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### 3.3V $\mu$ P Power Supply Monitor and Reset Circuit

#### General Description

The ASM1832 is a fully integrated microprocessor supervisor. It can halt and restart a “hung-up” microprocessor, restart a microprocessor after a power failure. It has a watchdog timer and external reset override. RESET and  $\overline{\text{RESET}}$  outputs are push-pull.

A precision temperature-compensated reference and comparator circuits monitor the 3.3V,  $V_{CC}$  input voltage status. During power-up or when the  $V_{CC}$  power supply falls outside selectable tolerance limits, both RESET and  $\overline{\text{RESET}}$  become active. When  $V_{CC}$  rises above the threshold voltage, the reset signals remain active for an additional 250ms minimum, allowing the power supply and system microprocessor to stabilize. The trip point tolerance signal, TOL, selects the trip level tolerance to be either 10% or 20%.

A debounced manual reset input,  $\overline{\text{PBRST}}$ , activates the reset outputs for a minimum period of 250ms. There is a watchdog timer to stop and restart a microprocessor that is “hung-up”. The watchdog timeouts periods are selectable: 150ms, 610ms, and 1200ms. If the  $\overline{\text{ST}}$  input is not strobed LOW before the time-out period expires, a reset is generated.

Devices are available in 8-pin DIP, 8-pin SO and compact 8-pin MicroSO packages.

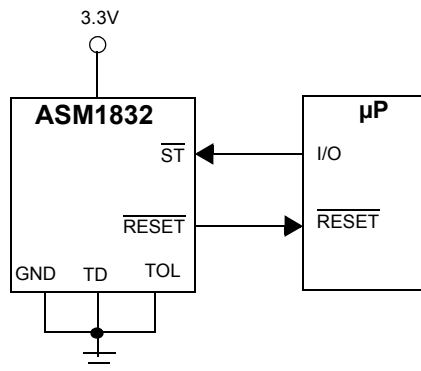
#### Key Features

- 3.3V supply monitor
- Push-pull output
- Selectable watchdog period
- Debounce manual push-button reset input
- Precision temperature-compensated voltage reference and comparator.
- Power-up, power-down and brown out detection
- 250ms minimum reset time
- Active LOW and HIGH reset signal
- Selectable trip point tolerance: 10% or 20%
- Low-cost 8-pin DIP/SO and 8-pin Micro SO packages
- Wide operating temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

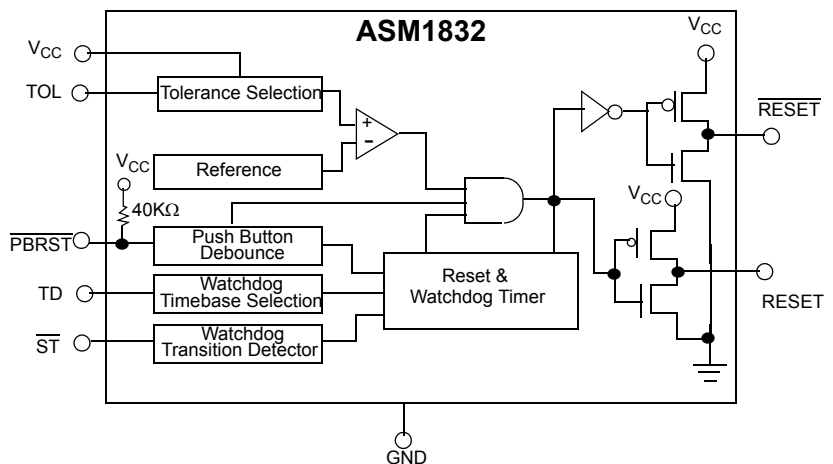
#### Applications

- Microprocessor systems
- Computers
- Controllers
- Portable instruments
- Automotive systems

#### Typical Operating Circuit



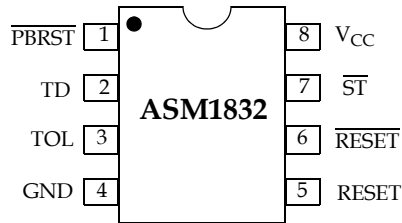
#### Block Diagram





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**Pin Configuration**



**Pin Description**

Pin # 8-Pin Package	Pin Name	Function
1	$\overline{\text{PBRST}}$	Debounced manual pushbutton reset input.
2	TD	Watchdog time delay selection. ( $t_{\text{TD}} = 150\text{ms}$ for TD = GND, $t_{\text{TD}} = 610\text{ms}$ for TD=Open, and $t_{\text{TD}} = 1200\text{ms}$ for TD = $V_{\text{CC}}$ ).
3	TOL	Selects 10% (TOL connected to GND) or 20% (TOL connected to $V_{\text{CC}}$ ) trip point tolerance.
4	GND	Ground.
5	RESET	Active HIGH reset output. RESET is active: 1. If $V_{\text{CC}}$ falls below the reset voltage trip point. 2. If $\overline{\text{PBRST}}$ is LOW. 3. If $\overline{\text{ST}}$ is not strobed LOW before the timeout period set by TD expires. 4. During power-up.
6	$\overline{\text{RESET}}$	Active LOW reset output. (See RESET).
7	$\overline{\text{ST}}$	Strobe input.
8	$V_{\text{CC}}$	3.3V power.



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**Detailed Description**

The ASM1832 monitors the microprocessor or microcontroller power supply and issues reset signals, both active HIGH and active LOW, that halt processor operation whenever the power supply voltage levels are outside a predetermined tolerance.

**RESET and  $\overline{\text{RESET}}$  outputs**

RESET and  $\overline{\text{RESET}}$  signals are active for a minimum of 250ms after the supply has returned to in-tolerance level. This allows the power supply and monitored processor to stabilize before instruction execution is allowed to begin.

**Trip Point Tolerance Selection**

The TOL input is used to determine the level  $V_{CC}$  can vary below 3.3V without asserting a reset. With TOL connected to  $V_{CC}$ , RESET and  $\overline{\text{RESET}}$  become active whenever  $V_{CC}$  falls below 2.64V. RESET and  $\overline{\text{RESET}}$  become active when the  $V_{CC}$  falls below 2.98V if TOL is connected to ground.

After  $V_{CC}$  has risen above the trip point set by TOL, RESET and  $\overline{\text{RESET}}$  remain active for a minimum time period of 250ms. On power-down, one  $V_{CC}$  falls below the reset threshold RESET stays LOW and is guaranteed to be 0.4V or less until  $V_{CC}$  drops below 1.2V. The active HIGH reset signal is valid down to a  $V_{CC}$  level of 1.2V also.

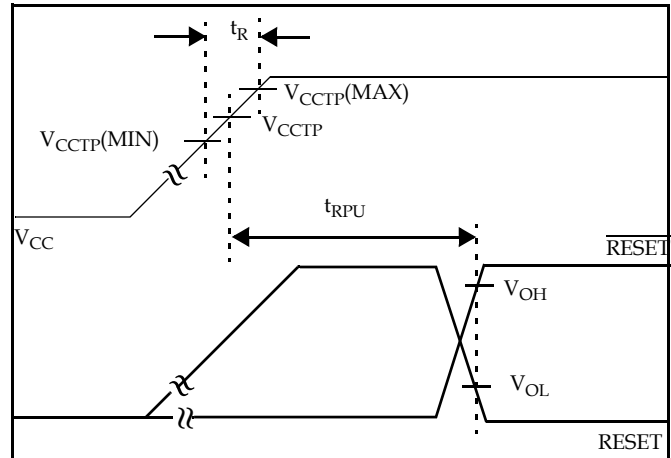


Figure 1: Timing Diagram : Power Up

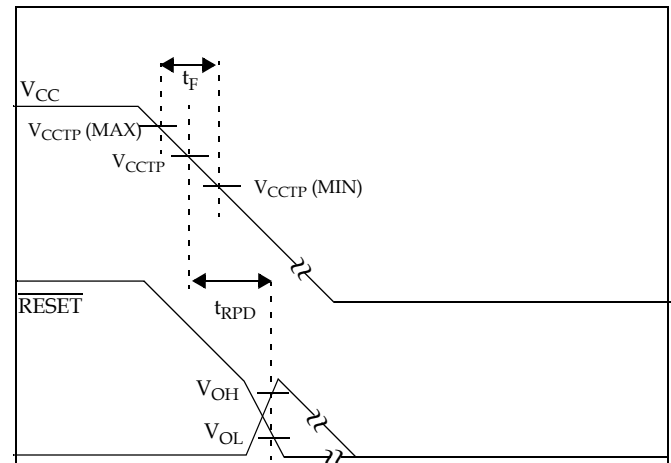


Figure 2: Timing Diagram : Power Down

Tolerance Select	Tolerance	TRIP Point Voltage (V)		
		Min	Nom	Max
TOL = $V_{CC}$	20%	2.47	2.55	2.64
TOL = GND	10%	2.80	2.88	2.97

**Application Information**

**Manual Reset Operation**

Push-button switch input,  $\overline{\text{PBRST}}$ , allows the user to override the internal trip point detection circuits and issue reset signals. The pushbutton input is debounced and is pulled HIGH through an internal 40k $\Omega$  resistor.

When  $\overline{\text{PBRST}}$  is held LOW for the minimum time  $t_{PB}$ , both resets become active and remain active for a minimum time period of 250ms after  $\overline{\text{PBRST}}$  returns HIGH.



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The debounced input is guaranteed to recognize pulses greater than 20ms. No external pull-up resistor is required, since  $\overline{\text{PBRST}}$  is pulled HIGH by an internal 40kΩ resistor.

The  $\overline{\text{PBRST}}$  can be driven from a TTL or CMOS logic line or shorted to ground with a mechanical switch.

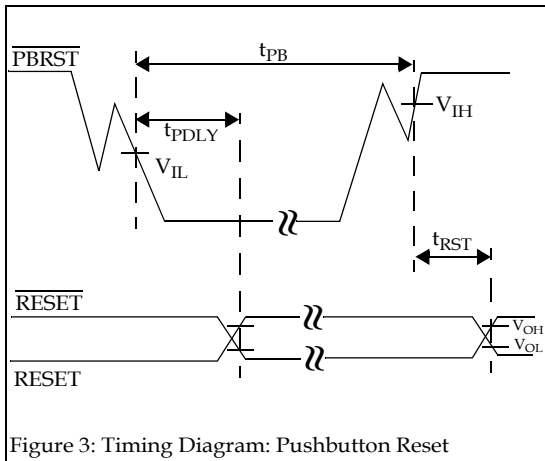


Figure 3: Timing Diagram: Pushbutton Reset

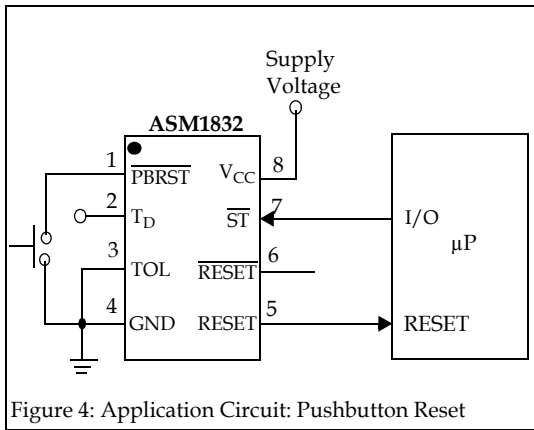


Figure 4: Application Circuit: Pushbutton Reset

**Watchdog Timer and  $\overline{\text{ST}}$  Input**

A watchdog timer stops and restarts a microprocessor that is “hung-up”. The  $\mu\text{P}$  must toggle the  $\overline{\text{ST}}$  input within a set period (as selectable through  $T_D$  input) to verify proper software execution. If the  $\overline{\text{ST}}$  is not toggled low within the minimum timeout period, reset signals become active. On power-up after the supply voltage returns to an in-tolerance condition, the reset signal remains active for 250ms minimum, allowing the power supply and system microprocessor to stabilize.

$\overline{\text{ST}}$  Pulses as short as 20ns can be detected.

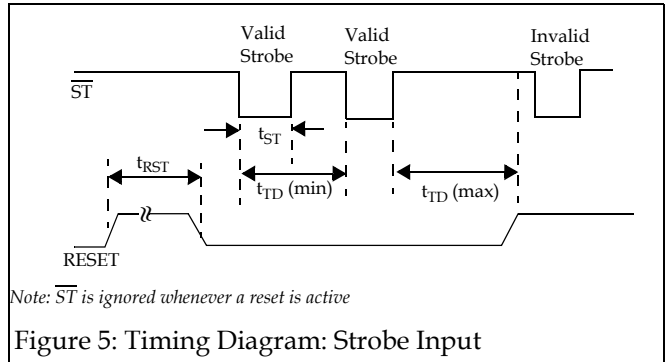


Figure 5: Timing Diagram: Strobe Input

Timeouts periods of approximately 150ms, 610ms or 1,200ms are selected through the  $T_D$  pin.

TD Voltage level	Watchdog Time-out Period (ms)		
	Min	Nom	Max
GND	62.5	150	250
Floating	250	610	1000
V <sub>CC</sub>	500	1200	2000

The watchdog timer can not be disabled. It must be strobed with a high-to-low transition to avoid watchdog timeout and reset.

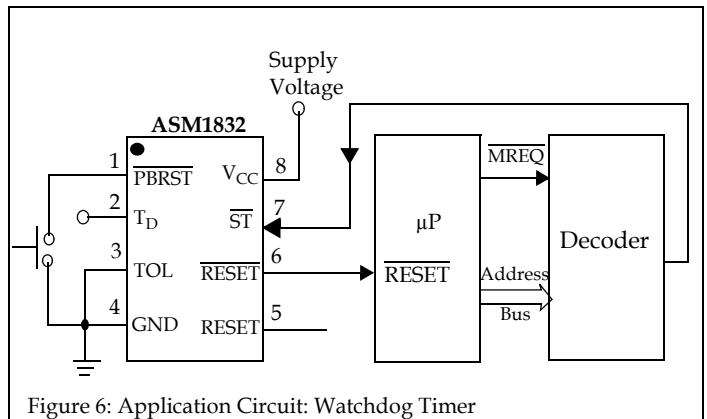


Figure 6: Application Circuit: Watchdog Timer



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## Absolute Maximum Ratings

Parameter	Min	Max	Unit
Voltage on VCC	-0.5	7	V
Voltage on $\overline{ST}$ , TD	-0.5	$V_{CC} + 0.5$	V
Voltage on $\overline{PBRST}$ , $\overline{RESET}$ , $\overline{RESET}$	-0.5	$V_{CC} + 0.5$	V
Operating Temperature Range	-40	+85	°C
Soldering Temperature (for 10 sec)		+260	°C
Storage Temperature	-55	+125	°C
Note: 1. Voltages are measured with respect to ground 2. These are stress ratings only and functional implication is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.			

## DC Electrical Characteristics

Unless otherwise stated,  $1.2 \leq V_{CC} \leq 5.5V$  and over the operating temperature range of  $-40^{\circ}C$  to  $+85^{\circ}C$ . All voltages are referenced to ground.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	$V_{CC}$		1.0		5.5	V
$\overline{ST}$ and $\overline{PBRST}$ Input High Level	$V_{IH}$	$V_{CC} \geq 2.7V$	2		$V_{CC} + 0.3$	V
$\overline{ST}$ and $\overline{PBRST}$ Input High Level	$V_{IH}$	$V_{CC} < 2.7V$	$V_{CC} - 0.4V$			V
$\overline{ST}$ and $\overline{PBRST}$ Input Low Level	$V_{IL}$		-0.3		0.5	V
$V_{CC}$ Trip Point ( $T_{OL} = GND$ )	$V_{CCTP}$		2.80	2.88	2.97	V
$V_{CC}$ Trip Point ( $T_{OL} = V_{CC}$ )	$V_{CCTP}$		2.47	2.55	2.64	V
Watchdog Timeout Period	$t_{TD}$	$T_D = GND$	62.5	150	250	ms
Watchdog Timeout Period	$t_{TD}$	$T_D = V_{CC}$	500	1200	2000	ms
Watchdog Timeout Period	$t_{TD}$	$T_D$ Floating	250	610	1000	ms



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Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	$V_{OH}$	$I = -500\mu A$ , $V_{CC} < 27.V$ Note 1	$V_{CC} - 0.3V$	$V_{CC} - 0.1V$		V
Output Current	$I_{OH}$	Output = 2.4V, $V_{CC} \geq 2.7V$		350		$\mu A$
Output Current	$I_{OL}$	Output = 0.4V, $V_{CC} \geq 2.7V$	10			mA
Input Leakage	$I_{IL}$		-1.0		1.0	$\mu A$
RESET Low Level	$V_{OL}$	Note 1			0.4	V
Internal Pull-up Resistor		$\overline{PBRST}$ pin		40		k $\Omega$
Operating Current	$I_{CC1}$	Outputs open, $V_{CC} \leq 3.6V$ and all inputs at $V_{CC}$ or GND			20	$\mu A$
Input Capacitance	$C_{IN}$				5	pF
Output Capacitance	$C_{OUT}$				7	pF
$\overline{PBRST}$ Manual Reset Minimum Low Time	$t_{PB}$	$\overline{PBRST} = V_{IL}$	20			ms
Reset Active Time	$t_{RST}$		250	610	1000	ms
$\overline{ST}$ Pulse Width	$t_{ST}$	Must not exceed $t_{RD}$ minimum. Watchdog cannot be disabled.	20			ns
$V_{CC}$ Fail Detect to $\overline{RESET}$ or RESET	$t_{RPD}$	Pulses $< 2\mu s$ at $V_{CCTP}$ minimum will not cause reset		5	8	$\mu s$
$V_{CC}$ Slew Rate	$t_F$		20			$\mu s$
$\overline{PBRST}$ Stable LOW to RESET and RESET Active	$t_{PDLY}$				20	ms
$V_{CC}$ Detect to RESET or RESET inactive	$t_{RPU}$	$t_{rise} = 5\mu s$	250	610	1000	ms
$V_{CC}$ Slew Rate	$t_R$		0			ns

## Notes

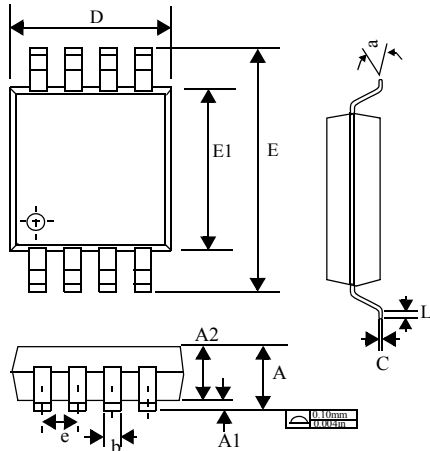
1. RESET remains within 0.5V of  $V_{CC}$  on power-down until  $V_{CC}$  falls below 2V.  $\overline{RESET}$  remains within 0.5V of ground on power-don until  $V_{CC}$  falls below 2.0V.



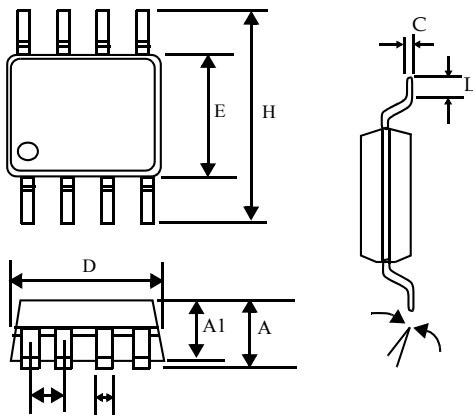
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Package Information

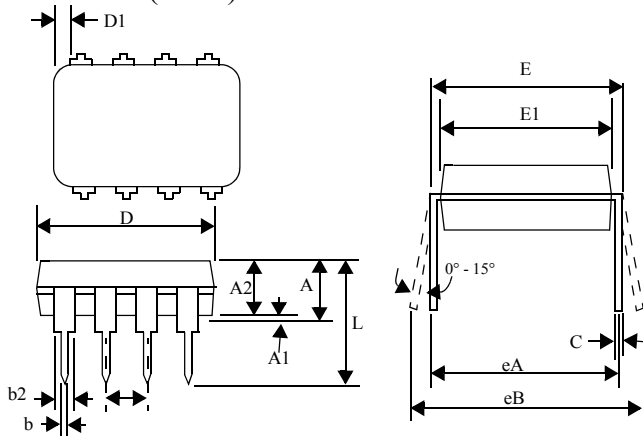
MicroSO (8-Pin)



SO (8-Pin)



Plastic DIP (8-Pin)



	Inches		Millimeteres	
	Min	Max	Min	Max
MicroSO (8-Pin)				
A	-	0.0433	-	0.10
A1	0.0020	0.0059	0.050	0.15
A2	0.0295	0.0374	0.75	0.95
b	0.0098	0.0157	0.25	0.40
C	0.0051	0.0091	0.13	0.23
D	0.1142	0.1220	2.90	3.10
e	0.0256 BSC		0.65 BSC	
E	0.193 BSC		4.90 BSC	
E1	0.1142	0.1220	2.90	3.10
L	0.0157	0.0276	0.40	0.70
a	0°	6°	0°	6°
SO (8-Pin)				
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
B	0.013	0.020	0.33	0.51
C	0.007	0.010	0.19	0.25
e	0.050		1.27	
E	0.150	0.157	3.80	4.00
H	0.228	0.244	5.80	6.20
L	0.016	0.050	0.40	1.27
D	0.189	0.197	4.80	2.00
Plastic DIP (8-Pin)				
A	-	0.210	-	5.33
A1	0.015	-	0.38	-
A2	0.115	0.195	2.92	4.95
b	0.014	0.022	0.36	0.56
b2	0.045	0.070	1.14	1.78
b3	0.030	0.045	0.80	1.14
D	0.355	0.400	9.02	10.16
D1	0.005	-	0.13	-
E	0.300	0.325	7.62	8.26
E1	0.240	0.280	6.10	7.11
e	0.100	-	2.54	-
eA	0.300	-	7.62	-
eB	-	0.430	-	10.92
eC	-	0.060	-	-
L	0.115	0.150	2.92	3.81



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**Ordering Information**

Part Number	Package	Operating Temperature Range	Maximum Supply Current ( $\mu\text{A}$ )	Voltage Monitoring Application
ASM1832	8-Pin DIP	-40°C to 85°C	20	3.3 V
ASM1832S	8-SO	-40°C to 85°C	20	3.3 V
ASM1832SEMA	8-MicroSO	-40°C to 85°C	20	3.3 V



**ASM1832**



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