

Microprocessor Monitor

Features

- Precision Voltage Monitor
 - Adjustable +4.5V or +4.75V
- Reset Pulse Width – 250 msec minimum
- No External Components
- Adjustable Watchdog Timer
 - 150 msec, 600 msec or 1.2 sec
- Operating Voltage 4.0V to 5.5V
- Debounced Manual Reset Input for External Override

General Description

The TC1232 is a fully-integrated processor supervisor that provides three important functions to safeguard processor sanity: precision power on/off reset control, watchdog timer and external reset override.

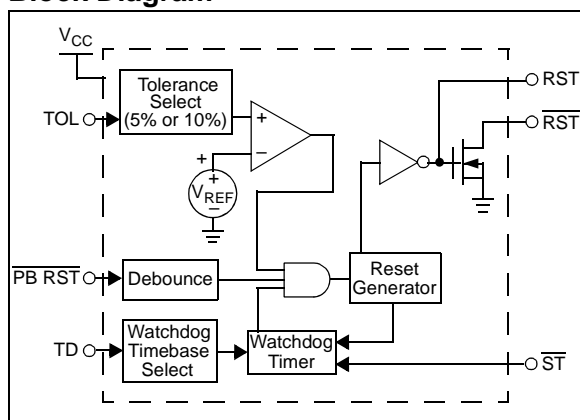
On power-up, the TC1232 holds the processor in the reset state for a minimum of 250 msec after V_{CC} is within tolerance to ensure a stable system start-up.

Microprocessor sanity is monitored by the onboard watchdog circuit. The microprocessor must provide a periodic low-going signal on the \overline{ST} input. Should the processor fail to supply this signal within the selected time-out period (150 msec, 600 msec or 1200 msec), an out-of-control processor is indicated and the TC1232 issues a processor reset as a result.

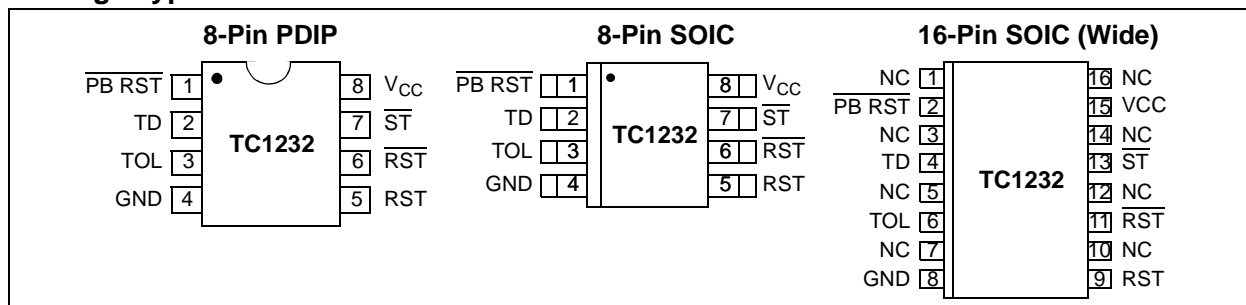
The outputs of the TC1232 are immediately driven active when the PB input is brought low by an external push button switch or other electronic signal. When connected to a push button switch, the TC1232 provides contact debounce.

The TC1232 is packaged in a space-saving 8-Pin PDIP or SOIC package, a 16-Pin SOIC (wide) package and requires no external components.

Block Diagram



Package Types



Device Features

Device	\overline{RST} pin			RST pin		Trip Points (Max)	Minimum Reset Active Time (ms)	WDI Input Typical Timeouts (ms)	MR Input
	Type	Pull-up Resistor	Active Level	Type	Active Level				
TC1232	Open-drain	External	Low	Push-pull	High	4.75V or 4.5V	250	150, 600 or 1200	Yes

TC1232

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Voltage on Any Pin (With Respect to GND)
 -0.3V to +5.8V

Operating Temperature Range:
 C-Version 0°C to +70°C
 E-Version -40°C to +85°C

Storage Temperature Range: -65°C to +150°C

† Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of the specifications is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

DC CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, $T_A = T_{MIN}$ to T_{MAX} ; $V_{CC} = +4.0V$ to $5.5V$.						
Parameters	Sym	Min	Typ	Max	Units	Conditions
Supply Voltage	V_{CC}	4.0	5.0	5.5	V	
\overline{ST} and $\overline{PB RST}$ Input High Level	V_{IH}	2.0	—	$V_{CC} + 0.3$	V	Note 1
\overline{ST} and $\overline{PB RST}$ Input Low Level	V_{IL}	-0.3	—	+0.8	V	
Input Leakage \overline{ST} , TOL	I_L	-1.0	—	+1.0	μA	
Output Current RST	I_{OH}	-1.0	-12	—	mA	$V_{OH} = 2.4V$
Current RST, \overline{RST}	I_{OL}	2.0	10	—	mA	$V_{OL} = 0.4V$
Operating Current	I_{CC}	—	50	200	μA	Note 2
V_{CC} 5% Trip Point	V_{CCTP}	4.50	4.62	4.74	V	TOL = GND (Note 3)
V_{CC} 10% Trip Point	V_{CCTP}	4.25	4.37	4.49	V	TOL = V_{CC} (Note 3)
Capacitance Electrical Characteristics: Unless otherwise noted, $T_A = +25^\circ C$. (Note 4)						
Input Capacitance \overline{ST} , TOL	C_{IN}	—	—	5	pF	
Output Capacitance RST, \overline{RST}	C_{OUT}	—	—	7	pF	

- Note 1:** $\overline{PB RST}$ is internally pulled up to V_{CC} with an internal impedance of typically 40 k Ω .
- 2:** Measured with outputs open.
- 3:** All voltages referenced to GND.
- 4:** Ensured by design.

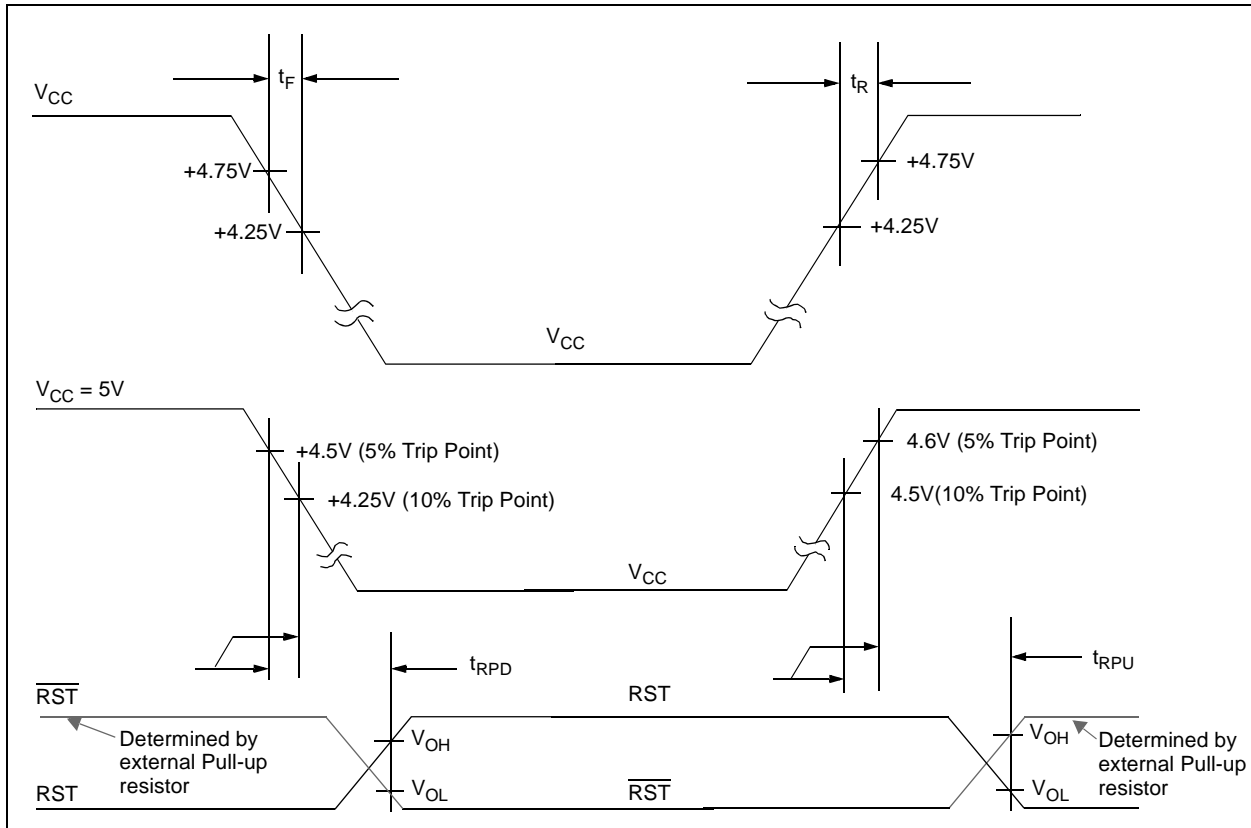


FIGURE 1-1: Rise Time, Fall Time and Reset Detected to Reset Active Timing Waveforms.

AC CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, $T_A = T_{MIN}$ to T_{MAX} ; $V_{CC} = +4.0V$ to $5.5V$.						
Parameters	Sym	Min	Typ	Max	Units	Conditions
V_{CC} Fall Time	t_F	10	—	—	μs	Note 1
V_{CC} Rise Time	t_R	0	—	—	μs	Note 1
V_{CC} Trip Point Detected to RST High and \overline{RST} Low	t_{RPD}	—	—	100	ns	V_{CC} falling
V_{CC} Trip Point Detected to RST High and \overline{RST} Open	t_{RPU}	250	610	1000	ms	V_{CC} rising (Note 2)

Note 1: Ensured by design.

2: $t_R = 5 \mu s$.

TC1232

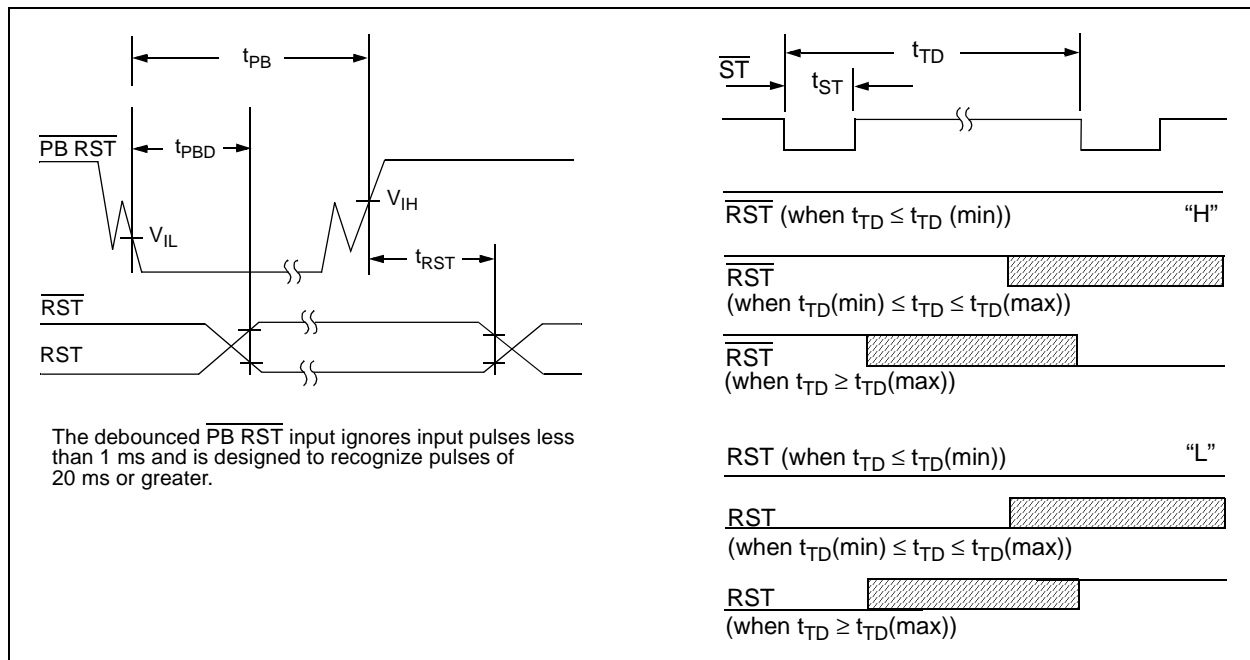


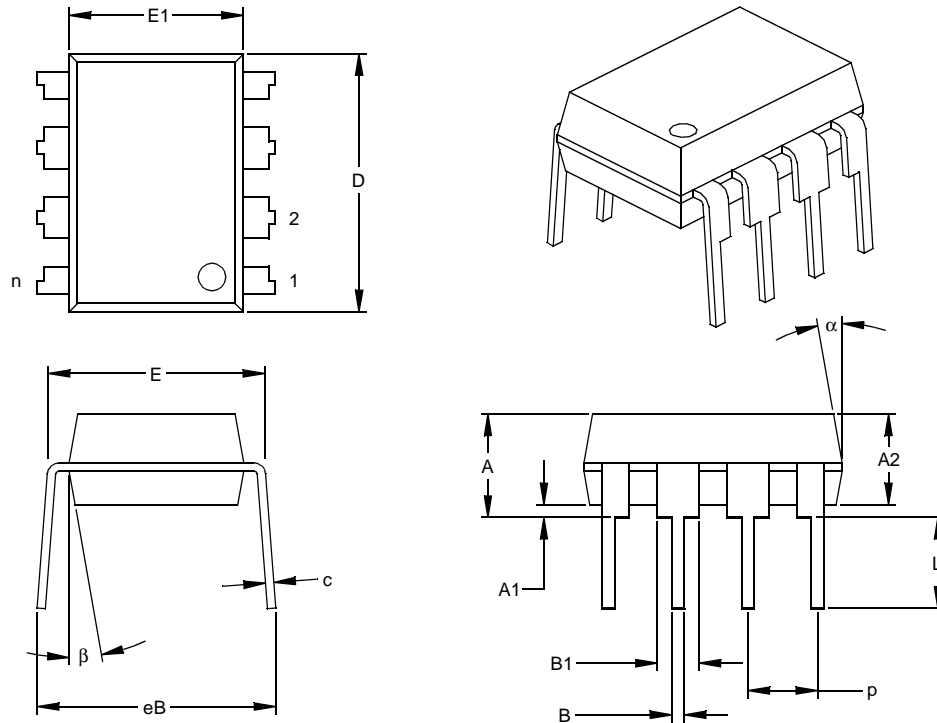
FIGURE 1-2: Push Button Reset and Watchdog Timer Reset Timing Waveforms.

AC CHARACTERISTICS (CONTINUED)

Electrical Specifications: Unless otherwise noted, $T_A = T_{\text{MIN}}$ to T_{MAX} ; $V_{\text{CC}} = +4.0\text{V}$ to 5.5V .						
Parameters	Sym	Min	Typ	Max	Units	Conditions
PB $\overline{\text{RST}}$ Pulse Width	t_{PB}	20	—	—	ms	Note 1
PB $\overline{\text{RST}}$ Falling Edge Low to Reset Active	t_{PBD}	1	4	20	ms	
PB $\overline{\text{RST}}$ Rising Edge High to Reset Inactive	t_{RST}	250	610	1000	ms	
$\overline{\text{ST}}$ Pulse Width	t_{ST}	20	—	—	ns	
$\overline{\text{ST}}$ Time-out Period	t_{TD}	62.5	150	250	ms	TD Pin = 0V
		250	600	1000	ms	TD Pin = Open
		500	1200	2000	ms	TD Pin = V_{CC}

Note 1: $\overline{\text{PB RST}}$ must be held low for a minimum of 20 ms to ensure a reset.

8-Lead Plastic Dual In-line (PA) – 300 mil (PDIP)



Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.360	.373	.385	9.14	9.46	9.78
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing	§ eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter

§ Significant Characteristic

Notes:

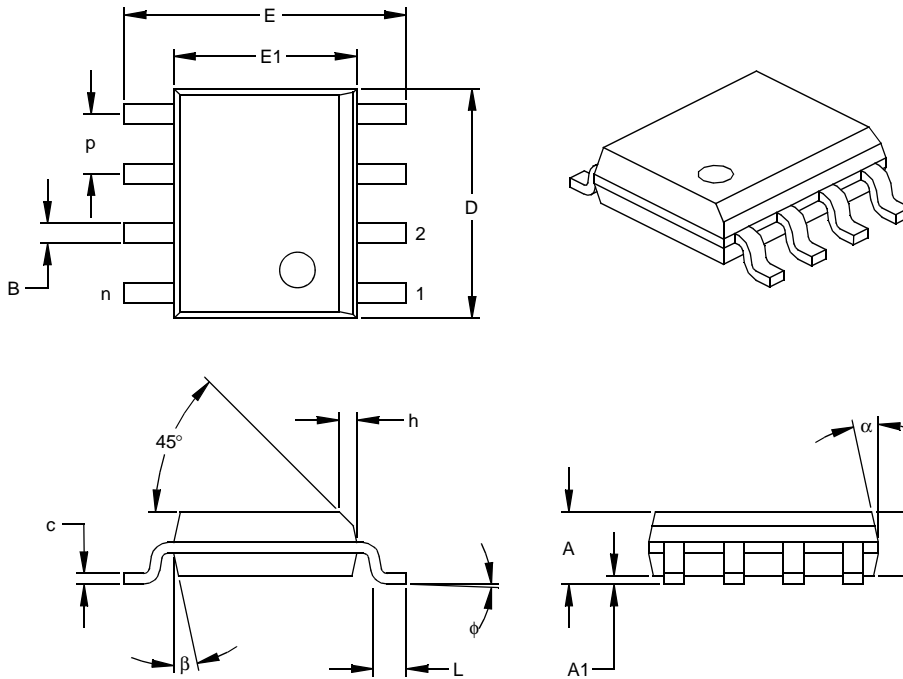
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-001

Drawing No. C04-018

TC1232

8-Lead Plastic Small Outline (OA) – Narrow, 150 mil (SOIC)



Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.050			1.27	
Overall Height	A	.053	.061	.069	1.35	1.55	1.75
Molded Package Thickness	A2	.052	.056	.061	1.32	1.42	1.55
Standoff §	A1	.004	.007	.010	0.10	0.18	0.25
Overall Width	E	.228	.237	.244	5.79	6.02	6.20
Molded Package Width	E1	.146	.154	.157	3.71	3.91	3.99
Overall Length	D	.189	.193	.197	4.80	4.90	5.00
Chamfer Distance	h	.010	.015	.020	0.25	0.38	0.51
Foot Length	L	.019	.025	.030	0.48	0.62	0.76
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.013	.017	.020	0.33	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-057

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>X</u>	<u>/XX</u>	Examples:
Device	Temperature Range	Package	
Device: TC1232: Microprocessor Monitor			a) TC1232COA: 0°C to +70°C, 8L-SOIC
Temperature Range: C = 0°C to +70°C			b) TC1232COA713: 0°C to +70°C, 8L-SOIC, Tape and Reel
E = -40°C to +85°C			c) TC1232COE: 0°C to +70°C, 16L-SOIC
Package: PA = Plastic DIP (300 mil Body), 8-lead			d) TC1232COE713: 0°C to +70°C, 16L-SOIC Tape and Reel
OA = Plastic SOIC, (150 mil Body), 8-lead			e) TC1232CPA: 0°C to +70°C, 8L-PDIP
OA713 = Plastic SOIC, (150 mil Body), 8-lead Tape and Reel			f) TC1232EOA: -40°C to +85°C, 8L-SOIC
OE = Plastic SOIC (300 mil Body), 16-lead			g) TC1232EOA713: -40°C to +85°C, 8L-SOIC, Tape and Reel
OE713 = Plastic SOIC (300 mil Body), 16-lead Tape and Reel			h) TC1232EOE: -40°C to +85°C, 16L-SOIC
			i) TC1232EOE713: -40°C to +85°C, 16L-SOIC, Tape and Reel
			j) TC1232EPA: -40°C to +85°C, 8L-PDIP