

MB84256C-70/-70L/-70LL/-10/-10L/-10LL

CMOS 256K-BIT LOW POWER SRAM

32,768 WORD x 8-BIT CMOS STATIC RANDOM ACCESS MEMORY WITH DATA RETENTION

The Fujitsu MB84256C is a 32,768-word by 8-bit static random access memory fabricated with a CMOS silicon gate process. The memory utilizes asynchronous circuitry and may be maintained in any state for an indefinite period of time. All pins are TTL compatible, and a single +5V power supply is required.

The MB84256C is ideally suited for use in microprocessor systems and other applications where fast access time and ease of use are required. All devices offer the advantages of low power dissipation, low cost and high performance.

- Organization: 32,768 x 8 bits
- Fast access time: 70 ns max. (MB84256C-70/-70L/-70LL)
100 ns max. (MB84256C-10/-10L/-10LL)
- Completely static operation: No clock required
- TTL compatible inputs/outputs
- Three state outputs
- Single +5V power supply, $\pm 10\%$ tolerance
- Low power standby:

CMOS level: 5.5 mW max. (MB84256C-70/-10)
0.55 mW max. (MB84256C-70L/-70LL/-10L/-10LL)

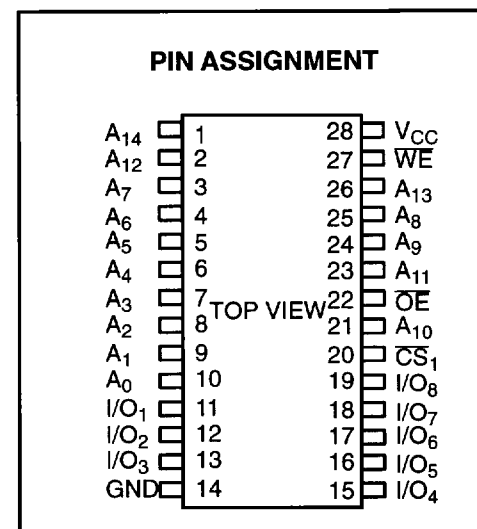
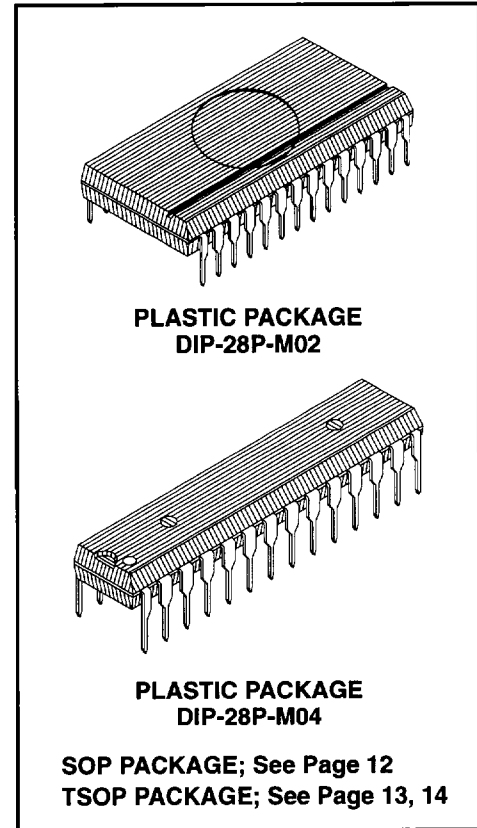
TTL level: 16.5 mW max. (MB84256C-70/-70L/-70LL/-10/-10L/-10LL)

- Data retention: 2.0V min.
- Standard 28-pin Plastic Packages:
 - DIP (600mil) MB84256C-xx(L/LL)P
 - Skinny DIP (300 mil) MB84256C-xx(L/LL)P-SK
 - SOP MB84256C-xx(L/LL)PF
 - TSOP (normal bend) MB84256C-xx(L/LL)PFTN
 - TSOP (reverse bend) MB84256C-xx(L/LL)PFTR

ABSOLUTE MAXIMUM RATINGS (see NOTE)

| Rating | Symbol | Value | Unit |
|------------------------|------------|------------------------|-------------|
| Supply Voltage | V_{CC} | -0.5 to +7.0 | V |
| Input Voltage | V_{IN} | -0.5 to $V_{CC} + 0.5$ | V |
| Output Voltage | $V_{I/O}$ | -0.5 to $V_{CC} + 0.5$ | V |
| Temperature Under Bias | T_{BIAS} | -10 to +85 | $^{\circ}C$ |
| Storage Temperature | T_{STG} | -40 to +125 | $^{\circ}C$ |

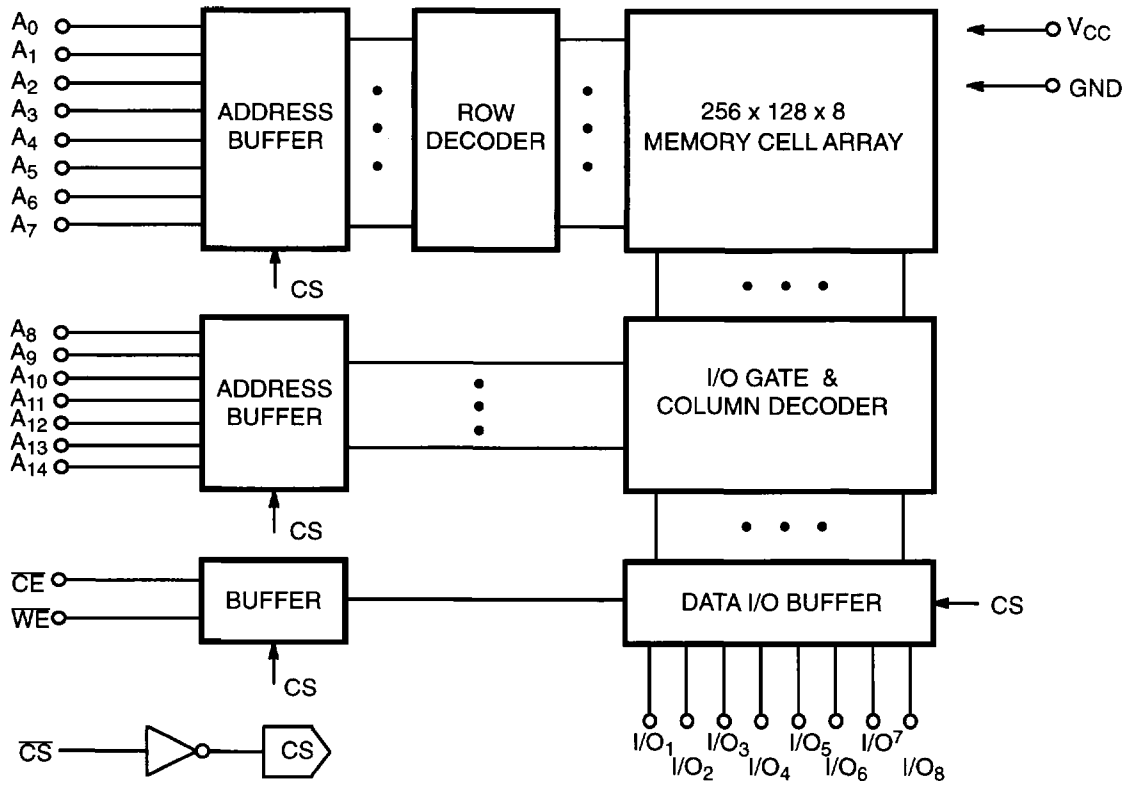
NOTE: Permanent device damage may occur if the above **Absolute Maximum Ratings** are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

MB84256C-70/-70L/-70LL
MB84256C-10/-10L/-10LL

Fig. 1 – MB84256C BLOCK DIAGRAM



TRUTH TABLE

| \overline{CS} | \overline{OE} | \overline{WE} | MODE | SUPPLY CURRENT | I/O PIN |
|-----------------|-----------------|-----------------|-------------------|----------------|-----------|
| H | X | X | Not Selected | I_{SB} | High-Z |
| L | H | H | D_{OUT} Disable | I_{CC} | High-Z |
| L | L | H | Read | I_{CC} | D_{OUT} |
| L | X | L | Write | I_{CC} | D_{IN} |

CAPACITANCE ($T_A = 25^\circ C, f = 1MHz$)

| Parameter | Symbol | Min | Typ | Max | Unit |
|-------------------------------------|-----------|-----|-----|-----|------|
| I/O Capacitance ($V_{I/O} = 0V$) | $C_{I/O}$ | — | — | 8 | pF |
| Input Capacitance ($V_{IN} = 0V$) | C_{IN} | — | — | 7 | pF |

RECOMMENDED OPERATING CONDITION

(Referenced to GND)

| Parameter | Symbol | Min | Typ | Max | Unit |
|---------------------|----------|-----|-----|-----|------|
| Supply Voltage | V_{CC} | 4.5 | 5.0 | 5.5 | V |
| Ambient Temperature | T_A | 0 | — | +70 | °C |

DC CHARACTERISTICS

(Recommended operating conditions otherwise noted.)

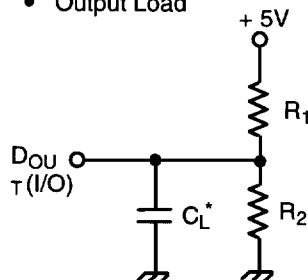
| Parameter | Symbol | Test Condition | MB84256C-70/-10 | | MB84256C-70L/-70LL/-10L/-10LL | | Unit |
|--------------------------|-----------|---|-----------------|----------------|-------------------------------|----------------|---------|
| | | | Min | Max | Min | Max | |
| Standby Supply Current | I_{SB1} | $\overline{CS} \geq V_{CC}-0.2V$ | — | 1 | — | 0.1 | mA |
| | I_{SB2} | $\overline{CS} = V_{IH}$ | — | 3 | — | 3 | mA |
| Active Supply Current | I_{CC1} | $V_{IN} = V_{IH} \text{ or } V_{IL},$ $\overline{CS} = V_{IL}, I_{OUT} = 0mA$ | — | 10 | — | 10 | mA |
| Operating Supply Current | I_{CC2} | Cycle = Min, Duty = 100% $I_{OUT} = 0mA$ | — | 60 | — | 60 | mA |
| | I_{CC3} | Cycle = 1 μ s, Duty = 100% $I_{OUT} = 0mA$ | — | 15 | — | 15 | mA |
| Input Leakage Current | I_{LI} | $V_{IN} = 0V \text{ to } V_{CC}$ | -1 | 1 | -1 | 1 | μ A |
| Output Leakage Current | $I_{L/O}$ | $V_{I/O} = 0V \text{ to } V_{CC}$ $\overline{CS} = V_{IH} \text{ or } \overline{OE} = V_{IH} \text{ or}$ $\overline{WE} = V_{IL}$ | -1 | 1 | -1 | 1 | μ A |
| Input High Voltage | V_{IH} | — | 2.2 | $V_{CC} + 0.3$ | 2.2 | $V_{CC} + 0.3$ | V |
| Input Low Voltage | V_{IL} | — | -3.0 * | 0.8 | -3.0 * | 0.8 | V |
| Output High Voltage | V_{OH} | $I_{OH} = -1.0mA$ | 2.4 | — | 2.4 | — | V |
| Output Low Voltage | V_{OL} | $I_{OL} = 2.1mA$ | — | 0.4 | — | 0.4 | V |

Note: All voltages are referenced to GND.

*: -3.0V min. for pulse width less than 20 ns. (V_{IL} min. = -0.3V at DC level.)

Fig. 2 – AC TEST CONDITIONS

• Output Load



- Input Pulse Levels: 0.6V to 2.4V
- Input Pulse Rise & Fall Times: 5ns (Transient between 0.8V and 2.2V)
- Timing Reference Levels: Input: $V_{IL}=0.8V, V_{IH}=2.2V$
Output: $V_{OL}=0.8V, V_{OH}=2.0V$

* Including Jig and stray capacitance

| | R_1 | R_2 | C_L | Parameters Measured |
|---------|---------------|--------------|-------|--|
| Load I | 1.8K Ω | 990 Ω | 100pF | except $t_{CLZ}, t_{CHZ}, t_{WLZ}, t_{OLZ}, t_{OHZ}$ and t_{WHZ} |
| Load II | 1.8K Ω | 990 Ω | 5pF | $t_{CLZ}, t_{CHZ}, t_{WLZ}, t_{OLZ}, t_{OHZ}$ and t_{WHZ} |

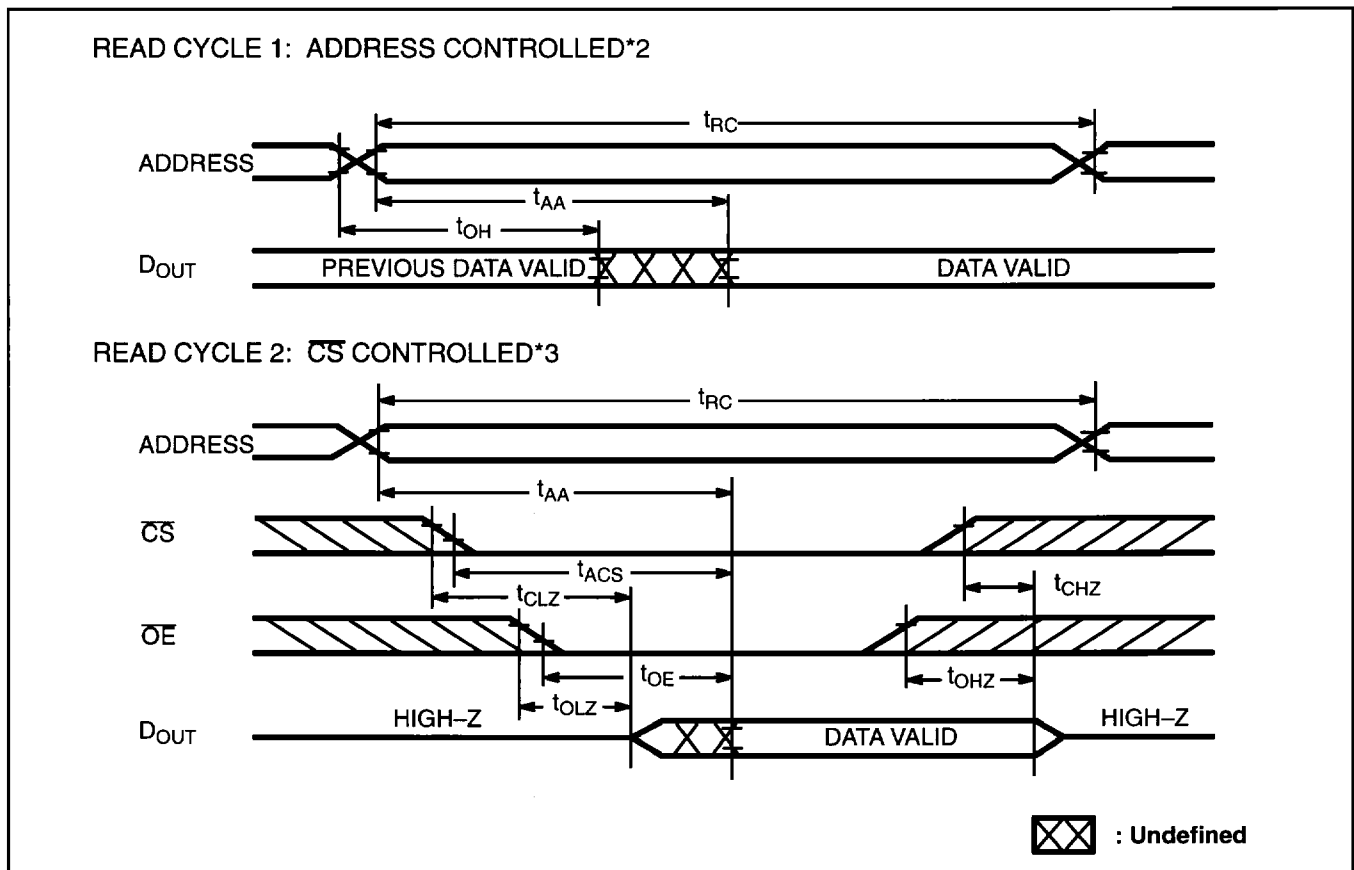
AC CHARACTERISTICS

(Recommended operating conditions otherwise noted.)

READ CYCLE *1

| Parameter | Symbol | MB84256C-70/-70L/-70LL | | MB84256C-10/-10L/-10LL | | Unit |
|-----------------------------------|-----------|------------------------|-----|------------------------|-----|------|
| | | Min | Max | Min | Max | |
| Read Cycle Time | t_{RC} | 70 | — | 100 | — | ns |
| Address Access Time *2 | t_{AA} | — | 70 | — | 100 | ns |
| \overline{CS} 1 Access Time *3 | t_{ACS} | — | 70 | — | 100 | ns |
| Output Enable to Output Valid | t_{OE} | — | 35 | — | 40 | ns |
| Output Hold from Address Change | t_{OH} | 20 | — | 20 | — | ns |
| Chip Select to Output Low-Z *4 | t_{CLZ} | 10 | — | 10 | — | ns |
| Output Enable to Output Low-Z *4 | t_{OLZ} | 5 | — | 5 | — | — |
| Chip Select to Output High-Z *4 | t_{CHZ} | — | 25 | — | 40 | ns |
| Output Enable to Output High-Z *4 | t_{OHZ} | — | 25 | — | 40 | — |

READ CYCLE TIMING DIAGRAM *1



Note: *1 \overline{WE} is high for Read cycle.

*2 Device is continuously selected, $\overline{CS} = \overline{OE} = V_{IL}$.

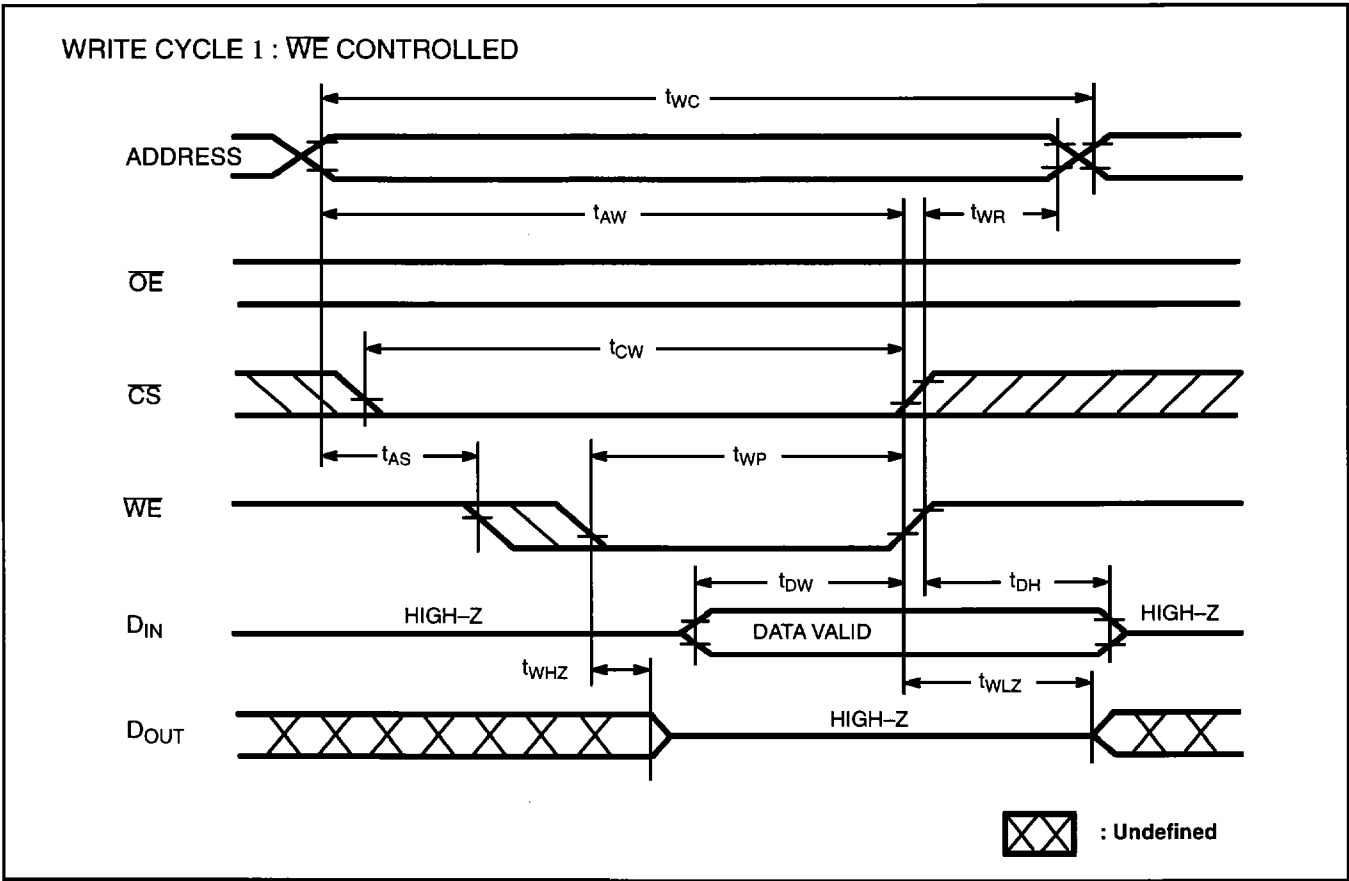
*3 Address valid prior to or coincident with \overline{CS} transition low.

*4 Transition is measured at the point of $\pm 500mV$ from steady state voltage with specified Load II in Fig. 2.

WRITE CYCLE *1*2

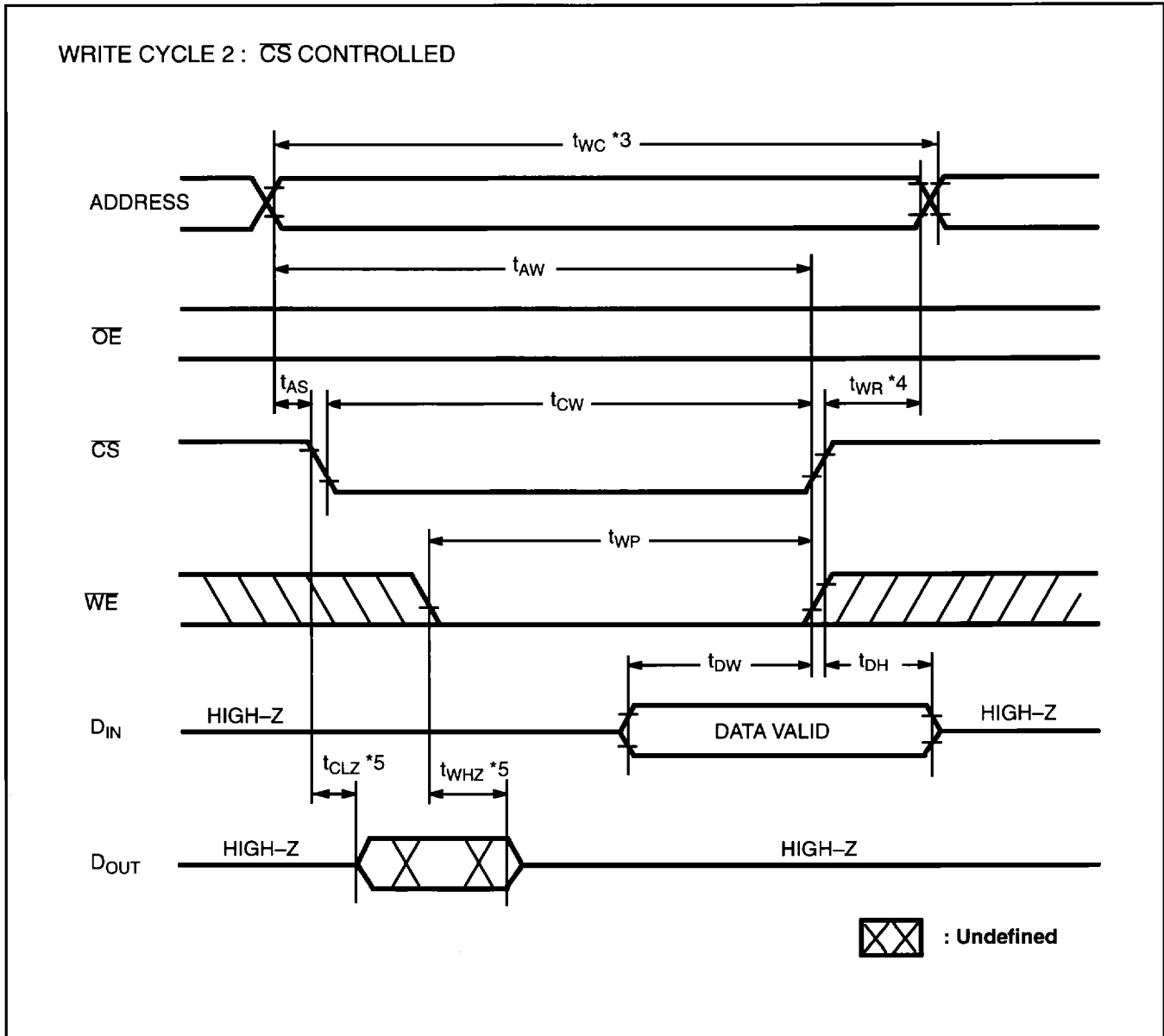
| Parameter | Symbol | MB84256C-70/-70L/-70LL | | MB84256C-10/-10L/-10LL | | Unit |
|-------------------------------|-----------|------------------------|-----|------------------------|-----|------|
| | | Min | Max | Min | Max | |
| Write Cycle Time *3 | t_{WC} | 70 | — | 100 | — | ns |
| Address Valid to End of Write | t_{AW} | 50 | — | 80 | — | ns |
| Chip Select to End of Write | t_{CW} | 50 | — | 80 | — | ns |
| Data Valid to End of Write | t_{DW} | 25 | — | 40 | — | ns |
| Data Hold Time | t_{DH} | 0 | — | 0 | — | ns |
| Write Pulse Width | t_{WP} | 50 | — | 60 | — | ns |
| Address Setup Time | t_{AS} | 0 | — | 0 | — | ns |
| Write Recovery Time *4 | t_{WR} | 0 | — | 0 | — | ns |
| WE to Output Low-Z *5 | t_{WLZ} | 5 | — | 5 | — | ns |
| WE to Output High-Z *5 | t_{WHZ} | — | 25 | — | 40 | ns |

WRITE CYCLE TIMING DIAGRAM *1 *2



Note: *1 If OE, CS are in the READ Mode during this period, I/O pins are in the output state so that the input signals of opposite phase to the outputs must not be applied.
 *2 If CS goes high simultaneously with WE high, the output remains in high impedance state.
 *3 All write cycle are determined from last address transition to the first address transition of the next address.
 *4 t_{WR} is defined from the end point of WRITE Mode..
 *5 Transition is measured at the point of $\pm 500mV$ from steady state voltage with specified Load I in Fig. 2.

WRITE CYCLE TIMING DIAGRAM *1 *2



Note: *1 If \overline{OE} , \overline{CS} are in the READ Mode during this period, I/O pins are in the output state so that the input signals of opposite phase to the outputs must not be applied.

*2 If \overline{CS} goes high simultaneously with \overline{WE} high, the output remains in high impedance state.

*3 All write cycle are determined from last address transition to the first address transition of the next address.

*4 t_{WR} is defined from the end point of WRITE Mode..

*5 Transition is measured at the point of $\pm 500\text{mV}$ from steady state voltage with specified Load II in Fig. 2.

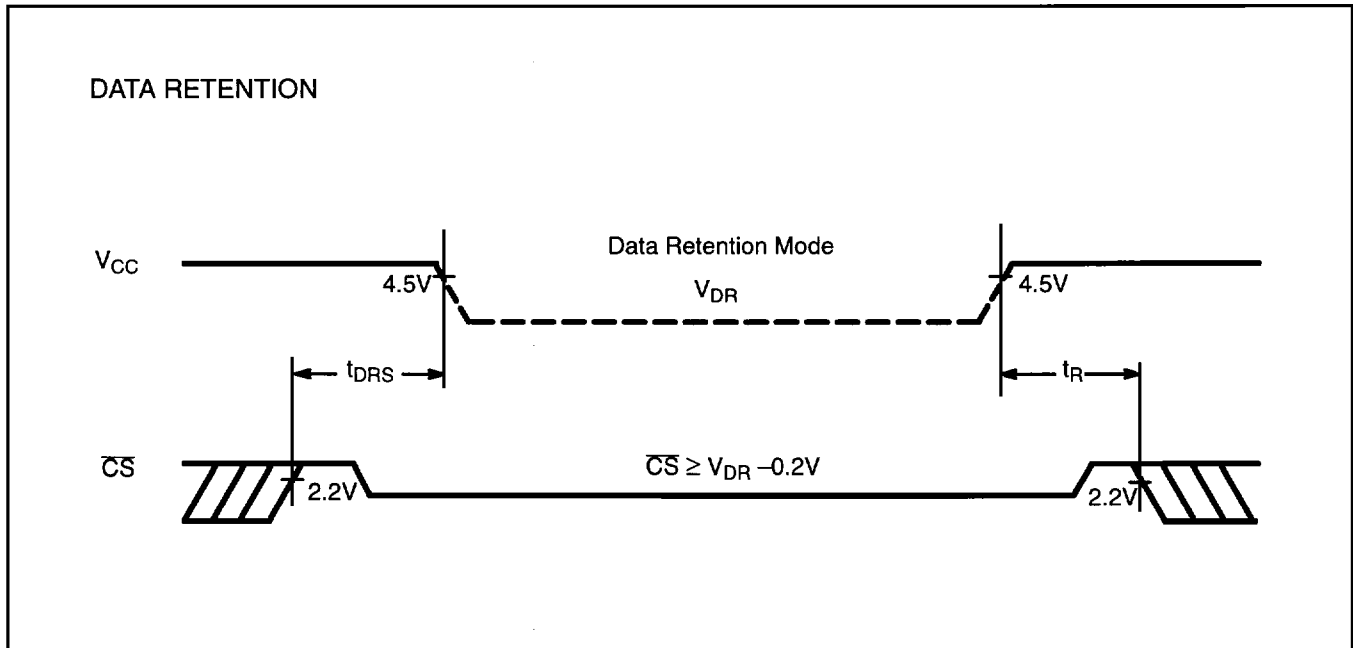
DATA RETENTION CHARACTERISTICS

(Recommended operating conditions otherwise noted.)

| Parameter | | Symbol | Min | Typ | Max | Unit |
|----------------------------------|------------|-----------|----------|-----|-------|---------------|
| Data Retention Supply Voltage *1 | | V_{DR} | 2.0 | — | 5.5 | V |
| Data Retention Supply Current *2 | Standard | I_{DR} | — | — | 1.0 | mA |
| | L-Version | | — | 1.0 | 50 | μA |
| | LL-Version | | — | 1.0 | 50 *3 | |
| Data Retention Setup Time | | t_{DRS} | 0 | — | — | ns |
| Operation Recovery Time | | t_R | t_{RC} | — | — | ns |

- Note:** *1 $\overline{CS} \geq V_{DR} - 0.2\text{V}$
 *2 $V_{DR} = 3.0\text{V}$, $\overline{CS} \geq V_{DR} - 0.2\text{V}$
 *3 $I_{DR} = 5 \mu\text{A}$ max. at $V_{DR} = 3.0\text{V}$, $T_A = 40^\circ\text{C}$

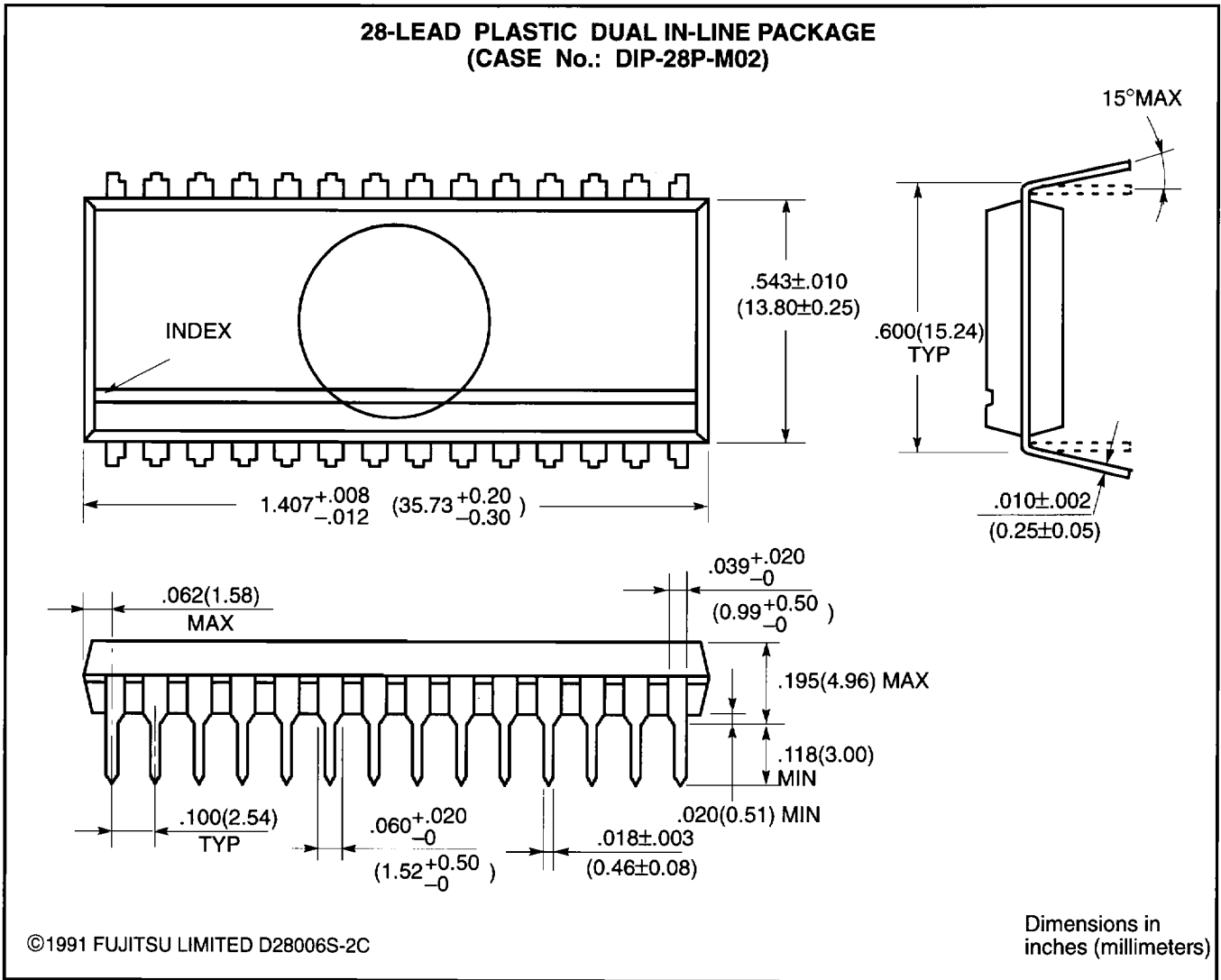
DATA RETENTION TIMING



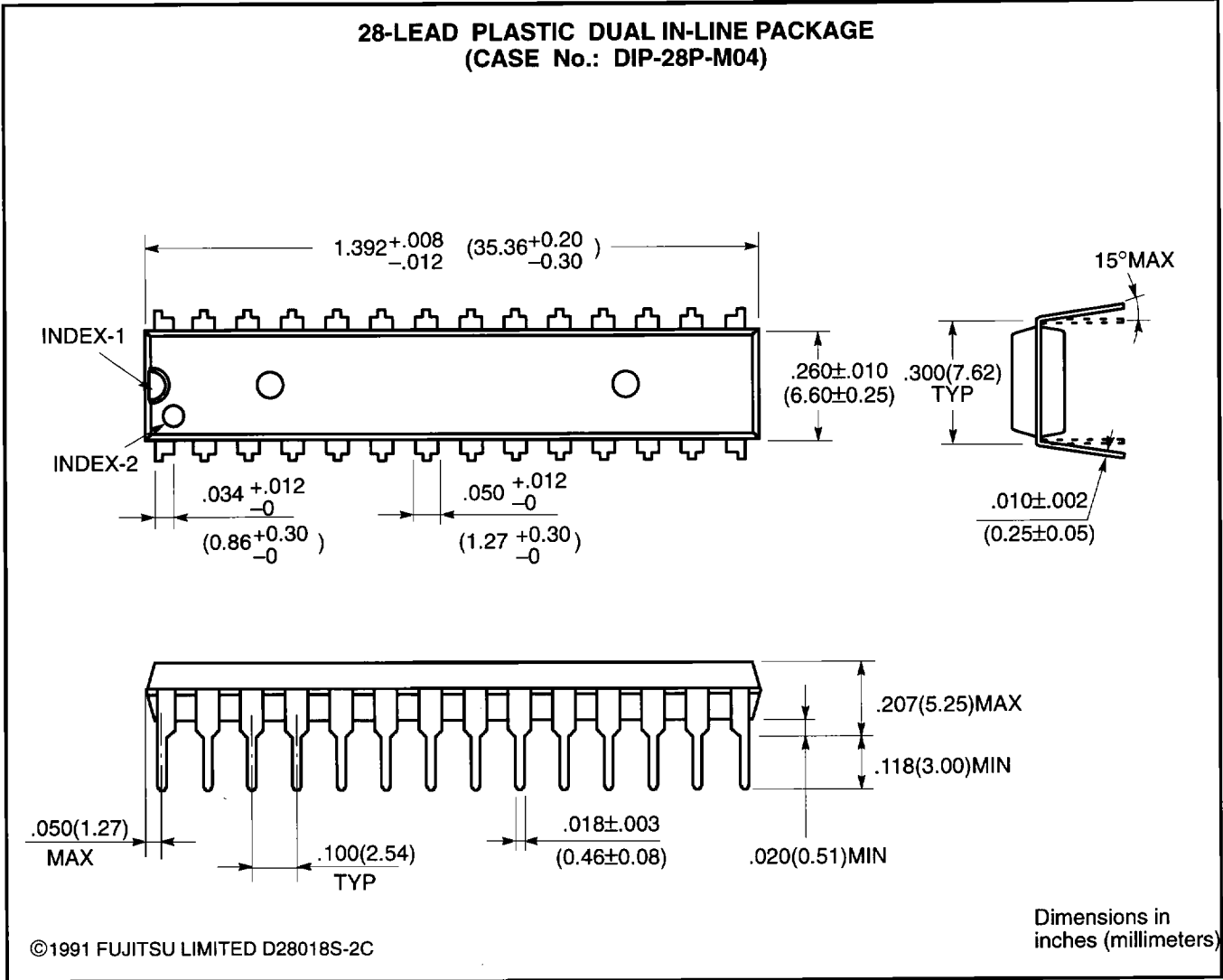
MB84256C-70/-70L/-70LL
 MB84256C-10/-10L/-10LL

PACKAGE DIMENSIONS

(Suffix: P)



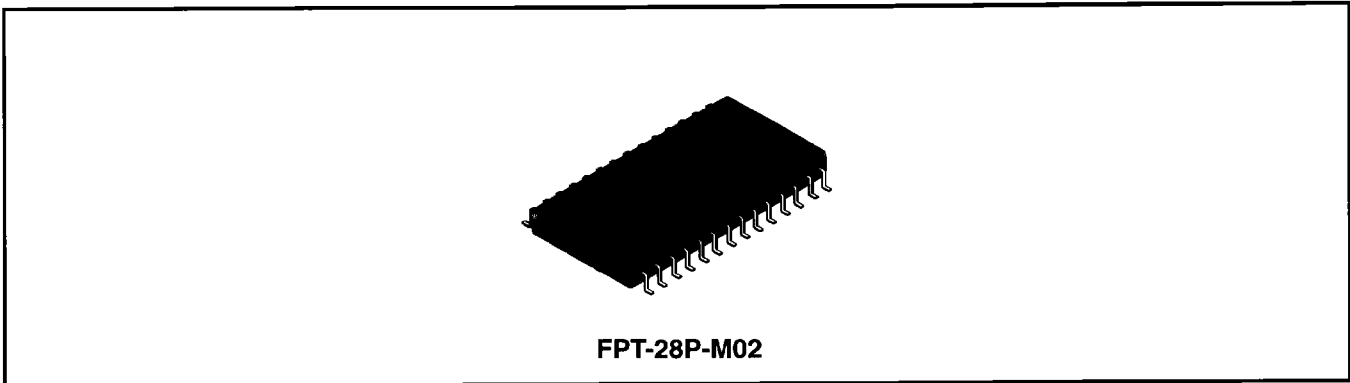
PACKAGE DIMENSIONS (Continued)
 (Suffix: P-SK)



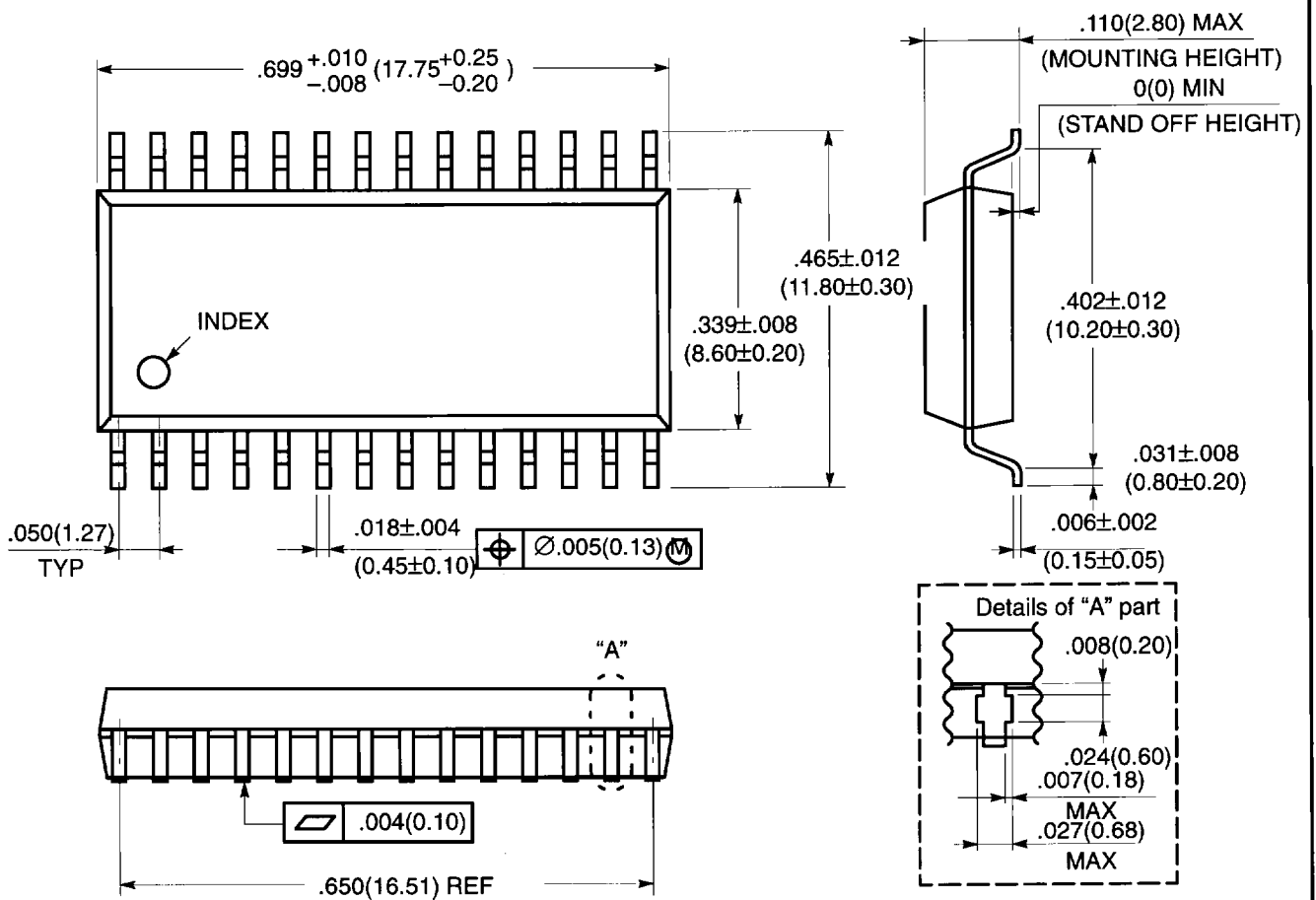
MB84256C-70/-70L/-70LL
 MB84256C-10/-10L/-10LL

PACKAGE DIMENSIONS (Continued)

(Suffix: PF)



28-LEAD PLASTIC FLAT PACKAGE (CASE No.: FPT-28P-M02)

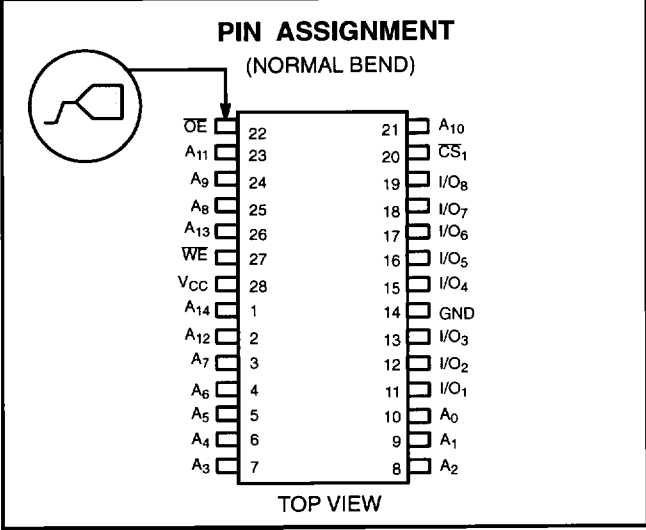
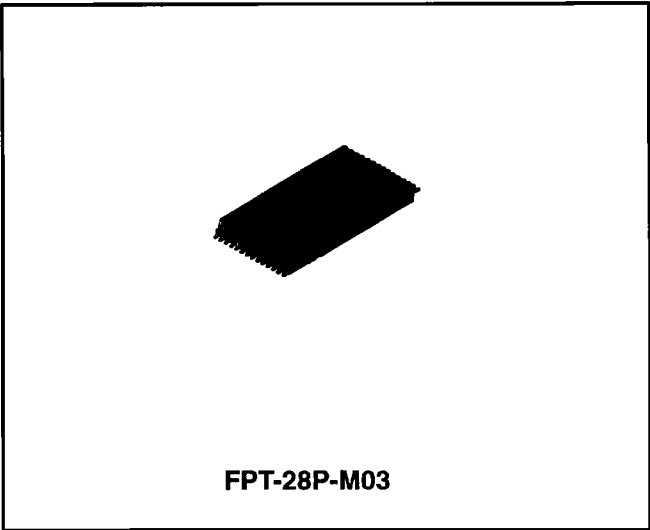


Dimensions in inches (millimeters)

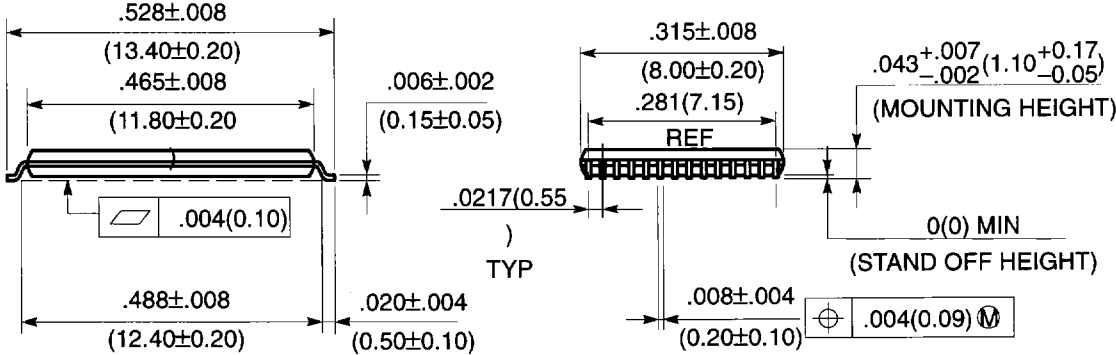
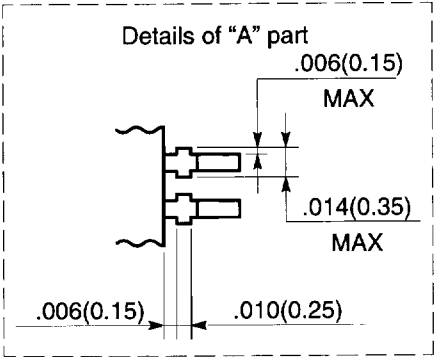
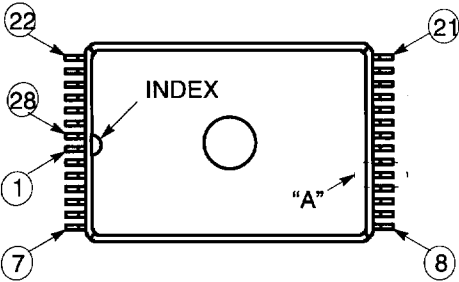
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PACKAGE DIMENSIONS (Continued)

(Suffix: PFTN)



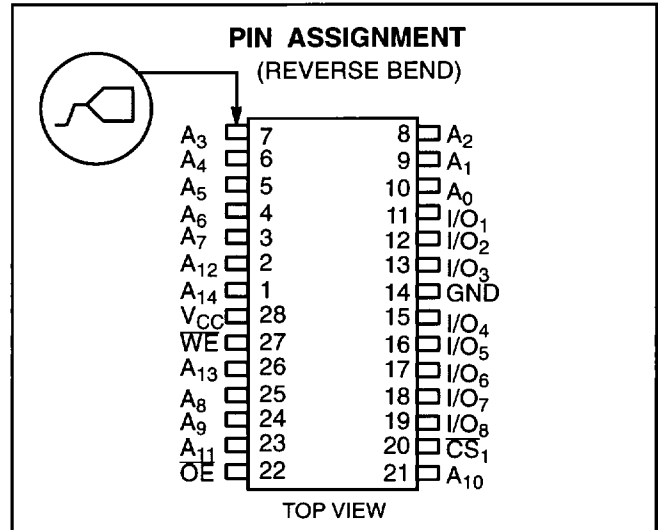
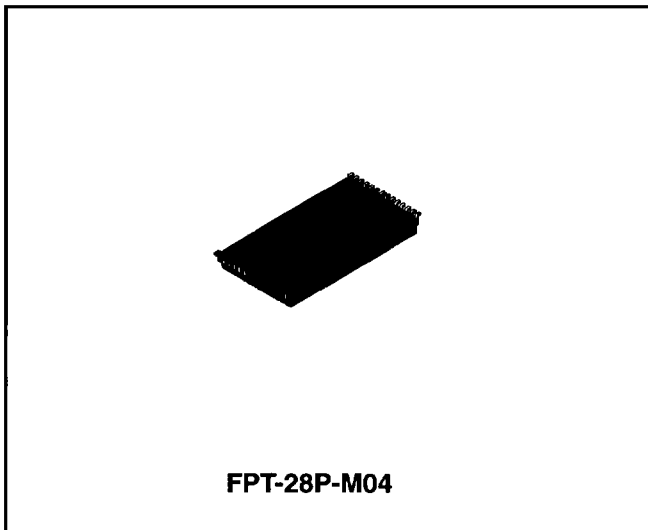
28-LEAD PLASTIC FLAT PACKAGE (CASE No.: FPT-28P-M03)



Dimensions in inches (millimeters)

PACKAGE DIMENSIONS (Continued)

(Suffix: PFTR)



28-LEAD PLASTIC FLAT PACKAGE (CASE No.: FPT-28P-M04)

