

General Description

The MIC1832 is a multifunction circuit which monitors microprocessor activity, external reset and power supplies in microprocessor based systems. The circuit functions include a watchdog timer, power supply monitor, microprocessor reset, and manual pushbutton reset input.

The power supply line is monitored with a comparator and an internal voltage reference. /RST is forced low when an out-of-tolerance condition exists and remains asserted for at least 250ms after V_{CC} rises above the threshold voltage (2.55V or 2.88V). The /RST pin will remain logic low with V_{CC} as low as 1.4V.

The Watchdog input (/ST) monitors μP activity and will assert /RST if no μP activity has occurred within the watchdog timeout period. The watchdog timeout period is selectable with nominal period of 150, 600, 1200 milliseconds.

Features

- Power OK/Resettime delay, 250ms min.
- Watchdog timer, 150ms, 600ms, or 1.2s typical
- Precision supply voltage monitor, select between 5% or 10% of supply voltage
- Available in 8-pin surface mount (SO)
- Debounced External reset input
- Low supply current, <18μA typical

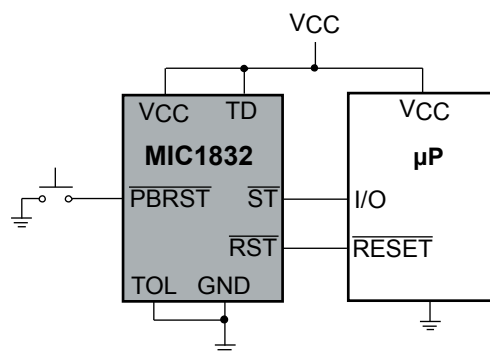
Applications

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

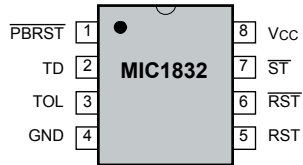
Ordering Information

Part Number		Temperature Range	Package
Standard	Pb-Free		
MIC1832N	MIC1832NY	-40°C to +85°C	8-Pin PDIP
MIC1832M	MIC1832MY	-40°C to +85°C	8-Pin SOIC

Typical Application



Pin Configuration



8-Pin PDIP Package

8-Pin SOIC Package

Pin Description

Pin Number	Pin Name	Pin Function
1	/PBRST	Pushbutton Reset Input: This input is debounced and can be driven with external logic signals or by means of a mechanical pushbutton to actively force a reset. All pulses less than 1ms in duration on the /PBRST pin are ignored, whereas, any pulse with a duration of 20ms or greater is guaranteed to cause a reset.
2	TD	Time Delay input: This input selects the timebase used by the watchdog timer. When TD = 0V, the watchdog timeout period is set to a normal value of 150ms, when TD = open, the watchdog timeout period is set to a nominal value of 600ms and when TD = V_{CC} , the watchdog period is 1.2s nominally.
3	TOL	Tolerance Select Input: Selects whether 5% or 10% of V_{CC} is used as the reset threshold voltage. When TOL = 0V, the 5% tolerance level is selected and when TOL = V_{CC} , a 10% tolerance level is selected.
4	GND	IC ground pin, 0V reference
5	RST	RST is asserted high if either V_{CC} goes below the reset threshold, the watchdog times out or /PBRST is pulled low for a minimum of 20ms. RST remains asserted for one reset timeout period after V_{CC} exceeds the reset threshold or after the watch times out or after /PBRST goes high.
6	/RST	/RST is asserted low if either V_{CC} goes below the reset threshold, the watchdog times out or /PBRST is pulled low for a minimum of 20ms. /RST remains asserted for one reset timeout period after V_{CC} exceeds the reset threshold or after the watch times out or after /PBRST goes high. Open-drain output
7	/ST	Input to watchdog timer. If /ST does not see a transition from high to low within the watchdog timeout period, RST and /RST will be asserted.
8	V_{CC}	Primary supply input, +5V

Absolute Maximum Ratings (Note 1)

Terminal Voltage	
V_{CC}	-0.3V to 7V
All other inputs	-0.3V to ($V_{CC} + 0.3V$)
Input Current	
V_{CC}	250mA
GND, all other inputs	25mA
Lead Temperature (soldering, 10 sec.)	300°C
Storage Temperature	-65°C to 150°C

Operating Ratings (Note 2)

Operating Temperature Range	
MIC1832M/N	-40°C to 85°C
MIC1832D	-40°C to 85°C
Power Dissipation	700mW

Electrical Characteristics

$V_{IN} = xx$; $R_L = xx$; $T_A =$ Operating Temperature Range, **bold** values indicate $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$; unless noted

Parameter	Condition	Min	Typ	Max	Units
Supply Voltage Range	V_{CC}			5.5	V
Supply Current	$I_{CC} @ V_{CC} = 5V$ (Note 4)		18	30	μA
	$I_{CC} @ V_{CC} = 3.3V$ (Note 4)		15	25	μA
/ST and /PBRST Input Levels	V_{IH} (Note 5)	2		$V_{CC}+0.3$	V
	V_{IH} (Note 6)	$V_{CC}-0.4$		$V_{CC}+0.3$	V
	V_{IL}	-0.3		0.5	V
Input Leakage, /ST (Note 7)	I_{IL}			± 1	μA
Output Voltage, /RST, RST	$I_{SOURCE} = 350\mu\text{A}$, $V_{CC} = 3.3V$	2.4			V
Output Voltage, /RST, RST	$I_{SINK} = 10\text{mA}$, $V_{CC} = 3.3V$			0.4	V
Output Voltage	$V_{CC} = 1.4V$, $I_{SINK} = 50\mu\text{A}$			0.3	V
V_{CC} 5% Trip Point (Reset Threshold Voltage)	TOL = Gnd	2.8	2.88	2.97	V
V_{CC} 10% Trip Point (Reset Threshold Voltage)	TOL = V_{CC}	2.47	2.55	2.64	V
Input Capacitance, /ST, TOL	C_{IN} (Note 8)			5	pF
Output Capacitance, /RST, RST	C_{OUT} (Note 8)			7	pF

AC Electrical Characteristics

$V_{CC} = 4.5V$ to $5.5V$; $T_A =$ Operating Temperature Range, **bold** values indicate $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$; unless noted

/PBRST Min. Pulse Width, t_{PB}	/PBRST = V_{IL} (Note 9)	20			ms
/PBRST Delay, t_{PBD}		1	4	20	ms
Reset Active Time, t_{RST}		250	610	1000	ms
/ST Pulse Width, t_{ST}		20			ms
/ST Timeout Period, t_{TD}	TD = 0V	62.5	150	250	ms
	TD = Open	250	600	1000	ms
	TD = V_{CC}	500	1200	2000	ms
V_{CC} Fall Time, t_F		40			μs
V_{CC} Rise Time, t_R		0			ns
V_{CC} Detect to /RST Low and RST High, t_{RPD}	V_{CC} Falling (Note 10)		5	8	μs
V_{CC} Detect to /RST Low and RST Low, t_{RPD}	V_{CC} Falling (Note 9)	250	610	1000	μs

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- 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.** Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5k in series with 100pF.
- Note 4.** I_{CC} is measured with /PBRST and all outputs open and inputs within 0.5V of supply rails
- Note 5.** Measured with $V_{CC} \geq 2.7V$
- Note 6.** Measured with $V_{CC} < 2.7V$
- Note 7.** /PBRST has an internal pull-up resistor to V_{CC} (typ. 40k Ω)
- Note 8.** Guaranteed by design at $T_A = 25^\circ C$
- Note 9.** /PBRST must be held low for a minimum of 20ms to guarantee a reset
- Note 10.** V_{CC} falling a 8.5mV/ μs

Timing Diagrams

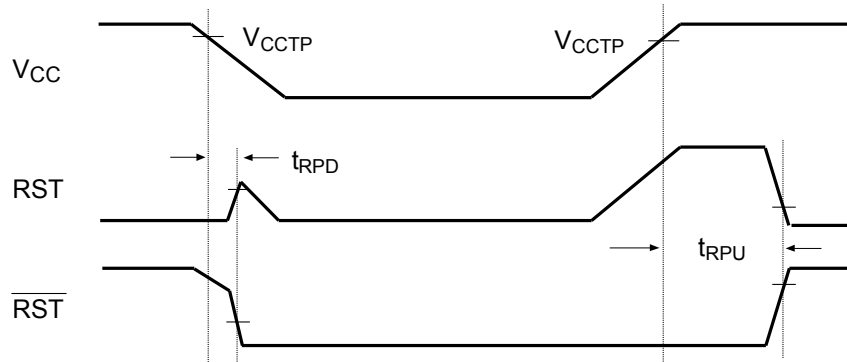


Figure 1. Power-Up/Power-Down Sequence

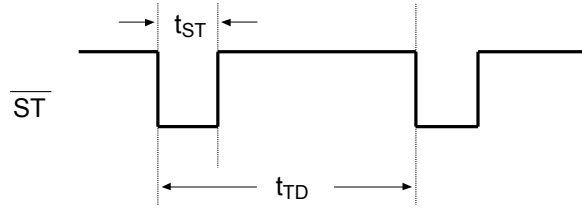


Figure 2. Watchdog Input

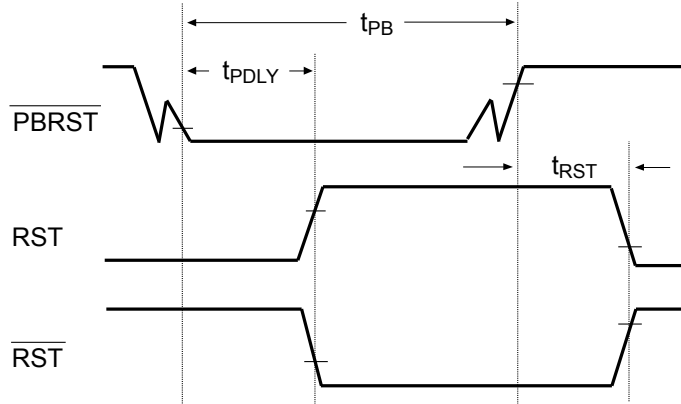


Figure 3. Pushbutton Reset

Applications Information

Power Monitor

The $\overline{\text{RST}}$ and RST pins are asserted whenever V_{CC} falls below the reset threshold voltage as determined by the TOL pin. A 5% tolerance level (4.62V reset threshold voltage) can be selected by connecting the TOL pin to ground and a 10% tolerance can be selected by connecting the TOL pin to V_{CC} . The reset pins will remain asserted for a period of 250ms after V_{CC} has risen above the reset threshold voltage. The reset function ensures the microprocessor is properly reset and powers up into a known condition after a power failure. $\overline{\text{RST}}$ will remain valid with V_{CC} as low as 1.4V.

Watchdog Timer

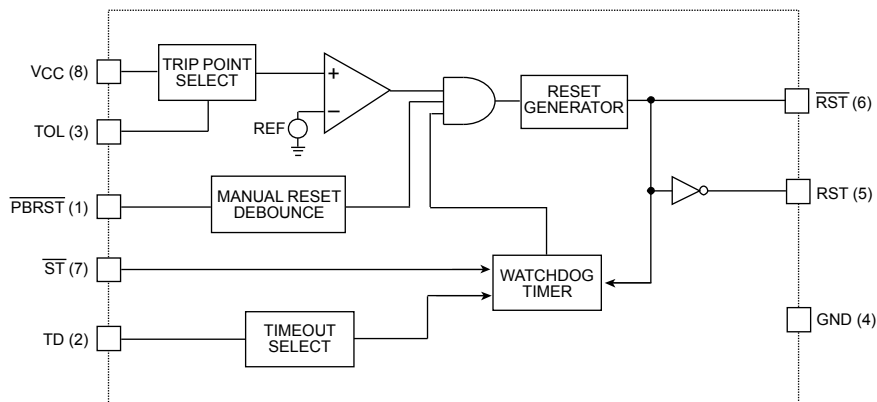
The microprocessor can be mounted by connecting the $\overline{\text{ST}}$ pin (watchdog input) to a bus line or I/O line. If a high-to-low does not occur on the $\overline{\text{ST}}$ pin within the watchdog timeout

period (determined by the TD pin, see Table 1.), the $\overline{\text{RST}}$ and the RST will remain asserted for 250ms when this occurs. A minimum pulse of 75ns or any transition high-to-low on the $\overline{\text{ST}}$ pin will reset the watchdog timer. The watchdog timer will be reset if $\overline{\text{ST}}$ sees a valid transition within the watchdog timeout period.

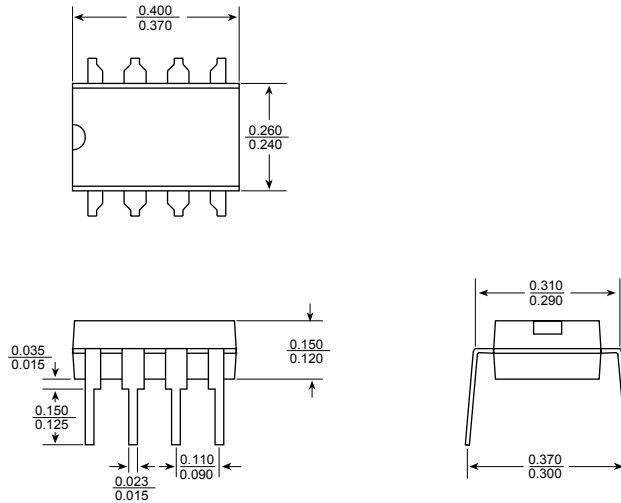
Pushbutton Reset Input

The $\overline{\text{PBRST}}$ input can be driven with a manual pushbutton switch or with external logic signals. The input is internally debounced and requires an active low signal to force the reset outputs into their active states. The $\overline{\text{PBRST}}$ input will recognize any pulse that is 20ms in duration or greater and will ignore all pulses that are less than 1ms in duration.

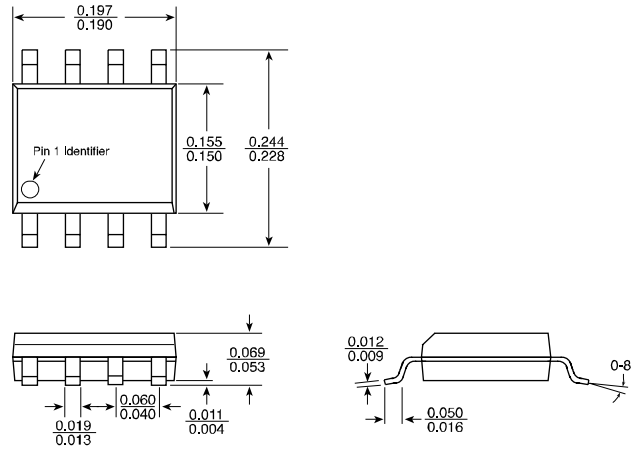
Block Diagram



Package Information



8-Pin PDIP (N)



8-Pin SOIC (M)

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