

General Description

The MIC705, MIC706, MIC707, and MIC708 are inexpensive microprocessor supervisory circuits that monitor power supplies in microprocessor-based systems. The circuit functions include a watchdog timer, microprocessor reset, 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 reset threshold level. When the supply voltage drops below the respective reset threshold level, /RESET is asserted.

Datasheets and support documentation are available on Micrel's web site at: www.micrel.com.

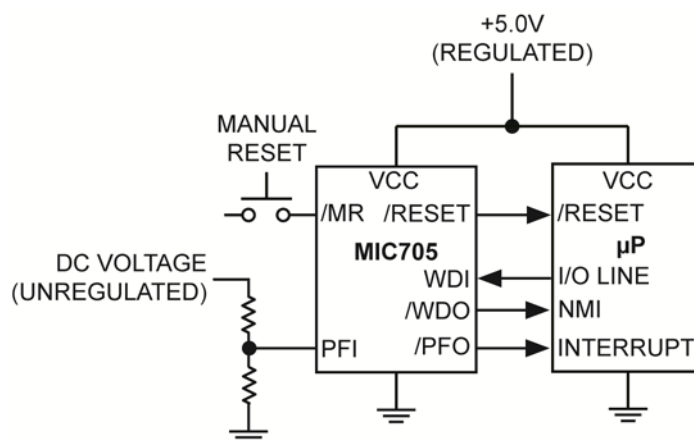
Features

- Debounced manual reset input is TTL/CMOS compatible
- Reset pulse width: 200ms
- Watchdog timer: 1.6s (MIC705/706)
- 4.65V or 4.40V precision voltage monitor
- Early power-fail warning or low-battery detect

Applications

- Automotive systems
- Intelligent systems
- Critical microprocessor power monitoring
- Battery-powered computers
- Computers
- Controllers

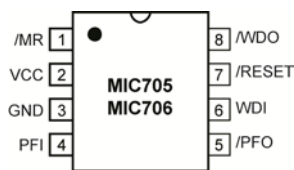
Typical Application



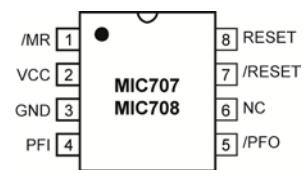
Ordering Information

| Part Number | Threshold (V) | /RESET | RESET | WDI | Junction Temperature Range | Package |
|-------------|---------------|--------|-------|-----|----------------------------|------------|
| MIC705MY | 4.65 | √ | | √ | -40°C to +85°C | 8-Pin SOIC |
| MIC706MY | 4.40 | √ | | √ | -40°C to +85°C | 8-Pin SOIC |
| MIC707MY | 4.65 | √ | √ | | -40°C to +85°C | 8-Pin SOIC |
| MIC708MY | 4.40 | √ | √ | | -40°C to +85°C | 8-Pin SOIC |

Pin Configuration



MIC705/706
8-Pin SOIC (M)
(Top View)



MIC707/708
8-Pin SOIC (M)
(Top View)

Pin Description

| Pin Number MIC706 | Pin Number MIC708 | Pin Name | Pin Name |
|----------------------|----------------------|----------|---|
| 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 VCC 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 | Watchdog Input. The WDI input monitors microprocessor activity; an internal watchdog timer resets itself with each transition on the watchdog input. If the WDI pin 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. |

Pin Description (Continued)

| Pin Number MIC706 | Pin Number MIC708 | Pin Name | Pin Name |
|----------------------|----------------------|----------|--|
| 7 | 7 | /RESET | /RESET is asserted if either VCC 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 VCC 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 to 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 if VCC is below the reset threshold voltage and will remain low until VCC returns to a valid level. |
| N/A | 8 | RESET | RESET is the compliment of /RESET and is asserted if either VCC 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⁽¹⁾

| | |
|--|-----------------------------------|
| Terminal Voltage | |
| VCC | -0.3V to +6.0V |
| All Other Inputs..... | -0.3V to (V _{CC} + 0.3V) |
| Input Current | |
| VCC, GND | 25mA |
| Output Current (All) | 20mA |
| Lead Temperature (soldering, 10s)..... | 300°C |
| Storage Temperature (T _s)..... | -65°C to +150°C |

Operating Ratings⁽²⁾

| | |
|-----------------------------------|----------------|
| Operating Temperature Range | -40°C to +85°C |
| Power Dissipation (SOP) | 400mW |
| Thermal Resistance | |
| 8-Pin SOIC..... | 150°C/W |

Electrical Characteristics⁽³⁾

V_{CC} = 4.75V to 5.5V for MIC705/707; V_{CC} = 4.5V to 5.5V for MIC706/708; T_A = Operating Temperature Range, **bold** values indicate -40°C ≤ T_A ≤ +85°C, unless noted.

| Parameter | Condition | Min. | Typ. | Max. | Units |
|--|--|------------------------|------|------|-------|
| Operating Voltage Range | | 1.4 | | 5.5 | V |
| Supply Current | | | | 60 | μA |
| Reset Voltage Threshold | MIC705, MIC707 | 4.50 | 4.65 | 4.75 | V |
| | MIC706, MIC708 | 4.25 | 4.4 | 4.5 | |
| Reset Threshold Hysteresis | | | 40 | | mV |
| Reset Pulse Width (t _{RS}) | | 140 | 200 | 280 | ms |
| /RESET Output Voltage | I _{SOURCE} = 800μA | V _{CC} - 1.5V | | | V |
| | I _{SINK} = 3.2mA | | | 0.4 | |
| RESET Output Voltage | I _{SOURCE} = 800μA | V _{CC} - 1.5V | | | V |
| | I _{SINK} = 1.2mA | | | 0.4 | |
| Watchdog Timeout Period (t _{WD}) | | 1.0 | 1.6 | 2.25 | s |
| WDI Minimum Input Pulse (t _{WP}) | V _{IL} = 0.4V, V _{IH} = 80% of V _{CC} | 50 | | | ns |
| WDI Threshold Voltage | V _{IH} , V _{CC} = 5V | 3.5 | | | V |
| | V _{IL} , V _{CC} = 5V | | | 0.8 | |
| WDI Input Current | WDI = 0V | -150 | -50 | | μA |
| | WDI = V _{CC} | | 50 | 150 | |
| WDO Output Voltage | I _{SOURCE} = 800μA | V _{CC} - 1.5V | | | V |
| | I _{SINK} = 1.2mA | | | 0.4 | |
| /MR Pull-Up Current | /MR = 0V | 100 | 250 | 600 | μA |

Notes:

- Exceeding the absolute maximum ratings may damage the device.
- The device is not guaranteed to function outside its operating ratings.
- Specification for packaged product only

Electrical Characteristics⁽³⁾ (Continued)

$V_{CC} = 4.75V$ to $5.5V$ for MIC705/707; $V_{CC} = 4.5V$ to $5.5V$ for MIC706/708; T_A = Operating Temperature Range, **bold** values indicate $-40^{\circ}C \leq T_A \leq +85^{\circ}C$, unless noted.

| Parameter | Condition | Min. | Typ. | Max. | Units |
|--|--------------------------------------|-----------------|------|------|-------|
| /MR Pulse Width (t_{MR}) | | 150 | | | ns |
| /MR Input Threshold | V_{IL} | | | 0.8 | V |
| | V_{IH} | 2.0 | | | |
| /MR-to-Reset Output Delay (t_{MD}) | | | | 250 | ns |
| PFI Input Threshold | $V_{CC} = 5V$ | 1.2 | 1.25 | 1.3 | V |
| PFI Input Current | | -25 | 0.01 | +25 | nA |
| /PFO Output Voltage | $I_{SINK} = 3.2mA$ | | | 0.4 | V |
| | $V_{CC} = 5V, I_{SOURCE} = 800\mu A$ | $V_{CC} - 1.5V$ | | | |

Timing Diagram

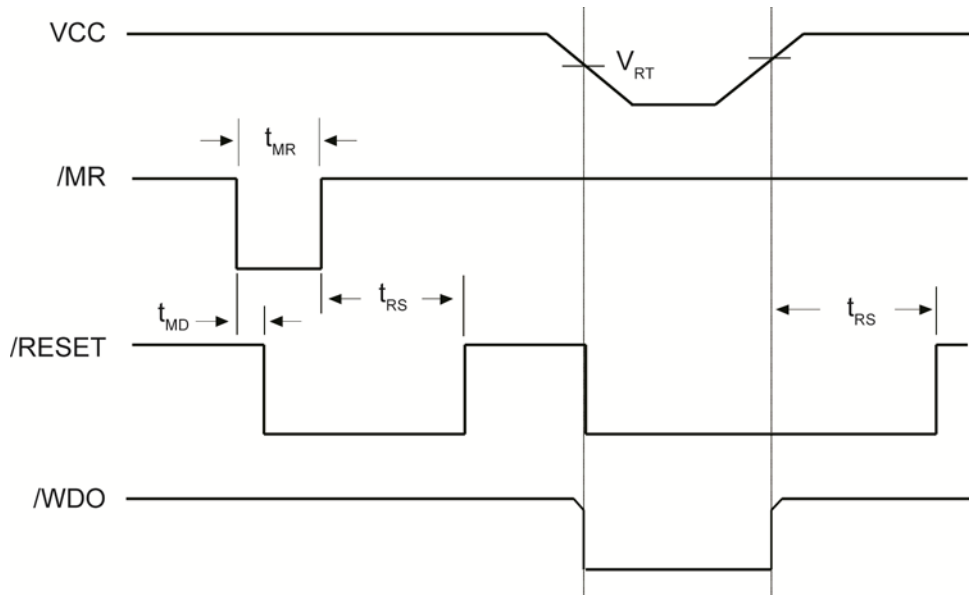
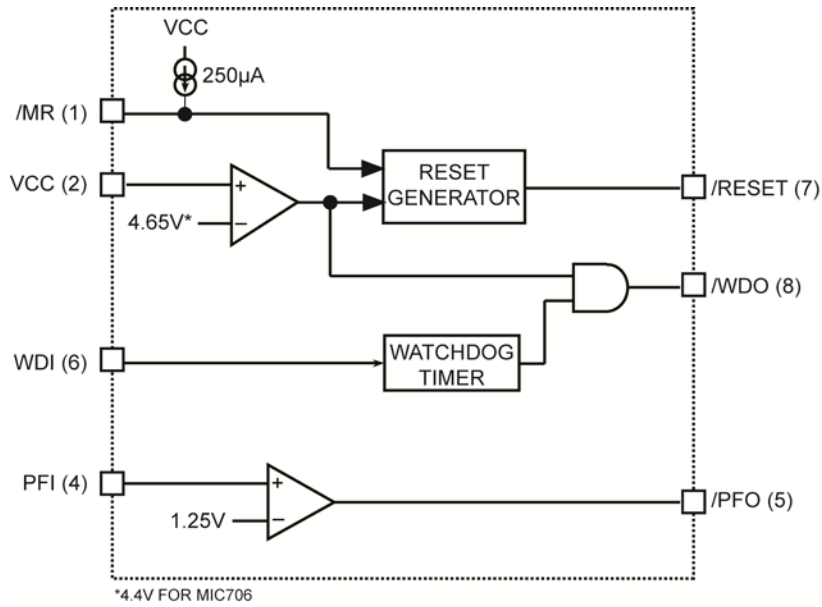
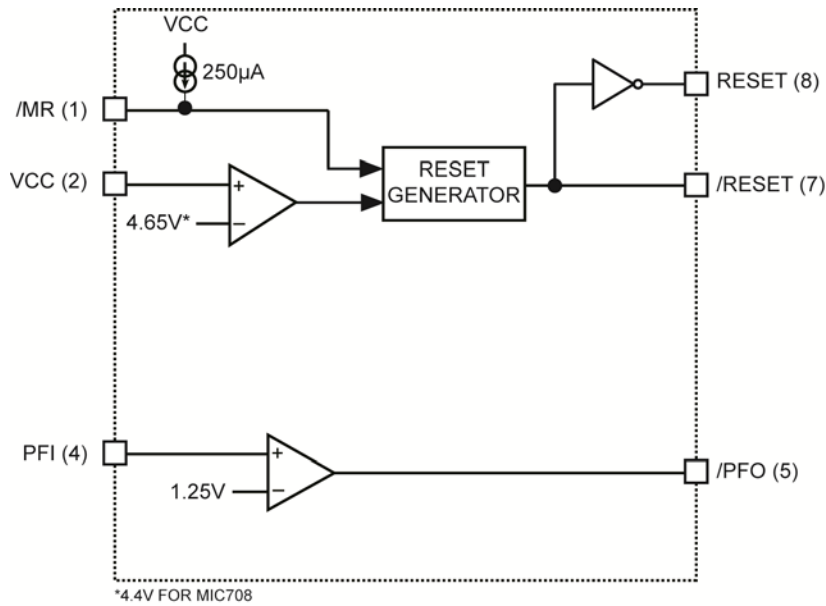


Figure 1. Timing Diagram for Reset

Block Diagrams



MIC705/MIC706 Block Diagram



MIC707/MIC708 Block Diagram

Application Information

Microprocessor Reset

The /RESET pin is asserted whenever V_{CC} falls below the reset threshold voltage or when /MR goes low. The reset pin remains asserted for a period of 200ms after V_{CC} has risen above the reset threshold voltage and /MR goes high. 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.

Power-Fail Warning

An additional comparator which is independent of the other functions on the MIC706/706/707/708 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 shutdown procedures prior to power loss. Hysteresis can be added to this comparator with external resistors, as is commonly done with any 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 period, then /WDO will go low. A minimum pulse of 50ns 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 left floating. If V_{CC} falls below the reset threshold voltage, then /WDO goes low immediately regardless of WDI.

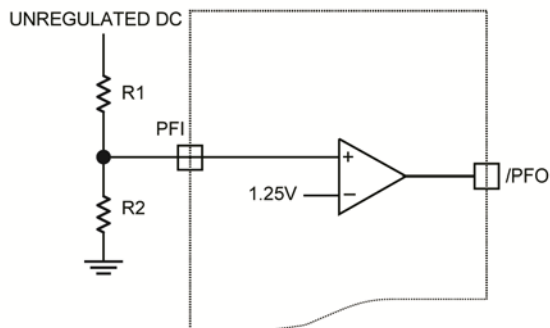
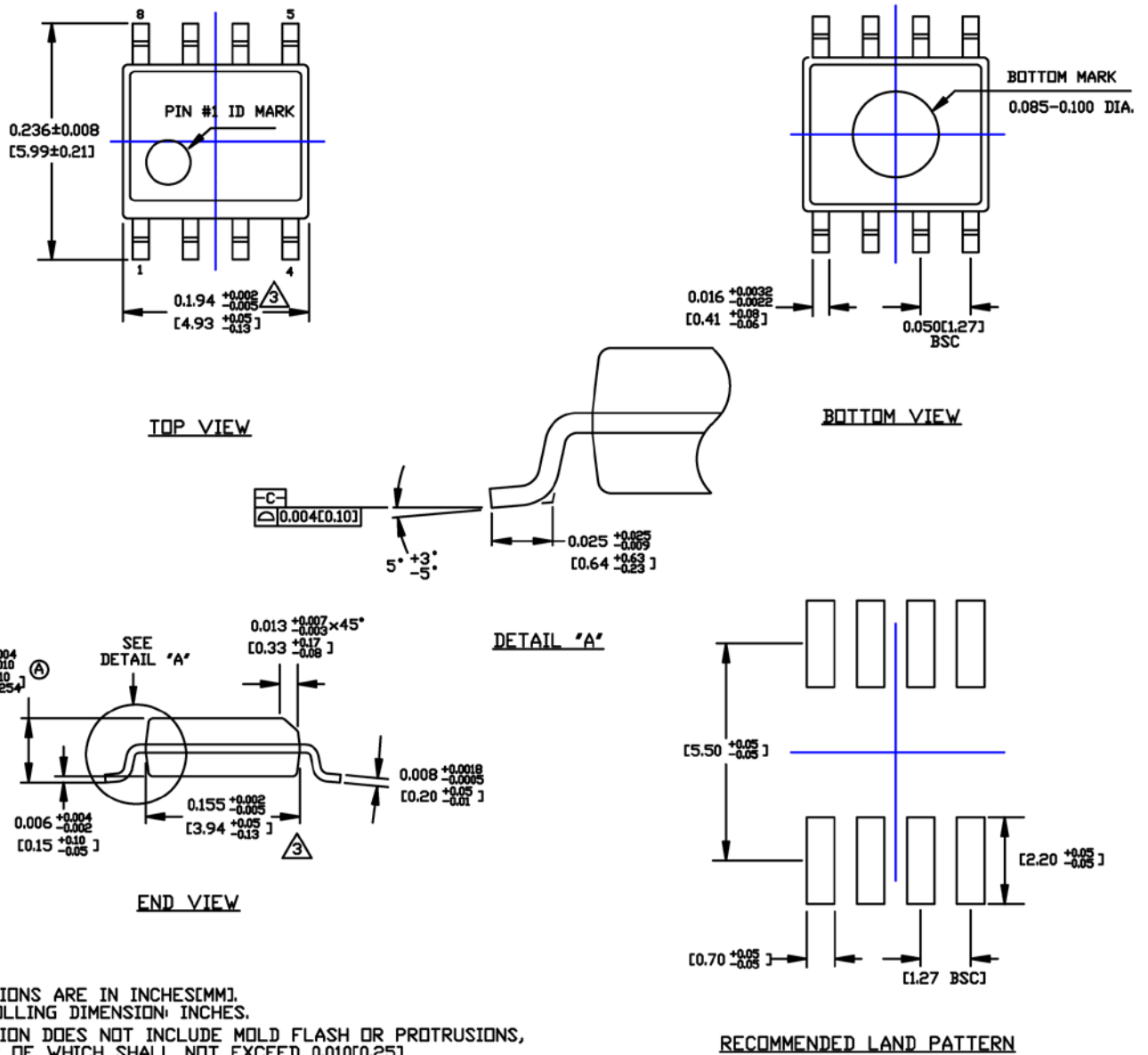


Figure 2. Power-Fail Comparator

Package Information and Recommended Landing Pattern⁽⁴⁾



8-Pin SOIC (M)

Note:

4. Package information is correct as of the publication date. For updates and most current information, go to www.micrel.com.

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