POWER MANAGEMENT

3.3V µP Power Supply Monitor and Reset Circuit
– Selectable Trip-Point Tolerance and Watchdog Period
– Push-Button Reset
– Push-Pull Reset Outputs

The IMP1832 microprocessor supervisor can halt and restart a "hung-up" or "stalled" microprocessor, restart a microprocessor after a power failure, and debounce a manual push-button microprocessor reset switch. The IMP1832 features over 40% lower supply current than the pin compatible Dallas Semiconductor DS1832.

Precision temperature compensated reference and comparator circuits monitor the 3.3V, V_{CC} input voltage. During power-up or when the V_{CC} power supply falls outside selectable tolerance limits, both RESET and $\overline{RESET}$ 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-percent.

RESET and $\overline{RESET}$ outputs are push-pull.

A debounced manual reset input, $\overline{PBRST}$, activates the reset outputs for a minimum period of 250ms.
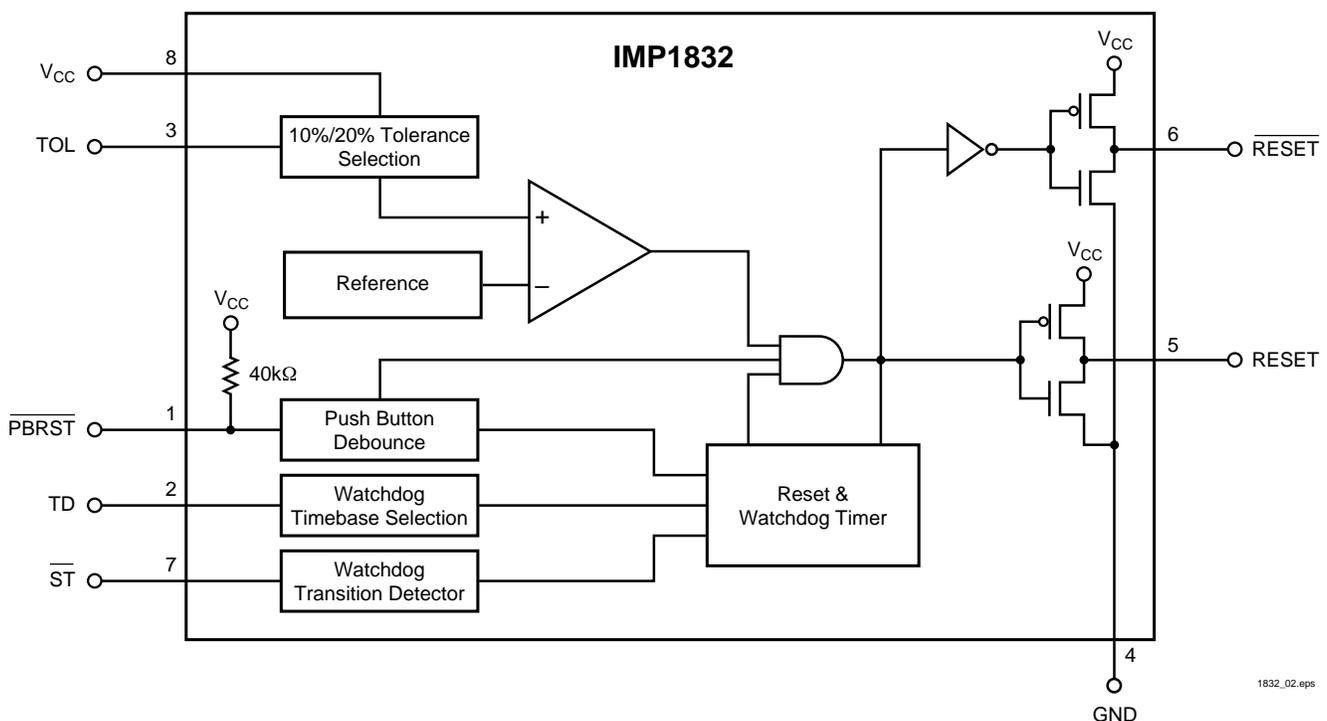
Key Features

- ◆ Pin compatible with the Dallas Semiconductor DS1832
  — Over 40% lower supply current
- ◆ 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 brownout 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 MicroSO packages
- ◆ Wide operating temperature –40°C to +85°C

Also included is a watchdog timer to stop and restart a microprocessor that is "hung-up". Three watchdog time-out periods are selectable: 150ms, 610ms and 1,200ms. If the $\overline{ST}$ input is not strobed LOW before the time-out period expires, a reset is issued.

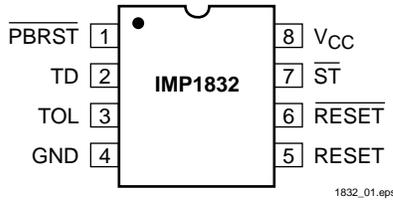Devices are available in 8-pin DIP, 8-pin SO and compact 8-pin MicroSO packages.

Block Diagram

Pin Configuration

DIP/SO/MicroSO


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PBRST  1        8  VCC
   TD  2  IMP1832  7  ST
  TOL  3        6  RESET
  GND  4        5  RESET
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Pin Descriptions

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

Ordering Information

Part Number	Package	Operating Temperature Range	Maximum Supply Current (μA)	Voltage Monitoring Application
IMP1832	8-DIP	−40°C to 85°C	20	3.3V
IMP1832S	8-SO	−40°C to 85°C	20	3.3V
IMP1832SEMA	8-MicroSO	−40°C to 85°C	20	3.3V

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Absolute Maximum Ratings

Voltage on V_{CC} . . . . −0.5V to 7V
Voltage on $\overline{ST}$, TD . . . . −0.5V to V_{CC} + 0.5V
Voltage on $\overline{PBRST}$, RESET, $\overline{RESET}$ . . . . −0.5V to V_{CC} + 0.5V
Operating Temperature Range . . . . −40°C to 85°C

Soldering Temperature . . . . 260°C for 10 seconds
Storage Temperature . . . . −55°C to 125°C

Voltages measured with respect to ground.
These are stress ratings only and functional operation is not implied.

Electrical Characteristics

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage (V_{CC})	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} + 0.3V	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 (TOL = GND)	V_{CCTP}		2.80	2.88	2.97	V
V_{CC} Trip Point (TOL = V_{CC})	V_{CCTP}		2.47	2.55	2.64	V
Watchdog Time-Out Period	t_{TD}	TD = GND	62.5	150	250	ms
Watchdog Time-Out Period	t_{TD}	TD = V_{CC}	500	1200	2000	ms
Watchdog Time-Out Period	t_{TD}	TD floating	250	610	1000	ms
Output Voltage	V_{OH}	I = −500µA, $V_{CC} < 2.7V$	V_{CC} - 0.3V	V_{CC} - 0.1V		V
Output Current	I_{OH}	Output = 2.4V, $V_{CC} \geq 2.7V$		350		µA
Output Current	I_{OL}	Output = 0.4V, $V_{CC} \geq 2.7V$	10			mA
Input Leakage	I_{IL}		−1.0		1.0	µA
RESET Low Level	V_{OL}				0.4	V
Internal Pull-Up Resistor		$\overline{PBRST}$ pin		40		kΩ
Operating Current	I_{CC1}	Outputs open. $V_{CC} \leq 3.6V$ and all inputs at V_{CC} or GND			20	µA
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 < 2µs at V_{CCTP} minimum will not cause reset.		5	8	µs
V_{CC} Slew Rate	t_F		20			µs
$\overline{PBRST}$ Stable LOW to RESET and $\overline{RESET}$ Active	t_{PDLY}				20	ms
V_{CC} Detect to $\overline{RESET}$ or RESET Inactive	t_{RPU}	t_{rise} = 5µs	250	610	1000	ms
V_{CC} Slew Rate	t_R		0			ns

Application Information

Supply Voltage Monitor

The IMP1832 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.

Tolerance levels are set with the TOL pin.

RESET and $\overline{\text{RESET}}$ signals are generated at the last moment of a valid V_{CC} signal. On power-up, both reset signals are active for a minimum of 250ms after the supply has returned to intolerance level. This allows the power supply and monitored processor to stabilize before instruction execution is allowed to begin.

Trip Point Tolerance Selection

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 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.
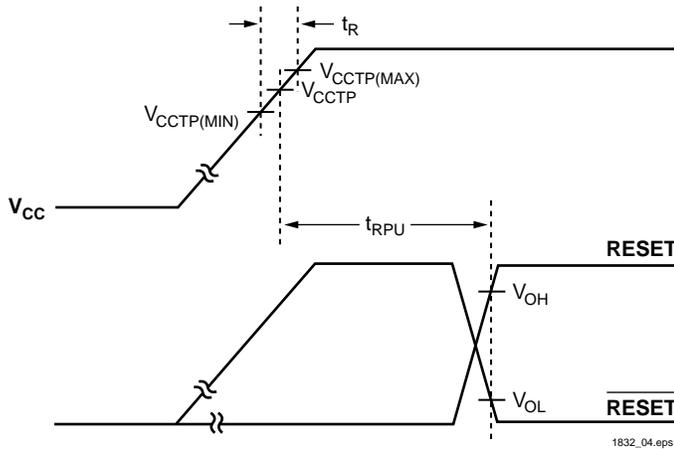

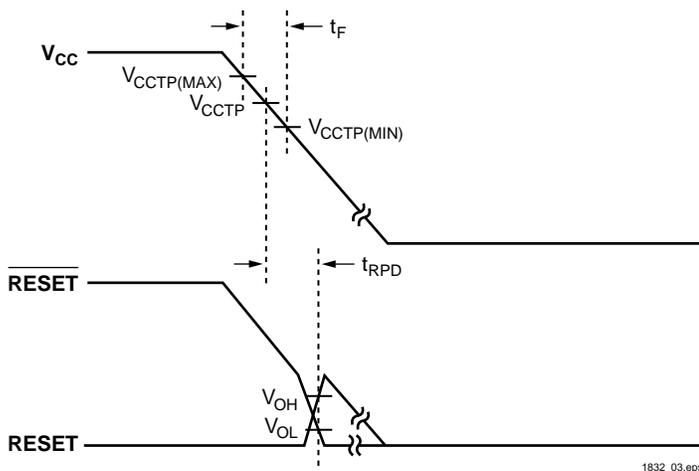*Figure 1. Timing Diagram: Power Up*

Figure 2. Timing Diagram: Power Down

On power-down, once 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.

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

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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 40kΩ 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.

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.
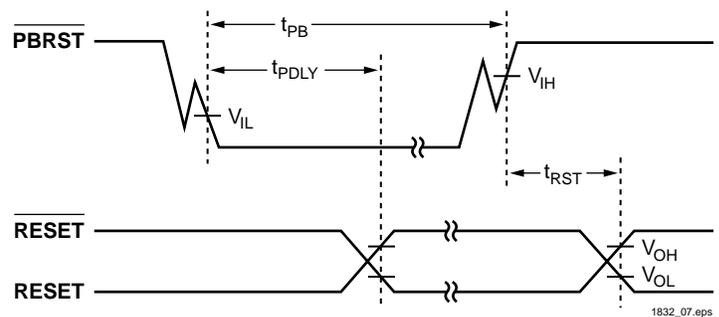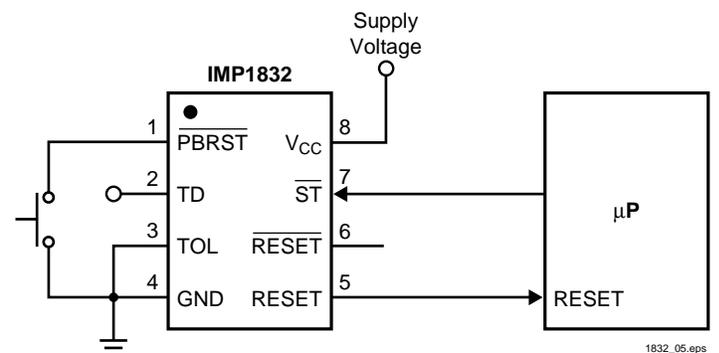

Figure 3. Timing Diagram: Pushbutton Reset

*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". Through the time delay input, TD, three watchdog time-out periods are selectable: 150ms, 610ms and 1,200ms. If the strobe input, $\overline{\text{ST}}$, is not strobed LOW prior to timeout, reset signals become active. On power-up or after the supply voltage returns to an in-tolerance condition, the reset signal remains active for 250ms minimum, allowing the power supply and system micro-processor to stabilize.

$\overline{\text{ST}}$ Pulses as short as 20ns can be detected.
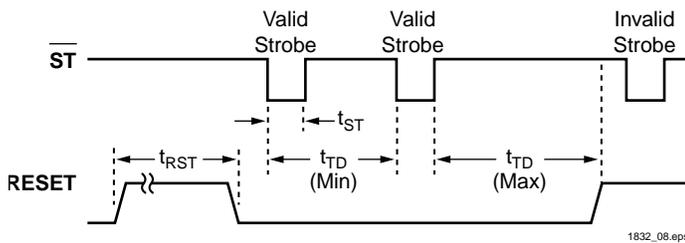
Note: $\overline{\text{ST}}$ is ignored whenever a reset is active.

**Figure 5. Timing Diagram: Strobe Input**

A HIGH-to-LOW $\overline{\text{ST}}$ signal transition must be regularly issued no later than the minimum time-out period defined by the state of the TD signal. This guarantees the watchdog timer does not time-out.

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

TD Voltage Level	Watchdog Time-Out Period (ms)		
	Min	Nominal	Max
GND	62.5	150	250
Floating	250	610	1000
V_{CC}	500	1200	2000

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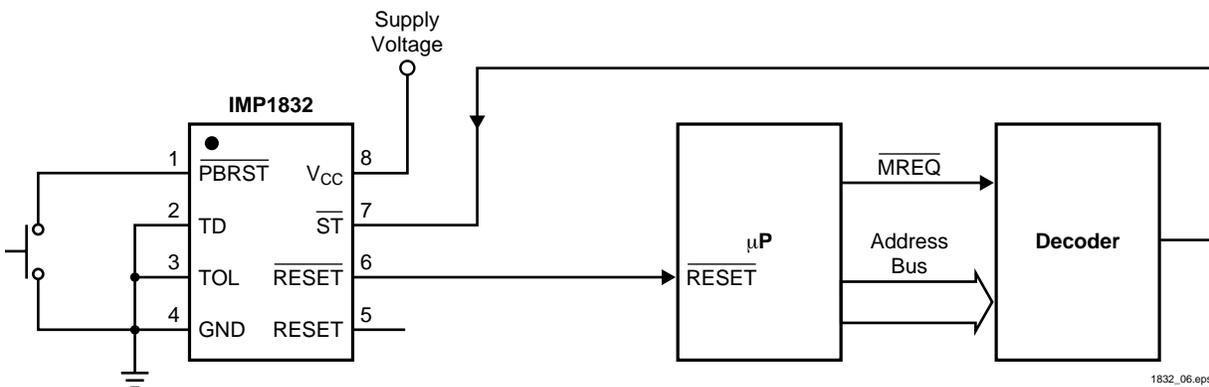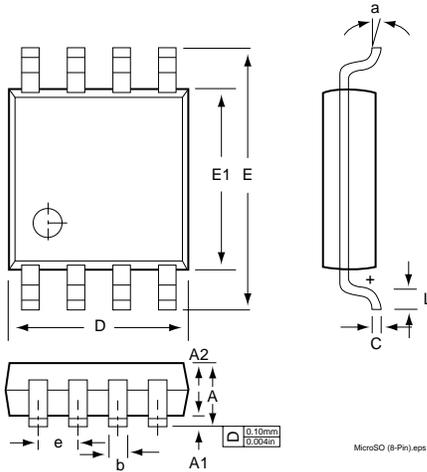

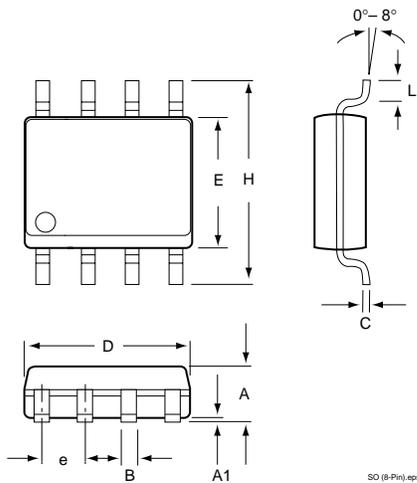**Figure 6. Application Circuit: Watchdog Timer**

Package Dimensions
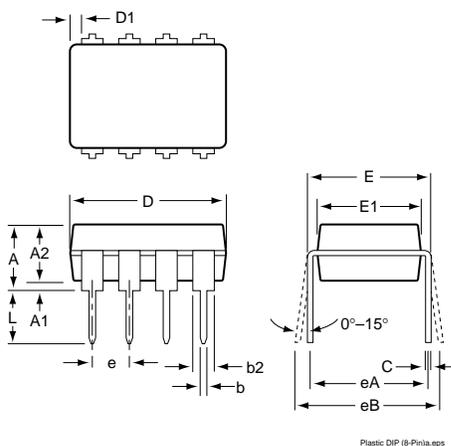
MicroSO (8-Pin)

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SO (8-Pin)

SO (8-Pin).eps

Plastic DIP (8-Pin)

Plastic DIP (8-Pin)a.eps

	Inches		Millimeters	
	Min	Max	Min	Max
MicroSO (8-Pin)*				
A	——	0.0433	——	1.10
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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 * JEDEC Drawing MO-187AA
 ** JEDEC Drawing MS-112AA
*** JEDEC Drawing MS-001BA

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