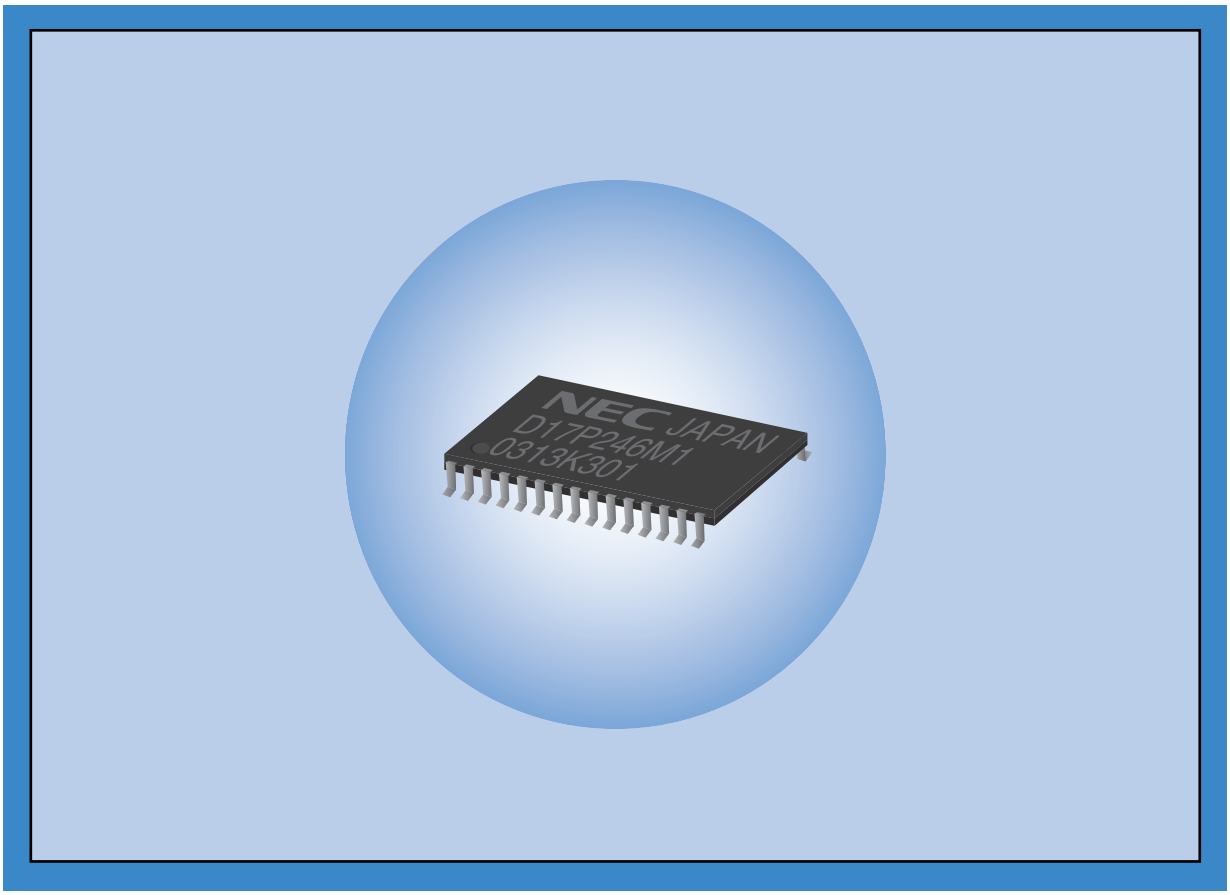
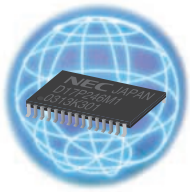
Empowered by Innovation NEC

Microcontrollers for Remote Controllers



December 2003

For General-Purpose Remote Controllers



6x Series

3.5 to 4.5 MHz ceramic oscillation

µPD69A

20 SSOP, 56 keys
ROM: 4074 × 10 bits, RAM: 128 × 4 bits
High-speed instruction execution can be selected (mask option).
V_{DD} = 2.0 to 3.6 V, 1.8 to 3.6 V (mask option)

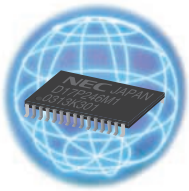
µPD68B

20 SSOP, 56 keys
ROM: 2026 × 10 bits, RAM: 32 × 4 bits
Low-voltage operation version of µPD68A.
V_{DD} = 1.65 to 3.6 V

µPD67B

20 SSOP, 56 keys
ROM: 1002 × 10 bits, RAM: 32 × 4 bits
Low-voltage operation version of µPD67A.
V_{DD} = 1.65 to 3.6 V

For Preset Remote Controllers



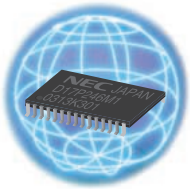
1724x Series

- **μPD17246** — 30 SSOP, ROM: 32 KB, RAM: 447 × 4 bits
- **μPD17245** — 30 SSOP, ROM: 24 KB, RAM: 447 × 4 bits
- **μPD17244** — 30 SSOP, ROM: 20 KB, RAM: 447 × 4 bits
- **μPD17243** — 30 SSOP, ROM: 16 KB, RAM: 447 × 4 bits
- **μPD17242** — 30 SSOP, ROM: 12 KB, RAM: 447 × 4 bits
- **μPD17241** — 30 SSOP, ROM: 8 KB, RAM: 447 × 4 bits
- **μPD17240** — 30 SSOP, ROM: 4 KB, RAM: 447 × 4 bits

789088 Subseries

- **μPD789088** — 30 SSOP, ROM: 32 KB, RAM: 576 bytes
- **μPD789086** — 30 SSOP, ROM: 16 KB, RAM: 384 bytes

For LCD Remote Controllers



789327 Subseries

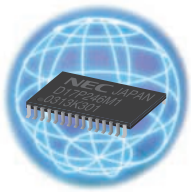
- µPD789327 — 52 LQFP — ROM: 24 KB, RAM: 512 bytes
- µPD789326 — 52 LQFP — ROM: 16 KB, RAM: 512 bytes
- µPD789324 — 52 LQFP — ROM: 8 KB, RAM: 256 bytes
- µPD789322 — 52 LQFP — ROM: 4 KB, RAM: 256 bytes

789467 Subseries

- µPD789467 — 52 LQFP — ROM: 24 KB, RAM: 512 bytes
- µPD789466 — 52 LQFP — ROM: 16 KB, RAM: 512 bytes
- µPD789464 — 52 LQFP — ROM: 8 KB, RAM: 256 bytes
- µPD789462 — 52 LQFP — ROM: 4 KB, RAM: 256 bytes

μPD6x Series

For infrared remote control transmitters/
general-purpose applications



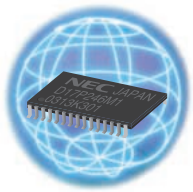
Part Number	μPD67B	μPD68B	μPD69A	μPD6P9
Major applications	Remote controllers for AV and household electric appliances			
ROM size	1002 × 10 bits	2026 × 10 bits	4074 × 10 bits	
	Mask ROM			One-time PROM
RAM size	32 × 4 bits		128 × 4 bits	
Number of supported keys	32 (standard)/56 (when using key expansion pin)			
Operation clock frequency	3.5 to 4.5 MHz (ceramic oscillation)			
Instruction execution time	16 μs (@ 4 MHz operation)		16 μs or 8 μs Note 1 (@ 4 MHz operation)	
Modulation carrier frequency	Each high-/low-level width can be set from 250 ns to 64 μs (@ 4 MHz operation) via modulo registers			
Timer	9-bit programmable timer: 1 channel			
POC circuit	On chip			
RAM retention detector	None		On chip	
Power supply voltage	1.65 to 3.6 V		2.0 to 3.6 V or 1.8 to 3.6 V Note 2	2.2 to 3.6 V
Package	20-pin plastic SSOP (7.62 mm (300))			
Development tools	Assembler			

Notes 1. Selectable by mask option in the μPD69A. Fixed in each product of the μPD6P9.

2. Selectable by mask option

μPD1724x Series

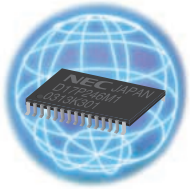
For preset remote controllers/
small-scale general-purpose applications



Part Number	μPD17240	μPD17241	μPD17242	μPD17243	μPD17244	μPD17245	μPD17246	μPD17P246
Major applications	Preset remote controllers, toys, portable systems							
ROM size	2048 × 16 bits	4096 × 16 bits	6144 × 16 bits	8192 × 16 bits	10240 × 16 bits	12288 × 16 bits	16384 × 16 bits	
	Mask ROM							One-time PROM
RAM size	447 × 4 bits							
Carrier generator for infrared remote controller	On chip							
I/O ports	Input: 5, I/O: 19							
External interrupt	1							
Timer	Basic interval timer/watchdog timer: 1 channel							
Low voltage detector	Mask option							On chip
RAM retention detector	On chip							
Instruction execution time	High-speed mode: 4 μs/Normal mode: 8 μs (@ 4 MHz operation)							
Power supply voltage	2.0 to 3.6 V							2.2 to 3.6 V
Package	30-pin plastic SSOP (7.62 mm (300))							
Development tools	Assembler, device file, integrated debugger, in-circuit emulator							

μPD789088 Subseries

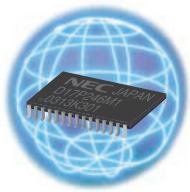
For preset remote controllers/
small-scale general-purpose applications



Part Number		μPD789086	μPD789088	μPD78F9088
Major applications		Preset remote controllers		
ROM size		16 KB	32 KB	
		Mask ROM		Flash memory
RAM size	High-speed RAM	256 bytes	320 bytes	
	Low-speed RAM	128 bytes	256 bytes	
Operation clock frequency		1.0 to 5.0 MHz (ceramic/crystal oscillation)		
Instruction execution time		0.4 μs/0.8 μs/1.6 μs (@ 5.0 MHz operation)		
General-purpose registers		8 bits × 8 registers		
Instruction set		• 16-bit operations • Bit manipulation (set, reset, test) etc.		
I/O ports		24		
Timers		• 16-bit timer: 1 channel • 8-bit timer: 3 channels • Watchdog timer: 1 channel		
Timer outputs		1		
Serial interface		UART/3-wire serial I/O mode: 1 channel		
Key return detection		8 pins		
Vectored interrupt sources	Maskable	Internal: 8, External: 2		
	Non-maskable	Internal: 1		
Reset		• Reset by $\overline{\text{RESET}}$ signal input • Internal reset by watchdog timer • Reset via power-on-clear circuit		
Power supply voltage		1.8 to 5.5 V		
Package		30-pin plastic SSOP (7.62 mm (300))		
Development tools		Assembler, C compiler, device file, integrated debugger, system simulator, in-circuit emulator, automatic program generation tool		

μPD789327 Subseries

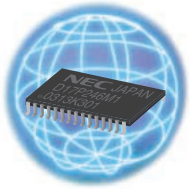
For infrared remote control transmitters/
LCD drive



Part Number		μPD789322	μPD789324	μPD789326	μPD789327	μPD78F9328
Major applications		Remote controllers for AV and air conditioners				
ROM size		4 KB	8 KB	16 KB	24 KB	32 KB
		Mask ROM				Flash memory
RAM size	High-speed RAM	256 bytes		512 bytes		
	LCD display RAM	24 × 4 bits				
Operation clock frequency		• 1.0 to 5.0 MHz (Main system clock: Ceramic/crystal oscillation) • 32.768 kHz (Subsystem clock)				
Instruction execution time		• 0.4 μs/1.6 μs (@ 5.0 MHz operation with main system clock) • 122 μs (@ 32.768 kHz operation with subsystem clock)				
General-purpose registers		8 bits × 8 registers				
Instruction set		• 16-bit operations • Bit manipulation (set, reset, test) etc.				
I/O ports		21				
Timers		• 8-bit timer: 2 channels • Watch timer: 1 channel • Watchdog timer: 1 channel				
Timer outputs		1				
POC circuit		Mask option				On chip
Serial interface		3-wire serial I/O mode: 1 channel				
LCD controller/driver		• Segment signal outputs: 24 • Common signal outputs: 4				
Key return detection		4 pins				
Vectored interrupt sources	Maskable	Internal: 6, External: 2				
	Non-maskable	Internal: 1				
Reset		• Reset by $\overline{\text{RESET}}$ signal input • Internal reset by watchdog timer • Reset via power-on-clear circuit				
Power supply voltage		1.8 to 5.5 V				
Package		52-pin plastic LQFP (10 × 10)				
Development tools		Assembler, C compiler, device file, integrated debugger, system simulator, in-circuit emulator				

μPD789467 Subseries

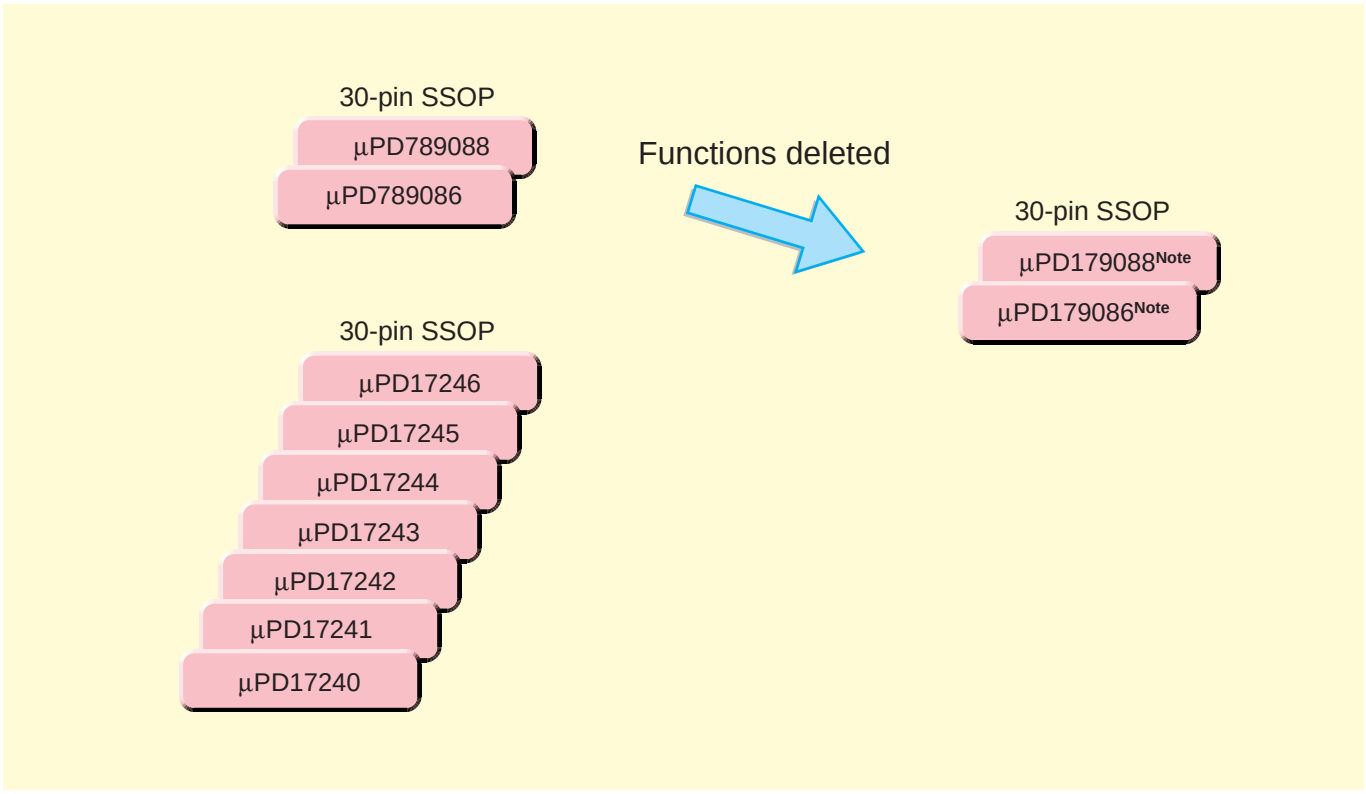
For infrared remote control transmitters/ LCD drive



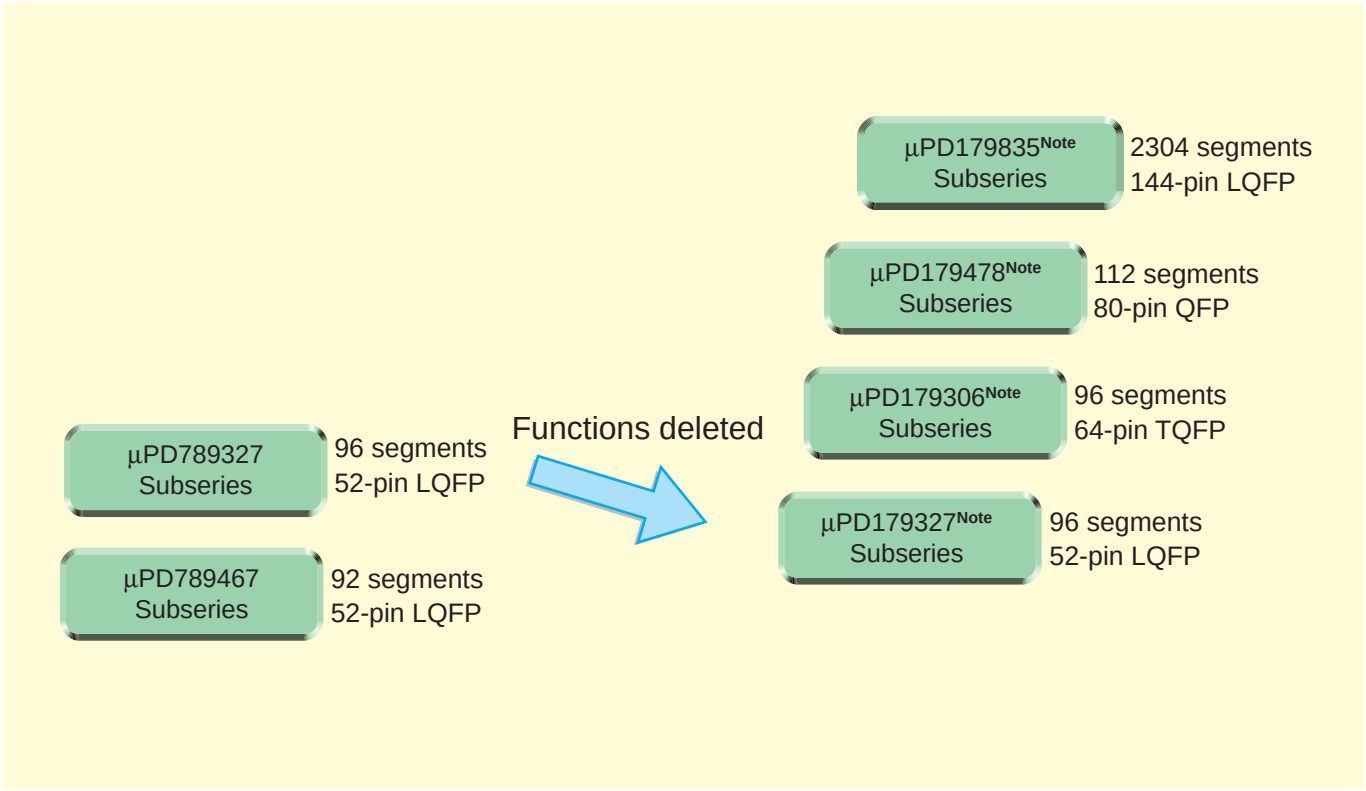
Part Number		μPD789462	μPD789464	μPD789466	μPD789467	μPD78F9468
Major applications		Remote controllers for AV and air conditioners				
ROM size		4 KB	8 KB	16 KB	24 KB	32 KB
		Mask ROM				Flash memory
RAM size	High-speed RAM	256 bytes		512 bytes		
	LCD display RAM	23 × 4 bits				
Operation clock frequency		• 1.0 to 5.0 MHz (Main system clock: Ceramic/crystal oscillation) • 32.768 kHz (Subsystem clock)				
Instruction execution time		• 0.4 μs/1.6 μs (@ 5.0 MHz operation with main system clock) • 122 μs (@ 32.768 kHz operation with subsystem clock)				
General-purpose registers		8 bits × 8 registers				
Instruction set		• 16-bit operations • Bit manipulation (set, reset, test) etc.				
I/O ports		18				
Timers		• 8-bit timer: 2 channels • Watch timer: 1 channel • Watchdog timer: 1 channel				
Timer outputs		1				
POC circuit		Mask option				On chip
A/D converter		8-bit resolution × 1 channel				
LCD controller/driver		• Segment signal outputs: 23 • Common signal outputs: 4 • On-chip booster				
Key return detection		4 pins				
Vectored interrupt sources	Maskable	Internal: 6, External: 2				
	Non-maskable	Internal: 1				
Reset		• Reset by $\overline{\text{RESET}}$ signal input • Internal reset by watchdog timer • Reset via power-on-clear circuit				
Power supply voltage		1.8 to 5.5 V				
Package		52-pin plastic LQFP (10 × 10)				
Development tools		Assembler, C compiler, device file, integrated debugger, system simulator, in-circuit emulator				

Product Lineup

<Microcontrollers for preset remote controllers>



<Microcontrollers for LCD remote controllers>

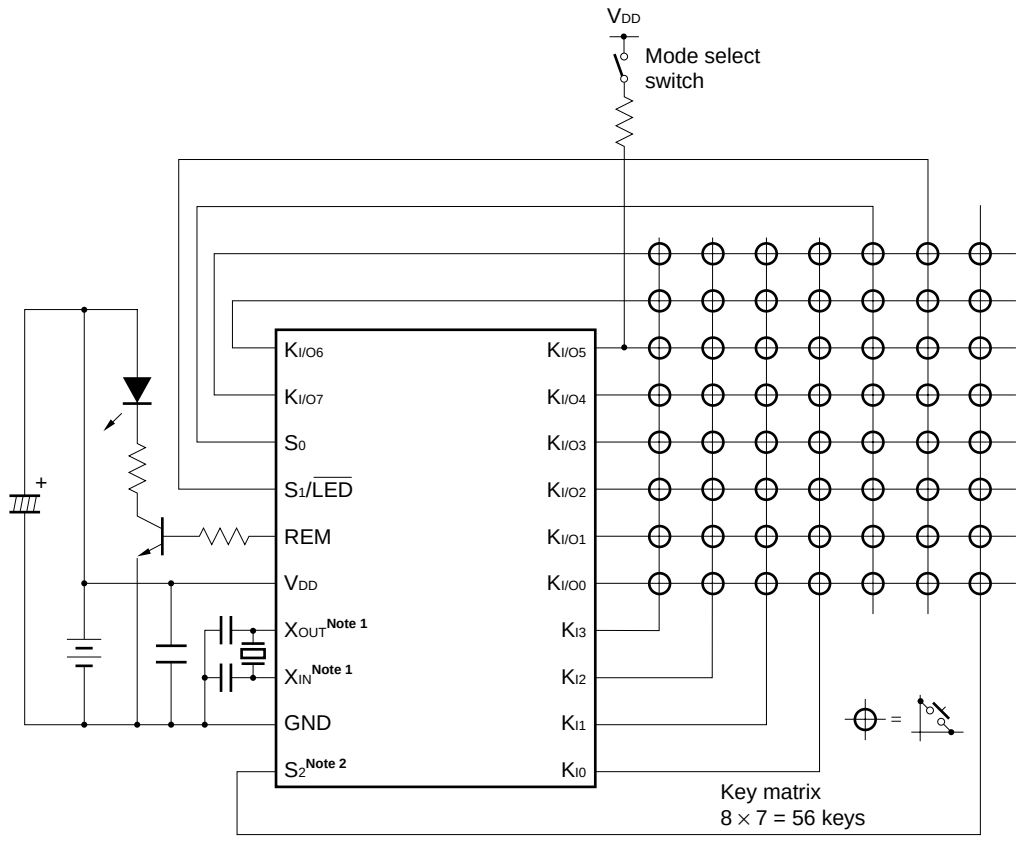


Note These devices are under development, so the parameters for these devices may change or NEC Electronics may withdraw these devices prior to production.

Application

For remote control transmitter (56 keys; mode selection switch supported)

μPD6x Series



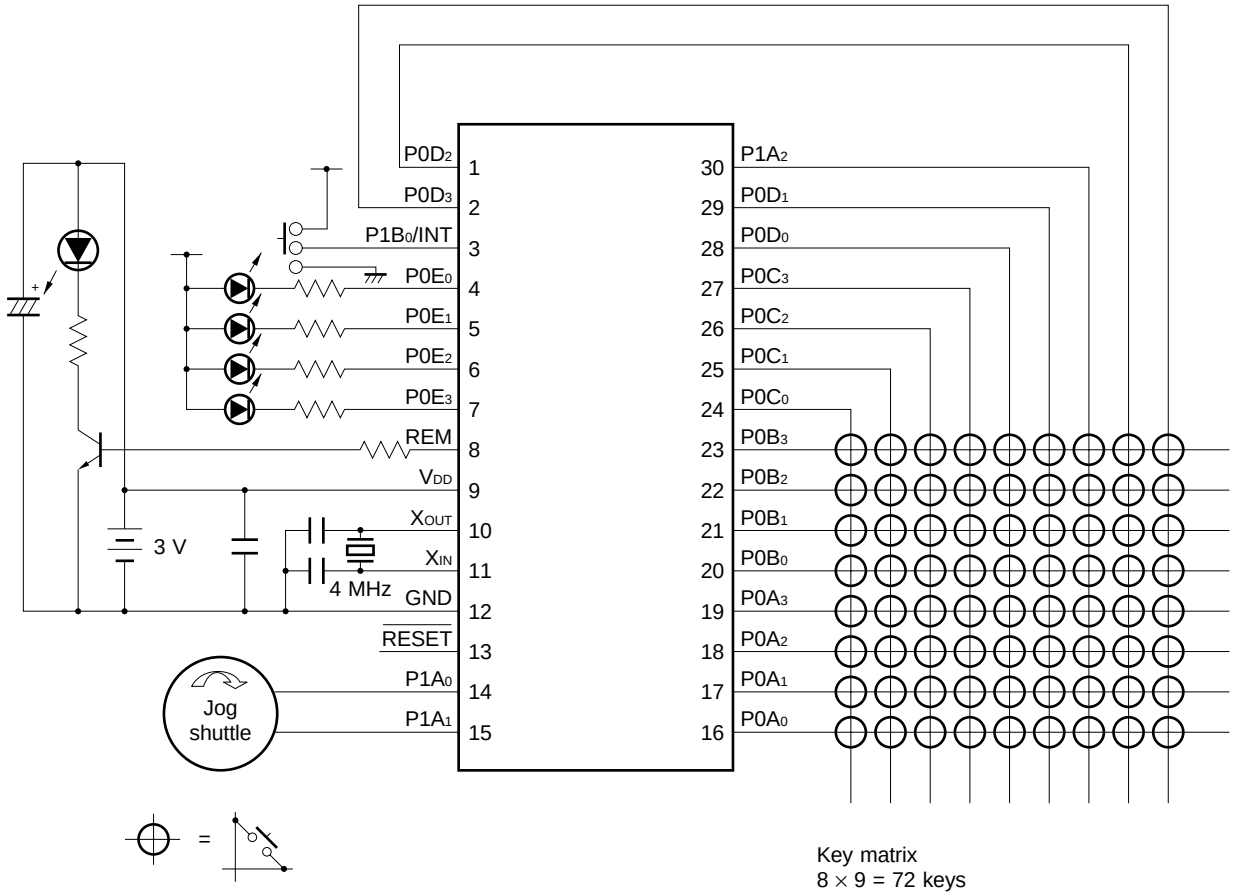
Notes 1. When incorporation of a capacitor for oscillation has not been specified by a mask option.

2. Set so that STOP mode release is enabled.

Application

For remote control transmitter
(72 keys supported)

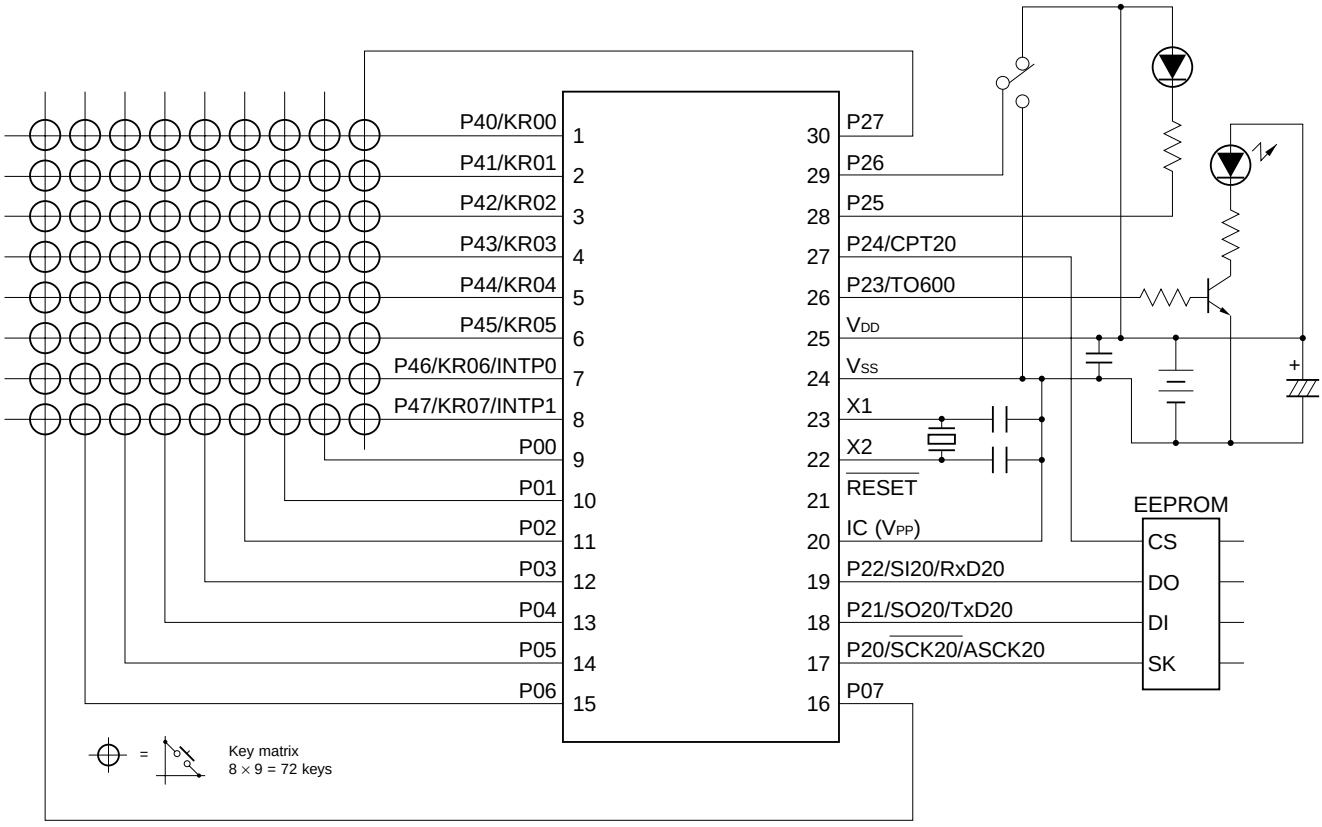
μPD1724x Series



Application

For remote control transmitter
(72 keys supported)

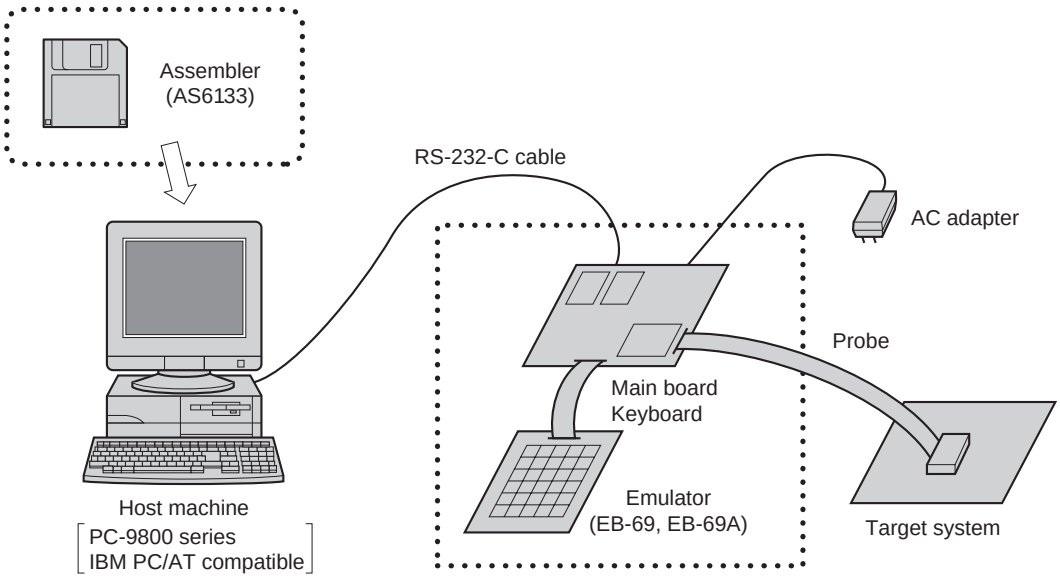
μPD789088 Subseries



Development Tools

The μPD6x Series is developed in the following environment.

Development environment: PC-9800 series, IBM PC/AT™ compatibles



Remarks **1.** The RS-232-C cable, probe, and AC adapter are sold separately.
2. EB-69 and EB-69A are manufactured by Naito Densei Machida Mfg. Co., Ltd.

Software

◆Assembler (AS6133)

Features
- Absolute assembler for μPD6x Series.
- Output load module file to serve as EB-69 and EB-69A input and diagnostic lists.

Hardware

◆ Emulator (EB-69, EB-69A)

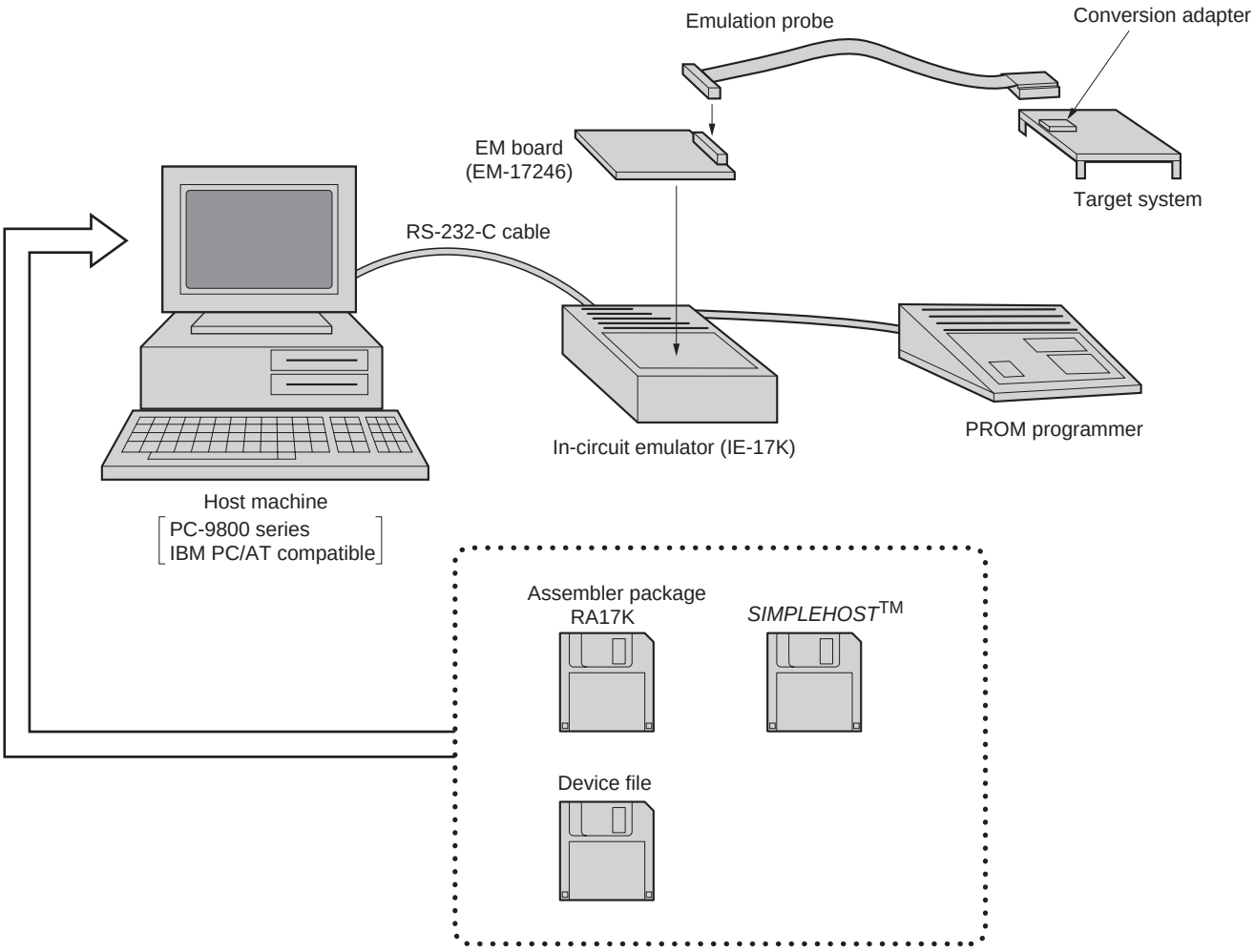
Features
- Operations such as key input and infrared LED light emission confirmation can be performed using the keyboard unit provided.
- Connection to target is possible using the probe (sold separately).
- Event functions including step execution and program execution break are included.
- Guard functions including stack overflow and coverage break are included.

Remark EB-69 and EB-69A are manufactured by Naito Densei Machida Mfg. Co., Ltd.

Development Tools

The μPD1724x Series is developed in the following environment.

Development environment: PC-9800 series, IBM PC/AT compatibles



Software

- RA17K (relocatable assembler package)
- Device file: Available for each product
- *SIMPLEHOST*: Compatible with RA17K

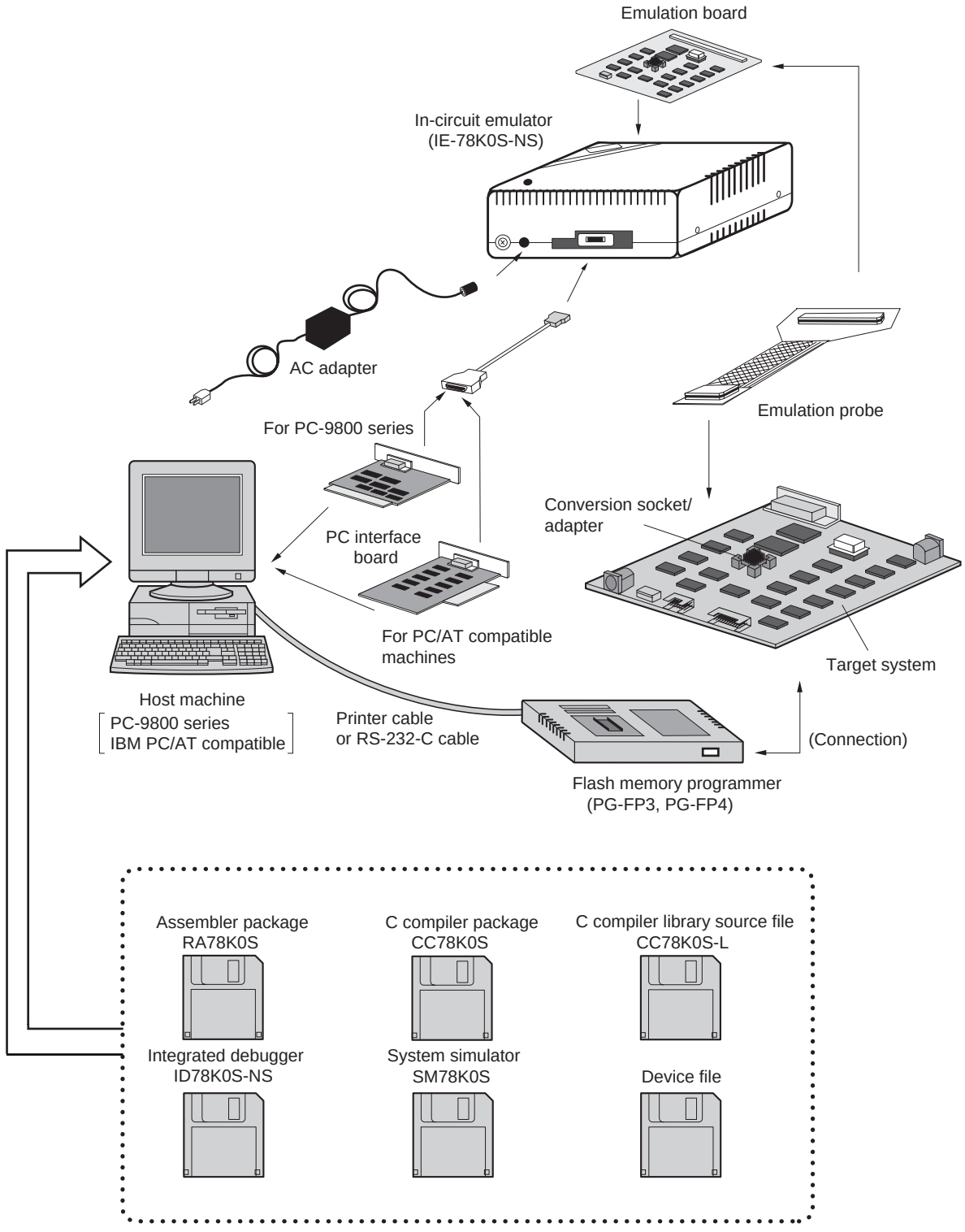
Hardware

- IE-17K or IE-17K-ET (in-circuit emulator)
- EM-17246 (EM board manufactured by Naito Densei Machida Mfg. Co., Ltd.)
- Emulation probe
- Conversion adapter
- PC-9800 series or IBM PC/AT compatible
- PROM programmer (for writing to one-time PROM such as AF-9706, AF-9708, AF-9709 manufactured by Ando Electric Co., Ltd.)
- Programmer adapter (PA-17P236 manufactured by NEC Electronics)

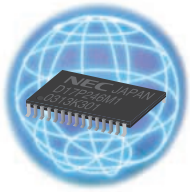
Development Tools

The μPD789088, 789327, and 789467 Subseries are developed in the following environment.

Development environment: PC-9800 series, IBM PC/AT compatibles



Development Tools



μPD789088, 789327, and 789467 Subseries

Software

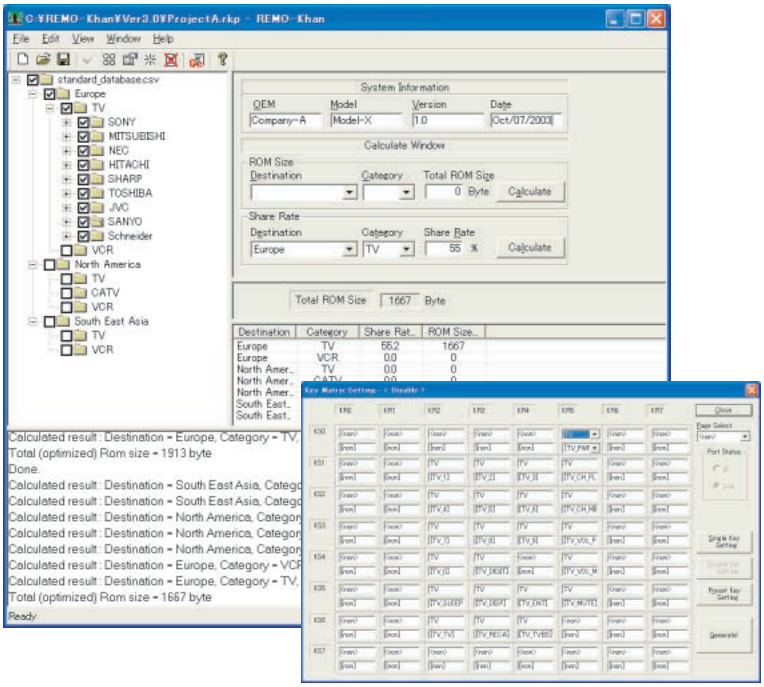
- RA78K0S (relocatable assembler package)
- CC78K0S (C compiler package)
- CC78K0S-L (C compiler library source file)
- ID78K0S-NS (integrated debugger)
- SM78K0S (system simulator)
- Device file: Available for each product

Hardware

- IE-78K0S-NS (in-circuit emulator)
- IE-70000-MC-PS-B (AC adapter)
- IE-70000-98-IF-C/IE-70000-PC-IF-C/IE-70000-PCI-IF-A/IE-70000-CD-IF-A (PC interface board)
- Emulation board: Available for each product
- Emulation probe
- Conversion socket/adapter
- PC-9800 series or IBM PC/AT compatible
- Flash memory programmer (PG-FP3/PG-FP4, FL-PR3/FL-PR4 manufactured by Naito Densei Machida Mfg. Co., Ltd.)
- Flash memory writing adapter (manufactured by Naito Densei Machida Mfg. Co., Ltd.)

Automatic Program Generation Tool

The following shows an automatic program generation tool for the μPD789088 Subseries.



This tool is used to automatically generate the program of the μPD789088 Subseries microcontrollers for preset remote controllers. The features and functions are as follows.

Features

This tool includes the TV/VCR remote controller output format and code information used in many parts of the world. By selecting and setting the specifications of the remote controller on the Windows user interface, tricky program development can be completed quickly and easily. This tool realizes a troublesome program development to complete in short time.

Functions

The major items that can be selected or set are as follows.

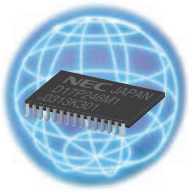
- Selection of machinery category/manufacturer/output format
- Selection of keys to be used
- Setting of key allocation on key matrix

Operating Environment

Host machine: PC-9800 series or IBM PC/AT compatible

OS:	Windows™ 98, Windows Me, Windows 2000, Windows XP (Professional, Home Edition)
CPU:	For Windows 98, Windows Me: Pentium™ 150 MHz or higher is recommended For Windows 2000, Windows XP (Professional, Home Edition): Intel™ Pentium/Celeron™ series, AMD K6/Athlon/Duron Family, or compatible processor with a clock rate of 300 MHz or higher is recommended
Memory:	For Windows 98, Windows Me: 32 MB min. For Windows 2000, Windows XP (Professional, Home Edition): 128 MB min.

Homepage



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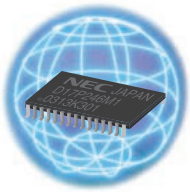
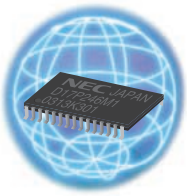
http://www.necel.com/micro/index_e.html

Memo



Memo

Memo



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NEC Electronics Corporation
1753, Shimonumabe, Nakahara-ku,
Kawasaki, Kanagawa 211-8668,
Japan
Tel: 044-435-5111
http://www.necel.com/

[North America]

NEC Electronics America, Inc.
2880 Scott Blvd.
Santa Clara, CA 95050-2554, U.S.A.
Tel: 408-588-6000
800-366-9782
http://www.necelam.com/

[Europe]

NEC Electronics (Europe) GmbH
Oberrather Str. 4
40472 Düsseldorf, Germany
Tel: 0211-6503-01
http://www.ee.nec.de/

Sucursal en España
Juan Esplandiu, 15
28007 Madrid, Spain
Tel: 091-504-2787

Succursale Française
9, rue Paul Dautier, B.P. 52
78142 Velizy-Villacoublay Cédex
France
Tel: 01-3067-5800

Filiale Italiana
Via Fabio Filzi, 25/A
20124 Milano, Italy
Tel: 02-667541

Branch The Netherlands
Boschdijk 187a
5612 HB Eindhoven
The Netherlands
Tel: 040-2445845

Tyskland Filial
P.O. Box 134
18322 Taeby, Sweden
Tel: 08-6380820

United Kingdom Branch
Cygnus House, Sunrise Parkway
Linford Wood, Milton Keynes
MK14 6NP, U.K.
Tel: 01908-691-133

[Asia & Oceania]

NEC Electronics Hong Kong Limited
12/F., Cityplaza 4,
12 Taikoo Wan Road, Hong Kong
Tel: 2886-9318

Seoul Branch
11F., Samik Lavied'or Bldg., 720-2,
Yeoksam-Dong, Kangnam-Ku,
Seoul, 135-080, Korea
Tel: 02-558-3737

NEC Electronics Shanghai, Ltd.
7th Floor, HSBC Tower, 101Yin Cheng East Road,
Pudong New Area, Shanghai P.R. China P.C:200120
Tel: 021-6841-1138

NEC Electronics Taiwan Ltd.
7F, No. 363 Fu Shing North Road
Taipei, Taiwan, R. O. C.
Tel: 02-2719-2377

NEC Electronics Singapore Pte. Ltd.
238A Thomson Road,
#12-08 Novena Square,
Singapore 307684
Tel: 6253-8311

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