TC1272/TC1273/TC1274

3-Pin Reset Monitors for 5V Systems

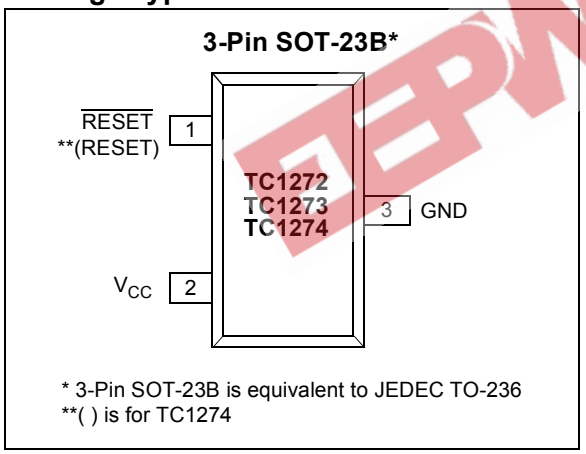
Features

- Precision V_{CC} Monitor for 5.0V Systems
- 100 msec Minimum $\overline{\text{RESET}}$, RESET Output Duration
- Output Valid to V_{CC} = 1.2V
- V_{CC} Transient Immunity
- Small 3-Pin SOT-23B Package
- No External Components

Applications

- Computers
- Embedded Systems
- Battery-Powered Equipment
- Critical µP Power Supply Monitoring

Package Type



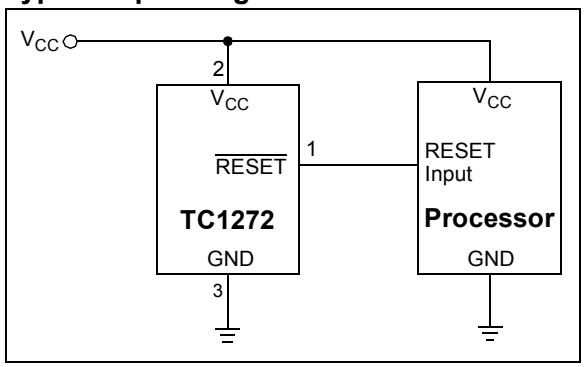
General Description

The TC1272/TC1273/TC1274 are cost-effective system supervisor circuits designed to monitor V_{CC} in digital systems and provide a reset signal to the host processor when necessary. No external components are required.

The reset output is driven active within 20 µsec of V_{CC} falling through the reset voltage threshold. RESET is maintained active for a minimum of 100 msec after V_{CC} rises above the reset threshold. The TC1274 has an active-high RESET output, while the TC1272 and TC1273 have an active-low $\overline{\text{RESET}}$ output. The TC1272 and TC1274 each have a complimentary output, while the TC1273 has an open-drain output. The output of the TC1272 and TC1273 is valid down to V_{CC} = 1.2V. The TC1274 is valid down to V_{CC} = 1.8V. All three devices are available in a 3-Pin SOT-23B package.

The TC1272/TC1273/TC1274 devices are optimized to reject fast transient glitches on the V_{CC} line.

Typical Operating Circuit



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Supply Voltage (V_{CC} to GND) .....+6.0V
$\overline{RESET}$, RESET..... -0.3V to (V_{CC} + 0.3V)
Input Current, V_{CC}.....20 mA
Output Current, $\overline{RESET}$, RESET.....20 mA
Power Dissipation ($T_A \leq 70°C$)
3-Pin SOT-23B (derate 4 mW/°C above +70°C)
.....230 mW
Operating Temperature Range.....-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 = -40°C to +85°C. Typical values are at T_A = +25°C.

Parameters	Sym	Min	Typ	Max	Units	Conditions
Supply Voltage						
TC1272, TC1273	V_{CC}	1.2	—	5.5	V	**Note 1**
TC1274	V_{CC}	1.8	—	5.5	V	
Output Voltage @ 0-500 µA	V_{OH}	V_{CC} – 0.5V	V_{CC} – 0.1V	—	V	TC1272, TC1274 **(Note 1)**
Output Current @ 2.4 Volts						
V_{CC} = 5V TC1272	I_{OH}	—	10	—	mA	**Note 2**
V_{CC} = 4V TC1274	I_{OH}	—	8	—	mA	
Output Current @ 0.4 Volts	I_{OL}	+10	30	—	mA	**Note 2**, **Note 5**
Operating Current						
V_{CC} < 5.5V: TC1272, TC1274	I_{CC}	—	17	40	µA	**Note 3**
V_{CCTP} < V_{CC} < 5.5V: TC1273	I_{CC}	—	17	40	µA	**Note 3**
V_{CC} < V_{CCTP}: TC1273	I_{CC}	—	700	1200	µA	**Note 3**
V_{CC} Trip Point (TC1272/3/4-5)	V_{CCTP-5}	4.50	4.62	4.75	V	**Note 1**
V_{CC} Trip Point (TC1272/3/4-10)	$V_{CCTP-10}$	4.25	4.37	4.49	V	**Note 1**
V_{CC} Trip Point (TC1272/3/4-15)	$V_{CCTP-15}$	4.00	4.12	4.24	V	**Note 1**
Output Capacitance	C_{OUT}	—	9	—	pF	
Internal Pull-Up Resistor	R_P	3	6	9	kΩ	
AC Electrical Characteristics: T_A = -40°C to +85°C unless otherwise noted. Typical values are at T_A = +25°C.						
RESET Active Time	t_{RST}	100	200	300	msec	
V_{CC} Detect to $\overline{RESET}$ TC1272, TC1273	t_{RPD1}	—	20	50	µsec	$V_{CC(LOW)}$ = 1V, Figure 4-2
V_{CC} Detect to RESET - TC1274	t_{RPD2}	—	20	50	µsec	$V_{CC(LOW)}$ = 1V, Figure 4-4
V_{CC} Slew Rate (V_{CCTP}(MAX) to V_{CCTP}(MIN))	t_F	300	—	—	µsec	Figure 4-2, Figure 4-4
V_{CC} Slew Rate (V_{CCTP}(MIN) to V_{CCTP}(MAX))	t_R	0	—	—	nsec	Figure 4-1, Figure 4-3
V_{CC} Detect to $\overline{RESET}$ TC1272, TC1273	t_{RPU1}	100	200	300	msec	**Note 4**, Figure 4-1
V_{CC} Detect to RESET - TC1274	t_{RPU2}	100	200	300	msec	**Note 4**, Figure 4-3

Note 1: All voltages referenced to ground.
2: Measured with $V_{CC} \geq 2.7$ volts.
3: Measured with $\overline{RESET}$ output open for TC1272/TC1273; measured with RESET output open for TC1274.
4: t_R = 5 µsec.
5: A 1 kΩ external resistor may be required in some applications for proper operation of the microprocessor reset control circuit when using the TC1273.

2.0 TYPICAL PERFORMANCE CURVES

Note:	The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

Note: Unless otherwise indicated, T_A = -40°C to +85°C. Typical values are at T_A = +25°C.
Comparator Overdrive voltage (V_{OD}) is defined in Figure 4-5

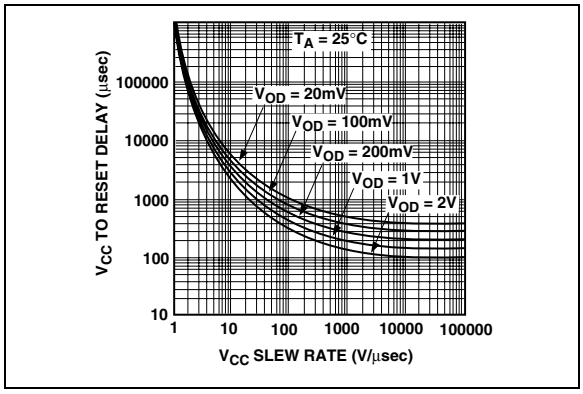


FIGURE 2-1: *V_{CC} Detect to Reset ($\overline{RESET}$).*

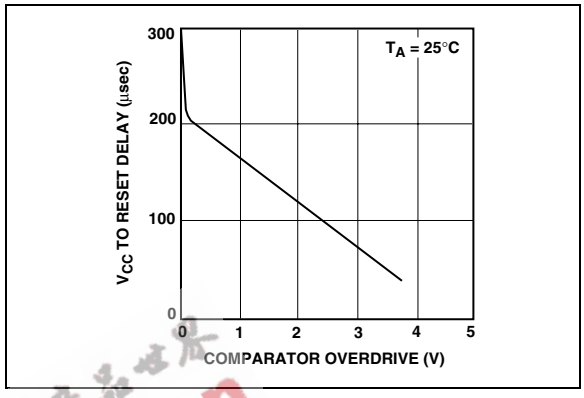


FIGURE 2-2: *Reset Delays vs. Comparator Overdrive.*

3.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 3-1.

TABLE 3-1: PIN FUNCTION TABLES

Pin No.	Symbol	Function
1	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$ Output (TC1272 and TC1273)
1	RESET	RESET Output (TC1274)
2	V_{CC}	Supply voltage (1.2V to 5.5V TC1272 and TC1273; 1.8V to 5.5V TC1274)
3	GND	Ground

3.1 $\overline{\text{RESET}}$ Output ($\overline{\text{RESET}}$)

The $\overline{\text{RESET}}$ output remains low while V_{CC} is below the reset voltage threshold, and for 200 msec (100 msec min.) after V_{CC} rises above reset threshold. The output stage of the TC1272 is complimentary, while the output stage of the TC1273 is open-drain.

3.2 RESET Output (RESET)

The RESET output remains high while V_{CC} is below the reset voltage threshold, and for 200 msec (100 msec min.) after V_{CC} rises above reset threshold. The output stage of the TC1274 is complimentary.

4.0 APPLICATIONS INFORMATION

4.1 Operation – Power Monitor

The TC1272/TC1273/TC1274 is designed to function as a voltage monitor for +5V systems. These devices provide a RESET signal to indicate that the V_{CC} has dropped below a preset voltage level that is selected by the suffix part number. In addition, the RESET is held active for approximately 200 ms after the power supply has risen above the voltage threshold level to allow time for the power supply to stabilize before system operation commences.

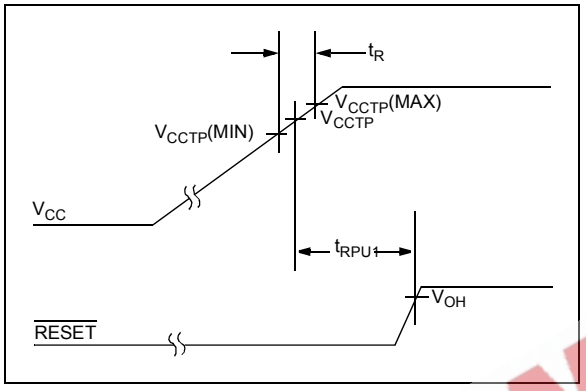


FIGURE 4-1: *Timing Diagram – Power Up (TC1272/TC1273).*

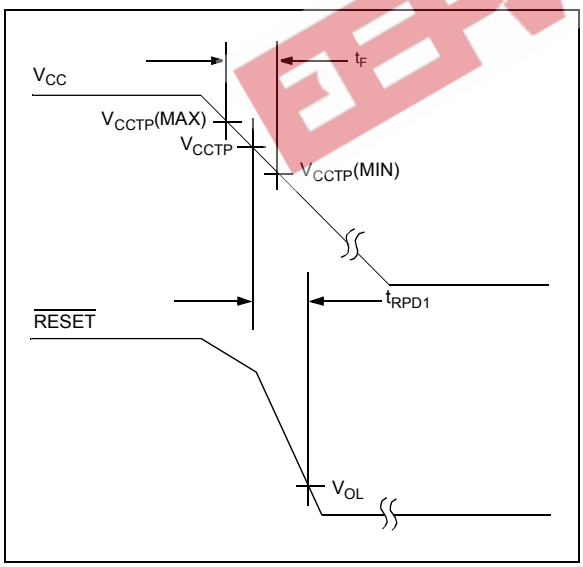


FIGURE 4-2: *Timing Diagram – Power Down (TC1272/TC1273).*

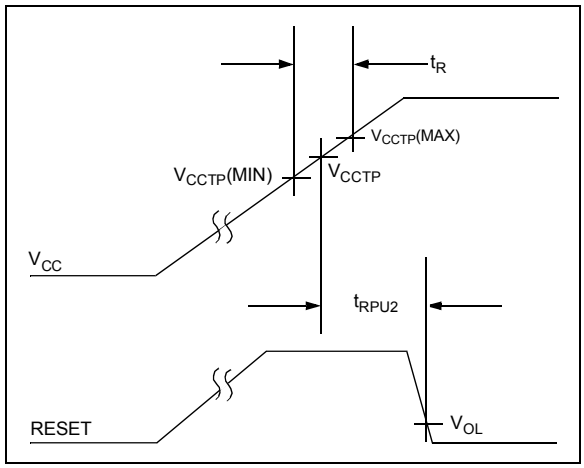


FIGURE 4-3: *Timing Diagram – Power Up (TC1274).*

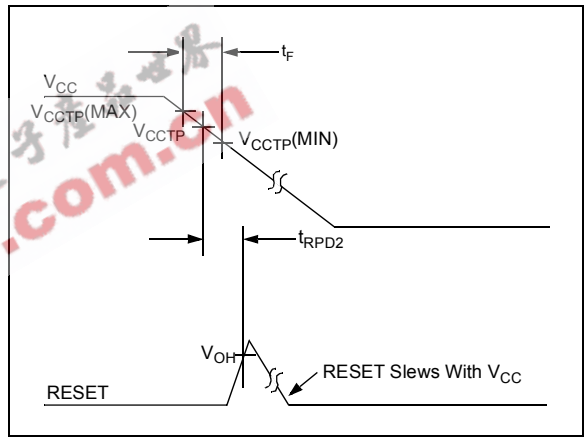


FIGURE 4-4: *Timing Diagram – Power Down (TC1274).*

4.2 V_{CC} Transient Rejection

The TC1272/TC1273/TC1274 provides accurate V_{CC} monitoring and reset timing during power-up, power-down and brownout/sag conditions, and rejects negative-going transients (glitches) on the power supply line. Figure 4-5 shows the maximum transient duration vs. maximum negative excursion (overdrive) for glitch rejection. Any combination of duration and overdrive that lays **under** the curve will **not** generate a reset signal. Combinations above the curve are detected as a brownout or power-down condition. Transient immunity can be improved by adding a capacitor in close proximity to the V_{CC} pin of the TC1272/TC1273/TC1274.

4.3 $\overline{\text{RESET}}$ Signal Integrity During Power-Down

The TC1272 $\overline{\text{RESET}}$ output is valid to V_{CC} = 1.2V. Below this voltage the output becomes an "open circuit" and does not sink current. This means CMOS logic inputs to the µP will be floating at an undetermined voltage. Most digital systems are completely shut down well above this voltage. However, in situations where $\overline{\text{RESET}}$ must be maintained valid to V_{CC} = 0V, a pull-down resistor must be connected from $\overline{\text{RESET}}$ to ground to discharge stray capacitances and hold the output low (Figure 4-6). This resistor value, though not critical, should be chosen such that it does not appreciably load $\overline{\text{RESET}}$ under normal operation (100 kΩ will be suitable for most applications). Similarly, a pull-up resistor to V_{CC} is required for the TC1274 to ensure a valid high $\overline{\text{RESET}}$ for V_{CC} below 1.8V.

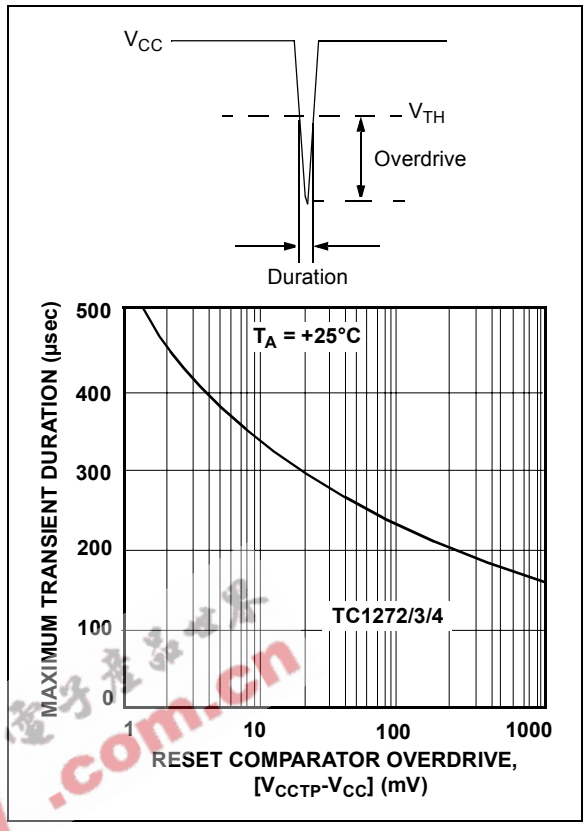


FIGURE 4-5: *Maximum Transient Duration vs. Overdrive For Glitch Rejection At +25°C.*

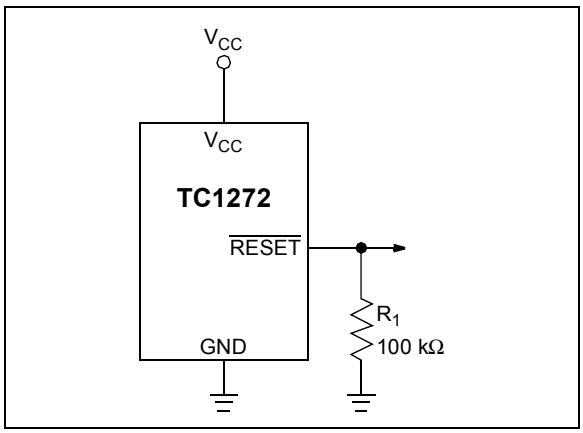
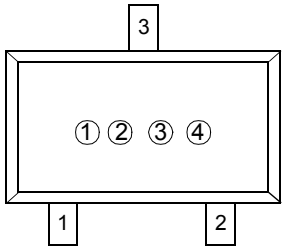


FIGURE 4-6: *Ensuring $\overline{\text{Reset}}$ Valid To V_{cc} = 0V.*

5.0 PACKAGING INFORMATION

5.1 Package Marking Information

3-Pin SOT-23B



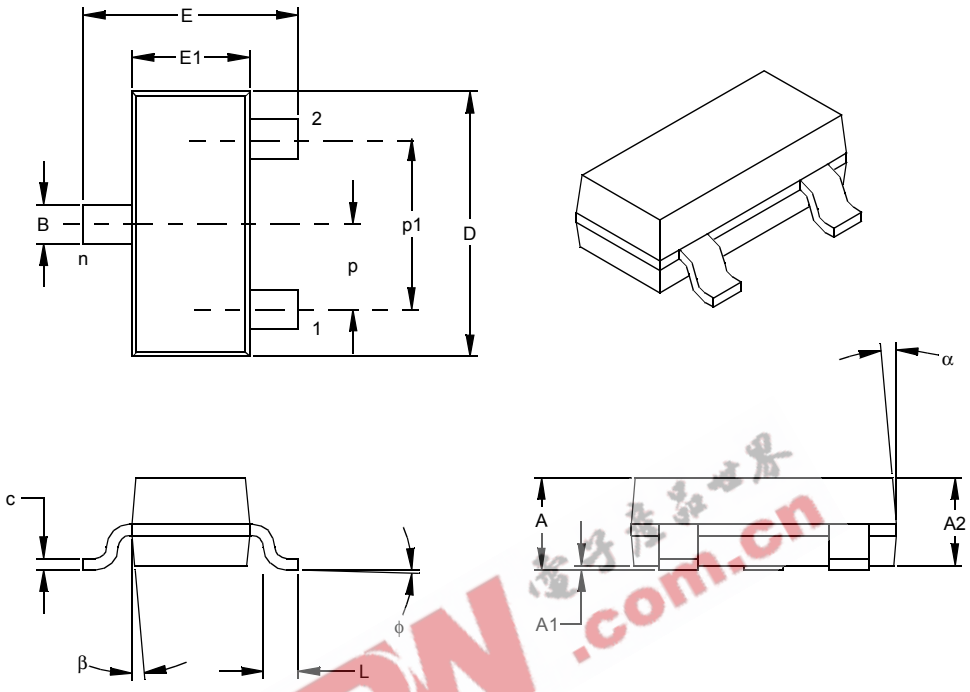
①&② represents part number code + temperature range and voltage

Reset V_{CC} Threshold (V)	TC1272 Code	TC1273 Code	TC1274 Code
4.62	X1	Y1	Z1
4.37	X2	Y2	Z2
4.12	X3	Y3	Z3

③ represents year and quarter code

④ represents lot ID number

3-Lead Plastic Small Outline Transistor (TT) (SOT23)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		3			3	
Pitch	p		.038			0.96	
Outside lead pitch (basic)	p1		.076			1.92	
Overall Height	A	.035	.040	.044	0.89	1.01	1.12
Molded Package Thickness	A2	.035	.037	.040	0.88	0.95	1.02
Standoff §	A1	.000	.002	.004	0.01	0.06	0.10
Overall Width	E	.083	.093	.104	2.10	2.37	2.64
Molded Package Width	E1	.047	.051	.055	1.20	1.30	1.40
Overall Length	D	.110	.115	.120	2.80	2.92	3.04
Foot Length	L	.014	.018	.022	0.35	0.45	0.55
Foot Angle	ϕ	0	5	10	0	5	10
Lead Thickness	c	.004	.006	.007	0.09	0.14	0.18
Lead Width	B	.015	.017	.020	0.37	0.44	0.51
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

* 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: TO-236
Drawing No. C04-104

PRODUCT IDENTIFICATION SYSTEM

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

PART NO.	XX	X	/XX
Device	Reset V_{CC} Threshold	Temperature Range	Package

Device:	TC1272:	3-Pin Reset Monitor - Complementary
	TC1273:	3-Pin Reset Monitor - Open Drain
	TC1274:	3-Pin Reset Monitor - Complementary
Reset V_{CC} Threshold Voltage	5 = 4.62V	
	10 = 4.37V	
	15 = 4.12V	
Temperature Range:	E = -40°C to +85°C	
Package:	NB = Plastic Small Outline Transistor (SOT-23), 3-lead	

Examples:

a) TC1272-10ENBTR: 4.37V Reset
b) TC1272-15ENBTR: 4.12V Reset
c) TC1272-5ENBTR: 4.62V Reset

a) TC1273-10ENBTR: 4.37V Reset
b) TC1273-15ENBTR: 4.12V Reset
c) TC1273-5ENBTR: 4.62V Reset

a) TC1274-10ENBTR: 4.37V Reset
b) TC1274-15ENBTR: 4.12V Reset
c) TC1274-5ENBTR: 4.62V Reset

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