

September 1989  
Edition 2.1

FUJITSU

DATA SHEET

**MB3773****POWER SUPPLY MONITOR WITH WATCH-DOG TIMER****POWER SUPPLY MONITOR WITH WATCH-DOG TIMER**

The Fujitsu MB3773 is designed to monitor the voltage level of a power supply (+5 V or an arbitrary voltage) in a microprocessor circuit, memory board in a large-size computer, for example. The MB3773 also contains a watch-dog timer function to detect uncontrol. Table status of processor and reset system/processor.

If the circuit's power supply deviates more than a specified amount, then the MB3773 generates a reset signal to the microprocessor. Thus, the computer data is protected from accidental erasure.

When the MB3773 does not receive the clock pulse from the processor in the specified period, the MB3773 generates a reset signal to the microprocessor.

Using the MB3773 requires few external components. To monitor only a +5 volt supply, the MB3773 requires the connection of one external capacitor.

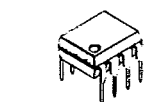
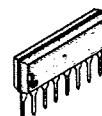
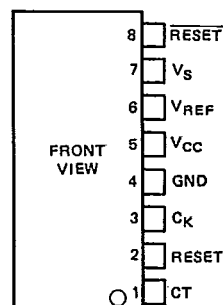
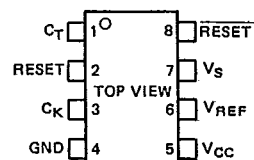
The MB3773 is available in an 8-pin Dual In-Line package space saving Flat Package, or a Single In-Line Package.

- Precision voltage detection ( $V_S = 4.2 \text{ V} \pm 2.5\%$ )
- Threshold level with hysteresis
- Low voltage output for reset signal ( $V_{CC} = 0.8 \text{ V typ.}$ )
- Precision reference voltage output ( $V_{REF} = 1.245 \text{ V} \pm 1.5\%$ )
- External clock monitor and reset signal generator
- Negative-edge input watch-dog timer
- Minimal number of external components (one capacitor min.)
- Available in a variety of packages
  - 8-pin Dual In-Line Package
  - 8-pin Flat Package
  - 8-pin Single In-Line Package

**ABSOLUTE MAXIMUM RATINGS**

| Rating                                            | Symbol    | Value                             | Unit             |
|---------------------------------------------------|-----------|-----------------------------------|------------------|
| Supply Voltage                                    | $V_{CC}$  | -0.3 to +18                       | V                |
| Input Voltage                                     | $V_S$     | -0.3 to $V_{CC} + 0.3 (\leq +18)$ | V                |
|                                                   | $V_{CK}$  | -0.3 to +18                       | V                |
| RESET, RESET Supply Voltage                       | $V_{OH}$  | -0.3 to $V_{CC} + 0.3 (\leq 18)$  | V                |
| Power Dissipation ( $T_A \leq 85^\circ\text{C}$ ) | $P_D$     | 200                               | mW               |
| Storage Temperature                               | $T_{STG}$ | -55 to +125                       | $^\circ\text{C}$ |

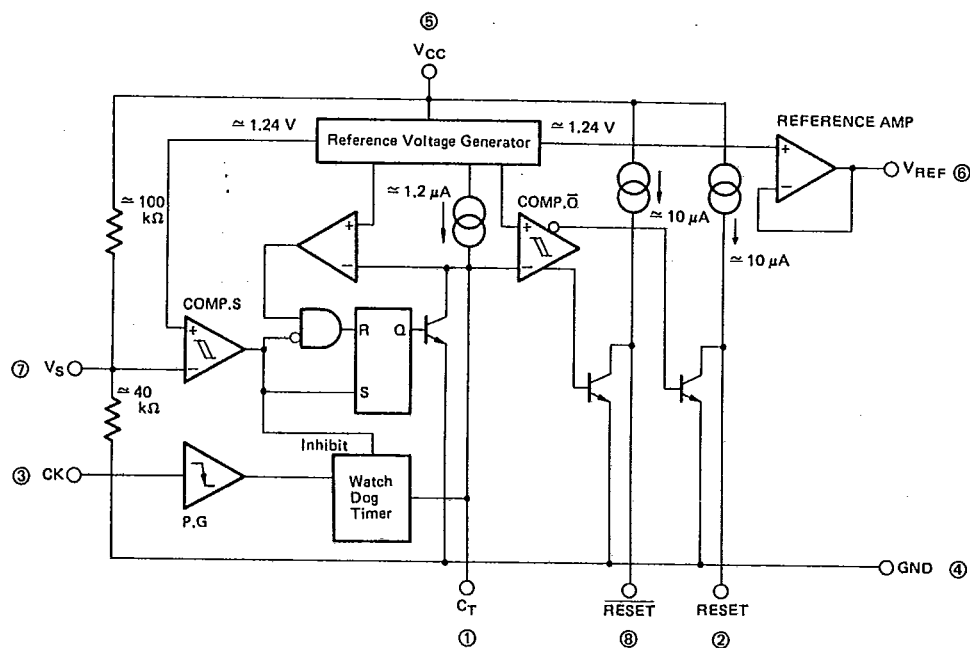
**NOTE:** Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

PLASTIC PACKAGE  
DIP-08P-M01PLASTIC PACKAGE  
FPT-08P-M01PLASTIC PACKAGE  
SIP-08P-M03**PIN ASSIGNMENT**

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.

## MB3773

Fig. 1 - MB3773 BLOCK DIAGRAM

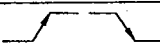


## RECOMMENDED OPERATING CONDITIONS

| Parameter                     | Symbol           | Value       | Unit        |
|-------------------------------|------------------|-------------|-------------|
| Supply Voltage                | $V_{CC}$         | +3.5 to +16 | V           |
| Reset, Reset Sink Current     | $I_{OL}$         | 0 to 20     | mA          |
| $V_{REF}$ Output Current      | $I_{OUT}$        | -200 to +5  | mA          |
| Watch Clock Setting Time      | $t_{WD}$         | 0.1 to 1000 | ms          |
| Rising/Falling Time           | $t_{FC}, t_{RC}$ | <100        | $\mu s$     |
| Terminal Capacitance          | $C_T$            | 0.001 to 10 | $\mu F$     |
| Operating Ambient Temperature | $T_A$            | -40 to +85  | $^{\circ}C$ |

## ELECTORICAL CHARACTERISTICS

## (1) DC CHARACTERISTICS

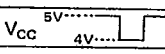
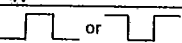
| Parameter                                    | Condition                                                                                  | Symbol            | Value |       |       | Unit    |
|----------------------------------------------|--------------------------------------------------------------------------------------------|-------------------|-------|-------|-------|---------|
|                                              |                                                                                            |                   | Min   | Typ   | Max   |         |
| Supply Current                               | Watch dog timer operating                                                                  | $I_{CC}$          |       | 600   | 900   | $\mu A$ |
| Detection Voltage                            | $V_{CC}$  | $V_{SL}$          | 4.10  | 4.20  | 4.30  | V       |
|                                              | $T_A = -40^{\circ}C$ to $+85^{\circ}C$                                                     |                   | 4.05  | 4.20  | 4.35  |         |
|                                              | $V_{CC}$  | $V_{SH}$          | 4.20  | 4.30  | 4.40  |         |
|                                              | $T_A = -40^{\circ}C$ to $+85^{\circ}C$                                                     |                   | 4.15  | 4.30  | 4.45  |         |
| Hysteresis Width                             | $V_{CC}$  | $V_{HYS}$         | 50    | 100   | 150   | mV      |
| Reference Voltage                            |                                                                                            | $V_{REF}$         | 1.227 | 1.245 | 1.263 | V       |
|                                              | $T_A = -40^{\circ}C$ to $+85^{\circ}C$                                                     |                   | 1.215 | 1.245 | 1.275 |         |
| Reference Voltage Change Rate                | $V_{CC} = 3.5V$ to $16V$                                                                   | $\Delta V_{REF1}$ |       | 3     | 10    | mV      |
| Reference Voltage Output Loading Change Rate | $I_{OUT} = -200\mu A$ to $+5\mu A$                                                         | $\Delta V_{REF2}$ | -5    |       | +5    | mV      |
| CK Threshold Voltage                         | $T_A = -40^{\circ}C$ to $+85^{\circ}C$                                                     | $V_{TH}$          | 0.8   | 1.25  | 2.0   | V       |
| CK Input Current                             | $V_{CK} = 5.0V$                                                                            | $I_{IH}$          |       | 0     | 1.0   | $\mu A$ |
|                                              | $V_{CK} = 0.0V$                                                                            | $I_{IL}$          | -1.0  | -0.1  |       |         |
| $C_T$ Open Current                           | Watch Dog Timer Operating<br>$V_{CT} = 1.0V$                                               | $I_{CTD}$         | 7     | 10    | 14    | $\mu A$ |
| High Level Output Voltage                    | $V_S$ open, $I_{RESET} = -5\mu A$                                                          | $V_{OH1}$         | 4.5   | 4.9   |       | V       |
|                                              | $V_S = 0V$ , $I_{RESET} = -5\mu A$                                                         | $V_{OH2}$         | 4.5   | 4.9   |       |         |
| Output Saturation Voltage                    | $V_S = 0V$ , $I_{RESET} = 3mA$                                                             | $V_{OL1}$         |       | 0.2   | 0.4   | V       |
|                                              | $V_S = 0V$ , $I_{RESET} = 10mA$                                                            | $V_{OL2}$         |       | 0.3   | 0.5   |         |
|                                              | $V_S$ open, $I_{RESET} = 3mA$                                                              | $V_{OL3}$         |       | 0.2   | 0.4   |         |
|                                              | $V_S$ open, $I_{RESET} = 10mA$                                                             | $V_{OL4}$         |       | 0.3   | 0.5   |         |
| Output Sink Current                          | $V_S = 0V$ , $V_{RESET} = 1.0V$                                                            | $I_{OL1}$         | 20    | 60    |       | mA      |
|                                              | $V_S$ open, $V_{RESET} = 1.0V$                                                             | $I_{OL2}$         | 20    | 60    |       |         |

## MB3773

## (1) DC CHARACTERISTICS (Continued)

| Parameter                     | Condition                                                       | Symbol     | Value |     |     | Unit    |
|-------------------------------|-----------------------------------------------------------------|------------|-------|-----|-----|---------|
|                               |                                                                 |            | Min   | Typ | Max |         |
| $C_T$ Charge Current          | Power on reset operating<br>$V_{CT} = 1.0V$                     | $I_{CTU}$  | 0.5   | 1.2 | 2.5 | $\mu A$ |
| Min. Supply Voltage for RESET | $V_{RESET} = 0.4V$<br>$I_{RESET} = 0.2mA$                       | $V_{CCL1}$ |       | 0.8 | 1.2 | V       |
| Min. Supply Voltage for RESET | $V_{RESET} = V_{CC} - 0.1V$<br>$R_L$ (2 pin - GND) = $1M\Omega$ | $V_{CCL2}$ |       | 0.8 | 1.2 | V       |

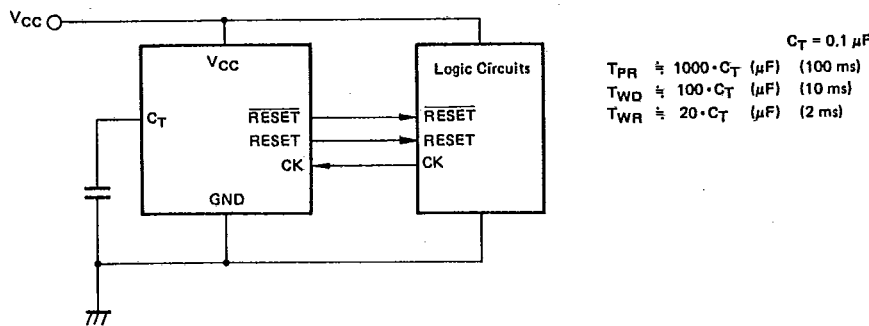
## (2) AC CHARACTERISTICS

| Parameter                                   | Condition                                                                                                                                                                    | Symbol    | Value |     |     | Unit    |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|-----|-----|---------|
|                                             |                                                                                                                                                                              |           | Min   | Typ | Max |         |
| $V_{CC}$ Input Pulse Width                  |                                                                                            | $T_{PI}$  | 8.0   |     |     | $\mu s$ |
| CK Input Pulse Width                        | CK  or  | $T_{CKW}$ | 3.0   |     |     | $\mu s$ |
| CK Input Frequency                          |                                                                                                                                                                              | $T_{CK}$  | 20    |     |     | $\mu s$ |
| Watch Dog Timer Watching Time               | $C_T = 0.1\mu F$                                                                                                                                                             | $T_{WD}$  | 5     | 10  | 15  | ms      |
| Watch Dog Timer Reset Time                  | $C_T = 0.1\mu F$                                                                                                                                                             | $T_{WR}$  | 1     | 2   | 3   | ms      |
| Rising Reset Hold Time                      | $C_T = 0.1\mu F$ , $V_{CC}$                                                               | $T_{PR}$  | 50    | 100 | 150 | ms      |
| Output Propagation Delay Time from $V_{CC}$ | RESET, $R_L = 2.2k\Omega$ ,<br>$C_L = 100pF$                                                                                                                                 | $T_{PD1}$ |       | 2   | 10  | $\mu s$ |
|                                             | RESET, $R_L = 2.2k\Omega$ ,<br>$C_L = 100pF$                                                                                                                                 | $T_{PD2}$ |       | 3   | 10  |         |
| Output Rising Time*                         | $R_L = 2.2k\Omega$<br>$C_L = 100pF$                                                                                                                                          | $t_R$     |       | 1.0 | 1.5 | $\mu s$ |
| Output Falling Time*                        | $R_L = 2.2k\Omega$<br>$C_L = 100pF$                                                                                                                                          | $t_F$     |       | 0.1 | 0.5 |         |

\* Output Rising/Falling time are measured at 10% to 90% of Voltage.

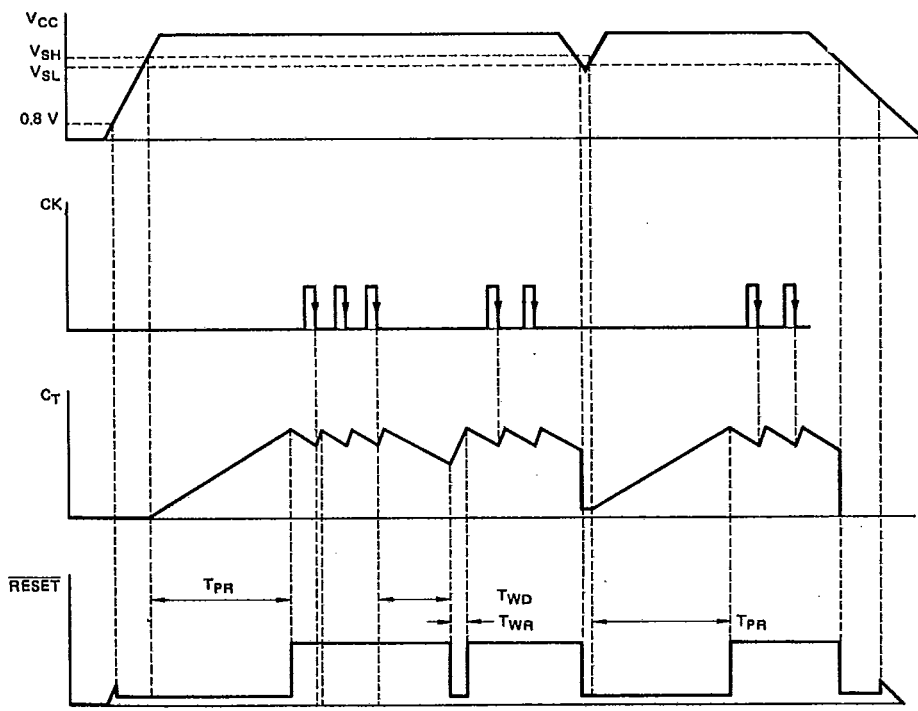
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Fig. 2 - MB 3773 BASIC OPERATION



$C_T = 0.1 \mu F$

|                                         |          |
|-----------------------------------------|----------|
| $T_{PR} \approx 1000 \cdot C_T (\mu F)$ | (100 ms) |
| $T_{WD} \approx 100 \cdot C_T (\mu F)$  | (10 ms)  |
| $T_{WR} \approx 20 \cdot C_T (\mu F)$   | (2 ms)   |



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# TYPICAL CHARACTERISTICS CURVES

Fig. 3 - SUPPLY CURRENT  
vs. SUPPLY VOLTAGE

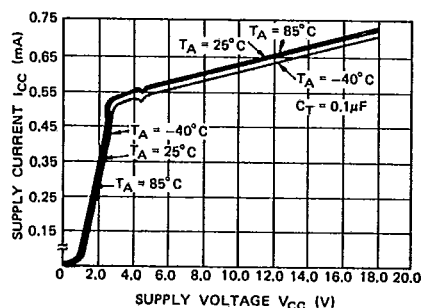


Fig. 4 - OUTPUT VOLTAGE  
vs. SUPPLY VOLTAGE

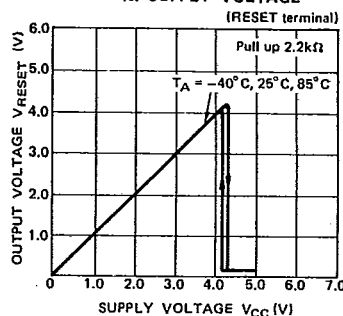


Fig. 5 - OUTPUT VOLTAGE  
vs. SUPPLY VOLTAGE

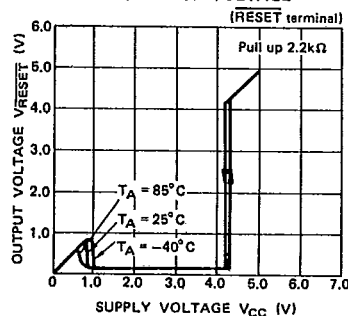


Fig. 6 - DETECTION VOLTAGE  
( $V_{SH}, V_{SL}$ ) vs. TEMPERATURE

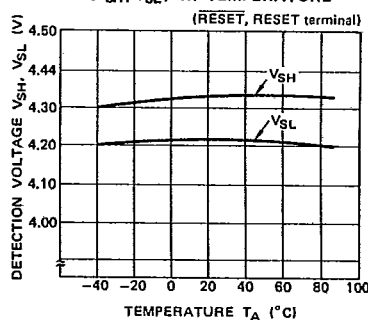


Fig. 7 - OUTPUT SATURATION  
VOLTAGE vs. OUTPUT SINK CURRENT

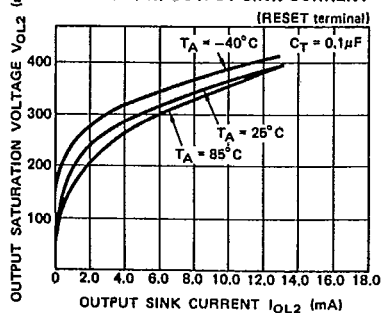
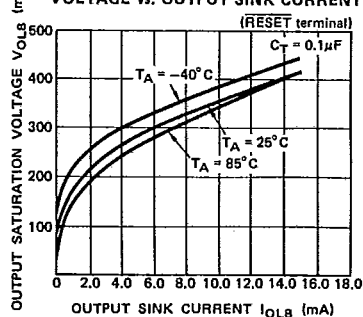
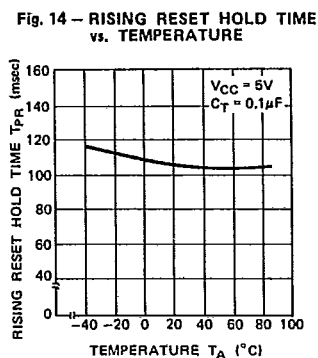
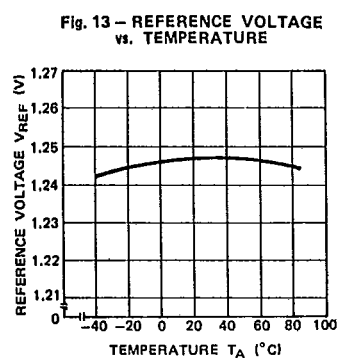
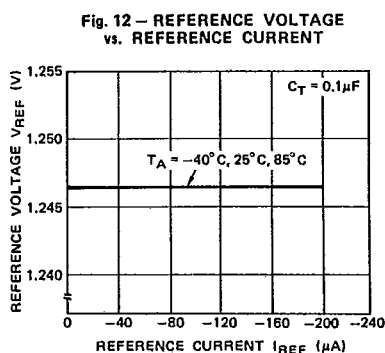
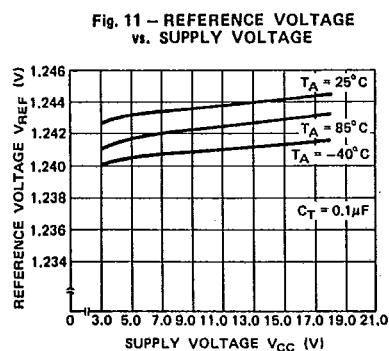
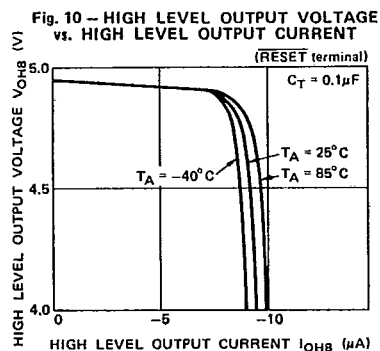
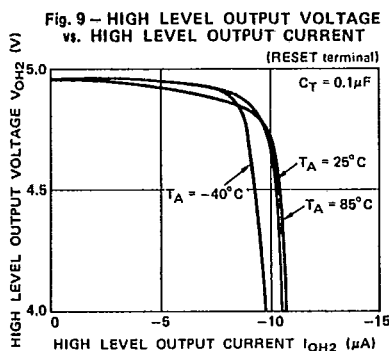


Fig. 8 - OUTPUT SATURATION  
VOLTAGE vs. OUTPUT SINK CURRENT



## TYPICAL CHARACTERISTICS CURVES (continued)



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## TYPICAL CHARACTERISTICS CURVES (continued)

Fig. 15 - RESET TIME vs. TEMPERATURE

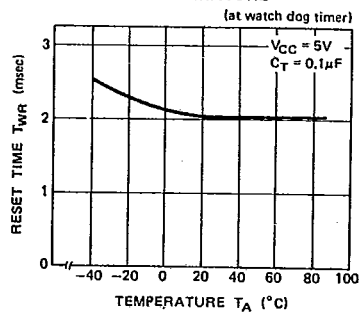


Fig. 16 - WATCH DOG TIMER WATCHING TIME vs. TEMPERATURE

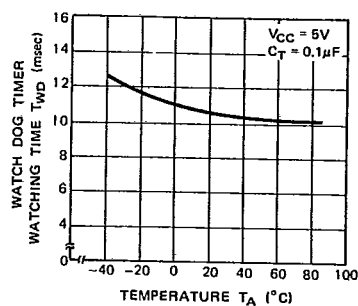


Fig. 17 - TERMINAL CAPACITANCE vs. RISING RESET HOLD TIME

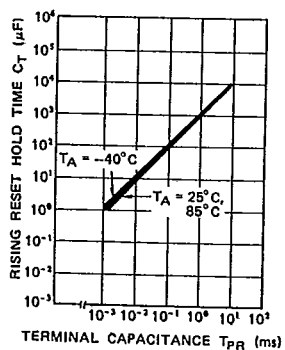


Fig. 18 - TERMINAL CAPACITANCE vs. RESET TIME

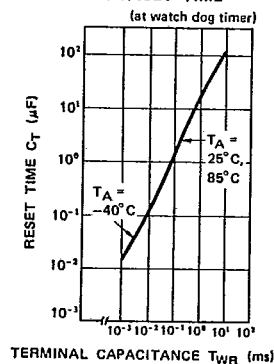
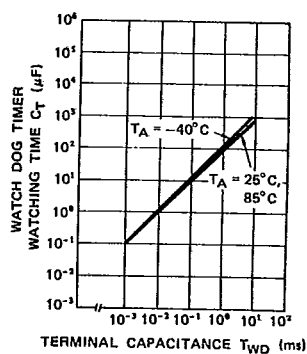
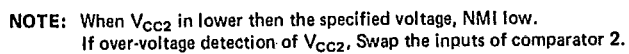
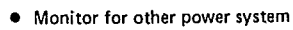


Fig. 19 - TERMINAL CAPACITANCE vs. WATCH DOG TIMER WATCHING TIME





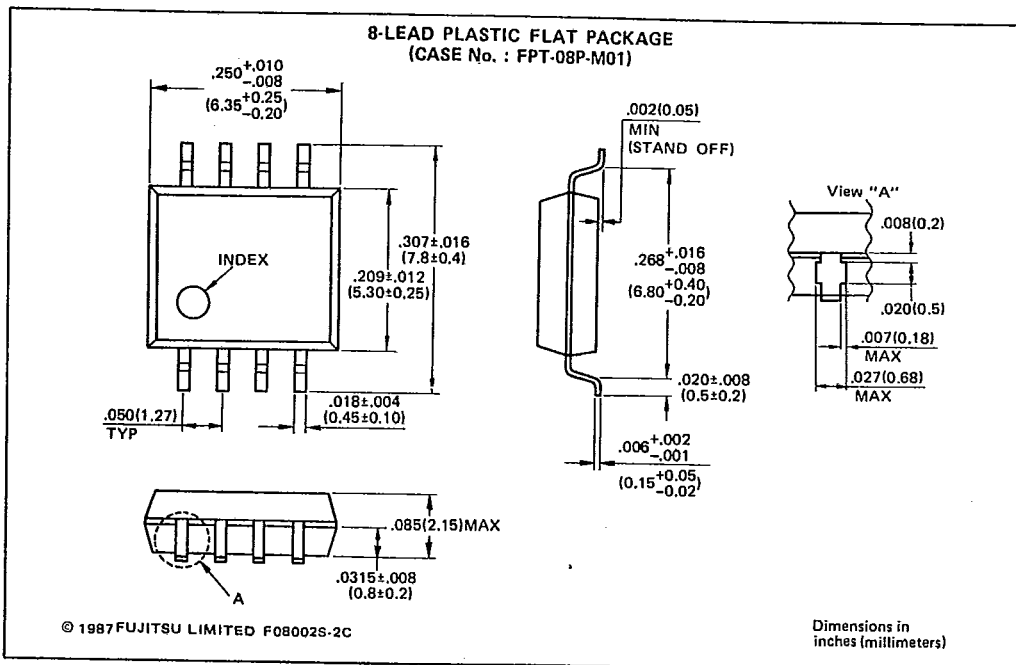
- **Sagging Monitor and Watch-Dog Timer**



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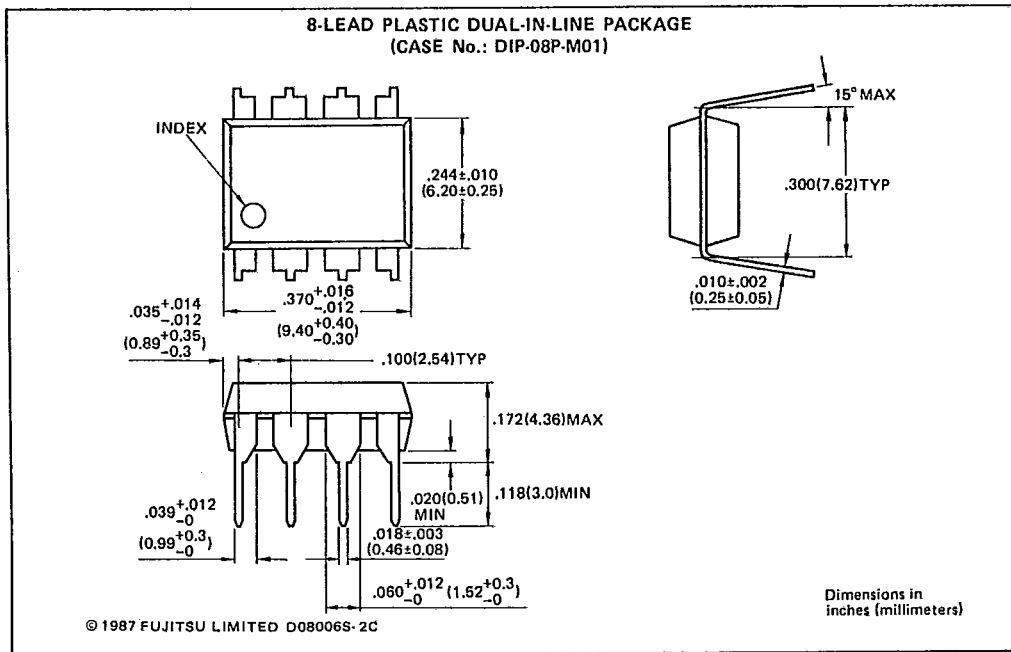
# PACKAGE DIMENSIONS



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# PACKAGE DIMENSIONS (continued)



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# PACKAGE DIMENSIONS

