

NEC

MOS INTEGRATED CIRCUIT  
 $\mu$ PD43257B

256K-BIT CMOS STATIC RAM  
32K-WORD BY 8-BIT

Description

The  $\mu$ PD43257B is a high speed, low power, and 262,144 bits (32,768 words by 8 bits) CMOS static RAM. Battery backup is available. And the  $\mu$ PD43257B has two chip enable pins (/CE1, CE2) to extend the capacity. The  $\mu$ PD43257B is packed in 28-pin plastic DIP and 28-pin plastic SOP.

Features

- 32,768 words by 8 bits organization
- Fast access time: 70, 85 ns (MAX.)
- Low V<sub>CC</sub> data retention: 2.0 V (MIN.)
- Two Chip Enable inputs: /CE1, CE2

Part number	Access time ns (MAX.)	Operating supply voltage V	Operating ambient temperature °C	Supply current		
				At operating mA (MAX.)	At standby $\mu$ A (MAX.)	At data retention $\mu$ A (MAX.) <sup>Note</sup>
$\mu$ PD43257B-xxL	70, 85	4.5 to 5.5	0 to 70	45	50	3
$\mu$ PD43257B-xxLL				45	15	2

**Note** T<sub>A</sub> ≤ 40 °C, V<sub>CC</sub> = 3.0 V

Version X

This Data sheet can be applied to the version X. This version is identified with its lot number. Letter X in the fifth character position in a lot number signifies version X.



The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.  
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

# Ordering Information

Part number	Package	Access time ns (MAX.)	Supply current μA (MAX.)		Remark
			At standby	At data retention <sup>Note</sup>	
μPD43257BCZ-70L	28-PIN PLASTIC DIP (15.24 mm (600))	70	50	3	L version
μPD43257BCZ-85L		85			
μPD43257BCZ-70LL		70	15	2	LL version
μPD43257BCZ-85LL		85			
μPD43257BGU-70L	28-PIN PLASTIC SOP (11.43 mm (450))	70	50	3	L version
μPD43257BGU-85L		85			
μPD43257BGU-70LL		70	15	2	LL version
μPD43257BGU-85LL		85			

**Note** T<sub>A</sub> ≤ 40 °C, V<sub>CC</sub> = 3.0 V

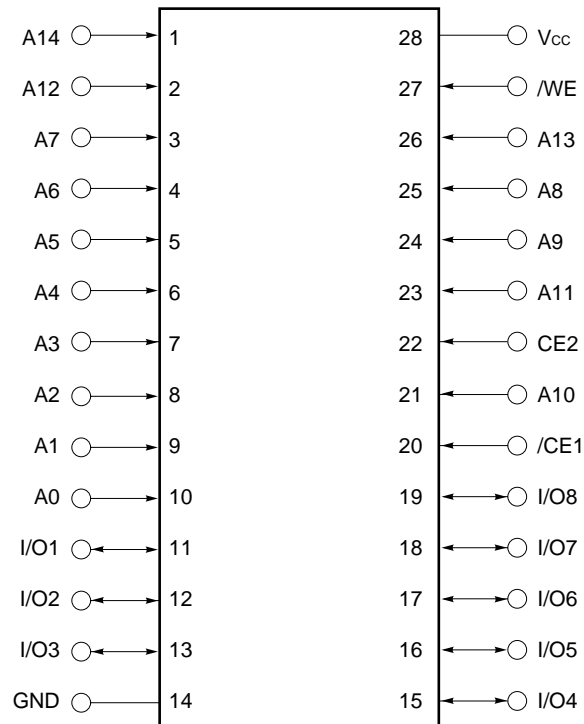
## Pin Configurations (Marking Side)

/xxx indicates active low signal.

### 28-PIN PLASTIC DIP (15.24 mm (600))

[ μPD43257BCZ-xxL ]

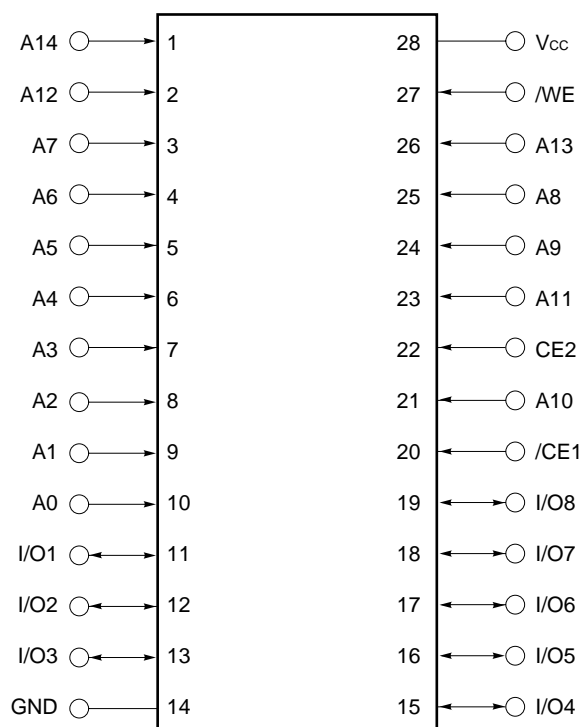
[ μPD43257BCZ-xxLL ]



- A0 - A14 : Address inputs
- I/O1 - I/O8 : Data inputs / outputs
- /CE1 : Chip Enable 1
- CE2 : Chip Enable 2
- /WE : Write Enable
- Vcc : Power supply
- GND : Ground

**Remark** Refer to **Package Drawings** for the 1-pin marking.

## 28-PIN PLASTIC SOP (11.43 mm (450))

[  $\mu$ PD43257BGU-xxL ][  $\mu$ PD43257BGU-xxLL ]

A0 - A14 : Address inputs

I/O1 - I/O8 : Data inputs / outputs

/CE1 : Chip Enable 1

CE2 : Chip Enable 2

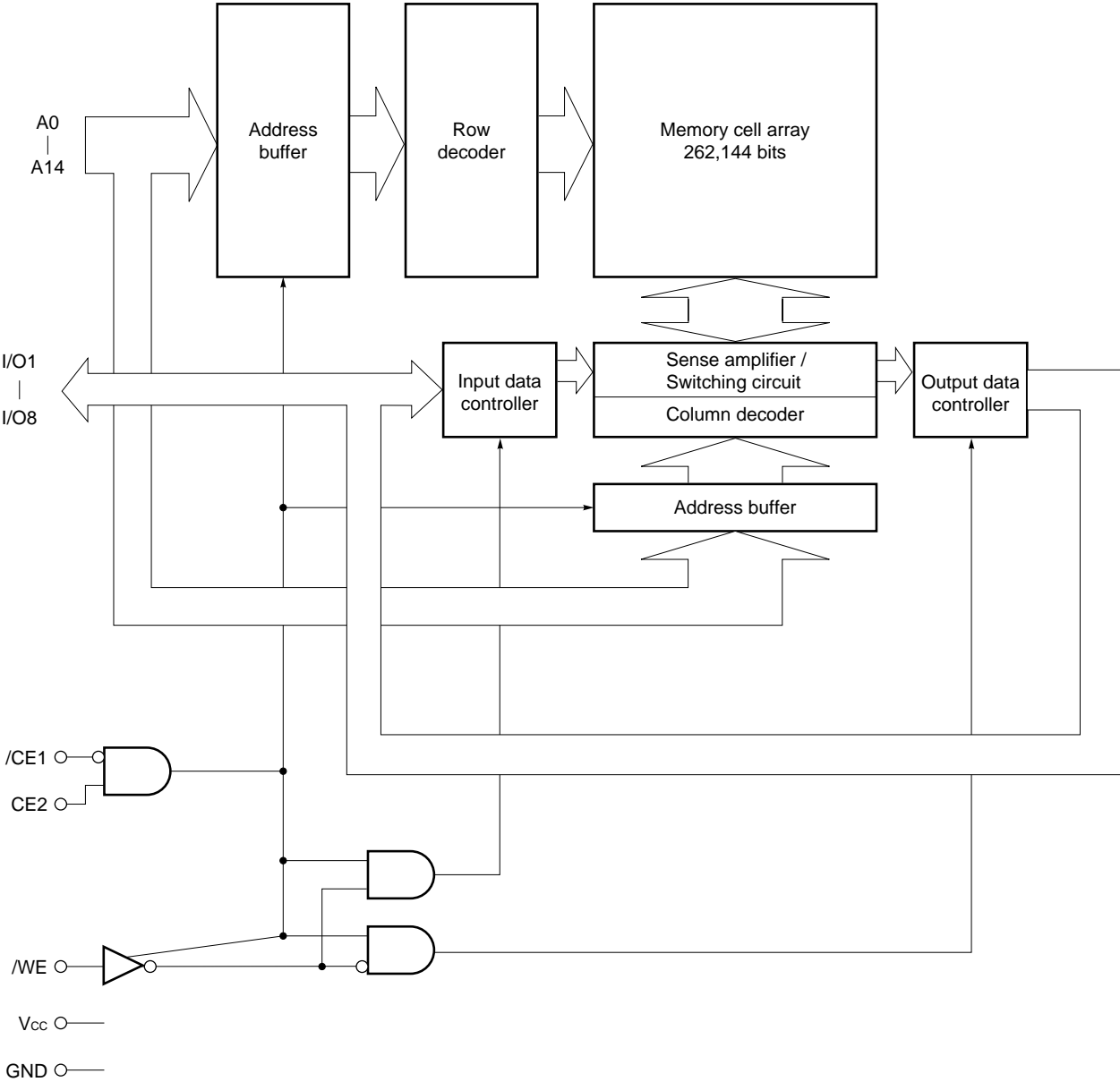
/WE : Write Enable

Vcc : Power supply

GND : Ground

**Remark** Refer to **Package Drawings** for the 1-pin marking.

Block Diagram



Truth Table

/CE1	CE2	/WE	Mode	I/O	Supply current
H	×	×	Not selected	High impedance	I <sub>SB</sub>
×	L	×			
L	H	H	Read	D <sub>OUT</sub>	I <sub>CCA</sub>
L	H	L	Write	D <sub>IN</sub>	

Remark × : V<sub>IH</sub> or V<sub>IL</sub>

## Electrical Specifications

## Absolute Maximum Ratings

Parameter	Symbol	Condition	Rating	Unit
Supply voltage	V <sub>CC</sub>		-0.5 <sup>Note</sup> to +7.0	V
Input / Output voltage	V <sub>T</sub>		-0.5 <sup>Note</sup> to V <sub>CC</sub> + 0.5	V
Operating ambient temperature	T <sub>A</sub>		0 to 70	°C
Storage temperature	T <sub>stg</sub>		-55 to +125	°C

**Note** -3.0 V (MIN.) (Pulse width : 50 ns)

**Caution** Exposing the device to stress above those listed in Absolute Maximum Rating could cause permanent damage. The device is not meant to be operated under conditions outside the limits described in the operational section of this specification. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

## Recommended Operating Conditions

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply voltage	V <sub>CC</sub>		4.5	5.0	5.5	V
High level input voltage	V <sub>IH</sub>		2.2		V <sub>CC</sub> +0.5	V
Low level input voltage	V <sub>IL</sub>		-0.3 <sup>Note</sup>		+0.8	V
Operating ambient temperature	T <sub>A</sub>		0		70	°C

**Note** -3.0 V (MIN.) (Pulse width: 50 ns)

Capacitance (T<sub>A</sub> = 25 °C, f = 1 MHz)

Parameter	Symbol	Test conditions	MIN.	TYP.	MAX.	Unit
Input capacitance	C <sub>IN</sub>	V <sub>IN</sub> = 0 V			5	pF
Input / Output capacitance	C <sub>I/O</sub>	V <sub>I/O</sub> = 0 V			8	pF

**Remarks 1.** V<sub>IN</sub> : Input voltage

V<sub>I/O</sub> : Input / Output voltage

**2.** These parameters are periodically sampled and not 100% tested.

DC Characteristics (Recommended Operating Conditions Unless Otherwise Noted)

Parameter	Symbol	Test condition	μPD43257B-xxL			μPD43257B-xxLL			Unit
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Input leakage current	I <sub>LI</sub>	V <sub>IN</sub> = 0 V to V <sub>CC</sub>	-1.0		+1.0	-1.0		+1.0	μA
I/O leakage current	I <sub>LO</sub>	V <sub>I/O</sub> = 0 V to V <sub>CC</sub> , /CE1 = V <sub>IH</sub> or CE2 = V <sub>IL</sub> or /WE = V <sub>IL</sub>	-1.0		+1.0	-1.0		+1.0	μA
Operating supply current	I <sub>CCA1</sub>	/CE1 = V <sub>IL</sub> , CE2 = V <sub>IH</sub> , Minimum cycle time, I <sub>I/O</sub> = 0 mA	μPD43257B-70			μPD43257B-85			mA
					45			45	
	I <sub>CCA2</sub>	/CE1 = V <sub>IL</sub> , CE2 = V <sub>IH</sub> , I <sub>I/O</sub> = 0 mA			10			10	
	I <sub>CCA3</sub>	/CE1 ≤ 0.2 V, CE2 ≥ V <sub>CC</sub> - 0.2 V, Cycle = 1 MHz, I <sub>I/O</sub> = 0 mA, V <sub>IL</sub> ≤ 0.2 V, V <sub>IH</sub> ≥ V <sub>CC</sub> - 0.2 V			10			10	
Standby supply current	I <sub>SB</sub>	/CE1 = V <sub>IH</sub> or CE2 = V <sub>IL</sub> ,			3			3	mA
	I <sub>SB1</sub>	/CE1 ≥ V <sub>CC</sub> - 0.2 V, CE2 ≥ V <sub>CC</sub> - 0.2 V		1.0	50		0.5	15	
	I <sub>SB2</sub>	CE2 ≤ 0.2 V		1.0	50		0.5	15	
High level output voltage	V <sub>OH1</sub>	I <sub>OH</sub> = -1.0 mA	2.4			2.4			V
	V <sub>OH2</sub>	I <sub>OH</sub> = -0.1 mA	V <sub>CC</sub> -0.5			V <sub>CC</sub> -0.5			
Low level output voltage	V <sub>OL</sub>	I <sub>OL</sub> = 2.1 mA			0.4			0.4	V

Remarks 1. V<sub>IN</sub> : Input voltage

V<sub>I/O</sub> : Input / Output voltage

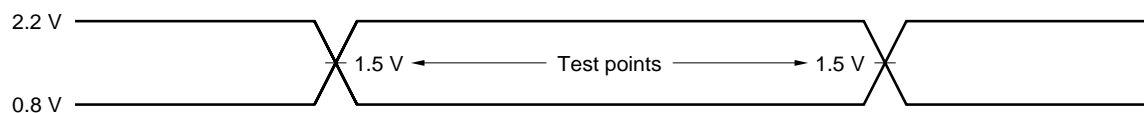
2. These DC characteristics are in common regardless of package types and access time.

# AC Characteristics (Recommended Operating Conditions Unless Otherwise Noted)

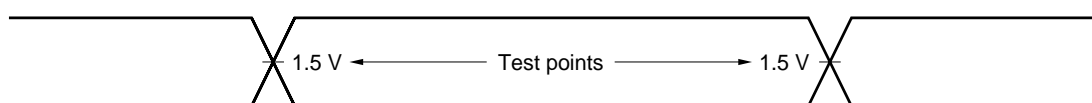
## AC Test Conditions

[ μPD43257B-70L, μPD43257B-85L, μPD43257B-70LL, μPD43257B-85LL ]

### Input Waveform (Rise and Fall Time ≤ 5 ns)



### Output Waveform

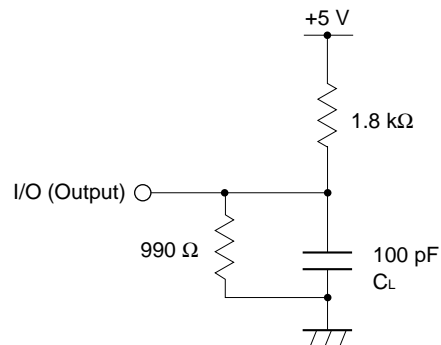


### Output Load

AC characteristics with notes should be measured with the output load shown in **Figure 1** and **Figure 2**.

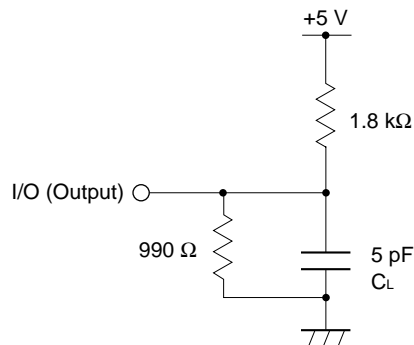
**Figure 1**

(tAA, tCO1, tCO2, tOH)



**Figure 2**

(tLZ1, tLZ2, tHZ1, tHZ2, tWHZ, tOW)



**Remark** CL includes capacitance of the probe and jig, and stray capacitance.



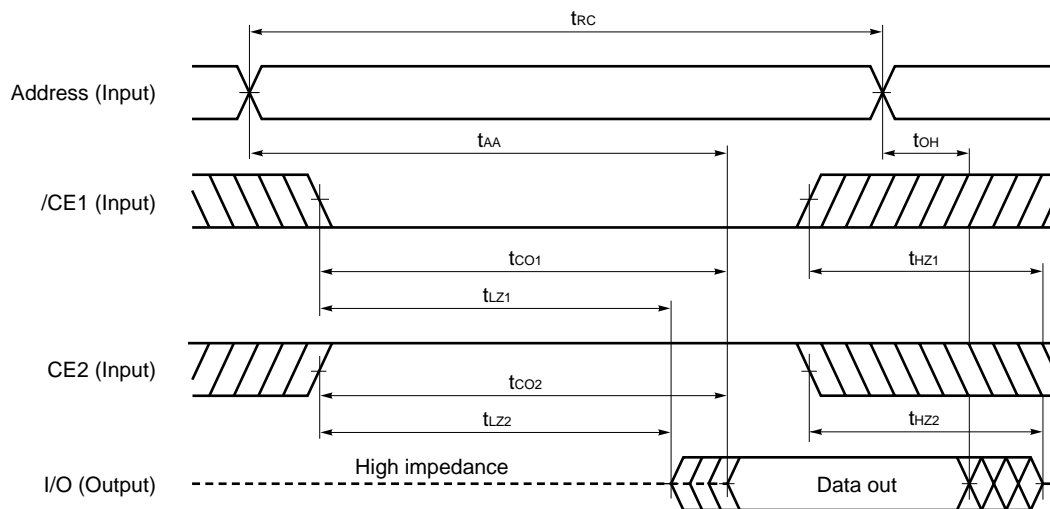
**Read Cycle**

Parameter	Symbol	$\mu$ PD43257B-70		$\mu$ PD43257B-85		Unit	Condition
		MIN.	MAX.	MIN.	MAX.		
Read cycle time	$t_{RC}$	70		85		ns	
Address access time	$t_{AA}$		70		85	ns	<b>Note 1</b>
/CE1 access time	$t_{CO1}$		70		85	ns	
CE2 access time	$t_{CO2}$		70		85	ns	
Output hold from address change	$t_{OH}$	10		10		ns	
/CE1 to output in low impedance	$t_{LZ1}$	10		10		ns	<b>Note 2</b>
CE2 to output in low impedance	$t_{LZ2}$	10		10		ns	
/CE1 to output in high impedance	$t_{HZ1}$		30		30	ns	
CE2 to output in high impedance	$t_{HZ2}$		30		30	ns	

**Notes** 1. See the output load shown in **Figure 1**.

2. See the output load shown in **Figure 2**.

**Remark** These AC characteristics are in common regardless of package types and L, LL versions.

**Read Cycle Timing Chart**

**Remark** In read cycle, /WE should be fixed to high level.

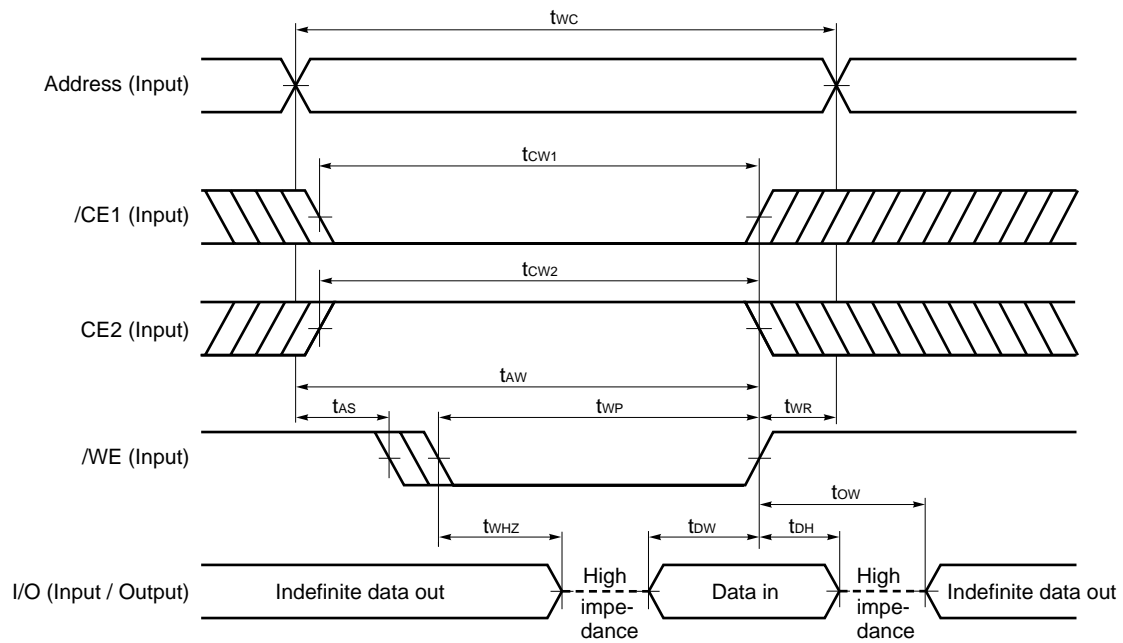
**Write Cycle**

Parameter	Symbol	$\mu$ PD43257B-70		$\mu$ PD43257B-85		Unit	Condition
		MIN.	MAX.	MIN.	MAX.		
Write cycle time	t <sub>WC</sub>	70		85		ns	
/CE1 to end of write	t <sub>CW1</sub>	50		70		ns	
CE2 to end of write	t <sub>CW2</sub>	50		70		ns	
Address valid to end of write	t <sub>AW</sub>	50		70		ns	
Address setup time	t <sub>AS</sub>	0		0		ns	
Write pulse width	t <sub>WP</sub>	55		65		ns	
Write recovery time	t <sub>WR</sub>	0		0		ns	
Data valid to end of write	t <sub>DW</sub>	30		35		ns	
Data hold time	t <sub>DH</sub>	0		0		ns	
/WE to output in high impedance	t <sub>WHZ</sub>		30		30	ns	<b>Note</b>
Output active from end of write	t <sub>OW</sub>	10		10		ns	

**Note** See the output load shown in **Figure 2**.

**Remark** These AC characteristics are in common regardless of package types and L, LL versions.

# Write Cycle Timing Chart 1 (/WE Controlled)

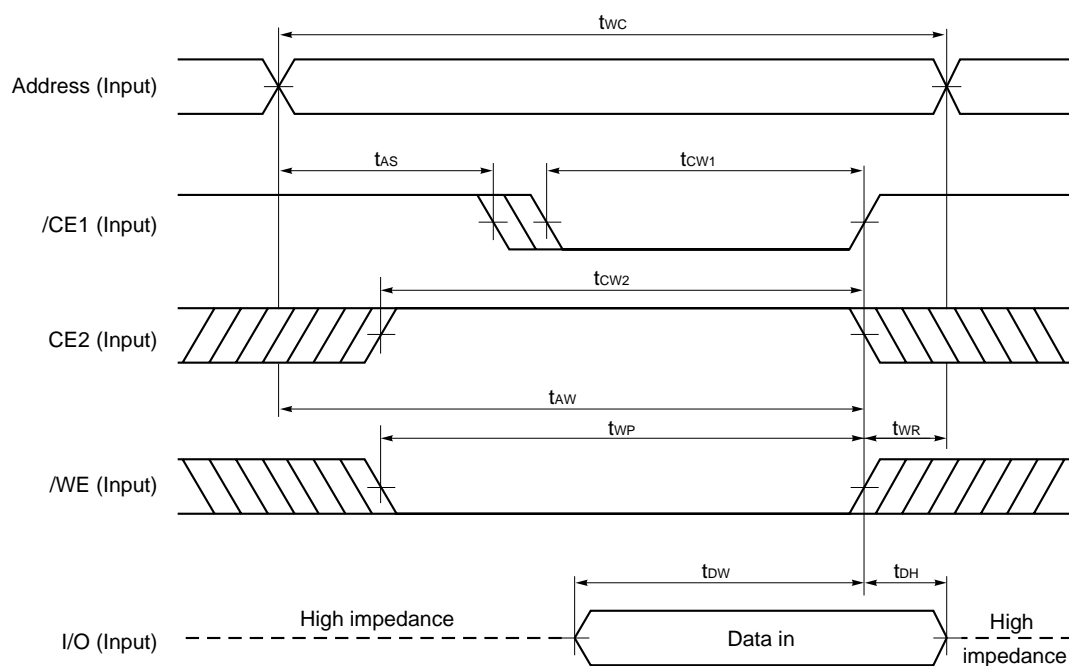


**Cautions** 1. During address transition, at least one of pins /CE1, CE2, /WE should be inactivated.

- ★ 2. When I/O pins are in the output state, therefore the input signals must not be applied to the output.

- Remarks** 1. Write operation is done during the overlap time of a low level /CE1, /WE and a high level CE2.  
 2. If /CE1 changes to low level at the same time or after the change of /WE to low level, or if CE2 changes to high level at the same time or after the change of /WE to low level, the I/O pins will remain high impedance state.  
 3. When /WE is at low level, the I/O pins are always high impedance. When /WE is at high level, read operation is executed. Therefore /OE should be at high level to make the I/O pins high impedance.

# Write Cycle Timing Chart 2 (/CE1 Controlled)

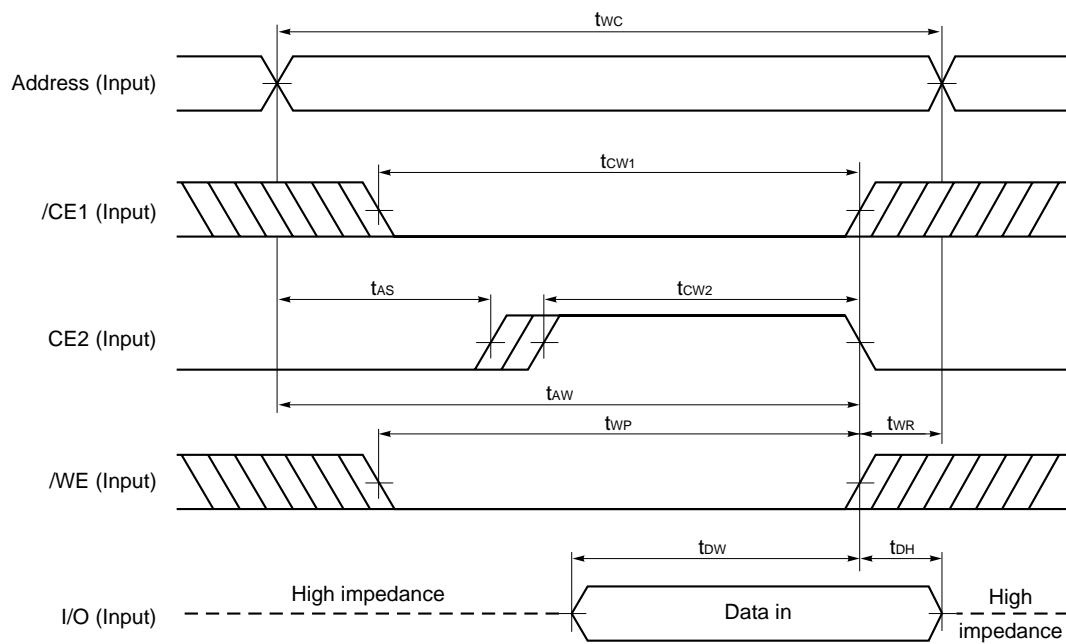


**Cautions** 1. During address transition, at least one of pins  $\overline{\text{CE1}}$ , CE2,  $\overline{\text{WE}}$  should be inactivated.

- ★ 2. When I/O pins are in the output state, therefore the input signals must not be applied to the output.

**Remark** Write operation is done during the overlap time of a low level  $\overline{\text{CE1}}$ ,  $\overline{\text{WE}}$  and a high level CE2.

### Write Cycle Timing Chart 3 (CE2 Controlled)



**Cautions** 1. During address transition, at least one of pins /CE1, CE2, /WE should be inactivated.

- ★ 2. When I/O pins are in the output state, therefore the input signals must not be applied to the output.

**Remark** Write operation is done during the overlap time of a low level /CE1, /WE and a high level CE2.

Low V<sub>CC</sub> Data Retention Characteristics (T<sub>A</sub> = 0 to 70 °C)

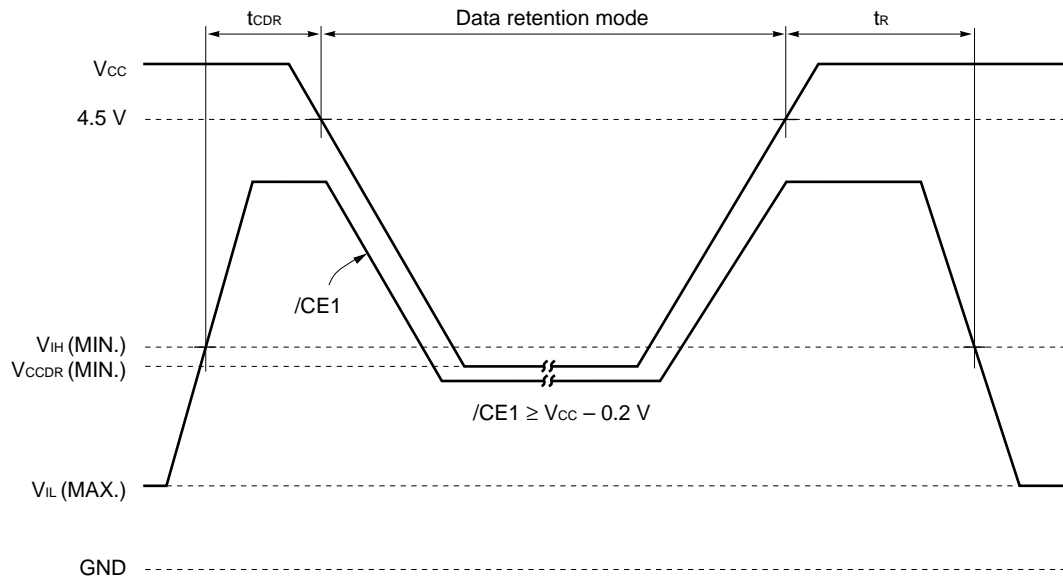
Parameter	Symbol	Test Condition	μPD43257B-xxL			μPD43257B-xxLL			Unit
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Data retention supply voltage	V <sub>CCDR1</sub>	/CE1 ≥ V <sub>CC</sub> – 0.2 V, CE2 ≥ V <sub>CC</sub> – 0.2 V	2.0		5.5	2.0		5.5	V
	V <sub>CCDR2</sub>	CE2 ≤ 0.2 V	2.0		5.5	2.0		5.5	
Data retention supply current	I <sub>CCDR1</sub>	V <sub>CC</sub> = 3.0 V, /CE1 ≥ V <sub>CC</sub> – 0.2 V, CE2 ≥ V <sub>CC</sub> – 0.2 V		0.5	20 <sup>Note1</sup>		0.5	7 <sup>Note2</sup>	μA
	I <sub>CCDR2</sub>	V <sub>CC</sub> = 3.0 V, CE2 ≤ 0.2 V		0.5	20 <sup>Note1</sup>		0.5	7 <sup>Note2</sup>	
Chip deselection to data retention mode	t <sub>CDR</sub>		0			0			ns
Operation recovery time	t <sub>R</sub>		5			5			ms

**Notes** 1. 3 μA (T<sub>A</sub> ≤ 40 °C)

2. 2 μA (T<sub>A</sub> ≤ 40 °C), 1 μA (T<sub>A</sub> ≤ 25 °C)

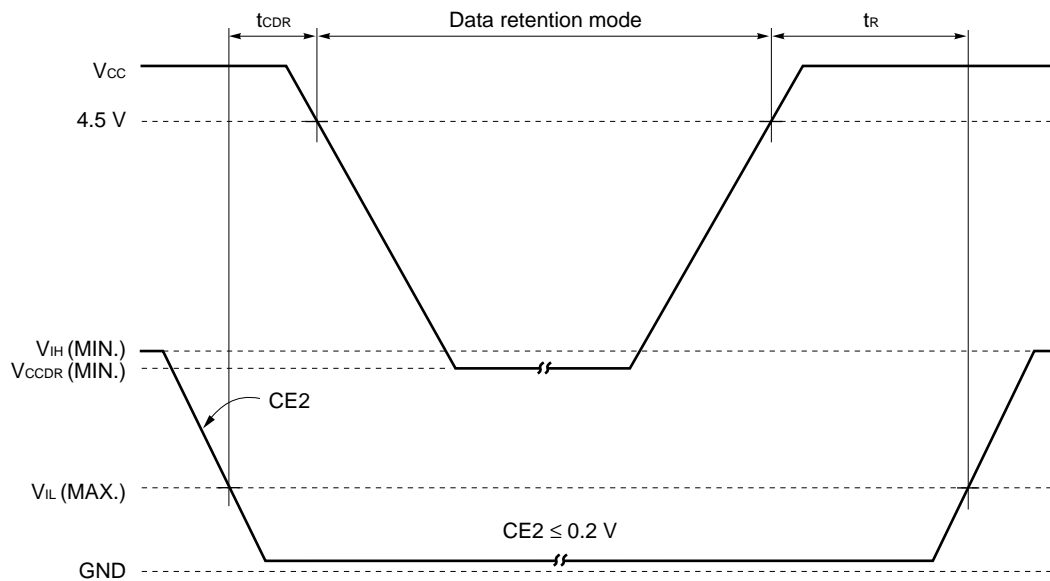
## Data Retention Timing Chart

### (1) /CE1 Controlled



**Remark** On the data retention mode by controlling  $\overline{\text{CE1}}$ , the input level of CE2 must be  $\text{CE2} \geq V_{\text{CC}} - 0.2 \text{ V}$  or  $\text{CE2} \leq 0.2 \text{ V}$ . The other pins (Address, I/O,  $\overline{\text{WE}}$ ) can be in high impedance state.

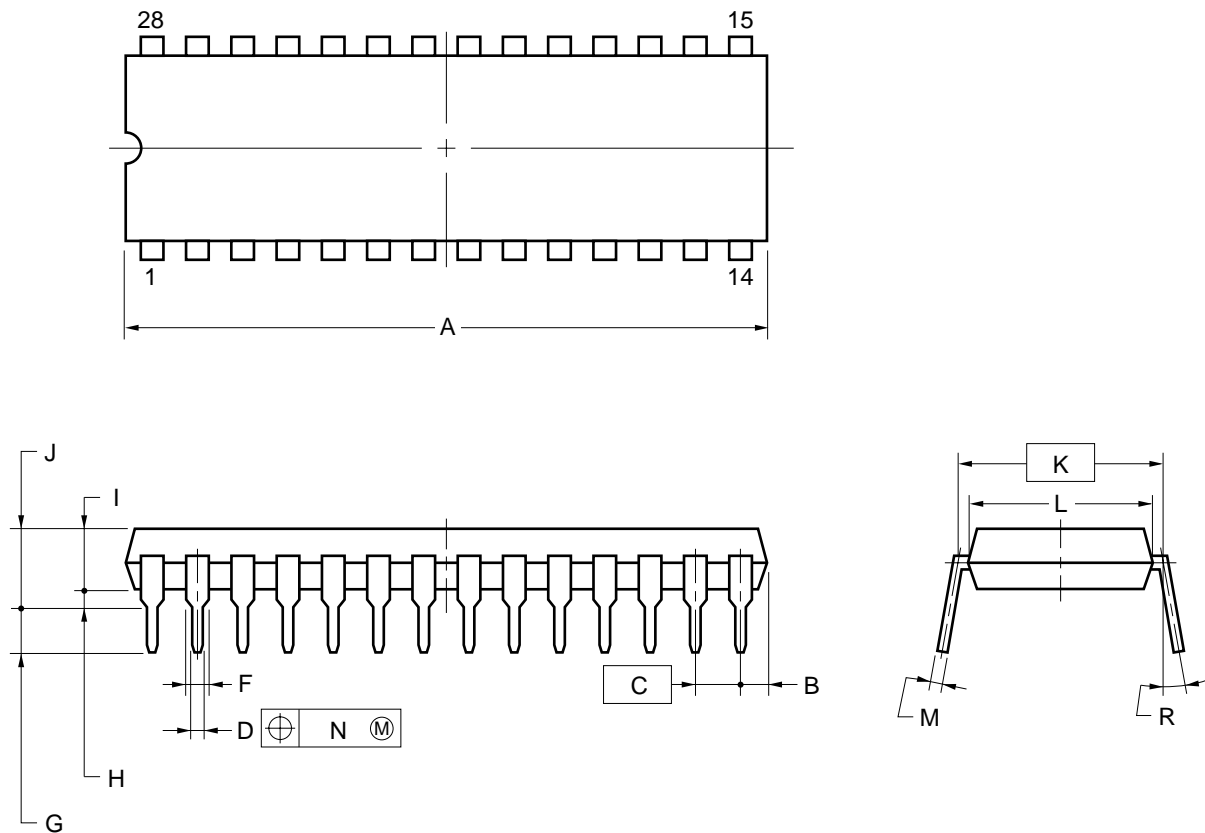
### (2) CE2 Controlled



**Remark** On the data retention mode by controlling CE2, the other pins ( $\overline{\text{CE1}}$ , Address, I/O,  $\overline{\text{WE}}$ ) can be in high impedance state.

★ Package Drawings

28-PIN PLASTIC DIP (15.24 mm (600))



NOTES

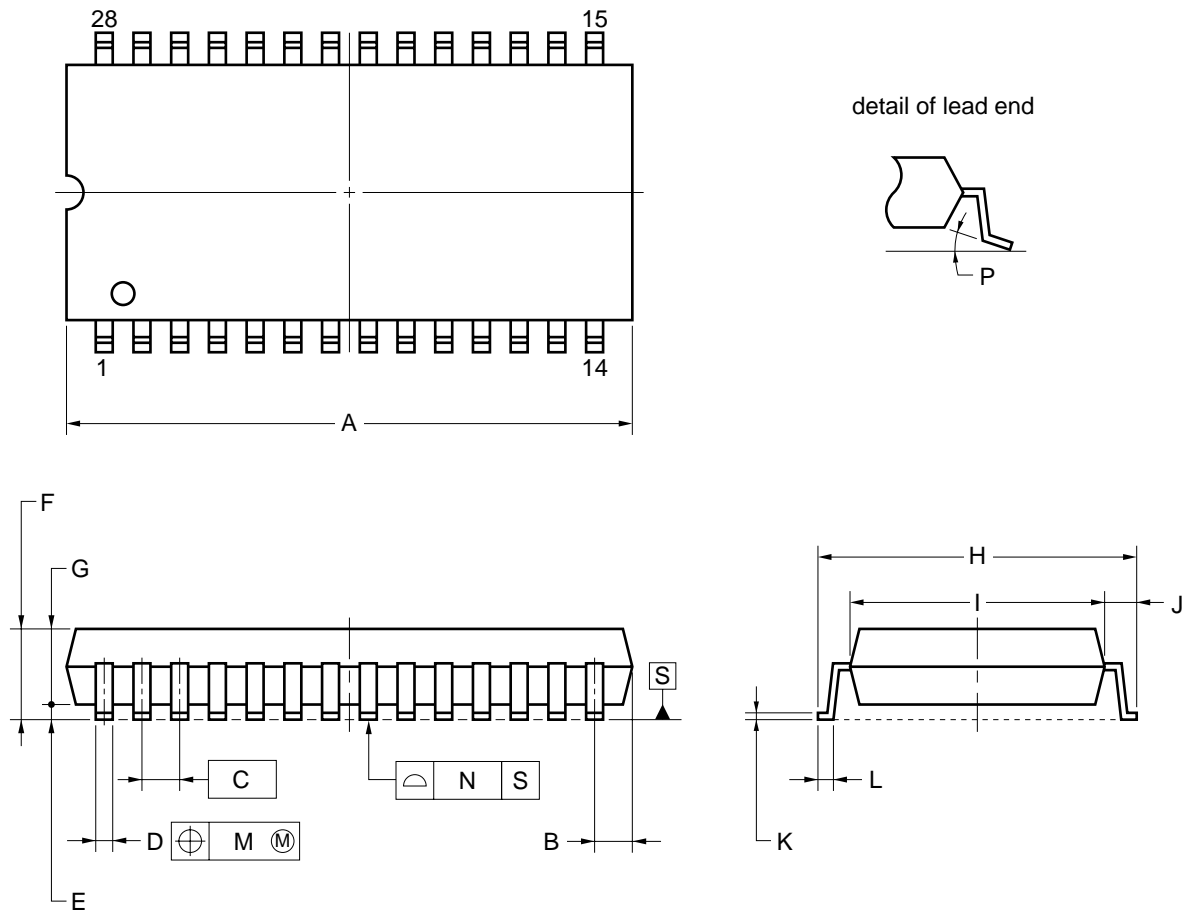
1. Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.
2. Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS
A	38.10 MAX.
B	2.54 MAX.
C	2.54 (T.P.)
D	0.50±0.10
F	1.2 MIN.
G	3.6±0.3
H	0.51 MIN.
I	4.31 MAX.
J	5.72 MAX.
K	15.24 (T.P.)
L	13.2
M	0.25 <sup>+0.10</sup> <sub>-0.05</sub>
N	0.25
R	0~15°

P28C-100-600A1-2



# 28-PIN PLASTIC SOP (11.43 mm (450))



## NOTE

Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	18.0 <sup>+0.6</sup> <sub>-0.05</sub>
B	1.27 MAX.
C	1.27 (T.P.)
D	0.42 <sup>+0.08</sup> <sub>-0.07</sub>
E	0.2±0.1
F	2.95 MAX.
G	2.55±0.1
H	11.8±0.3
I	8.4±0.1
J	1.7±0.2
K	0.22±0.05
L	0.7±0.2
M	0.12
N	0.10
P	3° <sup>+7°</sup> <sub>-3°</sub>

P28GU-50-450A-4

### Recommended Soldering Conditions

The following conditions must be met when soldering  $\mu$ PD43257B. For more details, refer to our document “SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL” (C10535E).

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

### Types of Surface Mount Device

$\mu$ PD43257BGU-xxL : 28-PIN PLASTIC SOP (11.43 mm (450))

$\mu$ PD43257BGU-xxLL : 28-PIN PLASTIC SOP (11.43 mm (450))

Please consult with our sales offices.

### Types of Through Hole Mount Device

$\mu$ PD43257BCZ-xxL : 28-PIN PLASTIC DIP (15.24 mm (600))

$\mu$ PD43257BCZ-xxLL : 28-PIN PLASTIC DIP (15.24 mm (600))

Soldering process	Soldering conditions
Wave soldering (only to leads)	Solder temperature : 260 °C or below, Flow time : 10 seconds or below
Partial heating method	Terminal temperature : 300 °C or below, Time : 3 seconds or below (Per one lead)

**Caution** Do not jet molten solder on the surface of package.

**NOTES FOR CMOS DEVICES****① PRECAUTION AGAINST ESD FOR SEMICONDUCTORS**

Note:

Strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred. Environmental control must be adequate. When it is dry, humidifier should be used. It is recommended to avoid using insulators that easily build static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work bench and floor should be grounded. The operator should be grounded using wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with semiconductor devices on it.

**② HANDLING OF UNUSED INPUT PINS FOR CMOS**

Note:

No connection for CMOS device inputs can be cause of malfunction. If no connection is provided to the input pins, it is possible that an internal input level may be generated due to noise, etc., hence causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using a pull-up or pull-down circuitry. Each unused pin should be connected to  $V_{DD}$  or GND with a resistor, if it is considered to have a possibility of being an output pin. All handling related to the unused pins must be judged device by device and related specifications governing the devices.

**③ STATUS BEFORE INITIALIZATION OF MOS DEVICES**

Note:

Power-on does not necessarily define initial status of MOS device. Production process of MOS does not define the initial operation status of the device. Immediately after the power source is turned ON, the devices with reset function have not yet been initialized. Hence, power-on does not guarantee out-pin levels, I/O settings or contents of registers. Device is not initialized until the reset signal is received. Reset operation must be executed immediately after power-on for devices having reset function.

- **The information in this document is current as of June, 2000. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
  - No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
  - NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
  - Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
  - While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
  - NEC semiconductor products are classified into the following three quality grades:  
 "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.  
 "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots  
 "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)  
 "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.
- The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.
- (Note)
- (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.
- (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).