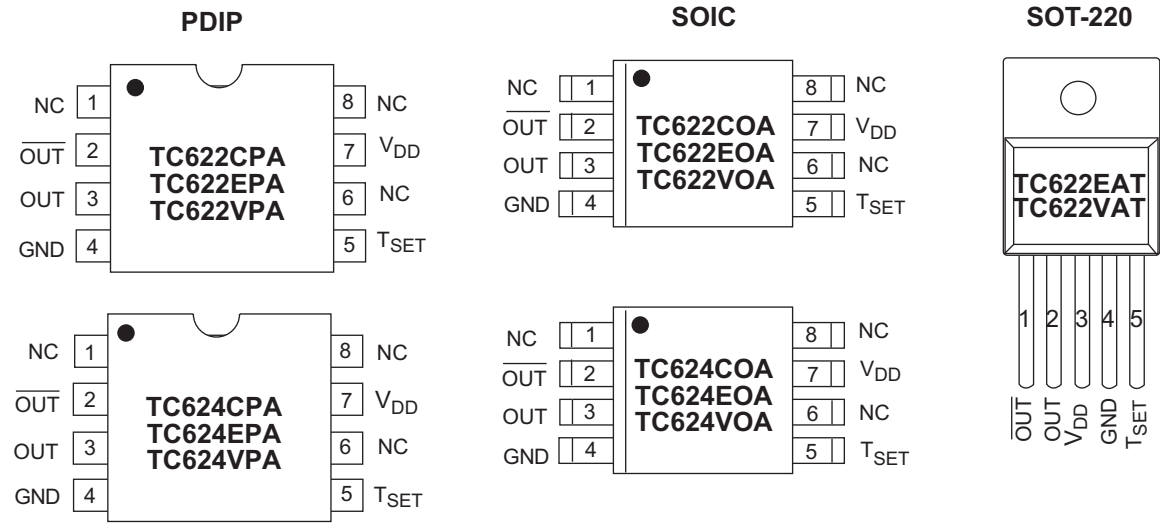
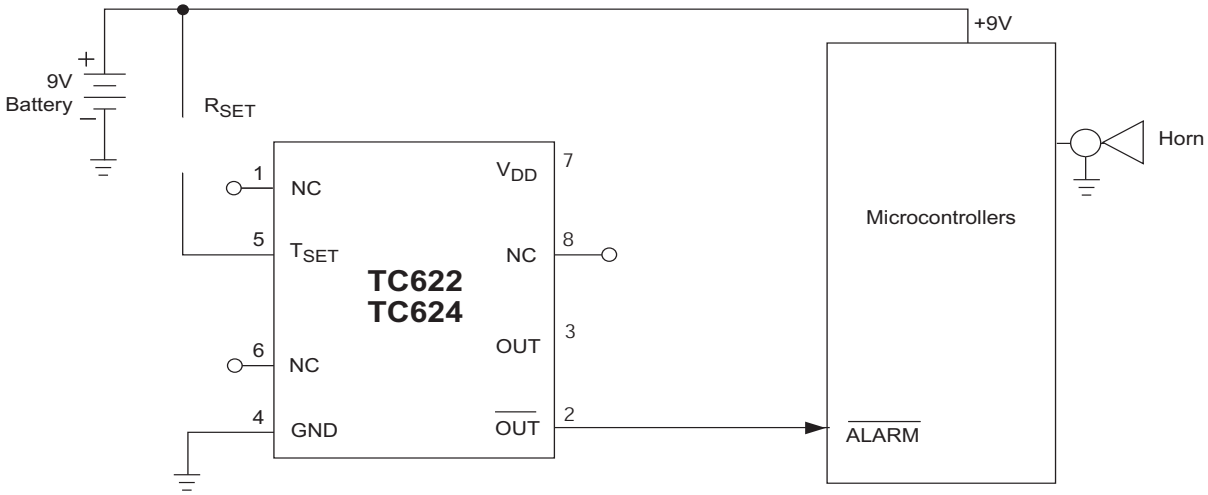
## Package Type




**Note:** For TO-220 Package, Pin 3 is connected to case heatsink.

## Functional Block Diagram



## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings*

Supply Voltage (TC622) ..... 20V
(TC624) ..... 5.5V
Input Voltage Any Input .. (GND – 0.3V) to ($V_{DD}$ +0.3V)
Operating Temperature ..... -40°C to +125°C
C Version ..... 0°C to +70°C
E Version ..... -40°C to +85°C
V Version ..... -40°C to +125°C
Storage Temperature ..... -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.

.

**TC622/TC624 ELECTRICAL SPECIFICATIONS**

| **Electrical Characteristics:** Over operating temperature range, unless otherwise specified. | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sym** | **Parameter** | **Device** | **Min** | **Typ** | **Max** | **Unit** | **Test Conditions** |
| $V_{DD}$ | Supply Voltage Range | TC622<br>TC624 | 4.5<br>2.7 | —<br>— | 18<br>4.5 | V | |
| $I_{DD}$ | Supply Current | TC622<br>TC624 | —<br>— | 200<br>170 | 600<br>300 | µA | 5.0V ≤ $V_{DD}$ ≤ 18V<br>2.7V ≤ $V_{DD}$ ≤ 4.5V |
| $V_{OH}$ | Output Voltage (High) | TC622 | 0.90 x $V_{DD}$<br><br>0.80 x $V_{DD}$ | —<br><br>— | —<br><br>— | V | 5.0V ≤ $V_{DD}$ ≤ 18V, -40°C ≤ $T_A$ ≤ +125°C, $I_{OH}$ = 250 µA<br>$I_{OH}$ = 500 µA |
| $V_{OL}$ | Output Voltage (Low) | TC622 | —<br>—<br>— | —<br>—<br>— | 0.15 x $V_{DD}$<br>0.30 x $V_{DD}$<br>0.35 x $V_{DD}$ | V | -40°C ≤ $T_A$ ≤ +85°C, $I_{OL}$ = 500 µA<br>$I_{OL}$ = 1 mA<br>-40°C ≤ $T_A$ ≤ +125°C, $I_{OL}$ = 1 mA |
| $V_{OH}$ | Output Voltage (High) | TC624 | —<br>0.90 x $V_{DD}$<br>0.80 x $V_{DD}$ | <br>—<br>— | <br>—<br>— | V | 2.7V ≤ $V_{DD}$ ≤ 4.5V<br>-40°C ≤ $T_A$ ≤ +125°C, $I_{OH}$ = 250 µA<br>$I_{OH}$ = 500 µA |
| $V_{OL}$ | Output Voltage (Low) | TC624 | —<br>—<br>— | —<br>—<br>— | 0.1 x $V_{DD}$<br>0.2 x $V_{DD}$<br>0.25 x $V_{DD}$ | V | -40°C ≤ $T_A$ ≤ +85°C, $I_{OL}$ = 500 µA<br>$I_{OL}$ = 1 mA<br>-40°C ≤ $T_A$ ≤ +125°C, $I_{OL}$ = 1 mA |
| $T_{SET}$ | Absolute Accuracy | TC622<br>TC624 | T - 5<br>T - 5 | T ± 1<br>T ± 1 | T + 5<br>T + 5 | °C | $T_{SET}$ = Programmed Temperature<br>$T_{SET}$ = Programmed Temperature |
| OUT | Trip Point Hysteresis | TC622<br>TC624 | —<br>— | 2<br>2 | —<br>— | °C | |

## 2.0 PIN DESCRIPTION

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

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

| Pin No. (8-Pin SOIC) (8-Pin PDIP) | Symbol | Description |
|---|---|---|
| 1 | NC | No Internal Connection. |
| 2 | $\overline{OUT}$ | Active low output. |
| 3 | OUT | Active high output. |
| 4 | GND | Ground Terminal. |
| 5 | $T_{SET}$ | Temperature set point. Connect an external 1% resistor from $T_{SET}$ to $V_{CC}$ to set trip point. |
| 6 | NC | No Internal Connection. |
| 7 | $V_{DD}$ | Power supply input. |
| 8 | NC | No Internal Connection. |

| Pin No. (5-Pin SOT-220) | Symbol | Description |
|---|---|---|
| 1 | $\overline{OUT}$ | Active low output. |
| 2 | OUT | Active high output. |
| 3 | $V_{DD}$ | Power supply input. |
| 4 | GND | Ground Terminal. |
| 5 | $T_{SET}$ | Temperature set point. Connect an external 1% resistor from $T_{SET}$ to $V_{CC}$ to set trip point. |

## 3.0 DETAILED DESCRIPTION

### 3.1 Trip Point Programming

When the temperature of the device exceeds the programmed temperature trip point, $T_{SET}$, the OUT and $\overline{OUT}$ outputs are driven into their active states. The desired trip point temperature is programmed with a single external resistor connected between the $T_{SET}$ input and $V_{CC}$. The relationship between the resistor value and the trip point temperature is given by Equation 3-1.

**EQUATION 3-1:**

$$R_{TRIP} = 0.5997 \text{ x } T^{2.1312}$$

Where:

$R_{TRIP}$ = Programming resistor value in Ohms

T = Desired trip temperature in degrees Kelvin.

For example, as shown in Figure 3-1, to program the device to trip at 50°C, the programming resistor is:

$$R_{TRIP} = 0.5997 \text{ x } ((50 + 273.15)^{2.1312}) = 133.65 \text{ k}\Omega$$

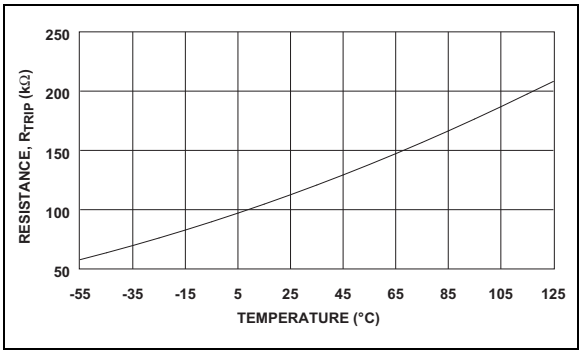



***FIGURE 3-1:*** *Programming Resistor Values vs. Temperature*

### 3.2 Hysteresis

To prevent output "chattering" at the trip point temperature, the temperature detector in the TC622/TC624 has 2°C hysteresis (see Figure 3-2). The outputs are driven active when the temperature crosses the set point determined by the external resistor. As temperature declines below the set point, the hysteresis action will hold the outputs true until the temperature drops 2°C below the threshold.

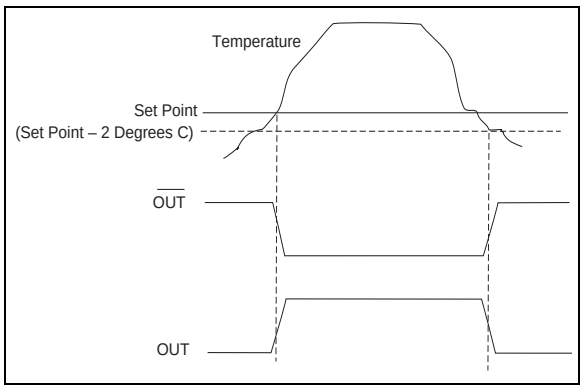



***FIGURE 3-2:*** *TC622/TC624 Hysteresis*

## 4.0 TYPICAL APPLICATIONS

### 4.1 Over-Temperature Shutdown

The TC622 can be used to create a simple over-temperature shutdown circuit. In this circuit, temperature is sensed within the system enclosure (internal system ambient) or at the heatsink itself. When measured temperature exceeds a preset limit, a fault is indicated and the system shuts down.

Figure 4-1 illustrates an over-temperature shutdown circuit using the TC622 sensor in a single TO-220 package, allowing direct attachment to the heatsink surface. As shown, the TC622 outputs are driven active when the heatsink temperature equals the trip point temperature set by $R_{TRIP}$. When this happens, the crowbar circuit is activated, causing the supply output to fold back to zero. The TC622 outputs remain active until the heatsink temperature falls a minimum of 2°C (built-in hysteresis) below the trip point temperature, at which time the device again allows normal supply operation.

### 4.2 Cooling and Heating Applications

The TC622/TC624 can be used to control a DC fan as shown in Figure 4-2. The fan turns on when the sensed temperature rises above $T_{SET}$ and remains on until the temperature falls below $T_{SET}$ - 2°C.

Figure 4-3 shows the TC622 acting as a heater thermostat. Circuit operation is identical to that of the cooling fan application.

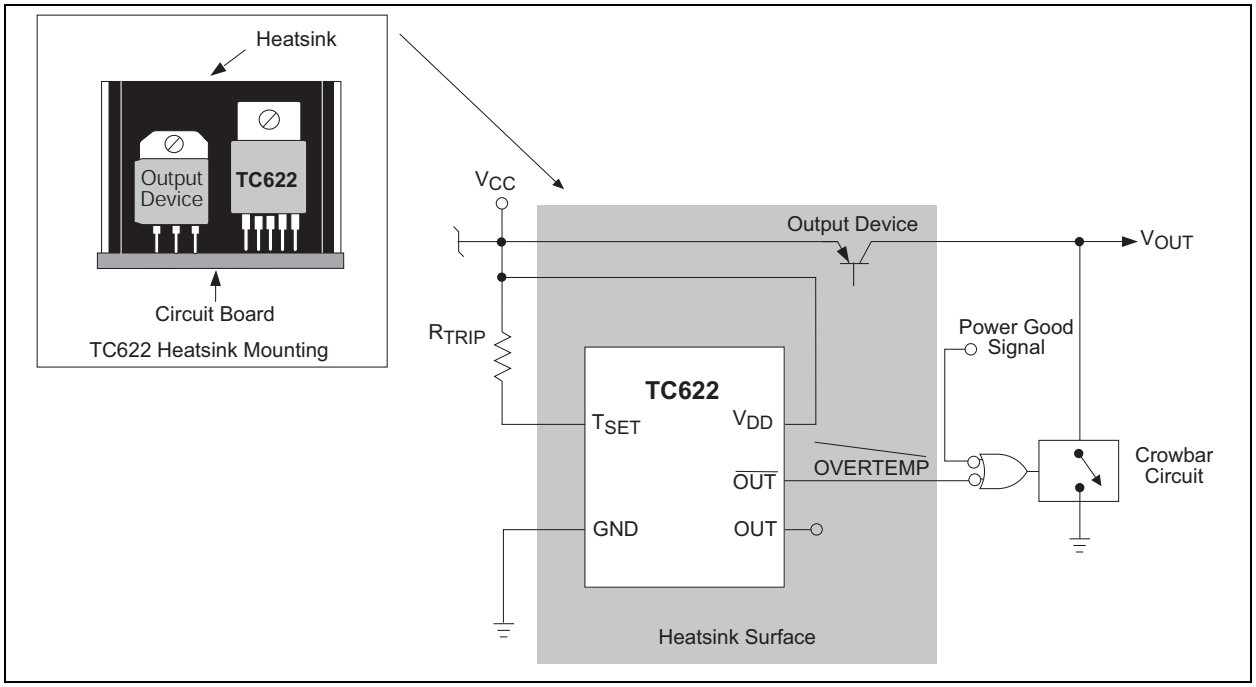



***FIGURE 4-1:*** *TC622 Power Supply Over-Temperature Shutdown*

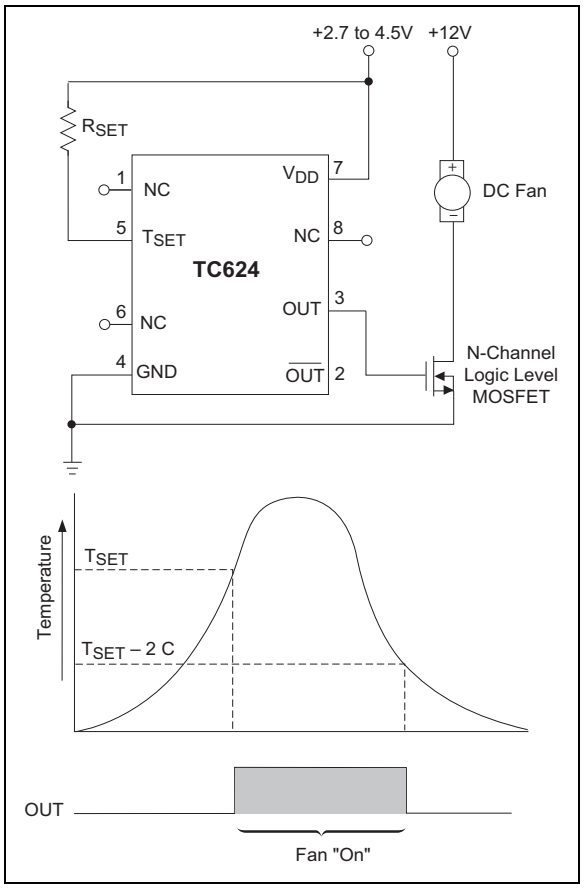



***FIGURE 4-2:*** *TC624 As A Fan Controller for Notebook PC*

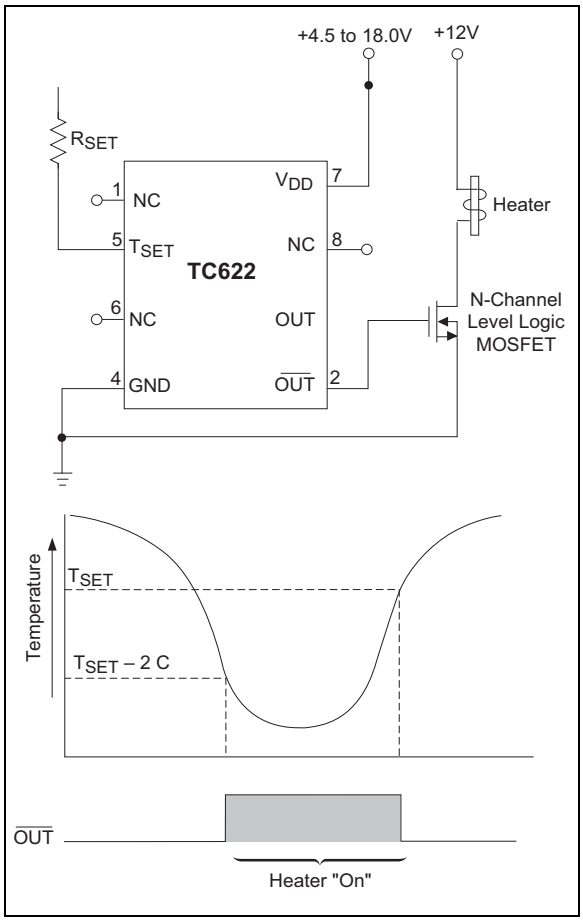



***FIGURE 4-3:*** *TC622 As A Heater Thermostat*

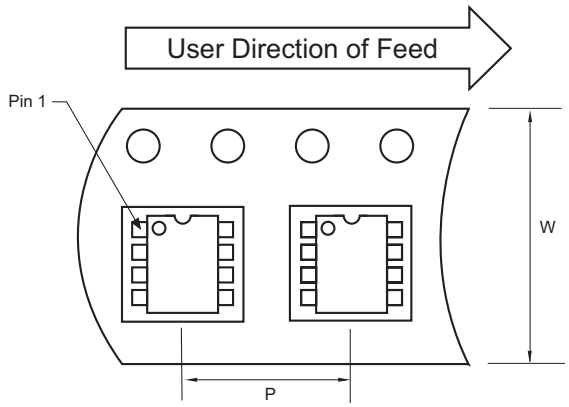
## 5.0 PACKAGING INFORMATION

### 5.1 Package Marking Information

Package marking data not available at this time.

### 5.2 Taping Form

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




Standard Reel Component Orientation
for 713 Suffix Device

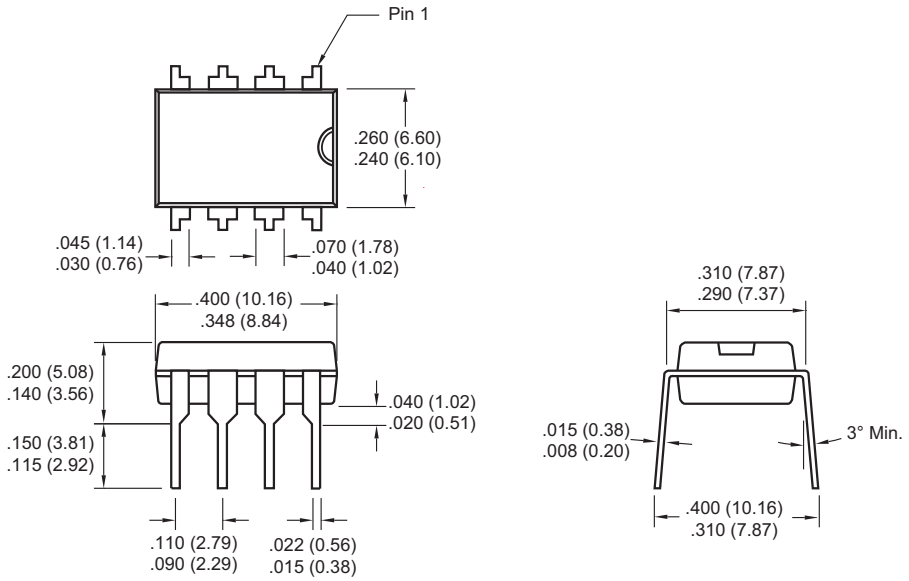
**Carrier Tape, Number of Components Per Reel and Reel Size**

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

## 5.3 Package Dimensions

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

### 8-Pin Plastic DIP

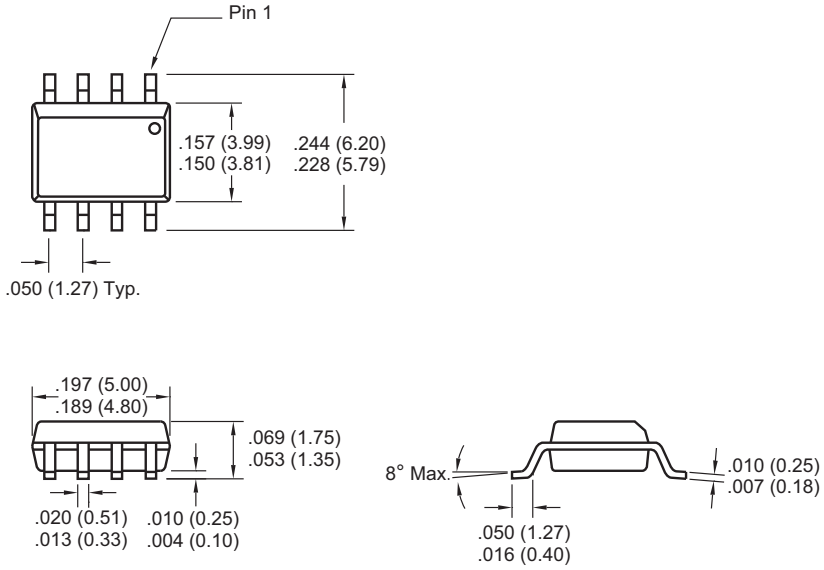



**Dimensions: inches (mm)**

## 5.4 Package Dimensions (Continued)

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

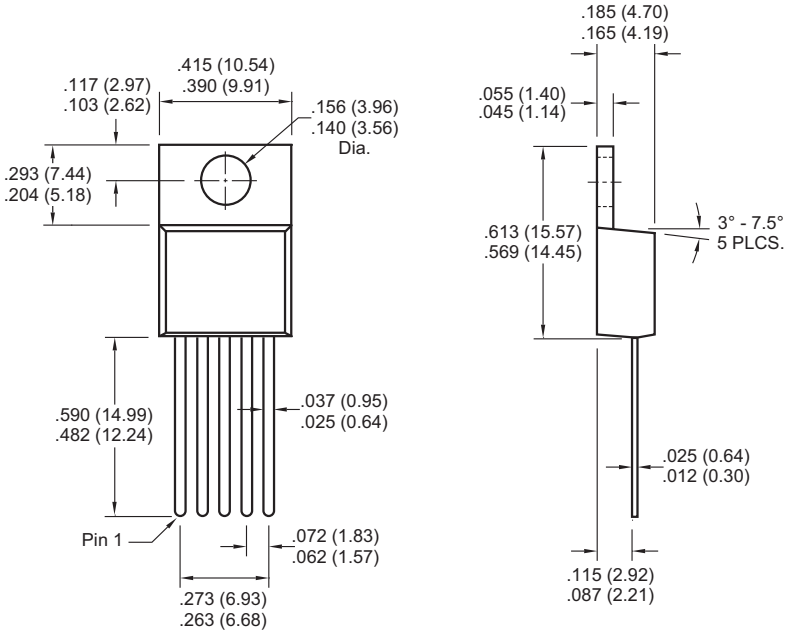
### 8-Pin SOIC




**Dimensions: inches (mm)**

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

### 5-Pin TO-220




**Dimensions: inches (mm)**

## 6.0 REVISION HISTORY

### Revision D (December 2012)

Added a note to each package outline drawing.

**NOTES:**

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