

## 4-Pin $\mu$ P Reset Monitors

### Features

- Precision  $V_{CC}$  Monitor for 1.8V, 2.7V, 3.0V, 3.3V and 5.0V Nominal Supplies
- Manual Reset Input
- 140msec Minimum  $\overline{\text{RESET}}$ , RESET Output Duration
- $\overline{\text{RESET}}$  Output Valid to  $V_{CC} = 1.0\text{V}$  (TC1270)
- Low  $7\mu\text{A}$  Supply Current
- $V_{CC}$  Transient Immunity
- Small 4-Pin SOT-143 Package
- No External Components
- Replacement for MAX811/812 and Offers a Lower Threshold Voltage Option

### Applications

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

### Device Selection Table

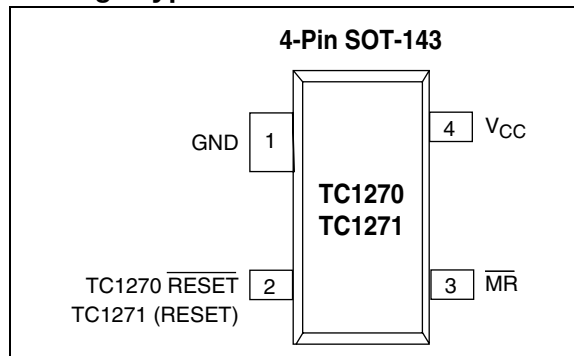
| Part Number | Package       | Temp. Range    |
|-------------|---------------|----------------|
| TC1270xERC  | 4-Pin SOT-143 | -40°C to +85°C |
| TC1271xERC  | 4-Pin SOT-143 | -40°C to +85°C |

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

| Suffix* | Reset $V_{CC}$ Threshold (V) |
|---------|------------------------------|
| L       | 4.63                         |
| M       | 4.38                         |
| T       | 3.08                         |
| S       | 2.93                         |
| R       | 2.63                         |
| F       | 1.75                         |

\*Custom thresholds available, contact factory.

### Package Type



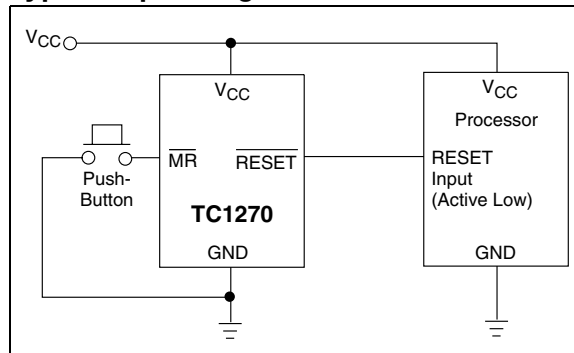
### General Description

The TC1270 and TC1271 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. A manual reset input is provided to override the reset monitor, and is suitable for use as a push-button reset. No external components are required.

The reset output is driven active within 20 $\mu\text{sec}$  (4 $\mu\text{sec}$  for F version) of  $V_{CC}$  falling through the reset voltage threshold. RESET is maintained active for a minimum of 140msec after  $V_{CC}$  rises above the reset threshold. The TC1271 has an active-high  $\overline{\text{RESET}}$  output while the TC1270 has an active-low  $\overline{\text{RESET}}$  output. The output of the TC1270 is valid down to  $V_{CC} = 1\text{V}$ . Both devices are available in a 4-Pin SOT-143 package.

The TC1270/TC1271 devices are optimized to reject fast transient glitches on the  $V_{CC}$  line. Low supply current of  $7\mu\text{A}$  ( $V_{CC} = 3.3\text{V}$ ) makes these devices suitable for battery powered applications.

### Typical Operating Circuit



# TC1270/TC1271

## 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,  $\overline{\text{RESET}}$ , RESET ..... 20mA  
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.

### TC1270/TC1271 ELECTRICAL SPECIFICATIONS

| Electrical Characteristics: $V_{CC}$ = 5V for L/M versions, $V_{CC}$ = 3.3V for T/S versions, $V_{CC}$ = 3V for R version, $V_{CC}$ = 2.0V for F version. $T_A$ = -40°C to +85°C unless otherwise noted. Typical values are at $T_A$ = +25°C. (Note 1). |                                                   |                   |              |                    |                 |                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------|--------------|--------------------|-----------------|-------------------------------------------------------------------------------------------------------|
| Symbol                                                                                                                                                                                                                                                  | Parameter                                         | Min               | Typ          | Max                | Units           | Test Conditions                                                                                       |
| $V_{CC}$                                                                                                                                                                                                                                                | $V_{CC}$ Range                                    | 1.2               | —            | 5.5                | V               |                                                                                                       |
| $I_{CC}$                                                                                                                                                                                                                                                | Supply Current                                    | —<br>—<br>—       | 7<br>10<br>6 | 15<br>15<br>12     | $\mu\text{A}$   | $V_{CC} > V_{TH}$ , for L/M/R/S/T/F<br>$V_{CC} < V_{TH}$ , for L/M/R/S/T<br>$V_{CC} < V_{TH}$ , for F |
| $V_{TH}$                                                                                                                                                                                                                                                | Reset Threshold                                   | 4.54              | 4.63         | 4.72               | V               | TC127_L; $T_A$ = +25°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 4.50              | —            | 4.75               |                 | $T_A$ = -40°C to +85°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 4.30              | 4.38         | 4.46               |                 | TC127_M; $T_A$ = +25°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 4.25              | —            | 4.50               |                 | $T_A$ = -40°C to +85°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 3.03              | 3.08         | 3.14               |                 | TC127_T; $T_A$ = +25°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 3.00              | —            | 3.15               |                 | $T_A$ = -40°C to +85°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 2.88              | 2.93         | 2.98               |                 | TC127_S; $T_A$ = +25°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 2.85              | —            | 3.00               |                 | $T_A$ = -40°C to +85°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 2.58              | 2.63         | 2.68               |                 | TC127_R; $T_A$ = +25°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 2.55              | —            | 2.70               |                 | $T_A$ = -40°C to +85°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 1.71              | 1.75         | 1.79               |                 | TC127_F; $T_A$ = +25°C                                                                                |
|                                                                                                                                                                                                                                                         |                                                   | 1.70              | —            | 1.80               |                 | $T_A$ = -40°C to +85°C                                                                                |
|                                                                                                                                                                                                                                                         | Reset Threshold Tempco                            | —                 | 30           | —                  | ppm/°C          |                                                                                                       |
|                                                                                                                                                                                                                                                         | $V_{CC}$ to Reset Delay                           | —<br>—            | 20<br>5      | —<br>—             | $\mu\text{sec}$ | $V_{CC} = V_{TH}$ to $V_{TH} - 125\text{mV}$ ; L/M/R/S/T/F                                            |
| $t_{RP}$                                                                                                                                                                                                                                                | Reset Active Timeout Period                       | 140               | 280          | 560                | msec            | $V_{CC} = V_{TH(MAX)}$                                                                                |
| $t_{MR}$                                                                                                                                                                                                                                                | $\overline{\text{MR}}$ Minimum Pulse Width        | 10                | —            | —                  | $\mu\text{sec}$ |                                                                                                       |
|                                                                                                                                                                                                                                                         | $\overline{\text{MR}}$ Glitch Immunity            | —                 | 0.1          | —                  | $\mu\text{sec}$ |                                                                                                       |
| $t_{MD}$                                                                                                                                                                                                                                                | $\overline{\text{MR}}$ to Reset Propagation Delay | —                 | 0.5          | —                  | $\mu\text{sec}$ |                                                                                                       |
| $V_{IH}$<br>$V_{IL}$                                                                                                                                                                                                                                    | $\overline{\text{MR}}$ Input Threshold            | 2.3<br>—          | —<br>—       | —<br>0.8           | V               | $V_{CC} > V_{TH(MAX)}$ ,<br>TC127_L/M                                                                 |
| $V_{IH}$<br>$V_{IL}$                                                                                                                                                                                                                                    |                                                   | 0.7 $V_{CC}$<br>— | —<br>—       | —<br>0.15 $V_{CC}$ | V               | $V_{CC} > V_{TH(MAX)}$ ,<br>TC127_R/S/T/F                                                             |
|                                                                                                                                                                                                                                                         | $\overline{\text{MR}}$ Pull-up Resistance         | 10                | 20           | 40                 | k $\Omega$      |                                                                                                       |

**Note** 1: Production testing done at  $T_A$  = +25°C, over temperature limits ensured by design.  
2: RESET output for TC1270, RESET output for TC1271.

## TC1270/TC1271 ELECTRICAL SPECIFICATIONS (CONTINUED)

**Electrical Characteristics:**  $V_{CC} = 5V$  for L/M versions,  $V_{CC} = 3.3V$  for T/S versions,  $V_{CC} = 3V$  for R version,  $V_{CC} = 2.0V$  for F version.  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$  unless otherwise noted. Typical values are at  $T_A = +25^{\circ}C$ . (Note 1).

| Symbol   | Parameter                          | Min            | Typ | Max | Units | Test Conditions                                                            |
|----------|------------------------------------|----------------|-----|-----|-------|----------------------------------------------------------------------------|
| $V_{OH}$ | RESET Output Voltage High (TC1271) | $0.8 V_{CC}$   | —   | —   | V     | $I_{SOURCE} = 150\mu A$ ;<br>$V_{CC} \leq V_{TH(MIN)}$                     |
| $V_{OL}$ | RESET Output Voltage Low (TC1271)  | —              | —   | 0.2 | V     | TC1271F only,<br>$I_{SINK} = 500\mu A$ ,<br>$V_{CC} = V_{TH(MAX)}$         |
|          |                                    | —              | —   | 0.3 |       | TC1271R/S/T only,<br>$I_{SINK} = 1.2mA$ , $V_{CC} = V_{TH(MAX)}$           |
|          |                                    | —              | —   | 0.4 |       | TC1271L/M only, $I_{SINK} = 3.2mA$ ,<br>$V_{CC} = V_{TH(MAX)}$             |
| $V_{OL}$ | RESET Output Voltage Low (TC1270)  | —              | —   | 0.3 | V     | TC1270R/S/T only,<br>$I_{SINK} = 1.2mA$ , $V_{CC} = V_{TH(MIN)}$           |
|          |                                    | —              | —   | 0.4 |       | TC1270F only:<br>$I_{SINK} = 500\mu A$ , $V_{CC} = V_{TH(MIN)}$            |
|          |                                    | —              | —   | TBD |       | TC1270L/M only,<br>$I_{SINK} = 3.2mA$ , $V_{CC} = V_{TH(MIN)}$             |
|          |                                    | —              | —   |     |       | $I_{SINK} = 50\mu A$ , $V_{CC} > 1.0V$                                     |
| $V_{OH}$ | RESET Output Voltage High (TC1270) | $V_{CC} - 1.5$ | —   | —   | V     | TC1270L/M only,<br>$I_{SOURCE} = 800\mu A$ ,<br>$V_{CC} = V_{TH(MAX)}$     |
|          |                                    | $0.8 V_{CC}$   | —   | —   |       | TC1270R/S/T/F only,<br>$I_{SOURCE} = 500\mu A$ ,<br>$V_{CC} = V_{TH(MAX)}$ |

**Note** 1: Production testing done at  $T_A = +25^{\circ}C$ , over temperature limits ensured by design.  
2: RESET output for TC1270, RESET output for TC1271.

# TC1270/TC1271

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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**

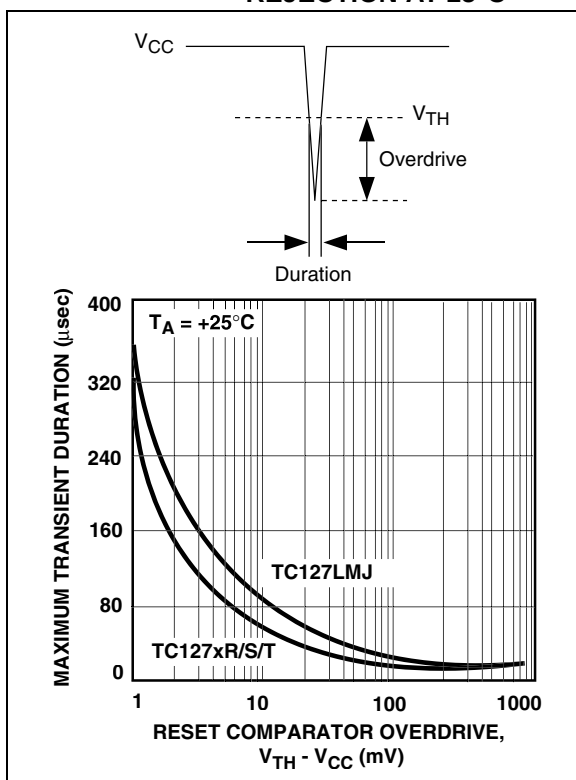
| Pin No.<br>(SOT-143-4) | Symbol                                | Description                                                                                                                                                                 |
|------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                      | GND                                   | Ground.                                                                                                                                                                     |
| 2                      | $\overline{\text{RESET}}$<br>(TC1270) | $\overline{\text{RESET}}$ output remains low while $V_{CC}$ is below the reset voltage threshold, and for at least 140msec min. after $V_{CC}$ rises above reset threshold. |
| 2                      | RESET<br>(TC1271)                     | RESET output remains high while $V_{CC}$ is below the reset voltage threshold, and for at least 140msec min. after $V_{CC}$ rises above reset threshold.                    |
| 3                      | $\overline{\text{MR}}$                | Manual reset input generates a reset when $\overline{\text{MR}}$ is below $V_{IL}$ .                                                                                        |
| 4                      | $V_{CC}$                              | Supply voltage.                                                                                                                                                             |

## 3.0 APPLICATIONS INFORMATION

### 3.1 $V_{CC}$ Transient Rejection

The TC1270/TC1271 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 3-1 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 TC1270/TC1271.

**FIGURE 3-1: MAXIMUM TRANSIENT DURATION VS. OVERDRIVE FOR GLITCH REJECTION AT 25°C**

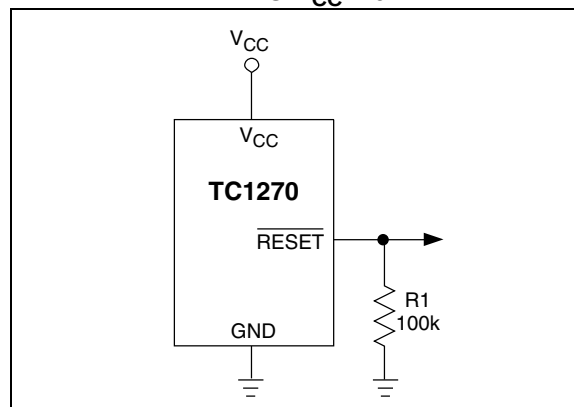


### 3.2 RESET Signal Integrity During Power-Down

The TC1270  $\overline{\text{RESET}}$  output is valid to  $V_{CC} = 1.0\text{V}$ . Below this voltage the output becomes an "open circuit" and does not sink current. This means CMOS logic inputs to the  $\mu\text{P}$  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  $V_{CC} = 0\text{V}$ , a pull-down resistor must

be connected from  $\overline{\text{RESET}}$  to ground to discharge stray capacitances and hold the output low (Figure 3-2). This resistor value, though not critical, should be chosen such that it does not appreciably load  $\overline{\text{RESET}}$  under normal operation (100k $\Omega$  will be suitable for most applications). Similarly, a pull-up resistor to  $V_{CC}$  is required for the TC1271 to ensure a valid high  $\overline{\text{RESET}}$  for  $V_{CC}$  below 1.1V.

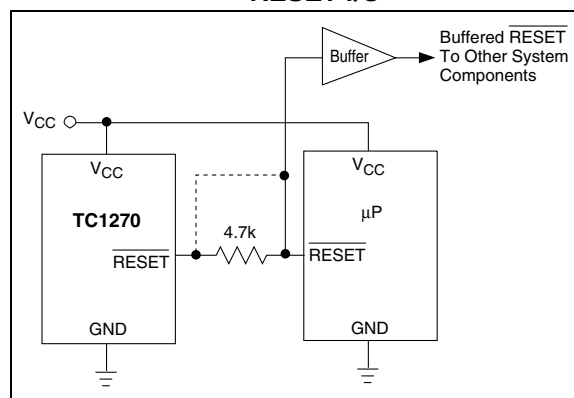
**FIGURE 3-2: ENSURING RESET VALID TO  $V_{CC} = 0\text{V}$**



### 3.3 Processors With Bidirectional I/O Pins

Some  $\mu\text{P}$ 's (such as Motorola 68HC11) have bi-directional reset pins. Depending on the current drive capability of the processor pin, an indeterminate logic level may result if there is a logic conflict. This can be avoided by adding a 4.7 k $\Omega$  resistor in series with the output of the TC1270/TC1271 (Figure 3-3). If there are other components in the system which require a reset signal, they should be buffered so as not to load the reset line. If the other components are required to follow the reset I/O of the  $\mu\text{P}$ , the buffer should be connected as shown with the solid line.

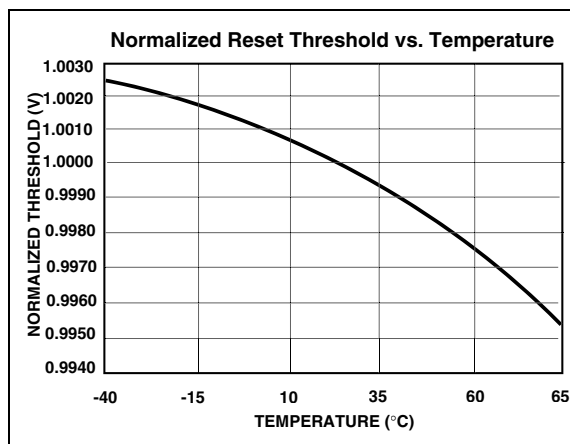
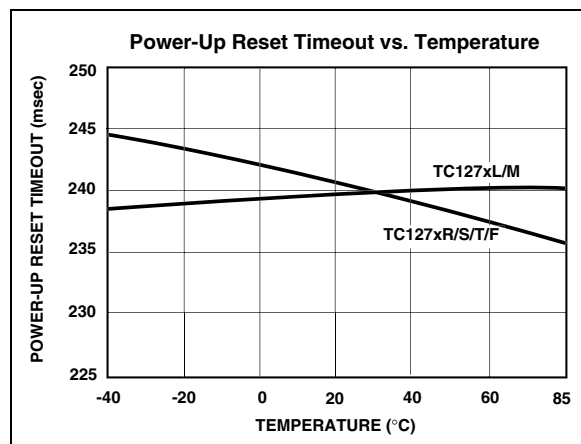
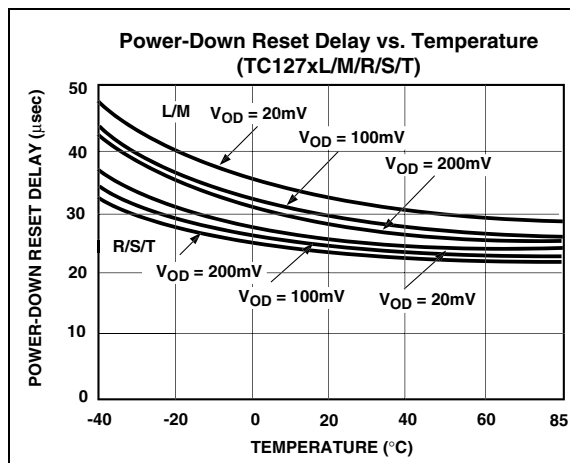
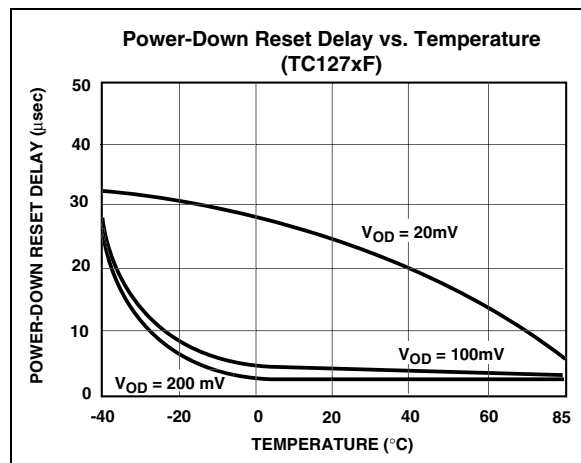
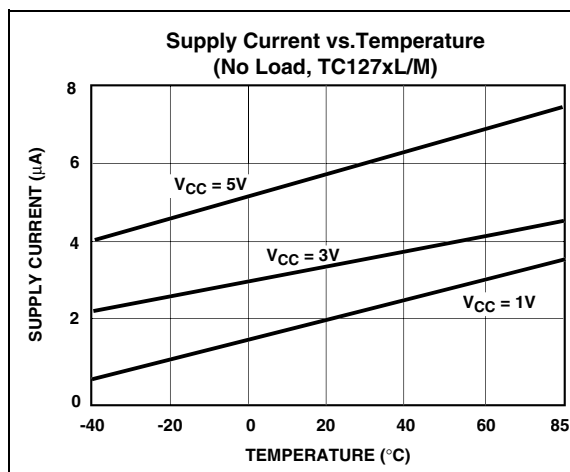
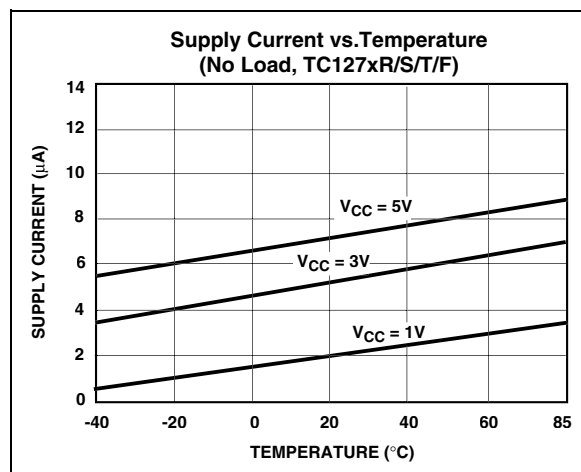
**FIGURE 3-3: INTERFACING TO BIDIRECTIONAL RESET I/O**



# TC1270/TC1271

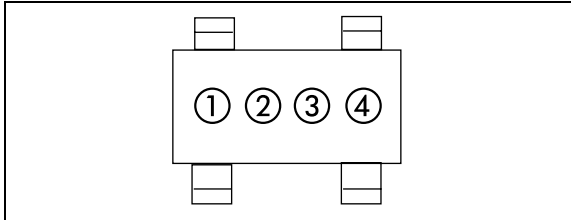
## 4.0 TYPICAL CHARACTERISTICS

**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.



## 5.0 PACKAGING INFORMATION

### 5.1 Package Marking Information



① & ② = part number code + temperature range  
(two-digit code)

| Part Number | (V)  | Code |
|-------------|------|------|
| TC1271LERC  | 4.63 | T1   |
| TC1271MERC  | 4.38 | T2   |
| TC1271TERC  | 3.08 | T3   |
| TC1271SERC  | 2.93 | T4   |
| TC1271RERC  | 2.63 | T5   |
| TC1271FERC  | 1.75 | T7   |

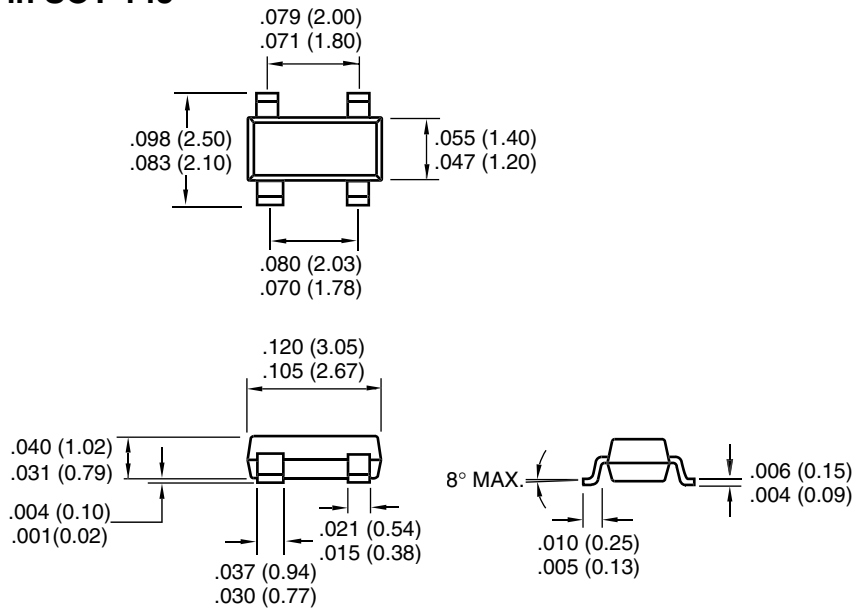
③ represents year and quarter code

④ represents production lot ID code

| Part Number | (V)  | Code |
|-------------|------|------|
| TC1270LERC  | 4.63 | S1   |
| TC1270MERC  | 4.38 | S2   |
| TC1270TERC  | 3.08 | S3   |
| TC1270SERC  | 2.93 | S4   |
| TC1270RERC  | 2.63 | S5   |
| TC1270FERC  | 1.75 | S7   |

### 5.2 Package Dimensions

#### 4-Pin SOT-143



Dimensions: inches (mm)

# TC1270/TC1271

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NOTES:



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Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

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# TC1270/TC1271

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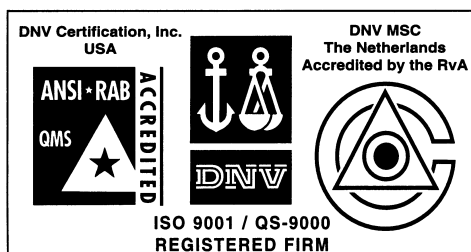
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