

### General Description

The MIC705, MIC706, MIC707, and MIC708 are inexpensive microprocessor supervisory circuit that monitors power supplies in microprocessor based systems. The circuit functions include a watchdog timer, microprocessor reset, backup battery switchover, power failure warning and a debounced manual reset input.

The MIC705 and MIC706 offer a watchdog timer function while the MIC707 and MIC708 have an active high reset output in addition to the active low reset output.

Supply voltage monitor levels of 4.65V and 4.4V are available. The MIC705 and MIC707 have a nominal reset threshold level of 4.65V while the MIC706 and MIC708 have a 4.4V nominal threshold level. When the supply voltage drops below the respective reset threshold level, /RESET is asserted.

### Features

- 30μA Maximum Supply Current
- Debounced manual reset input is TTL/CMOS Compatible
- Reset Pulse Width, 200ms
- Watchdog timer, 1.6s (MIC706)
- Precision supply voltage monitor
- Early power fail warning or low battery detect

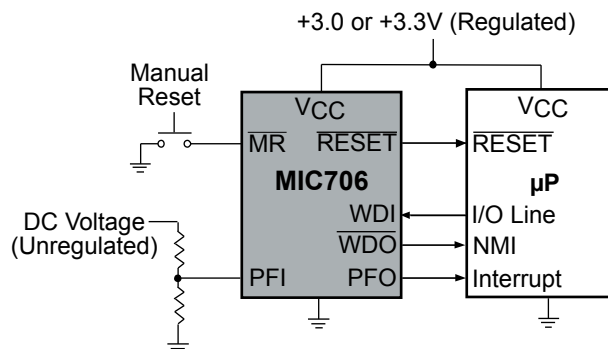
### Applications

- Laptop computers
- Intelligent systems
- Critical microprocessor power monitoring
- Printers
- Computers
- Controllers

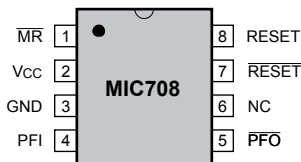
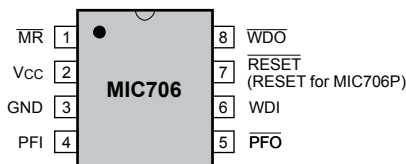
### Ordering Information

| Part Number |           | Temperature Range | Package    |
|-------------|-----------|-------------------|------------|
| Standard    | Pb-Free   |                   |            |
| MIC70__N    | MIC70__NY | −40°C to +85°C    | 8-Pin PDIP |
| MIC70__M    | MIC70__MY | −40°C to +85°C    | 8-Pin SOIC |

### Typical Application



## Pin Configuration



**8-Pin PDIP Package**

**8-Pin SOIC Package**

## Pin Description

| Pin Number<br>MIC705/6 | Pin Number<br>MIC707/8 | Pin Name | Pin Function                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------|------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                      | 1                      | /MR      | Manual Reset Input forces /RESET to assert when pulled below 0.8V. An internal pull-up current of 250μA on this input forces it high when left floating. this input can also be driven from TTL or CMOS logic.                                                                                                                                                                                    |
| 2                      | 2                      | VCC      | Primary supply input, +5V                                                                                                                                                                                                                                                                                                                                                                         |
| 3                      | 3                      | GND      | IC ground pin, 0V reference                                                                                                                                                                                                                                                                                                                                                                       |
| 4                      | 4                      | PFI      | Power Fail Input. Internally connected to the power fail comparator which is referenced to 1.25V. The Power Fail Output (/PFO) remains high if PFI is above 1.25V. PFI should be connected to GND or V <sub>OUT</sub> if the power fail comparator is not used.                                                                                                                                   |
| 5                      | 5                      | /PFO     | Power Fail Output. The power fail comparator is independent of all other function on this device.                                                                                                                                                                                                                                                                                                 |
| 6                      | N/A                    | WDI      | Watch Dog Input. The WDI input monitors microprocessor activity, an internal watchdog timer resets itself with each transition on the watchdog input. If the WDIpin is held high or low for longer than the watchdog timeout period, /WDO is forced to active low. the watchdog function can be disabled by floating the WDI pin.                                                                 |
| N/A                    | 6                      | N/C      | Not Internally Connected                                                                                                                                                                                                                                                                                                                                                                          |
| 7                      | 7                      | /RESET   | /RESET is asserted if either V <sub>CC</sub> goes below the reset threshold voltage or by low signal on the manual reset input (/MR). /RESET remains asserted for one reset timeout period (200ms) after V <sub>CC</sub> exceeds the reset threshold voltage or after the manual reset pin transition from low to high. The watchdog timer will not assert /RESET unless /WDO is connected to /MR |
| 8                      | N/A                    | /WDO     | Output for the Watchdog Timer. The watchdog timer resets itself with each transition o the watchdog input. If the WDI pin is held high or low for longer than the watchdog timeout period, /WDO is forced low. /WDO will also be forced low id V <sub>CC</sub> is below the reset threshold voltageand will remain low until V <sub>CC</sub> returns to a valid level.                            |
| N/A                    | 8                      | RESET    | RESET is the compliment of /RESET and is asserted if either V <sub>CC</sub> goes below the reset threshold voltage or by a low signal on the manual reset input (/MR). RESET is suitable for microprocessor systems that use active high reset.                                                                                                                                                   |

**Absolute Maximum Ratings<sup>(1)</sup>**

|                                             |                                    |
|---------------------------------------------|------------------------------------|
| Terminal Voltage                            |                                    |
| V <sub>CC</sub> .....                       | –0.3V to +6.0V                     |
| All other inputs .....                      | –0.3V to (V <sub>OUT</sub> + 0.3V) |
| Input Current                               |                                    |
| V <sub>CC</sub> , Gnd .....                 | 25mA                               |
| Output Current (all outputs) .....          | 20mA                               |
| Lead Temperature (soldering, 10 sec.) ..... | 300°C                              |
| Storage Temperature .....                   | –65°C to +150°C                    |

**Operating Ratings<sup>(2)</sup>**

|                                |                |
|--------------------------------|----------------|
| Operating Temperature Range    |                |
| MIC70_N .....                  | –40°C to +85°C |
| MIC70_M .....                  | –40°C to +85°C |
| Power Dissipation (PDIP) ..... | 475mW          |
| Power Dissipation (SOP) .....  | 400mW          |

**Electrical Characteristics<sup>(3)</sup>**

V<sub>CC</sub> = 2.70V to 5.5V for MIC70\_P/R; V<sub>CC</sub> = 3.00V to 5.5V for MIC70\_S; V<sub>CC</sub> = 3.15V to 5.5V for MIC70\_T;  
T<sub>A</sub> = Operating Temperature Range, **bold** values indicate –40°C ≤ T<sub>A</sub> ≤ +85°C; unless noted

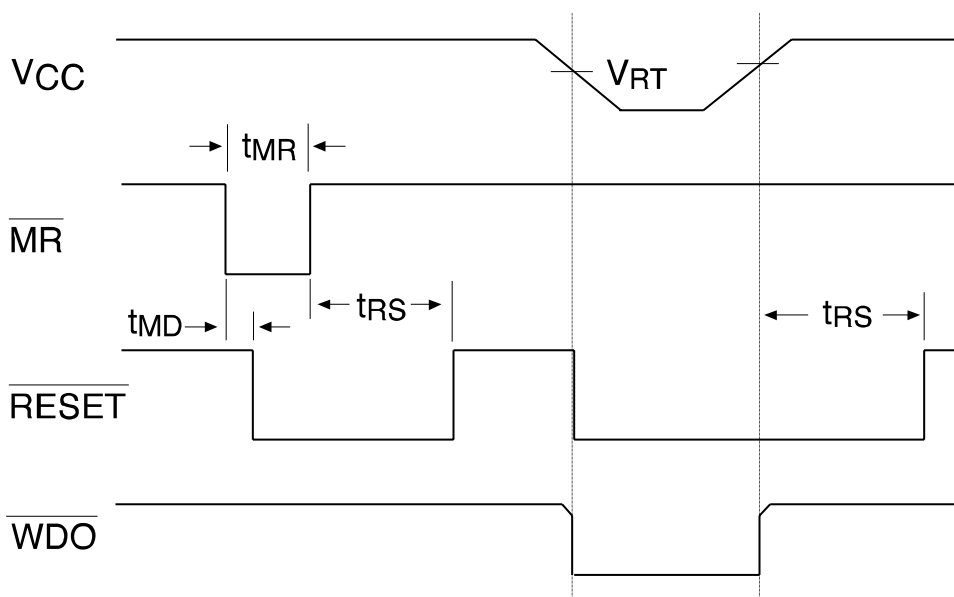
| Parameter                                  | Conditions                                                                                                                                  | Min.                  | Typ. | Max  | Units |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------|-------|
| Operating Voltage Range, V <sub>CC</sub>   |                                                                                                                                             | 1.4                   |      | 5.5  | V     |
| Supply Current                             |                                                                                                                                             |                       |      | 30   | μA    |
| Reset Voltage Threshold                    | MIC70_P/R                                                                                                                                   | 2.55                  | 2.63 | 2.70 | V     |
|                                            | MIC70_S                                                                                                                                     | 2.85                  | 2.93 | 3.00 | V     |
|                                            | MIC70_T                                                                                                                                     | 3.00                  | 3.08 | 3.15 | V     |
| Reset Threshold Hysteresis                 |                                                                                                                                             |                       | 20   |      | mV    |
| Reset Pulse Width, t <sub>RS</sub>         |                                                                                                                                             | 140                   | 200  | 280  | ms    |
| /RESET Output Voltage<br>(MIC70_R/S/T)     | I <sub>Source</sub> = 200μA<br>I <sub>Sink</sub> = 1.2mA<br>I <sub>Sink</sub> = 50μA, V <sub>CC</sub> = 1.4V                                | 0.8 × V <sub>CC</sub> |      |      | V     |
|                                            |                                                                                                                                             |                       |      | 0.3  | V     |
|                                            |                                                                                                                                             |                       |      | 0.3  | V     |
| RESET Output Voltage<br>(MIC706P)          | I <sub>Source</sub> = 200μA<br>I <sub>Sink</sub> = 1.2mA                                                                                    | 0.8 × V <sub>CC</sub> |      |      | V     |
|                                            |                                                                                                                                             |                       |      | 0.3  | V     |
| RESET Output Voltage<br>(MIC708R/S/T)      | I <sub>Source</sub> = 200μA<br>I <sub>Sink</sub> = 500μA                                                                                    | 0.8 × V <sub>CC</sub> |      |      | V     |
|                                            |                                                                                                                                             |                       |      | 0.3  | V     |
| Watchdog Timeout Period, t <sub>WD</sub>   |                                                                                                                                             | 1.0                   | 1.6  | 2.25 | sec   |
| WDI Minimum Input Pulse, t <sub>WP</sub>   | V <sub>IL</sub> = 0.4V, V <sub>IH</sub> = 80% of V <sub>CC</sub><br>V <sub>IL</sub> = 0.4V, V <sub>IH</sub> = 80% of V <sub>CC</sub> > 4.5V | 100                   |      |      | ns    |
|                                            |                                                                                                                                             | 50                    |      |      | ns    |
| WDI Threshold Voltage                      | V <sub>IH</sub>                                                                                                                             | 0.7 × V <sub>CC</sub> |      |      | V     |
|                                            | V <sub>IL</sub>                                                                                                                             |                       |      | 0.6  | V     |
| WDI Input Current                          | WDI = 0V or V <sub>CC</sub>                                                                                                                 | -1                    |      | 1    | μA    |
| WDO Output Voltage                         | I <sub>Source</sub> = 200μA<br>I <sub>Sink</sub> = 500μA                                                                                    | 0.8 × V <sub>CC</sub> |      |      | V     |
|                                            |                                                                                                                                             |                       |      | 0.3  | V     |
| /MR Pull-Up Current                        | /MR = 0V                                                                                                                                    | 20                    | 250  | 600  | μA    |
| /MR Pulse Width, t <sub>MR</sub>           | V <sub>CC</sub> = 4.5V                                                                                                                      | 500                   |      |      | ns    |
|                                            |                                                                                                                                             | 150                   |      |      | ns    |
| /MR Input Threshold                        | V <sub>IL</sub>                                                                                                                             | 0.7 × V <sub>CC</sub> |      | 0.6  | V     |
|                                            | V <sub>IH</sub>                                                                                                                             |                       |      |      | V     |
| /MR to Reset Output Delay, t <sub>MD</sub> |                                                                                                                                             |                       |      | 750  | ns    |
| PFI Input Threshold                        |                                                                                                                                             | 1.2                   | 1.25 | 1.3  | V     |
| PFI Input Current                          |                                                                                                                                             | -25                   | 0.01 | +25  | nA    |
| /PFO Output Voltage                        | I <sub>Sink</sub> = 1.2mA                                                                                                                   | 0.8 × V <sub>CC</sub> |      | 0.3  | V     |
|                                            | I <sub>Source</sub> = 200μA                                                                                                                 |                       |      |      | V     |

**Note 1.** Exceeding the absolute maximum rating may damage the device.

**Note 2.** The device is not guaranteed to function outside its operating rating.

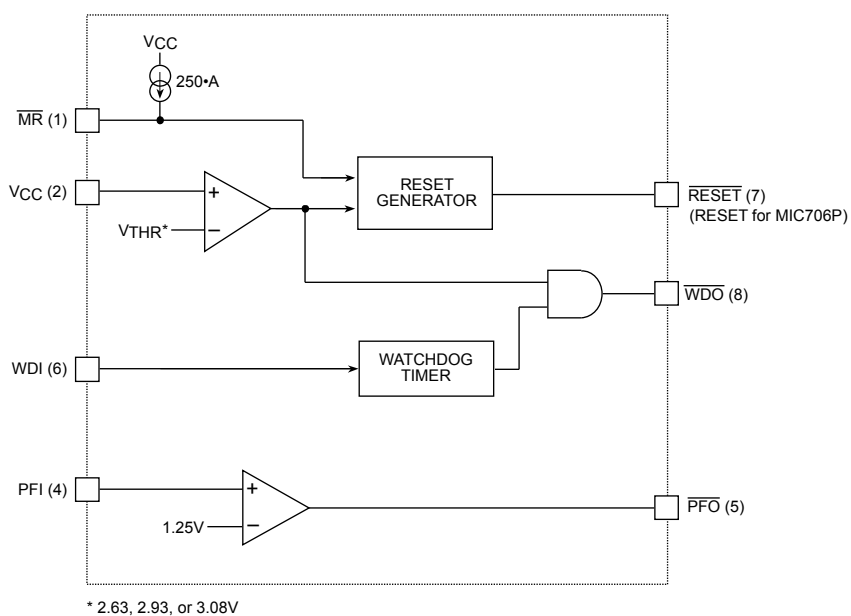
**Note 3.** Specification for packaged product only.

## Timing Diagram

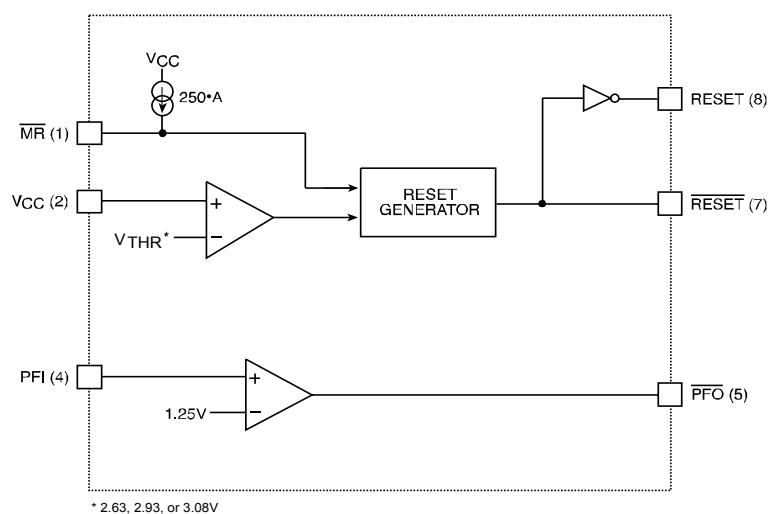


Timing Diagram for Reset

## Block Diagram



**MIC705/MIC706 Block diagram**



**MIC707/MIC708 Block Diagram**

## Applications Information

### Power Fail Warning

An additional comparator which is independent of the other functions on the MIC706P/R/S/T is provided for early warning of power failure. An external voltage divider can be used to compare unregulated DC to an internal 1.25V reference. The voltage divider ratio on the input of the power-fail comparator (PFI) can be chosen so as to trip the power fail comparator a few milliseconds before  $V_{CC}$  falls below the maximum reset threshold voltage. The output of the power-fail comparator (/PFO) can be used to interrupt the microprocessor when used in this mode and execute shut-down procedures prior to power loss. Hysteresis can be added to this comparator with external resistors, as is commonly done with any comparator. When  $V_{CC} < V_{BATT} - 1.2V$  (typ.), the power-fail comparator is turned off and /PFO is pulled low in order to conserve power.

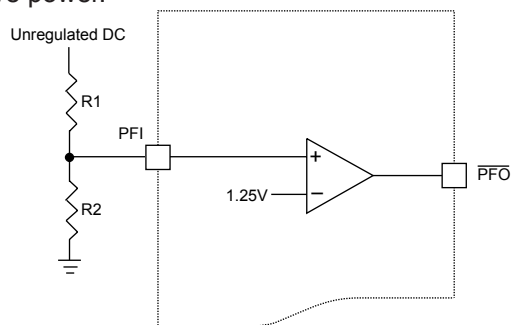


Figure 1. Power Fail Comparator

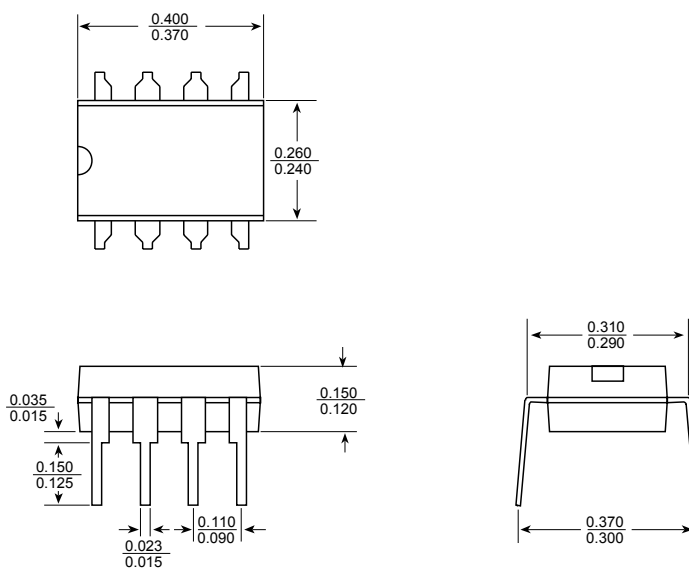
### Watchdog Timer

The microprocessor can be monitored by connecting the WDI pin (watchdog input) to a bus line or an I/O line. If a transition doesn't occur on the WDI pin within the watchdog timeout (Table 1.), the microprocessor is reset. /RESET will remain asserted for 200ms when this occurs. A minimum pulse of 100ns or any transition low-to-high or high-to-low on the WDI pin will reset the watchdog timer. The output of the watchdog timer (WDO) will remain high, if WDI sees a valid transition within the watchdog period or if  $V_{CC}$  falls below the reset threshold as the watchdog timer is disabled when this happens.

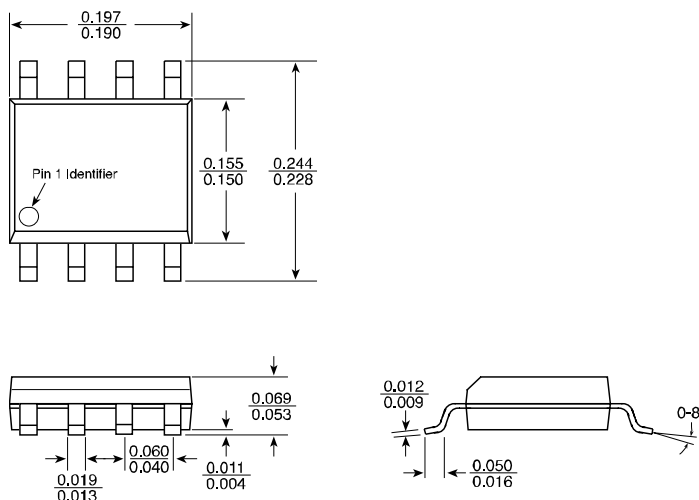
### Microprocessor Reset

The /RESET pin is asserted whenever  $V_{CC}$  falls below the reset threshold voltage. The reset pin remains asserted for a period of 200ms after  $V_{CC}$  has risen above the reset threshold voltage. The reset timeout period can also be selected by the end user, see Table 1. The reset function ensures the microprocessor is properly reset and powers up into a known condition after a power failure. /RESET will remain valid with  $V_{CC}$  as low as 1.4V and when auxiliary power is connected to  $V_{BATT}$  ( $V_{BATT} > 2.0V$ ), the reset pin will remain valid with  $V_{CC}$  from 0V to 5.5V.

## Package Information



**8-Pin PDIP (N)**



**8-Pin SOIC (M)**

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