TC1275/TC1276/TC1277

3-Pin Reset Monitors for 3.3V Systems

Features

- Precision V_{CC} Monitor for 3.3V Systems
- 100msec 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

Device Selection Table

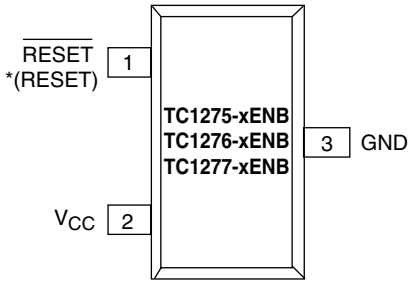
Part Number	Order	Package	Temp. Range
TC1275-xENB	Complimentary	3-Pin SOT-23B	-40°C to +85°C
TC1276-xENB	Open Drain	3-Pin SOT-23B	-40°C to +85°C
TC1277-xENB	Complimentary	3-Pin SOT-23B	-40°C to +85°C

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

Suffix	Reset V_{CC} Threshold (V)
5	3.06
10	2.88
20	2.55

Package Type

3-Pin SOT-23B



NOTE: 3-Pin SOT-23B is equivalent to JEDEC TO-236
*( ) is for TC1277

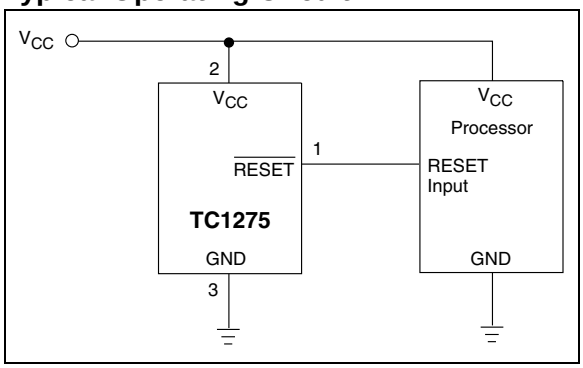
General Description

The TC1275/TC1276/TC1277 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 TC1277 has an active-high RESET output while the TC1275 and TC1276 have an active-low $\overline{\text{RESET}}$ output. TC1275 and TC1277 each have a complimentary output while the TC1276 has an open drain output. The output of the TC1275 and TC1276 is valid down to V_{CC} = 1.2V. The TC1277 is valid down to V_{CC} = 1.8V. All three devices are available in a 3-Pin SOT-23B package.

The TC1275/TC1276/TC1277 devices are optimized to reject fast transient glitches on the V_{CC} line.

Typical Operating Circuit



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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}.....20mA
Output Current, $\overline{RESET}$, RESET.....20mA
Power Dissipation ($T_A \leq 70°C$)
3-Pin SOT-23B (derate 4mW/°C above +70°C)
.....230mW
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.

TC1275/TC1276/TC1277 ELECTRICAL SPECIFICATIONS

Recommended DC Operating Conditions: T_A = -40°C to +85°C unless otherwise noted. Typical values are at T_A = +25°C.							
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Units**	**Device**	**Test Conditions**
V_{CC}	Supply Voltage	1.2 1.8	— —	5.5 5.5	V	TC1275, TC1276 TC1277	Note 1
DC Electrical Characteristics: T_A = -40°C to +85°C unless otherwise noted. Typical values are at T_A = +25°C.							
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Units**		**Test Conditions**
V_{OH}	Output Voltage @ 0-500µA	V_{CC} – 0.5V	V_{CC} – 0.1V	—	V	TC1275, TC1277	Note 1
I_{OH}	Output Current @ 2.4 Volts V_{CC} = 5V V_{CC} = 2.7V	 — —	 13 1.3	 — —	mA	 TC1275 TC1277	 Note 2
I_{OL}	Output Current @ 0.4 Volts	+10	30	—	mA		Note 2, Note 5
I_{CC}	Operating Current V_{CC} < 5.5V V_{CCTP} < V_{CC} < 5.5V V_{CC} < V_{CCTP}	 — — —	 20 20 350	 35 35 700	µA	 TC1275, TC1277 TC1276 TC1276	 Note 3 Note 3 Note 3
V_{CCTP-5}	V_{CC} Trip Point (TC1275/6/7-5)	2.98	3.06	3.15	V		Note 1
$V_{CCTP-10}$	V_{CC} Trip Point (TC1275/6/7-10)	2.80	2.88	2.97	V		Note 1
$V_{CCTP-20}$	V_{CC} Trip Point (TC1275/6/7-20)	2.47	2.55	2.64	V		Note 1
C_{OUT}	Output Capacitance	—	9	—	pF		
R_P	Internal Pull-Up Resistor	3.0	6.0	9.0	kΩ	TC1276	
AC Electrical Characteristics: T_A = -40°C to +85°C unless otherwise noted. Typical values are at T_A = +25°C.							
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Units**		**Test Conditions**
t_{RST}	RESET Active Time	100	200	300	msec		
t_{RPD1}	V_{CC} Detect to $\overline{RESET}$	—	20	50	µsec	TC1275, TC1276	$V_{CC(LOW)}$ = 1V, Figure 3-2
t_{RPD2}	V_{CC} Detect to RESET	—	20	50	µsec	TC1277	$V_{CC(LOW)}$ = 1V, Figure 3-4
t_F	V_{CC} Slew Rate (V_{CCTP}(MAX) to V_{CCTP}(MIN))	300	—	—	µsec		Figure 3-2, Figure 3-4
t_R	V_{CC} Slew Rate (V_{CCTP}(MIN) to V_{CCTP}(MAX))	0	—	—	nsec		Figure 3-1, Figure 3-3
t_{RPU1}	V_{CC} Detect to $\overline{RESET}$	100	200	300	msec	TC1275, TC1276	Note 4, Figure 3-1
t_{RPU2}	V_{CC} Detect to RESET	100	200	300	msec	TC1277	Note 4, Figure 3-3

Note 1: All voltages referenced to ground.
2: Measured with $V_{CC} \geq 2.7$ volts.
3: Measured with $\overline{RESET}$ output open for TC1275/TC1276; measured with RESET output open for TC1277.
4: t_R = 5µsec.
5: A 1kΩ external resistor may be required in some applications for proper operation of the microprocessor reset control circuit when using the TC1276.

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2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Pin No. (3-Pin SOT-23B)	Symbol	Description
1	$\overline{\text{RESET}}$ (TC1275/ TC1276)	$\overline{\text{RESET}}$ 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 TC1275 is complimentary. The output stage of the TC1276 is open drain.
1	RESET (TC1277)	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 output stage of the TC1277 is complimentary.
2	V_{CC}	Supply voltage (1.2V to 5.5V TC1275 and TC1276, 1.8V to 5.5V TC1277).
3	GND	Ground.

3.0 APPLICATIONS INFORMATION

3.1 Operation – Power Monitor

The TC1275/TC1276/TC1277 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 200msec after the power supply has reached the selected tolerance. This allows the power supply and microprocessor to stabilize before RESET is released.

FIGURE 3-1: Timing Diagram – Power Up (TC1275/TC1276)

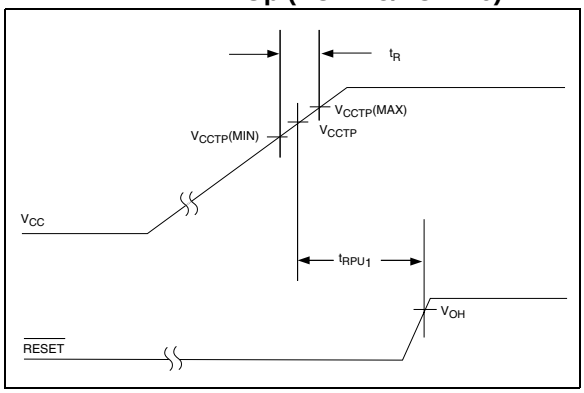


FIGURE 3-2: Timing Diagram – Power Down (TC1275/TC1276)

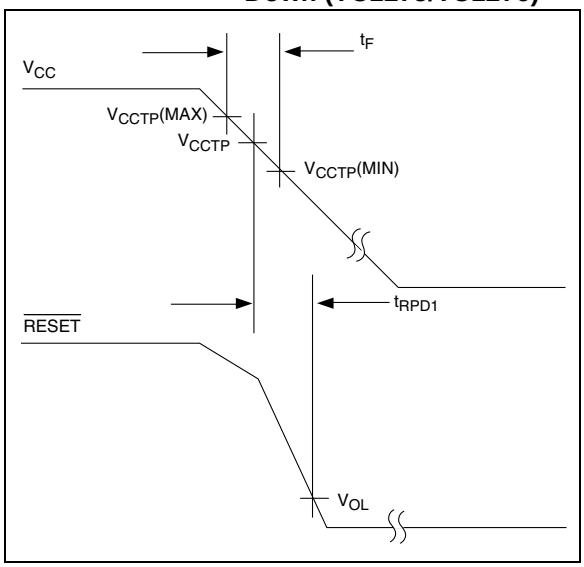


FIGURE 3-3: Timing Diagram – Power Up (TC1277)

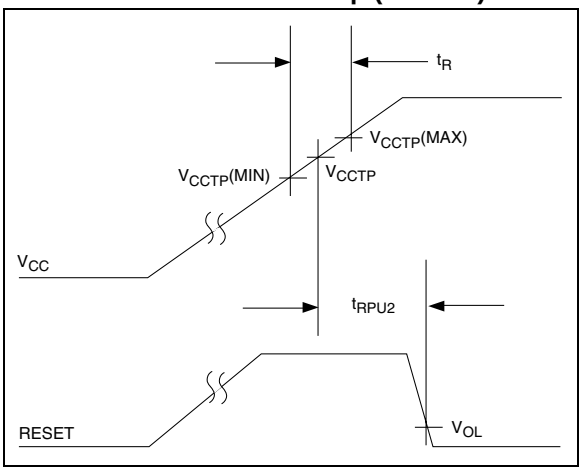
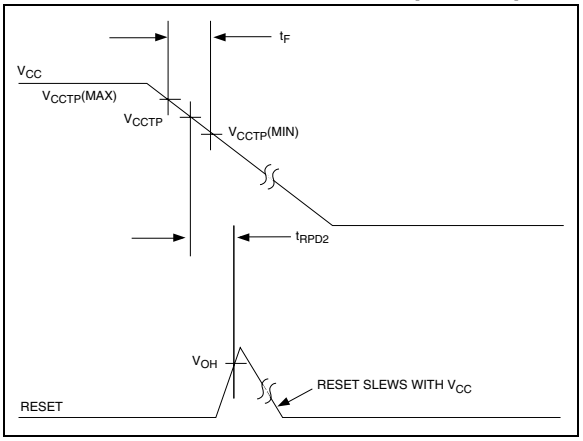


FIGURE 3-4: Timing Diagram – Power Down (TC1277)



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3.2 V_{CC} Transient Rejection

The TC1275/TC1276/TC1277 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 3-5 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. Transient immunity can be improved by adding a capacitor in close proximity to the V_{CC} pin of the TC1275/TC1276/TC1277.

3.3 $\overline{\text{RESET}}$ Signal Integrity During Power-Down

The TC1275 $\overline{\text{RESET}}$ 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 3-6). This resistor value, though not critical, should be chosen such that it does not appreciably load $\overline{\text{RESET}}$ under normal operation (100kΩ will be suitable for most applications). Similarly, a pull-up resistor to V_{CC} is required for the TC1277 to ensure a valid high $\overline{\text{RESET}}$ for V_{CC} below 1.8V.

FIGURE 3-5: MAXIMUM TRANSIENT DURATION VS. OVERDRIVE FOR GLITCH REJECTION AT 25°C

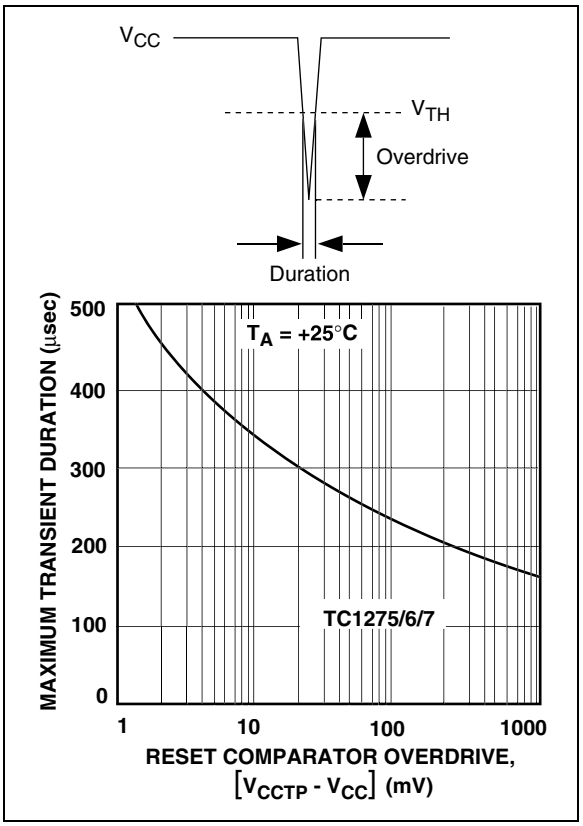
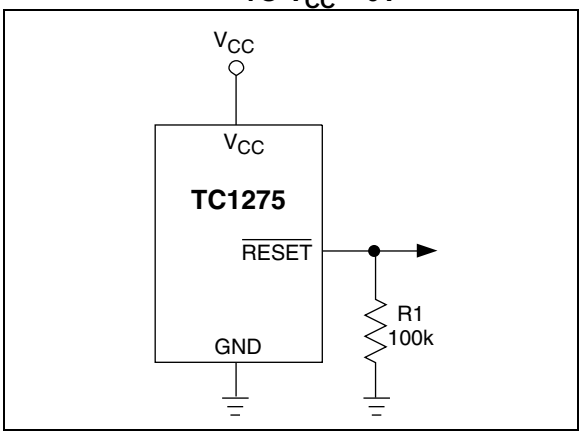
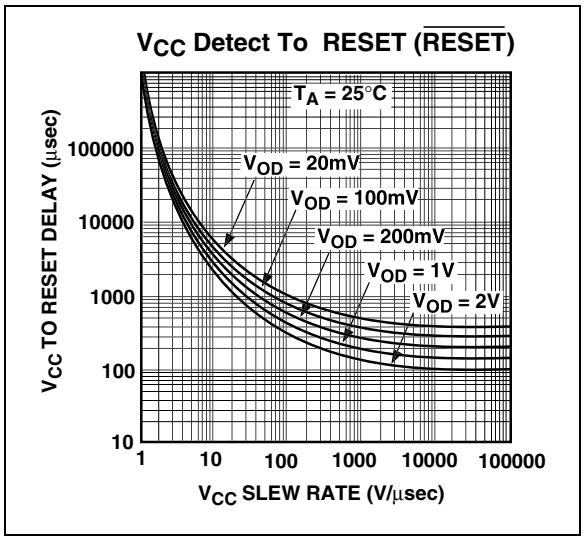


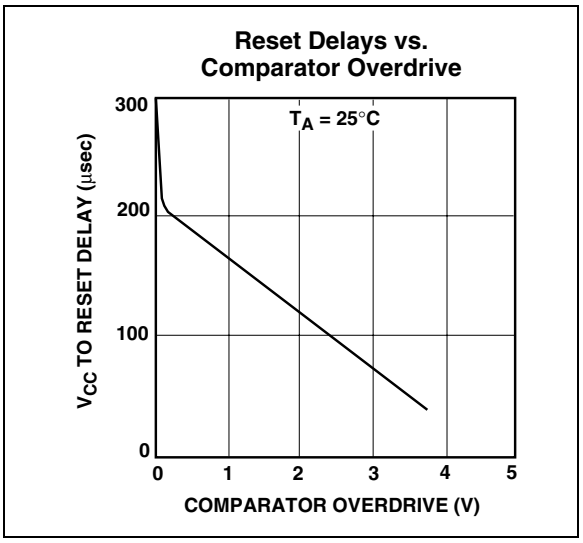
FIGURE 3-6: ENSURING $\overline{\text{RESET}}$ VALID TO V_{CC} = 0V



4.0 TYPICAL CHARACTERISTICS

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.

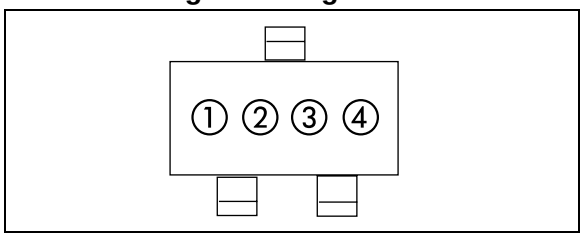




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5.0 PACKAGING INFORMATION

5.1 Package Marking Information



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

TC1275 (V)	Code
2.55	DA
2.88	DB
3.06	DC

TC1276 (V)	Code
2.55	EA
2.88	EB
3.06	EC

TC1277 (V)	Code
2.55	FA
2.88	FB
3.06	FC

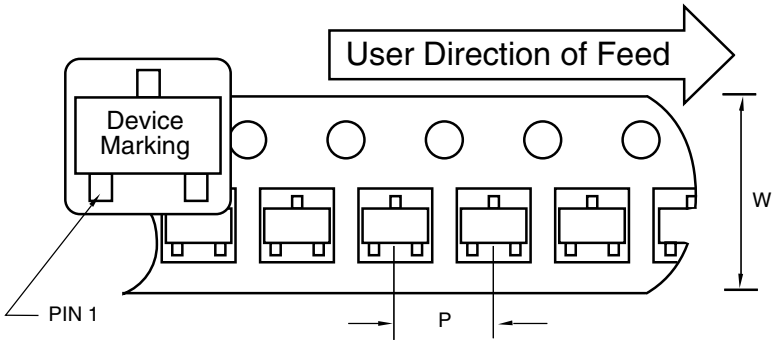
ex: 1275-20 = ⒹⒶ○○

③ represents year and quarter code

④ represents production lot ID code

5.2 Taping Form

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



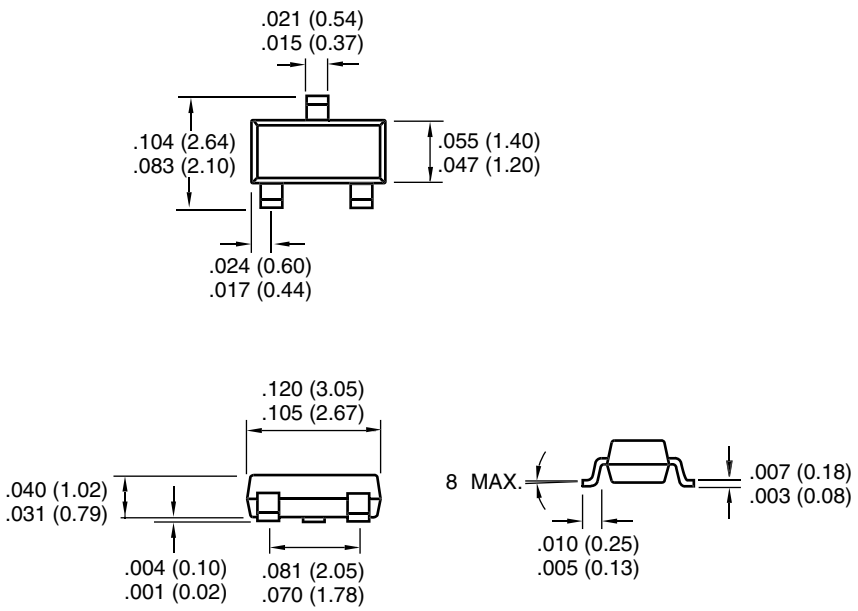
Standard Reel Component Orientation
For TR Suffix Device
(Mark Right Side Up)

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

5.3 Package Dimensions

3-Pin SOT-23B



Dimensions: inches (mm)

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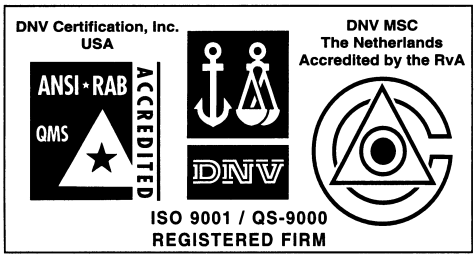
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