MIC706P/R/S/T, MIC708R/S/T

µP Supervisory Circuit

General Description

The MIC706 and MIC708 are inexpensive microprocessor supervisory circuits that monitor power supplies in 3.0V and 3.3V microprocessor-based systems. The circuit functions include a watchdog timer, microprocessor reset, power-failure warning, and a debounced manual reset input.

The MIC706 offers a watchdog timer function, while the MIC708 has an active-high reset output in addition to the active-low reset output.

The R, S, and T versions are similar in all respects except for supply voltage reset threshold levels. The threshold levels are 2.63, 2.93, and 3.08V, respectively. When the supply voltage drops below the reset threshold level, /RESET (and RESET for the MIC708) is asserted.

The MIC706P is identical to the MIC706R, except that the Reset output is asserted high.

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

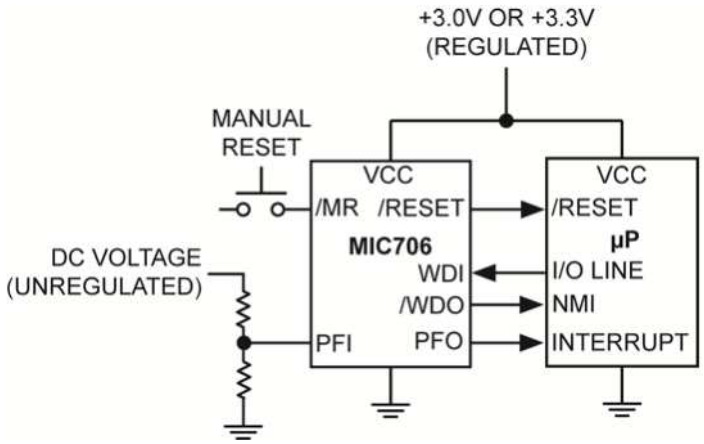
Features

- Maximum supply current: 30µA
- Debounced manual reset input is TTL/CMOS compatible
- Reset pulse width: 200ms
- Watchdog timer: 1.6s (MIC706)
- Precision supply voltage monitor
- Easy power-fail warning or low-battery detect

Applications

- Laptop and desktop computers
- Intelligent systems
- Critical microprocessor power monitoring
- Printers
- Controllers

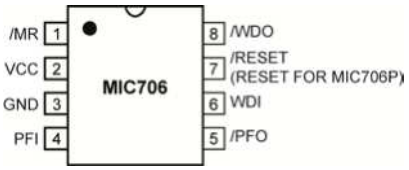
Typical Application



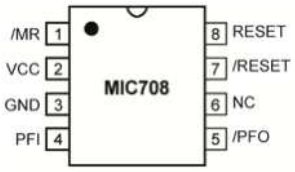
Ordering Information

Part Number	Threshold (V)	/RESET	RESET	WDI	Junction Temperature Range	Package
MIC706PMY	2.63		√	√	–40°C to +85°C	8-Pin SOIC
MIC706RMY	2.63	√		√	–40°C to +85°C	8-Pin SOIC
MIC706SMY	2.93	√		√	–40°C to +85°C	8-Pin SOIC
MIC706TMY	3.08	√		√	–40°C to +85°C	8-Pin SOIC
MIC708RMY	2.63	√	√		–40°C to +85°C	8-Pin SOIC
MIC708SMY	2.93	√	√		–40°C to +85°C	8-Pin SOIC
MIC708TMY	3.08	√	√		–40°C to +85°C	8-Pin SOIC

Pin Configuration



MIC706
8-Pin SOIC (M)
(Top View)



MIC708
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 outputs 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_{OUT} 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 V_{CC} 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.
7 (MIC706P)	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
- V_{CC} ..... −0.3V to +6.0V
- All Other Inputs. ..... −0.3V to (V_{CC} + 0.3V)

Input Current
- V_{CC}, 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} = 2.70V to 5.5V for MIC70_P/R; V_{CC} = 3.00V to 5.5V for MIC70_S; V_{CC} = 3.15V to 5.5V for MIC70_T.
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				30	µA
Reset Voltage Threshold	MIC70_P/R	2.55	2.63	2.70	V
	MIC70_S	2.85	2.93	3.00	
	MIC70_T	3.00	3.08	3.15	
Reset Threshold Hysteresis			20		mV
Reset Pulse Width (t_{RS})		140	200	280	ms
/RESET Output Voltage (MIC70_R/S/T)	I_{SOURCE} = 200µA	0.8 × V_{CC}			V
	I_{SINK} = 1.2mA			0.3	
	I_{SINK} = 50µA, V_{CC} = 1.4V			0.3	
RESET Output Voltage (MIC706P)	I_{SOURCE} = 200µA	0.8 × V_{CC}			V
	I_{SINK} = 1.2mA			0.3	
RESET Output Voltage (MIC708R/S/T)	I_{SOURCE} = 200µA	0.8 × V_{CC}			V
	I_{SINK} = 500µA			0.3	
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}	100			ns
	V_{IL} = 0.4V, V_{IH} = 80% of V_{CC} > 4.5V	50			
WDI Threshold Voltage	V_{IH}	0.7 × V_{CC}			V
	V_{IL}			0.6	
WDI Input Current	WDI = 0V or V_{CC}	−1		1	µA
WDO Output Voltage	I_{SOURCE} = 200µA	0.8 × V_{CC}			V
	I_{SINK} = 500µA			0.3	
/MR Pull-Up Current	/MR = 0V	20	250	600	µA

Notes:

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

Electrical Characteristics[3] (Continued)

V_{CC} = 2.70V to 5.5V for MIC70_P/R; V_{CC} = 3.00V to 5.5V for MIC70_S; V_{CC} = 3.15V to 5.5V for MIC70_T.
T_A = Operating Temperature Range, **bold** values indicate –40°C ≤ T_A ≤ +85°C, unless noted.

Parameter	Condition	Min.	Typ.	Max.	Units
/MR Pulse Width (t_{MR})	V_{CC} > 4.5V	500			ns
		150			
/MR Input Threshold	V_{IL}			0.6	V
	V_{IH}	0.7 × V_{CC}			
/MR-to-Reset Output Delay (t_{MD})				750	ns
PFI Input Threshold		1.2	1.25	1.3	V
PFI Input Current		–25	0.01	+25	nA
/PFO Output Voltage	I_{SINK} = 1.2mA			0.3	V
	I_{SOURCE} = 200µA	0.8 × V_{CC}			

Timing Diagram

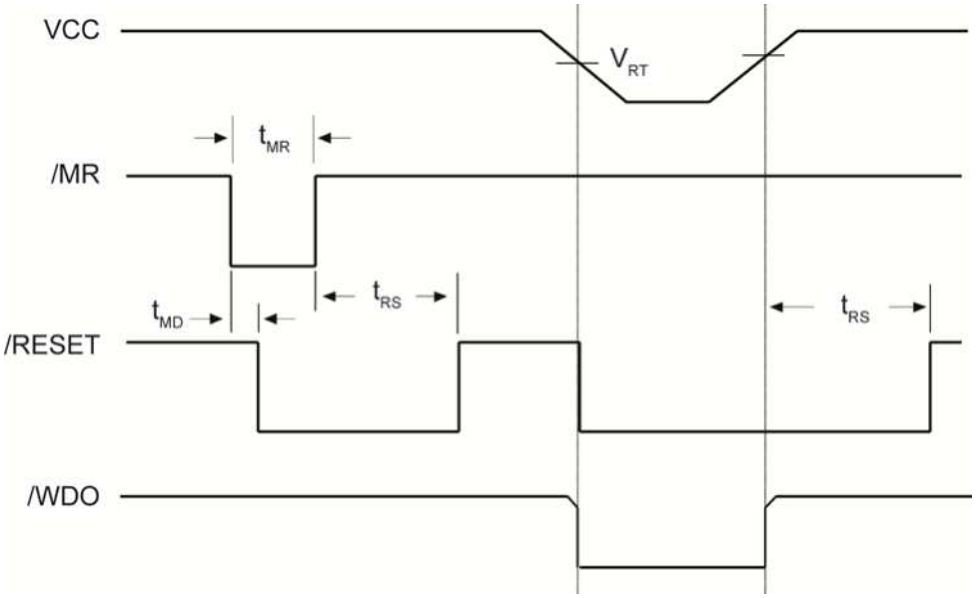
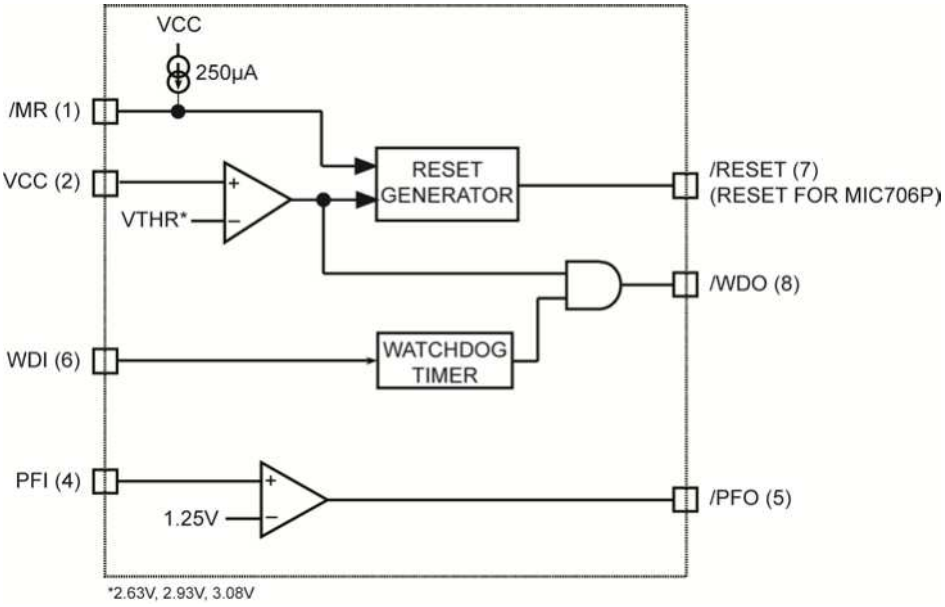
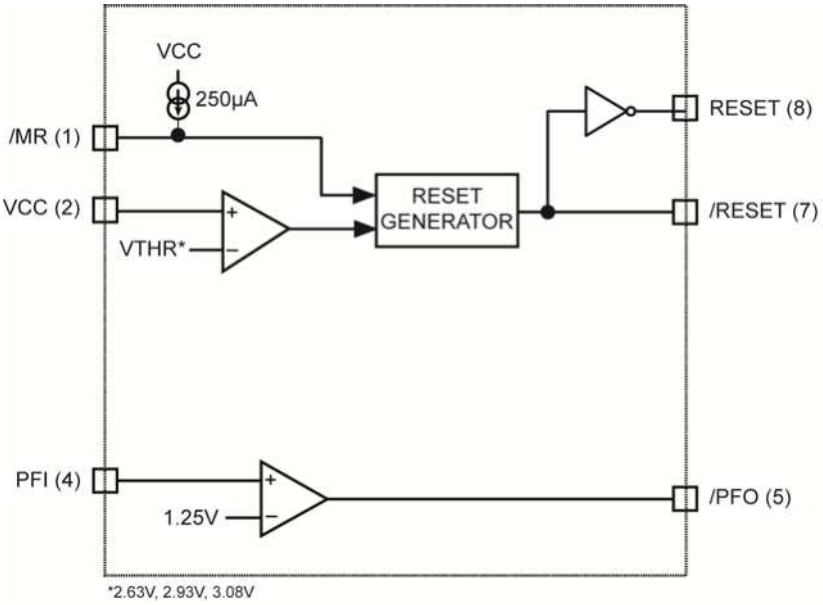


Figure 1. Timing Diagram for Reset

Block Diagram



MIC706 Block Diagram



MIC708 Block Diagram

Application Information

An additional comparator which is independent of the other functions on the MIC706P and MIC708 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.

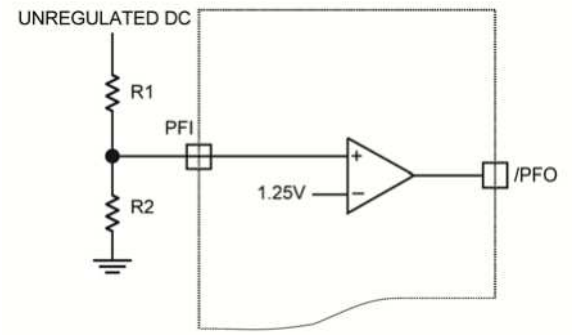


Figure 2. Power-Fail Comparator

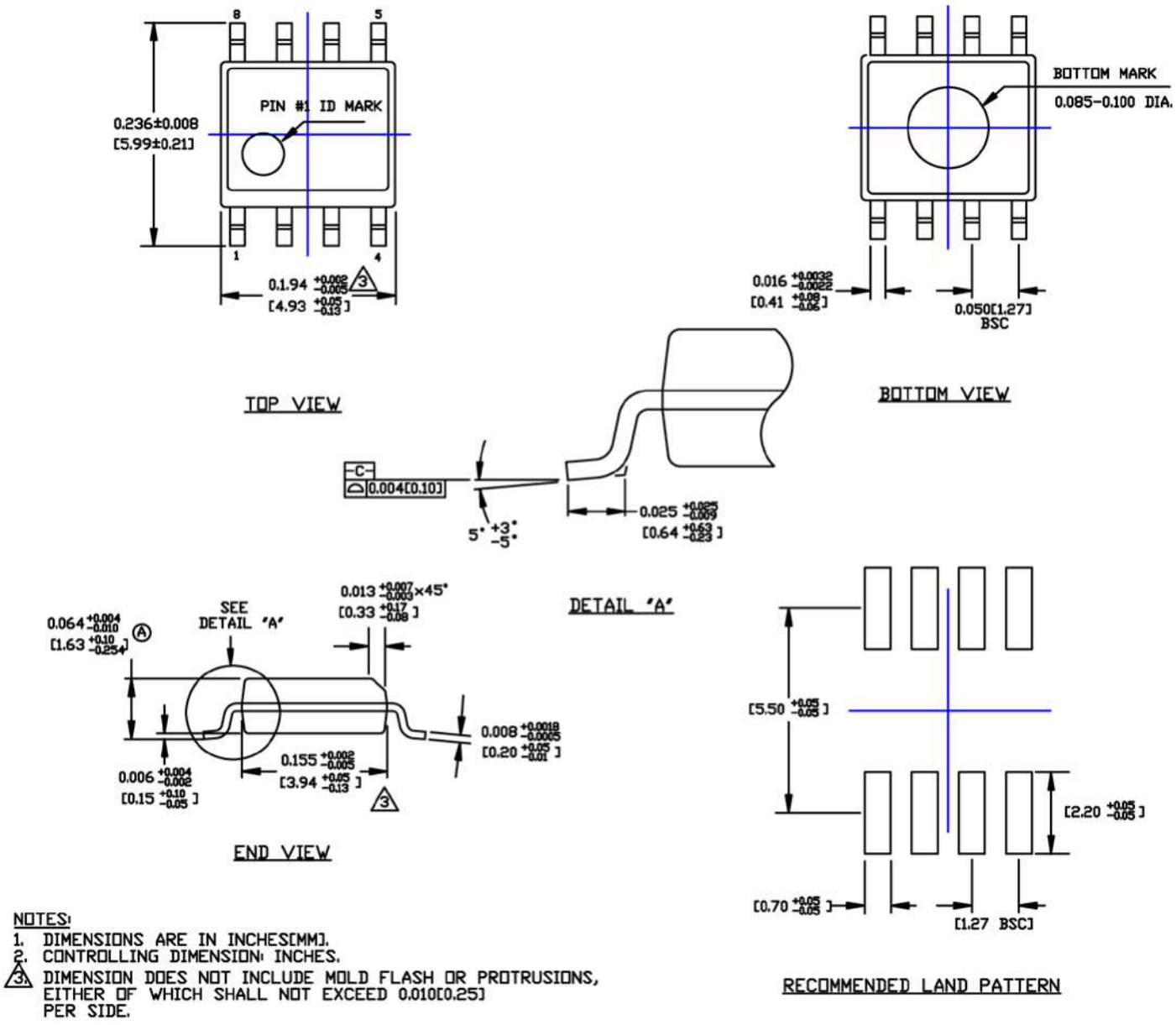
Watchdog Timer

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 in the watchdog timeout period, then /WDO will go low. 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. If VCC falls below the reset threshold voltage, then /WDO goes low immediately regardless of WDI. /WDO can be connected to /MR to generate a reset pulse upon watchdog timeout.

Microprocessor Reset

The /RESET pin is asserted whenever VCC falls below the reset threshold voltage or when /MR goes low. The reset pin remains asserted for a period of 200ms after VCC 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 VCC as low as 1.4V.

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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