

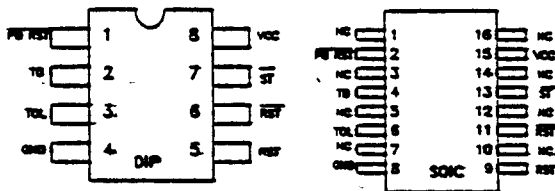


# CMOS MICROPROCESSOR MONITOR CIRCUIT

## Features

- Precision Voltage Monitor - 5% or 10% Power Supply selected by TOL pin
- Power On or Out of Tolerance Reset
- Watchdog Timer - 150ms, 600ms, or 1.2 sec
- Pushbutton monitoring for external override
- Low Power CMOS
- Space saving 8-pin DIP
- Pin Compatible with DS1232
- Industrial Temperature Range

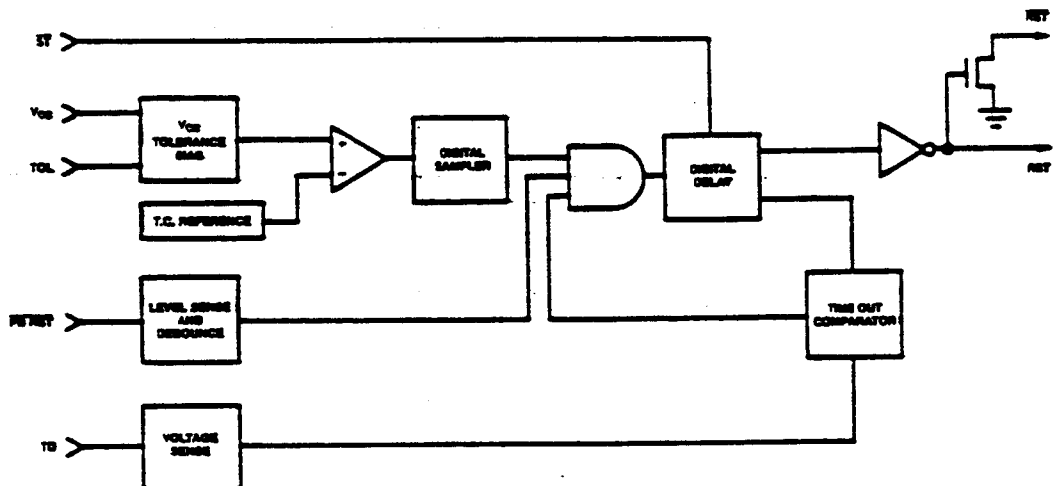
## Package Options



## General Description

CMD Microcircuits Microprocessor Monitor features precision circuitry for simplified monitoring of microprocessor systems: power supply monitoring, software execution checking, and external override. A temperature compensated reference circuit monitors power (VCC) and forces Reset active whenever an out of tolerance condition occurs. Reset is held active for 250ms after VCC returns to an in tolerance condition. Software execution is monitored by the watchdog timer which will produce an active Reset unless the strobe input is driven low prior to timeout. An external override is accomplished by the Push Button Reset Input which debounces the input and creates an active Reset for a minimum of 250ms. The combination of CMD Microcircuits' Advanced CMOS and reduced system component count produces a more accurate and reliable system than is possible with discrete components.

## Micromonitor Block Diagram



**Absolute Maximum Ratings:**

| Ratings                    | Symbol   | Value                  |
|----------------------------|----------|------------------------|
| Supply Voltage             | $V_{CC}$ | -0.3V to +7.0V         |
| Input Voltage (All Inputs) | $V_{IN}$ | -0.3V to $V_{DD}+0.3V$ |
| DC Current per Pin         | $I_{IN}$ | -10mA to +10mA         |
| Operating Temperature      | $T_A$    | -40°C to +85°C         |
| Storage Temperature        | $T_S$    | -65°C to +150°C        |
| Junction Temperature       | $T_J$    | -150°C                 |

This device contains input protection against damage due to high static voltages or electric fields; however, precautions should be taken to avoid application of voltages higher than the maximum rating.

**Note:** Exceeding these ratings may cause permanent damage. Functional operation under these conditions is not implied.

**DC Electrical Characteristics:  $V_{CC} = 5.0V \pm 10\%$ ,  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$** 

| Parameter   | Symbol     | Min      | Typ  | Max         | Units         | Notes |
|---|------------|----------|------|-------------|---------------|-------|
| $\overline{ST}$ and $\overline{PB}$ RST Input, High Level | $V_{IH}$   | 2.0      |      | $V_{CC}+.3$ | V             | 1     |
| $\overline{ST}$ and $\overline{PB}$ RST Input, Low Level  | $V_{IL}$   | -0.3     |      | +0.8        | V             | 1     |
| TD Input, High Level                                      | $V_{IH}$   | $V_{CC}$ |      | $V_{CC}+.3$ | V             | 1,4   |
| TD Input, Low Level                                       | $V_{IL}$   | -0.3     |      | $V_{SS}$    | V             | 1,4   |
| Input Leakage   | $I_{IL}$   | -1.0     |      | +1.0        | $\mu\text{A}$ | 3,4   |
| Output Current @ 2.4V                                     | $I_{OH}$   | -1.0     | -2.0 |             | mA            | 5     |
| Output Current @ .4V                                      | $I_{OL}$   | 3.2      | 6.0  |             | mA            |       |
| Operating Current   | $I_{CC}$   |          | 0.5  | 2.0         | mA            | 2     |
| $V_{CC}$ Trip Point (TOL = GND)                           | $V_{CCTP}$ | 4.50     | 4.62 | 4.74        | V             | 1     |
| $V_{CC}$ Trip Point (TOL = $V_{CC}$ )                     | $V_{CCTP}$ | 4.25     | 4.37 | 4.49        | V             | 1     |
| Input Capacitance ( $T_A = 25^\circ\text{C}$ )            | $C_{IN}$   |          |      | 5.0         | pF            |       |
| Output Capacitance ( $T_A = 25^\circ\text{C}$ )           | $C_{OUT}$  |          |      | 7.0         | pF            |       |



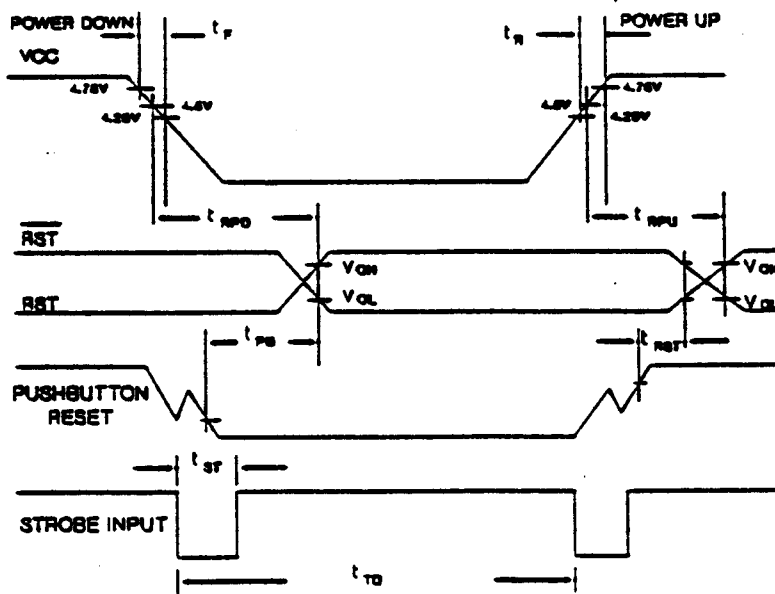
AC Electrical Characteristics: (-40°C to +85°C, V<sub>CC</sub> = 5V ± 10%)

| Parameter   | Symbol    | Min | Typ | Max  | Units | Notes |
|---|-----------|-----|-----|------|-------|-------|
| $\overline{\text{PB RST}} \ V_{IL}$   | $t_{PB}$  | 20  |     |      | ms    |       |
| RESET Active Time   | $t_{RST}$ | 250 | 610 | 1200 | ms    |       |
| $\overline{\text{ST}}$ Pulse Width  | $t_{ST}$  | 20  |     |      | ns    |       |
| V <sub>CC</sub> Detect to $\overline{\text{RST}}$ and $\overline{\text{RST}}$ | $t_{RPD}$ |     |     | 100  | ns    |       |
| V <sub>CC</sub> Slew Rate 4.75V - 4.25V                                       | $t_f$     | 300 |     |      | μs    |       |
| V <sub>CC</sub> Detect to $\overline{\text{RST}}$ and $\overline{\text{RST}}$ | $t_{RPU}$ | 250 | 610 | 1000 | ms    | 6     |
| V <sub>CC</sub> Slew Rate 4.25V - 4.75V                                       | $t_r$     | 0   |     |      | ns    |       |

NOTES:

1. All voltages referenced to ground.
2. Measured with outputs open,  $\overline{\text{ST}}$  at V<sub>OH</sub> or V<sub>OL</sub> and  $\overline{\text{PB RST}}$  and TD floating.
3.  $\overline{\text{PB RST}}$  is internally pulled up to V<sub>CC</sub> with an internal impedance of 10K typical.
4. TD is internally pulled to 0.4V<sub>CC</sub> through an internal impedance of 125KΩ, and will switch watchdog timer to mid time out period when input pin is left floating.
5.  $\overline{\text{RST}}$  is an open drain output.
6.  $t_f = 5\mu\text{s}$

Timing Diagrams



NOTE:

t<sub>TD</sub> is the maximum elapsed time between  $\overline{\text{ST}}$  pulses which will keep the watchdog timer from forcing  $\overline{\text{RST}}$  and  $\overline{\text{RST}}$  to the active state for a time of t<sub>RST</sub>. t<sub>TD</sub> times are given as maximum. The minimum time is 25% of the maximum.

- t<sub>TD</sub> = 250ms max. with TD pin at Ground
- t<sub>TD</sub> = 1 second max. with TD pin floating
- t<sub>TD</sub> = 2 seconds max. with TD pin at V<sub>CC</sub>



**FUNCTIONAL DESCRIPTION**

**Power Monitor**

The CM1232 detects out-of-tolerance power supply conditions and warns a processor-based system of impending power failure. When V<sub>CC</sub> falls below a preset level (defined by TOL), the internal V<sub>CC</sub> comparator activates RST (Pin 5) and  $\overline{\text{RST}}$  (Pin 6). With TOL connected to ground, these reset signals become active as V<sub>CC</sub> falls below 4.75V. With TOL connected to V<sub>CC</sub>, the reset signals become active as V<sub>CC</sub> falls below 4.5V. RST and  $\overline{\text{RST}}$  make excellent control signals for a microprocessor since processing can be stopped at the last possible moment of valid V<sub>CC</sub>. On power up the two reset signals are kept active for a minimum of 250ms to allow the power supply and processor to stabilize.

**Pushbutton Reset**

The CM1232 provides an active low input pin for direct connection to a pushbutton (Figure 1). Internally this input is debounced and activates the RST and  $\overline{\text{RST}}$  signals for a minimum of 250ms. The 250ms delay starts as the Pushbutton Reset pin is released from the low level.

**Watchdog Timer**

The CM1232 provides a watchdog timer function by forcing RST and  $\overline{\text{RST}}$  signals active whenever the ST input does not transition for a predetermined time period. The time period is determined by the TD input: 150ms with TD connected to ground; 600ms with TD left unconnected; and 1.2 seconds with TD connected to V<sub>CC</sub>. The watchdog timer starts timing out as soon as RST and  $\overline{\text{RST}}$  go inactive. If a high to low transition occurs on the ST input prior to time out, the watchdog timer is reset and begins its timeout period again. If the watchdog timer is allowed to time out, the RST and  $\overline{\text{RST}}$  signals are driven to the active state for a minimum of 250ms. The ST input can be derived from microprocessor address signals, data signals, or control signals. When the microprocessor is functioning normally, these signals would be generated by the microprocessor from a software routine, keeping the watchdog timer from timing out as long as the microprocessor routine was functioning properly. An example is shown in Figure 2.

**Pushbutton Reset**

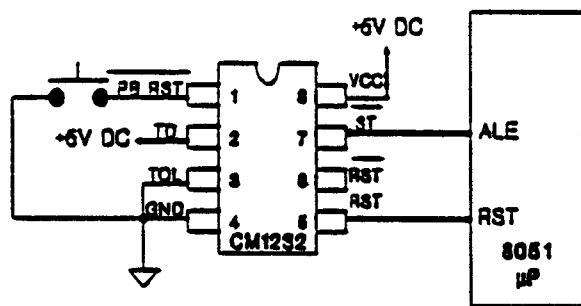


Figure 1

**Watchdog Timer**

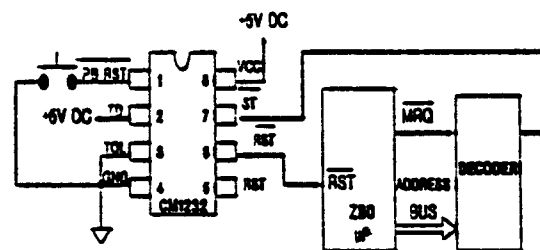


Figure 2