The Infinite Bandwidth Company™

MIC705/6/7/8

µP Supervisory Circuits

Description

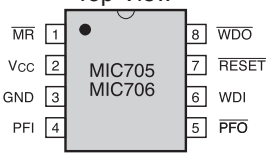
The MIC705/MIC706/MIC707/MIC708 are inexpensive microprocessor supervisory circuits that monitor power supplies in microprocessor based systems. The circuit functions include a watchdog timer, microprocessor reset, power failure warning and a debounced manual reset input.

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.

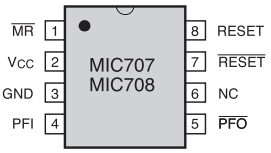
Supply voltage monitor levels of 4.65V and 4.4V are available. The MIC705/MIC707 have a nominal reset threshold level of 4.65V while the MIC706 and MIC708 have a 4.4V nominal reset threshold level. When the supply voltage drops below the respective reset threshold level, $\overline{\text{RESET}}$ is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

Pin Configuration

Top View



N Package - 8 Lead Plastic DIP Package
M Package - 8 Lead Plastic SOIC Package



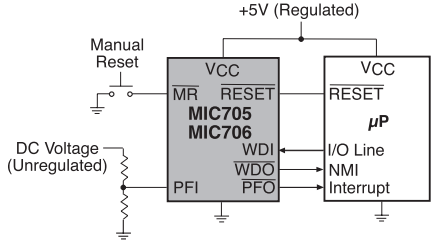
Features

- Debounced Manual Reset Input is TTL/CMOS Compatible
- Reset Pulse Width, 200ms
- Watchdog Timer, 1.6s (MIC705/MIC706)
- 4.4V or 4.65V Precision Voltage Monitor
- Early Power Fail Warning or Low Battery Detect

Typical Applications

- Automotive Systems
- Intelligent Instruments
- Critical Microprocessor Power Monitoring
- Printers
- Computers
- Controllers

Typical Operating Circuit



Ordering Information

Part	Package	Temp. Range
MIC70_N	8-Lead PDIP	-40°C to +85°C
MIC70_M	8-Lead SOIC	-40°C to +85°C

Absolute Maximum Ratings

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 outputs) 20mA

Operating Temperature Range
  MIC70_N, MIC70_M . . . . . -40°C to 85°C
Storage Temperature Range . . . . . -65°C to 150°C
Lead Temperature (Soldering - 10 sec.) . . . . . 300°C
Power Dissipation (PDIP) 475mW
Power Dissipation (SOIC) 400mW

Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent device failure. Functionality at or above these limits is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability. Operating ranges define those limits between which the functionality of the device is guaranteed.

Electrical Characteristics

V_{CC} = 4.75V to 5.5V for MIC705/MIC707, V_{CC} = 4.5V to 5.5V for MIC706/MIC708, T_A = -40°C to 85°C unless otherwise noted.

Parameter	Conditions	Min	Typ	Max	Units
Operating Voltage Range, V_{CC}	MIC70--	1.4		5.5	V
Supply Current	MIC70--			60	µA
Reset Voltage Threshold	MIC705, MIC707 MIC706, MIC708	4.50 4.25	4.65 4.4	4.75 4.5	V
Reset Threshold Hysteresis			40		mV
Reset Pulse Width, t_{RS}		140	200	280	ms
$\overline{\text{RESET}}$ Output Voltage	I_{Source} = 800µA I_{Sink} = 3.2mA MIC70--C, I_{Sink} = 50µA, V_{CC} = 1.4V	V_{CC} - 1.5V		 0.4 0.3	V
RESET Output Voltage	I_{Source} = 800µA I_{Sink} = 1.2mA	V_{CC} - 1.5V		 0.4	V
Watchdog Timeout Period, t_{WD}		1.0	1.6	2.25	sec
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 V_{IL}, V_{CC} = 5V	3.5		 0.8	V
WDI Input Current	WDI = 0V WDI = V_{CC}	-150	-50 50	 150	µA
WDO Output Voltage	I_{Source} = 800µA I_{Sink} = 1.2mA	V_{CC} - 1.5V		 0.4	V

Electrical Characteristics

V_{CC} = 4.75V to 5.5V for MIC705/MIC707, V_{CC} = 4.5V to 5.5V for MIC706/MIC708, T_A = -40°C to 85°C unless otherwise noted.

Parameter	Conditions	Min	Typ	Max	Units
$\overline{MR}$ Pull-Up Current	$\overline{MR}$ = 0V	100	250	600	μA
$\overline{MR}$ Pulse Width, t_{MR}		150			nS
$\overline{MR}$ Input Threshold	V_{IL} V_{IH}	 2.0		0.8	V
$\overline{MR}$ 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
$\overline{PFO}$ Output Voltage	I_{Sink} = 3.2mA V_{CC} = 5V, I_{Source} = 800μA	 V_{CC} - 1.5V		0.4	V

Pin Functions

Pin Name	Pin No. MIC705 MIC706	Pin No. MIC707 MIC708	
$\overline{MR}$	1	1	Manual Reset Input forces $\overline{RESET}$ 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.
VCC	2	2	Primary supply input, +5V.
GND	3	3	IC ground pin, 0V reference.
PFI	4	4	Power fail input. Internally connected to the power fail comparator which is referenced to 1.25V. The power fail output ($\overline{PFO}$) 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.
$\overline{PFO}$	5	5	Power fail output. The power fail comparator is independent of all other functions on this device.
WDI	6	N/A	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, $\overline{WDO}$ is forced to active low. The watchdog function can be disabled by floating the WDI pin.
N/C	N/A	6	No Connect
$\overline{RESET}$	7	7	$\overline{RESET}$ is asserted if either V_{CC} goes below the reset threshold or by a low signal on the manual reset input ($\overline{MR}$). $\overline{RESET}$ remains asserted for one reset timeout period (200ms) after V_{CC} exceeds the reset threshold or after the manual reset pin transitions from low to high. The watchdog timer will not assert $\overline{RESET}$ unless $\overline{WDO}$ is connected to $\overline{MR}$.
$\overline{WDO}$	8	N/A	Output for the watchdog timer. The 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, $\overline{WDO}$ is forced low. $\overline{WDO}$ will also be forced low if V_{CC} is below the reset threshold and will remain low until V_{CC} returns to a valid level.
RESET	N/A	8	RESET is the compliment of $\overline{RESET}$ and is asserted if either V_{CC} goes below the reset threshold or by a low signal on the manual reset input ($\overline{MR}$). RESET is suitable for microprocessors systems that use an active high reset.

Block Diagram

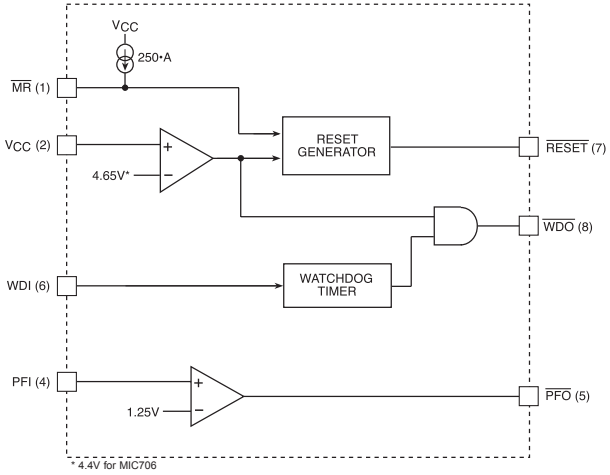


Figure 1. MIC705/MIC706 Block Diagram

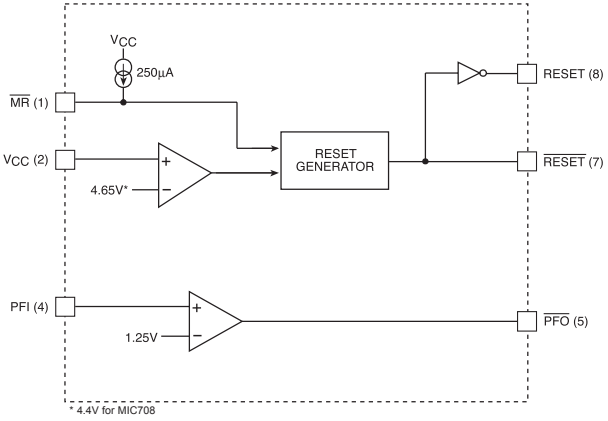


Figure 2. MIC707/MIC708 Block Diagram

Circuit Description

Power Fail Warning

An additional comparator which is independent of other functions on the MIC705/706/707/708 is provided for early warning of power failure. An external voltage

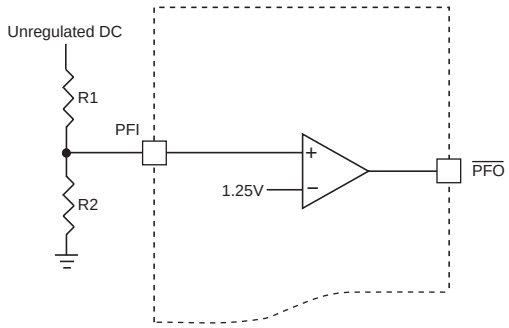


Figure 3. Power Fail Comparator

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 ($\overline{PFO}$) can be used to interrupt the microprocessor when used in this mode and execute shut-down procedures prior to power loss.

Watchdog Timer

The microprocessor can be monitored by connecting the WDI pin (watchdog input) to a bus line or I/O line. If a transition doesn't occur on the WDI pin within the watchdog timeout period, then $\overline{WDO}$ 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 ($\overline{WDO}$) will remain high if WDI sees a valid transition within the watchdog timeout period or if WDI is left floating. If V_{CC} falls below the reset threshold voltage then $\overline{WDO}$ goes low immediately regardless of WDI. Thus, if WDI is left floating, then $\overline{WDO}$ can be used as a low line indicator.

Microprocessor Reset

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

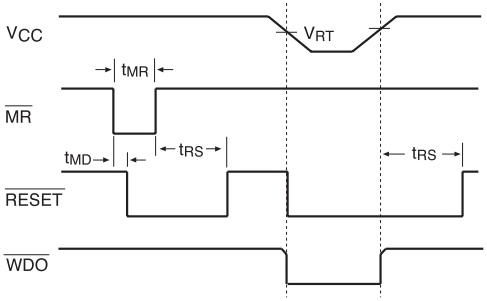


Figure 4. Reset Timing Diagram

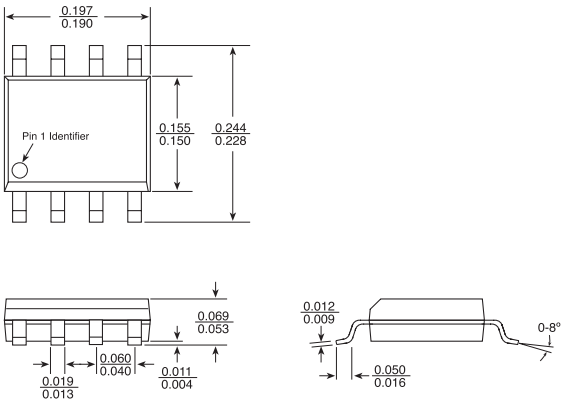
microprocessor is properly reset and powers up into a known condition after a power failure. $\overline{RESET}$ will remain valid with V_{CC} as low as 1.4V.

Alternate Source Cross Reference Guide

Industry P/N	MIC Direct Replacement
MAX705CPA	MIC705N
MAX705CSA	MIC705M
MAX705EPA	MIC705N
MAX705ESA	MIC705M
ADM705AN	MIC705N
DS1705EPA	MIC705N
DS1705ESA	MIC705M
MAX706CPA	MIC706N
MAX706CSA	MIC706M
MAX706EPA	MIC706N
ADM706AN	MIC706N
DS1706EPA	MIC706N
DS1706ESA	MIC706M
MAX707CPA	MIC707N
MAX707CSA	MIC707M
MAX707EPA	MIC707N
MAX707ESA	MIC707M
ADM707AN	MIC707N
DS1707EPA	MIC707N
DS1707ESA	MIC707M
MAX708CPA	MIC708N
MAX708CSA	MIC708M
MAX708EPA	MIC708N
MAX708ESA	MIC708M
ADM708AN	MIC708N
DS1708EPA	MIC708N
DS1708ESA	MIC708M

Packaging Information

M Package, 8-Pin Small Outline



N Package, 8-Pin Plastic Dual-In-Line