

## 3-Pin Reset Monitors for 5V Systems

### Features

- Precision  $V_{CC}$  Monitor for 5.0V System Supplies
- 250msec Minimum 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  $\mu P$  Power Supply Monitoring

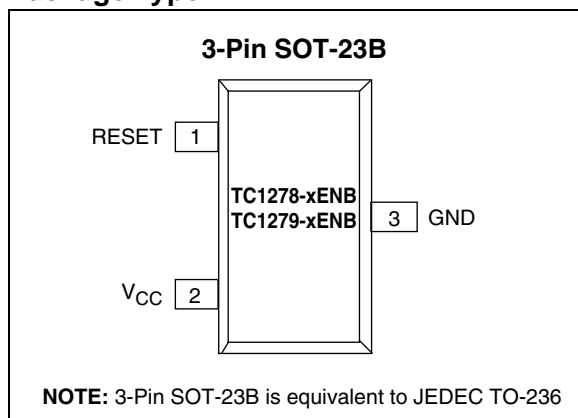
### Device Selection Table

| Part Number | Order      | Package       | Temp. Range    |
|-------------|------------|---------------|----------------|
| TC1278-xENB | Open Drain | 3-Pin SOT-23B | -40°C to +85°C |
| TC1279-xENB | Open Drain | 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      | 4.625                        |
| 10     | 4.375                        |
| 15     | 4.125                        |

### Package Type

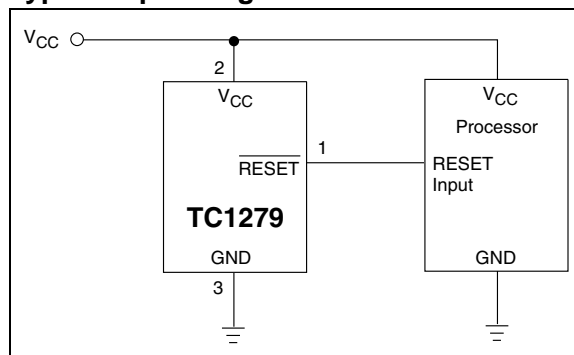


### General Description

The TC1278/TC1279 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 5 $\mu$ sec of  $V_{CC}$  falling through the reset voltage threshold. RESET is maintained active for a minimum of 250msec after  $V_{CC}$  rises above the reset threshold. The TC1278 has an active-high RESET output while the TC1279 has an active-low RESET output, and both devices have an open drain output stage. The output is valid down to  $V_{CC} = 1.2V$ . Both devices are available in a 3-Pin SOT-23B package.

### Typical Operating Circuit



# TC1278/TC1279

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings\*

|   |   |
|---|---|
| Supply Voltage ( $V_{CC}$ to GND).....                                  | +6.0V                                       |
| $\overline{\text{RESET}}$ , RESET.....                                  | -0.3V to ( $V_{CC} + 0.3V$ )                |
| Input Current, $V_{CC}$ .....   | 20mA  |
| Output Current, RESET.....  | 20mA  |
| Power Dissipation ( $T_A \leq 70^\circ\text{C}$ )                       |   |
| 3-Pin SOT-23B (derate 4mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$ ) |   |
| .....   | 230mW                                       |
| Operating Temperature Range.....  | $-40^\circ\text{C}$ to $+85^\circ\text{C}$  |
| Storage Temperature Range.....  | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |

\*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.

### TC1278/TC1279 ELECTRICAL SPECIFICATIONS

| Recommended DC Operating Conditions: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$ . |  |      |       |      |                 |                  |  |
|---|--|------|-------|------|-----------------|------------------|--|
| Symbol  | Parameter                                    | Min  | Typ   | Max  | Units           | Device           | Test Conditions  |
| $V_{CC}$  | Supply Voltage                               | 1.2  | —     | 5.5  | V               |                  | Note 1   |
| DC Electrical Characteristics: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$ .       |  |      |       |      |                 |                  |  |
| Symbol  | Parameter                                    | Min  | Typ   | Max  | Units           |                  | Test Conditions  |
| $V_{OL}$  | Low Level @ RESET<br>RESET                   | —    | —     | 0.4  | V               | TC1278<br>TC1279 | Note 1   |
| $I_{OL}$  | Output Current @ 0.4 Volts                   | +8   | —     | —    | mA              |                  | Note 2   |
| $I_{CC1}$   | Operating Current                            | —    | 0.9   | 2.0  | mA              | TC1278           | $V_{CC} > V_{CCCTP(MAX)}$<br>$V_{CC} > V_{CCCTP(MAX)}$ |
|   |  | —    | —     | 40   | $\mu\text{A}$   | TC1279           |  |
| $I_{CC2}$   | Operating Current                            | —    | —     | 40   | $\mu\text{A}$   | TC1278           | $V_{CC} < V_{CCCTP(MIN)}$<br>$V_{CC} < V_{CCCTP(MIN)}$ |
|   |  | —    | 0.9   | 2.0  | mA              | TC1279           |  |
| $V_{CCCTP-5}$   | $V_{CC}$ Trip Point (TC1278/9-5)             | 4.50 | 4.625 | 4.74 | V               |                  | Note 1   |
| $V_{CCCTP-10}$  | $V_{CC}$ Trip Point (TC1278/9-10)            | 4.25 | 4.375 | 4.49 | V               |                  | Note 1   |
| $V_{CCCTP-15}$  | $V_{CC}$ Trip Point (TC1278/9-15)            | 4.00 | 4.125 | 4.24 | V               |                  | Note 1   |
| $C_{OUT}$   | Output Capacitance                           | —    | 9     | —    | pF              |                  |  |
| $R_P$   | Internal Pull-Up Resistor                    | 3    | 6     | 9    | k $\Omega$      |                  |  |
| AC Electrical Characteristics: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$ .       |  |      |       |      |                 |                  |  |
| Symbol  | Parameter                                    | Min  | Typ   | Max  | Units           |                  | Test Conditions  |
| $t_{RST}$   | RESET Active Time                            | 250  | 350   | 450  | msec            |                  |  |
| $t_{RPD1}$  | $V_{CC}$ Detect to $\overline{\text{RESET}}$ | —    | 2     | 5    | $\mu\text{sec}$ | TC1279           | Figure 3-2   |
| $t_{RPD2}$  | $V_{CC}$ Detect to RESET                     | —    | 2     | 5    | $\mu\text{sec}$ | TC1278           | Figure 3-4   |
| $t_F$   | $V_{CC}$ Slew Rate<br>(4.75V-4.00V)          | 300  | —     | —    | $\mu\text{sec}$ |                  | Figure 3-2, Figure 3-4                                 |
| $t_R$   | $V_{CC}$ Slew Rate<br>(4.00V-4.75V)          | 0    | —     | —    | nsec            |                  | Figure 3-1, Figure 3-3                                 |
| $t_{RPU1}$  | $V_{CC}$ Detect to $\overline{\text{RESET}}$ | 250  | 350   | 450  | msec            | TC1279           | Figure 3-1   |
| $t_{RPU2}$  | $V_{CC}$ Detect to RESET                     | 250  | 350   | 450  | msec            | TC1278           | Figure 3-3   |

Note 1: All voltages referenced to ground.

Note 2: A 1k $\Omega$  external resistor may be required in some applications for proper operation of the microprocessor reset control circuit when using the TC1279.  $V_{CC} = 1.8V$ .

## 2.0 PIN DESCRIPTIONS

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

**TABLE 2-1: PIN FUNCTION TABLE**

| Pin No.<br>(3-Pin SOT-23B) | Symbol                             | Description  |
|----------------------------|------------------------------------|--|
| 1                          | $\overline{\text{RESET}}$ (TC1279) | $\overline{\text{RESET}}$ output remains low while $V_{CC}$ is below the reset voltage threshold, and for 350msec (250msec min.) after $V_{CC}$ rises above reset threshold. The output stage of the TC1279 is open drain. |
| 1                          | RESET (TC1278)                     | RESET output remains high while $V_{CC}$ is below the reset voltage threshold, and for 350msec (250msec min.) after $V_{CC}$ rises above reset threshold. The output stage of the TC1278 is open drain.                    |
| 2                          | $V_{CC}$                           | Supply voltage (1.2V to 5.5V).   |
| 3                          | GND                                | Ground.  |

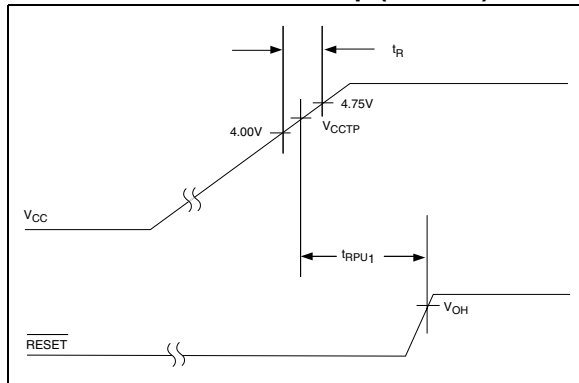
# TC1278/TC1279

## 3.0 APPLICATIONS INFORMATION

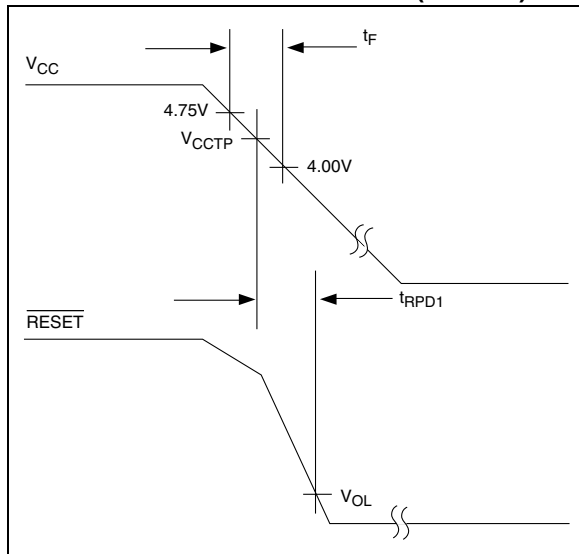
### 3.1 Operation – Power Monitor

The TC1278/TC1279 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 350msec after the power supply has reached the selected tolerance. This allows the power supply and microprocessor to stabilize before RESET is released.

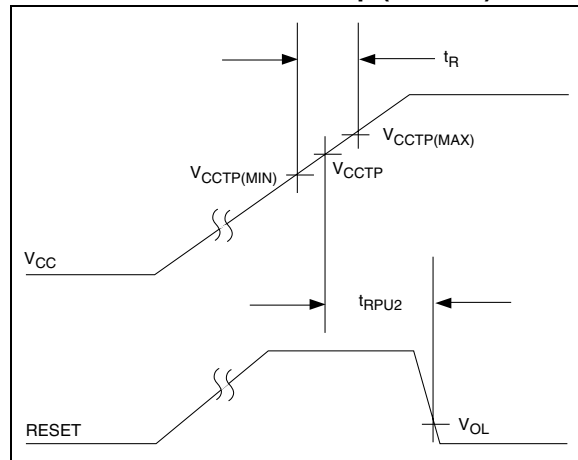
**FIGURE 3-1: Timing Diagram – Power Up (TC1279)**



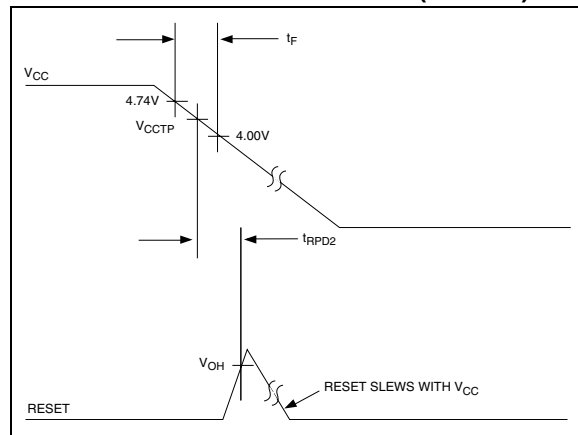
**FIGURE 3-2: Timing Diagram – Power Down (TC1279)**



**FIGURE 3-3: Timing Diagram – Power Up (TC1278)**



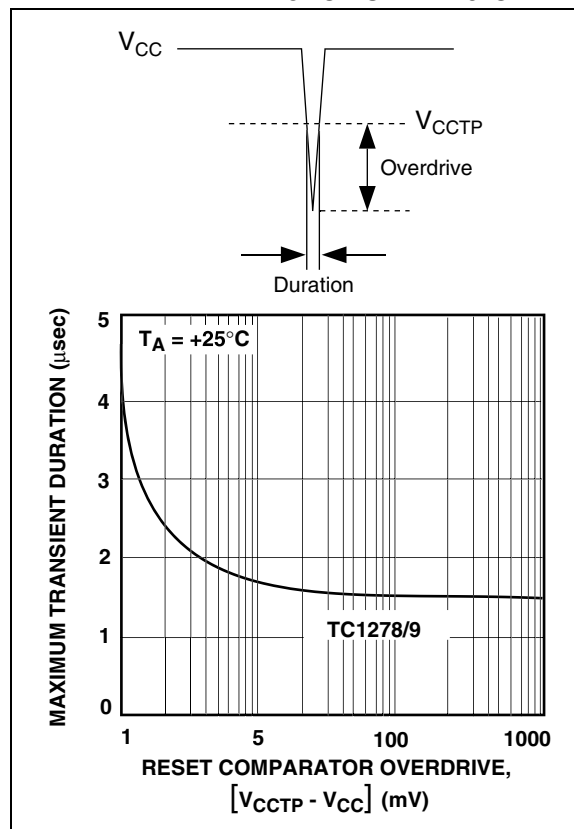
**FIGURE 3-4: Timing Diagram – Power Down (TC1278)**



## 3.2 $V_{CC}$ Transient Rejection

The TC1278/TC1279 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 TC1278/TC1279.

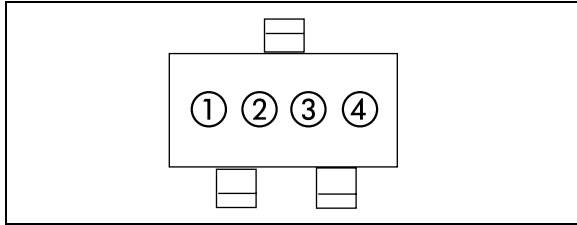
**FIGURE 3-5: MAXIMUM TRANSIENT DURATION VS. OVERDRIVE FOR GLITCH REJECTION AT 25°C**



# TC1278/TC1279

## 4.0 PACKAGING INFORMATION

### 4.1 Package Marking Information



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

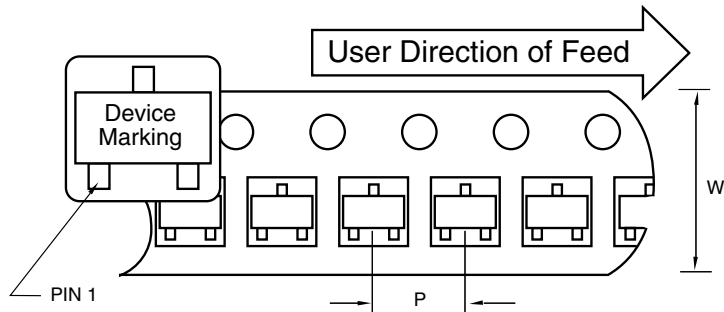
| Part Number  | Code |
|--------------|------|
| TC1278-5ENB  | PA   |
| TC1278-10ENB | PB   |
| TC1278-15ENB | PC   |
| TC1279-5ENB  | RA   |
| TC1279-10ENB | RB   |
| TC1279-15ENB | RC   |

③ represents year and 2-month code

④ represents production lot ID code

### 4.2 Taping Form

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



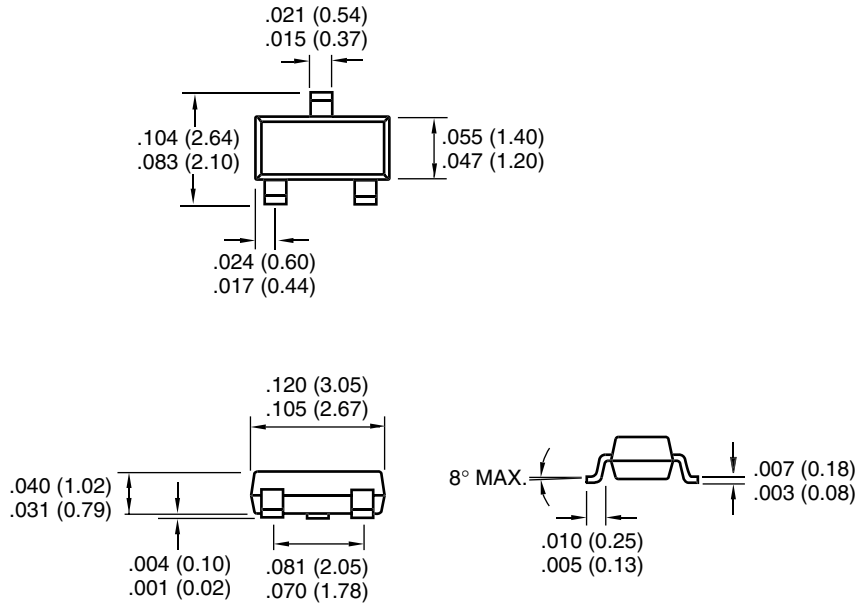
Standard Reel Component Orientation  
For TR Suffix Device  
(Mark Right Side Up)

#### 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      |

## 4.3 Package Dimensions

### 3-Pin SOT-23B



Dimensions: inches (mm)

# TC1278/TC1279

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NOTES:



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# TC1278/TC1279

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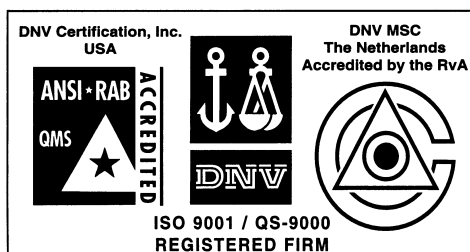
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