

# TC1278/TC1279

## 3-Pin Reset Monitors for 5V Systems

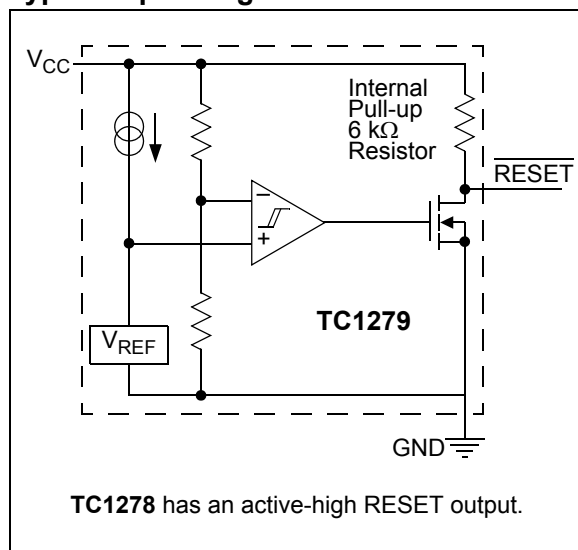
### Features

- Precision  $V_{CC}$  Monitor for 5.0V System Supplies
- 250 ms Minimum RESET Output Duration
- Output Valid to  $V_{CC} = 1.2V$
- $V_{CC}$  Transient Immunity
- Small 3-Pin SOT-23 Package
- No External Components
- Internal Pull-up Resistor
- Available in 3 different voltage detection levels:
  - 4.625V (typ.), -5 suffix
  - 4.375V (typ.), -10 suffix
  - 4.125V (typ.), -15 suffix

### Applications

- Computers
- Embedded Systems
- Battery Powered Equipment
- Critical  $\mu P$  Power Supply Monitoring

### Typical Operating Circuit

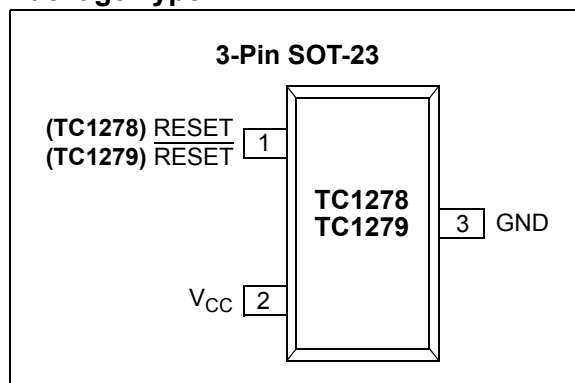


### General Description

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 open-drain output uses an internal pull-up resistor of approximately 6 k $\Omega$ .

The reset output is driven active within 5  $\mu s$  of  $V_{CC}$  falling through the reset voltage threshold. RESET is maintained active for a minimum of 250 ms 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, with both devices having an open-drain output stage. The output is valid down to  $V_{CC} = 1.2V$ . Both devices are available in a 3-Pin SOT-23 package.

### Package Type



# TC1278/TC1279

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings †

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

## DC CHARACTERISTICS

| Electrical Specifications: Unless otherwise indicated, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ . Typical values are at $T_A = +25^\circ\text{C}$ . |               |      |       |      |               |                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------|-------|------|---------------|------------------------------------------------|
| Parameters                                                                                                                                                  | Sym           | Min  | Typ   | Max  | Units         | Conditions                                     |
| Supply Voltage                                                                                                                                              | $V_{CC}$      | 1.2  | —     | 5.5  | V             | Note 1                                         |
| Low Level @ RESET (TC1278)<br>RESET (TC1279)                                                                                                                | $V_{OL}$      | —    | —     | 0.4  | V             | Note 1                                         |
| Output Current @ 0.4 Volts                                                                                                                                  | $I_{OL}$      | +8   | —     | —    | mA            | Note 2                                         |
| Operating Current:<br>TC1278                                                                                                                                | $I_{CC1}$     | —    | 0.9   | 2.0  | mA            | $V_{CC} > V_{CCTP(MAX)}$ , RESET = 1, (Note 3) |
| TC1279                                                                                                                                                      |               | —    | —     | 40   | $\mu\text{A}$ | $V_{CC} > V_{CCTP(MAX)}$ , RESET = 1, Note 4   |
| Operating Current:<br>TC1278                                                                                                                                | $I_{CC2}$     | —    | —     | 40   | $\mu\text{A}$ | $V_{CC} < V_{CCTP(MIN)}$ , RESET = 0, (Note 4) |
| TC1279                                                                                                                                                      |               | —    | 0.9   | 2.0  | mA            | $V_{CC} < V_{CCTP(MIN)}$ , RESET = 0, (Note 3) |
| $V_{CC}$ Trip Point (TC1278/9-5)                                                                                                                            | $V_{CCTP-5}$  | 4.50 | 4.625 | 4.74 | V             | Note 1                                         |
| $V_{CC}$ Trip Point (TC1278/9-10)                                                                                                                           | $V_{CCTP-10}$ | 4.25 | 4.375 | 4.49 | V             | Note 1                                         |
| $V_{CC}$ Trip Point (TC1278/9-15)                                                                                                                           | $V_{CCTP-15}$ | 4.00 | 4.125 | 4.24 | V             | Note 1                                         |
| Output Capacitance                                                                                                                                          | $C_{OUT}$     | —    | 9     | —    | pF            |                                                |
| Internal Pull-Up Resistor                                                                                                                                   | $R_P$         | 3    | 6     | 9    | k $\Omega$    |                                                |

**Note 1:** All voltages referenced to ground.

- 2:** A 1 k $\Omega$  external resistor may be required in some applications for proper operation of the microprocessor reset control circuit when using the TC1279.  $V_{CC} = 1.8V$ .
- 3:** Operating current is specified with the open-drain output in the active ("ON") condition.
- 4:** Operating current is specified with the open-drain output in the non-active ("OFF") condition.

## AC CHARACTERISTICS

| <b>Electrical Specifications:</b> Unless otherwise indicated, $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ . Typical values are at $T_A = +25^{\circ}\text{C}$ . |                   |     |     |     |               |                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----|-----|-----|---------------|---------------------------------------------------------|
| Parameters                                                                                                                                                               | Sym               | Min | Typ | Max | Units         | Conditions                                              |
| RESET Active Time                                                                                                                                                        | $t_{\text{RST}}$  | 250 | 350 | 450 | ms            |                                                         |
| $V_{\text{CC}}$ Detect to $\overline{\text{RESET}}$ (TC1279)                                                                                                             | $t_{\text{RPD1}}$ | —   | 2   | 5   | $\mu\text{s}$ | <a href="#">Figure 3-2</a>                              |
| $V_{\text{CC}}$ Detect to RESET (TC1278)                                                                                                                                 | $t_{\text{RPD2}}$ | —   | 2   | 5   | $\mu\text{s}$ | <a href="#">Figure 3-4</a>                              |
| $V_{\text{CC}}$ Slew Rate (4.75V-4.00V)                                                                                                                                  | $t_{\text{F}}$    | 300 | —   | —   | $\mu\text{s}$ | <a href="#">Figure 3-2</a> , <a href="#">Figure 3-4</a> |
| $V_{\text{CC}}$ Slew Rate (4.00V-4.75V)                                                                                                                                  | $t_{\text{R}}$    | 0   | —   | —   | ns            | <a href="#">Figure 3-1</a> , <a href="#">Figure 3-3</a> |
| $V_{\text{CC}}$ Detect to $\overline{\text{RESET}}$ (TC1279)                                                                                                             | $t_{\text{RPU1}}$ | 250 | 350 | 450 | ms            | <a href="#">Figure 3-1</a>                              |
| $V_{\text{CC}}$ Detect to RESET (TC1278)                                                                                                                                 | $t_{\text{RPU2}}$ | 250 | 350 | 450 | ms            | <a href="#">Figure 3-3</a>                              |

# TC1278/TC1279

## 2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 2-1](#).

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

| Pin No. | Symbol                                | Function                         |
|---------|---------------------------------------|----------------------------------|
| 1       | $\overline{\text{RESET}}$<br>(TC1279) | $\overline{\text{RESET}}$ output |
| 1       | RESET<br>(TC1278)                     | RESET output                     |
| 2       | $V_{CC}$                              | Supply voltage (1.2V to 5.5V).   |
| 3       | GND                                   | Ground.                          |

### 2.1 $\overline{\text{RESET}}$ (TC1279)

$\overline{\text{RESET}}$  output remains low while  $V_{CC}$  is below the reset voltage threshold, and for 350 ms (250 ms min.) after  $V_{CC}$  rises above reset threshold. The output stage of the TC1279 is open-drain.

### 2.2 RESET (TC1278)

RESET output remains high while  $V_{CC}$  is below the reset voltage threshold, and for 350 ms (250 ms min.) after  $V_{CC}$  rises above reset threshold. The output stage of the TC1278 is open-drain.

### 2.3 $V_{CC}$

Supply voltage (1.2V to 5.5V).

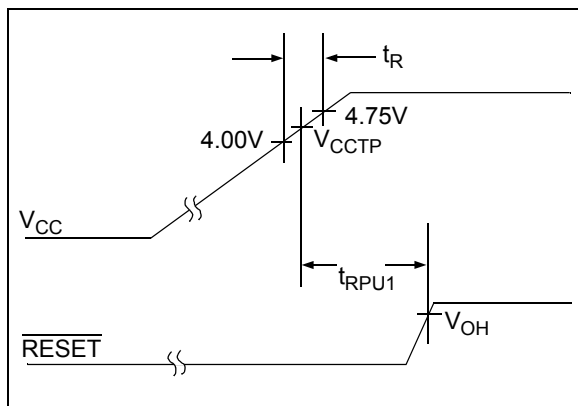
### 2.4 Ground

Device ground.

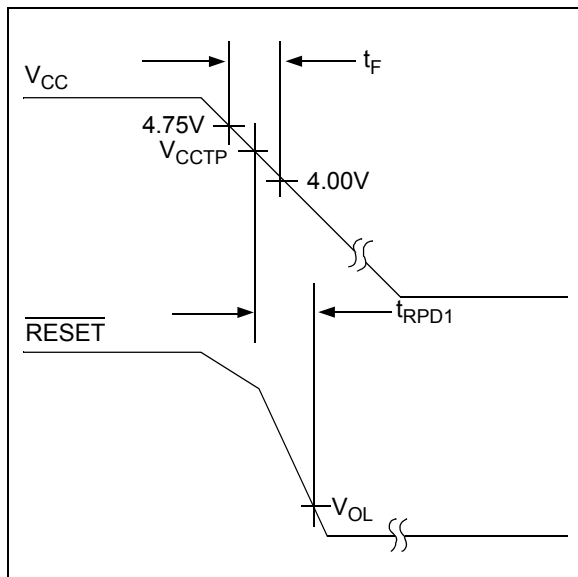
## 3.0 APPLICATIONS INFORMATION

### 3.1 Operation – Power Monitor

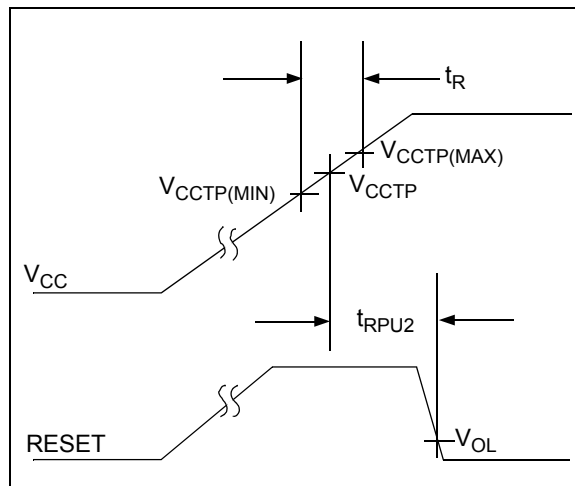
The TC1278/TC1279 provide the function of detecting out-of-tolerance power supply conditions and warning a processor-based system of impending power failure. When  $V_{CC}$  is detected as out-of-tolerance, the RESET signal is asserted. On power-up, RESET is kept active for approximately 350 ms after the power supply has reached the selected tolerance. This allows the power supply and microprocessor to stabilize before RESET is released.



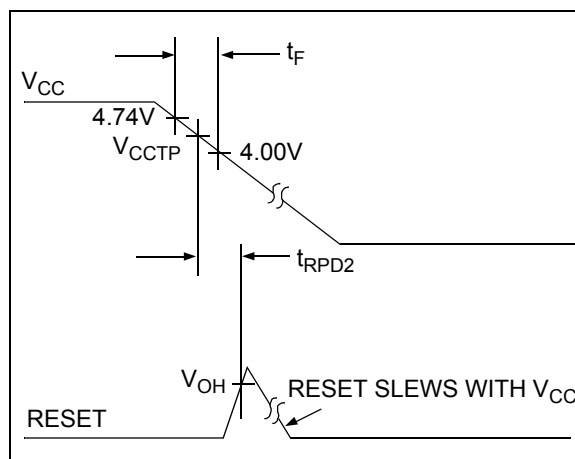
**FIGURE 3-1:** TC1279 Power Up Timing Diagram.



**FIGURE 3-2:** TC1279 Power-Down Timing Diagram.



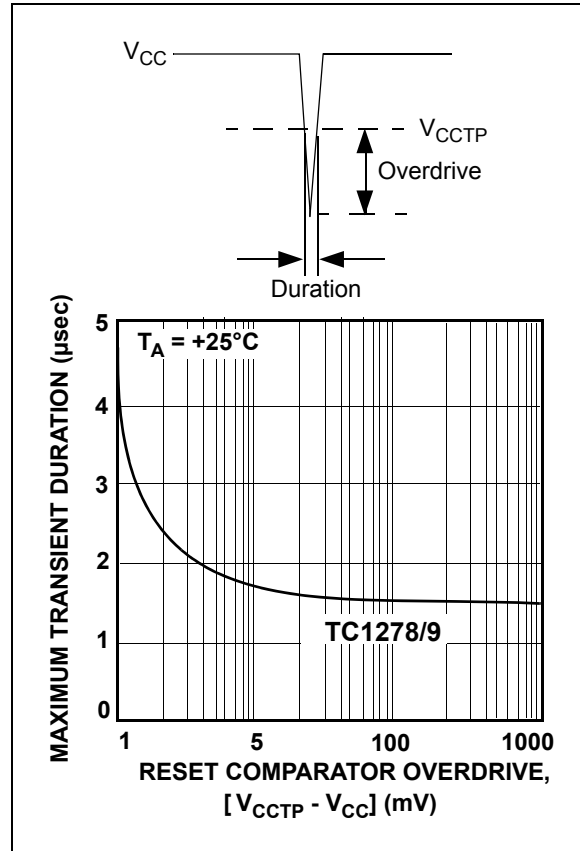
**FIGURE 3-3:** TC1278 Power-Up Timing Diagram.



**FIGURE 3-4:** TC1278 Power-Down Timing Diagram.

## 3.2 $V_{CC}$ Transient Rejection

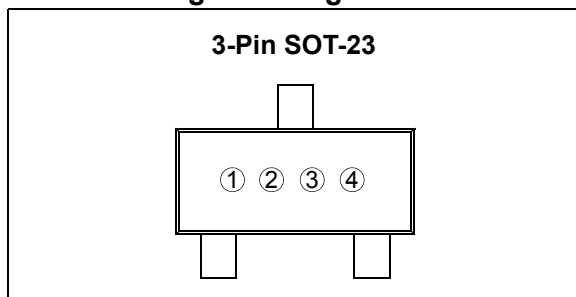
The TC1278/TC1279 provides accurate  $V_{CC}$  monitoring and reset timing during power-up, power-down, and brownout/sag conditions. Furthermore, it rejects negative-going transients (glitches) on the power supply line. Figure 3-5 shows the maximum transient duration vs. maximum negative excursion (overdrive) 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  $+25^\circ\text{C}$ .

## 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 |

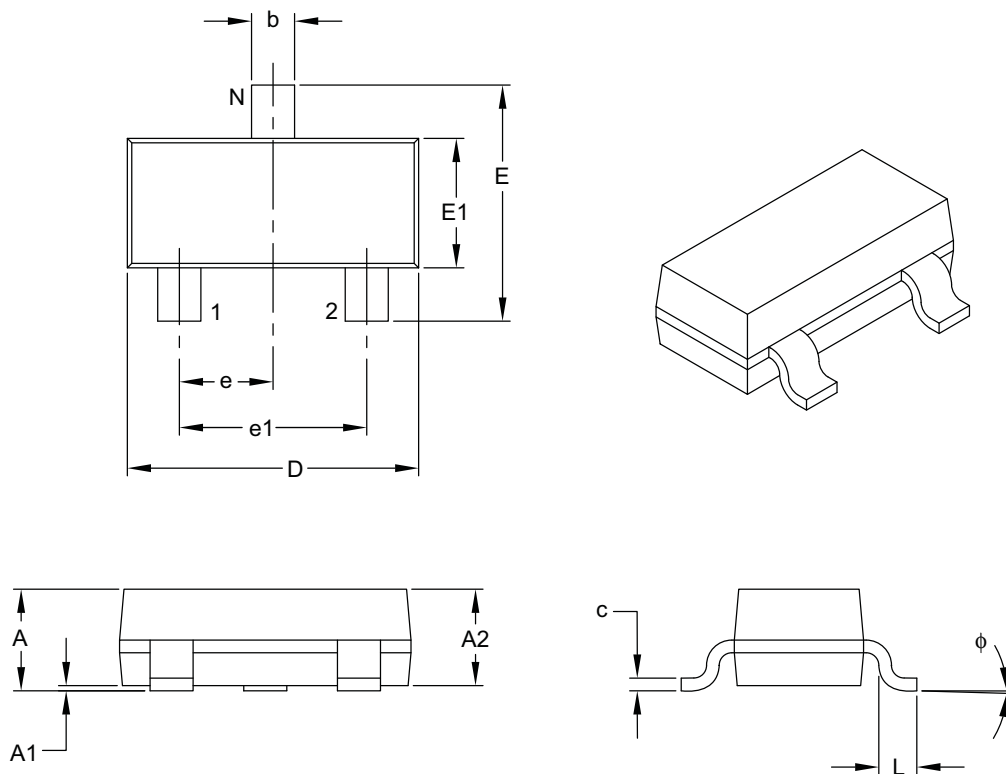
③ represents year and 2-month code

④ represents production lot ID code

# TC1278/TC1279

## 3-Lead Plastic Small Outline Transistor (TT or NB) [SOT-23]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



| Dimension Limits         | Units | MILLIMETERS |      |      |
|--------------------------|-------|-------------|------|------|
|                          |       | MIN         | NOM  | MAX  |
| Number of Pins           | N     | 3           |      |      |
| Lead Pitch               | e     | 0.95 BSC    |      |      |
| Outside Lead Pitch       | e1    | 1.90 BSC    |      |      |
| Overall Height           | A     | 0.89        | —    | 1.12 |
| Molded Package Thickness | A2    | 0.79        | 0.95 | 1.02 |
| Standoff                 | A1    | 0.01        | —    | 0.10 |
| Overall Width            | E     | 2.10        | —    | 2.64 |
| Molded Package Width     | E1    | 1.16        | 1.30 | 1.40 |
| Overall Length           | D     | 2.67        | 2.90 | 3.05 |
| Foot Length              | L     | 0.13        | 0.50 | 0.60 |
| Foot Angle               | φ     | 0°          | —    | 10°  |
| Lead Thickness           | c     | 0.08        | —    | 0.20 |
| Lead Width               | b     | 0.30        | —    | 0.54 |

**Notes:**

- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M.  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-104B



## 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>-XX</u>                                                                               | <u>X</u>             | <u>XX</u> |
|-------------------------------------|------------------------------------------------------------------------------------------|----------------------|-----------|
| Device                              | Reset V <sub>CC</sub><br>Threshold                                                       | Temperature<br>Range | Package   |
| Device                              | TC1278: 3-Pin Reset Monitor for 5V Systems<br>TC1279: 3-Pin Reset Monitor for 5V Systems |                      |           |
| Reset V <sub>CC</sub><br>Threshold: | 5 = 4.625V<br>10 = 4.375V<br>15 = 4.125V                                                 |                      |           |
| Temperature Range                   | E = -40°C to +85°C                                                                       |                      |           |
| Package                             | NBTR = Plastic Small Outline Transistor, (SOT23), 3-lead<br>(Tape and Reel)              |                      |           |

**Examples:**  
a) TC1278-5ENBTR: 4.625 Reset  
b) TC1278-10ENBTR: 4.375 Reset  
c) TC1278-15ENBTR: 4.125 Reset  
  
a) TC1279-5ENBTR: 4.625 Reset  
b) TC1279-10ENBTR: 4.375 Reset  
c) TC1279-15ENBTR: 4.125 Reset

# TC1278/TC1279

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NOTES:

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