 5)
μPD77C20AGW	EVAKIT-7720B	—	ASM77	SM77C25	μPD77P20D	—
μPD77C20AL	EVAKIT-7720B	—	ASM77	SM77C25	—	—
μPD77C20ALK	EVAKIT-7720B	—	ASM77	SM77C25	—	—
μPD77220L	EVAKIT-77230	—	RA77230	SM77230, SIM77230	—	—
μPD77220R	EVAKIT-77230	DDK-77220 (Note 8)	RA77230	SM77230, SIM77230	μPD77P220R (EPROM) μPD77P220L (OTP)	PA-77P230R
μPD77P220L	EVAKIT-77230	—	RA77230	SM77230 SIM77230	—	PA-77P220L
μPD77P220R	EVAKIT-77230	DDK-77220 (Note 8)	RA77230	SM77230, SIM77230	—	PA-77P230R
μPD77230AR	EVAKIT-77230	—	RA77230	SM77230, SIM77230	μPD77P230R	PA-77P230R
μPD77230AR-003	EVAKIT-77230	DDK-77230	RA77230	SM77230, SIM77230	μPD77P230R	PA-77P230R
μPD77P230AR	EVAKIT-77230	DDK-77230	RA77230	SM77230, SIM77230	μPD77P230R	PA-77P230R
μPD77240R	IE-77240	IE-77240	RA77240	SIM77240	—	—
μPD77C25C	EVAKIT-77C25	—	RA77C25	SM77C25	μPD77P25C/D	PA-77P25C
μPD77C25GW	EVAKIT-77C25	—	RA77C25	SM77C25	μPD77P25GW	—
μPD77C25L	EVAKIT-77C25	—	RA77C25	SM77C25	μPD77P25L	PA-77P25L
μPD77P25C	EVAKIT-77C25	—	RA77C25	SM77C25	—	PA-77P25C
μPD77P25D	EVAKIT-77C25	—	RA77C25	SM77C25	—	PA-77P25C
μPD77P25GW	EVAKIT-77C25	—	RA77C25	SM77C25	—	PA-77P25GW

DSP and Speech Products (cont)

Device (Note 7)	Emulator	Evaluation Board	Assembler (Note 1)	Simulator (Note 2)	EPROM/OTP Device	PG-1500 Adapter (Note 3)
μPD77P25L	EVAKIT-77C25	—	RA77C25	SM77C25	—	PA-77P25L
μPD7755C	NV-300 System (Note 9)	EB-7759	—	—	μPD77P56CR	PA-77P56C
μPD7755G	NV-300 System (Note 9)	EB-775/NV-310 (Note 6)	—	—	μPD77P56G (Note 10)	PA-77P56C
μPD7756C	NV-300 System (Note 9)	EB-775/NV-310	—	—	μPD77P56CR (Note 10)	PA-77P56C
μPD7756G	NV-300 System (Note 9)	EB-775/NV-310 (Note 6)	—	—	μPD77P56G (Note 10)	PA-77P56C
μPD77P56CR	NV-300 System (Note 9)	EB-775/NV-310	—	—	—	PA-77P56C
μPD77P56G	NV-300 System (Note 9)	EB-775/NV-310 (Note 6)	—	—	—	PA-77P56C
μPD7757C	NV-300 System (Note 9)	EB-775/NV-310	—	—	—	—
μPD7757G	NV-300 System (Note 9)	EB-775/NV-310 (Note 6)	—	—	—	—
μPD7759C	NV-300 System (Note 9)	EB-775/NV-310	—	—	—	—
μPD7759GC	NV-300 System (Note 9)	EB-775/NV-310	—	—	—	—
μPD77501GC	NV-300 System (Note 9)	—	—	—	—	—
μPD77810L	IE-77810	—	RA77810	—	—	—
μPD77810R	IE-77810	—	RA77810	—	—	—

Notes:

(1) The following assemblers are available:

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:

SIM77230-VVT1	Simulator for 77230 (VAX/UNIX)
SIM77230-VXT1	Simulator for 77230 (VAX/UNIX™ 4.2 BSD or Ultrix)
SM77C25	Simulator for 77C25 (IBM-PC)
SM77230	Simulator for 77220, 77230 (IBM-PC)
SIM77240	Simulator for 77240 (IBM-PC)

(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-775 comes with an emulation probe for only the 18-pin DIP.

(7) Packages:

C	18, 28, or 40-pin plastic DIP
D	28-pin ceramic DIP
G	24-pin plastic SOP
GC	52-pin plastic QFP
L	44-or 68-pin PLCC
LK	28-pin PLCC
R	68-pin ceramic PGA
GW	32-pin SOP

(8) DDK-77220 is supported by Hypersignal Workstation/Window, a DSP software platform from Hyperception.

(9) The NV-300 current version is Version 3.0. An upgrade from previous versions (hardware and software) is available under the designation NV-301.

(10) The NV-310 emulation board includes a simple 77P56 programmer module.

PG-1500 Programming Adapters

Target Chip	Socket Adapter (Note 1)	Adapter Module (Note 2)
Standard 27xxx EPROM Devices		
μPD27256 (21 V)	—	027A Board
μPD27256A (12.5 V)	—	027A Board
μPD27C256 (21 V)	—	027A Board
μPD27C256A (12.5 V)	—	027A Board
μPD27C512	—	027A Board
μPD27C1000	—	027A Board
μPD27C1001	—	027A Board
μPD27C1024	—	027A Board
75xx 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
75xxx Series Devices		
μPD75P008CU	PA-75P008CU	04A Board
μPD75P008GB	PA-75P008CU	04A Board
μPD75P036CW	PA-75P036CW	04A Board
μPD75P036GC	PA-75P036GC	04A Board
μPD75P108BCW	PA-75P108CW	04A Board
μPD75P108CW	PA-75P108CW	04A Board
μPD75P108DW	PA-75P108CW	04A Board
μPD75P108BGF	PA-75P116GF	04A Board
μPD75P108G	PA-75P108G	04A Board
μPD75P116CW	PA-75P108CW	04A Board
μPD75P116GF	PA-75P116GF	04A Board
μPD75P216ACW	PA-75P216ACW	04A Board
μPD75P218CW	PA-75P216ACW	04A Board
μPD75P218GF	PA-75P218GF	04A Board
μPD75P218KB	PA-75P218KB	04A Board
μPD75P308GF	PA-75P308GF	04A Board
μPD75P308K	PA-75P308K	04A Board
μPD75P316GF	PA-75P308GF	04A Board
μPD75P316AGF	PA-75P308GF	04A Board
μPD75P316AK	PA-75P308K	04A Board
μPD75P328GC	PA-75P328GC	04A Board

PG-1500 Programming Adapters (cont)

Target Chip	Socket Adapter (Note 1)	Adapter Module (Note 2)
μPD75P402C	(Note 3)	027A Board
μPD75P402CT	PA-75P402CT	027A Board
μPD75P402GB	PA-75P402GB	027A Board
μPD75P516GF	PA-75P516GF	04A Board
μPD75P516K	PA-75P516K	04A Board
78xx Series Devices		
μPD78CP14CW	PA-78CP14CW	027A Board
μPD78CP14DW	PA-78CP14CW	027A Board
μPD78CP14G36	PA-78CP14GQ	027A Board
μPD78CP14GF	PA-78CP14GF	027A Board
μPD78CP14L	PA-78CP14L	027A Board
μPD78CP14R	PA-78CP14GQ	027A Board
μPD78CP18CW	PA-78CP14CW	027A Board
μPD78CP18GQ	PA-78CP14GQ	027A Board
μPD78CP18GF	PA-78CP14GF	027A Board
μPD78CP18KB	PA-78CP14KB	027A Board
782xx Series Devices		
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
μPD78P238GC	PA-78P238GC	027A Board
μPD78P238GJ	PA-78P238GJ	027A Board
μPD78P238KF	PA-78P238KF	027A Board
μPD78P238LQ	PA-78P238LQ	027A Board
783xx Series Devices		
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
μPD78P312ARQ	PA-78P312GQ	027A Board
μPD78P322GJ	PA-78P322GJ	027A Board
μPD78P322KC	PA-78P322KC	027A Board
μPD78P322KD	PA-78P322KD	027A Board
μPD78P322L	PA-78P322L	027A Board
μPD78P334GJ	PA-78P334GJ	027A Board

PG-1500 Programming Adapters (cont)

Target Chip	Socket Adapter (Note 1)	Adapter Module (Note 2)
μPD78P334KE	PA-78P334KE	027A Board
μPD78P334LQ	PA-78P334LQ	027A Board
V-Series Devices		
μPD70P322K	PA-70P322L	027A Board
Digital Signal Processors		
μPD77P56CR	PA-77P56C	04A Board
μPD77P56G	PA-77P56C	04A Board
μPD77P25C	PA-77P25C	027A Board
μPD77P25D	PA-77P25C	027A Board
μPD77P220R	PA-77P230R	027A Board
μPD77P230R	PA-77P230R	027A Board

Notes:

(1) 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

Section 9. Telecom/ISDN Devices

CMOS Combos

Part No.	Description	Companding Law	Sync/Async Operation	Signaling	Loopback Test	Package
μPD9513 (Direct replacement for Intel 29C13/2913)	One master clock; 1.536 or 1.544 or 2.048 MHz	A- or μ-law	Sync only	No	No	20-pin CERDIP
μPD9514 (Direct replacement for Intel 29C14/2914)	Separate transmit/ receive clock	A- or μ-law	Both	Yes	Yes	24-pin CERDIP
μPD9516 (Direct replacement for Intel 29C16/2916)	2.048-MHz master clock	μ-law	Sync only	No	No	16-pin CERDIP
μPD9517 (Direct replacement for Intel 29C17/2917)	2.048-MHz master clock	A-law	Sync only	No	No	16-pin CERDIP
μPD9601 (Compatible replacement for Hitachi 44233C/ 44237C)	On-chip PLL	A-law	Both	No	Yes	16-pin CERDIP
μPD9602 (Compatible replacement for Hitachi 44234C/ 44238C)	On-chip PLL	μ-law	Both	No	Yes	16-pin CERDIP
μPD9604	Digital gain setting (Note 1)	μ-law	Both	No	Yes	16-pin CERDIP
μPD9605	Digital gain setting (Note 1)	A-law	Both	No	Yes	16-pin CERDIP
μPD9621	PLCC version of μPD9601	A-law	Both	No	Yes	18-pin PLCC
μPD9622	PLCC version of μPD9602	μ-law	Both	No	Yes	18-pin PLCC
μPD9624	PLCC version of μPD9604	μ-law	Both	No	Yes	18-pin PLCC
μPD9625	PLCC version of μPD9605	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
μPC7059	−48 V SLIC; constant resistance feed	Battery feed, supervision, 2-wire to 4-wire conversion	28-pin LCC
μPC7062	−24 V SLIC for key telephone	Battery feed, supervision, 2-wire to 4-wire conversion	28-pin LCC
μPC7069	−48 V SLIC; constant current feed	Battery feed, supervision, 2-wire to 4-wire conversion	28-pin LCC
μPC7051	PLCC version of μPC7059	Battery feed, supervision, 2-wire to 4-wire conversion	32-pin PLCC
μPC7063	PLCC version of μPC7062	Battery feed, supervision, 2-wire to 4-wire conversion	32-pin PLCC
μPC7061	PLCC version of μPC7069	Battery feed, supervision, 2-wire to 4-wire conversion	32-pin PLCC

POTS

Part No.	Description	Key Features	Package
μPD9706	Repertory tone/pulse dialer	Switchable tone/pulse, one-touch dialing, abbreviated dialing, 32-digit redial, loudspeaker hearing mode function	28-pin SOP or shrink DIP

Crosspoint Switches

Part No.	Description	Key Features	Package
μPD22100	4 x 4 analog crosspoint switch	16 crosspoint switches with control memory	16-pin DIP
μPD22148	4 x 8 analog crosspoint switch	32 crosspoint switches with control memory	24-pin DIP

ISDN Devices

Part No.	Description	Key Features	Package
μPD98001	Digital line interface controller (DLIC)	2-wire TCM transceiver, AMI-line code, 2.6-km loop length, +5-volt single supply voltage	64-pin shrink DIP or 68-pin PLCC
μPD98201	S/T interface transceiver	4-wire interface, conforms to CCITT I.430 recommendations, multiframing capability, collision detection/priority control, loopback test modes, +5-volt single supply voltage	64-pin flat
μPD72305	LAP-D controller	Performs all layer 2 processing, on-chip DMA, supports both basic and primary access rate	64-pin shrink DIP or 68-pin PLCC
μPD72107	LAP-B controller	Fully implemented LAP-B protocol, on-chip DMA, NRZ/NRZI coding	
μPD72307	Signaling system #7 controller	Supports CCITT Q.703 recommendation, on-chip DMA, 4.8-64 kb/s serial baud rate	
μPD98202	S-interface for TE	4-wire interface, conforms to CCITT I.430, CPU interface, HDLC functions, +5-volt single supply voltage	28-pin PLCC or plastic DIP
μPD98203	S-interface for NT/LT	4-wire interface, conforms to CCITT I.430, multiframing capability, +5-volt single supply voltage	20-pin plastic DIP

NEC

Section 10. ASIC Products

ECL-3B, -4, -4A

Device	Maximum Available Gates	Delay Time (ns)			Number of Buffers		Power Dissipation
		Internal Gate	Output Buffer	Input Buffer	Output	Input	
ECL-3B (100K, 10KH, TTL) (Notes 3, 4)							
μPB6323	2400	0.7	1.6 (ECL) 4.8 (TTL)	0.7 (ECL 0.9 (TTL)	55	120	1.9 mW/gate
μPB6341	4000	0.7	1.6 (ECL) 4.8 (TTL)	0.7 (ECL 0.9 (TTL)	72	156	
μPB6351	5000	0.7	1.6 (ECL) 4.8 (TTL)	0.7 (ECL 0.9 (TTL)	80	172	
ECL-4 (100K, 10KH) (Notes 1, 2, 5)							
μPB6303	600	0.22	0.77	0.23	48	88	3.2 mW/gate
μPB6312	1200	0.22	0.77	0.23	48	108	
ECL-4A (100K, 10KH, TTL) (Notes 3, 6)							
μPB63020	2400	0.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	60	102	2.7 mW/gate
μPB63040	4000	0.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	84	140	
μPB63060	6000	0.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	90	174	
μPB63080	8000	0.09	0.8 (ECL) 4.0 (TTL)	0.3 (ECL) 0.7 (TTL)	108	200	
μPB63100	10,000	0.09	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) ECL-3B: number of macros = 72.

(5) ECL-4: number of macros = 93.

(6) ECL-4A: number of macros = 173.

(7) Ambient temperature: 0 to +70°C.

(8) Technology: advanced bipolar process.

(9) Gate delay loading
ECL-3B, -4: F/O = 3, L = 3 mm
ECL-4A: F/O = 1; L = 0 mm.

CMOS-4

Device	Maximum Available Gates	Delay Time (ns)			Number of Buffers		Power Dissipation
		Internal Gate	Output Buffer	Input Buffer	Output	Input	
CMOS-4 (1.5-micron)							
μPD65022	2128	1.4	4.2	2	84	84	15 μW/gate/MHz
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% (5V ±5% for TTL interface)

(4) Input/output interface: TTL/CMOS compatible

(5) Technology: silicon-gate CMOS, two-layer Al metallization

(6) F/O = 3; L = 3 mm

CMOS-4A, -4L

Device	Maximum Available Gates	Delay Time (ns)			Number of Buffers		Power Dissipation
		Internal Gate	Output Buffer	Input Buffer	Output	Input	
CMOS-4A (1.5-micron)							
μPD65005	320	1.4	4	2	54	54	15 μW/gate/MHz
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/gate/MHz
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

(6) F/O = 3; L = 3 mm.

CMOS-4R

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

(5) F/O = 3; L = 3 mm.

CMOS-5, -5U, -5V

Device	Maximum Available Gates	Delay Time (ns)			Number of Buffers		Power Dissipation	RAM (Bits)
		Internal Gate	Output Buffer	Input Buffer	Output	Input		
CMOS-5 (1.2-micron) Two-layer metallization								
μPD65025	2016	1.0	2.5	2.0	88	88	12 μW/gate/MHz	
μPD65032	3366	1.0	2.5	2.0	106	106		
μPD65044	4400	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-5U (1.2-micron) Two-layer metallization								
μPD65015	1152	0.5	2.5	1.3	94	94	12 μW/gate/MHz	
μPD65016	1680	0.5	2.5	1.3	108	108		
μPD65029	2340	0.5	2.5	1.3	120	120		
CMOS-5V (1.2-micron) Two-layer metallization; high I/O count								
μPD65027	2340	1.0	2.5	1.5	116	116	12 μW/gate/MHz	
μPD65034	3366	1.0	2.5	1.5	128	128		
μPD65046	4400	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

(6) F/O = 2; L = 2 mm.

CMOS-6, -6A

Device	Maximum Available Gates	Delay Time (ns)			Number of Buffers		Power Dissipation
		Internal Gate	Output Buffer	Input Buffer	Output	Input	
CMOS-6 (1.0-micron) Three-layer metallization; channelless sea-of-gate array							
μPD65658	42,240	0.4	2.0	1.0	220	220	12 μW/gate/MHz
μPD65664	72,576	0.4	2.0	1.0	288	288	
μPD65672	119,232	0.4	2.0	1.0	368	368	
μPD65676	117,408	0.4	2.0	1.0	448	448	
CMOS-6A (1.0-micron) Three-layer metallization; channelless sea-of-gate array							
μPD65630	5376	0.4	2.0	1.0	84	84	12 μW/gate/MHz
μPD65636	8000	0.4	2.0	1.0	100	100	
μPD65640	11,520	0.4	2.0	1.0	120	120	
μPD65646	16,240	0.4	2.0	1.0	140	140	
μPD65650	21,120	0.4	2.0	1.0	160	160	
μPD65654	30,720	0.4	2.0	1.0	192	192	

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

(6) F/O = 2; L = 2 mm.

CMOS-7

Device	Maximum Available Gates	Delay Time (ns)			Number of Buffers		Power Dissipation
		Internal Gate	Output Buffer	Input Buffer	Output	Input	
CMOS-7 (0.8-micron) Three-layer metallization; channelless sea-of-gate array							
μPD65762	60,500	0.3	1.8	0.8	220	220	6.5 μW/gate/MHz
μPD65770	103,680	0.3	1.8	0.8	288	288	
μPD65776	169,280	0.3	1.8	0.8	368	368	
μPD65782	250,880	0.3	1.8	0.8	448	448	

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

(6) F/O = 2; L = 2 mm.

BiCMOS-4, -4A, -5

Device	Maximum Available Gates	Delay Time (ns)			Number of Buffers		Power Dissipation
		Internal Gate	Output Buffer	Input Buffer	Output	Input	
BiCMOS-4 (1.5-micron CMOS and bipolar with f_T=4 GHz)							
μPD67001	624	0.8	3.0	1.2	64	64	18 μW/gate/MHz
μPD67010	1124	0.8	3.0	1.2	84	84	
μPD67020	2248	0.8	3.0	1.2	120	120	
μPD67030	3140	0.8	3.0	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/gate/MHz
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	0.5	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	80	80	48 μW/gate/MHz
μPD67031	3240	0.5	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	96	96	
μPD67050	5320	0.5	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	124	124	
μPD67070	7216	0.5	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	148	148	
μPD67101	10,152	0.5	1.3 (ECL) 1.9 (TTL)	1.8 (ECL) 0.9 (TTL)	176	176	
μPD67240	24,528	0.5	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:

	CMOS/TTL	ECL 10KH	ECL 100K
BiCMOS-4	5 V ±10%	—	—
BiCMOS-4A	5 V ±10%	—	—
BiCMOS-5	5 V ±5%	−5.2 V ±5%	−4.5 V ±0.3 V

(4) Input/output interface: CMOS, ALS-TTL (input/output) and ECL-10KH, -100K for BiCMOS-5

(5) F/O = 3; L = 3 mm

SC-5 Standard Cell CMOS ASICs and CB-C7 Cell-Based CMOS ASICs

Device	Maximum Available Gates	Delay Time (ns) Internal Gate	Output Buffer	Input Buffer	Number of Buffers Input/Output Total	Power Dissipation	RAM	ROM
CB-C7 (0.8-micron CMOS)								
μPD94000	5000 to 100,000	0.3	1.8	0.8	348	6.5 μW/gate/MHz	Up to 64K bits	Up to 512K bits
SC-5 (1.2-micron CMOS)								
μPD93000	2000 to 30,000	1.0	2.5	2.0	280	18 μW/gate/MHz	128K bits max	1M bits max

Notes:

(1) Number of macros: 180

(2) Ambient temperature: −40 to +85°C

(3) Power source: 5 V ±10% (CMOS); 5 V ±5% (TTL)

(4) Input/output interface: TTL/CMOS compatible

(5) Technology: silicon-gate CMOS, two-layer Al metallization

(6) CB-C7 ASICs: Megafunctions available at initial offering.

Compatible Device	Function
μPD70108H (V20H)*	8-bit microprocessor
μPD70116H (V30H)*	16-bit microprocessor
μPD72065B	Floppy-disk controller
μPD72020	Graphics display controller
μPD71037	Programmable DMA controller
μPD71051	Serial interface
μPD71054	Programmable timer/counter
μPD71055	Parallel interface
μPD71059	Interrupt controller
μPD4991A	Real-time clock

* 16-MHz, 3-V operation

NEC

Section 11. Capacitors

Capacitors Cross Reference

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

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

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

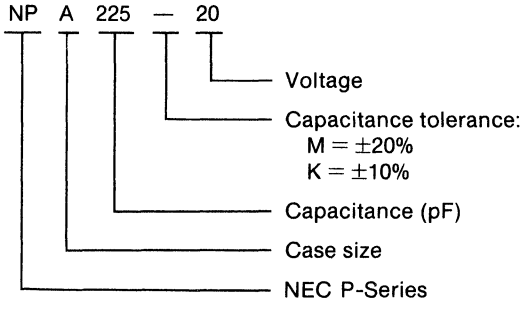
MEPCO	NEC
41DS	D-Series (ND)
41GS	D-Series (ND)
49BC	R-Series (NR)
49MC	R-Series (NR)

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)
894D	SVE-Series

Part Numbering System

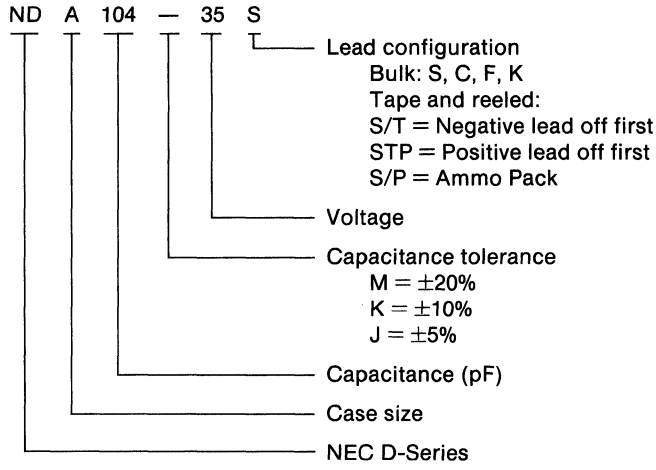
P-Series



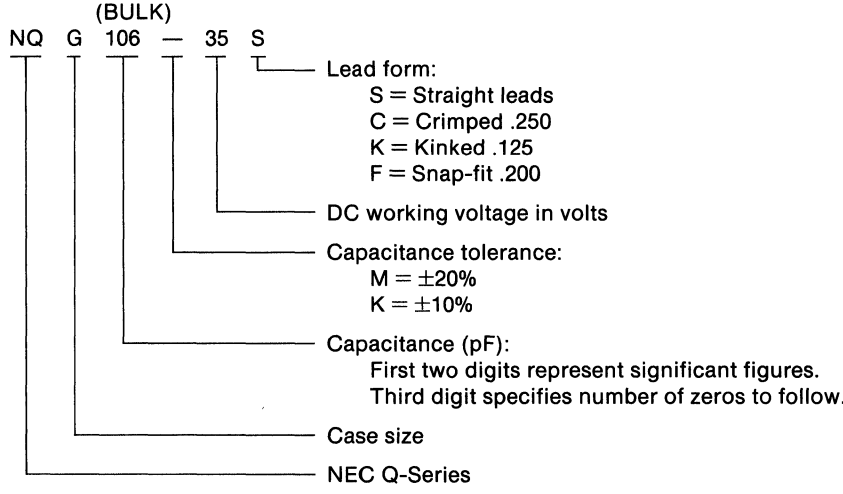
11

Part Numbering System (cont)

D-Series



Q-Series



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

Part Numbering System (cont)

Q-Series (cont)

(TAPING)
NQ G 106 — 35 DTP

- Packaging DTP = Taping on reel. Positive lead is first to leave reel with negative lead to leave last.
  DTN = Taping on reel. Negative lead is first to leave reel with positive lead to leave last.
  DTB = Fan fold box.
- DC working voltage in volts
- Capacitance tolerance:
  M = ±20%
  K = ±10%
- Capacitance (pF):
  First two digits represent significant figures. Third digit specifies number of zeros to follow.
- Case size
- NEC Q-Series

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

R-Series

NR A 105 — 16 * * (* Omit if bulk pack)

- 8 = 8 mm tape
  12 = 12 mm tape
- R—7 inch R** N—13 inch L**
  L—7 inch L** S—Stick
  P—13 inch R** C—Cartridge
- Rated voltage:
  35 V; 25 V; 20 V; 16 V; 10 V; 06 V; 04 V; 02 V
- Capacitance tolerance:
  M = ±20%
  K = ±10%
- Capacitance (pF)
- Case size
  A C U (A2)
  S (B2) T (D2)
  B D
- NEC R-Series

**Polarity direction in taping.

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Part Numbering System (cont)

SVE-Series

Tape and Reel (Standard)

T E SVE B2 1V 105 M 8 R

- R — Packing orientation
- 8 — Tape width
  - 8 mm for B2 case
  - 12 mm for C & D2 cases
- M — Capacitance tolerance
  - M for ±20 %
- 105 — Capacitance in pF code
  - First two digits represent significant figures.
  - Third digit specifies number of zeros to follow.
- 1V — Rated voltage:
  - 1H : 50 V
  - 1V : 35 V
  - 1E : 25 V
  - 1D : 20 V
  - 1C : 16 V
  - 1A : 10 V
- B2 — Case code
- SVE — SVE-series
- E — Reel number E : 178 mm (7 inch)
- T — Tape and reel

BULK (Packed in poly bag. Non-standard)

SVEB21V105M

- See above

Part Numbering System (cont)

FA-Series

FA 0H 105 Z

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

FE, FS, FYD, FYH, FYL, FR Series

FS 0H 473 Z

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

High-Capacitance, Resin Dipped

DB Y5V 1N 106 Z 1

- 1 — New design
- Z — Capacitance tolerance: Z = +80%, −20%
- 106 — Capacitance (pF): First two digits represent significant figures. Third digit specifies number of zeros to follow.
- 1N — Working voltage: 1N = 75 V DC; 1H = 50 V DC; 1E = 25 V DC
- Y5V — Temperature characteristic
- DB — Case size

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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

Part Number (Note 1, 2)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
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
4 V Rating (cont)				
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.

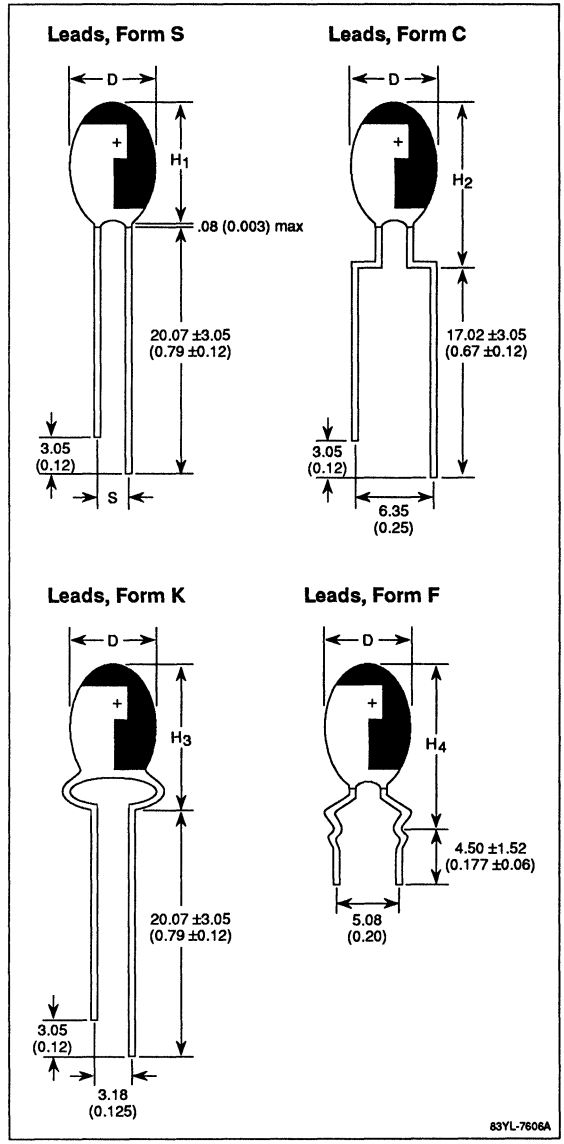
Case Size Dimensions, D-Series

Case	Diameter, D Maximum	Height Maximum H_1	H_2	H_3	H_4	Lead Spacing S ±0.5 (±0.02)
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) Dimension: mm (inch)

(2) Lead-wire diameter: 0.5 ±0.05 (0.02 ±0.002)



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

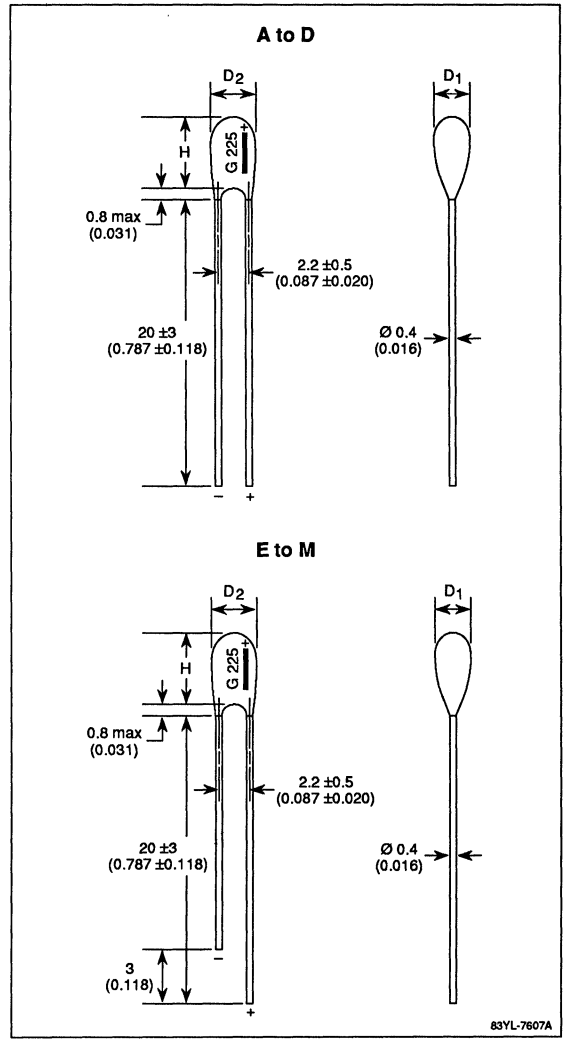
Part Number (Note 1)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
10 V Rating				
NPB105 __ 10	1.0	B	0.5	4
NPC155 __ 10	1.5	C	0.5	6
NPD225 __ 10	2.2	D	0.5	6
NPE335 __ 10	3.3	E	0.5	6
NPF475 __ 10	4.7	F	0.5	6
NPG685 __ 10	6.8	G	0.6	6
NPH106 __ 10	10	H	1.0	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, P-Series

Case Code	D_1 max	D_2 max	H max
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)



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:

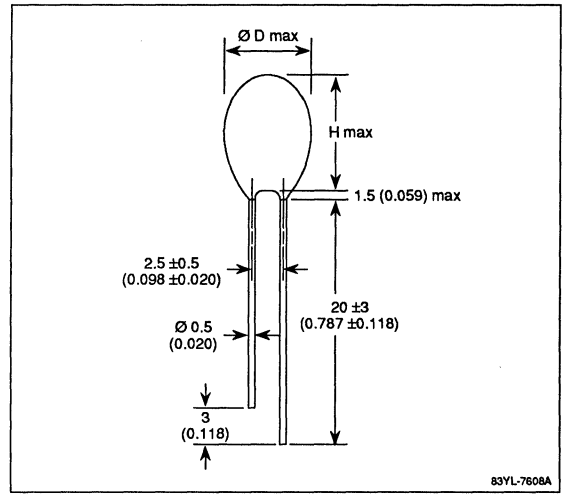
(1) In the first dash (—) to complete part number, insert capacitance tolerance symbol M = ±20%, K = ±10%.

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

Case Size Dimensions, Q-Series

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)	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
NRA334 __ 35	0.33	A	0.5	4
NRA474 __ 35	0.47	A	0.5	6
NRB474 __ 35	0.47	B	0.5	4
NRS474 __ 35	0.47	B2(S)	0.5	4
NRA684 __ 35	0.68	A	0.5	6
NRB684 __ 35	0.68	B	0.5	4
NRS684 __ 35	0.68	B2(S)	0.5	4
NRB105 __ 35	1.0	B	0.5	4
NRS105 __ 35	1.0	B2(S)	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
NRC335 __ 35	3.3	C	1.2	4
NRD335 __ 35	3.3	D	1.2	4
NRD475 __ 35	4.7	D	1.6	4
NRT475 __ 35	4.7	D2(T)	1.6	4
NRD685 __ 35	6.8	D	2.3	6
NRT685 __ 35	6.8	D2(T)	2.3	6
25 V Rating at 85 °C, 13 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(S)	0.8	6
NRC335 __ 25	3.3	C	0.8	4
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				
NRU104 __ 20	0.10	A2(U)	0.5	6
NRU154 __ 20	0.15	A2(U)	0.5	6
NRU224 __ 20	0.22	A2(U)	0.5	6
NRU334 __ 20	0.33	A2(U)	0.5	6
NRU474 __ 20	0.47	A2(U)	0.5	6
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(T)	4.4	6
16 V Rating at 85 °C, 10 V Rating at 125 °C				
NRA684 __ 16	0.68	A	0.5	4
NRU684 __ 16	0.68	A2(U)	0.5	6
NRA105 __ 16	1.0	A	0.5	4

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

R-Series Miniature Encapsulated Chip, Solid Tantalum Capacitors (cont)

Standard Ratings

Part Number (Note 1)	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)				
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
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(T)	5.2	6
10 V Rating at 85°C, 6.3 V Rating at 125°C				
NRA105 __ 10	1.0	A	0.5	4
NRU105 __ 10	1.0	A2(U)	0.5	8
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, B2	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	8
NRD226 __ 10	22.0	D	2.2	6

Part Number (Note 1)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
10 V Rating at 85°C, 6.3 V Rating at 125°C (cont)				
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	8
NRT476 __ 10	47.0	D2(T)	4.7	8
6.3 V Rating at 85°C, 4 V Rating at 125°C				
NRA155 __ 06	1.5	A	0.5	4
NRU155 __ 06	1.5	A2(U)	0.5	8
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	8
NRT686 __ 06	68.0	D2 (T)	4.2	8
4 V Rating at 85°C, 2.5 V Rating at 125°C				
NRA225 __ 04	2.2	A	0.5	4
NRU225 __ 04	2.2	A2(U)	0.5	8
NRA335 __ 04	3.3	A	0.5	4
NRU335 __ 04	3.3	A2(U)	0.5	8
NRA475 __ 04	4.7	A	1.9	4
NRA685 __ 04	6.8	A	0.5	8

R-Series Miniature Encapsulated Chip, Solid Tantalum Capacitors (cont)

Standard Ratings

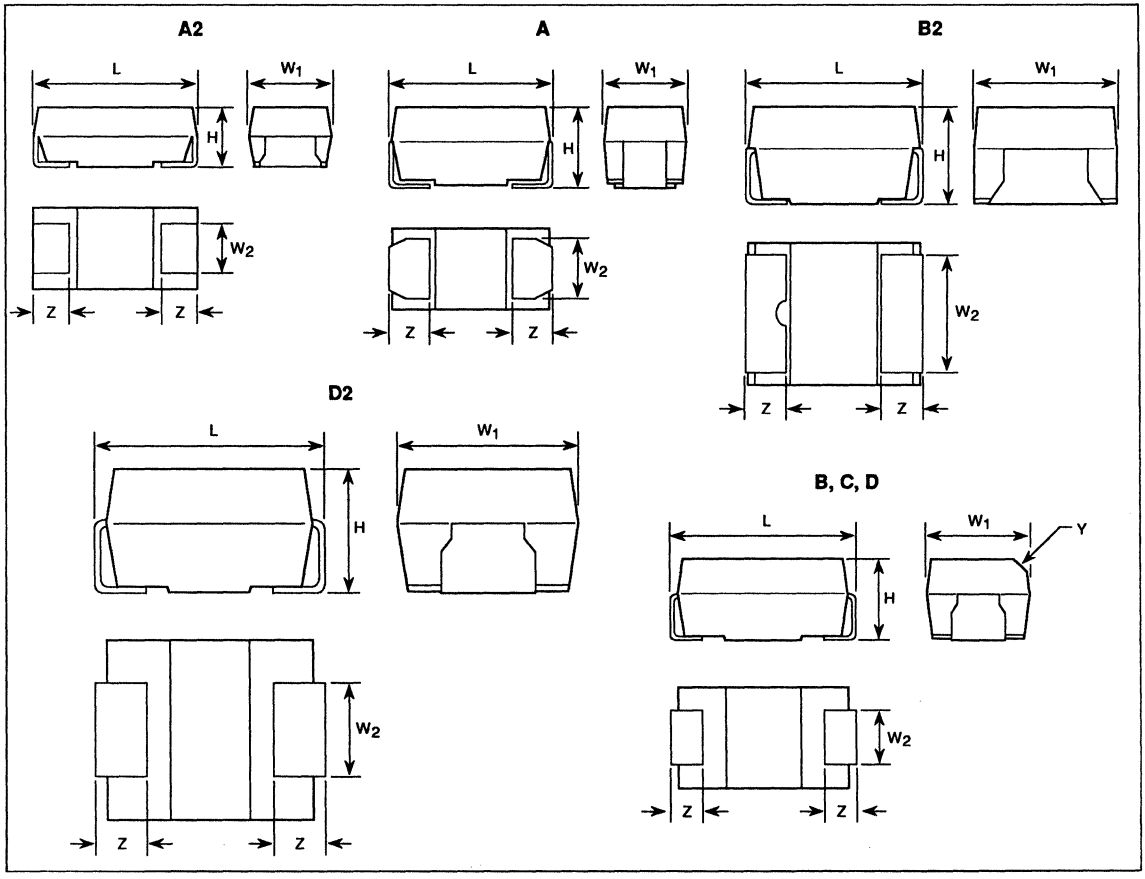
Part Number (Note 1)	Capacitance (μF)	Case	Leakage Current @ 25°C μA Max	Dissipation Factor @ 25°C, 120 Hz % Max
4 V Rating at 85°C, 2.5 V Rating at 125°C (cont)				
NRB685 __ 04	6.8	B	0.5	6
NRA106 __ 04	10.0	A	0.5	8
NRB106 __ 04	10.0	B	0.5	6
NRS106 __ 04	10.0	B2	0.5	6
NRS156 __ 04	15.0	B2(S)	0.6	8
NRC156 __ 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	8
NRT107 __ 04	100.0	D	4.0	8
2.5 V Rating at 85°C, 1.6 V Rating at 125°C				
NRU475 __ 02	4.7	A2(U)	0.5	8
NRA156 __ 02	15.0	A	0.5	8

R-Series Miniature Encapsulated Chip, Solid Tantalum Capacitors (cont)

Case Size Dimensions

Case Size †	L	W_1	W_2	H	Z	Y
A_2	3.2 ± 0.2 (0.126 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	1.2 ± 0.1 (0.047 ± 0.004)	1.2 max (0.047 max)	0.8 ± 0.3 (0.031 ± 0.012)	—
A	3.2 ± 0.2 (0.126 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	1.2 ± 0.1 (0.047 ± 0.004)	1.6 ± 0.2 (0.063 ± 0.008)	0.8 ± 0.3 (0.031 ± 0.012)	—
B_2 (S)	3.5 ± 0.2 (0.138 ± 0.008)	2.8 ± 0.2 (0.110 ± 0.008)	2.3 ± 0.1 (0.091 ± 0.004)	1.9 ± 0.2 (0.075 ± 0.008)	0.8 ± 0.3 (0.031 ± 0.012)	—
B	4.7 ± 0.3 (0.185 ± 0.012)	2.6 ± 0.3 (0.102 ± 0.012)	1.4 ± 0.1 (0.055 ± 0.004)	2.1 ± 0.3 (0.083 ± 0.012)	0.8 ± 0.3 (0.031 ± 0.012)	0.4C 0.016C
C	6.0 ± 0.3 (0.236 ± 0.012)	3.2 ± 0.3 (0.126 ± 0.012)	1.8 ± 0.1 (0.071 ± 0.004)	2.5 ± 0.3 (0.098 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	0.4C 0.016C
D_2 (T)	5.8 ± 0.3 (0.228 ± 0.012)	4.6 ± 0.3 (0.181 ± 0.012)	2.4 ± 0.1 (0.095 ± 0.004)	3.2 ± 0.3 (0.126 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	—
D	7.3 ± 0.3 (0.287 ± 0.012)	4.3 ± 0.3 (0.169 ± 0.012)	2.4 ± 0.1 (0.095 ± 0.004)	2.8 ± 0.3 (0.110 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	0.5C 0.020C

† Dimensions: mm (inch)

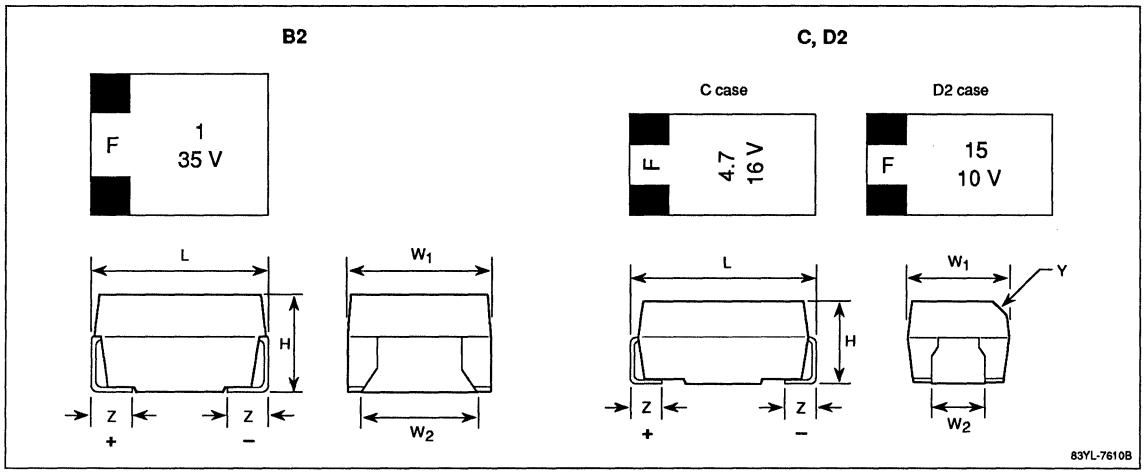


SVE-Series Surface Mount Chip Tantalum With Built-In Fuse

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

SVE-Series Surface Mount Chip Tantalum With Built-In Fuse (cont)



Dimensions

(Unit: mm)

Case Code	L	W_1	W_2	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	—

FA-Series Supercap Electric Double Layer Capacitor

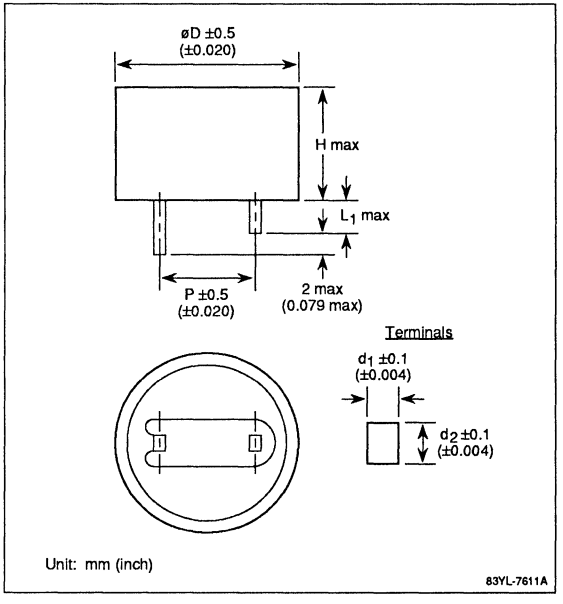
Specifications

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_l	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



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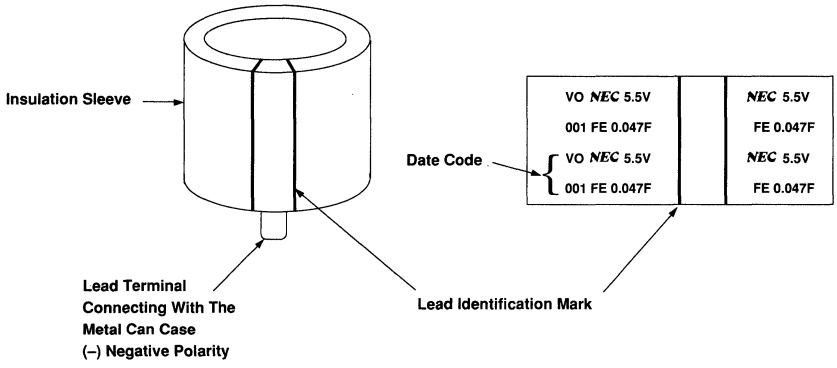
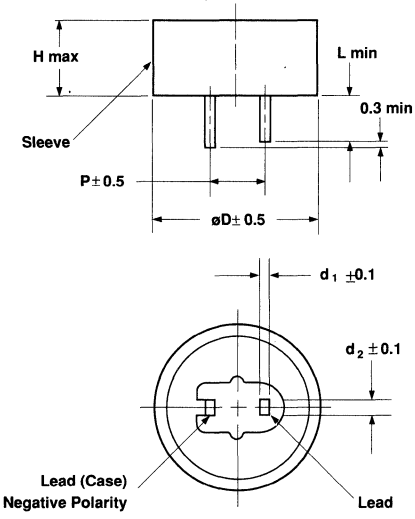
FE-Series Supercap Electric Double Layer Capacitor





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

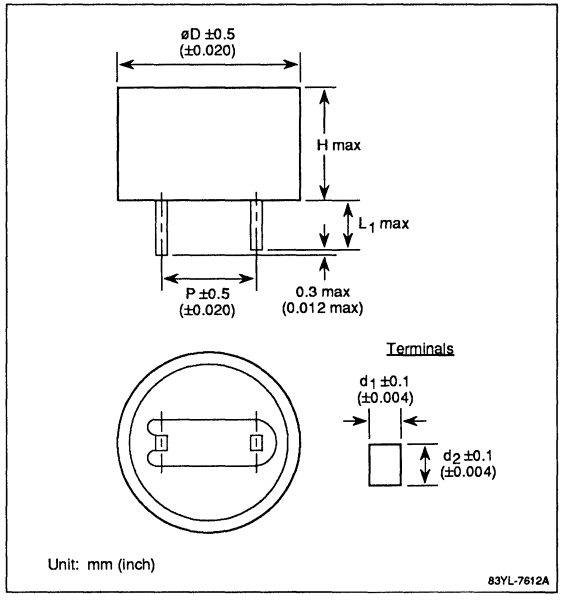
Specifications

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



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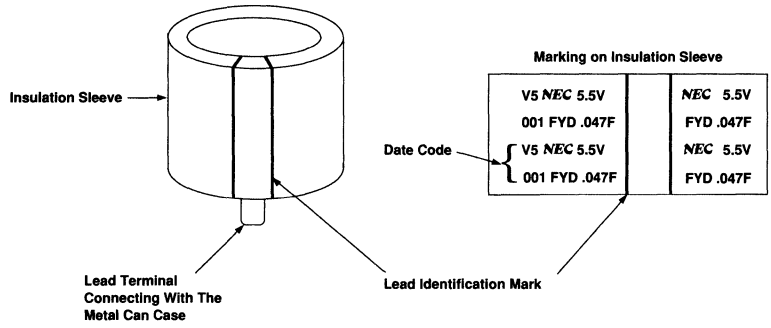
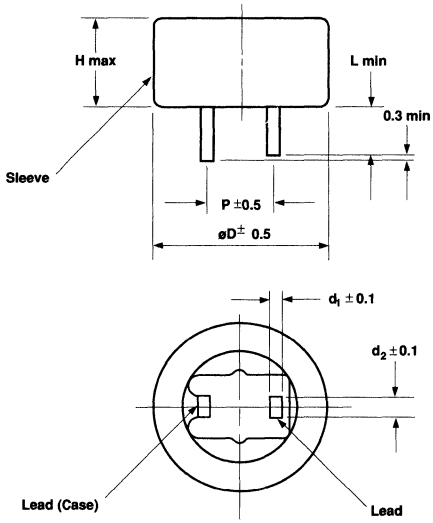
FYD-Series Supercap Electric Double Layer Capacitor





Dimensions

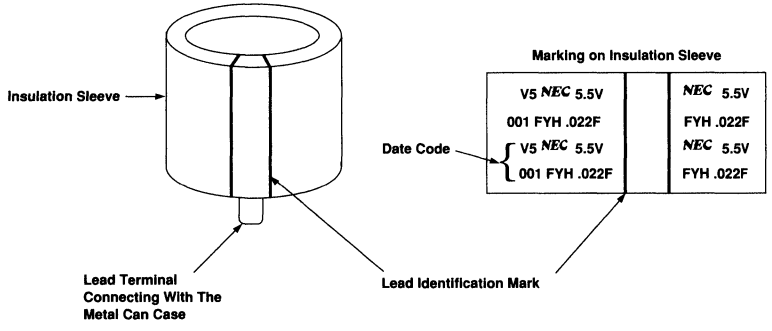
(Unit: mm)

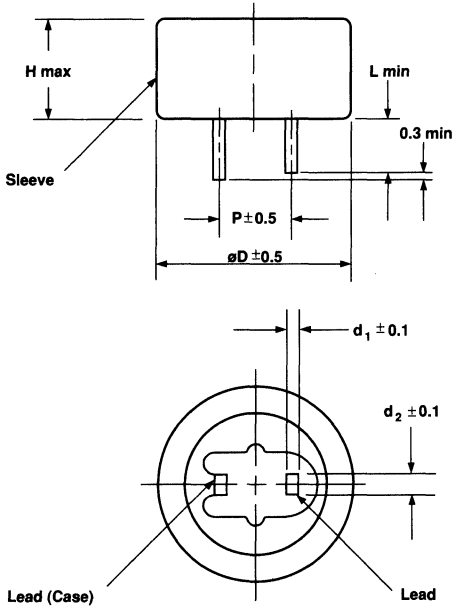
Part no.	øD	H	P	L	d1	d2
FYDOH473Z	11.5	8.5	5.08	2.7	0.4	1.2
FYDOH104Z	13.0	8.5	5.08	2.2	0.4	1.2
FYDOH224Z	14.5	15.0	5.08	2.4	0.4	1.2
FYDOH474Z	16.5	15.0	5.08	2.7	0.4	1.2
FYDOH105Z	21.5	16.0	7.62	3.0	0.6	1.2
FYDOH145Z	21.5	19.0	2.62	3.0	0.6	1.2
FYDOH225Z	28.5	22.0	10.16	3.0	0.6	1.2

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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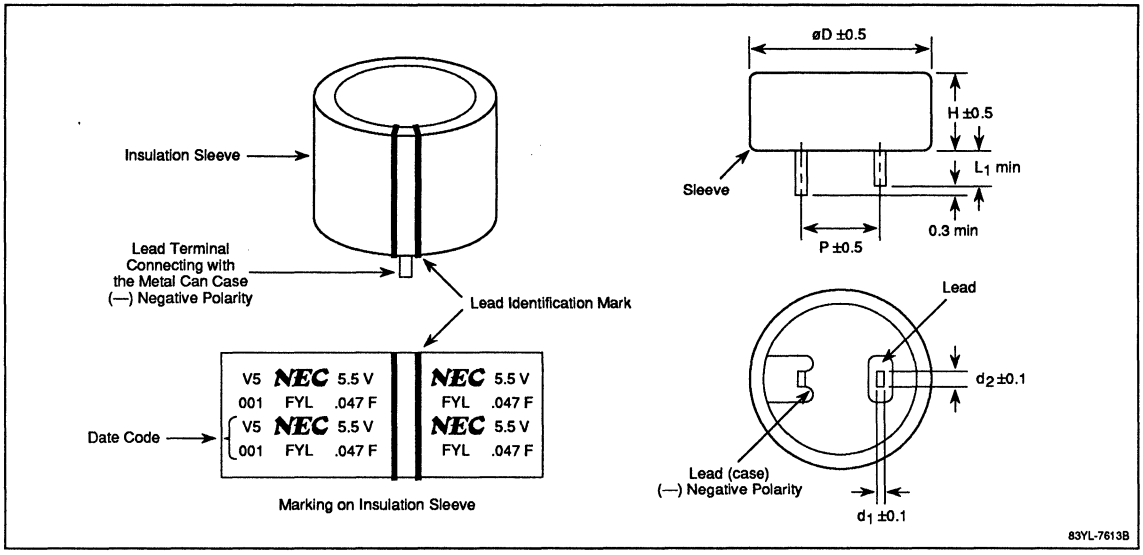
Specifications

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

FYL-Series Supercap Electric Double Layer Capacitor



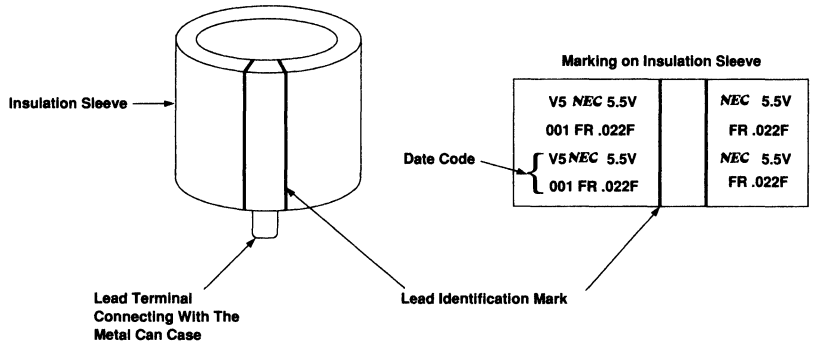
Dimensions (mm)

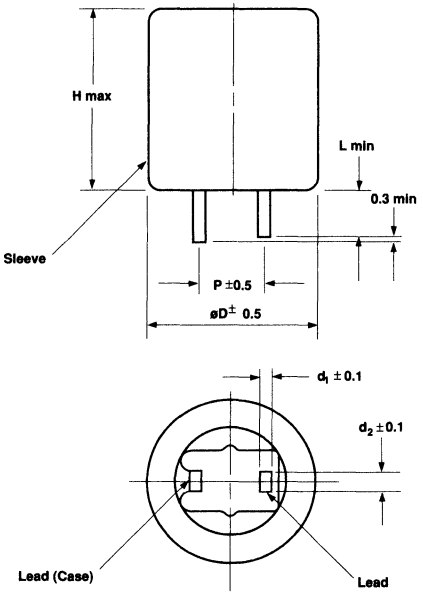
Part No.	φD	H	P	L	d_1	d_2
FYL0H103Z	11.0	5.0	5.08	2.7	0.2	1.2
FYL0H223Z	11.0	5.0	5.08	2.7	0.2	1.2
FYL0H473Z	12.0	5.0	5.08	2.7	0.2	1.2

Specifications

Part Number	Maximum Working Voltage (V)	Nominal Capacitance (F)	ESR (ohms)	Current (30 min) (mA)	Voltage Holding Characteristic (V)
FYL0H103Z	5.5	0.01	300	0.015	4.2
FYL0H223Z	5.5	0.022	200	0.033	4.2
FYL0H473Z	5.5	0.047	200	0.071	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

11

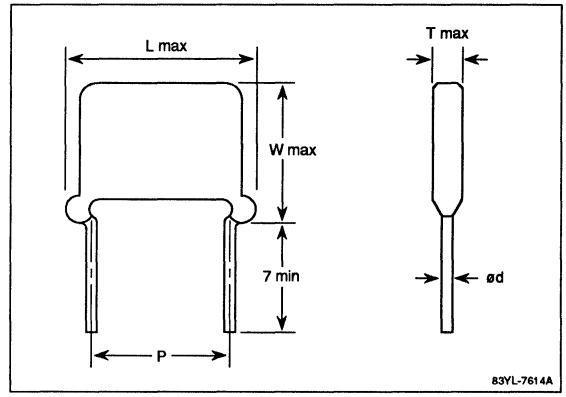
Specifications

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



Dimensions (mm)

Size Code	L	W	T	P	ϕd
DA	19.0	9.0	6.5	12.7 ±1.5	0.5
DB	24.0	18.0	7.5	15.2 ±1.5	0.8
DC	35.0	21.0	7.5	25.4 ±1.5	0.8

NEC

Section 12. Fluorescent Indicator Panel Displays (FIPs)

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)

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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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 o 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 configura 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) (cont)

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

Recommended Electrical Ratings

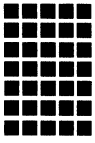
Mode of Fil.	E_f (V_{rms})	I_f (mA_{rms})	Mode of Oper.	$e_b = e_c$ (V_{p-p}) *$E_b = E_c$ (V_{dc})	Duty (—)	E_k (V_{dc})	I_b/dig. (mA) *i_b/1 seg	i_c/dig. (mA)	L (cd/m²)	L (ft.L)
AC	8.9	78	dynamic	45	1/50	8	4.4	3.5	690	(200)
AC	8.9	78	dynamic	45	1/50	10	7.0	6.0	690	(200)
AC	8.9	78	dynamic	45	1/50	8	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)

Display Configuration Table

A

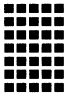
FIP16X1EA
FIP16X2BA

FIP16X1CA



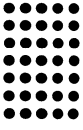
FIP16X1FA

FIP16X1KA

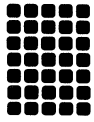


FIP17X1AA

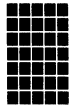
FIP20X1LB



FIP20X1DB



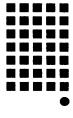
FIP20X1MA



FIP24X1AA/FIP24A7X
FIP20X4AA

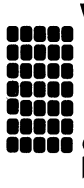
FIP20X2AA/FIP40C5X
FIP20X3AA/FIP60A5X
FIP40X1DA/FIP40E5X

B



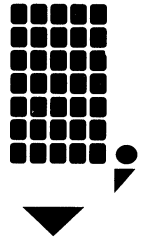
FIP16XM1BA/FIP16B6X

C



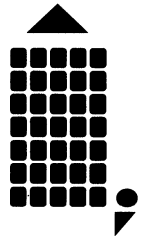
FIP16XM1BA/FIP16B11X

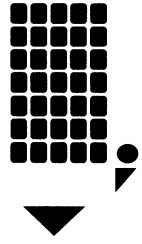
D



FIP16XM1CA/FIP16C11X
FIP16XM1DA/FIP16D11X/
FIP16D11AX
FIP20XM1BA

E





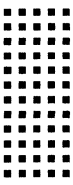
FIP10XM2AA

Display Configuration Table (cont)

F

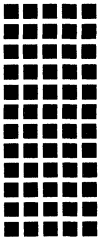
FIP20X1AA/FIP20A5X
FIP32X1BA/FIP32B5X
FIP40X1HB
FIP32X2AA
FIP40X2CB
FIP40X2CC
FIP80X2AA/FIP160A4X
FIP42X2AA
FIP40X6AA
FIP20X2EA
FIP24X2AA

G



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

H

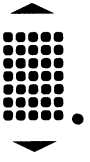


FIP20X1KA
FIP20X2BA
FIP40X2BA/FIP80A9X

I

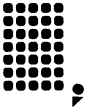
FIP80X1AA/FIP80A6X

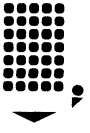
J



FIP20XM1AA

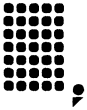
K





FIP12XM2AA

L

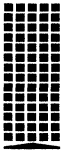


FIP16M2AA/FIP32A11X
FIP18X2AA
FIP20X2CA

M

FIP40X1AA/FIP40A5X
FIP40A5AX

N



FIP40X1GA/FIP40C9X

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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
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 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	3.9	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	88:88	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

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
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)

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	·88	12.5	6.6	$28.0^{+1.0}_{-0.5}$	50.0 ±1.0	7.5 ±1.0	2.54	10.0
FIP2A15S	2	88	15.0	8.0	33.0 ±1.0	55.0 ±1.0	$8.0^{+1.5}_{-0.5}$	2.54	10.0
FIP4H5	4	8888	5.0	2.5	14.5 ±1.0	41.0 ±1.0	6.5 ±0.7	2.54	8.0
FIP6A8B	6	18:88	7.62	3.8	22.8 ±1.0	75.2 ±1.0	7.7 ±1.0	2.54	10.0
FIP6A8S	6	1888	8.0	4.8	28.0 ±1.0	78.0 ±1.0	7.5 ±1.0	2.0	7.5
FIP7A8S FIP7A8AS	7	1888	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	1888	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	1888	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	1888 (Note 2)	8.0	4.5	24.5 ±1.0	85.0 ±1.0	7.5 ±0.7	2.0	7.7
FIP7F8S	7	1888 (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	1888	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	1888	8.0	4.6	24.5 ±1.0	76.0 ±1.0	6.1 ±0.7	2.54	15.0 to 3
FIP7Q8 Series	7	1888	8.0	4.6	24.5 ±1.0	76.0 ±1.0	6.1 ±0.7	2.54	15.0 to 3
FIP9B6 FIP9B6A	9	8.8.8.8.8.8.8.8.8.	5.5	2.65	20.0 ±1.0	70.0 ±1.0	6.5 ±0.5	2.54	3.5 9.0
FIP9LM6	9	88888	5.0	2.5	24.5 ±1.0	76.0 ±1.0	6.1 ±0.7	2.54	7.5
FIP9BM12	9	88888	7.0	3.0	28.0 ±1.0	98.0 ±1.0	7.5 ±0.7	2.54	13.7
FIP9G8	9	1888 CH 88	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	43 37 33 28 24 19 13 10 7 3 0 -3	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

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 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)

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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
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
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
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	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	4.4	23	dynamic	22	1/12.5	5	2.9	2.9	580	(170)

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ECR and Others

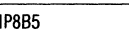
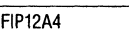
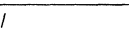
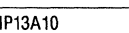
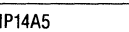
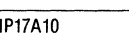
Type No. (Note 1)	No. of Digits	Character Format, Symbol	Outline Dimensions (in millimeters)						
			Character		Panel			Lead	
			Height	Width	Height	Length	Thickness	Pitch	Length
FIP6C13	6		12.5	6.8	33.0 ±1.0	98.0 ±1.0	7.8 ±0.7	4.0	10.5
FIP6A13	6		13.0	6.5	39.0 ±1.0	108.0 $^{+2.0}_{-0.5}$	10.0 max	2.54	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
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	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)

Calculator and Others

Type No. (Note 1)	No. of Digits	Character Format, Symbol	Outline Dimensions (in millimeters) Character Height	Character Width	Panel Height	Panel Length	Panel Thickness	Lead Pitch	Lead 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 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 (Note 1)	No. of Characters	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								
FC20X1RA-AB	20 (20 char, 1 line)	5 x 7 dot with cursor	5.0 x 3.33	— x 4.75	0.75 x 0.70	0.50 x 0.50	26 x 161 x 22	80 typ
FC20X1SA-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	26.5 x 230 x 22	120 typ
FC20X2JA-AB	40 (20 char, 2 line)	5 x 7 dot with cursor	5.0 x 3.3	12.62 x 4.75	0.75 x 0.70	0.50 x 0.50	34 x 161 x 3	100 typ
FC40X1LA-AB	40 (40 char, 1 line)	5 x 7 dot with cursor	5.0 x 3.3	— x 4.75	0.75 x 0.70	0.50 x 0.50	6 x 56 x 3	150 typ
FC40X2EA-AB	80 (40 char, 2 line)	5 x 7 dot with cursor	5.0 x 3.3	12.62 x 4.75	0.75 x 0.70	0.50 x 0.50	39.5 x 256 x 27	240 typ

General Characteristics

			Temperature Range		Vibration (10-55 Hz)		Relative Humidity		Mating Connector	
Device (Note 1)	Luminance cd/m^2 (fL)	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										
FC20X1RA-AB	1000 typ (291)	Green (505 nm)	−20 to +70	−40 to +85	0.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-34D-2.54R
FC20X1SA-AB	1000 typ (291)	Green (505 nm)	−20 to +70	−40 to +85	0.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-34D-2.54R
FC20X2JA-AB	1000 typ (291)	Green (505 nm)	−20 to +70	−40 to +85	0.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-34D-2.54R
FC40X1LA-AB	1000 typ (291)	Green (505 nm)	−20 to +70	−40 to +85	0.5	40	0 to 85	0 to 95	(Note 2)	HIF3BA-34D-2.54R
FC40X2EA-AB	1000 typ (291)	Green (505 nm)	−20 to +70	−40 to +85	0.5	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 (Note 1)	Min	Typ	Max	Min	Typ	Max
Character Type Modules						
FC20X1RA-AB	4.75	5.0	5.25	—	0.2	0.4
FC20X1SA-AB	4.75	5.0	5.25	—	0.5	0.7
FC20X2JA-AA/AB	4.75	5.0	5.25	—	0.3	0.4
FC40X1LA-AB	4.75	5.0	5.25	—	0.4	0.6
FC40X2EA-AB	4.75	5.0	5.25	—	0.8	1.0

Display Functions

Device (Note 1)	Data	Data Write	Command Write (Parallel)	Luminance Control (4-Level)	Reset	Display Blanking	Test Mode	Cursor Variety (3-Mode)	User Character Registration
Character Type Modules									
FC20X1RA-AB	•	•	•	•	•	•	•	•	•
FC20X1SA-AB	•	•	•	•	•	•	•	•	•
FC20X2JA-AB	•	•	•	•	•	•	•	•	•
FC40X1LA-AB	•	•	•	•	•	•	•	•	•
FC40X2EA-AB	•	•	•	•	•	•	•	•	•

NEC

Section 13. Optoelectronic Devices

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

Infrared 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

Optoisolator

PS 25 01 L -4 -K A

- A: Manufacturing code
- K: Optional: Rank (K,L,M)
- -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

Optical Semiconductor Devices

Part Number	Material	Device Type	Feature
NDL1XXX	Si	APD	
NDL2XXX	Si	PIN-PD	
NDL3XXX	AlGaInP	LD	
NDL4XXX	AlGaAs	LED	
NDL50XX	InGaAsP	LD	F-P LD
NDL51XX	Ge	APD	
NDL52XX	Ge	PIN-PD	
NDL53XX	InGaAsP	LED	
NDL54XX	InGaAs	PIN-PD	
NDL55XX	InGaAs	APD	
NDL56XX	InGaAsP	LD	DFB LD
NDL57XX	InGaAsP	LD Module	F-P LD
NDL58XX	InGaAsP	LD	DFB LD for 2.4 Gb/s

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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	λp (nm) Typ	Δλ (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
NDL3210		—	6.0	–10 to +50	–40 to +85	50	60	5.0	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
NDL5009D1		—	15.0	–40 to +70	–55 to +125	20	I_{th}+30	8.0	1310	4.0	0.2	Chip on carrier	
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
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
NDL5081		—	5.0	–40 to +70	–55 to +125	20	—	3.0	1310	30.0	0.5/0.7	Small package	L30
NDL5082		—	10.0	–40 to +70	–55 to +125	20	I_{th}+20	5.0	1310	10.0	0.2	Small package	L30
NDL5083		—	10.0	–40 to +70	–55 to +125	20	I_{th}+20	5.0	1310	10.0	0.2	Small package	L30
NDL5084		—	10.0	–40 to +70	–55 to +125	20	I_{th}+20	5.0	1310	10.0	0.2	Small package	L37
NDL5600	2	—	15.0	–40 to +70	–55 to +100	15	I_{th}+30	8.0	1310	0.1	0.2	DFB	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
NDL5603P		150	—	–20 to +65	–40 to +70	15	I_{th}+30	1.2	1310	0.1	0.3	With SMF, isolator	L40
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	DFB, no isolator	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
NDL5765P		1000*2	—	0 to +60	–40 to +85	30	600*2	25.0	1310	20.0	0.8	With SMF, w/o PD	L41A
NDL5765P1		1000*2	—	0 to +60	–40 to +85	30	600*2	25.0	1310	20.0	0.8	With SMF, flange, w/o PD	L42
NDL5766P		1000*2	—	–20 to +65	–40 to +70	30	800*2	70.0	1310	15.0	0.8	With SMF, w/o PD	L34

*1Min *2Typ *3Pulse Drive (PW = 1 ms, Duty = 1%) *4Max

Laser Diodes (cont)

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)	Typ	λp (nm) Typ	Δλ (nm) Max	t_r,t_f (ns) Typ	Remarks	Package Style
NDL5775P		1000*2	—	0 to +60	–40 to +85	40	600*2	20.0	1550	20.0	0.8	With SMF, w/o PD	L41A
NDL5775P1		1000*2	—	0 to +60	–40 to +85	40	600*2	20.0	1550	20.0	0.8	With SMF, flange, w/o PD	L42
NDL5776P		1000*2	—	–20 to +65	–40 to +70	40	800*2	45.0	1550	20.0	0.8	With SMF, w/o PD	L34
NDL5850C		—	10.0	0 to +60	0 to +70	25	I_{th}+30	5.0	1550	0.1	0.1/0.17	Chip on sub-carrier	—
NDL5850D		—	10.0	0 to +60	0 to +70	25	I_{th}+30	5.0	1550	0.1	0.1/0.17	Chip on sub-carrier	L27
NDL5851P		150	—	–20 to +60	–40 to +70	25	I_{th}+30	1.0	1550	0.1	0.1/0.17	With SMF, isolator	L40
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

*1Min *2Typ *3Pulse Drive (PW = 1 ms, Duty = 1%) *4Max

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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)	P_o, P_f (mW) Typ	λp (nm) Typ	Δλ (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
NDL4103L1	2	150	–40 to +70	–40 to +90	100	1.2	850	60	10	With μ-Lens	L38
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
NDL4105L1	2	150	–40 to +70	–40 to +90	100	2.0	850	50	—	With μ-Lens f_c = 35 MHz	L38
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
NDL5302L1	1	150	–40 to +80	–55 to +125	100	0.5	1300	160	2/3	With μ-Lens for GI-50	L38
NDL5302L2	1	150	–40 to +80	–55 to +125	100	0.5	1300	160	2/3	With μ-Lens for GI-62.5	L38
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
NDL5303PFC	1	150	–40 to +65	–40 to +70	100	25.0*4	1300	160	2/3	With GI-50, FC connector	L23
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

*4P_f (mW) *5Typ

Light Emitting Diodes (cont)
Remote Control

Part Number	Material	Features	Absolute Maximum Ratings (T_A = 25°C)			Typical Characteristics (T_A = 25°C)			
			P_d (mW)	I_F (mA)	T_{stg} (°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	φ240	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	φ240	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	φ100	29	$V_{(BR)R}$x0.9	200	40	1300	75	0.5		TO-18 Can
NDL5100C	50	0.5	–55 to +125	φ100	29	$V_{(BR)R}$x0.9	200	40	1300	75	0.5	Chip on carrier	Surface mount
NDL5100P	50	0.5	–40 to +70	φ100	29	$V_{(BR)R}$x0.9	200	40	1300	75	0.5	With GI-50/125	Pigtail
NDL5102	50	0.5	–55 to +125	φ30	35	$V_{(BR)R}$x0.9	80	50	1300	75	0.3		TO-18 Can
NDL5102C	50	0.5	–55 to +125	φ30	35	$V_{(BR)R}$x0.9	80	50	1300	75	0.3	Chip on carrier	Surface mount
NDL5102P	50	0.5	–30 to +70	φ30	35	$V_{(BR)R}$x0.9	80	50	1300	75	0.3	With SMF	Pigtail
NDL5103P	50	0.5	–40 to +85	φ50	35	$V_{(BR)R}$x0.9	150	50	1300	70	0.4	With GI-50	L44
NDL5104P	50	0.5	–40 to +85	φ100	29	$V_{(BR)R}$x0.9	200	40	1300	70	0.5	With GI-50	L44
NDL5104P1	50	0.5	–40 to +85	φ100	29	$V_{(BR)R}$x0.9	200	40	1300	70	0.5	With GI-50, flange	L45
NDL5105P	50	0.5	–40 to +85	φ30	35	$V_{(BR)R}$x0.9	80	50	1300	70	0.5	With SMF	L44
NDL5105P1	50	0.5	–40 to +85	φ30	35	$V_{(BR)R}$x0.9	80	50	1300	70	0.5	With SMF, flange	L45
NDL5500	10	0.5	–55 to +100	φ50	70	$V_{(BR)R}$x0.9	20	40	1300 1550	85 80	—	f_c = 1.0 GHz Min	TO-18 Can
NDL5500C	10	0.5	–55 to +100	φ50	70	$V_{(BR)R}$x0.9	20	40	1300 1550	85 80	—	Chip on carrier f_c = 1.0 GHz Min	Surface mount
NDL5500P	10	0.5	–40 to +70	φ50	70	$V_{(BR)R}$x0.9	20	40	1300 1550	85 80	—	With GI-50/125 f_c = 1.0 GHz Min	Pigtail
NDL5501P1	10	0.5	–40 to +85	φ50	70	$V_{(BR)R}$x0.9	20	40	1300 1550	80 75	0.5	With GI-50, flange	L45
NDL5510	10	0.5	–55 to +100	φ80	75	$V_{(BR)R}$x0.9	60	40	1300 1550	85 80	—	f_c = 700 MHz Min	L09A
NDL5510C	10	0.5	–55 to +100	φ80	75	$V_{(BR)R}$x0.9	60	40	1300 1550	85 80	—	Chip on carrier f_c = 700 MHz Min	L36
NDL5520P1	10	0.5	–40 to +85	φ50	60	$V_{(BR)R}$x0.9	10	40	1300 1550	80 75	—	With GI-50, flange f_c = 2.5 GHz Min	L45
NDL5522P	—	0.5	–40 to +85	φ50	55	$V_{(BR)R}$x0.9	10	40	1300 1550	80 75	—	With GI-50 f_c = 2.5 GHz Min	L43
OD8409	0.5	—	–40 to +80	—	30	$V_{(BR)R}$x0.9	0.2	40	1300	75	0.5		Receptacle
OD8456	0.5	—	–40 to +80	—	30	$V_{(BR)R}$x0.9	0.2	40	1300	75	0.5	With GI-62.5/125	Pigtail

*6Max φ = Diameter

PIN Photo Diodes
Fiber Optics

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	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	φ240	10	1.0*6	10	1.5	850	70	1.0		TO-18 Can
NDL2104	100	—	−65 to +150	φ440	10	1.0*6	10	2.8	850	70	4.0		TO-18 Can
NDL2208	100	—	−65 to +150	φ880	10	1.0*6	10	1.5	850	85	10		TO-18 Can
NDL5200	50	5.0	−55 to +125	φ240	6	500	6	7.0	1300	75	3.0		TO-18 Can
NDL5405	10	0.5	−55 to +150	φ80	5	0.1	5	1.0	1300 1550	85 80	0.3		TO-18 Can
NDL5405C	10	0.5	−55 to +150	φ80	5	0.1	5	1.0	1300 1550	85 80	0.3	Chip on carrier	Surface mount
NDL5405L	10	0.5	−55 to +125	φ80	5	0.1	5	1.0	1300 1550	85 80	0.3	With μ-Lens	L39
NDL5405P	10	0.5	−40 to +70	φ80	5	0.1	5	1.0	1300 1550	85 80	0.3	With GI-50/125	Pigtail
NDL5406	10	0.5	−55 to +150	270x330	5	0.5	5	4.5	1300 1550	85 80	4.0		TO-18 Can

*6Max φ = Diameter

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
PH302C-A	Low cost PIN photo diode Built-in visible cut filter	32	150	−40 to +80	4.6	to 10	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
PH310-A	Low cost PIN photo diode Ultra Small Package with Lens Built-in visible cut filter	32	150	−40 to +100	4.9 (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 (λ p = 940 nm).

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PIN Photo Diodes (cont)

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_D (nA) V_R (V)	Max	S(A/W) V_R (V)	λ (nm)	Typ	t_r, t_f (ns) 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) P_C (mW)	I_C (mA)	V_{CEO} (V)	T_{stg} (°C)	Typical Characteristics (T_A = 25°C) I_{CEO} (nA) V_{CE} = 10V 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/cm^2)	0.3 mA to V_{CE} = 5 V) (H = 0.5 mW/cm^2)
PH109	High sensitivity (Darlington Tr.)	100	50	30	−40 to +100	to 400	to 1.2	10 mA to
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/cm^2)	200 μA to V_{CE} = 5 V) (H = 500 μW/cm^2)

Photo ICs
Photo Interrupters

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
PS2505-2 PS2505L-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.)
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

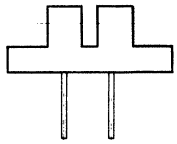
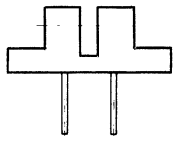
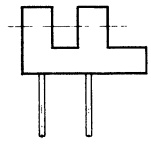
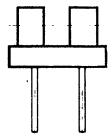
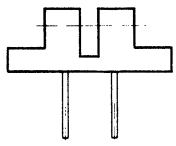
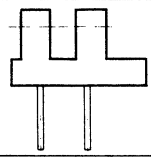
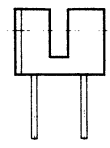
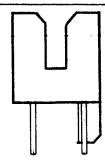
Part Number	Outline	Characteristics (T_A = 25°C) CTR (%)	I_F	V_{CE}	Features
PS4001		20 to	10 (mA)	2 (V)	Darlington Tr. Aperture: 1 mm□ 4 pin
PS4003		15 to	10	2	Darlington Tr. 4 pin
PS4005		20 to	10	2	Darlington Tr. 4 pin
PS4007		20 to	10	2	Darlington Tr. 4 pin
PS4008		0.5 to	10	2	Single Tr. High speed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

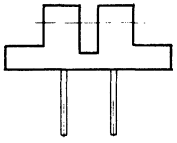
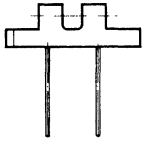
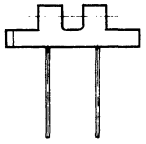
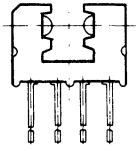
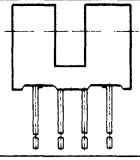
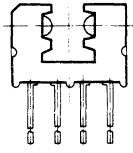
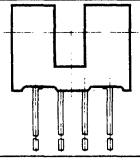
Part Number	Outline	Characteristics (T_A = 25°C) CTR (%)	I_F	V_{CE}	Features
PS4014		0.5 to	10	2	Single Tr. High speed (t_r, t_f=5 μs) 4 pin
PS4501		2.5 to	10	2	Single Tr. Aperture: 0.5 mm slit 4 pin
PS4502		200 to	5	2	Darlington Tr. Aperture: 0.5 mm slit High CTR 4 pin
PS4601		1.5 to	10	2	One-piece molded Single Tr. 4 pin in-line for high production auto insertion
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 Darlignton Tr. 4 pin in-line for high production auto insertion

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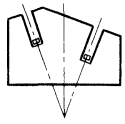
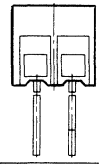
Photo Interrupters (cont)
Transistor Output Type (cont)

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

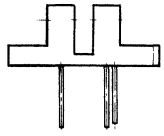
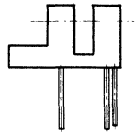
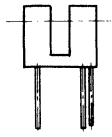
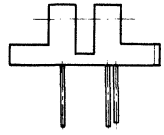
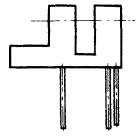
Part Number	Outline	Characteristics (T_A = 25°C) I_{FLH} (mA)	V_{CC} (V)	Features
PS5001HC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger circuit Active "HIGH" Open collector output Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5002HC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger circuit Active "HIGH"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

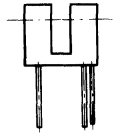
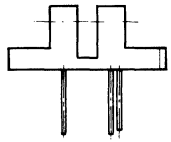
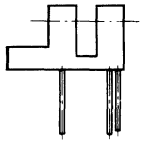
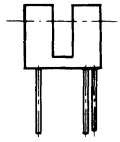
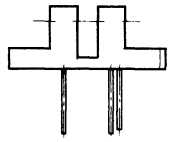
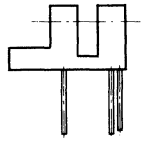
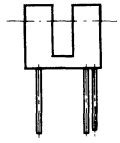
Part Number	Outline	Characteristics (T_A = 25°C) I_{FLH} (mA)	Characteristics (T_A = 25°C) V_{CC} (V)	Features
PS5003HR		to 5	5	Built-in Schmitt Trigger circuit Active "HIGH" Built-in pull up resistor Aperture: 0.5 mm slit (equivalent to 0.5 mm□) 5 pin
PS5001LC		to 5	5 R_L=280 Ω	Built-in Schmitt Trigger 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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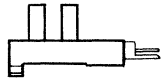
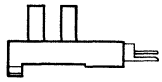
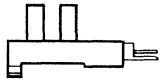
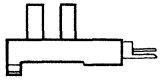
Photo Interrupters (cont)
IC Output Type (cont)

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-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
PLM101-1M	Plastic fiber link; 6 MB/s; 1 meter
PLM102-1M	PLM101-1M with screwhole

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
OD9438B1B3B06Y	Patchcord, DX, MM, 6M, Plastic
OD9470B3B06Y	Patchcord, D4, MM, 6M
OD9470B3B06Y-M	Patchcord, D4, MM, 6M, Master
OD9470PCB3B06Y	Patchcord, D4PC, MM, 6M
OD9470PCB3B06Y-M	Patchcord, D4PC, MM, 6M, Master

Part Number	Description
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
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)
OD9314BE	Ferrule, FC, SM, 125 μm (needs OD9321)
OD9321	Housing, FC, MM or SM
OD9384	Through Adapter, FC, MM or SM
OD9390	Receptacle, 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

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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
OD9610DBB	Polish Machine, for D4, SX, DX
OD9610FBB	Polish Machine, for FC
OD9620	Oven, Epoxy Curing, for FC, D4, SX, DX
OD9640	Kit, Hand Polish, for FC, D4, SX, DX
OD9641A	Kit, Machine Polish, for D4, SX, DX
OD9641B	Kit, Machine Polish, for FC
OD9641E	Kit, Machine Polish, for D4PC
ODS044	Collet Chuck, 2.5 mm, for FC
ODS045	Tool, Hand Polish, for DX
ODS046	Assembly Jig, for plastic D4, SX
ODS047	Epoxy, for FC, D4 Kevlar bonding
ODS048	Tool, Crimp, for plastic D4, SX
ODS050	Ferrule Selector, for FC, D4

Part Number	Description
ODS058	Tool, Crimp, for DX (DIB cable only)
ODS059	Adapter, Polish Machine, for DX
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
ODS069	Assembly Jig, for plastic D4 housing
ODS071	Assembly Jig, for OD9495, OD9498
ODS074	Epoxy, for FC, D4, SX, DX fiber bond
ODS088	Disk, Polish Machine, for FC, D4
ODS103	Powder, Buff, for D4PC
ODS110	Film, Hand Polish, for D4, SX, DX
ODS111	Film, Hand Buff, for D4
ODS112	Powder, Buff, for D4
ODS113	Film, Machine Polish, for FC
ODS114	Film, Machine Polish, for D4, SX, DX
ODS115	Film, Machine Buff, for FC, 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.

Sensors and IR Emitters Cross-Reference

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

Section 14. Consumer ICs

Note: Section 4 includes development tools for the 17K family of 4-bit microcontrollers.

Part Numbering System

μPC1234C	Typical part number
μP	NEC monolithic silicon integrated circuit
C	Device type B = bipolar digital C = bipolar analog D = MOS
1234	Device identifier
C	Package type (C = plastic molded DIP)

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
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
μPC1346GS	Car	RDS data demodulator	4.5 to 5.5	24 SOP
μPC1330HA	Tape deck	Record/playback audio head switch	4.5 to 15	9 SIP
μPC1340GH	Car	One-chip FM tuner	7.5 to 8.5	48 QFP
μPC2530G	Car	AM radio receiver	7.5 to 8.5	36 SOP
μPC2531GS	Car	FM front end	7.5 to 9	20 SOP
μPC2501H		Audio power amplifier		

Power Amplifier Circuits

Number	Application	Description	Supply Voltage (V)	Package
μPC1228HA	Car	Dual preamplifier	6 to 16	8 SIP
μPC1237HA	Car, Hi-Fi	Protector	25 to 60	8 SIP
μPC1270H	Car, Hi-Fi	30 to 50W power amplifier driver	±18 to ±36	10 SIP
μPC1298V	Car, Hi-Fi	50 to 80W power amplifier driver	±20 to ±46	14 V-DIP
μPC1308V	Car	18W, standby switch	9 to 16	14 V-DIP
μPC1310V	Car	7W, standby switch	9 to 16	14 V-DIP
μPC1313HA	Portable	Dual preamplifier with ALC	4 to 15	9 SIP
μPC1318AV	Car	23W, standby switch	9 to 16	14 V-DIP
μPC1321V	Car	23W audio power amplifier	9 to 16	14 V-DIP
μPC1335V	Home	20W dual	6 to 20	14 V-DIP
μPC1342V	Car, Hi-Fi	50 to 110W power amplifier driver	±20 to ±52	14 V-DIP
μPC2002V	Car	5.4W	8 to 18	5 V-DIP
μPC2502V	Car	19W, dual, BTL	9 to 16	15 V-DIP

Audio ICs (cont)

Phase-Locked Loops

Number	Description	Package
μPD2831C		
μPD2833C	Up to 900 MHz frequency synthesis	18 DIP
μPD2834C	Up to 500 MHz frequency synthesis	18 DIP
μPD2835CS/GS	PLL + prescaler for use with 1484/5/6/7	18 S-DIP/20 MF
μPD2836CS/GS	Up to 920 MHz with prescaler	18 S-DIP/20 SOP
μPD2840GS	Dual PLL frequency synthesizer for cordless phone	20 SOP
μPD2841GS	Dual PLL frequency synthesizer for cordless phone	20 SOP

Prescalers

Number	Description	Supply Voltage (V)	Package
μPB551C	÷10/11, ÷20/22, ÷40/44 (150 MHz)	4.5 to 5.5	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
μPB558G2	÷2 (260 MHz)	2.0 to 3.5	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
μPB567HA	÷8 (1 GHz)	4.5 to 5.5	7 SIP
μPB568C/HA/G2	÷64/68 (500 MHZ), ÷128/136 (1 GHz)	4.5 to 5.5	8 DIP/8 S-SIP/8 MF
μPB569C/G2	÷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. †	μPD1708	μPD1709	μPD1710	μPD1712	μPD1713
Main use	Car radio, tuner	TV, CATV	Car radio	Tuner, TV, CATV	Car radio, tuner
Package	52-pin flatpack	28-pin shrink DIP	52-pin flatpack	42-pin shrink DIP	52-pin flatpack
Supply voltage	5 V ±10%	5 V ±10%	5 V ±10%	5 V ±10%	5 V ±10%
Supply current (CPU)	400 μA typ	600 μA typ	600 μA typ	500 μA typ	400 μA typ
ROM	1528 steps x 16 bits	1526 steps x 16 bits	1016 steps x 16 bits	2040 steps x 16 bits	1528 steps x 16 bits
RAM	96 words x 4 bits	64 words x 4 bits	128 words x 4 bits	128 words x 4 bits	96 words x 4 bits
No. of commands	77	82	78	84	79
Display	LCD (1/2 duty)	LED	LED (FIP)	FIP (LED)	LCD (1/2 duty)
Segment	LCD driver incorporated Segment: 23 Common: 2	7 (LED driver incorporated)	7 (CMOS output)	7 (P-ch open drain)	LCD driver incorporated Segment: 21 Common: 2
Digit		2	7	6	
Input port	4 (K_0 to K_3)	0	5 (SD, K_0 to K_3)	4 (K_0 to K_3)	4 (K_0 to K_3) +2
Output port	8	2	0	8	7
I/O port	4	6 (serial I/O incorporated)	11	4 (serial I/O incorporated)	4
VDP (D/A converter)	0	1	1	1	0
A/D converter	0	1	0	1	0
Crystal oscillator	4.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz
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, 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
Application prescaler	Incorporated (50 MHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	μPB553AC (130 MHz), μPB562AC (1 GHz)	Incorporated (150 MHz)

† Only standard codes are acceptable.

Digital Tuning Systems: μPD1700 Series (cont)

Type No. †	μPD1715	μPD1716	μPD1719	μPD1720
Main use	Portable radio, radio, cassette	VTR, TV, car radio, Hi-fi tuner	Hi-fi tuner, car radio	Car radio (AM only)
Package	54-pin flatpack	28-pin shrink DIP	64-pin flatpack	52-pin flatpack
Supply voltage	2.2 to 3.5 V	5 V ±10%	5 V ±10%	5 V ±10%
Supply current (CPU)	30 μA typ	500 μA typ	500 μA typ	400 μA typ
ROM	1528 steps x 16 bits	1016 steps x 16 bits	2040 steps x 16 bits	1016 steps x 16 bits
RAM	96 words x 4 bits	64 words x 4 bits	256 words x 4 bits	64 words x 4 bits
Number of commands	76	82	94	78
Display	LCD (1/3 duty)	—	LCD (1/3 duty)	LCD (1/3 duty)
Segment	LCD driver incorporated Segment: 16 Common: 3	—	LCD driver incorporated Segment: 28 Common: 2	LCD driver incorporated Segment: 21 Common: 2
Input port	4 (K_0 to K_3)	0	4 (K_0 to K_3)	4 (K_0 to K3)
Output port	9	5	12	7
I/O port	4	8	8 (Serial I/O incorporated	4
VDP (D/A converter)	1	0	1	0
A/D converter	0	1	1	0
Crystal oscillator	7.5 MHz	4.5 MHz	4.5 MHz	4.5 MHz
PLL reference frequency	1, 3, 5, 6.25, 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
Application prescaler	Incorporated (130 MHz)	Incorporated (150 MHz), μPB567HA (1 GHz)	Incorporated	—

17K Family of 4-Bit Microcontrollers

Device (μPD)	OTP Device (μPD)	Features †	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package ‡	Package Code
Digital Tuning Systems, 170xx									
17001	17P001	Serial communication, A/D and D/A converters, PLL	4.5	4.4 to 5.5	8K	224	32	48-pin QFP	GH
17002	—	Serial communication, image display controller, A/D and D/A converters, PLL	8	4.5 to 5.5	8K	336	27	48-pin SDIP 64-pin QFP	CU GF
17003A	17P005	Serial communication, A/D and D/A converters, LCD, PLL	4.5	4.5 to 5.5	8K	320	63	80-pin QFP	GF
17005	17P005	Serial communication, A/D and D/A converters, LCD, PLL	4.5	4.5 to 5.5	16K	432	63	80-pin QFP	GF
17006	17P006	Serial communication, A/D and D/A converters, PLL	4.5	4.5 to 5.5	24K	896	61	80-pin QFP	GF
17008	17P008	Serial communication, image display controller, timer, A/D and D/A converters, PLL	8	4.5 to 5.5	32K	672	45	64-pin SDIP	CW
17010	17P010	Serial communication, A/D and D/A converters, LCD, PLL	4.5	4.5 to 5.5	16K	432	61	80-pin QFP	GF
17051	—	Serial communication, image display controller, timer, A/D and D/A converters	8	4.5 to 5.5	16K	4CU	31	48-pin SDIP	CU
17052	—	Serial communication, image display controller, timer, A/D and D/A converters	8	4.5 to 5.5	16K	4CU	44	64-pin SDIP	CW
17053	—	Serial communication, timer, A/D and D/A converters, PLL	8	4.5 to 5.5	24K	672	44	64-pin SDIP	CW
17401	17P401	Serial communication, image display controller, timer, A/D converter, LCD	10	4.5 to 5.5	24K	524	36	80-pin QFP	GF
General-Purpose Devices, 171xx									
17102	—	Serial communication, timer, A/D and D/A converters, LCD	8	4.5 to 6.6	4K	222	38	52-pin QFP	G
17103	17P103	General purpose	8	2.7 to 6.0	1K	16	11	16-pin SDIP 16-pin SOP	CX GS
17103L	17P103	General purpose, low voltage	8	1.8 to 3.6	1K	16	11	16-pin DIP 16-pin SOP	CX GS
17104	17P104	General purpose	8	2.7 to 6.0	1K	16	16	22-pin SDIP 24-pin SOP	CS GS1

17K Family of 4-Bit Microcontrollers (cont)

Device (μPD)	OTP Device (μPD)	Features †	Clock (MHz)	Supply Voltage (V)	ROM (X8)	RAM (X4)	I/O	Package ‡	Package Code
17104L	17P104	General purpose, low voltage	8	1.8 to 3.6	1K	16	16	22-pin SDIP 24-pin SOP	CS GS
17106	17P106	Serial communication, timer, LCD, front-panel control	4.5	4.5 to 5.5	8K	178	25	64-pin QFP	GC
17107	17P107	General purpose	1	2.5 to 6.0	1K	16	11	16-pin SDIP 16-pin SOP	CX GS
17107L	17P107	General purpose, low voltage	1	1.5 to 3.6	1K	16	11	16-pin SDIP 16-pin SOP	CX GS
17108	17P108	General purpose	1	2.5 to 6.0	1K	16	16	22-pin SDIP 24-pin SOP	CS GS
17108L	17P108	General purpose, low voltage	1	1.5 to 3.6	1K	16	16	22-pin SDIP 24-pin SOP	CS GS
17134A	17P136	Serial communication, timer, A/D converter	2	2.7 to 5.5	2K	112	21	28-pin SDIP 28-pin SOP	CT GT
17135A	17P137	Serial communication, timer, A/D converter	8	2.7 to 5.5	2K	112	21	28-pin SDIP 28-pin SOP	CT GT
17136A	17P136	Serial communication, timer, A/D converter	2	2.7 to 5.5	4K	112	21	28-pin SDIP 28-pin SOP	CT GT
17137A	17P137	Serial communication, timer, A/D converter	8	2.7 to 5.5	4K	112	21	28-pin SDIP 28-pin SOP	CT GT
Remote Control Devices, 172xx									
17201A	17P201	Serial communication, timer, A/D converter, LCD	4	2.0 to 6.0	6K	336	19	80-pin QFP	GF
17202A	17P201	Timer, LCD	4	2.0 to 6.0	4K	112	16	64-pin QFP	GF
17203A	17P203A	Serial communication, learning remote controller, timer, LCD, 16K bits of SRAM	4	2.0 to 6.0	8K	336	27	52-pin QFP	GC
17204	—	Serial communication, learning remote controller, timer, LCD, 8K bits of SRAM	4	2.0 to 6.0	16K	336	27	52-pin QFP	GC
17207	—	Serial communication, timer, A/D converter, LCD	4	2.0 to 6.0	8K	336	19	80-pin QFP	GF
Home Automation Devices, 173xx									
17301	17P301	Serial communication, timer, A/D converter, DTMF generator/ receiver	3.58	2.0 to 5.5	16K	336	48	64-pin QFP	GF

† DTMF: Dual-tone multifrequency
LCD: Liquid crystal display
PLL: Phase-locked loop
‡ Plastic

TV ICs

Number	Description	Package
μPC1406HA	Dual dc volume	14 SIP
μPC1486C	DTS interface for TV pattern A; 8.1 to 13.2 V	16 DIP
μPC1487C	DTS interface for TV pattern B; 8.1 to 13.2 V	16 DIP
μPC1498H	Vertical output (22 to 29 inch CRT tube)	8 SIP
μPC1820CA/GH	PIF processor/PLL	30 DIP
μPC1870CA**	U.S. multisound decoder	48 S-DIP
μPC1871CU**	U.S. multisound decoder	42 S-DIP
μPC1872**	U.S. multisound decoder	42 S-DIP
μPC1873	U.S. multisound decoder	28 S-DIP
μPC1880CA	Sync deflection for multisync display	48 S-DIP
μPC1891ACY	Matrix surround-sound processor	20 DIP
μPC2800GR	Infrared remote control preamplifier	
μPC2801GR/HA	Infrared remote control preamplifier	
MC-7000	U.S. multisound decoder	17-pin module

** Requires DBX license

IDTV ICs

Number	Description	Supply Voltage (V)	Package
μPD9320AGF-3BA	YC separation	4.5 to 5.5	100 QFP
μPD9321GF-3BA	YC separation	4.5 to 5.5	100 QFP
μPD9322GF-3BA	YC interpolation	4.5 to 5.5	100 QFP
μPD9323GF-3BA	Motion detection	4.5 to 5.5	100 QFP
μPD9324GF-3B8	Color demodulation	4.5 to 5.5	64 QFP
μPD9325CGF-3BA	Clock generator	4.5 to 5.5	100 QFP

EDTV ICs

Number	Description	Supply Voltage (V)	Package
μPD9380GD-5BC	YC separation and motion detection	4.5 to 5.5	136 QFP
μPD9381GF-3BA	YC processing	4.5 to 5.5	100 QFP
μPD9382GF-3BA	YC interpolation	4.5 to 5.5	100 QFP
μPD9383GF-3BA	Timing generating	4.5 to 5.5	100 QFP
μPD9384GF-3BA	Noise reduction	4.5 to 5.5	100 QFP

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
μPD6144AC/AG	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
μPD6450CX/GT	128 characters, 12 lines x 24 columns, 12x18 dot matrix	18 DIP/20 SOP
μPD6451CX/GT	All μPD6450 functions plus double-scan TV mode adaptation	18 DIP/20 SOP
μPD6452CX/GS	μPD6451 for S-VCR	24 DIP/SOP
μPD6460GT	64 characters, 6 lines x 16 columns, blinking (8 colors, blinking option)	20 SOP

Infrared Remote Control ICs

Receiver Preamplifiers

Type	Description	Supply Voltage (V)	Package
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 bandpass filter	5.0	8 SIP
μPC1491HA	Active "High," on-board bandpass filter	5.0	8 SIP
μPC2800HA/GR	Active "Low," internal trap circuit	5.0	8 SIP/SOP
μPC2801HA/GR	Active "High," internal trap circuit	5.0	8 SIP/SOP

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	μPD6123 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
μPC624C	DAC-08	8-bit	0.19%	150 ns	±15	Current output	16 DIP
μPC662GH	Orig	8-bit	±1/2 LSB	35 MHz	+5	3-channel	48 QFP
μPC6012C	AM-6012	12-bit	0.05%	400 ns	±15	Current output	20 DIP
μPD6325C/G	Orig	6-bit	—	—	+5	Quad D/A	16 DIP/SOP
μPD6326C	Orig	6-bit	—	—	+5	Octal D/A	16 DIP
μPD6335C/G	Orig	6-bit	—	—	+5	Quad D/A	16 DIP/SOP
μPD6336C	Orig	6-bit	—	—	+5	Octal D/A	16 DIP
μPD6355G	Orig	16-bit	—	3/5 MHz*	+5	Digital audio	28 MF
μPD6376CX/GS	Orig	16-bit	—	10 MHz	+5	2-channel digital audio	16 DIP/SOP
μPD6900C	Orig	8-bit	±1/2 LSB	20 MHz*	+5	Current output	22 DIP
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	Features	Package
μPC650D	Orig	12-bit	0.05%	45 μs	+5, −15	Parallel	28 DIP
μPC655CA							
μPC659G	Orig	8-bit	±1/2 LSB	20 MHz*	+5	Parallel	24 SOP
μPC660G	Orig	6-bit	±1/2 LSB	20 MHz*	+5	Parallel	16 SOP
μPC661G	Orig	6-bit	±1/4 LSB	20 MHz*	+5	Parallel	24 SOP
μPD6950C	Orig	8-bit	±1-1/2 LSB	15 MHz*	+5	Parallel	24 DIP
μPC6951C/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
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
μPD1630GF	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
μPD16307GF	41	150	300	DC-PDP (row)	80 QFP
μPD16309GF	64	200	1.2	DC-PDP (column)	100 QFP
μPD16400P(1)/W	100	18	—	LCD (horizontal)	Die/wafer
μPD16402P(1)/W	120	25	—	LCD (vertical)	Die/wafer
μPD16410N	100	40	—	LCD (common)	TAB/wafer

Display Driver ICs (cont)

Number	Drivers	Voltage (V)	Current (mA)	Type	Package
μPD16411N	192	40	—	LCD (segment)	TAB/wafer
μPD6300C	20	40	5	FIP	28 S-DIP
μPD6320/6321GC	(28 + 11)	18	±30	FIP/LCD, LED	52 QFP
μPD6322C	4 x 6	5	20	LED	28 DIP
μPD6323AC	21	40	5	FIP	28 DIP
μPD6323BC/C	21	35	5	FIP	28 DIP
μPD6332C	20	18	—	LCD	28 DIP
μPD6337GC-AB6	32	180	300	AC-DPP	52 QFP
μPD6340GC	20	75	25	FIP	52 QFP
μPD6345C/GS	8	38	100	General	16 DIP/16 SOP
μPD6700GH	47	15	5	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 standby feature.

Charge-Coupled Devices (CCD Image Sensors)

Number	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
μPD9318GB	Clock generator	44 QFP

Clock ICs

Number	Description	Package
μPD6529C	Automotive	42 DIP
μPD4990AC/AG	Serial I/O, calendar and clock	14 DIP/16 SOP
μPD4991ACX/AGS	4-bit parallel I/O RTC	18 DIP/20 SOP

E² PROMs

Part Number	Description	Supply Voltage (V)	Package
μPD6252C/GS-BA1	2K-bit (256 x 8), 10-year retention period	5.0	8 DIP/16 SOP
μPD6253CX/GS-BA1	1K-bit (128 x 8), 10-year retention period	5.0	8 DIP/SOP
μPD6254CX/GS-BA1	4K-bit (512 x 8), 10-year retention period	5.0	8 DIP/SOP

Hard-Disk Drive ICs

Part Number	Description	Package
μPC2134GT	R/W amplifier (ferrite head); 5 and 12 volt	24 SOP
μPC2132GS	R/W amplifier (ferrite head); 5 volt	24 SOP
μPD16810GS	Back EMF spindle motor driver; 2.5/3.5-inch HDD	20 SOP

Miscellaneous ICs

Part Number	Description	Package
μPD6302CA/G	MSK modem	24 DIP/SOP
μPC1097V/H	Actuator driver	5 V-DIP
μPC1100C/GS	Dual switching regulator control circuit	16 DIP/SOP
μPC1150C/GS	Dual switching regulator control circuit	16 DIP/SOP
μPC494C/G/GS	Switching regulator control circuit	16 DIP/SOP/SOP

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Fishkill, NY 12524
TEL: 914-897-2101
FAX: 914-897-2215

8 Old Sod Farm Road
Melville, NY 11747
TEL: 516-753-7526
FAX: 516-753-7137

EASTERN REGION [cont]

One Windsor Plaza
7535 Windsor Drive
Suite B101
Allentown, PA 18195
TEL: 215-391-9094
FAX: 215-391-9107

CENTRAL REGION

1500 West Shure Drive
Suite 250
Arlington Heights, IL 60004
TEL: 708-577-9090
FAX: 708-577-2147

201 E. Big Beaver Road
Suite 350
Troy, MI 48084
TEL: 313-680-0506
FAX: 313-680-1015

1550 East 79th Street
Suite 805
Bloomington, MN 55425
TEL: 612-854-4443
FAX: 612-854-1346

CENTRAL REGION [cont]

1105 Schrock Road
Suite 515
Columbus, OH 43229
TEL: 614-436-1778
FAX: 614-436-1769

30050 Chagrin Blvd.
Suite 120
Pepper Pike, OH 44124
TEL: 216-831-0067
FAX: 216-831-0758

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

12777 Jones Road
Suite 196
Houston, TX 77070
TEL: 713-955-2191
FAX: 713-955-2198

129 Woodland Trail
Leander, TX 78641
TEL: 512-259-4947
FAX: 512-259-2556

WESTERN REGION

One Embassy Centre
9020 S.W. Washington
Square Road
Suite 400
Tigard, OR 97223
TEL: 503-671-0177
FAX: 503-643-5911

WESTERN REGION [cont]

Encino Office Park Two
6345 Balboa Blvd.
Suite 240
Encino, CA 91316
TEL: 818-342-3112
FAX: 818-342-0842

200 E. Sandpointe
Bldg. 8
Suite 150
Santa Ana, CA 92707
TEL: 714-546-0501
FAX: 714-432-8793

14001 East Iliff Avenue
Suite 411
Aurora, CO 80014
TEL: 303-755-6353
FAX: 303-755-6728

NORTHERN CALIFORNIA REGION

401 Ellis Street
P.O. Box 7241
Mountain View, CA 94039
TEL: 415-965-6200
FAX: 415-965-6683

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401 Ellis Street
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Mountain View, CA 94039
TEL: 415-965-6142
FAX: 415-965-6130

One Embassy Centre
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Suite 400
Tigard, OR 97223
TEL 503 671-0177
FAX 503 643-5911

200 E. Sandpointe, Bldg. 8
Suite 450
Santa Ana, CA 92707
TEL: 714-546-0501
FAX: 714-432-8793

SOUTH CENTRAL/SOUTHEAST

16475 Dallas Parkway
Suite 380
Dallas, TX 75248
TEL: 214-250-4522
FAX: 214-931-8680

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

NORTH CENTRAL/NORTHEAST

1500 W. Shure Drive
Suite 240
Arlington Heights, IL 60004
TEL: 312-398-3600
FAX: 312-577-9219

One Natick Executive Park
Natick, MA 01760
TEL: 508-655-8833
FAX: 508-872-8692

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