

# MOS INTEGRATED CIRCUIT

## $\mu$ PD42S16800, 42S17800

16 M BIT DYNAMIC RAM  
(FAST PAGE MODE)

## PRELIMINARY

### DESCRIPTION

The NEC  $\mu$ PD42S16800 and  $\mu$ PD42S17800 are 2 097 152 words by 8 bits dynamic CMOS RAM with optional fast page mode. CMOS sense amplifier, peripheral circuits and 1 transistor memory cell technique realize high speed access, cycle time and low power dissipation.

Refresh is accomplished by performing RAS only refresh cycles, hidden refresh cycles,  $\overline{\text{CAS}}$  before RAS refresh cycles,  $\overline{\text{CAS}}$  before RAS self refresh cycles or normal read or write cycles on the 4096 address combinations of A0 to A11 (for  $\mu$ PD42S16800) or 2048 address combinations of A0 to A10 (for  $\mu$ PD42S17800) during a 256 ms period.

The  $\mu$ PD42S16800 and  $\mu$ PD42S17800 are packaged in 28-pin plastic SOJ and 28-pin plastic ZIP and 28-pin plastic TSOP.

### FEATURES

- 2 097 152 words by 8 bits organization
- 4 performance ranges

| DEVICE              | ACCESS TIME<br>(MAX.) | R/W CYCLE<br>(MIN.) | PAGE MODE CYCLE<br>(MIN.) | Low power dissipation |                               |
|---------------------|-----------------------|---------------------|---------------------------|-----------------------|-------------------------------|
|                     |                       |                     |                           | Active (MAX.)         | Standby                       |
| $\mu$ PD42S16800-50 | 50 ns                 | 90 ns               | 35 ns                     | 550 mW                | 2.2 mW (MAX.)<br>(CMOS level) |
| $\mu$ PD42S17800-50 |                       |                     |                           | 660 mW                |                               |
| $\mu$ PD42S16800-60 | 60 ns                 | 110 ns              | 40 ns                     | 495 mW                |                               |
| $\mu$ PD42S17800-60 |                       |                     |                           | 605 mW                |                               |
| $\mu$ PD42S16800-70 | 70 ns                 | 130 ns              | 45 ns                     | 440 mW                |                               |
| $\mu$ PD42S17800-70 |                       |                     |                           | 550 mW                |                               |
| $\mu$ PD42S16800-80 | 80 ns                 | 150 ns              | 50 ns                     | 385 mW                |                               |
| $\mu$ PD42S17800-80 |                       |                     |                           | 495 mW                |                               |

- Single +5V  $\pm$  10% power supply
- On-chip substrate bias generator
- Multiplexed address inputs

| DEVICE           | Row Address | Column Address | Refresh cycle      |
|------------------|-------------|----------------|--------------------|
| $\mu$ PD42S16800 | A0 to A11   | A0 to A8       | 4096 cycles/256 ms |
| $\mu$ PD42S17800 | A0 to A10   | A0 to A9       | 2048 cycles/256 ms |

- Non latched I/O, TTL-compatible
- Read-modify-write, Fast Page Mode capability
- $\overline{\text{RAS}}$  only refresh, hidden refresh and  $\overline{\text{CAS}}$  before  $\overline{\text{RAS}}$  internal address refresh
- $\overline{\text{CAS}}$  before  $\overline{\text{RAS}}$  self refresh

# μPD42S16800,42S17800

## ORDERING INFORMATION

| PART NUMBER           | ACCESS TIME (MAX.) | PACKAGE                                   | QUALITY GRADE |
|-----------------------|--------------------|-------------------------------------------|---------------|
| μ PD42S16800LE-50     | 50ns               | 28-pin Plastic SOJ                        | STANDARD      |
| μ PD42S17800LE-50     |                    |                                           |               |
| μ PD42S16800LE-60     | 60ns               |                                           |               |
| μ PD42S17800LE-60     |                    |                                           |               |
| μ PD42S16800LE-70     | 70ns               |                                           |               |
| μ PD42S17800LE-70     |                    |                                           |               |
| μ PD42S16800LE-80     | 80ns               |                                           |               |
| μ PD42S17800LE-80     |                    |                                           |               |
| μ PD42S16800V-50      | 50ns               | 28-pin Plastic ZIP<br>(under development) |               |
| μ PD42S17800V-50      |                    |                                           |               |
| μ PD42S16800V-60      | 60ns               |                                           |               |
| μ PD42S17800V-60      |                    |                                           |               |
| μ PD42S16800V-70      | 70ns               |                                           |               |
| μ PD42S17800V-70      |                    |                                           |               |
| μ PD42S16800V-80      | 80ns               |                                           |               |
| μ PD42S17800V-80      |                    |                                           |               |
| μ PD42S16800G5-50-7JD | 50ns               | 28-pin Plastic TSOP                       |               |
| μ PD42S17800G5-50-7JD |                    |                                           |               |
| μ PD42S16800G5-60-7JD | 60ns               |                                           |               |
| μ PD42S17800G5-60-7JD |                    |                                           |               |
| μ PD42S16800G5-70-7JD | 70ns               |                                           |               |
| μ PD42S17800G5-70-7JD |                    |                                           |               |
| μ PD42S16800G5-80-7JD | 80ns               |                                           |               |
| μ PD42S17800G5-80-7JD |                    |                                           |               |
| μ PD42S16800G5-50-7KD | 50ns               | 28-pin Plastic TSOP (Reverse bent)        |               |
| μ PD42S17800G5-50-7KD |                    |                                           |               |
| μ PD42S16800G5-60-7KD | 60ns               |                                           |               |
| μ PD42S17800G5-60-7KD |                    |                                           |               |
| μ PD42S16800G5-70-7KD | 70ns               |                                           |               |
| μ PD42S17800G5-70-7KD |                    |                                           |               |
| μ PD42S16800G5-80-7KD | 80ns               |                                           |               |
| μ PD42S17800G5-80-7KD |                    |                                           |               |

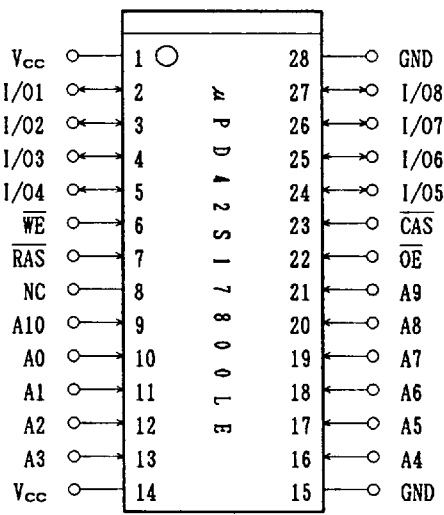
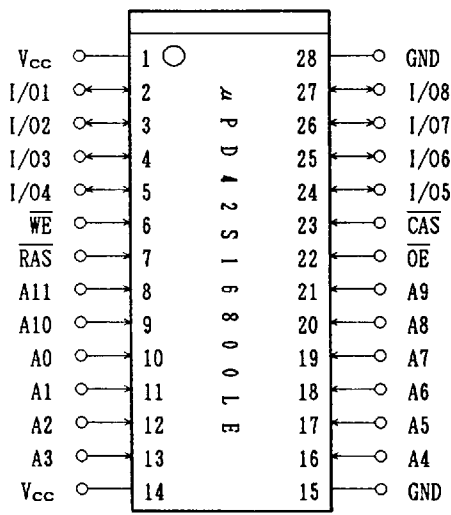
Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

μPD42S16800,42S17800

PIN CONFIGURATION (Marking Side)

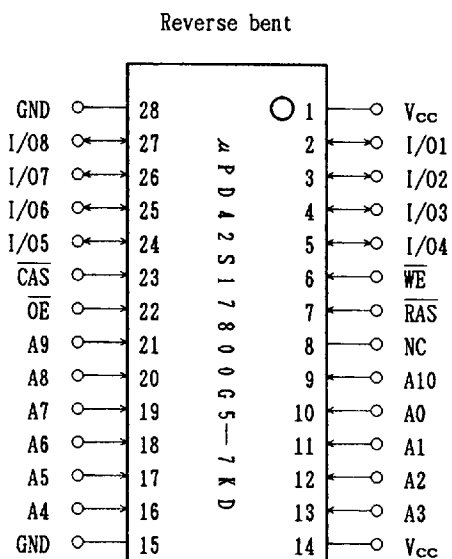
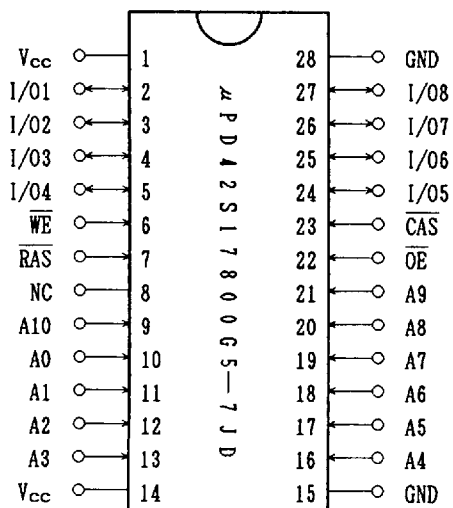
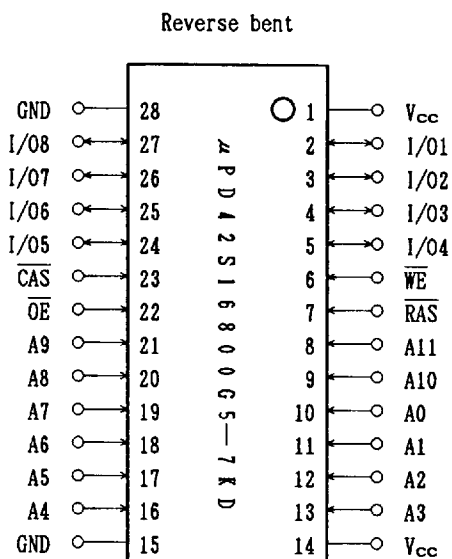
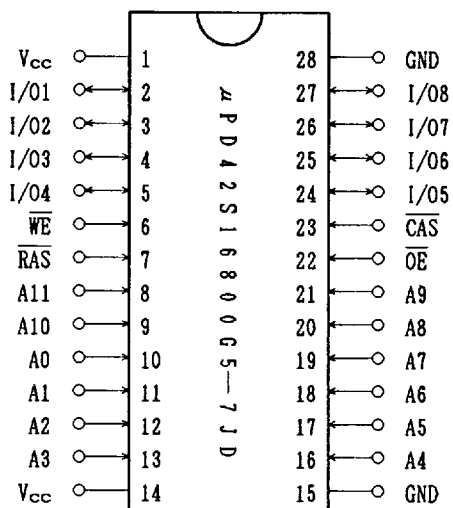
- A0 to A10(A11) : Address Inputs
- I/O1 to I/O8 : Data Inputs/Outputs
- RAS : Row Address Strobe
- CAS : Column Address Strobe
- WE : Write Enable
- OE : Output Enable
- Vcc : Supply Voltage
- GND : Ground
- NC : No Connection

28-pin Plastic SOJ (400 mil)



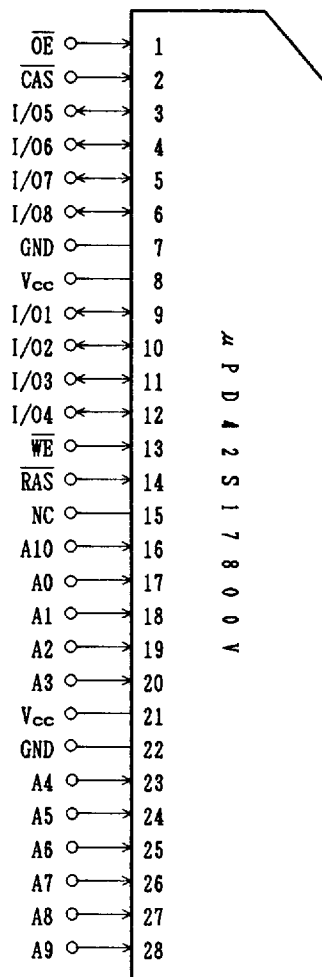
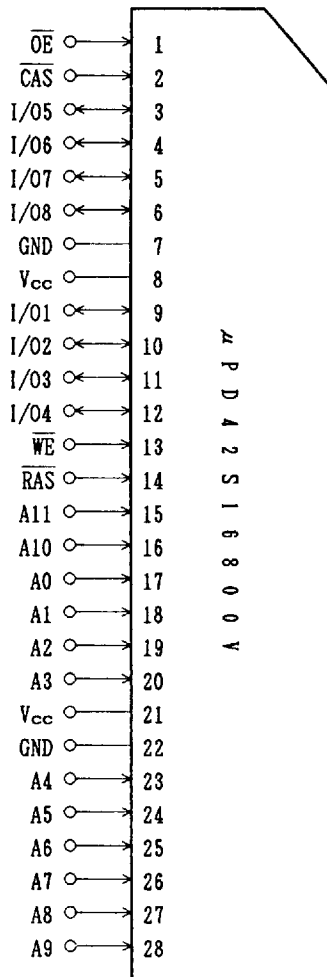
# μPD42S16800, 42S17800

28-pin Plastic TSOP (400 mil)



$\mu$ PD42S16800,42S17800

28-pin Plastic ZIP (475 mil)



# μPD42S16800,42S17800

## ELECTRICAL SPECIFICATIONS

### ABSOLUTE MAXIMUM RATINGS\*

| PARAMETER                          | SYMBOL    | TEST CONDITION | RATING       | UNIT |
|------------------------------------|-----------|----------------|--------------|------|
| Voltage on Any Pin Relative to GND | $V_T$     |                | -1.0 to +7.0 | V    |
| Short Circuit Output Current       | $I_O$     |                | 50           | mA   |
| Power Dissipation                  | $P_D$     |                | 1            | W    |
| Operating Temperature              | $T_{opt}$ |                | 0 to 70      | °C   |
| Storage Temperature                | $T_{stg}$ |                | -55 to +125  | °C   |

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

### RECOMMENDED OPERATING CONDITIONS NOTES:1,2

| PARAMETER                | SYMBOL   | TEST CONDITION | MIN. | TYP. | MAX.         | UNIT |
|--------------------------|----------|----------------|------|------|--------------|------|
| Supply Voltage           | $V_{CC}$ |                | 4.5  | 5.0  | 5.5          | V    |
| High Level Input Voltage | $V_{IH}$ |                | 2.4  |      | $V_{CC}+1.0$ | V    |
| Low Level Input Voltage  | $V_{IL}$ |                | -1.0 |      | 0.8          | V    |
| Ambient Temperature      | $T_a$    |                | 0    |      | 70           | °C   |

### CAPACITANCE ( $T_a=25^\circ\text{C}$ , $f=1\text{ MHz}$ )

| PARAMETER                     | SYMBOL   | TEST CONDITION                                                                                      | MIN. | TYP. | MAX. | UNIT |
|-------------------------------|----------|-----------------------------------------------------------------------------------------------------|------|------|------|------|
| Input Capacitance             | $C_{11}$ | A0 to A10 (A11)                                                                                     |      |      | 5    | pF   |
|                               | $C_{12}$ | $\overline{\text{RAS}}$ , $\overline{\text{CAS}}$ , $\overline{\text{WE}}$ , $\overline{\text{OE}}$ |      |      | 7    | pF   |
| Data Input/Output Capacitance | $C_D$    | I/O1 to I/O8                                                                                        |      |      | 7    | pF   |

## DC CHARACTERISTICS (Recommended Operating Conditions unless Otherwise noted)

【 $\mu$ PD42S16800】

| PARAMETER                                                                                     | SYMBOL     | TEST CONDITION                                                                                                                                                                                                                                                                                                      | MIN.                  | TYP. | MAX. | UNIT    | NOTES |
|-----------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------|---------|-------|
| Operating Current                                                                             | $I_{CC1}$  | $\overline{RAS}, \overline{CAS}$ Cycling<br>$t_{RC}=t_{RC(MIN.)}$ , $I_O=0mA$                                                                                                                                                                                                                                       | $\mu$ PD42S16800-50   |      | 100  | mA      | 3     |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-60   |      | 90   |         |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-70   |      | 80   |         |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-80   |      | 70   |         |       |
| Standby Current                                                                               | $I_{CC2}$  | $\overline{RAS}, \overline{CAS} \geq V_{IH(MIN.)}$ , $I_O=0mA$                                                                                                                                                                                                                                                      |                       |      | 2    | mA      |       |
|                                                                                               |            | $\overline{RAS}, \overline{CAS} \geq V_{CC}-0.2V$ , $I_O=0mA$                                                                                                                                                                                                                                                       |                       |      | 0.4  |         |       |
| Refresh Current<br>( $\overline{RAS}$ Only Refresh)                                           | $I_{CC3}$  | $\overline{RAS}$ Cycling,<br>$\overline{CAS} \geq V_{IH(MIN.)}$<br>$t_{RC}=t_{RC(MIN.)}$ , $I_O=0mA$                                                                                                                                                                                                                | $\mu$ PD42S16800-50   |      | 100  | mA      | 3     |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-60   |      | 90   |         |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-70   |      | 80   |         |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-80   |      | 70   |         |       |
| Operating Current<br>(Fast Page Mode)                                                         | $I_{CC4}$  | $\overline{CAS}$ Cycling,<br>$\overline{RAS} \leq V_{IL(MAX.)}$<br>$t_{PC}=t_{PC(MIN.)}$ , $I_O=0mA$                                                                                                                                                                                                                | $\mu$ PD42S16800-50   |      | 80   | mA      | 3     |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-60   |      | 70   |         |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-70   |      | 60   |         |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-80   |      | 50   |         |       |
| Refresh Current<br>( $\overline{CAS}$ before $\overline{RAS}$ Refresh)                        | $I_{CC5}$  | $\overline{RAS}$ Cycling,<br>$t_{RC}=t_{RC(MIN.)}$ , $I_O=0mA$                                                                                                                                                                                                                                                      | $\mu$ PD42S16800-50   |      | 100  | mA      | 3     |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-60   |      | 90   |         |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-70   |      | 80   |         |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $\mu$ PD42S16800-80   |      | 70   |         |       |
| Battery back-up Current<br>(Standby with $\overline{CAS}$ before<br>$\overline{RAS}$ Refresh) | $I_{CC6}$  | Standby: $V_{CC}-0.2V \leq \overline{RAS}$ ,<br>$\overline{CAS}$ before $\overline{RAS}$ Refresh:<br>4096 Cycle/256 ms<br>$\overline{RAS}, \overline{CAS}: 0V \leq V_{IL} \leq 0.2V$<br>$V_{CC}-0.2V \leq V_{IH} \leq V_{IH MAX.}$<br>$\overline{WE}, \overline{OE}: V_{IH}$<br>Address: Don't care<br>Output: OPEN | $t_{RAS} \leq 300ns$  |      | 350  | $\mu A$ |       |
|                                                                                               |            |                                                                                                                                                                                                                                                                                                                     | $t_{RAS} \leq 1\mu s$ |      | 500  |         |       |
| Self Refresh Current<br>( $\overline{CAS}$ before $\overline{RAS}$ Self<br>Refresh)           | $I_{CC7}$  | $\overline{RAS}, \overline{CAS}: 0V \leq V_{IL} \leq 0.2V$<br>$V_{CC}-0.2V \leq V_{IH} \leq V_{IH MAX.}$ $I_O=0mA$                                                                                                                                                                                                  |                       |      | 200  | $\mu A$ |       |
| Input Leakage Current                                                                         | $I_{I(L)}$ | $V_I=0$ to 5.5V, all other pins= 0V                                                                                                                                                                                                                                                                                 | -10                   |      | 10   | $\mu A$ |       |
| Output Leakage Current                                                                        | $I_{O(L)}$ | $D_{OUT}$ is disabled, $V_O=0$ to 5.5V                                                                                                                                                                                                                                                                              | -10                   |      | 10   | $\mu A$ |       |
| Output High Voltage                                                                           | $V_{OH}$   | $I_O=-5mA$                                                                                                                                                                                                                                                                                                          | 2.4                   |      |      | V       |       |
| Output Low Voltage                                                                            | $V_{OL}$   | $I_O=4.2mA$                                                                                                                                                                                                                                                                                                         |                       |      | 0.4  | V       |       |

## μPD42S16800,42S17800

## 【μPD42S17800】

| PARAMETER                                                                                                | SYMBOL            | TEST CONDITION                                                                                                                                                                                                                                                                                                                                                                                                                           | MIN.                               | TYP. | MAX. | UNIT | NOTES |
|----------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------|------|------|-------|
| Operating Current                                                                                        | I <sub>CC1</sub>  | $\overline{\text{RAS}}, \overline{\text{CAS}}$ Cycling<br>$t_{\text{RC}} = t_{\text{RC(MIN.)}}, I_{\text{O}} = 0\text{mA}$                                                                                                                                                                                                                                                                                                               | μPD42S17800-50                     |      | 120  | mA   | 3     |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-60                     |      | 110  |      |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-70                     |      | 100  |      |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-80                     |      | 90   |      |       |
| Standby Current                                                                                          | I <sub>CC2</sub>  | $\overline{\text{RAS}}, \overline{\text{CAS}} \geq V_{\text{IH(MIN.)}}, I_{\text{O}} = 0\text{mA}$                                                                                                                                                                                                                                                                                                                                       |                                    |      | 2    | mA   |       |
|                                                                                                          |                   | $\overline{\text{RAS}}, \overline{\text{CAS}} \geq V_{\text{CC}} - 0.2\text{V}, I_{\text{O}} = 0\text{mA}$                                                                                                                                                                                                                                                                                                                               |                                    |      | 0.4  |      |       |
| Refresh Current<br>( $\overline{\text{RAS}}$ Only Refresh)                                               | I <sub>CC3</sub>  | $\overline{\text{RAS}}$ Cycling,<br>$\overline{\text{CAS}} \geq V_{\text{IH(MIN.)}}$<br>$t_{\text{RC}} = t_{\text{RC(MIN.)}}, I_{\text{O}} = 0\text{mA}$                                                                                                                                                                                                                                                                                 | μPD42S17800-50                     |      | 120  | mA   | 3     |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-60                     |      | 110  |      |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-70                     |      | 100  |      |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-80                     |      | 90   |      |       |
| Operating Current<br>(Fast Page Mode)                                                                    | I <sub>CC4</sub>  | $\overline{\text{CAS}}$ Cycling,<br>$\overline{\text{RAS}} \leq V_{\text{IL(MAX.)}}$<br>$t_{\text{PC}} = t_{\text{PC(MIN.)}}, I_{\text{O}} = 0\text{mA}$                                                                                                                                                                                                                                                                                 | μPD42S17800-50                     |      | 80   | mA   | 3     |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-60                     |      | 70   |      |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-70                     |      | 60   |      |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-80                     |      | 50   |      |       |
| Refresh Current<br>( $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ Refresh)                     | I <sub>CC5</sub>  | $\overline{\text{RAS}}$ Cycling,<br>$t_{\text{RC}} = t_{\text{RC(MIN.)}}, I_{\text{O}} = 0\text{mA}$                                                                                                                                                                                                                                                                                                                                     | μPD42S17800-50                     |      | 120  | mA   | 3     |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-60                     |      | 110  |      |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-70                     |      | 100  |      |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | μPD42S17800-80                     |      | 90   |      |       |
| Battery back-up Current<br>(Standby with $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ Refresh) | I <sub>CC6</sub>  | Standby: $V_{\text{CC}} - 0.2\text{V} \leq \overline{\text{RAS}}, \overline{\text{CAS}}$ before $\overline{\text{RAS}}$ Refresh:<br>2048 Cycle/256 ms<br>$\overline{\text{RAS}}, \overline{\text{CAS}}: 0\text{V} \leq V_{\text{IL}} \leq 0.2\text{V}$<br>$V_{\text{CC}} - 0.2\text{V} \leq V_{\text{IH}} \leq V_{\text{IH MAX.}}$<br>$\overline{\text{WE}}, \overline{\text{OE}}: V_{\text{IH}}$<br>Address: Don't care<br>Output: OPEN | $t_{\text{RAS}} \leq 300\text{ns}$ |      | 300  | μA   |       |
|                                                                                                          |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                          | $t_{\text{RAS}} \leq 1\mu\text{s}$ |      | 400  |      |       |
| Self Refresh Current<br>( $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ Self Refresh)           | I <sub>CC7</sub>  | $\overline{\text{RAS}}, \overline{\text{CAS}}: 0\text{V} \leq V_{\text{IL}} \leq 0.2\text{V}$<br>$V_{\text{CC}} - 0.2\text{V} \leq V_{\text{IH}} \leq V_{\text{IH MAX.}}, I_{\text{O}} = 0\text{mA}$                                                                                                                                                                                                                                     |                                    |      | 200  | μA   | 16    |
| Input Leakage Current                                                                                    | I <sub>I(L)</sub> | $V_{\text{I}} = 0$ to 5.5V, all other pins = 0V                                                                                                                                                                                                                                                                                                                                                                                          | -10                                |      | 10   | μA   |       |
| Output Leakage Current                                                                                   | I <sub>O(L)</sub> | $\text{DOUT}$ is disabled, $V_{\text{O}} = 0$ to 5.5V                                                                                                                                                                                                                                                                                                                                                                                    | -10                                |      | 10   | μA   |       |
| Output High Voltage                                                                                      | V <sub>OH</sub>   | $I_{\text{O}} = -5\text{mA}$                                                                                                                                                                                                                                                                                                                                                                                                             | 2.4                                |      |      | V    |       |
| Output Low Voltage                                                                                       | V <sub>OL</sub>   | $I_{\text{O}} = 4.2\text{mA}$                                                                                                                                                                                                                                                                                                                                                                                                            |                                    |      | 0.4  | V    |       |

## AC CHARACTERISTICS

(Recommended Operating Conditions unless Otherwise noted) NOTES:2,4,5

(1/2)

| PARAMETER                                                                | SYMBOL            | μPD42S16800-50<br>μPD42S17800-50 |        | μPD42S16800-60<br>μPD42S17800-60 |        | μPD42S16800-70<br>μPD42S17800-70 |        | μPD42S16800-80<br>μPD42S17800-80 |        | UNIT | NOTES |
|--------------------------------------------------------------------------|-------------------|----------------------------------|--------|----------------------------------|--------|----------------------------------|--------|----------------------------------|--------|------|-------|
|                                                                          |                   | MIN.                             | MAX.   | MIN.                             | MAX.   | MIN.                             | MAX.   | MIN.                             | MAX.   |      |       |
| Random Read or Write Cycle Time                                          | t <sub>RC</sub>   | 90                               |        | 110                              |        | 130                              |        | 150                              |        | ns   | 6     |
| Read Write Cycle Time                                                    | t <sub>RWC</sub>  | 140                              |        | 160                              |        | 180                              |        | 200                              |        | ns   | 6     |
| Fast Page Mode Cycle Time(Read or Write)                                 | t <sub>PC</sub>   | 35                               |        | 40                               |        | 45                               |        | 50                               |        | ns   | 6     |
| Read Modify Write Cycle Time(Fast Page Mode)                             | t <sub>PRWC</sub> | 80                               |        | 85                               |        | 90                               |        | 100                              |        | ns   | 6     |
| Access Time from $\overline{\text{RAS}}$                                 | t <sub>RAC</sub>  |                                  | 50     |                                  | 60     |                                  | 70     |                                  | 80     | ns   | 7, 8  |
| Access Time from $\overline{\text{CAS}}$ (Falling Edge)                  | t <sub>CAC</sub>  |                                  | 13     |                                  | 15     |                                  | 18     |                                  | 20     | ns   | 7, 8  |
| Access Time from Column Address                                          | t <sub>AA</sub>   |                                  | 25     |                                  | 30     |                                  | 35     |                                  | 40     | ns   | 7, 8  |
| Access Time from $\overline{\text{CAS}}$ Precharge                       | t <sub>ACP</sub>  |                                  | 30     |                                  | 35     |                                  | 40     |                                  | 45     | ns   | 7     |
| Access Time from $\overline{\text{OE}}$                                  | t <sub>OEA</sub>  |                                  | 13     |                                  | 15     |                                  | 18     |                                  | 20     | ns   |       |
| $\overline{\text{RAS}}$ to Column Address Delay Time                     | t <sub>RAD</sub>  | 13                               | 25     | 15                               | 30     | 15                               | 35     | 17                               | 40     | ns   | 8     |
| $\overline{\text{CAS}}$ -Data Set-up Time                                | t <sub>CLZ</sub>  | 0                                |        | 0                                |        | 0                                |        | 0                                |        | ns   | 7     |
| $\overline{\text{OE}}$ -Data Set-up Time                                 | t <sub>OLZ</sub>  | 0                                |        | 0                                |        | 0                                |        | 0                                |        | ns   | 7     |
| Output Buffer Turn-off Delay ( $\overline{\text{CAS}}$ )                 | t <sub>OFF</sub>  | 0                                | 10     | 0                                | 13     | 0                                | 15     | 0                                | 15     | ns   | 9     |
| $\overline{\text{OE}}$ Data Delay Time                                   | t <sub>OED</sub>  | 10                               |        | 13                               |        | 15                               |        | 15                               |        | ns   |       |
| Output Buffer Turn-off Delay ( $\overline{\text{OE}}$ )                  | t <sub>OEZ</sub>  | 0                                | 10     | 0                                | 13     | 0                                | 15     | 0                                | 15     | ns   | 9     |
| $\overline{\text{OE}}$ Command Hold Time                                 | t <sub>OBH</sub>  | 0                                |        | 0                                |        | 0                                |        | 0                                |        | ns   |       |
| $\overline{\text{OE}}$ to $\overline{\text{RAS}}$ inactive Set-up Time   | t <sub>OBS</sub>  | 0                                |        | 0                                |        | 0                                |        | 0                                |        | ns   |       |
| Transition Time (Rise and Fall)                                          | t <sub>T</sub>    | 3                                | 50     | 3                                | 50     | 3                                | 50     | 3                                | 50     | ns   |       |
| $\overline{\text{RAS}}$ Precharge Time                                   | t <sub>RP</sub>   | 30                               |        | 40                               |        | 50                               |        | 60                               |        | ns   |       |
| $\overline{\text{RAS}}$ Pulse Width (Random Read,Write Cycle)            | t <sub>RAS</sub>  | 50                               | 10000  | 60                               | 10000  | 70                               | 10000  | 80                               | 10000  | ns   |       |
| $\overline{\text{RAS}}$ Pulse Width (Fast Page Mode)                     | t <sub>RASP</sub> | 50                               | 125000 | 60                               | 125000 | 70                               | 125000 | 80                               | 125000 | ns   |       |
| $\overline{\text{RAS}}$ Hold Time                                        | t <sub>RSH</sub>  | 13                               |        | 15                               |        | 18                               |        | 20                               |        | ns   |       |
| $\overline{\text{CAS}}$ Pulse Width                                      | t <sub>CAS</sub>  | 13                               | 10000  | 15                               | 10000  | 18                               | 10000  | 20                               | 10000  | ns   |       |
| $\overline{\text{CAS}}$ Hold Time                                        | t <sub>CSH</sub>  | 50                               |        | 60                               |        | 70                               |        | 80                               |        | ns   |       |
| $\overline{\text{RAS}}$ to $\overline{\text{CAS}}$ Delay Time            | t <sub>RCD</sub>  | 18                               | 32     | 20                               | 45     | 20                               | 50     | 25                               | 60     | ns   | 8     |
| $\overline{\text{CAS}}$ to $\overline{\text{RAS}}$ Precharge Time        | t <sub>CRP</sub>  | 5                                |        | 5                                |        | 5                                |        | 5                                |        | ns   | 10    |
| $\overline{\text{CAS}}$ Precharge Time                                   | t <sub>CPN</sub>  | 8                                |        | 10                               |        | 10                               |        | 10                               |        | ns   |       |
| $\overline{\text{CAS}}$ Precharge Time (Fast Page Mode)                  | t <sub>CP</sub>   | 8                                |        | 10                               |        | 10                               |        | 10                               |        | ns   |       |
| $\overline{\text{RAS}}$ Precharge $\overline{\text{CAS}}$ Hold Time      | t <sub>RPC</sub>  | 5                                |        | 5                                |        | 5                                |        | 5                                |        | ns   |       |
| $\overline{\text{RAS}}$ Hold Time from $\overline{\text{CAS}}$ Precharge | t <sub>RHCP</sub> | 30                               |        | 35                               |        | 40                               |        | 45                               |        | ns   |       |
| Row Address Set-up Time                                                  | t <sub>ASR</sub>  | 0                                |        | 0                                |        | 0                                |        | 0                                |        | ns   |       |
| Row Address Hold Time                                                    | t <sub>RAH</sub>  | 8                                |        | 10                               |        | 10                               |        | 12                               |        | ns   |       |

# μPD42S16800,42S17800

(2/2)

| PARAMETER                                                      | SYMBOL            | μPD42S16800-50<br>μPD42S17800-50 |      | μPD42S16800-60<br>μPD42S17800-60 |      | μPD42S16800-70<br>μPD42S17800-70 |      | μPD42S16800-80<br>μPD42S17800-80 |      | UNIT | NOTES |
|----------------------------------------------------------------|-------------------|----------------------------------|------|----------------------------------|------|----------------------------------|------|----------------------------------|------|------|-------|
|                                                                |                   | MIN.                             | MAX. | MIN.                             | MAX. | MIN.                             | MAX. | MIN.                             | MAX. |      |       |
| Column Address Set-up Time                                     | t <sub>ASC</sub>  | 0                                |      | 0                                |      | 0                                |      | 0                                |      | ns   |       |
| Column Address Hold Time                                       | t <sub>CAH</sub>  | 13                               |      | 15                               |      | 15                               |      | 15                               |      | ns   |       |
| Column Address Lead Time Referenced to $\overline{\text{RAS}}$ | t <sub>RAL</sub>  | 25                               |      | 30                               |      | 35                               |      | 40                               |      | ns   |       |
| Read Command Set-up Time                                       | t <sub>RCS</sub>  | 0                                |      | 0                                |      | 0                                |      | 0                                |      | ns   |       |
| Read Command Hold Time Referenced to $\overline{\text{RAS}}$   | t <sub>RRH</sub>  | 0                                |      | 0                                |      | 0                                |      | 0                                |      | ns   | 11    |
| Read Command Hold Time Referenced to $\overline{\text{CAS}}$   | t <sub>RCH</sub>  | 0                                |      | 0                                |      | 0                                |      | 0                                |      | ns   | 11    |
| Write Command Hold Time Referenced to $\overline{\text{CAS}}$  | t <sub>WCH</sub>  | 8                                |      | 10                               |      | 10                               |      | 15                               |      | ns   | 12    |
| Write Command Pulse Width                                      | t <sub>WP</sub>   | 8                                |      | 10                               |      | 10                               |      | 15                               |      | ns   | 12    |
| Data-in Set-up Time                                            | t <sub>DS</sub>   | 0                                |      | 0                                |      | 0                                |      | 0                                |      | ns   | 13    |
| Data-in Hold Time                                              | t <sub>DH</sub>   | 10                               |      | 10                               |      | 15                               |      | 15                               |      | ns   | 13    |
| $\overline{\text{WE}}$ Command Set-up Time                     | t <sub>WCS</sub>  | 0                                |      | 0                                |      | 0                                |      | 0                                |      | ns   | 14    |
| $\overline{\text{CAS}}$ to $\overline{\text{WE}}$ Delay        | t <sub>CWD</sub>  | 33                               |      | 38                               |      | 43                               |      | 45                               |      | ns   | 15    |
| $\overline{\text{RAS}}$ to $\overline{\text{WE}}$ Delay        | t <sub>RWD</sub>  | 70                               |      | 83                               |      | 95                               |      | 105                              |      | ns   | 15    |
| Column Address to $\overline{\text{WE}}$ Delay Time            | t <sub>AWD</sub>  | 45                               |      | 53                               |      | 60                               |      | 65                               |      | ns   | 15    |
| Write Command to $\overline{\text{RAS}}$ Lead Time             | t <sub>RWL</sub>  | 18                               |      | 20                               |      | 20                               |      | 20                               |      | ns   |       |
| Write Command to $\overline{\text{CAS}}$ Lead Time             | t <sub>CWL</sub>  | 13                               |      | 15                               |      | 15                               |      | 15                               |      | ns   |       |
| $\overline{\text{CAS}}$ Set-up Time for CBR Refresh            | t <sub>CSR</sub>  | 5                                |      | 5                                |      | 5                                |      | 5                                |      | ns   |       |
| $\overline{\text{CAS}}$ Hold Time for CBR Refresh              | t <sub>CHR</sub>  | 10                               |      | 10                               |      | 10                               |      | 10                               |      | ns   |       |
| $\overline{\text{RAS}}$ Pulse Width (Self Refresh Cycle)       | t <sub>RASS</sub> | 100                              |      | 100                              |      | 100                              |      | 100                              |      | μs   |       |
| $\overline{\text{RAS}}$ Precharge Time (Self Refresh Cycle)    | t <sub>RPS</sub>  | 90                               |      | 110                              |      | 130                              |      | 150                              |      | ns   |       |
| $\overline{\text{CAS}}$ Hold Time (Self Refresh Cycle)         | t <sub>CHS</sub>  | -50                              |      | -50                              |      | -50                              |      | -50                              |      | ns   |       |
| $\overline{\text{WE}}$ Set-up Time                             | t <sub>WSR</sub>  | 10                               |      | 10                               |      | 10                               |      | 10                               |      | ns   |       |
| $\overline{\text{WE}}$ Hold Time                               | t <sub>WHR</sub>  | 15                               |      | 15                               |      | 15                               |      | 15                               |      | ns   |       |
| Refresh Period                                                 | t <sub>REP</sub>  |                                  | 256  |                                  | 256  |                                  | 256  |                                  | 256  | ms   | 16    |

## NOTES:

1. All voltages referenced to GND.
2. An initial pause of  $100\mu s$  required after power-on followed by 8 refresh ( $\overline{RAS}$  only refresh or  $\overline{CAS}$  before  $\overline{RAS}$  refresh) cycles before proper device operation is achieved.
3.  $I_{CC1}$ ,  $I_{CC3}$ ,  $I_{CC4}$  and  $I_{CC5}$  depend on output loading and cycle rates. Specified values are obtained with the output open. In addition to this,  $I_{CC3}$  is measured on condition that column addresses in  $\overline{RAS}$  only cycle are held high or low level and  $I_{CC4}$  is measured on condition that column addresses in fast page mode are changed only one time during  $t_{PC(MIN.)}$ .
4. AC measurements assume  $t_T=5ns$
5.  $V_{IH(MIN.)}$  and  $V_{IL(MAX.)}$  are reference levels for measuring timing of input signals. Transition times are measured between  $V_{IH}$  and  $V_{IL}$ .
6. The minimum specifications are used only to indicate cycle time at which proper operation over the full temperature range ( $T_a=0$  to  $70^\circ C$ ) is assured.
7. Load = 2 TTL loads and  $100pF$
8. The access time is determined by  $\overline{RAS}$  access time  $t_{RAC}$ , address access time  $t_{AA}$ , and  $\overline{CAS}$  address time  $t_{CAC}$ . The relationship between these access time and  $t_{RCD}$ ,  $t_{RAD}$  is as follows.

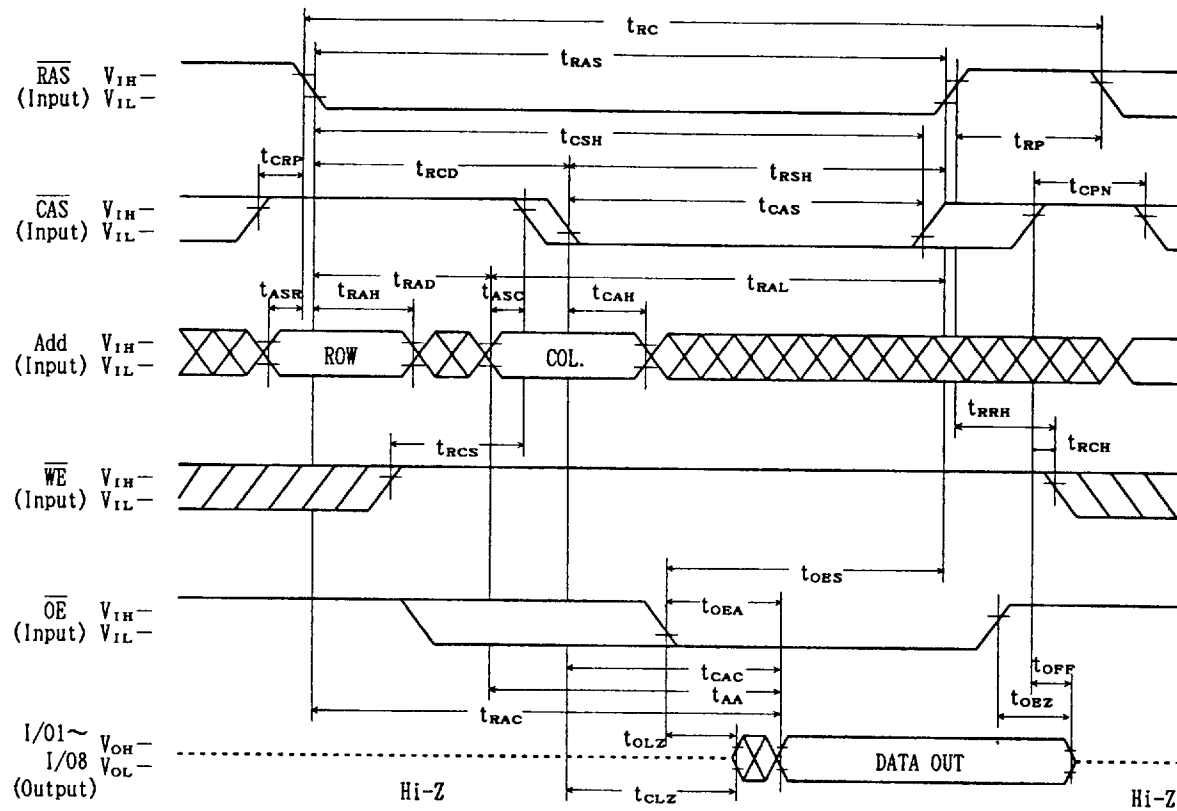
| CONDITION                                                     | ACCESS TIME     |
|---------------------------------------------------------------|-----------------|
| $t_{RAD} \leq t_{RAD(MAX.)}$ and $t_{RCD} \leq t_{RCD(MAX.)}$ | $t_{RAC(MAX.)}$ |
| $t_{RAD} \geq t_{RAD(MAX.)}$                                  | $t_{AA(MAX.)}$  |
| $t_{RCD} \geq t_{RCD(MAX.)}$                                  | $t_{CAC(MAX.)}$ |

9.  $t_{OFF(MAX.)}$  and  $t_{OEZ(MAX.)}$  defines the time at which the output achieves the open circuit condition and is not referenced to  $V_{OH}$  or  $V_{OL}$ .
10.  $t_{CRP}$  requirement should be applicable for  $\overline{RAS}/\overline{CAS}$  cycles preceded by any cycles.
11. Either  $t_{RRH}$  or  $t_{RCH}$  must be satisfied for a read cycle.
12.  $t_{WP}$  is applicable for late write cycle. If the cycle is early write, it should be satisfied value of  $t_{WCH}$ .
13. These parameters are referenced to  $\overline{CAS}$  leading edge in early write cycles and to  $\overline{WE}$  leading edge in late write or read-modify-write cycles.
14. If  $t_{WCS} \geq t_{WCS(MIN.)}$  the cycle is an early write cycle and the data output will remain open circuit throughout the entire cycle.
15. If  $t_{CWD} \geq t_{CWD(MIN.)}$ ,  $t_{RWD} \geq t_{RWD(MIN.)}$ ,  $t_{AWD} \geq t_{AWD(MIN.)}$  the cycle is a read-write and the data output will contain data read from the selected cell. If neither of the above conditions are met, the condition of the data out (at access time and until  $\overline{CAS}$  goes back to  $V_{IH}$ ) is indeterminate.
16. How to enter into  $\overline{CAS}$  before  $\overline{RAS}$  self refresh mode.
  - In case of using distributed  $\overline{CAS}$  before  $\overline{RAS}$  refresh  
Refresh 2048 or 4096 times during a 256ms (Before set into the  $\overline{CAS}$  before  $\overline{RAS}$  self refresh mode, and after reset).
  - In case of using burst  $\overline{CAS}$  before  $\overline{RAS}$  refresh  
Refresh 2048 times during a 32ms ( $\mu$ PD42S17800) or 4096 times during a 64ms ( $\mu$ PD42S16800) (Before set into the  $\overline{CAS}$  before  $\overline{RAS}$  self refresh mode, and after reset).
  - In case of use  $\overline{RAS}$  only refresh  
Refresh against all refresh address during 32ms ( $\mu$ PD42S17800) or 64ms ( $\mu$ PD42S16800) (Before set into the  $\overline{CAS}$  before  $\overline{RAS}$  self refresh mode, and after reset).

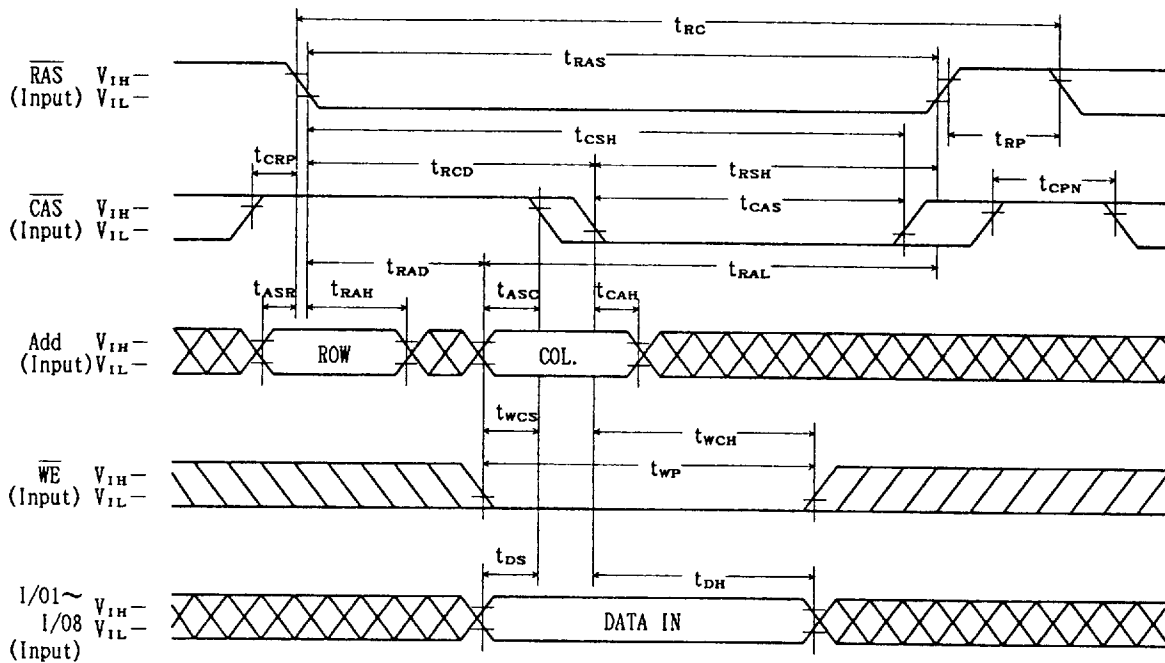
$\mu$ PD42S16800, 42S17800

TIMING DIAGRAMS

READ CYCLE

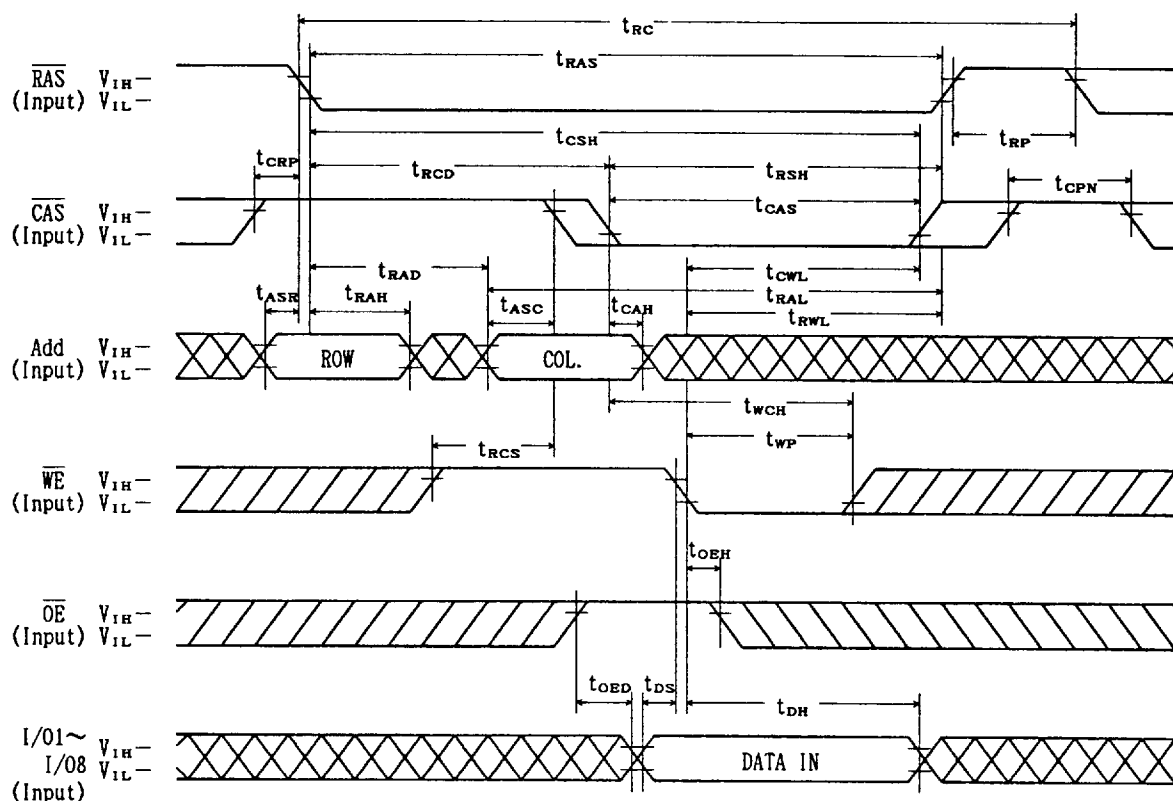


EARLY WRITE CYCLE

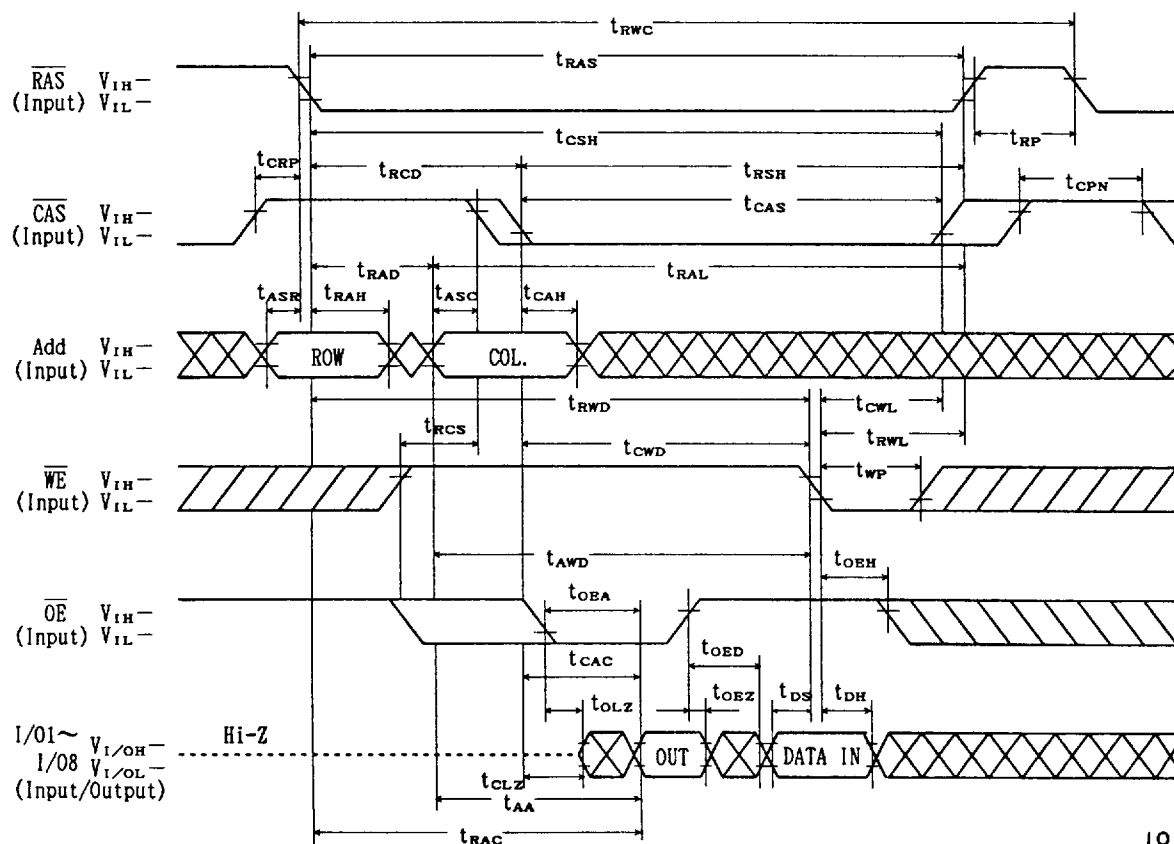


Note:  $\overline{OE}$  = Don't care

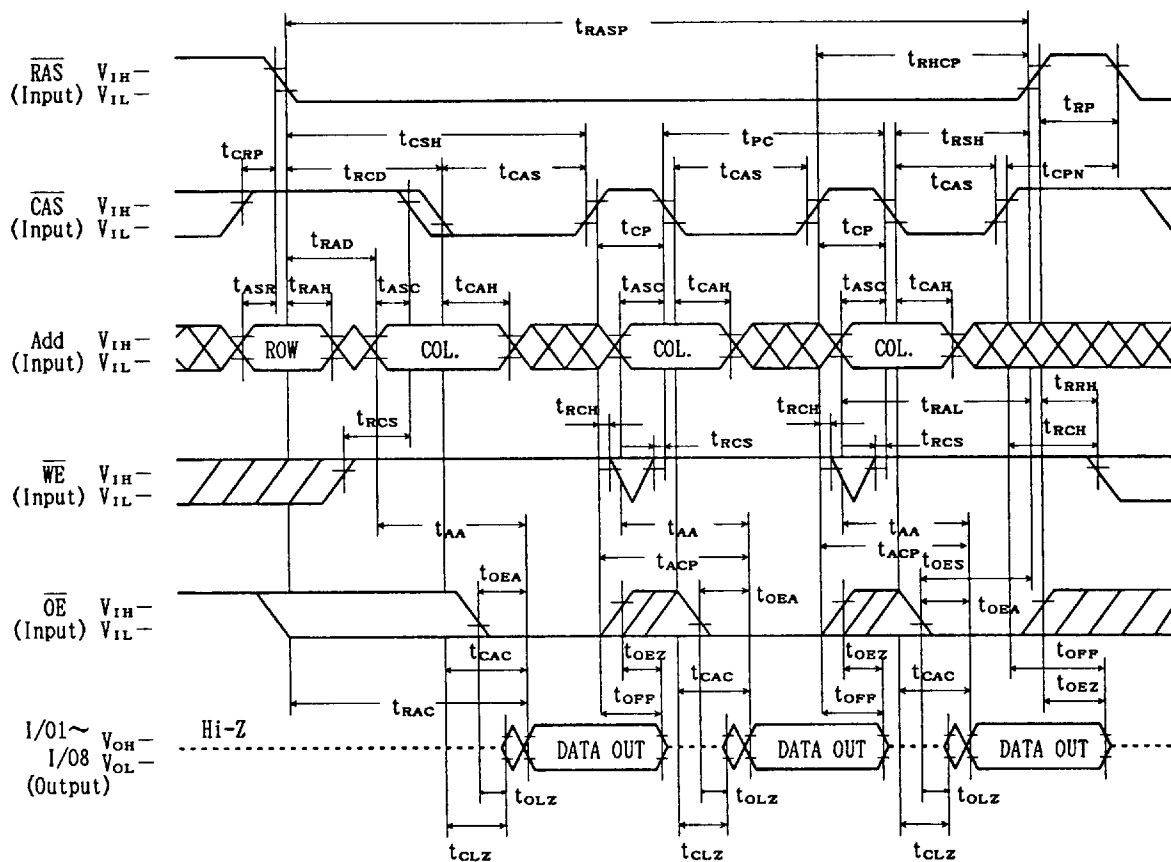
# LATE WRITE CYCLE



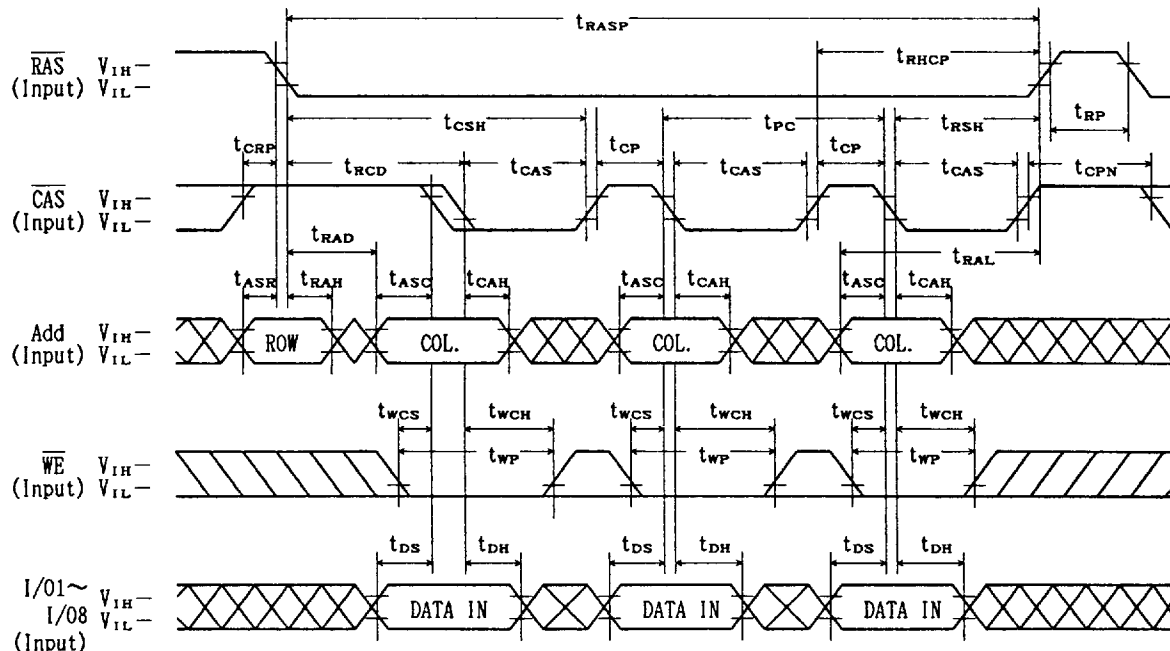
# READ MODIFY WRITE CYCLE



# FAST PAGE MODE READ CYCLE



# FAST PAGE MODE EARLY WRITE CYCLE



[illegible]

The timing diagram illustrates the relationship between various control and data signals during memory access operations. The signals shown are:

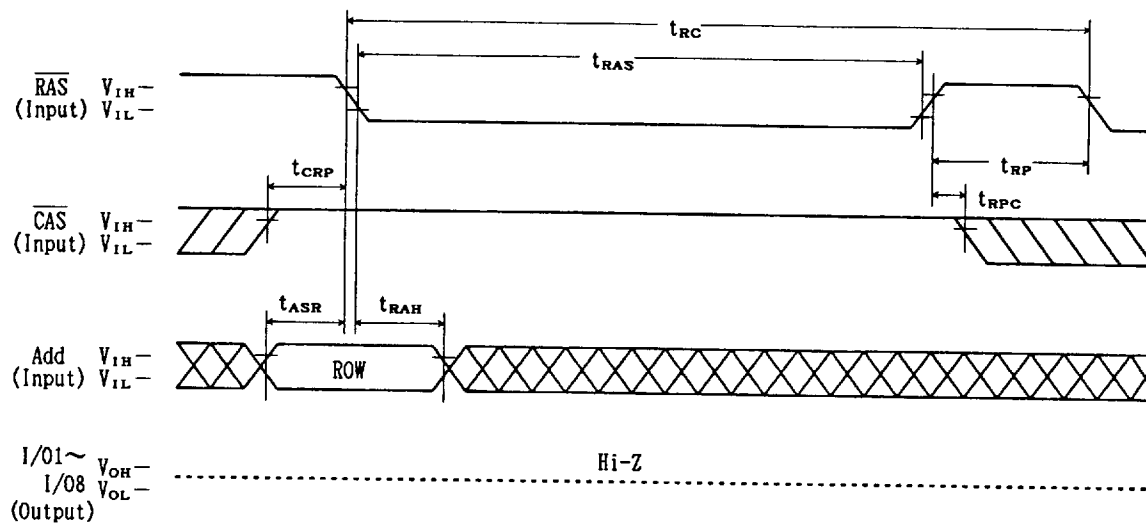
- RAS (Input)**: Row Address Strobe, active low.
- CAS (Input)**: Column Address Strobe, active low.
- Add (Input)**: Address bus, showing ROW and COL phases.
- WE (Input)**: Write Enable, active low.
- OE (Input)**: Output Enable, active low.
- I/O<sub>1</sub>~I/O<sub>8</sub>**: Input/Output bus, showing OUT and IN phases.

Key timing parameters labeled include:

- $t_{RASP}$ : RAS pulse width.
- $t_{RP}$ : RAS precharge time.
- $t_{CRP}$ ,  $t_{RCD}$ ,  $t_{CAS}$ ,  $t_{CP}$ ,  $t_{PRWC}$ ,  $t_{CPN}$ : Various RAS-related delays and times.
- $t_{RAD}$ ,  $t_{ASC}$ ,  $t_{CAH}$ ,  $t_{AL}$ : CAS-related delays and times.
- $t_{ASR}$ ,  $t_{RAH}$ ,  $t_{ASC}$ ,  $t_{CAH}$ : Address setup and hold times.
- $t_{RCS}$ ,  $t_{RWd}$ ,  $t_{CWL}$ ,  $t_{WPD}$ ,  $t_{AWD}$ ,  $t_{TRWL}$ ,  $t_{WP}$ : Timing parameters related to row and column address strobes and write enable.
- $t_{AA}$ ,  $t_{OEH}$ ,  $t_{ACP}$ : Timing parameters related to output enable and access time.
- $t_{DS}$ ,  $t_{CAC}$ ,  $t_{OED}$ ,  $t_{DH}$ ,  $t_{CLZ}$ ,  $t_{OEZ}$ ,  $t_{TOEA}$ : Timing parameters related to data strobe, column address strobe, output enable delay, data hold, column load, output enable zero, and output enable after delay.
- $t_{TRAC}$ : Total refresh cycle time.

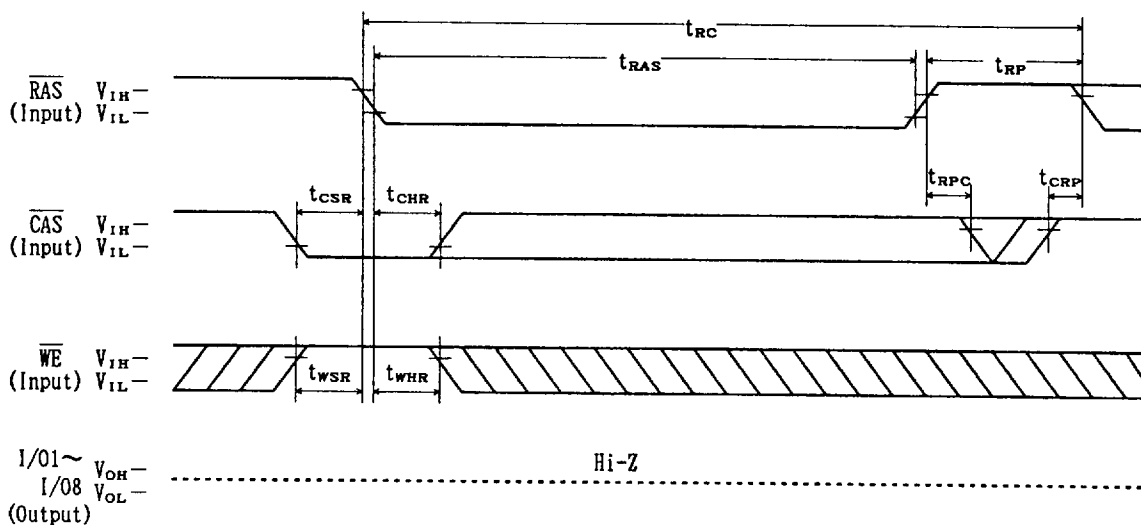
μPD42S16800,42S17800

RAS ONLY REFRESH CYCLE



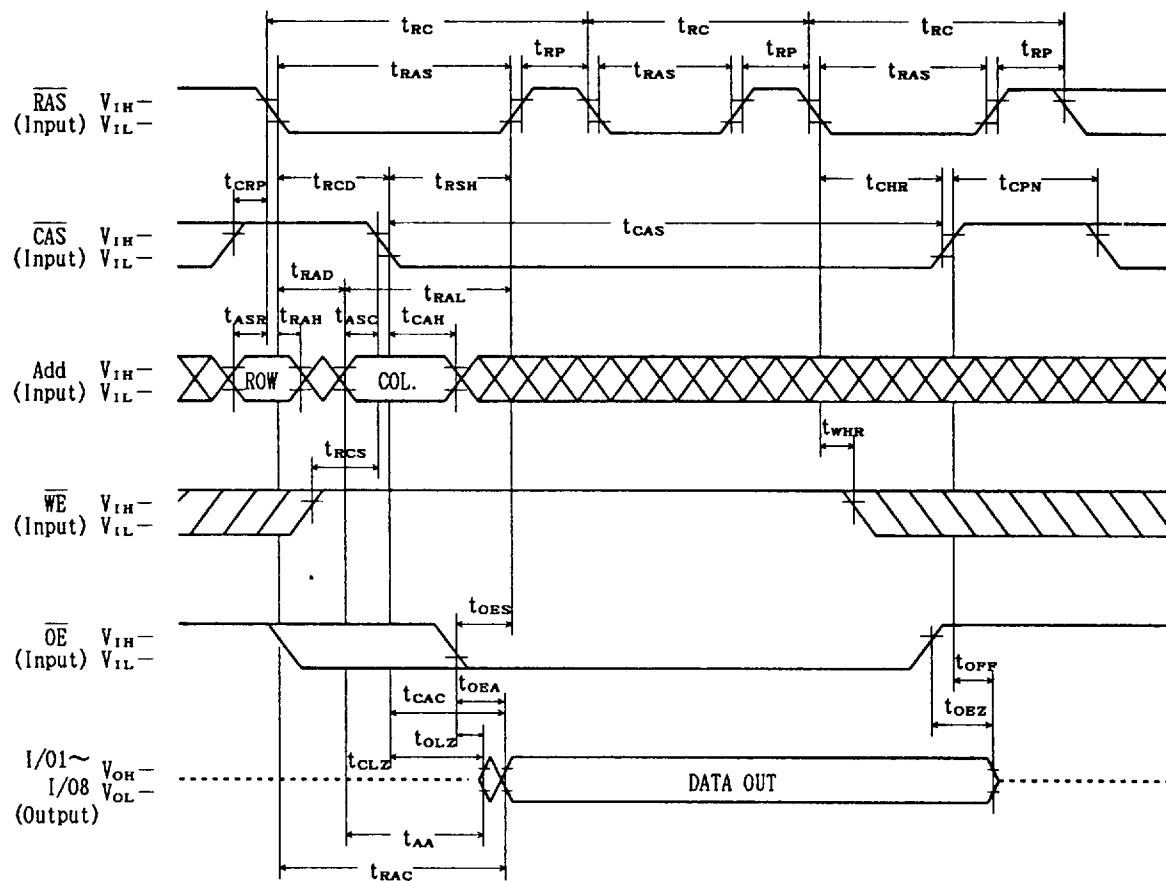
Note:  $\overline{WE}, \overline{OE}$  = Don't care

CAS BEFORE RAS REFRESH CYCLE

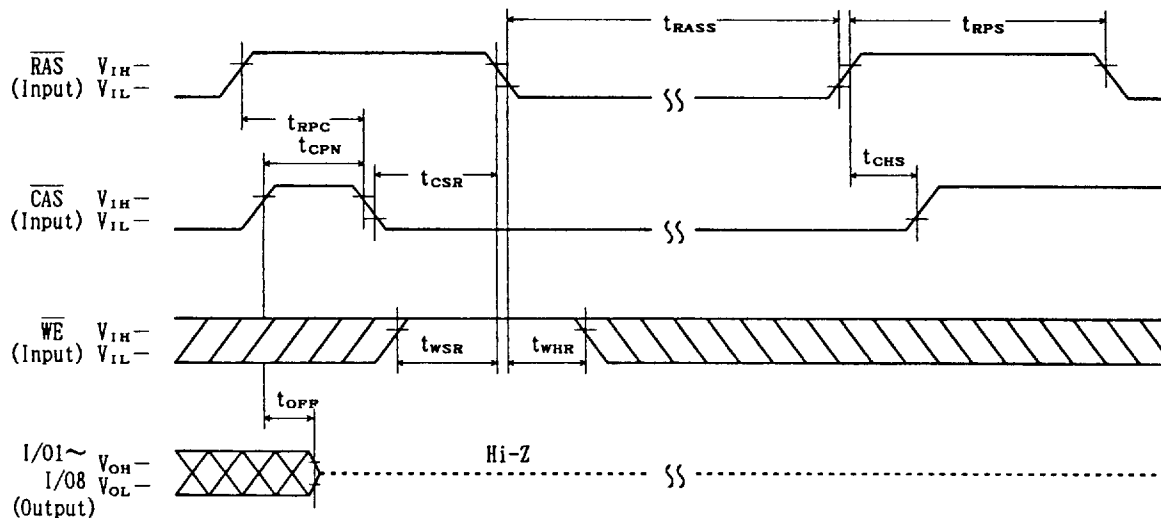


Note:  $\overline{OE}$  = Don't care

CAS BEFORE RAS HIDDEN REFRESH CYCLE



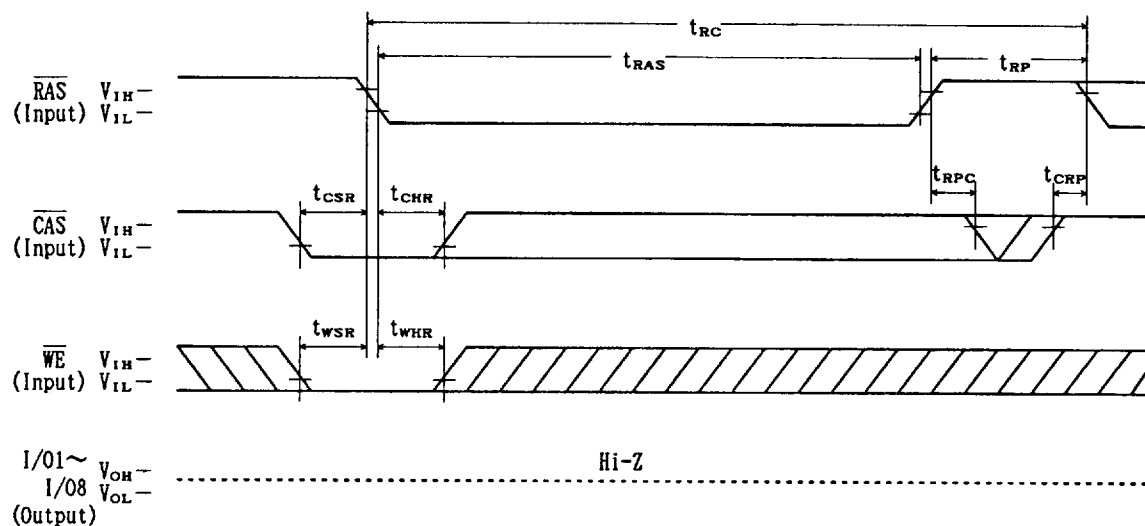
CAS BEFORE RAS SELF REFRESH CYCLE



# μPD42S16800,42S17800

## TEST MODE SET CYCLE

(WE AND CAS BEFORE RAS REFRESH CYCLE)



## TEST MODE

TEST MODE is fast test function. On using this mode, test time is reduced to 1/2.

In this TEST MODE, internal organization is 1M words by 16-bit apparent. The input levels of the CAS input A0 are Don't care.

### 1. How to enter into TEST MODE

Through TEST MODE SET CYCLE (WE and CAS before RAS refresh cycle), the device is entered into TEST MODE.

### 2. Write/Read in TEST MODE

Write data "1" or "0" through I/01 to I/08 by controlling address except for above-mentioned address. Each input data through each I/O (I/01, I/02, I/03, I/04, I/05, I/06, I/07, I/08) write 2 bits at once. And read through I/01 to I/08 to check written data.

In case of writing each 2 bits rightly, each I/O data is "1". But wrong, each I/O data is "0".

### 3. Refresh in TEST MODE

Use normal read cycle or WE and CAS before RAS refresh cycle.

### 4. How to reset TEST MODE

Through RAS only refresh cycle or CAS before RAS refresh cycle, the device is reset TEST MODE.

### 3. PACKAGE DRAWINGS

|                                |                       |     |
|--------------------------------|-----------------------|-----|
| 26 PIN PLASTIC SOJ (300mil)    | 24 Leads              | 495 |
| 28 PIN PLASTIC SOJ (400mil)    | 24 Leads              | 496 |
| 28 PIN PLASTIC SOJ (400mil)    | 28 Leads              | 497 |
| 32 PIN PLASTIC SOJ (400mil)    |                       | 498 |
| 42 PIN PLASTIC SOJ (400mil)    |                       | 499 |
| 26 PIN PLASTIC TSOP (300mil) * | 24 Leads              | 500 |
| 26 PIN PLASTIC TSOP (300mil) * | 24 Leads Reverse bent | 501 |
| 28 PIN PLASTIC TSOP (400mil)   | 24 Leads              | 502 |
| 28 PIN PLASTIC TSOP (400mil)   | 24 Leads Reverse bent | 503 |
| 28 PIN PLASTIC TSOP (400mil)   | 28 Leads              | 504 |
| 28 PIN PLASTIC TSOP (400mil)   | 28 Leads Reverse bent | 505 |
| 32 PIN PLASTIC TSOP (400mil)   |                       | 506 |
| 32 PIN PLASTIC TSOP (400mil)   | Reverse bent          | 507 |
| 50 PIN PLASTIC TSOP (400mil)   | 44 Leads              | 508 |
| 50 PIN PLASTIC TSOP (400mil)   | 44 Leads Reverse bent | 509 |
| 24 PIN PLASTIC ZIP (475mil)    |                       | 510 |
| 28 PIN PLASTIC ZIP (475mil)    |                       | 511 |
| 32 PIN PLASTIC ZIP (475mil)    |                       | 512 |

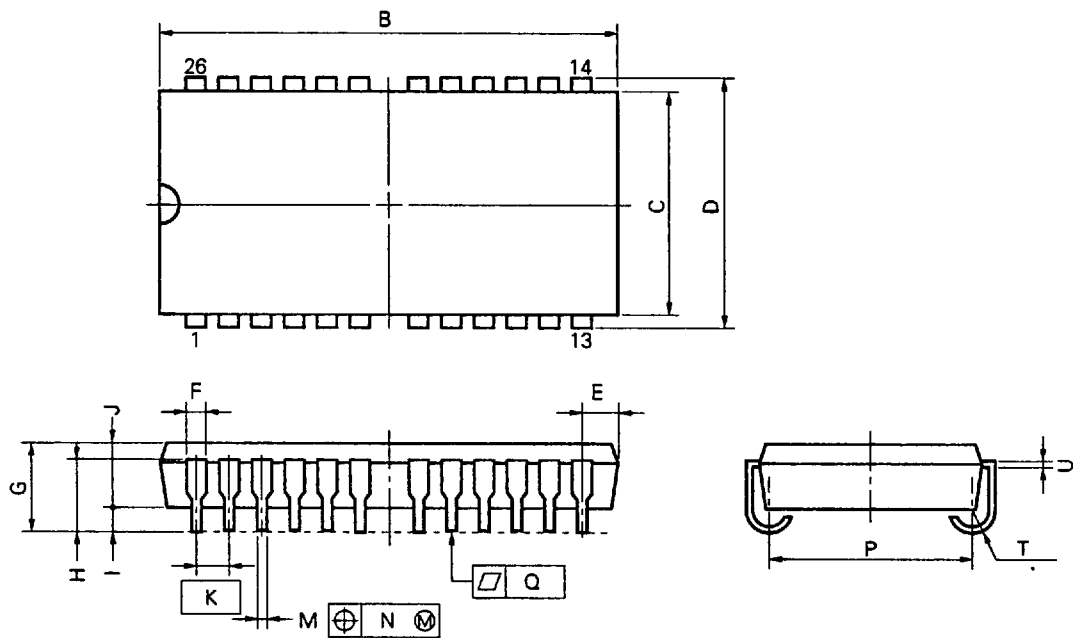
\* : under development

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494

26 PIN PLASTIC SOJ (300mil)  
24 Leads

NEC Cord:S26LA-300A

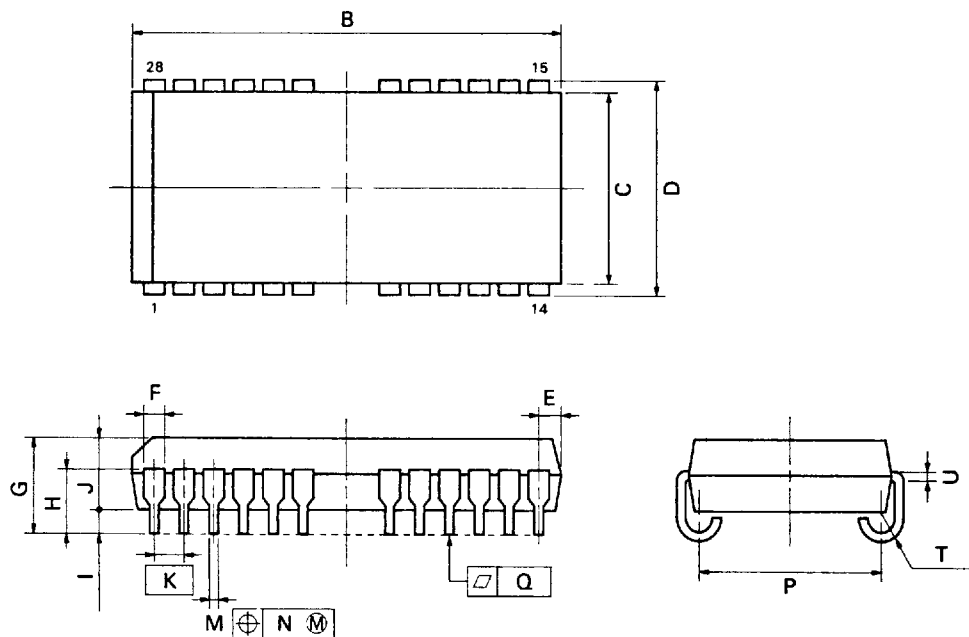


**NOTE**  
Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

| S26LA-300A |                                        |                                           |
|------------|----------------------------------------|-------------------------------------------|
| ITEM       | MILLIMETERS                            | INCHES                                    |
| B          | 17.1 <sup>+0.25</sup> <sub>-0.05</sub> | 0.673 <sup>+0.010</sup> <sub>-0.002</sub> |
| C          | 7.62                                   | 0.300                                     |
| D          | 8.47±0.2                               | 0.333 <sup>+0.009</sup> <sub>-0.008</sub> |
| E          | 1.03±0.15                              | 0.041 <sup>+0.006</sup> <sub>-0.007</sub> |
| F          | 0.74                                   | 0.029                                     |
| G          | 3.5±0.2                                | 0.138±0.008                               |
| H          | 2.545±0.2                              | 0.100±0.008                               |
| I          | 0.8 MIN.                               | 0.031 MIN.                                |
| J          | 2.6                                    | 0.102                                     |
| K          | 1.27 (T.P.)                            | 0.050 (T.P.)                              |
| M          | 0.40±0.10                              | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| N          | 0.12                                   | 0.005                                     |
| P          | 6.73±0.20                              | 0.265±0.008                               |
| Q          | 0.10                                   | 0.004                                     |
| T          | R 0.85                                 | R 0.033                                   |
| U          | 0.20 <sup>+0.10</sup> <sub>-0.05</sub> | 0.008 <sup>+0.004</sup> <sub>-0.002</sub> |

28 PIN PLASTIC SOJ (400mil)  
24 Leads

NEC Cord:P28LE-400A



P28LE-400A

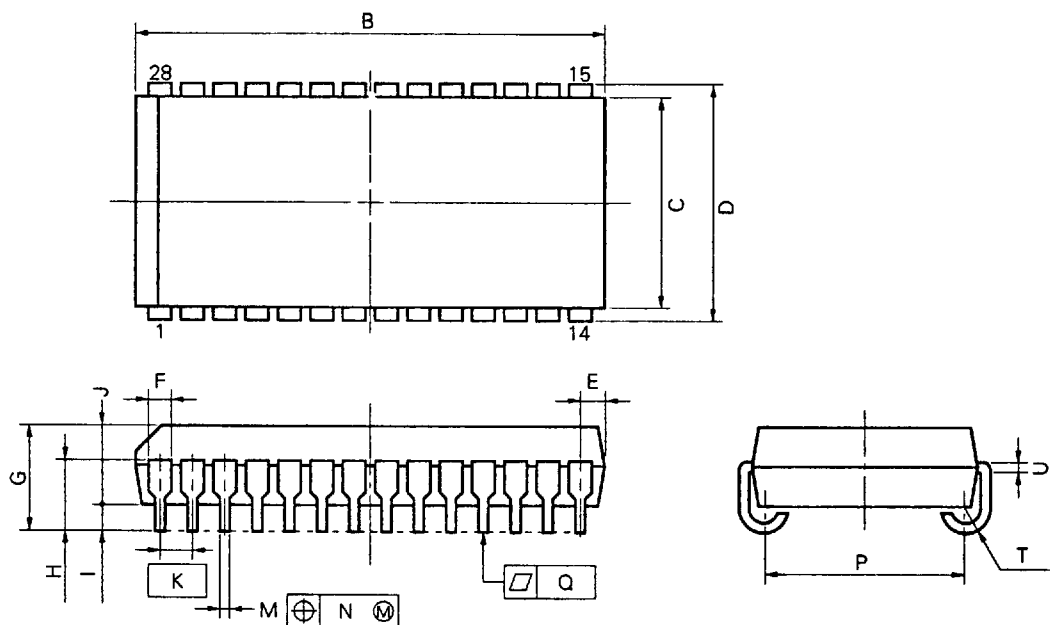
**NOTE**

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

| ITEM | MILLIMETERS                             | INCHES                                    |
|------|-----------------------------------------|-------------------------------------------|
| B    | 18.67 <sup>+0.25</sup> <sub>-0.35</sub> | 0.735 <sup>+0.008</sup> <sub>-0.013</sub> |
| C    | 10.16                                   | 0.400                                     |
| D    | 11.18 <sup>±0.2</sup>                   | 0.440 <sup>+0.008</sup> <sub>-0.007</sub> |
| E    | 1.08 <sup>-0.15</sup>                   | 0.043 <sup>+0.006</sup> <sub>-0.007</sub> |
| F    | 0.7                                     | 0.028                                     |
| G    | 3.5 <sup>±0.2</sup>                     | 0.138 <sup>+0.009</sup> <sub>-0.008</sub> |
| H    | 2.4 <sup>±0.2</sup>                     | 0.094 <sup>+0.008</sup> <sub>-0.008</sub> |
| I    | 0.8 MIN.                                | 0.031 MIN.                                |
| J    | 2.6                                     | 0.102                                     |
| K    | 1.27 (T.P.)                             | 0.050 (T.P.)                              |
| M    | 0.40 <sup>±0.10</sup>                   | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| N    | 0.12                                    | 0.005                                     |
| P    | 9.40 <sup>-0.20</sup>                   | 0.370 <sup>+0.008</sup> <sub>-0.007</sub> |
| Q    | 0.15                                    | 0.006                                     |
| T    | R0.85                                   | R0.033                                    |
| U    | 0.20 <sup>+0.10</sup> <sub>-0.08</sub>  | 0.008 <sup>+0.004</sup> <sub>-0.003</sub> |

28 PIN PLASTIC SOJ (400mil)  
28 Leads

NEC Cord:P28LE-400A1



**NOTE**

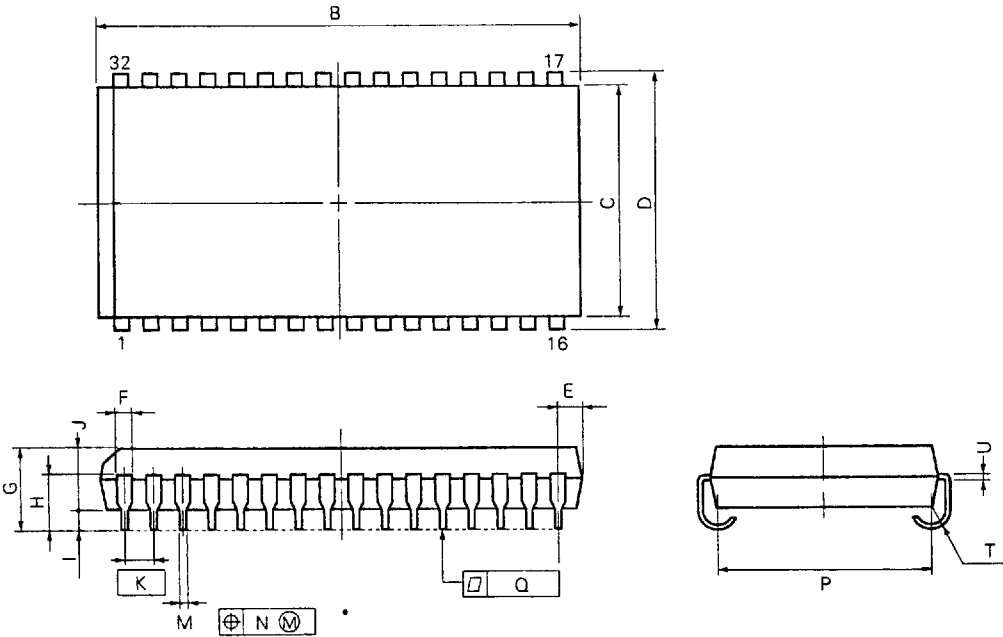
Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

P28LE-400A1

| ITEM | MILLIMETERS            | INCHES                    |
|------|------------------------|---------------------------|
| B    | $18.67^{+0.2}_{-0.35}$ | $0.735^{+0.008}_{-0.013}$ |
| C    | 10.16                  | 0.400                     |
| D    | $11.18 \pm 0.2$        | $0.440^{+0.008}_{-0.007}$ |
| E    | $1.08 \pm 0.15$        | $0.043^{+0.006}_{-0.007}$ |
| F    | 0.74                   | 0.029                     |
| G    | $3.5 \pm 0.2$          | $0.138^{+0.008}_{-0.007}$ |
| H    | $2.545 \pm 0.2$        | $0.100 \pm 0.008$         |
| I    | 0.8 MIN                | 0.031 MIN.                |
| J    | 2.6                    | 0.102                     |
| K    | 1.27 (T.P.)            | 0.050 (T.P.)              |
| M    | $0.40 \pm 0.10$        | $0.016^{+0.004}_{-0.005}$ |
| N    | 0.12                   | 0.005                     |
| P    | $9.40 \pm 0.20$        | $0.370^{+0.008}_{-0.007}$ |
| Q    | 0.10                   | 0.004                     |
| T    | R 0.85                 | R 0.033                   |
| U    | $0.20^{+0.10}_{-0.05}$ | $0.008^{+0.004}_{-0.002}$ |

32 PIN PLASTIC SOJ (400mil)

NEC Cord:P32LE-400A

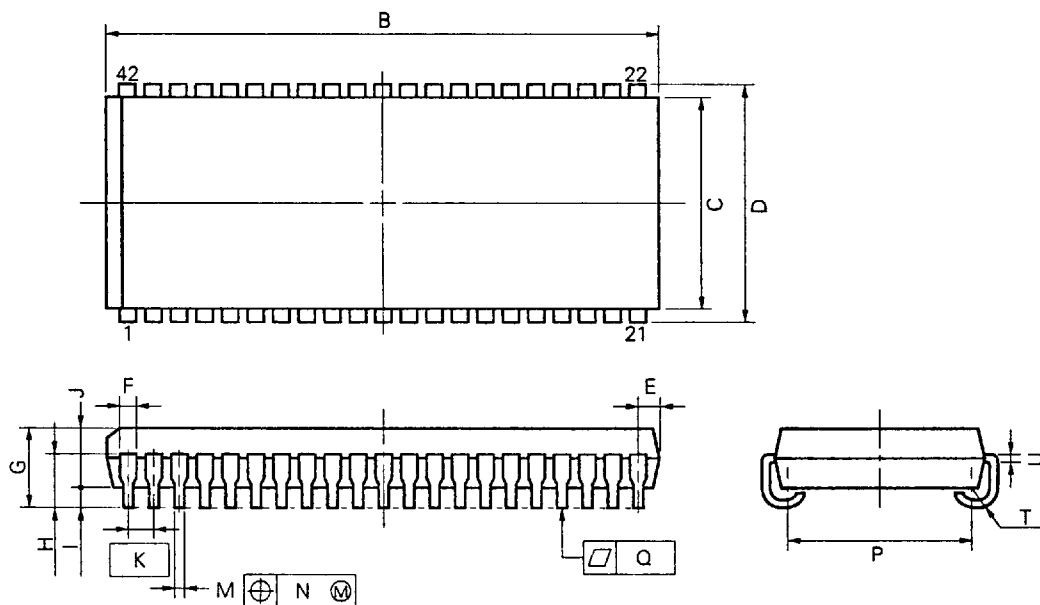


**NOTE**  
Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition

| P32LE-400A |                                        |                                           |
|------------|----------------------------------------|-------------------------------------------|
| ITEM       | MILLIMETERS                            | INCHES                                    |
| B          | 21.06±0.2                              | 0.829±0.008                               |
| C          | 10.16                                  | 0.400                                     |
| D          | 11.18±0.2                              | 0.440±0.008                               |
| E          | 1.005±0.1                              | 0.040 <sup>+0.004</sup> <sub>-0.005</sub> |
| F          | 0.74                                   | 0.029                                     |
| G          | 3.5±0.2                                | 0.138±0.008                               |
| H          | 2.545±0.2                              | 0.100±0.008                               |
| I          | 0.8 MIN                                | 0.031 MIN                                 |
| J          | 2.6                                    | 0.102                                     |
| K          | 1.27 (T.P.)                            | 0.050 (T.P.)                              |
| M          | 0.40±0.10                              | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| N          | 0.12                                   | 0.005                                     |
| P          | 9.4±0.20                               | 0.370±0.008                               |
| Q          | 0.1                                    | 0.004                                     |
| T          | R 0.85                                 | R 0.033                                   |
| U          | 0.20 <sup>+0.10</sup> <sub>-0.02</sub> | 0.008 <sup>+0.004</sup> <sub>-0.002</sub> |

## 42 PIN PLASTIC SOJ (400mil)

NEC Cord:P42LE-400A

**NOTE**

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

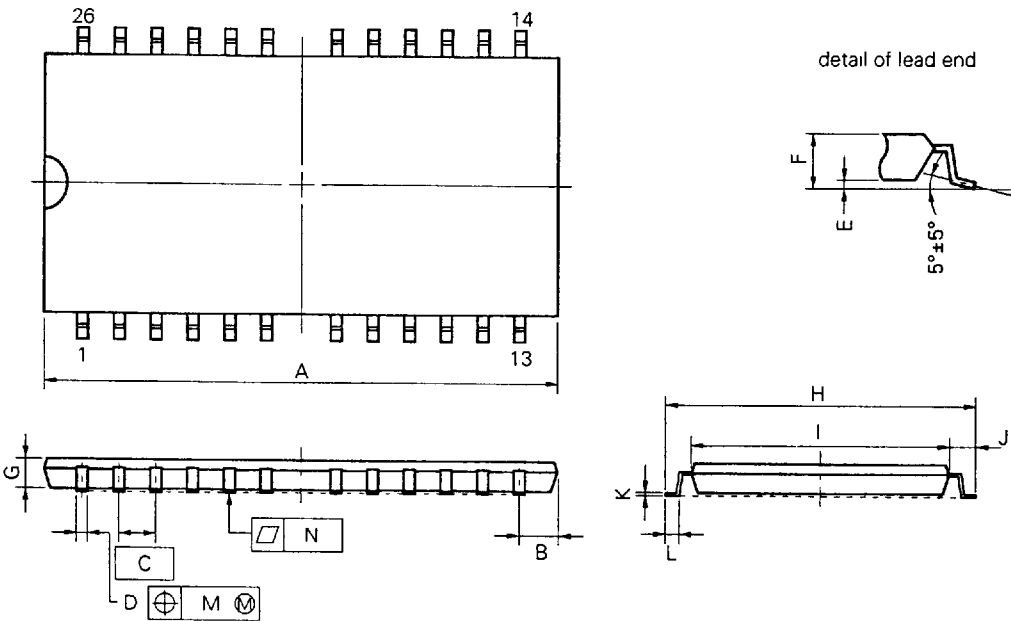
P42LE-400A

| ITEM | MILLIMETERS            | INCHES                    |
|------|------------------------|---------------------------|
| B    | $27.56^{+0.2}_{-0.35}$ | $1.085^{+0.008}_{-0.014}$ |
| C    | 10.16                  | 0.400                     |
| D    | $11.18 \pm 0.2$        | $0.440 \pm 0.008$         |
| E    | $1.08 \pm 0.15$        | $0.043^{+0.006}_{-0.007}$ |
| F    | 0.74                   | 0.029                     |
| G    | $3.5 \pm 0.2$          | $0.138 \pm 0.008$         |
| H    | $2.545 \pm 0.2$        | $0.100 \pm 0.008$         |
| I    | 0.8 MIN.               | 0.031 MIN.                |
| J    | 2.6                    | 0.102                     |
| K    | 1.27 (T.P.)            | 0.050 (T.P.)              |
| M    | $0.40 \pm 0.10$        | $0.016^{+0.004}_{-0.005}$ |
| N    | 0.12                   | 0.005                     |
| P    | $9.4 \pm 0.20$         | $0.370 \pm 0.008$         |
| Q    | 0.10                   | 0.004                     |
| T    | R 0.85                 | R 0.033                   |
| U    | $0.20^{+0.10}_{-0.05}$ | $0.008^{+0.004}_{-0.002}$ |

26 PIN PLASTIC TSOP (300mil) \*  
 24 Leads

\* : under development

NEC Cord:S26G3-50-7JD



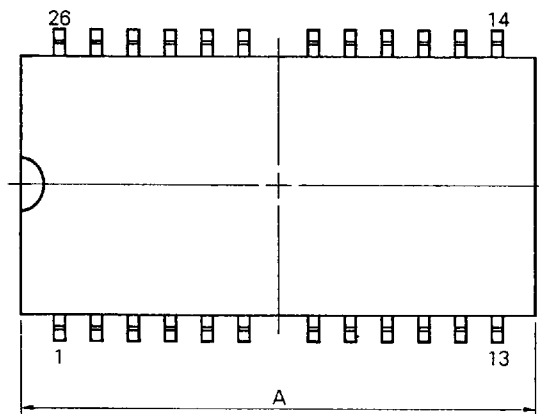
**NOTE**  
 Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

| S26G3-50-7JD |                                         |                                           |
|--------------|-----------------------------------------|-------------------------------------------|
| ITEM         | MILLIMETERS                             | INCHES                                    |
| A            | 17.40 MAX.                              | 0.685 MAX.                                |
| B            | 1.06 MAX.                               | 0.042 MAX.                                |
| C            | 1.27 (T.P.)                             | 0.050 (T.P.)                              |
| D            | 0.40±0.10                               | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| E            | 0.05±0.05                               | 0.002±0.002                               |
| F            | 1.1 MAX.                                | 0.044 MAX.                                |
| G            | 0.97                                    | 0.038                                     |
| H            | 9.22±0.2                                | 0.363±0.008                               |
| I            | 7.62±0.1                                | 0.300±0.004                               |
| J            | 0.8±0.2                                 | 0.031 <sup>+0.009</sup> <sub>-0.008</sub> |
| K            | 0.125 <sup>+0.10</sup> <sub>-0.05</sub> | 0.005 <sup>+0.004</sup> <sub>-0.002</sub> |
| L            | 0.5±0.1                                 | 0.020 <sup>+0.004</sup> <sub>-0.005</sub> |
| M            | 0.21                                    | 0.009                                     |
| N            | 0.10                                    | 0.004                                     |

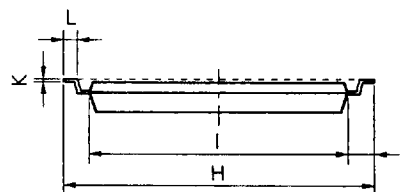
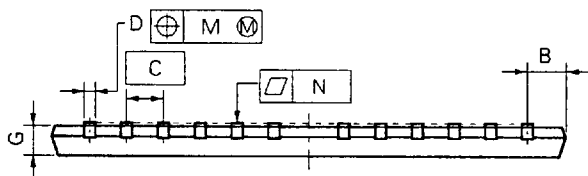
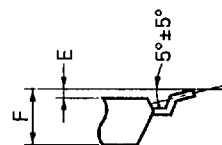
26 PIN PLASTIC TSOP (300mil) \*  
24 Leads Reverse bent

\* : under development

NEC Cord:S26G3-50-7KD



detail of lead end



S26G3-50-7KD

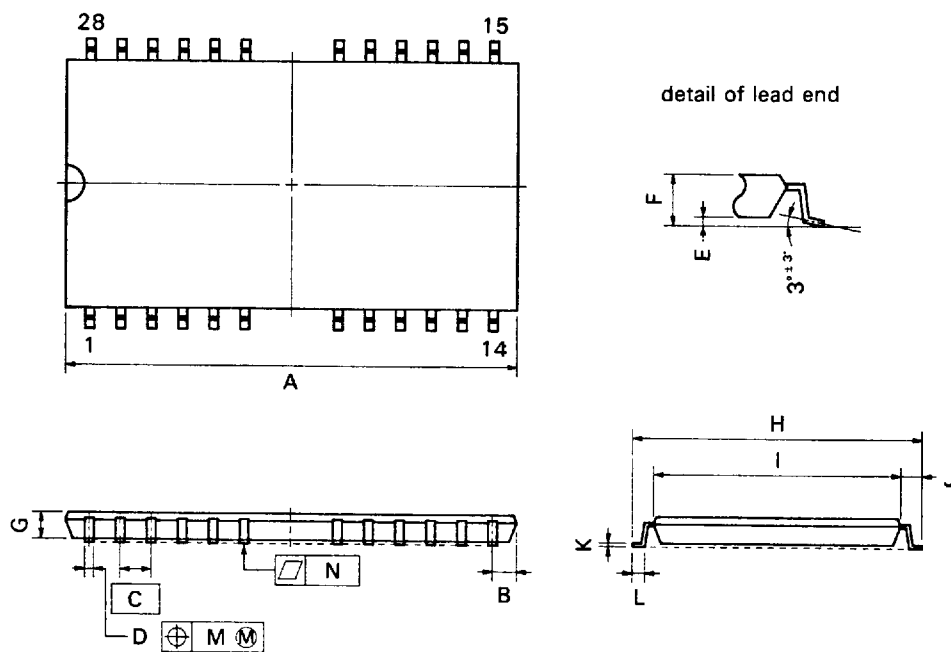
**NOTE**

Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P) at maximum material condition

| ITEM | MILLIMETERS                             | INCHES                                    |
|------|-----------------------------------------|-------------------------------------------|
| A    | 17.40 MAX.                              | 0.685 MAX.                                |
| B    | 1.06 MAX.                               | 0.042 MAX.                                |
| C    | 1.27 (T P )                             | 0.050 (T.P.)                              |
| D    | 0.40±0.10                               | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| E    | 0.05±0.05                               | 0.002±0.002                               |
| F    | 1.1 MAX.                                | 0.044 MAX.                                |
| G    | 0.97                                    | 0.038                                     |
| H    | 9.22±0.2                                | 0.363±0.008                               |
| I    | 7.62±0.1                                | 0.300±0.004                               |
| J    | 0.8±0.2                                 | 0.031 <sup>+0.009</sup> <sub>-0.008</sub> |
| K    | 0.125 <sup>+0.10</sup> <sub>-0.05</sub> | 0.005 <sup>+0.004</sup> <sub>-0.002</sub> |
| L    | 0.5±0.1                                 | 0.020 <sup>+0.004</sup> <sub>-0.005</sub> |
| M    | 0.21                                    | 0.009                                     |
| N    | 0.10                                    | 0.004                                     |

28 PIN PLASTIC TSOP (400mil)  
24 Leads

NEC Cord:S28G5-50-7JD1



**NOTE**

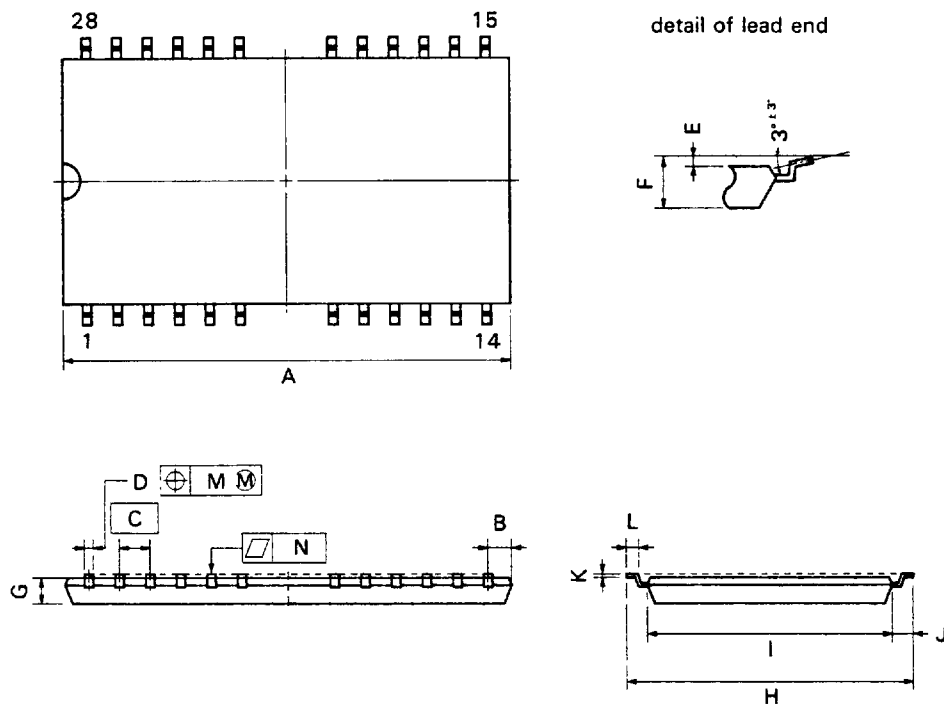
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

S28G5-50-7JD1

| ITEM | MILLIMETERS      | INCHES            |
|------|------------------|-------------------|
| A    | 18.81 MAX.       | 0.741 MAX.        |
| B    | 1.15 MAX.        | 0.046 MAX.        |
| C    | 1.27 (T.P.)      | 0.050 (T.P.)      |
| D    | 0.40 $\pm 0.10$  | 0.016 $\pm 0.004$ |
| E    | 0.05 $\pm 0.05$  | 0.002 $\pm 0.002$ |
| F    | 1.1 MAX.         | 0.044 MAX.        |
| G    | 0.97             | 0.038             |
| H    | 11.76 $\pm 0.2$  | 0.463 $\pm 0.008$ |
| I    | 10.16 $\pm 0.1$  | 0.400 $\pm 0.004$ |
| J    | 0.8 $\pm 0.2$    | 0.031 $\pm 0.008$ |
| K    | 0.125 $\pm 0.10$ | 0.005 $\pm 0.004$ |
| L    | 0.5 $\pm 0.1$    | 0.020 $\pm 0.004$ |
| M    | 0.21             | 0.009             |
| N    | 0.10             | 0.004             |

28 PIN PLASTIC TSOP (400mil)  
24 Leads Reverse bent

NEC Cord:S28G5-50-7KD1



**NOTE**

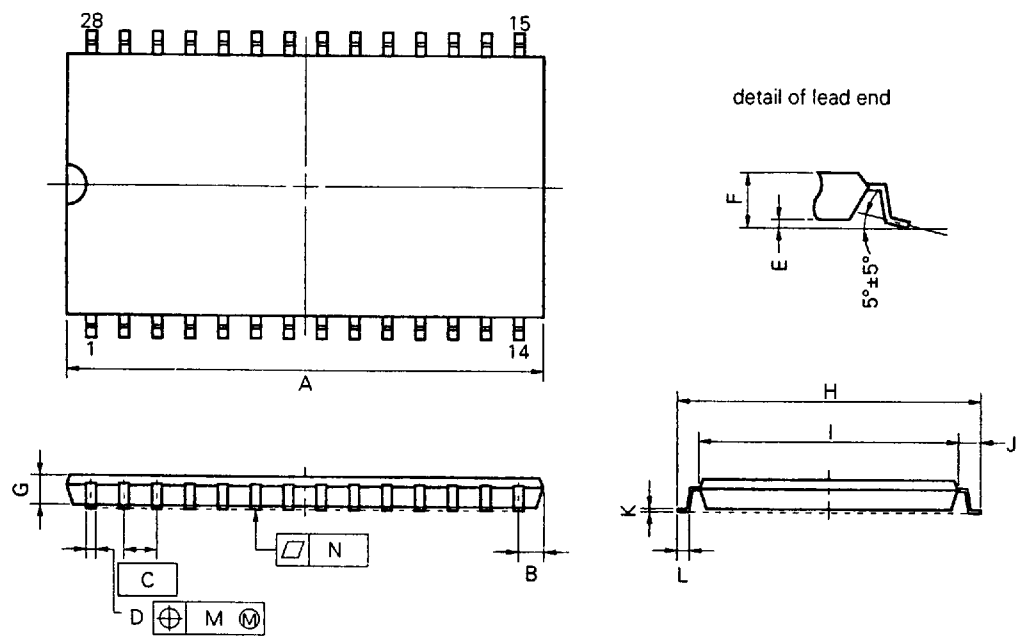
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

S28G5-50-7KD1

| ITEM | MILLIMETERS      | INCHES            |
|------|------------------|-------------------|
| A    | 18.81 MAX.       | 0.741 MAX.        |
| B    | 1.15 MAX.        | 0.046 MAX.        |
| C    | 1.27 (T.P.)      | 0.050 (T.P.)      |
| D    | 0.40 $\pm$ 0.10  | 0.016 $\pm$ 0.004 |
| E    | 0.05 $\pm$ 0.05  | 0.002 $\pm$ 0.002 |
| F    | 1.1 MAX.         | 0.044 MAX.        |
| G    | 0.97             | 0.038             |
| H    | 11.76 $\pm$ 0.2  | 0.463 $\pm$ 0.008 |
| I    | 10.16 $\pm$ 0.1  | 0.400 $\pm$ 0.004 |
| J    | 0.8 $\pm$ 0.2    | 0.031 $\pm$ 0.008 |
| K    | 0.125 $\pm$ 0.02 | 0.005 $\pm$ 0.001 |
| L    | 0.5 $\pm$ 0.1    | 0.020 $\pm$ 0.004 |
| M    | 0.21             | 0.009             |
| N    | 0.10             | 0.004             |

28 PIN PLASTIC TSOP (400mil)  
28 Leads

NEC Cord:S28G5-50-7JD2

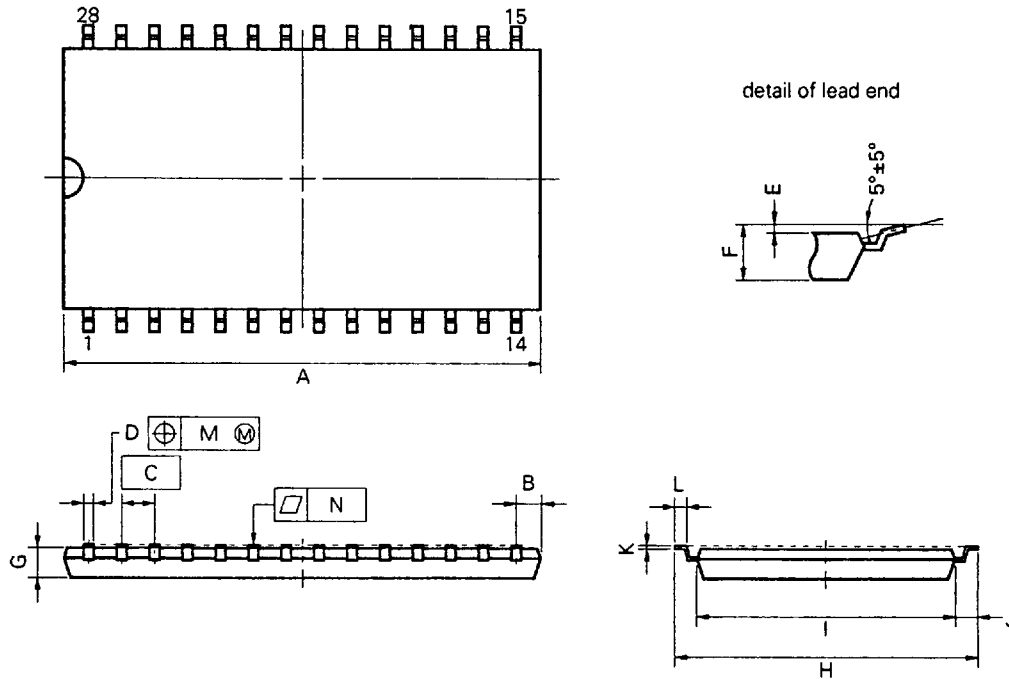


**NOTE**  
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

| S28G5-50-7JD2 |                                         |                                           |
|---------------|-----------------------------------------|-------------------------------------------|
| ITEM          | MILLIMETERS                             | INCHES                                    |
| A             | 18.81 MAX.                              | 0.741 MAX.                                |
| B             | 1.15 MAX.                               | 0.046 MAX.                                |
| C             | 1.27 (T.P.)                             | 0.050 (T.P.)                              |
| D             | 0.40±0.10                               | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| E             | 0.05±0.05                               | 0.002±0.002                               |
| F             | 1.1 MAX.                                | 0.044 MAX.                                |
| G             | 0.97                                    | 0.038                                     |
| H             | 11.76±0.2                               | 0.463±0.008                               |
| I             | 10.16±0.1                               | 0.400±0.004                               |
| J             | 0.8±0.2                                 | 0.031 <sup>+0.009</sup> <sub>-0.008</sub> |
| K             | 0.125 <sup>+0.10</sup> <sub>-0.05</sub> | 0.005 <sup>+0.004</sup> <sub>-0.002</sub> |
| L             | 0.5±0.15                                | 0.020 <sup>+0.006</sup> <sub>-0.007</sub> |
| M             | 0.21                                    | 0.009                                     |
| N             | 0.10                                    | 0.004                                     |

28 PIN PLASTIC TSOP (400mil)  
28 Leads Reverse bent

NEC Cord:S28G5-50-7KD2



**NOTE**

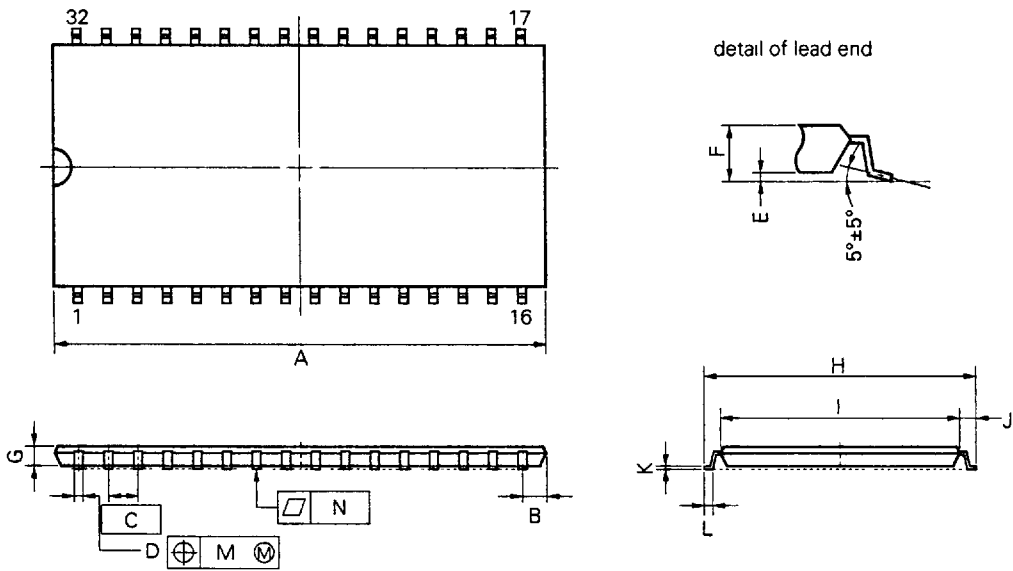
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

S28G5-50-7KD2

| ITEM | MILLIMETERS                             | INCHES                                    |
|------|-----------------------------------------|-------------------------------------------|
| A    | 18.81 MAX.                              | 0.741 MAX.                                |
| B    | 1.15 MAX.                               | 0.046 MAX.                                |
| C    | 1.27 (T.P.)                             | 0.050 (T.P.)                              |
| D    | 0.40±0.10                               | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| E    | 0.05±0.05                               | 0.002±0.002                               |
| F    | 1.1 MAX.                                | 0.044 MAX.                                |
| G    | 0.97                                    | 0.038                                     |
| H    | 11.76±0.2                               | 0.463±0.008                               |
| I    | 10.16±0.1                               | 0.400±0.004                               |
| J    | 0.8±0.2                                 | 0.031 <sup>+0.009</sup> <sub>-0.008</sub> |
| K    | 0.125 <sup>+0.10</sup> <sub>-0.05</sub> | 0.005 <sup>+0.004</sup> <sub>-0.002</sub> |
| L    | 0.5±0.15                                | 0.020 <sup>+0.006</sup> <sub>-0.007</sub> |
| M    | 0.21                                    | 0.009                                     |
| N    | 0.10                                    | 0.004                                     |

32 PIN PLASTIC TSOP (400mil)

NEC Cord:S32G5-50-7JD1

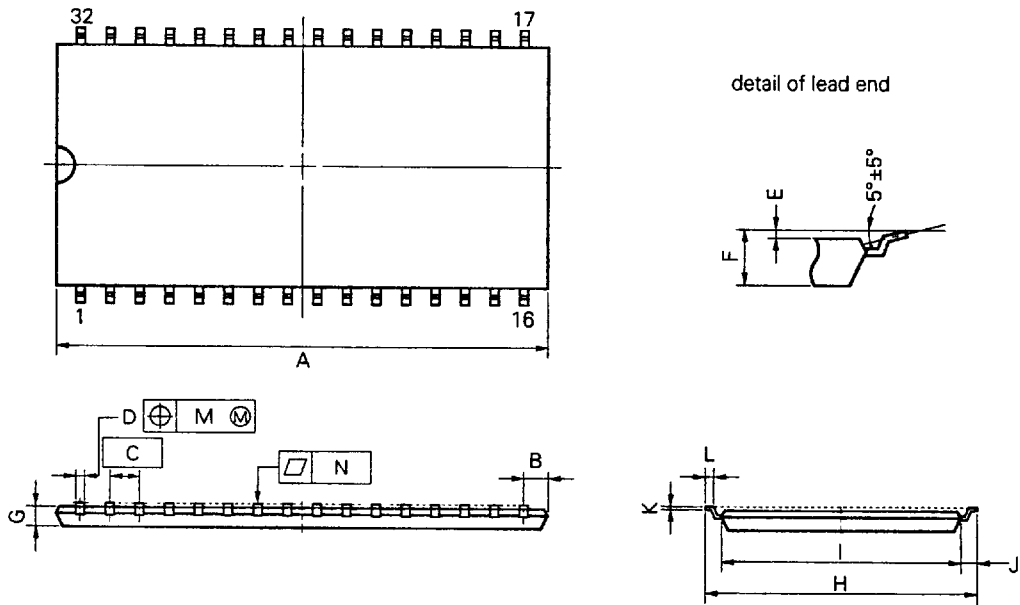


**NOTE**  
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

| S32G5-50-7JD1 |                                         |                                           |
|---------------|-----------------------------------------|-------------------------------------------|
| ITEM          | MILLIMETERS                             | INCHES                                    |
| A             | 21.17 MAX.                              | 0.834 MAX.                                |
| B             | 1.06 MAX.                               | 0.042 MAX.                                |
| C             | 1.27 (T.P.)                             | 0.050 (T.P.)                              |
| D             | 0.40±0.10                               | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| E             | 0.05±0.05                               | 0.002±0.002                               |
| F             | 1.1 MAX.                                | 0.044 MAX.                                |
| G             | 0.97                                    | 0.038                                     |
| H             | 11.76±0.2                               | 0.463±0.008                               |
| I             | 10.16±0.1                               | 0.400±0.004                               |
| J             | 0.8±0.2                                 | 0.031 <sup>+0.009</sup> <sub>-0.008</sub> |
| K             | 0.125 <sup>+0.10</sup> <sub>-0.05</sub> | 0.005 <sup>+0.004</sup> <sub>-0.002</sub> |
| L             | 0.5±0.15                                | 0.020 <sup>+0.006</sup> <sub>-0.007</sub> |
| M             | 0.21                                    | 0.009                                     |
| N             | 0.10                                    | 0.004                                     |

32 PIN PLASTIC TSOP (400mil)  
Reverse bent

NEC Cord:S32G5-50-7KD1



NOTE

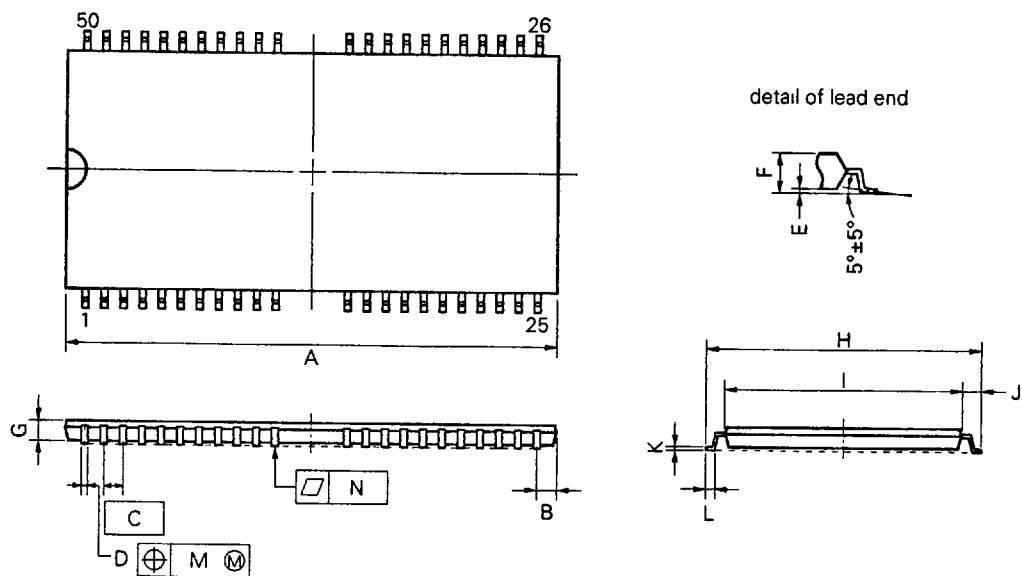
Each lead centerline is located within 0.21 mm (0.009 inch) of its true position (T.P.) at maximum material condition.

S32G5-50-7KD1

| ITEM | MILLIMETERS                             | INCHES                                    |
|------|-----------------------------------------|-------------------------------------------|
| A    | 21.17 MAX.                              | 0.834 MAX.                                |
| B    | 1.06 MAX.                               | 0.042 MAX.                                |
| C    | 1.27 (T.P.)                             | 0.050 (T.P.)                              |
| D    | 0.40±0.10                               | 0.016 <sup>+0.004</sup> <sub>-0.005</sub> |
| E    | 0.05±0.05                               | 0.002±0.002                               |
| F    | 1.1 MAX.                                | 0.044 MAX.                                |
| G    | 0.97                                    | 0.038                                     |
| H    | 11.76±0.2                               | 0.463±0.008                               |
| I    | 10.16±0.1                               | 0.400±0.004                               |
| J    | 0.8±0.2                                 | 0.031 <sup>+0.009</sup> <sub>-0.008</sub> |
| K    | 0.125 <sup>+0.10</sup> <sub>-0.05</sub> | 0.005 <sup>+0.004</sup> <sub>-0.002</sub> |
| L    | 0.5±0.15                                | 0.020 <sup>+0.006</sup> <sub>-0.007</sub> |
| M    | 0.21                                    | 0.009                                     |
| N    | 0.10                                    | 0.004                                     |

50 PIN PLASTIC TSOP (400mil)  
44 Leads

NEC Cord:S50G5-80-7JF



**NOTE**

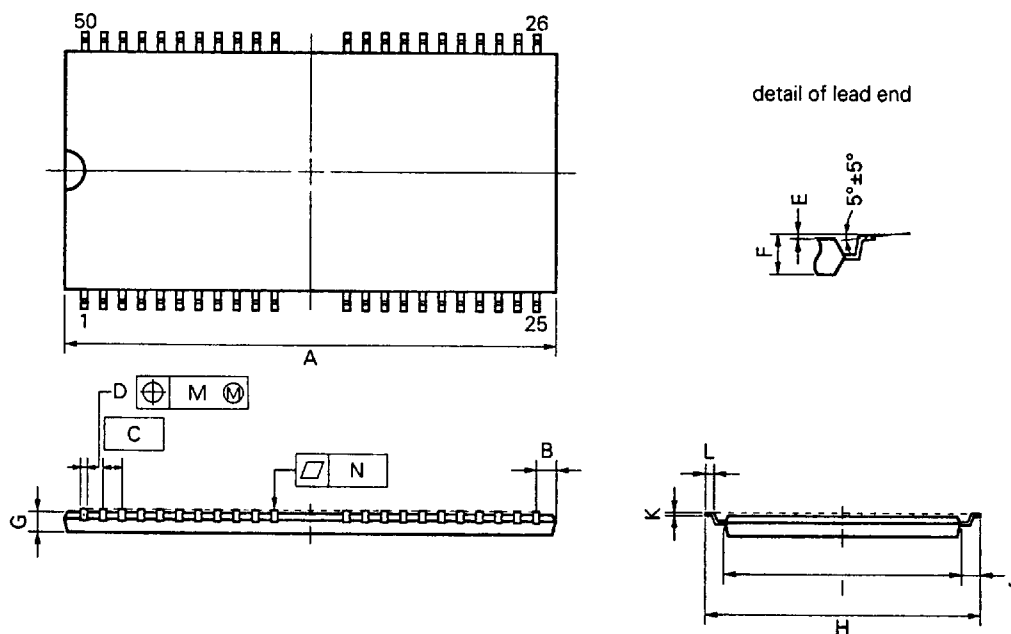
Each lead centerline is located within 0.13 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

S50G5-80-7JF

| ITEM | MILLIMETERS                             | INCHES                                    |
|------|-----------------------------------------|-------------------------------------------|
| A    | 21.45 MAX.                              | 0.845 MAX.                                |
| B    | 1.13 MAX.                               | 0.045 MAX.                                |
| C    | 0.8 (T.P.)                              | 0.031 (T.P.)                              |
| D    | 0.30±0.10                               | 0.012 <sup>+0.004</sup> <sub>-0.005</sub> |
| E    | 0.05±0.05                               | 0.002±0.002                               |
| F    | 1.1 MAX.                                | 0.044 MAX.                                |
| G    | 0.97                                    | 0.038                                     |
| H    | 11.76±0.2                               | 0.463±0.008                               |
| I    | 10.16±0.1                               | 0.400±0.004                               |
| J    | 0.8±0.2                                 | 0.031 <sup>+0.009</sup> <sub>-0.008</sub> |
| K    | 0.125 <sup>+0.10</sup> <sub>-0.05</sub> | 0.005 <sup>+0.004</sup> <sub>-0.002</sub> |
| L    | 0.5±0.15                                | 0.020 <sup>+0.006</sup> <sub>-0.007</sub> |
| M    | 0.13                                    | 0.005                                     |
| N    | 0.10                                    | 0.004                                     |

50 PIN PLASTIC TSOP (400mil)  
44 Leads Reverse bent

NEC Cord:S50G5-80-7KF



**NOTE**

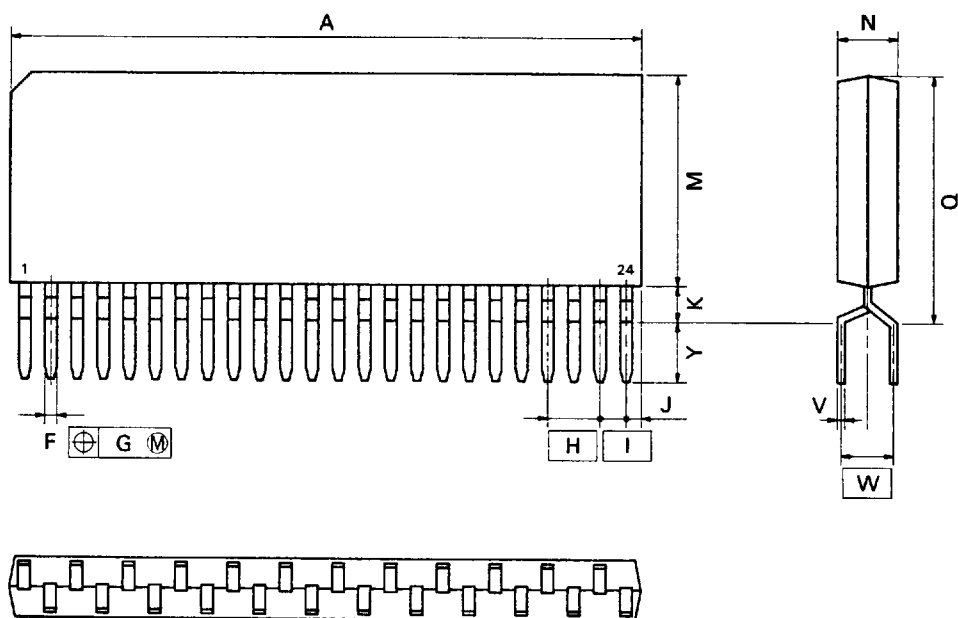
Each lead centerline is located within 0.13 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

S50G5-80-7KF

| ITEM | MILLIMETERS                             | INCHES                                    |
|------|-----------------------------------------|-------------------------------------------|
| A    | 21.45 MAX.                              | 0.845 MAX.                                |
| B    | 1.13 MAX.                               | 0.045 MAX.                                |
| C    | 0.8 (T.P.)                              | 0.031 (T.P.)                              |
| D    | 0.30±0.10                               | 0.012 <sup>+0.004</sup> <sub>-0.005</sub> |
| E    | 0.05±0.05                               | 0.002±0.002                               |
| F    | 1.1 MAX.                                | 0.044 MAX.                                |
| G    | 0.97                                    | 0.038                                     |
| H    | 11.76±0.2                               | 0.463±0.008                               |
| I    | 10.16±0.1                               | 0.400±0.004                               |
| J    | 0.8±0.2                                 | 0.031 <sup>+0.009</sup> <sub>-0.008</sub> |
| K    | 0.125 <sup>+0.10</sup> <sub>-0.05</sub> | 0.005 <sup>+0.004</sup> <sub>-0.002</sub> |
| L    | 0.5±0.15                                | 0.020 <sup>+0.006</sup> <sub>-0.007</sub> |
| M    | 0.13                                    | 0.005                                     |
| N    | 0.10                                    | 0.004                                     |

# 24 PIN PLASTIC ZIP (475mil)

NEC Cord:P24V-100-475A



P24V-100-475A

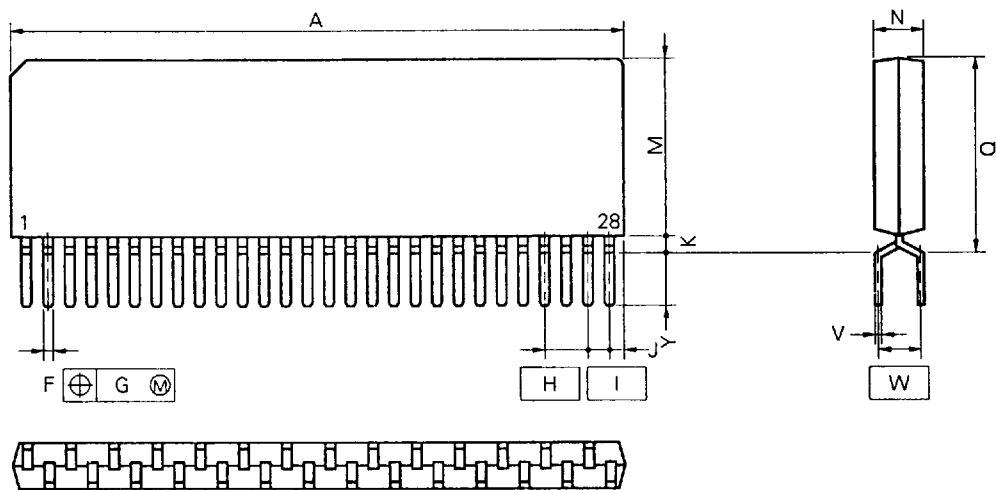
## NOTE

Each lead centerline is located within 0.25 mm (0.010 inch) of its true position (T.P.) at maximum material condition.

| ITEM | MILLIMETERS     | INCHES            |
|------|-----------------|-------------------|
| A    | 31.75 MAX.      | 1.250 MAX.        |
| F    | $0.50 \pm 0.1$  | $0.020 \pm 0.004$ |
| G    | $\phi 0.25$     | $\phi 0.010$      |
| H    | 2.54            | 0.100             |
| I    | 1.27            | 0.050             |
| J    | 1.27 MAX.       | 0.050 MAX.        |
| K    | 1.0 MIN.        | 0.039 MIN.        |
| M    | 10.8 MAX.       | 0.426 MAX.        |
| N    | $2.8 \pm 0.2$   | $0.110 \pm 0.008$ |
| Q    | 12.07 MAX.      | 0.476 MAX.        |
| V    | $0.25 \pm 0.10$ | $0.010 \pm 0.004$ |
| W    | 2.54            | 0.100             |
| Y    | $3.3 \pm 0.5$   | $0.130 \pm 0.02$  |

28 PIN PLASTIC ZIP (475mil)

NEC Cord:P28VF-100-475A

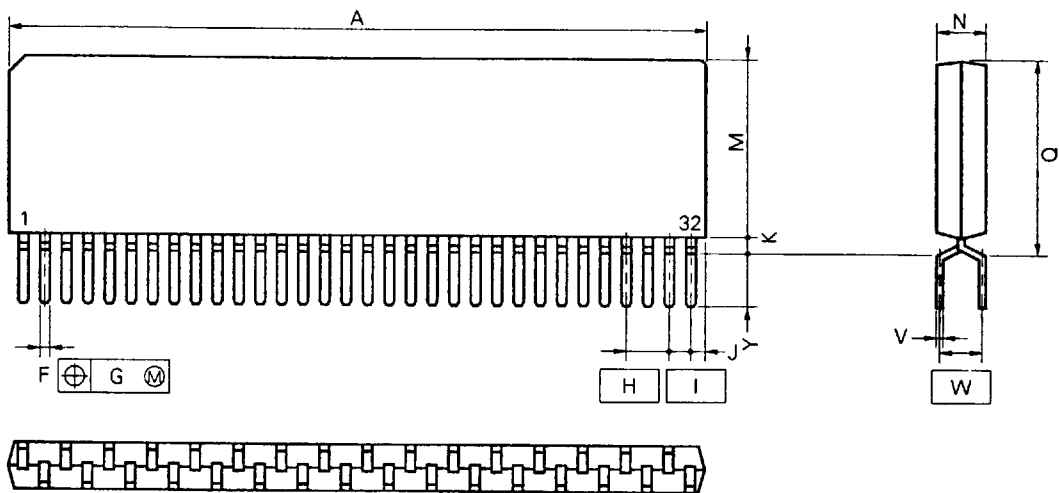


**NOTE**  
Each lead centerline is located within 0.25 mm (0.010 inch) of its true position (T.P.) at maximum material condition.

| P28VF-100-475A |                                        |                                           |
|----------------|----------------------------------------|-------------------------------------------|
| ITEM           | MILLIMETERS                            | INCHES                                    |
| A              | 36.83 MAX.                             | 1.450 MAX.                                |
| F              | 0.5±0.10                               | 0.020 <sup>+0.004</sup> <sub>-0.005</sub> |
| G              | 0.25                                   | 0.010                                     |
| H              | 2.54 (T.P.)                            | 0.100 (T.P.)                              |
| I              | 1.27 (T.P.)                            | 0.050 (T.P.)                              |
| J              | 1.27 MAX.                              | 0.050 MAX.                                |
| K              | 0.9 MIN.                               | 0.035 MIN.                                |
| M              | 10.8 MAX.                              | 0.426 MAX.                                |
| N              | 2.8±0.2                                | 0.110 <sup>+0.009</sup> <sub>-0.008</sub> |
| Q              | 12.07 MAX.                             | 0.475 MAX.                                |
| V              | 0.25 <sup>+0.10</sup> <sub>-0.05</sub> | 0.010 <sup>+0.004</sup> <sub>-0.003</sub> |
| W              | 2.54 (T.P.)                            | 0.100 (T.P.)                              |
| Y              | 3.25±0.2                               | 0.128±0.008                               |

32 PIN PLASTIC ZIP (475mil)

NEC Cord:P32VF-100-475A



**NOTE**  
Each lead centerline is located within 0.25 mm (0.010 inch) of its true position (T.P.) at maximum material condition.

| P32VF-100-475A |                                        |                                           |
|----------------|----------------------------------------|-------------------------------------------|
| ITEM           | MILLIMETERS                            | INCHES                                    |
| A              | 41.91 MAX.                             | 1.650 MAX                                 |
| F              | 0.5±0.10                               | 0.020 <sup>+0.004</sup> <sub>-0.005</sub> |
| G              | 0.25                                   | 0.010                                     |
| H              | 2.54 (T.P.)                            | 0.100 (T.P.)                              |
| I              | 1.27 (T.P.)                            | 0.050 (T.P.)                              |
| J              | 1.27 MAX.                              | 0.050 MAX.                                |
| K              | 0.9 MIN.                               | 0.035 MIN.                                |
| M              | 10.8 MAX.                              | 0.426 MAX.                                |
| N              | 2.8±0.2                                | 0.110 <sup>+0.009</sup> <sub>-0.008</sub> |
| Q              | 12.07 MAX.                             | 0.475 MAX.                                |
| V              | 0.25 <sup>+0.10</sup> <sub>-0.05</sub> | 0.010 <sup>+0.004</sup> <sub>-0.003</sub> |
| W              | 2.54 (T.P.)                            | 0.100 (T.P.)                              |
| Y              | 3.25±0.2                               | 0.128±0.008                               |