TelCom Semiconductor, Inc.



# Low Dropout Positive Fixed Voltage Regulator

## FEATURES

- **Space Saving 3-Pin DPAK, 8-Pin SOIC and 3-Pin SOT–223 Power Packages**
- **1.0V Dropout**
- **Output Current in Excess of 800mA**
- **Thermal Protection**
- **Short Circuit Protection**
- **Output Trimmed to 1.0% Tolerance**

## TYPICAL APPLICATIONS

- **Systems Requiring Post Regulation**
- **Telecom Equipment**
- **Industrial or Process Equipment**
- **Battery Chargers and Regulators**
- **Powering DSP Applications**

## GENERAL DESCRIPTION

The TC33269 Series is a low dropout, medium current, fixed positive voltage regulator specifically designed for use in low input voltage applications. This device offers the circuit designer an economical solution for precision voltage regulation, while keeping power losses to a minimum.

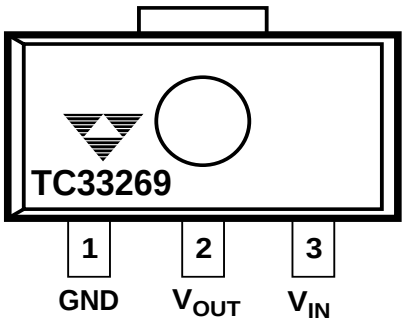
The regulator consists of a 1.0V dropout composite PNP-NPN pass transistor, current limiting, and thermal shutdown.

## ORDERING INFORMATION*

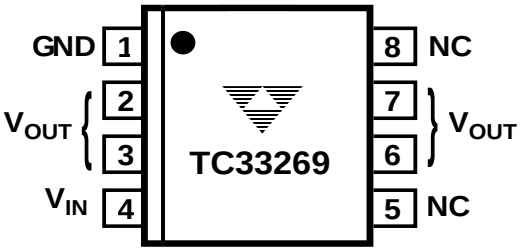
| Part Number | (V) | Package | Operating Ambient Temp. Range |
|---|---|---|---|
| TC33269-3.3VOA | 3.3V | 8-Pin SOIC | —40°C to +85°C |
| TC33269-3.3VVB | 3.3V | 3-Pin DPAK | —40°C to +85°C |
| TC33269-3.3VDB | 3.3V | 3-Pin SOT-223 | —40°C to +85°C |

*Contact Factory for other voltage options

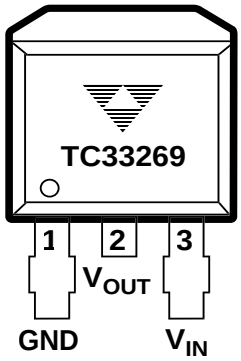
### 3-Pin SOT-223




### 8-Pin SOIC




### 3-Pin DPAK



# TC33269 Series

## MAXIMUM RATINGS

Power Supply Input Voltage ..... $V_{IN}$ = 20V
Power Dissipation
- 3-Pin DPAK
  - $T_A$ = 25°C ..... $P_D$ = Internally Limited W
  - Thermal Resistance, Junction-to-Ambient; ..... $\theta_{JA}$ = 92°C/W
  - Thermal Resistance, Junction-to-Case; ..... $\theta_{JC}$ = 6.0°C/W
- 8-Pin SOIC
  - $T_A$ = 25°C ..... $P_D$ = Internally Limited W
  - Thermal Resistance, Junction-to-Ambient; ..... $\theta_{JA}$ = 160°C/W
  - Thermal Resistance, Junction-to-Case; ..... $\theta_{JC}$ = 25°C/W
- 3-Pin SOT-223
  - $T_A$ = 25°C ..... $P_D$ = Internally Limited W
  - Thermal Resistance, Junction-to-Ambient; ..... $\theta_{JA}$ = 245°C/W
  - Thermal Resistance, Junction-to-Case; ..... $\theta_{JC}$ = 15°C/W

Operating Junction Temperature Range .... $T_J$ = –40 to +150°C
Storage Temperature Range ..... $T_{STG}$ = –55 to +150°C

**NOTE:** ESD data available upon request.

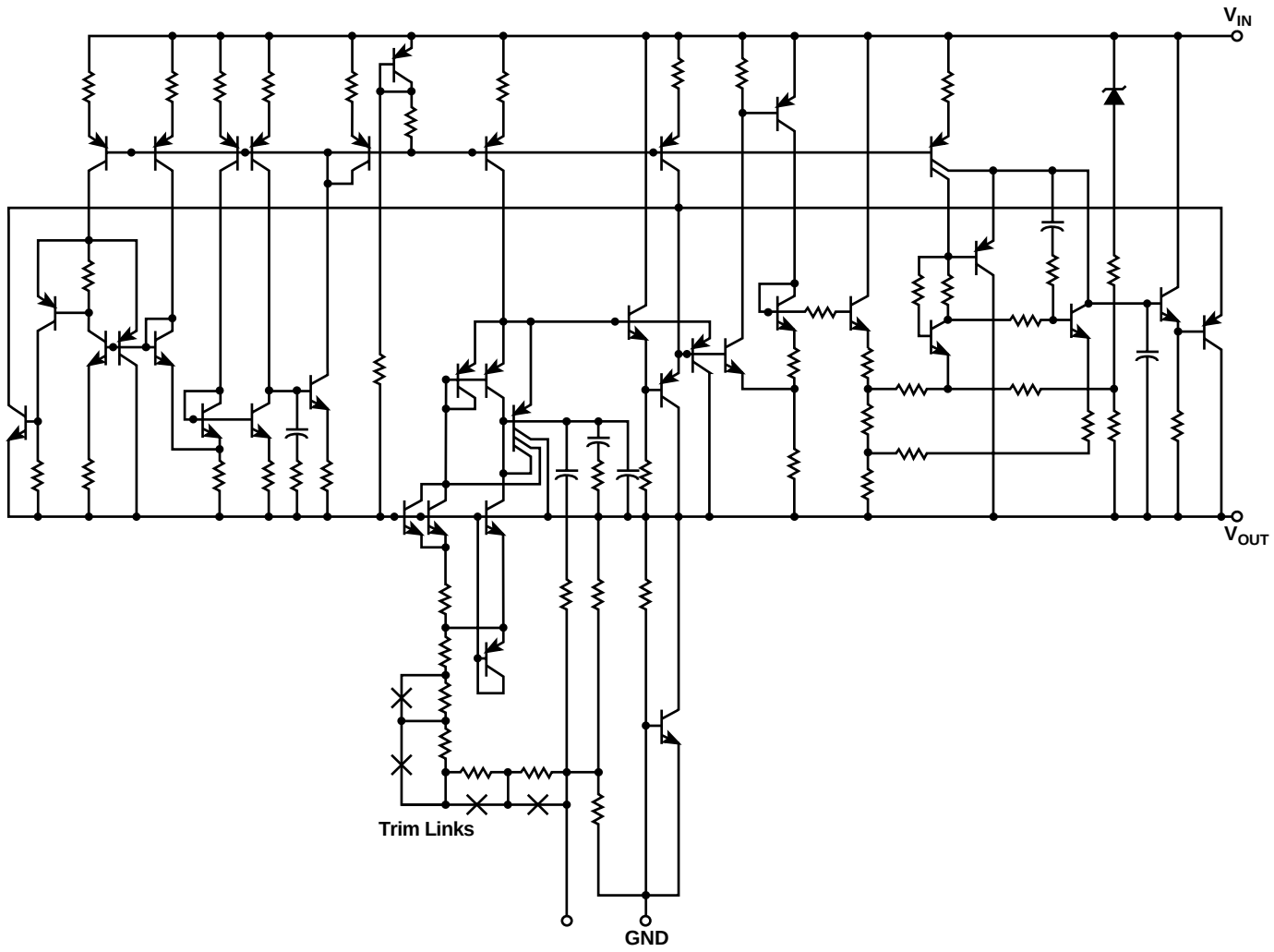
## ELECTRICAL CHARACTERISTICS:

$C_{OUT}$ = 10µF, $T_A$ = 25°C, for min/max values $T_J$ = –40 to +125°C, unless otherwise noted.

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $V_{OUT}$ | Output Voltage | $I_{OUT}$ = 10mA, $T_J$ = 25°C<br>3.3 Suffix $V_{CC}$ = 5.3V | <br>3.27 | <br>3.3 | <br>3.33 | V |
| $V_{OUT}$ | Output Voltage (Line, Load and Temperature) [Note1] | 1.25V ≤ $V_{IN}$ – $V_{OUT}$ ≤ 15V, $I_{OUT}$ = 500mA<br>1.35V ≤ $V_{IN}$ – $V_{OUT}$ ≤ 10V, $I_{OUT}$ = 800mA<br>3.3 Suffix | <br><br>3.23 | <br><br>3.3 | <br><br>3.37 | V |
| $REG_{LINE}$ | Line Regulation | $I_{OUT}$ = 10mA, $V_{IN}$ = [$V_{OUT}$+ 1.5V] to $V_{IN}$ = 20V, $T_J$ = 25°C | — | — | 0.3 | % |
| $REG_{LOAD}$ | Load Regulation | $V_{IN}$ = $V_{OUT}$ + 3.0V, $I_{OUT}$ = 10mA to 800mA, $T_J$ = 25°C | — | — | 0.5 | % |
| $V_{IN} – V_{OUT}$ | Dropout Voltage | $I_{OUT}$ = 500mA<br>$I_{OUT}$ = 800mA | —<br>— | 1.0<br>1.1 | 1.25<br>1.35 | V |
| RR | Ripple Rejection | 10$V_{PP}$, 120Hz Sinewave; $I_{OUT}$ = 500mA | 55 | — | — | dB |
| $I_{LIMIT}$ | Current Limit | $V_{IN}$ – $V_{OUT}$ = 10V | 800 | — | — | mA |
| $I_Q$ | Quiescent Current (Fixed Output) | $V_{OUT}$ = 3.3V | — | 5.5 | 8.0 | mA |
| $I_{LOAD}$ | Minimum Required Load Current | Fixed Output Voltage | — | — | 0 | mA |

## FUNCTIONAL BLOCK DIAGRAM

**Internal Schematic**




**This device contains 38 active transistors.**

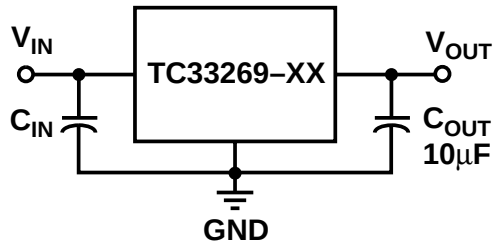
## TC33269 Series

### APPLICATIONS INFORMATION

Figures 1 is a typical application circuit. The output current capability of the regulator is in excess of 800mA, with a typical dropout voltage of less than 1.0V. Internal protective features include current and thermal limiting.

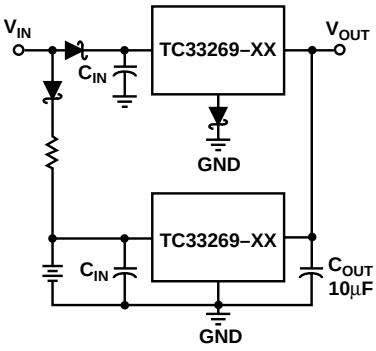
The TC33269 Series is not internally compensated and thus requires an external output capacitor for stability. The capacitor should be at least 10µF with an equivalent series resistance (ESR) of less than 10Ω over the anticipated operating temperature range. With economical electrolytic capacitors, cold temperature operation can pose a problem. As temperature decreases, the capacitance also decreases and the ESR increases, which could cause the circuit to oscillate. Solid tantalum capacitors may be a better choice if small size is a requirement. Also capacitance and ESR of a solid tantalum capacitor is more stable over temperature. An input bypass capacitor is recommended to improve transient response or if the regulator is connected to the supply input filter with long wire lengths. This will reduce the circuit's sensitivity to the input line impedance at high frequencies. A 0.33µF or larger tantalum, mylar, ceramic, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with shortest possible lead or track length directly across the regulator's input terminals. **Applications should be tested over all operating conditions to insure stability.**

Internal thermal limiting circuitry is provided to protect the integrated circuit in the event that the maximum junction temperature is exceeded. When activated, typically at 170°C, the output is disabled. There is no hysteresis built into the thermal limiting circuit. As a result, if the device is overheating, the output will appear to be oscillating. This feature is provided to prevent catastrophic failures from accidental device overheating. **It is not intended to be used as a substitute for proper heatsinking.**




An input capacitor is not necessary for stability, however it will improve the overall performance.

**Figure 1. Typical Fixed Output Application**




The Schottky diode in series with the ground leg of the upper regulator shifts its output voltage higher by the forward voltage drop of the diode. This will cause the lower device to remain off until the input voltage is removed.

**Figure 2. Battery Backed-Up Power Supply**

## TYPICAL CHARACTERISTICS

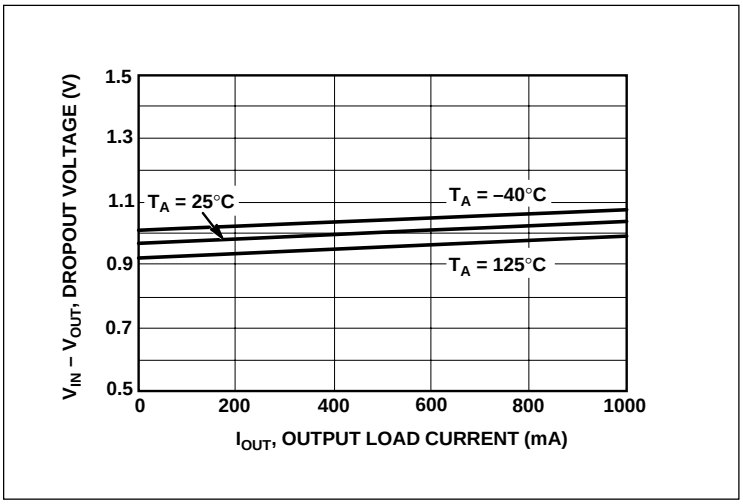



Figure 3. Dropout Voltage versus Output Load Current

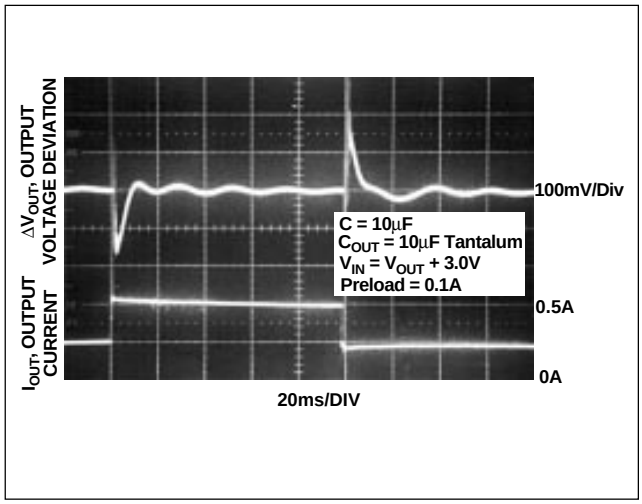



Figure 4. Transient Load Regulation

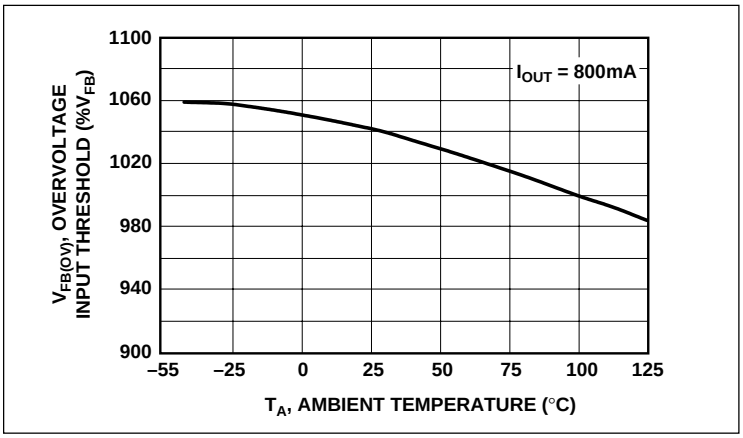



Figure 5. Dropout Voltage versus Temperature

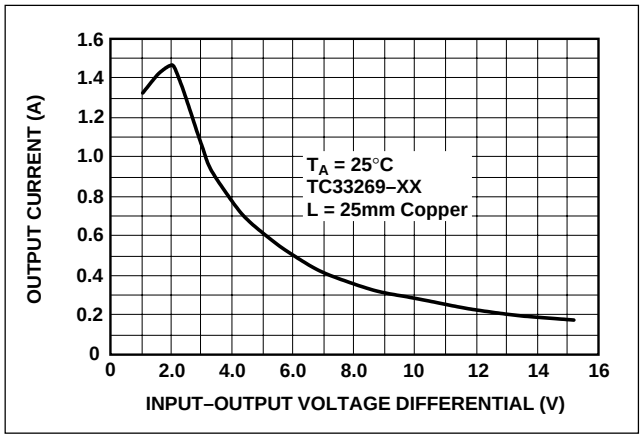



Figure 6. TC33269-XX Output DC Current versus Input–Output Differential Voltage

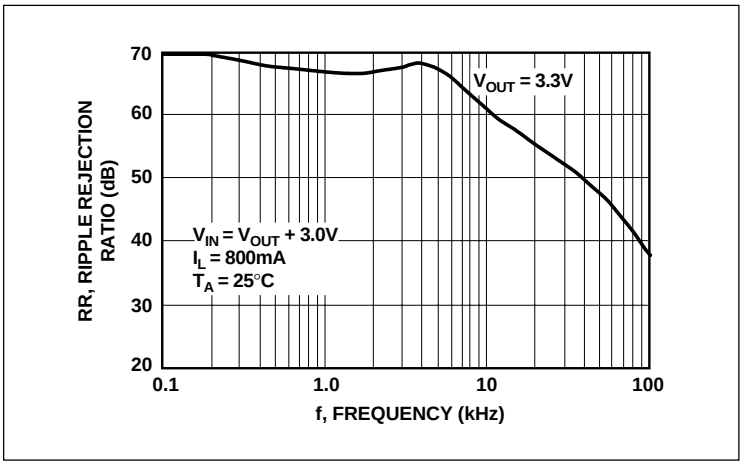



Figure 7. TC33269 Ripple Rejection versus Frequency

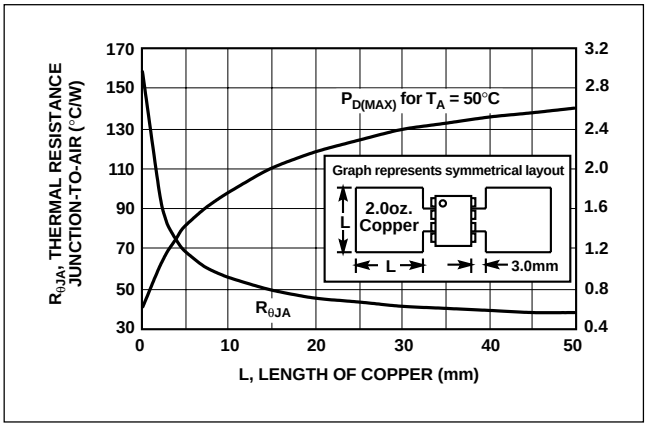



Figure 8. 8-Pin SOIC Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

## TC33269 Series

### TYPICAL CHARACTERISTICS

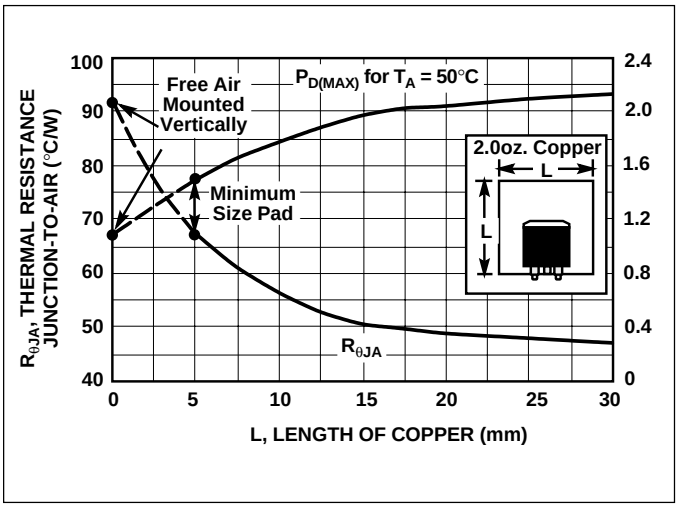



**Figure 9. 3-Pin DPAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length**

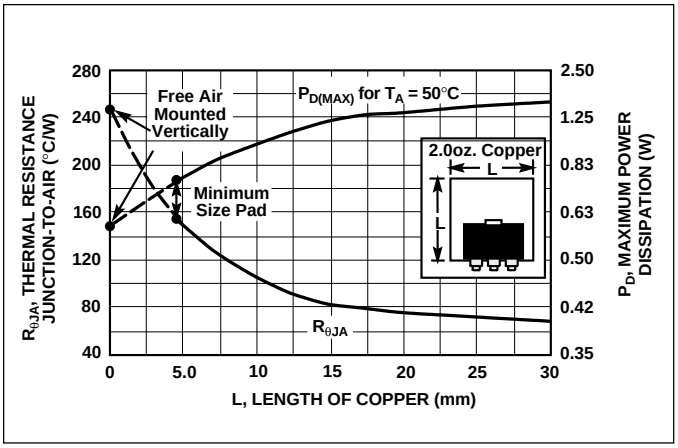
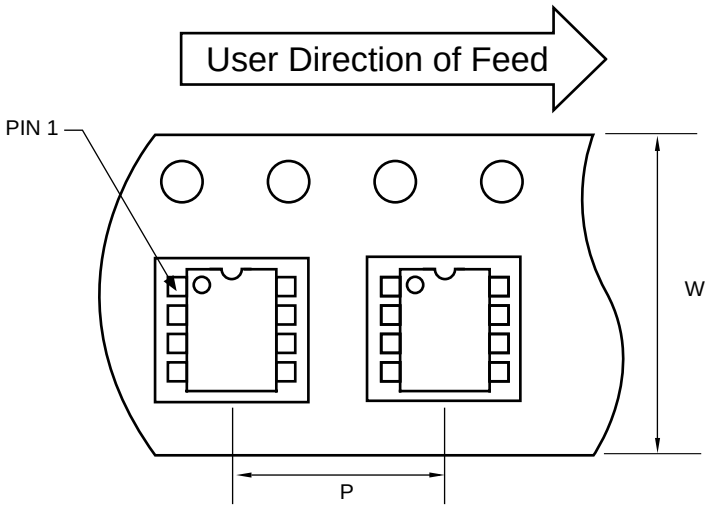



**Figure 10. 3 Pin SOT-223 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length**

## TAPE AND REEL INFORMATION

### Component Taping Orientation for 8-Pin SOIC (Narrow) Devices

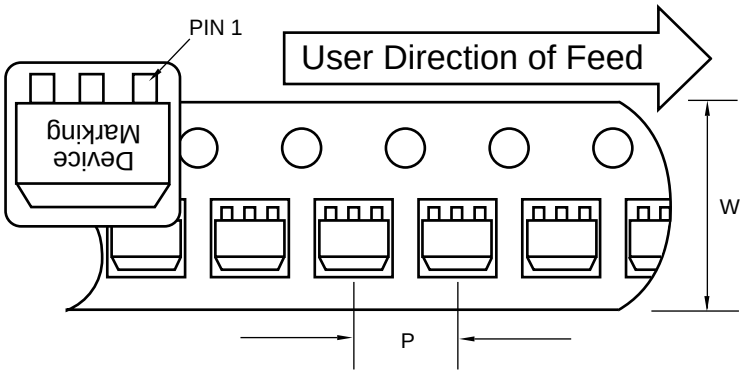



Standard Reel Component Orientation
for TR Suffix Device

**Carrier Tape, Number of Components Per Reel and Reel Size**

| Package | Carrier Width (W) | Pitch (P) | Part Per Full Reel | Reel Size |
|---|---|---|---|---|
| 8-Pin SOIC (N) | 12 mm | 8 mm | 2500 | 13 in |

### Component Taping Orientation for 3-Pin DPAK Devices




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

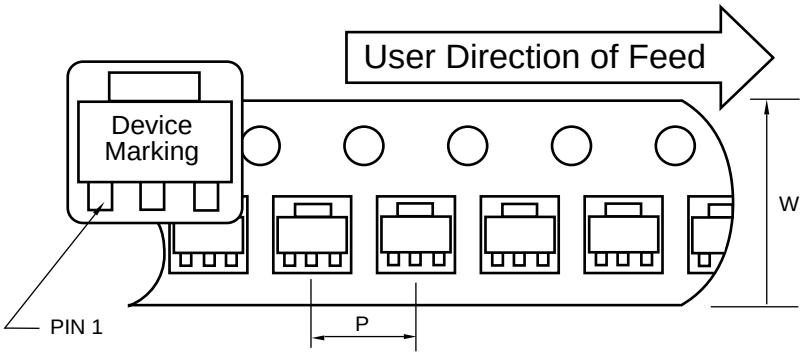
**Carrier Tape, Number of Components Per Reel and Reel Size**

| Package | Carrier Width (W) | Pitch (P) | Part Per Full Reel | Reel Size |
|---|---|---|---|---|
| 3-Pin DPAK | 16 mm | 8 mm | 2500 | 13 in |

## TC33269 Series

### TAPE AND REEL INFORMATION

Component Taping Orientation for 3-Pin SOT-223 Devices



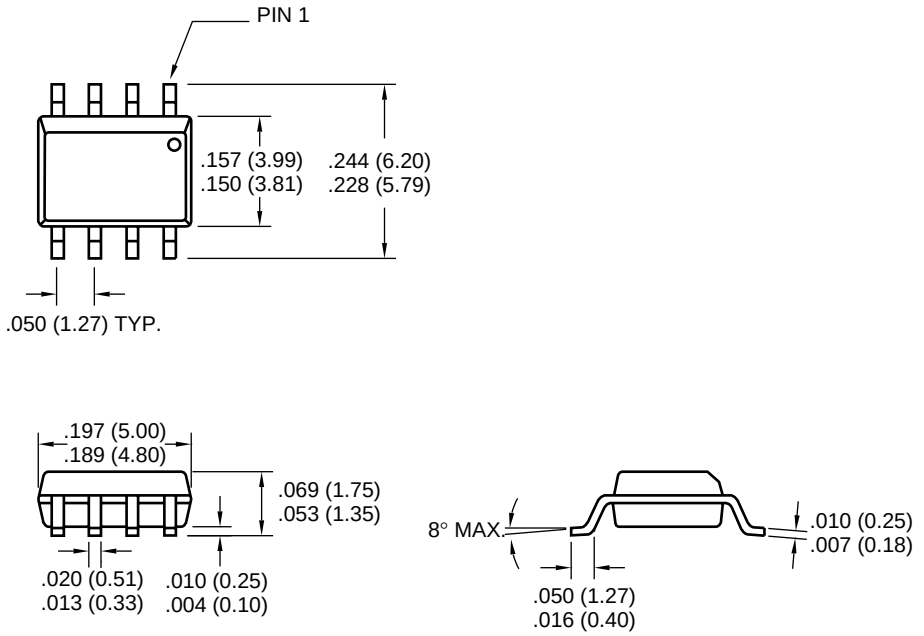

Standard Reel Component Orientation
for TR Suffix Device
(Mark Right Side Up)

**Carrier Tape, Number of Components Per Reel and Reel Size**

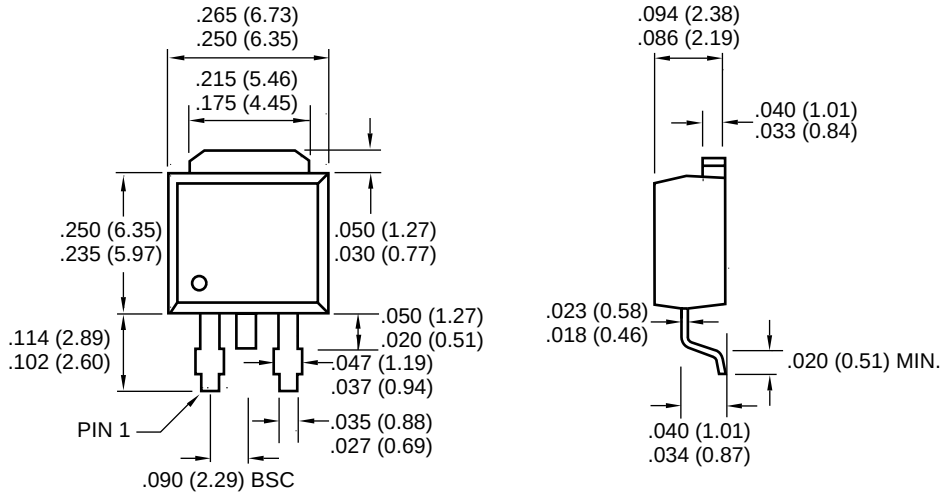
| Package | Carrier Width (W) | Pitch (P) | Part Per Full Reel | Reel Size |
|---|---|---|---|---|
| 3-Pin SOT-223 | 12 mm | 8 mm | 4000 | 13 in |

## PACKAGE DIMENSIONS

### 8-Pin SOIC (Narrow)




### 3-Pin DPAK

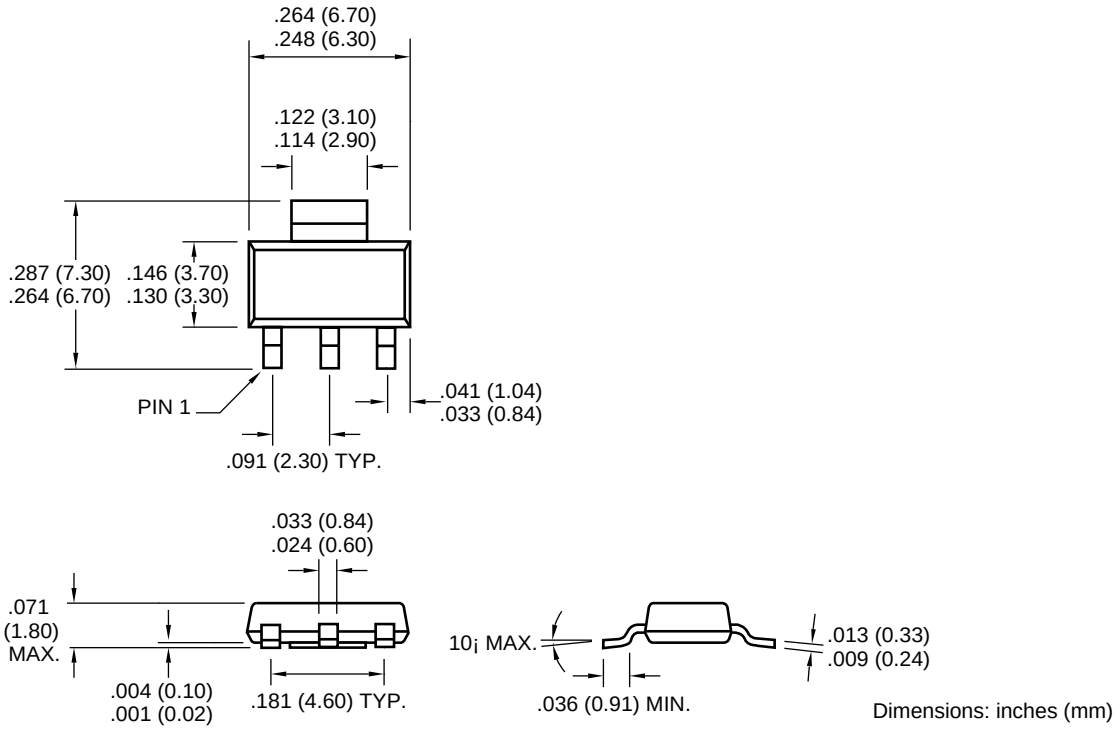



Dimensions: inches (mm)

# TC33269 Series

## PACKAGE DIMENSIONS

3-Pin SOT-223

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