

# High Precision Temperature-to-Voltage Converter

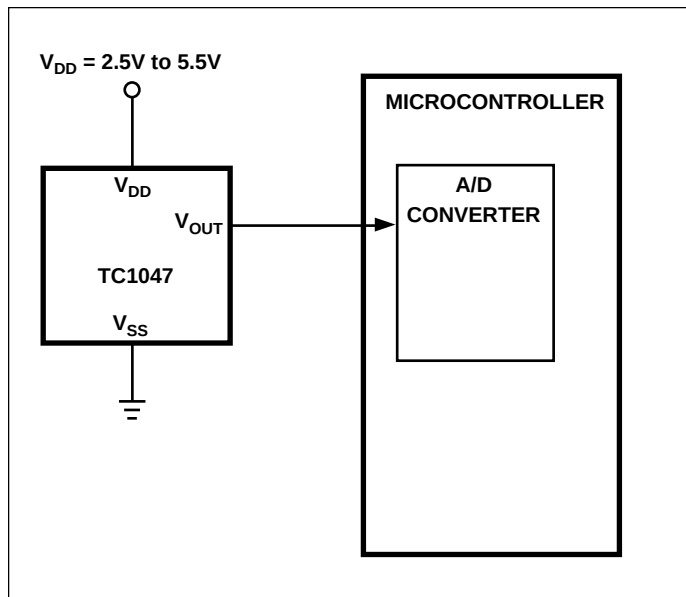
## FEATURES

- Supply Voltage Range ..... 2.7V to 4.4V  
..... 2.5V to 5.5V\*
- 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 ..... 10mV/°C
- Small 3-Pin SOT-23B Package
- Very Low Supply Current ..... 35 $\mu\text{A}$  Typical

## TYPICAL APPLICATIONS

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

## FUNCTIONAL BLOCK DIAGRAM



## GENERAL DESCRIPTION

The TC1047 is a linear output temperature sensor whose output voltage is directly proportional to measured temperature. The TC1047 can accurately measure temperature from -40°C to +125°C.

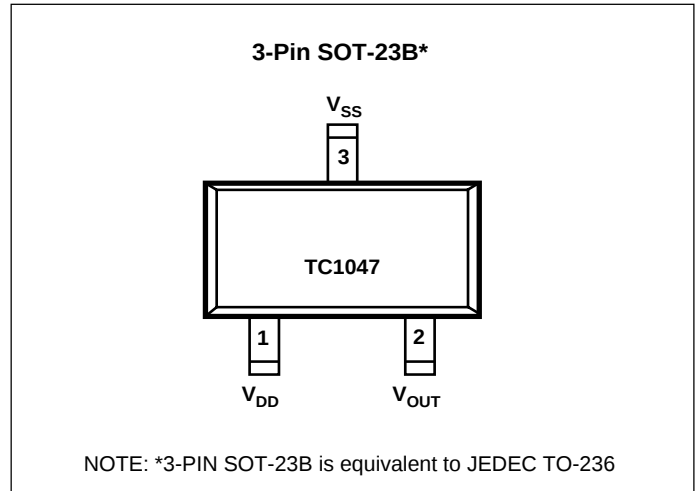
For the TC1047, the output voltage range is typically 100mV at -40°C, 500mV at 0°C, 750mV at +25°C, and 1.75V at +125°C. A 10mV/°C voltage slope allows for the wide temperature range. The TC1047 is packaged in space saving 3-Pin SOT-23B packages, making them ideal for space critical applications.

## ORDERING INFORMATION

| Part No.  | Package       | Temp. Range (Sensor) |
|-----------|---------------|----------------------|
| TC1047VNB | 3-Pin SOT-23B | -40°C to +125°C      |

\* Please contact Microchip Technology Inc. for devices with 2.5V to 5.5V supply voltage range.

## PIN CONFIGURATION



## TC1047

### 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                   |
| Lead Temperature (Soldering, 10 sec) .....        | +260°C                            |

\*Static-sensitive device. Unused devices must be stored in conductive material. Protect devices from static discharge and static fields. 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 operational sections of the specifications is not implied. Exposure to Absolute Maximum Rating Conditions for extended periods may affect device reliability.

**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                       | Test Conditions            | Min  | Typ       | Max  | Units                      |
|---------------------------|---------------------------------|----------------------------|------|-----------|------|----------------------------|
| $V_{DD}$                  | Supply Voltage                  | Note 1                     | 2.7  | —         | 4.4  | V                          |
|                           |                                 |                            | 2.5  | —         | 5.5  |                            |
| $I_Q$                     | Supply Current, Operating       |                            | —    | 35        | 60   | $\mu\text{A}$              |
| $A_V$                     | Average Slope of Output Voltage |                            | —    | 10        | —    | $\text{mV}/^\circ\text{C}$ |
| $\text{TMP}_{\text{ACY}}$ | Temperature Accuracy            | $T_A = 25^\circ\text{C}$   | -2   | $\pm 0.5$ | +2   | $^\circ\text{C}$           |
|                           |                                 | $T_A = +125^\circ\text{C}$ | -3   | $\pm 0.5$ | +3   | $^\circ\text{C}$           |
|                           |                                 | $T_A = -40^\circ\text{C}$  | —    | 1.5       | —    | $^\circ\text{C}$           |
| $V_{\text{OUT}}$          | Output Voltage                  | $T_A = -40^\circ\text{C}$  | —    | 100       | —    | mV                         |
|                           |                                 | $T_A = 25^\circ\text{C}$   | 730  | 750       | 770  | mV                         |
|                           |                                 | $T_A = +125^\circ\text{C}$ | 1720 | 1750      | 1780 | mV                         |
| $I_{\text{OUT}}$          | Output Source and Sink Current  |                            | 100  | —         | —    | $\mu\text{A}$              |

**NOTES:** 1. Contact Microchip Technology Inc. for devices with a 2.5V to 5.5V supply voltage range.

### DETAILED DESCRIPTION

The TC1047 has an output voltage that varies linearly with temperature in degrees Celsius. Figure 1 shows a plot

of the output voltage versus temperature for the TC1047. The temperature slope is fixed at  $10 \text{ mV}/^\circ\text{C}$ , and the output voltage at  $0^\circ\text{C}$  is 500 mV.

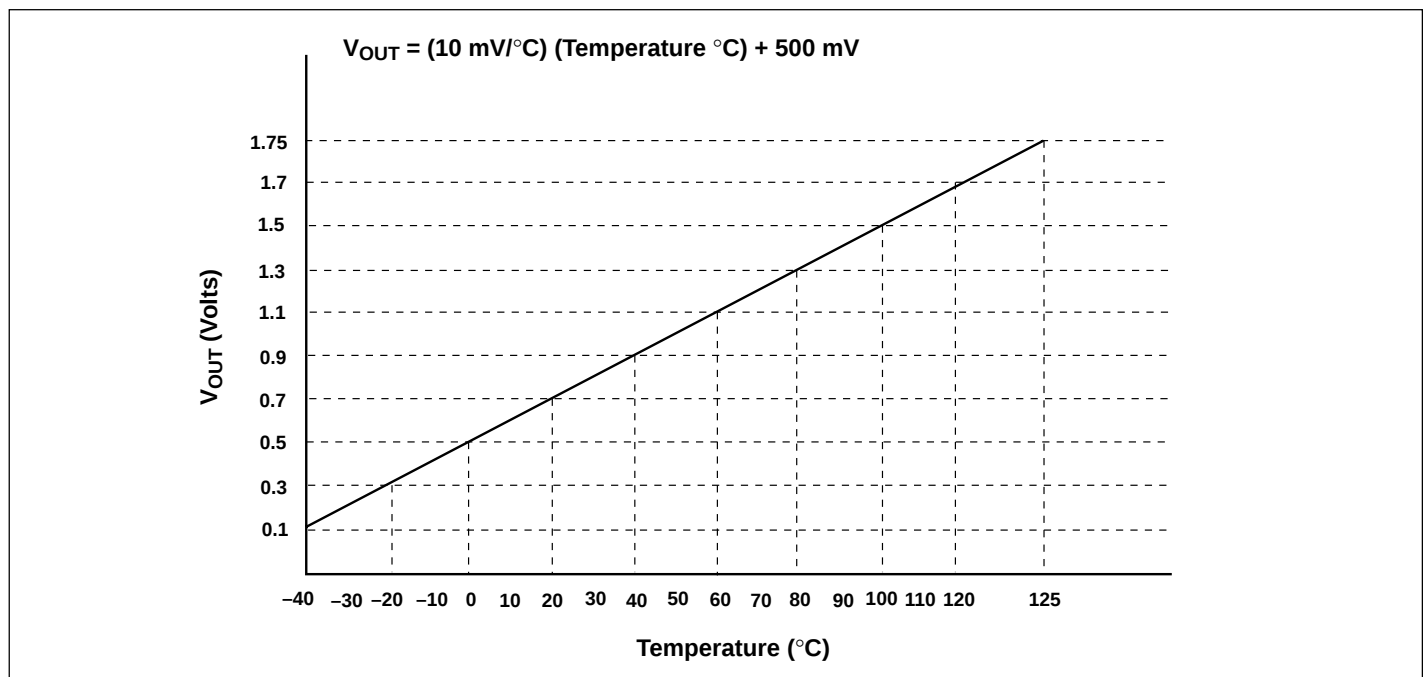
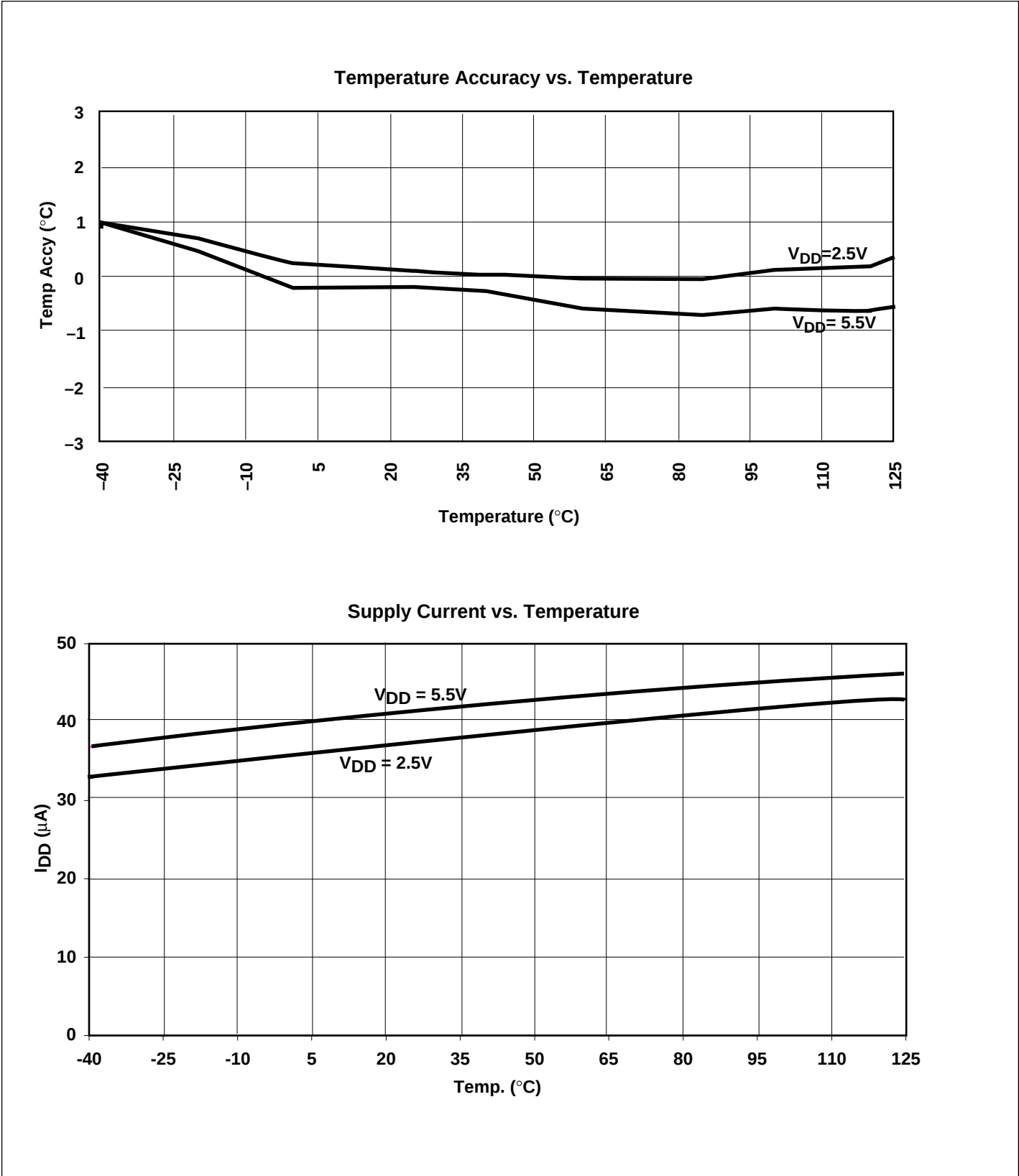


Figure 1. Output Voltage vs. Temperature for TC1047

TYPICAL CHARACTERISTIC CURVES

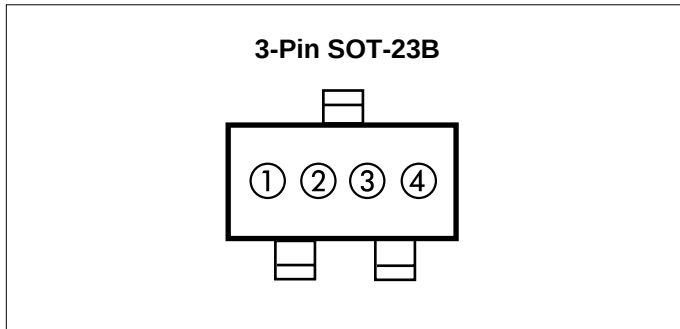


## TC1047

### PIN DESCRIPTION

| Pin Number | Name      | Description                        |
|------------|-----------|------------------------------------|
| 1          | $V_{DD}$  | Input Supply Voltage               |
| 2          | $V_{OUT}$ | Temperature Sensor Output Terminal |
| 3          | $V_{SS}$  | Ground Terminal                    |

### MARKINGS



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

| Part Number | Code |
|-------------|------|
| TC1047VNB   | AL   |

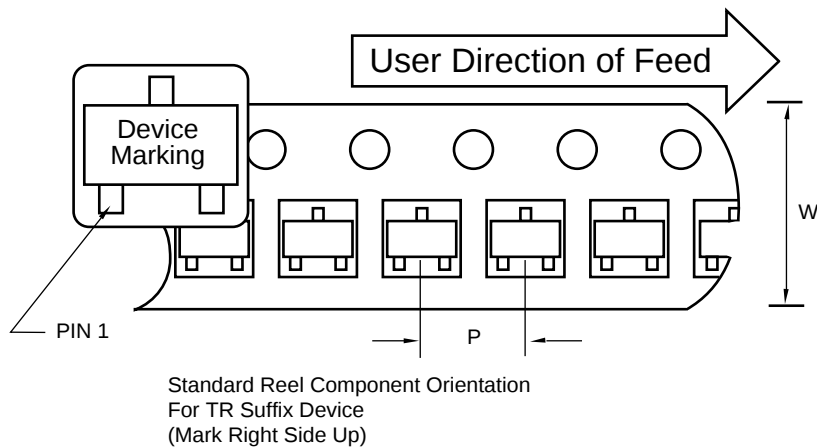
ex: 1047VNB= (A)(L)○○

③ represents year and 2-month period code

④ represents lot ID number

### TAPING FORM

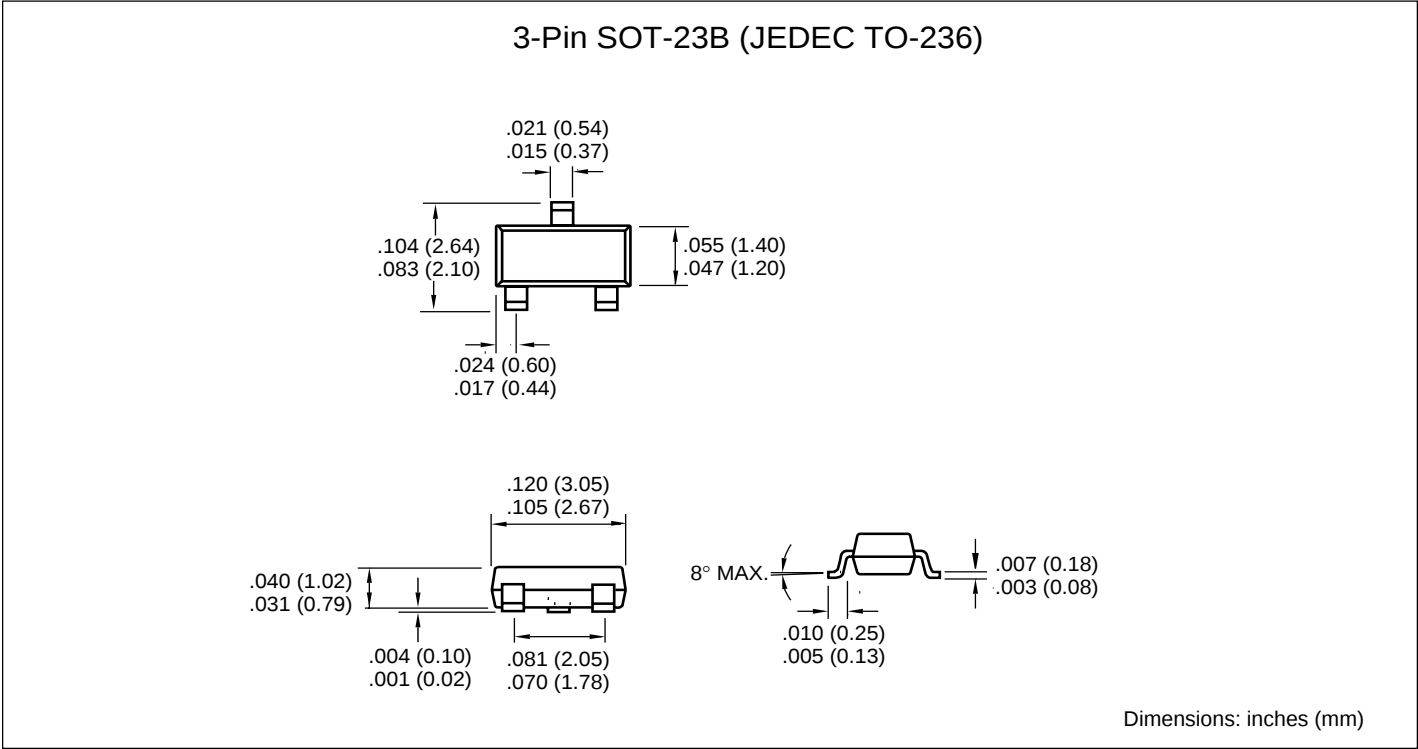
#### Component Taping Orientation for 3-Pin SOT-23B (JEDEC TO-236) Devices



#### 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      |

PACKAGE DIMENSIONS





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