

256K-BIT CMOS STATIC RAM  
32K-WORD BY 8-BIT  
EXTENDED TEMPERATURE OPERATION

## Description

The  $\mu$ PD43256B-X is a high speed, low power, and 262,144 bits (32,768 words by 8 bits) CMOS static RAM.

The  $\mu$ PD43256B-X is an extended-operating-temperature version of the  $\mu$ PD43256B (X version :  $T_A = -25$  to  $+85$  °C). And A and B versions are low voltage operations. Battery backup is available.

The  $\mu$ PD43256B-X is packed in 28-pin plastic TSOP (I) (8 x 13.4 mm).

## Features

- 32,768 words by 8 bits organization
- Fast access time: 70, 85, 100, 120, 150 ns (MAX.)
- Operating ambient temperature:  $T_A = -25$  to  $+85$  °C
- Low voltage operation (A version:  $V_{CC} = 3.0$  to  $5.5$  V, B version:  $V_{CC} = 2.7$  to  $5.5$  V)
- Low  $V_{CC}$  data retention: 2.0 V (MIN.)
- /OE input for easy application

| Part number                          | Access time<br>ns (MAX.)                         | Operating supply<br>voltage<br>V | Operating ambient<br>temperature<br>°C | Supply current            |                              |  |
|--------------------------------------|--|----------------------------------|--|---------------------------|------------------------------|--|
|                                      |  |                                  |  | At operating<br>mA (MAX.) | At standby<br>$\mu$ A (MAX.) | At data retention<br>$\mu$ A (MAX.) <sup>Note1</sup> |
| ★ $\mu$ PD43256B-xxX                 | 70, 85   | 4.5 to 5.5                       | -25 to +85                             | 45                        | 50                           | 2  |
| $\mu$ PD43256B-AxxX                  | 85 <sup>Note2</sup> , 100, 120 <sup>Note2</sup>  | 3.0 to 5.5                       |  |                           |                              |  |
| $\mu$ PD43256B-BxxX <sup>Note2</sup> | 100, 120 <sup>Note2</sup> , 150 <sup>Note2</sup> | 2.7 to 5.5                       |  | 40                        |                              |  |

**Notes 1.**  $T_A \leq 40$  °C,  $V_{CC} = 3.0$  V

**2.** 100 s (MAX.) ( $V_{CC} = 4.5$  to  $5.5$  V)

## Version X

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



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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<br>ns (MAX.) | Operating supply<br>voltage<br>V | Operating ambient<br>temperature<br>°C | Remark    |
|----------------------|---|--------------------------|----------------------------------|--|-----------|
| μPD43256BGW-70X-9JL  | 28-PIN PLASTIC TSOP(I)<br>(8x13.4) (Normal bent)  | 70                       | 4.5 to 5.5                       | −25 to +85                             |           |
| μPD43256BGW-85X-9JL  |   | 85                       | 3.0 to 5.5                       |  |           |
| μPD43256BGW-A85X-9JL |   | 85                       |                                  |  | A version |
| μPD43256BGW-A10X-9JL |   | 100                      |                                  |  |           |
| μPD43256BGW-A12X-9JL |   | 120                      | 2.7 to 5.5                       |  | B version |
| μPD43256BGW-B10X-9JL |   | 100                      |                                  |  |           |
| μPD43256BGW-B12X-9JL |   | 120                      |                                  |  |           |
| μPD43256BGW-B15X-9JL |   | 150                      |                                  |  |           |
| μPD43256BGW-70X-9KL  | 28-PIN PLASTIC TSOP(I)<br>(8x13.4) (Reverse bent) | 70                       | 4.5 to 5.5                       |  |           |
| μPD43256BGW-85X-9KL  |   | 85                       | 3.0 to 5.5                       |  |           |
| μPD43256BGW-A85X-9KL |   | 85                       |                                  |  | A version |
| μPD43256BGW-A10X-9KL |   | 100                      |                                  |  |           |
| μPD43256BGW-A12X-9KL |   | 120                      | 2.7 to 5.5                       |  | B version |
| μPD43256BGW-B10X-9KL |   | 100                      |                                  |  |           |
| μPD43256BGW-B12X-9KL |   | 120                      |                                  |  |           |
| μPD43256BGW-B15X-9KL |   | 150                      |                                  |  |           |

# ★ Pin Configurations (Marking Side)

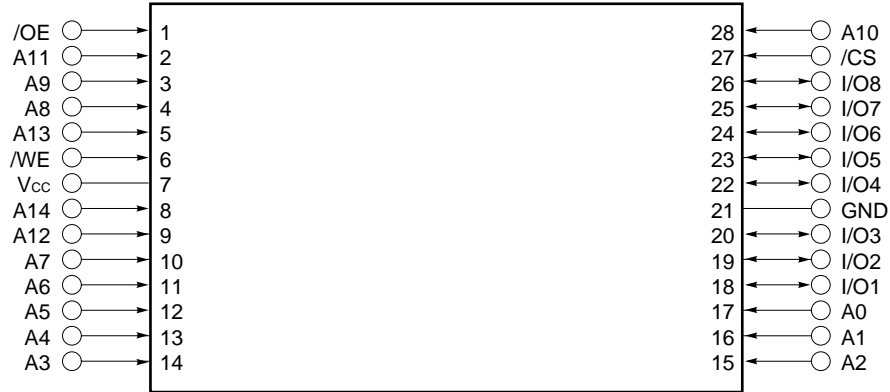
/xxx indicates active low signal.

## 28-PIN PLASTIC TSOP(I) (8x13.4) (Normal bent)

[μPD43256BGW-xxX-9JL]

[μPD43256BGW-AxxX-9JL]

[μPD43256BGW-BxxX-9JL]



## 28-PIN PLASTIC TSOP(I) (8x13.4) (Reverse bent)

[μPD43256BGW-xxX-9KL]

[μPD43256BGW-AxxX-9KL]

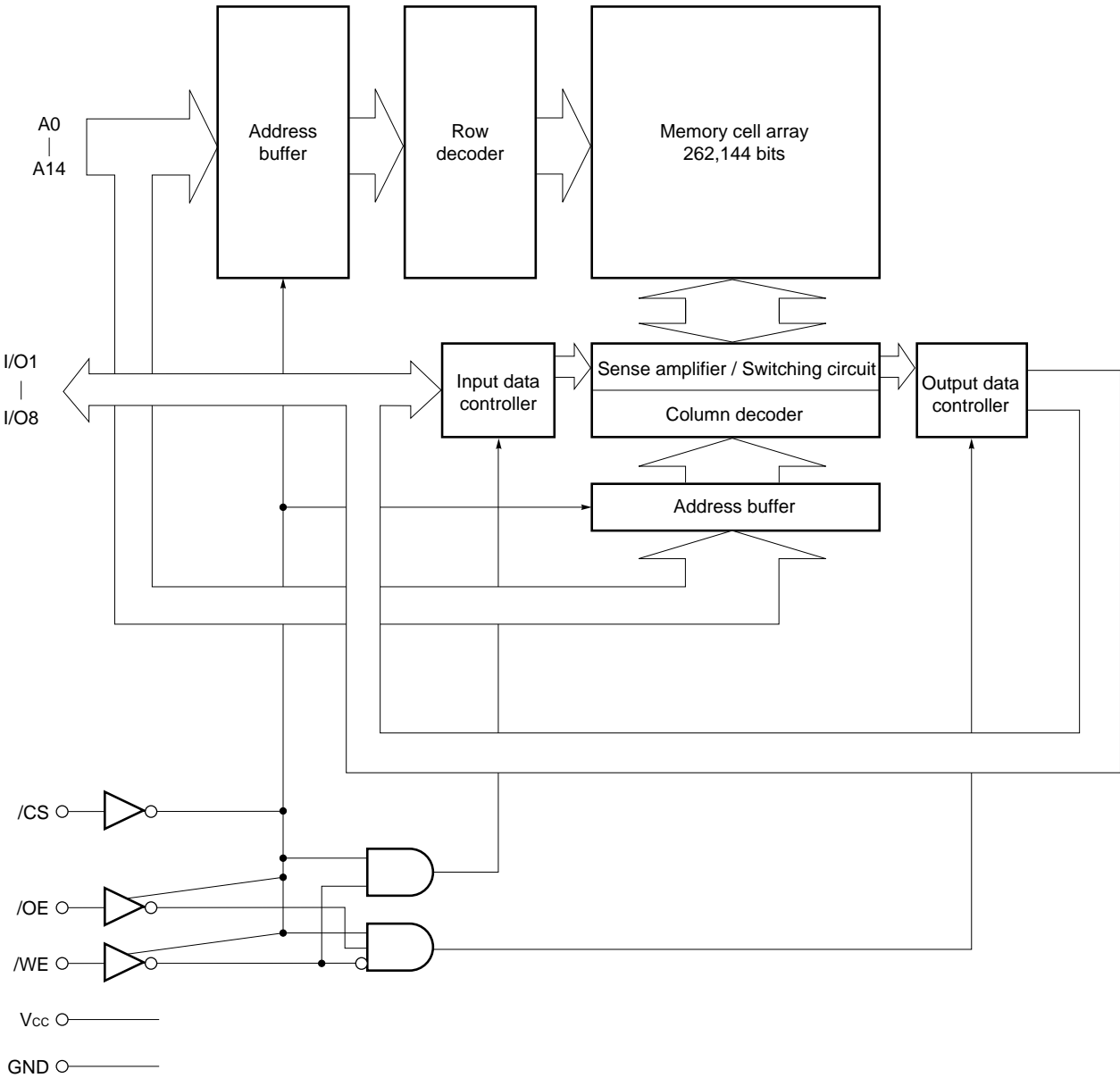
[μPD43256BGW-BxxX-9KL]



- A0 - A14 : Address inputs
- I/O1 - I/O8 : Data inputs / outputs
- /CS : Chip Select
- /WE : Write Enable
- /OE : Output Enable
- V<sub>cc</sub> : Power supply
- GND : Ground

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

Block Diagram



Truth Table

| /CS | /OE | /WE | Mode           | I/O              | Supply current   |
|-----|-----|-----|----------------|------------------|------------------|
| H   | ×   | ×   | Not selected   | High impedance   | I <sub>SB</sub>  |
| L   | H   | H   | Output disable |                  | I <sub>CCA</sub> |
| L   | ×   | L   | Write          | D <sub>IN</sub>  |                  |
| L   | L   | H   | Read           | D <sub>OUT</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>   |           | −25 to +85                                    | °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 | μPD43256B-xxX        |                      | μPD43256B-AxxX       |                      | μPD43256B-BxxX       |                      | Unit |
|-------------------------------|-----------------|-----------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|------|
|                               |                 |           | MIN.                 | MAX.                 | MIN.                 | MAX.                 | MIN.                 | MAX.                 |      |
| Supply voltage                | V <sub>CC</sub> |           | 4.5                  | 5.5                  | 3.0                  | 5.5                  | 2.7                  | 5.5                  | V    |
| High level input voltage      | V <sub>IH</sub> |           | 2.4                  | V <sub>CC</sub> +0.5 | 2.4                  | V <sub>CC</sub> +0.5 | 2.4                  | V <sub>CC</sub> +0.5 | V    |
| Low level input voltage       | V <sub>IL</sub> |           | −0.3 <sup>Note</sup> | +0.6                 | −0.3 <sup>Note</sup> | +0.4                 | −0.3 <sup>Note</sup> | +0.4                 | V    |
| Operating ambient temperature | T <sub>A</sub>  |           | −25                  | +85                  | −25                  | +85                  | −25                  | +85                  | °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) (1/2)

| Parameter                  | Symbol            | Test condition   | μPD43256B-xxX        |      |      | Unit |
|----------------------------|-------------------|--|----------------------|------|------|------|
|                            |                   |  | 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 | μA   |
| I/O leakage current        | I <sub>LO</sub>   | V <sub>I/O</sub> = 0 V to V <sub>CC</sub> , /OE = V <sub>IH</sub> or<br>/CS = V <sub>IH</sub> or /WE = V <sub>IL</sub>     | -1.0                 |      | +1.0 | μA   |
| ★ Operating supply current | I <sub>CCA1</sub> | /CS = V <sub>IL</sub> , Minimum cycle time, I <sub>I/O</sub> = 0 mA  |                      |      | 45   | mA   |
|                            | I <sub>CCA2</sub> | /CS = V <sub>IL</sub> , I <sub>I/O</sub> = 0 mA  |                      |      | 15   |      |
|                            | I <sub>CCA3</sub> | /CS ≤ 0.2 V, Cycle = 1 MHz,<br>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 |                      |      | 15   |      |
| Standby supply current     | I <sub>SB</sub>   | /CS = V <sub>IH</sub>  |                      |      | 3    | mA   |
|                            | I <sub>SB1</sub>  | /CS ≥ V <sub>CC</sub> - 0.2 V  |                      | 1.0  | 50   |      |
| High level output voltage  | V <sub>OH1</sub>  | I <sub>OH</sub> = -1.0 mA  | 2.4                  |      |      | V    |
|                            | V <sub>OH2</sub>  | I <sub>OH</sub> = -0.1 mA  | V <sub>CC</sub> -0.5 |      |      |      |
| Low level output voltage   | V <sub>OL</sub>   | I <sub>OL</sub> = 2.1 mA   |                      |      | 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.

DC Characteristics (Recommended Operating Conditions Unless Otherwise Noted) (2/2)

| Parameter                 | Symbol            | Test condition   |                         | μPD43256B-AxxX        |      |      | μPD43256B-BxxX        |      |      | 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> , /OE = V <sub>IH</sub> or<br>/CS = V <sub>IH</sub> or /WE = V <sub>IL</sub>     |                         | -1.0                  |      | +1.0 | -1.0                  |      | +1.0 | μA   |
| Operating supply current  | I <sub>CCA1</sub> | /CS = V <sub>IL</sub> ,<br>Minimum cycle time,<br>I <sub>I/O</sub> = 0 mA  | μPD43256B-A85X          |                       |      | 45   |                       |      | —    | mA   |
|                           |                   |  | μPD43256B-A10X          |                       |      | 40   |                       |      | —    |      |
|                           |                   |  | μPD43256B-A12X          |                       |      | 40   |                       |      | —    |      |
|                           |                   |  | μPD43256B-B10X          |                       |      | —    |                       |      | 40   |      |
|                           |                   |  | μPD43256B-B12X          |                       |      | —    |                       |      | 40   |      |
|                           |                   |  | μPD43256B-B15X          |                       |      | —    |                       |      | 40   |      |
|                           |                   |  | V <sub>CC</sub> ≤ 3.3 V |                       |      | —    |                       |      | 25   |      |
|                           | I <sub>CCA2</sub> | /CS = V <sub>IL</sub> , I <sub>I/O</sub> = 0 mA  |                         |                       |      | 15   |                       |      | 15   |      |
|                           |                   |  | V <sub>CC</sub> ≤ 3.3 V |                       |      | —    |                       |      | 10   |      |
|                           | I <sub>CCA3</sub> | /CS ≤ 0.2 V, Cycle = 1 MHz, I <sub>I/O</sub> = 0 mA,<br>V <sub>IL</sub> ≤ 0.2 V, V <sub>IH</sub> ≥ V <sub>CC</sub> - 0.2 V | V <sub>CC</sub> ≤ 3.3 V |                       |      | 15   |                       |      | 15   |      |
|                           |                   |  | V <sub>CC</sub> ≤ 3.3 V |                       |      | —    |                       |      | 10   |      |
| Standby supply current    | I <sub>SB</sub>   | /CS = V <sub>IH</sub>  |                         |                       |      | 3    |                       |      | 3    | mA   |
|                           |                   |  | V <sub>CC</sub> ≤ 3.3 V |                       |      | —    |                       |      | 2    |      |
|                           | I <sub>SB1</sub>  | /CS ≥ V <sub>CC</sub> - 0.2 V  |                         | 1.0                   | 50   |      | 1.0                   | 50   |      | μA   |
|                           |                   |  | V <sub>CC</sub> ≤ 3.3 V |                       |      | —    |                       |      | 25   |      |
| High level output voltage | V <sub>OH1</sub>  | I <sub>OH</sub> = -1.0 mA, V <sub>CC</sub> ≥ 4.5 V   |                         | 2.4                   |      |      | 2.4                   |      |      | V    |
|                           |                   | I <sub>OH</sub> = -0.5 mA, V <sub>CC</sub> < 4.5 V   |                         | 2.4                   |      |      | 2.4                   |      |      |      |
|                           | V <sub>OH2</sub>  | I <sub>OH</sub> = -0.02 mA   |                         | V <sub>CC</sub> - 0.1 |      |      | V <sub>CC</sub> - 0.1 |      |      |      |
| Low level output voltage  | V <sub>OL</sub>   | I <sub>OL</sub> = 2.1 mA, V <sub>CC</sub> ≥ 4.5 V  |                         |                       |      | 0.4  |                       |      | 0.4  | V    |
|                           |                   | I <sub>OL</sub> = 1.0 mA, V <sub>CC</sub> < 4.5 V  |                         |                       |      | 0.4  |                       |      | 0.4  |      |
|                           | V <sub>OL1</sub>  | I <sub>OL</sub> = 0.02 mA  |                         |                       |      | 0.1  |                       |      | 0.1  |      |

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

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

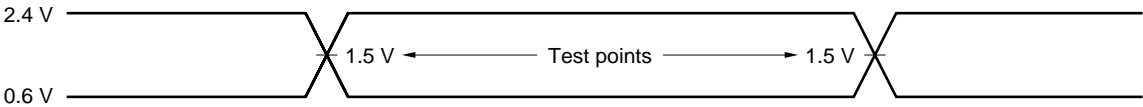
2. These DC characteristics are in common regardless of package types.

AC Characteristics (Recommended Operating Conditions Unless Otherwise Noted)

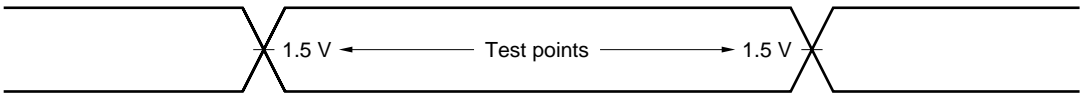
AC Test Conditions

[μPD43256B-70X, μPD43256B-85X]

Input Waveform (Rise and Fall Time ≤ 5 ns)



Output Waveform



Output Load

AC characteristics should be measured with the following output load conditions.

Figure 1

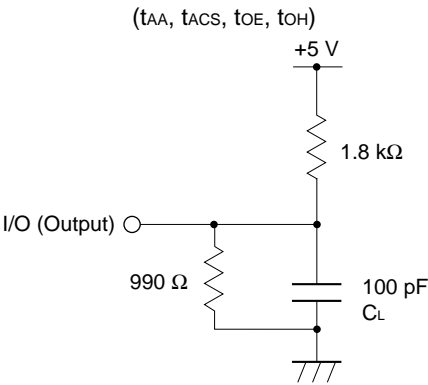
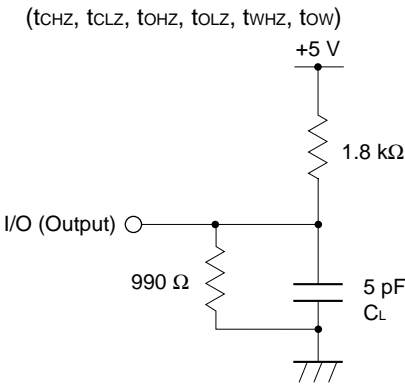


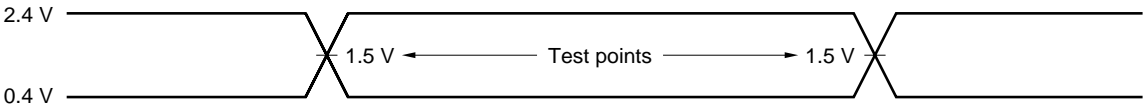
Figure 2



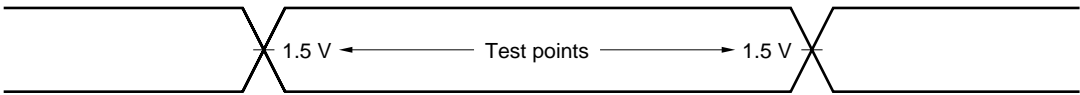
**Remark** CL includes capacitance of the probe and jig, and stray capacitance.

[μPD43256B-A85X, μPD43256B-A10X, μPD43256B-A12X, μPD43256B-B10X, μPD43256B-B12X, μPD43256B-B15X]

Input Waveform (Rise and Fall Time ≤ 5 ns)



Output Waveform



★

Output Load

AC characteristics should be measured with the following output load conditions.

|  |  |
|--|--|
| t <sub>AA</sub> , t <sub>ACS</sub> , t <sub>OE</sub> , t <sub>OH</sub> | t <sub>CHZ</sub> , t <sub>CLZ</sub> , t <sub>OHZ</sub> , t <sub>OLZ</sub> , t <sub>WHZ</sub> , t <sub>OW</sub> |
| 1TTL + 50 pF   | 1TTL + 5 pF  |

Read Cycle (1/2)

| Parameter                       | Symbol           | V <sub>CC</sub> ≥ 4.5 V |      |               |      |                                  |      | Unit | Con-<br>dition |
|---------------------------------|------------------|-------------------------|------|---------------|------|----------------------------------|------|------|----------------|
|                                 |                  | μPD43256B-70X           |      | μPD43256B-85X |      | μPD43256B-AxxX<br>μPD43256B-BxxX |      |      |                |
|                                 |                  | MIN.                    | MAX. | MIN.          | MAX. | MIN.                             | MAX. |      |                |
| Read cycle time                 | t <sub>RC</sub>  | 70                      |      | 85            |      | 100                              |      | ns   | Note           |
| Address access time             | t <sub>AA</sub>  |                         | 70   |               | 85   |                                  | 100  | ns   |                |
| /CS access time                 | t <sub>ACS</sub> |                         | 70   |               | 85   |                                  | 100  | ns   |                |
| /OE access time                 | t <sub>OE</sub>  |                         | 35   |               | 40   |                                  | 50   | ns   |                |
| Output hold from address change | t <sub>OH</sub>  | 10                      |      | 10            |      | 10                               |      | ns   |                |
| /CS to output in low impedance  | t <sub>CLZ</sub> | 10                      |      | 10            |      | 10                               |      | ns   |                |
| /OE to output in low impedance  | t <sub>OLZ</sub> | 5                       |      | 5             |      | 5                                |      | ns   |                |
| /CS to output in high impedance | t <sub>CHZ</sub> |                         | 30   |               | 30   |                                  | 35   | ns   |                |
| /OE to output in high impedance | t <sub>OHZ</sub> |                         | 30   |               | 30   |                                  | 35   | ns   |                |

**Note** See the **output load**.

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

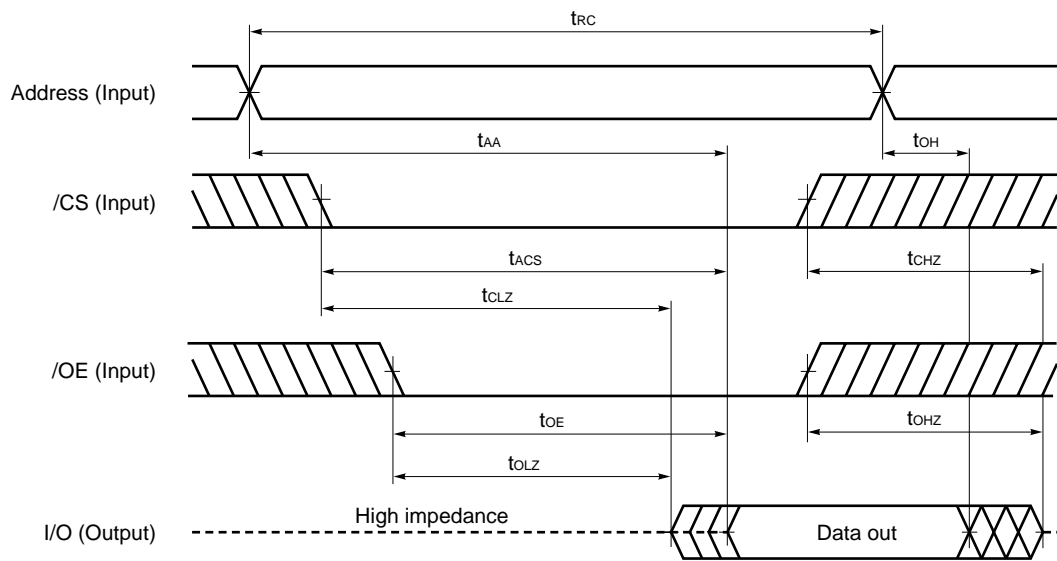
Read Cycle (2/2)

| Parameter                       | Symbol           | V <sub>CC</sub> ≥ 3.0 V |      |                |      |                |      | V <sub>CC</sub> ≥ 2.7 V |      |                |      |                |      | Unit | Con-<br>dition |
|---------------------------------|------------------|-------------------------|------|----------------|------|----------------|------|-------------------------|------|----------------|------|----------------|------|------|----------------|
|                                 |                  | μPD43256B-A85X          |      | μPD43256B-A10X |      | μPD43256B-A12X |      | μPD43256B-B10X          |      | μPD43256B-B12X |      | μPD43256B-B15X |      |      |                |
|                                 |                  | MIN.                    | MAX. | MIN.           | MAX. | MIN.           | MAX. | MIN.                    | MAX. | MIN.           | MAX. | MIN.           | MAX. |      |                |
| Read cycle time                 | t <sub>RC</sub>  | 85                      |      | 100            |      | 120            |      | 100                     |      | 120            |      | 150            |      | ns   | Note           |
| Address access time             | t <sub>AA</sub>  |                         | 85   |                | 100  |                | 120  |                         | 100  |                | 120  |                | 150  | ns   |                |
| /CS access time                 | t <sub>ACS</sub> |                         | 85   |                | 100  |                | 120  |                         | 100  |                | 120  |                | 150  | ns   |                |
| /OE access time                 | t <sub>OE</sub>  |                         | 50   |                | 60   |                | 60   |                         | 60   |                | 60   |                | 70   | ns   |                |
| Output hold from address change | t <sub>OH</sub>  | 10                      |      | 10             |      | 10             |      | 10                      |      | 10             |      | 10             |      | ns   |                |
| /CS to output in low impedance  | t <sub>CLZ</sub> | 10                      |      | 10             |      | 10             |      | 10                      |      | 10             |      | 10             |      | ns   |                |
| /OE to output in low impedance  | t <sub>OLZ</sub> | 5                       |      | 5              |      | 5              |      | 5                       |      | 5              |      | 5              |      | ns   |                |
| /CS to output in high impedance | t <sub>CHZ</sub> |                         | 35   |                | 35   |                | 40   |                         | 35   |                | 40   |                | 50   | ns   |                |
| /OE to output in high impedance | t <sub>OHZ</sub> |                         | 35   |                | 35   |                | 40   |                         | 35   |                | 40   |                | 50   | ns   |                |

**Note** See the **output load**.

**Remark** These AC characteristics are in common regardless of package types.

# Read Cycle Timing Chart



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

Write Cycle (1/2)

| Parameter                       | Symbol           | V <sub>CC</sub> ≥ 4.5 V |      |               |      |                                  |      | Unit | Con-<br>dition |
|---------------------------------|------------------|-------------------------|------|---------------|------|----------------------------------|------|------|----------------|
|                                 |                  | μPD43256B-70X           |      | μPD43256B-85X |      | μPD43256B-AxxX<br>μPD43256B-BxxX |      |      |                |
|                                 |                  | MIN.                    | MAX. | MIN.          | MAX. | MIN.                             | MAX. |      |                |
| Write cycle time                | t <sub>WC</sub>  | 70                      |      | 85            |      | 100                              |      | ns   |                |
| /CS to end of write             | t <sub>CW</sub>  | 60                      |      | 70            |      | 80                               |      | ns   |                |
| Address valid to end of write   | t <sub>AW</sub>  | 60                      |      | 70            |      | 80                               |      | ns   |                |
| Write pulse width               | t <sub>WP</sub>  | 55                      |      | 60            |      | 70                               |      | ns   |                |
| Data valid to end of write      | t <sub>DW</sub>  | 30                      |      | 35            |      | 40                               |      | ns   |                |
| Data hold time                  | t <sub>DH</sub>  | 5                       |      | 5             |      | 5                                |      | ns   |                |
| Address setup time              | t <sub>AS</sub>  | 0                       |      | 0             |      | 0                                |      | ns   |                |
| Write recovery time             | t <sub>WR</sub>  | 0                       |      | 0             |      | 0                                |      | ns   |                |
| /WE to output in high impedance | t <sub>WHZ</sub> |                         | 30   |               | 30   |                                  | 35   | ns   | Note           |
| Output active from end of write | t <sub>OW</sub>  | 5                       |      | 5             |      | 5                                |      | ns   |                |

**Note** See the **output load**.

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

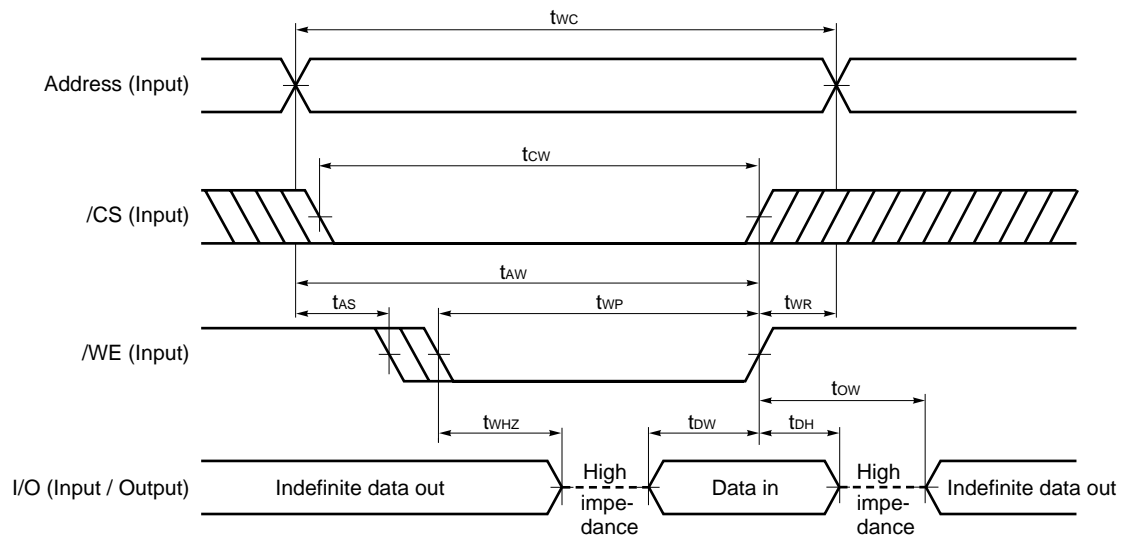
Write Cycle (2/2)

| Parameter                       | Symbol           | V <sub>CC</sub> ≥ 3.0 V |      |                |      |                |      | V <sub>CC</sub> ≥ 2.7 V |      |                |      |                |      | Unit | Con-<br>dition |
|---------------------------------|------------------|-------------------------|------|----------------|------|----------------|------|-------------------------|------|----------------|------|----------------|------|------|----------------|
|                                 |                  | μPD43256B-A85X          |      | μPD43256B-A10X |      | μPD43256B-A12X |      | μPD43256B-B10X          |      | μPD43256B-B12X |      | μPD43256B-B15X |      |      |                |
|                                 |                  | MIN.                    | MAX. | MIN.           | MAX. | MIN.           | MAX. | MIN.                    | MAX. | MIN.           | MAX. | MIN.           | MAX. |      |                |
| Write cycle time                | t <sub>WC</sub>  | 85                      |      | 100            |      | 120            |      | 100                     |      | 120            |      | 150            |      | ns   |                |
| /CS to end of write             | t <sub>CW</sub>  | 70                      |      | 70             |      | 90             |      | 70                      |      | 90             |      | 100            |      | ns   |                |
| Address valid to end of write   | t <sub>AW</sub>  | 70                      |      | 70             |      | 90             |      | 70                      |      | 90             |      | 100            |      | ns   |                |
| Write pulse width               | t <sub>WP</sub>  | 60                      |      | 60             |      | 80             |      | 60                      |      | 80             |      | 90             |      | ns   |                |
| Data valid to end of write      | t <sub>DW</sub>  | 60                      |      | 60             |      | 70             |      | 60                      |      | 70             |      | 80             |      | ns   |                |
| Data hold time                  | t <sub>DH</sub>  | 5                       |      | 5              |      | 5              |      | 5                       |      | 5              |      | 5              |      | ns   |                |
| Address setup time              | t <sub>AS</sub>  | 0                       |      | 0              |      | 0              |      | 0                       |      | 0              |      | 0              |      | ns   |                |
| Write recovery time             | t <sub>WR</sub>  | 0                       |      | 0              |      | 0              |      | 0                       |      | 0              |      | 0              |      | ns   |                |
| /WE to output in high impedance | t <sub>WHZ</sub> |                         | 35   |                | 35   |                | 40   |                         | 35   |                | 40   |                | 40   | ns   | Note           |
| Output active from end of write | t <sub>OW</sub>  | 5                       |      | 5              |      | 5              |      | 5                       |      | 5              |      | 5              |      | ns   |                |

**Note** See the **output load**.

**Remark** These AC characteristics are in common regardless of package types.

Write Cycle Timing Chart 1 (/WE Controlled)



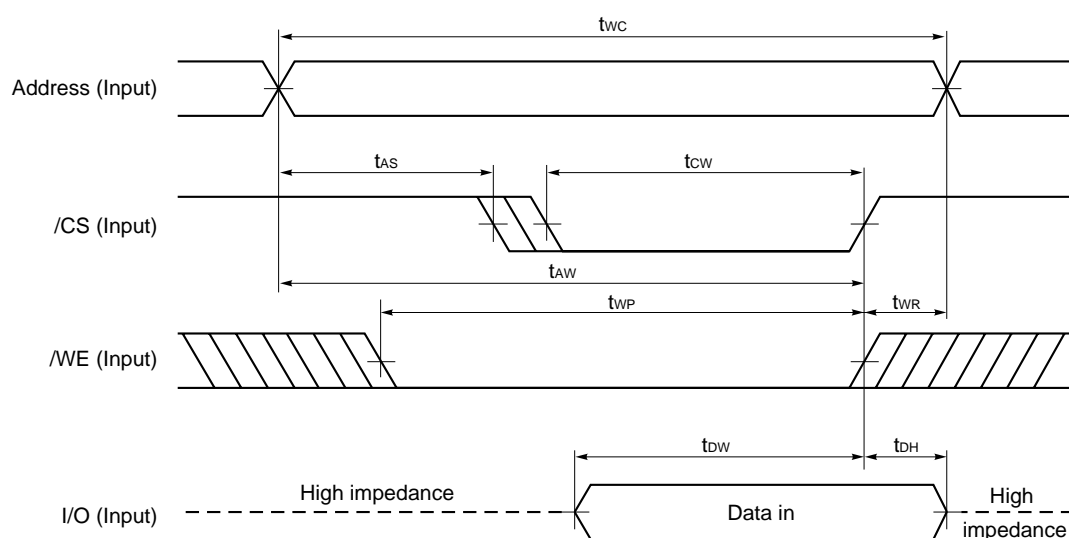
**Cautions** 1. /CS or /WE should be fixed to high level during address transition.

2. When I/O pins are in the output state, do not apply to the I/O pins signals that are opposite in phase with output signals.

**Remarks** 1. Write operation is done during the overlap time of a low level /CS and a low level /WE.

2. 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.
3. If /CS changes to low level at the same time or after the change of /WE to low level, the I/O pins will remain high impedance state.

**Write Cycle Timing Chart 2 (/CS Controlled)**



- Cautions**
1. /CS or /WE should be fixed to high level during address transition.
  2. When I/O pins are in the output state, do not apply to the I/O pins signals that are opposite in phase with output signals.

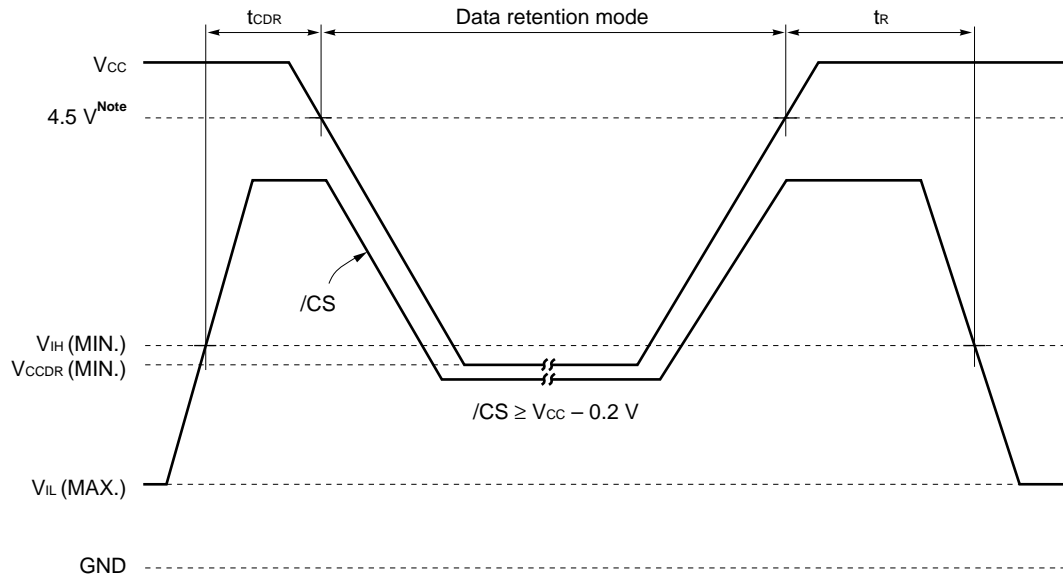
**Remark** Write operation is done during the overlap time of a low level /CS and a low level /WE.

**Low V<sub>CC</sub> Data Retention Characteristics (T<sub>A</sub> = –25 to +85 °C)**

| Parameter                               | Symbol            | Test Condition   | MIN. | TYP. | MAX.               | Unit |
|---|-------------------|--|------|------|--------------------|------|
| Data retention supply voltage           | V <sub>CCDR</sub> | /CS ≥ V <sub>CC</sub> – 0.2 V                          | 2.0  |      | 5.5                | V    |
| Data retention supply current           | I <sub>CCDR</sub> | V <sub>CC</sub> = 3.0 V, /CS ≥ V <sub>CC</sub> – 0.2 V |      | 0.5  | 20 <sup>Note</sup> | μA   |
| Chip deselection to data retention mode | t <sub>CDR</sub>  |  | 0    |      |                    | ns   |
| Operation recovery time                 | t <sub>r</sub>    |  | 5    |      |                    | ms   |

**Note** 2 μA (T<sub>A</sub> ≤ 40 °C), 7 μA (T<sub>A</sub> ≤ 70 °C)

**Data Retention Timing Chart**

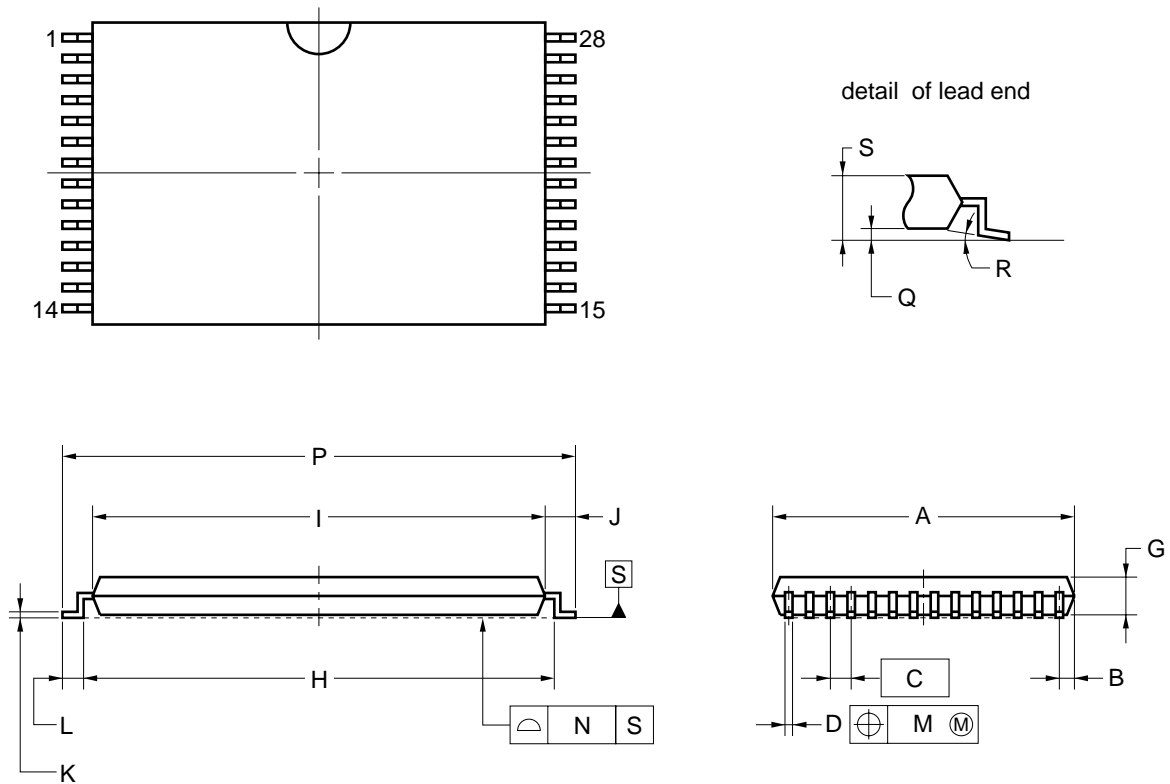


**Note** A version : 3.0 V, B version : 2.7 V

**Remark** The other pins (Address, /OE, /WE, I/O) can be in high impedance state.

★ Package Drawings

28-PIN PLASTIC TSOP(I) (8x13.4)



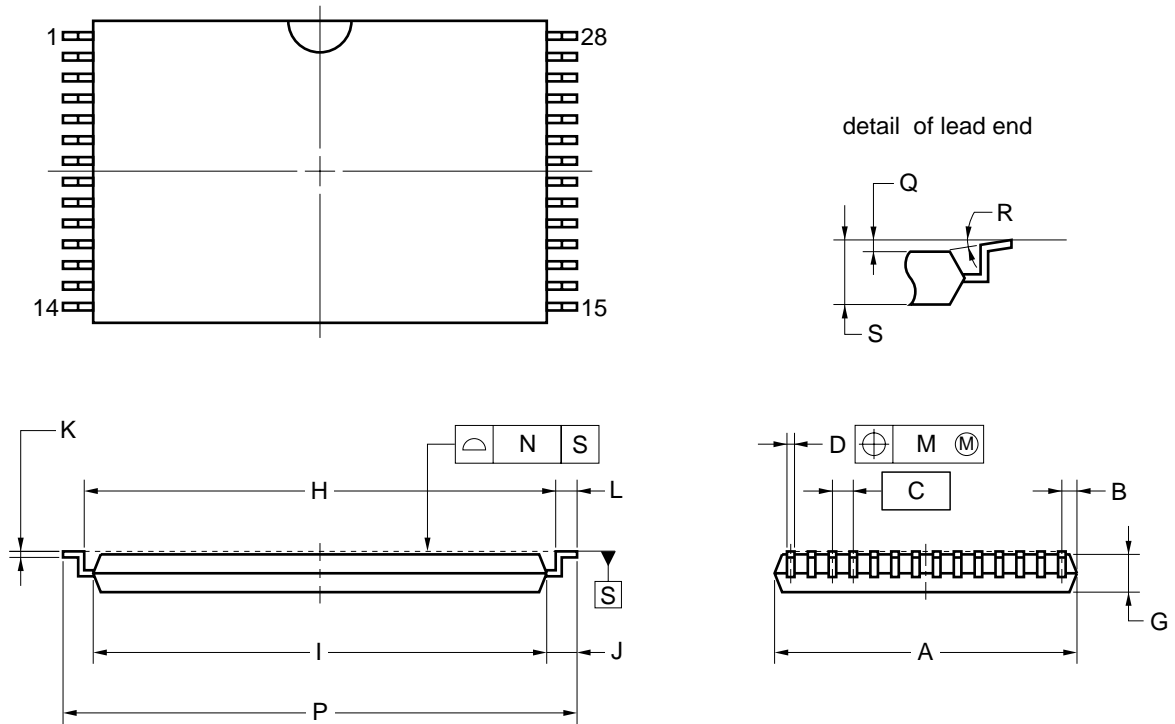
NOTES

1. Each lead centerline is located within 0.08 mm of its true position (T.P.) at maximum material condition.
2. "A" excludes mold flash. (Includes mold flash : 8.4mm MAX.)

| ITEM | MILLIMETERS                               |
|------|---|
| A    | 8.0±0.1                                   |
| B    | 0.6 MAX.                                  |
| C    | 0.55 (T.P.)                               |
| D    | 0.22 <sup>+0.08</sup> <sub>-0.07</sub>    |
| G    | 1.0                                       |
| H    | 12.4±0.2                                  |
| I    | 11.8±0.1                                  |
| J    | 0.8±0.2                                   |
| K    | 0.145 <sup>+0.025</sup> <sub>-0.015</sub> |
| L    | 0.5±0.1                                   |
| M    | 0.08                                      |
| N    | 0.10                                      |
| P    | 13.4±0.2                                  |
| Q    | 0.1±0.05                                  |
| R    | 3° <sup>+7°</sup> <sub>-3°</sub>          |
| S    | 1.2 MAX.                                  |

P28GW-55-9JL-2

## 28-PIN PLASTIC TSOP(I) (8x13.4)



### NOTE

- Each lead centerline is located within 0.08 mm of its true position (T.P.) at maximum material condition.
- "A" excludes mold flash. (Includes mold flash : 8.4mm MAX.)

| ITEM           | MILLIMETERS                               |
|----------------|---|
| A              | 8.0±0.1                                   |
| B              | 0.6 MAX.                                  |
| C              | 0.55 (T.P.)                               |
| D              | 0.22 <sup>+0.08</sup> <sub>-0.07</sub>    |
| G              | 1.0                                       |
| H              | 12.4±0.2                                  |
| I              | 11.8±0.1                                  |
| J              | 0.8±0.2                                   |
| K              | 0.145 <sup>+0.025</sup> <sub>-0.015</sub> |
| L              | 0.5±0.1                                   |
| M              | 0.08                                      |
| N              | 0.10                                      |
| P              | 13.4±0.2                                  |
| Q              | 0.1±0.05                                  |
| R              | 3° <sup>+7°</sup> <sub>-3°</sub>          |
| S              | 1.2 MAX.                                  |
| P28GW-55-9KL-2 |   |

**Recommended Soldering Conditions**

Please consult with our sales offices for soldering conditions of the  $\mu$ PD43256B-X.

**Types of Surface Mount Device**

$\mu$ PD43256BGW-xxX-9JL: 28-PIN PLASTIC TSOP(I) (8x13.4) (Normal bent)

$\mu$ PD43256BGW-xxX-9KL: 28-PIN PLASTIC TSOP(I) (8x13.4) (Reverse bent)

$\mu$ PD43256BGW-AxxX-9JL: 28-PIN PLASTIC TSOP(I) (8x13.4) (Normal bent)

$\mu$ PD43256BGW-AxxX-9KL: 28-PIN PLASTIC TSOP(I) (8x13.4) (Reverse bent)

$\mu$ PD43256BGW-BxxX-9JL: 28-PIN PLASTIC TSOP(I) (8x13.4) (Normal bent)

$\mu$ PD43256BGW-BxxX-9KL: 28-PIN PLASTIC TSOP(I) (8x13.4) (Reverse bent)

[MEMO]

## 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.

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