

## High Precision Temperature-to-Voltage Converter

### Features

- Supply Voltage Range: 2.7V to 4.4V
- Wide Temperature Measurement Range: -40°C to +125°C
- High Temperature Converter Accuracy:  $\pm 2^\circ\text{C}$ , Max, at 25°C
- Linear Temperature Slope: 6.25mV/°C
- Very Low Supply Current: 35 $\mu\text{A}$  Typical
- Small 3-Pin SOT-23B Package

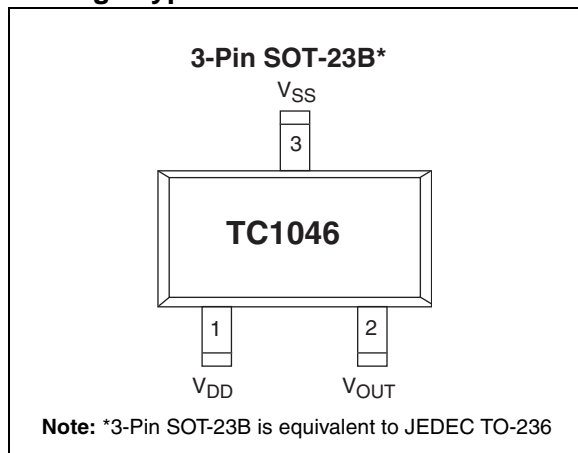
### Applications

- Cellular Phones
- Power Supply Thermal Shutdown
- Temperature Controlled Fans
- Temperature Measurement/Instrumentation
- Temperature Regulators
- Consumer Electronics
- Portable Battery Powered Equipment

### Device Selection Table

Part Number	Package	Temp. Range
TC1046VNB	3-Pin SOT-23B	-40°C to +125°C

### Package Type



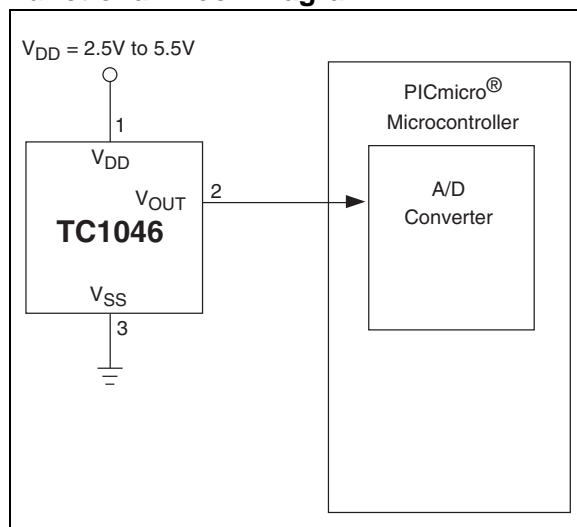
### General Description

The TC1046 is a linear output temperature sensor whose output voltage is directly proportional to measured temperature. The TC1046 can accurately measure temperature from -40°C to +125°C.

The output voltage range for these devices is typically 174mV at -40°C, 424mV at 0°C, 580 mV at +25°C, and 1205mV at +125°C. A 6.25mV/°C voltage slope allows for the wide temperature range.

The TC1046 is packaged in a 3-Pin SOT-23B package, making them ideal for space critical applications.

### Functional Block Diagram



# TC1046

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings\*

Supply Voltage .....+7V  
 Voltage on Any Pin with Respect to Supplies:  
 ..... $V_{SS} - 0.3$  to  $V_{DD} + 0.3V$   
 Operating Temperature .....-40°C to +125°C  
 Storage Temperature Range .....-55°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.

### TC1046 ELECTRICAL SPECIFICATIONS

**Electrical Characteristics:** These specifications apply for the entire supply voltage range and for  $T_A = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ , unless otherwise specified.

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
$V_{DD}$	Supply Voltage	2.7	—	4.4	V	
$I_Q$	Supply Current, Operating	—	35	60	$\mu\text{A}$	
$A_V$	Average Slope of Output Voltage	—	6.25	—	$\text{mV}/^\circ\text{C}$	
$TMP_{ACY}$	Temperature Accuracy at 25°C	-2	$\pm 0.5$	+2	$^\circ\text{C}$	$T_A = 25^\circ\text{C}$
		-3	$\pm 0.5$	+3	$^\circ\text{C}$	$T_A = +125^\circ\text{C}$
		—	1.0	—	$^\circ\text{C}$	$T_A = -40^\circ\text{C}$
$V_{OUT}$	Output Voltage	—	174	193	mV	$T_A = -40^\circ\text{C}$
		568	580	592	mV	$T_A = 25^\circ\text{C}$
		1187	1205	1224	mV	$T_A = +125^\circ\text{C}$
$I_{OUT}$	Output Source and Sink Current	100	—	—	$\mu\text{A}$	

## 2.0 PIN DESCRIPTIONS

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

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

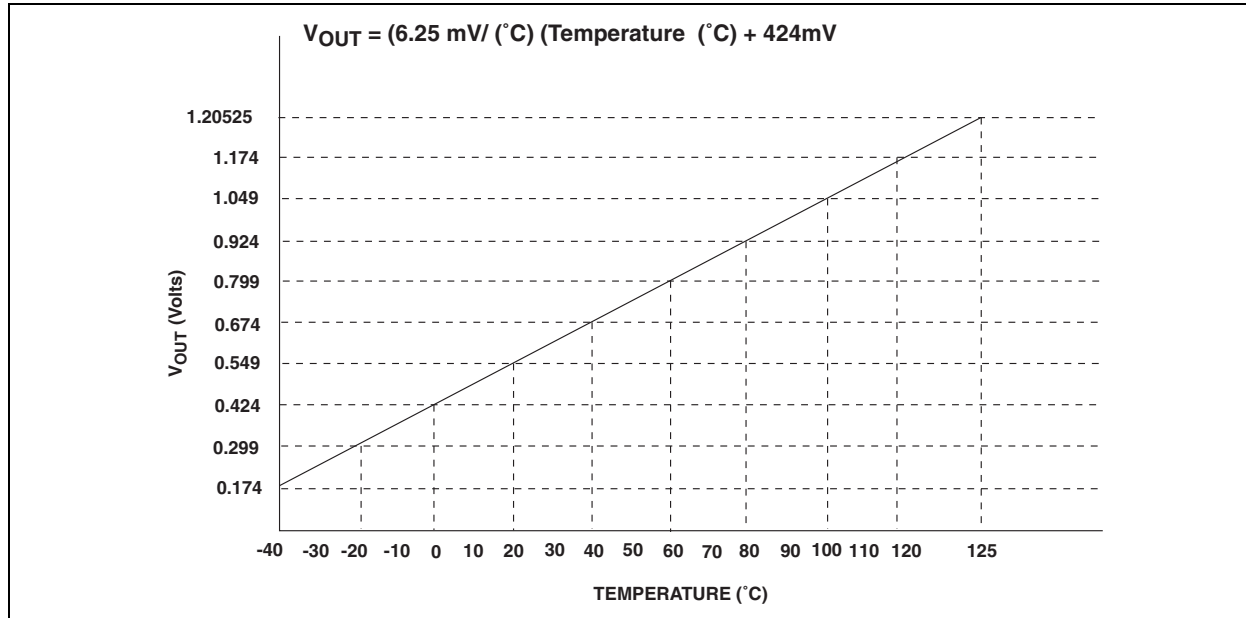
Pin Number (3-Pin SOT-23B)	Symbol	Description
1	$V_{DD}$	Input Supply Voltage
2	$V_{OUT}$	Temperature Sensor Output
3	$V_{SS}$	Ground

# TC1046

## 3.0 DETAILED DESCRIPTION

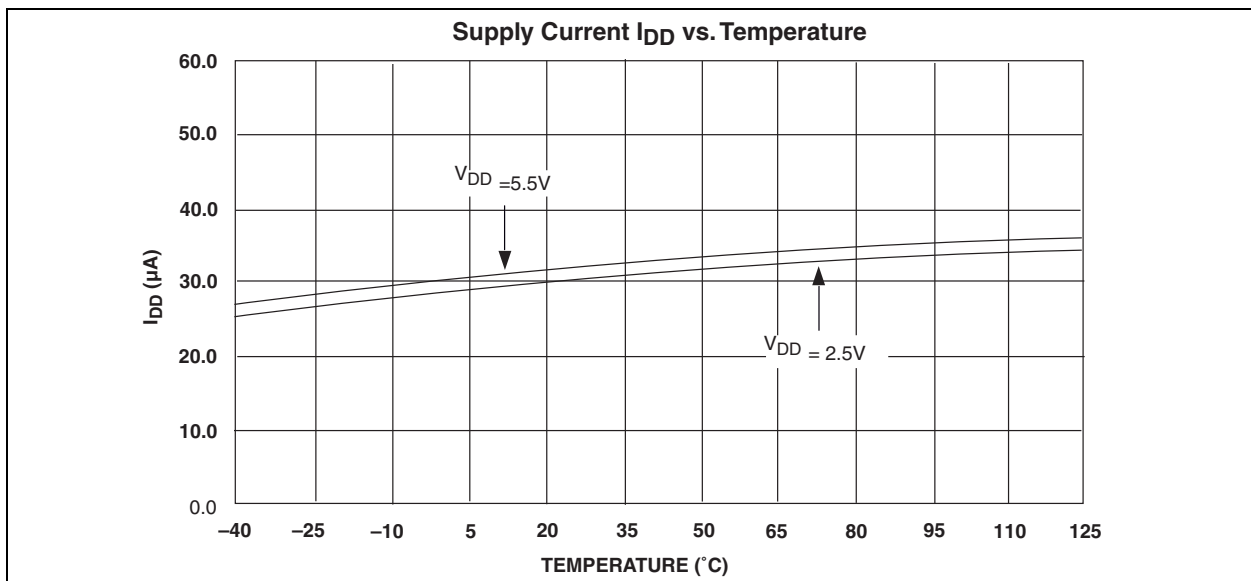
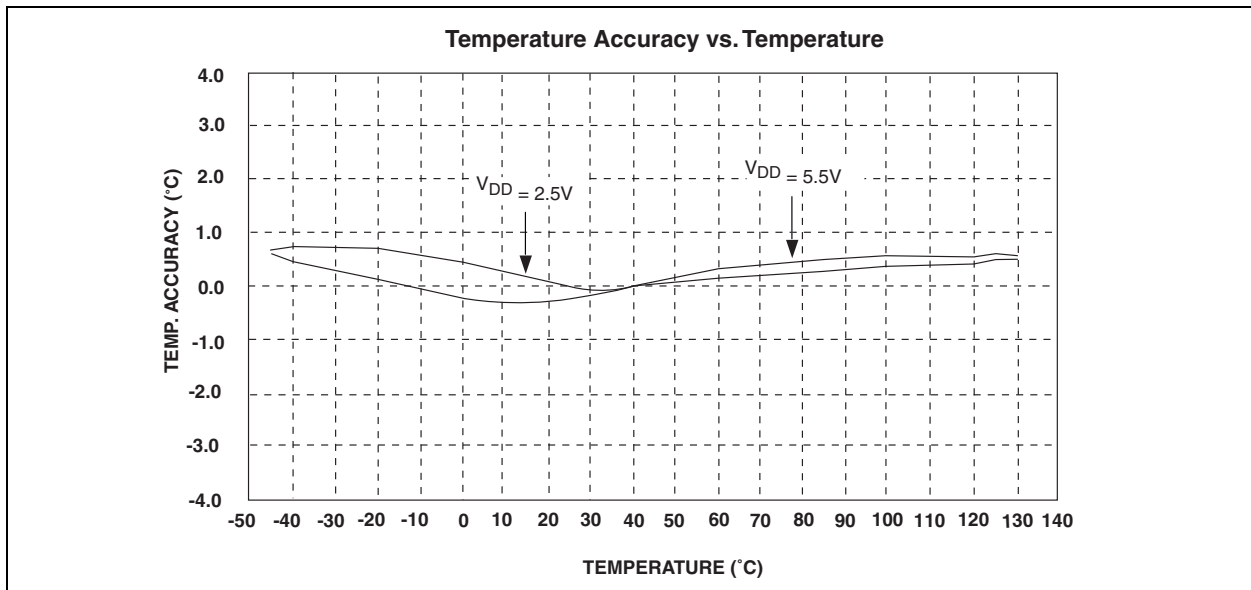
The TC1046 has an output voltage that varies linearly with temperature in degrees Celsius. See Figure 3-1, "Output Voltage versus Temperature" for the TC1046. The temperature slope is fixed at 6.25mV/°C and the output voltage at 0°C is 424mV.

**FIGURE 3-1: OUTPUT VOLTAGE VS. TEMPERATURE**



## 4.0 TYPICAL CHARACTERISTICS

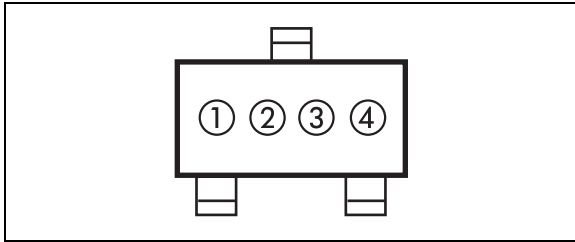
**Note:** The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.



# TC1046

## 5.0 PACKAGING INFORMATION

### 5.1 Package Marking Information



1 & 2 = part number code + temperature range and voltage (two letter code)

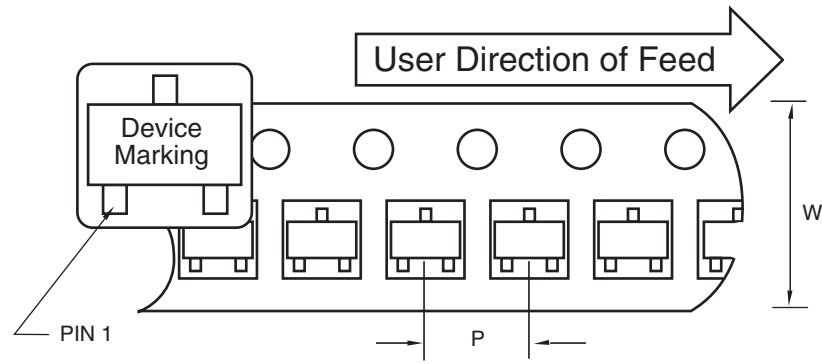
Ex: 1046VNB = AK

3 = Year and two-month period code

4 = Lot ID number

### 5.2 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)

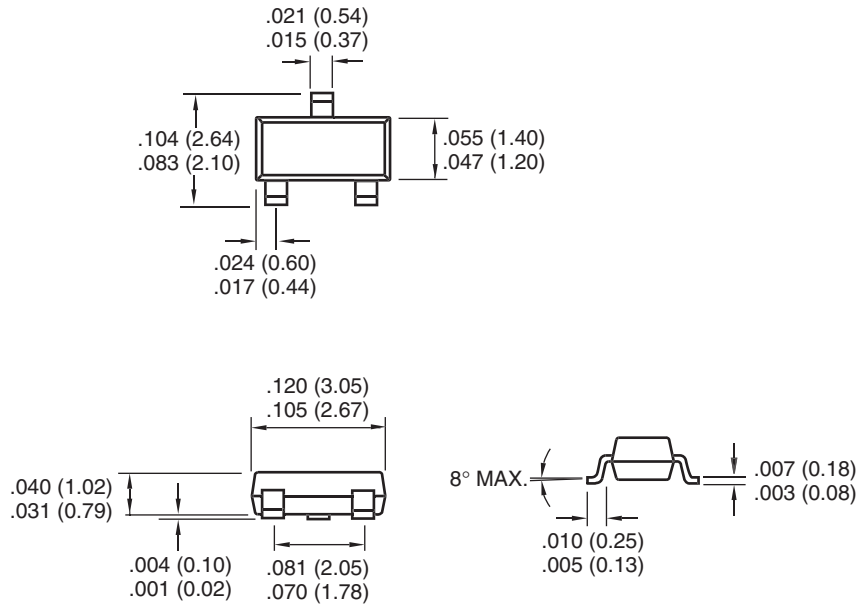
#### Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
3-Pin SOT-23B	8 mm	4 mm	3000	7 in

## 5.3 Package Dimensions

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

### 3-Pin SOT-23B



Dimensions: inches (mm)

## 6.0 REVISION HISTORY

### Revision C (December 2012)

Added a note to each package outline drawing.



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# TC1046

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NOTES:

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