3-Pin Reset Monitors For 5V Systems

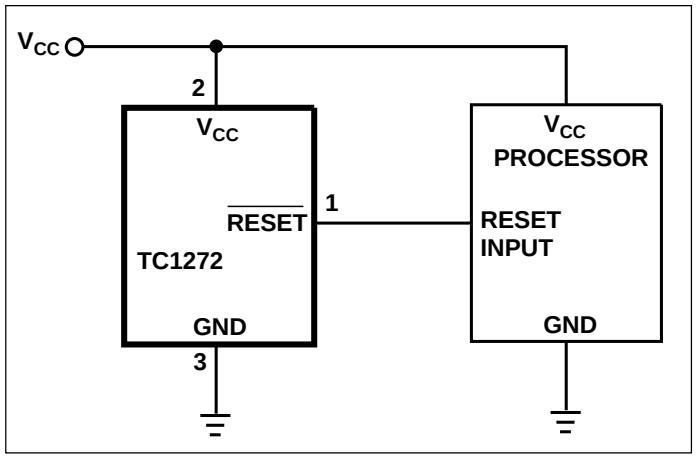
FEATURES

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

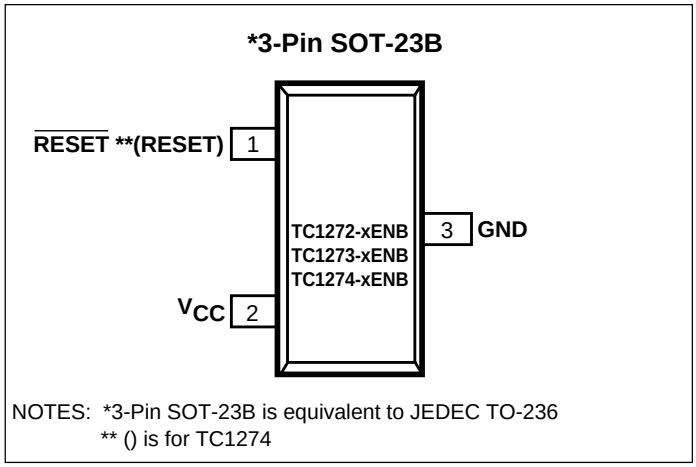
TYPICAL APPLICATIONS

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

TYPICAL OPERATING CIRCUIT



PIN CONFIGURATION



NOTES: *3-Pin SOT-23B is equivalent to JEDEC TO-236
** () is for TC1274

GENERAL DESCRIPTION

The TC1272, TC1273 and 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 20µsec of V_{CC} falling through the reset voltage threshold. Reset is maintained active for a minimum of 100msec 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 guaranteed valid down to V_{CC} = 1.2V. The TC1274 is guaranteed valid down to V_{CC} =1.8 V. All three devices are available in a 3-Pin SOT-23B package.

The TC1272/3/4 are optimized to reject fast transient glitches on the V_{CC} line.

ORDERING INFORMATION

Part No.	Order	Package	Temp. Range
TC1272-xENB	Complimentary	3-Pin SOT-23B	– 40°C to +85°C
TC1273-xENB	Open Drain	3-Pin SOT-23B	– 40°C to +85°C
TC1274-xENB	Complimentary	3-Pin SOT-23B	– 40°C to +85°C

NOTE: The "x" denotes a suffix for V_{CC} threshold - see table below.

Suffix	Reset V_{CC} Threshold (V)
5	4.62
10	4.37
15	4.12

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} 20mA
Output Current, $\overline{RESET}$, RESET 20mA
Operating Temperature Range ..... – 40°C to +85°C
Power Dissipation ($T_A \leq 70°C$)
3-Pin SOT-23B (derate 4mW/°C above +70°C) 230mW
Storage Temperature Range ..... – 65°C to +150°C
Lead Temperature (Soldering, 10 sec) ..... +260°C

*This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to Absolute Maximum Rating Conditions for extended periods may affect device reliability.

RECOMMENDED DC OPERATING CONDITIONS: T_A = –40°C to + 85°C unless otherwise specified. Typical values apply at TA = +25°C.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage(TC1272, TC1273) (TC1274)	(note 1)	1.2 1.8	— —	5.5 5.5	V V

DC ELECTRICAL CHARACTERISTICS: T_A = –40°C to + 85°C unless otherwise specified. Typical values apply at T_A = +25°C.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{OH}	Output Voltage @ 0-500 µA (TC1272, TC1274)	(Note 1)	V_{CC} - 0.5V	V_{CC} - 0.1V	—	V
I_{OH}	Output Current @2.4 Volts V_{CC} = 5V (TC1272) V_{CC} = 4V (TC1274)	 (Note 2)	 — —	 10 8	 — —	 mA mA
I_{OL}	Output Current @0.4 Volts	(Notes 2,5)	+10	30	—	mA
I_{CC}	Operating Current V_{CC} <5.5V (TC1272, TC1274) V_{CCTP} <V_{CC} <5.5V (TC1273) V_{CC} <V_{CCTP} (TC1273)	 (Note 3) (Note 3) (Note 3)	 — — —	 17 17 700	 40 40 1200	 µA µA µA
V_{CCTP-5}	V_{CC} Trip Point (TC1272/3/4-5)	(Note 1)	4.50	4.62	4.75	V
$V_{CCTP-10}$	V_{CC} Trip Point (TC1272/3/4-10)	(Note 1)	4.25	4.37	4.49	V
$V_{CCTP-15}$	V_{CC} Trip Point (TC1272/3/4-15)	(Note 1)	4.00	4.12	4.24	V
C_{OUT}	Output Capacitance		—	9	—	pF
R_P	Internal Pull-Up Resistor (TC1273)		3	6	9	kΩ

AC ELECTRICAL CHARACTERISTICS: T_A = –40°C to + 85°C unless otherwise specified. Typical values apply at T_A = +25°C.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
t_{RST}	RESET Active Time		100	200	300	msec
t_{RPD1}	V_{CC} Detect to $\overline{RESET}$ (TC1272, TC1273)	$V_{CC(LOW)}$= 1V (Figure 2)	—	20	50	µsec
t_{RPD2}	V_{CC} Detect to RESET (TC1274)	$V_{CC(LOW)}$= 1V (Figure 4)	—	20	50	µsec
t_F	V_{CC} Slew Rate (V_{CCTP} (MAX) to V_{CCTP} (MIN))	(Figures 2, 4)	300	—	—	µsec
t_R	V_{CC} Slew Rate (V_{CCTP} (MIN) to V_{CCTP} (MAX))	(Figures 1, 3)	0	—	—	nsec
t_{RPU1}	V_{CC} Detect to $\overline{RESET}$ (TC1272, TC1273)	(Note 4, Figure 1)	100	200	300	msec
t_{RPU2}	V_{CC} Detect to RESET	(TC1274) (Note 4, Figure 3)	100	200	300	msec

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

PIN DESCRIPTION

Pin No. (3-Pin SOT-23B)	Symbol	Description
1	$\overline{\text{RESET}}$ (TC1272, TC1273)	$\overline{\text{RESET}}$ output remains low while V_{CC} is below the reset voltage threshold, and for 200msec (100msec min.) after V_{CC} rises above reset threshold. The output stage of the TC1272 is complimentary. The output stage of the TC1273 is open drain.
1	RESET (TC1274)	RESET output remains high while V_{CC} is below the reset voltage threshold, and for 200msec (100msec min.) after V_{CC} rises above reset threshold. The ouput stage of the TC1274 is complimentary.
2	V_{CC}	Supply voltage (1.2V to 5.5V TC1272 and TC1273, 1.8V to 5.5V TC1274)
3	GND	Ground

APPLICATION INFORMATION

Operation - Power Monitor

The TC1272, TC1273, TC1274 provide the function of detecting out-of-tolerance power supply conditions and warning a processor-based system of impending power failure. When V_{CC} is detected as out-of-tolerance, the RESET signal is asserted. On power-up, RESET is kept active for approximately 200 ms after the power supply has reached the selected tolerance. This allows the power supply and microprocessor to stabilize before RESET is released.

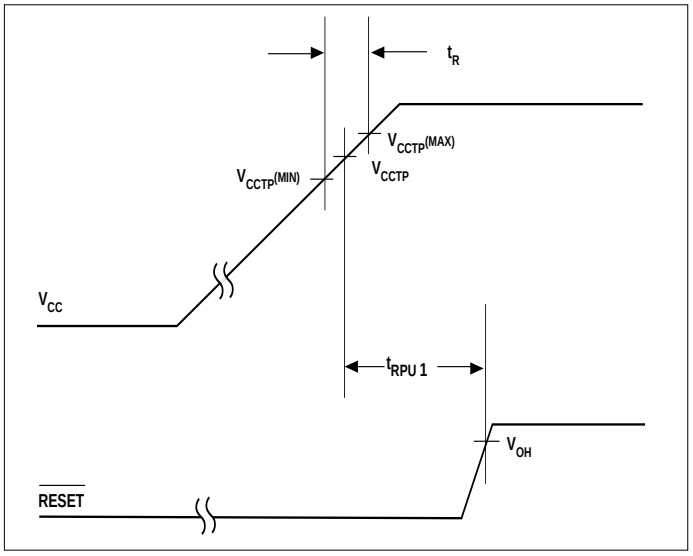


Figure 1. Timing Diagram: Power Up (TC1272, TC1273)

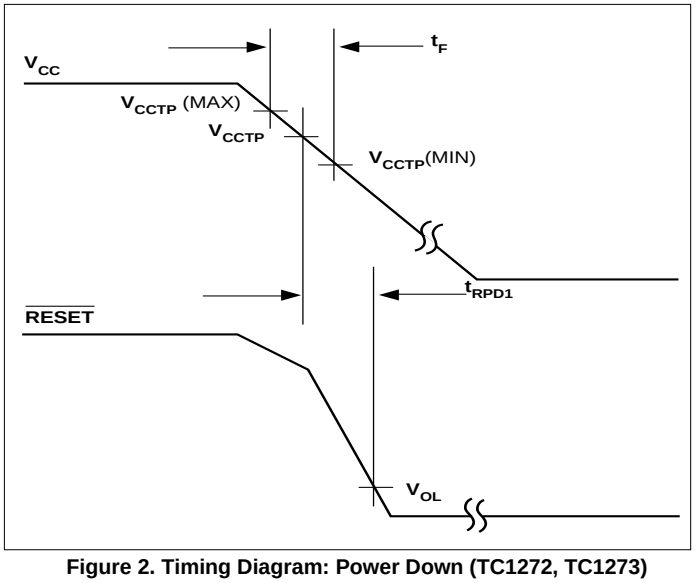


Figure 2. Timing Diagram: Power Down (TC1272, TC1273)

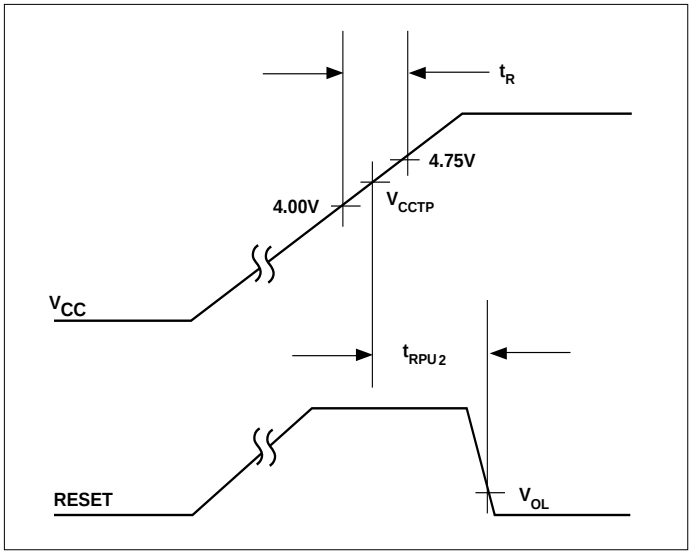


Figure 3. Timing Diagram: Power Up (TC1274)

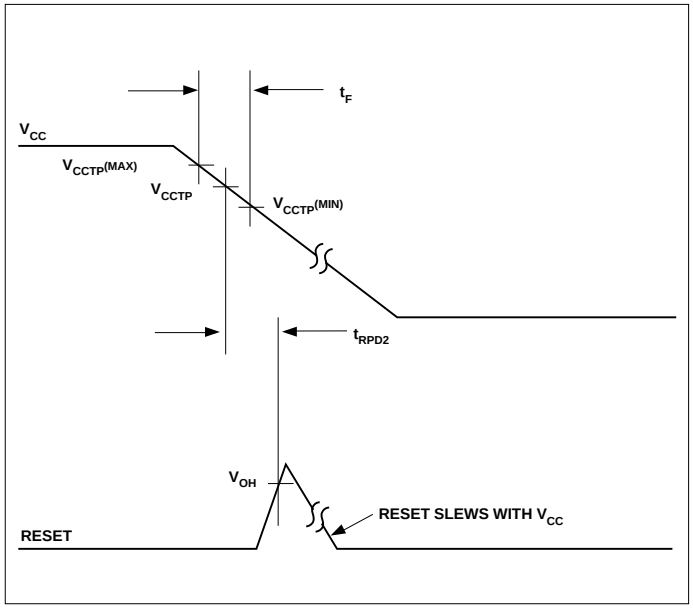


Figure 4. Timing Diagram: Power Down (TC1274)

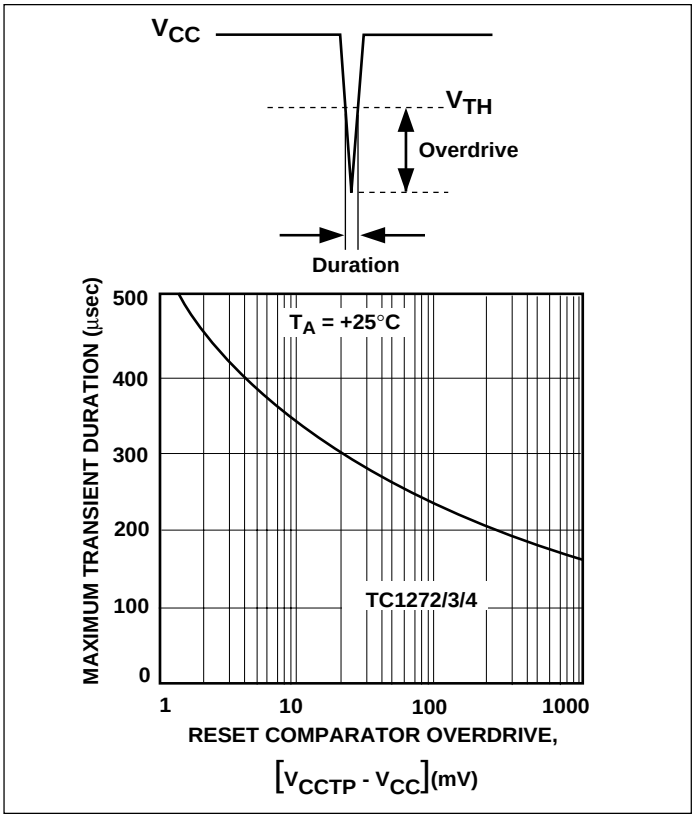


Figure 5. Maximum Transient Duration vs. Overdrive for Glitch Rejection at 25°C

V_{CC} Transient Rejection

The TC1272/3/4 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 5 shows the maximum transient duration vs. maximum negative excursion (overdrive) for glitch rejection. Any combination of duration and overdrive which lies **under** the curve will **not** generate a reset signal. Combinations above the curve are detected as a brownout or power-down. Transient immunity can be improved by adding a capacitor in close proximity to the V_{CC} pin of the TC1272/3/4.

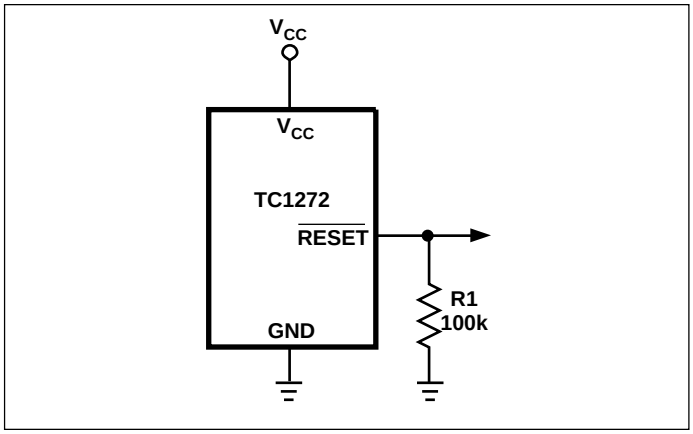


Figure 6. Ensuring $\overline{RESET}$ Valid to V_{CC} = 0V

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

The TC1272 $\overline{RESET}$ 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 shutdown well above this voltage. However, in situations where $\overline{RESET}$ must be maintained valid to V_{CC} = 0V, a pull-down resistor must be connected from $\overline{RESET}$ to ground to discharge stray capacitances and hold the output low (Figure 6). This resistor value, though not critical, should be chosen such that it does not appreciably load $\overline{RESET}$ under normal operation (100kΩ will be suitable for most applications). Similarly, a pull-up resistor to V_{CC} is required for the TC1274 to ensure a valid high $\overline{RESET}$ for V_{CC} below 1.8V.

TYPICAL CHARACTERISTICS

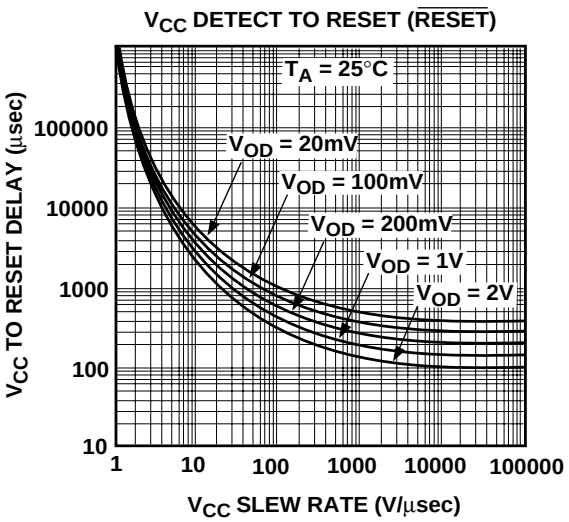


Figure 7

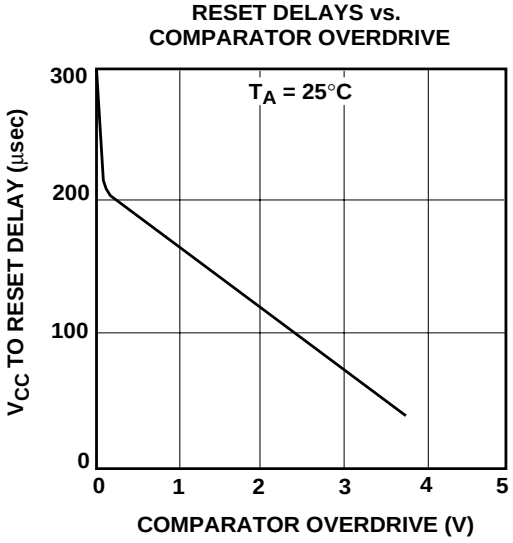
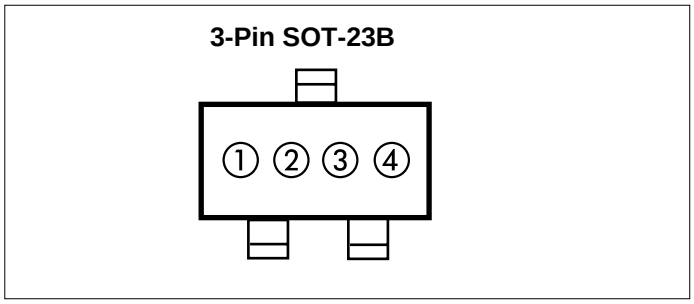


Figure 8

MARKINGS



PART NUMBERS AND PART MARKINGS

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

TC1272 (V)	Code
4.62	X1
4.37	X2
4.12	X3

TC1273 (V)	Code
4.62	Y1
4.37	Y2
4.12	Y3

TC1274 (V)	Code
4.62	Z1
4.37	Z2
4.12	Z3

ex: 1272-5 = ⓍⓁ◯◯

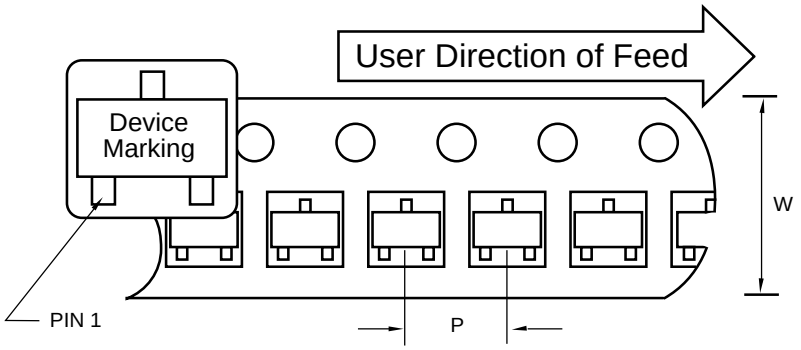
③ represents year and quarter code

④ represents lot ID number

TC1272
TC1273
TC1274

TAPING FORM

Component Taping Orientation for 3-Pin SOT-23B (JEDEC TO-236) Devices



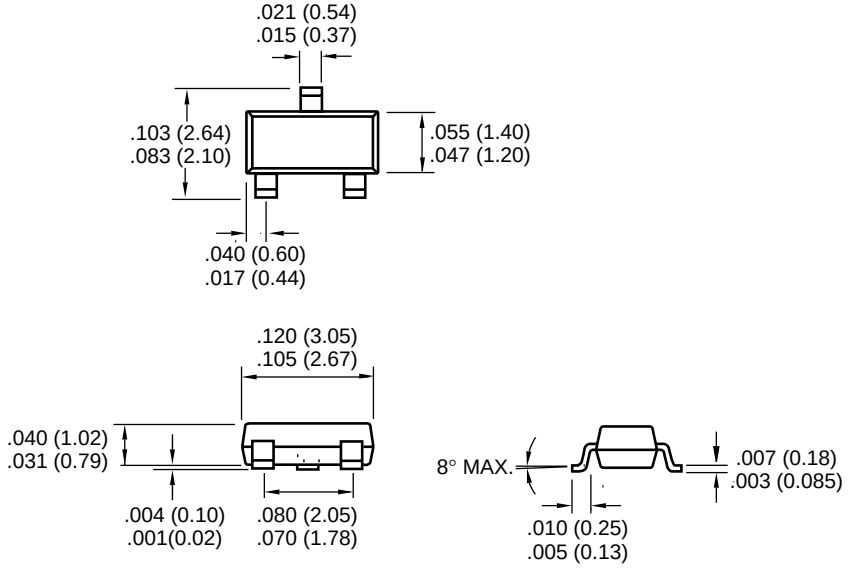
Standard Reel Component Orientation
For TR Suffix Device
(Mark Right Side Up)

Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
3-Pin SOT-23B	8 mm	4 mm	3000	7 in

PACKAGE DIMENSIONS

3-Pin SOT-23B (JEDEC TO-236)



Dimensions: inches (mm)

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