TC1047/TC1047A

Precision Temperature-to-Voltage Converter

Features

- Supply Voltage Range:
  - TC1047: 2.7V to 4.4V
  - TC1047A: 2.5V to 5.5V
- Wide Temperature Measurement Range: –40°C to +125°C
- High Temperature Converter Accuracy: ± 2°C, Max, at 25°C
- Linear Temperature Slope 10 mV/°C (typ.)
- Available in 3-Pin SOT-23B Package
- Very Low Supply Current:
  - 35 µA Typical

Typical Applications

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

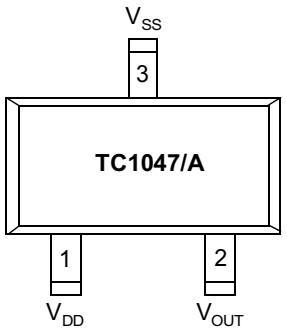
General Description

The TC1047 and TC1047A are linear voltage output temperature sensors whose output voltage is directly proportional to the measured temperature. The TC1047 and TC1047A can accurately measure temperature from –40°C to +125°C. With the TC1047, the supply voltage can vary between 2.7V and 4.4V. The power supply range of the TC1047A is from 2.5V to 5.5V.

The output voltage range for these devices is typically 100mV at –40°C, 500 mV at 0°C, 750 mV at +25°C, and 1.75V at +125°C. A 10 mV/°C voltage slope output response allows for a predictable temperature measurement over a wide temperature range. The TC1047 and TC1047A are packaged in 3-pin SOT-23B packages, making them ideal for space critical applications.

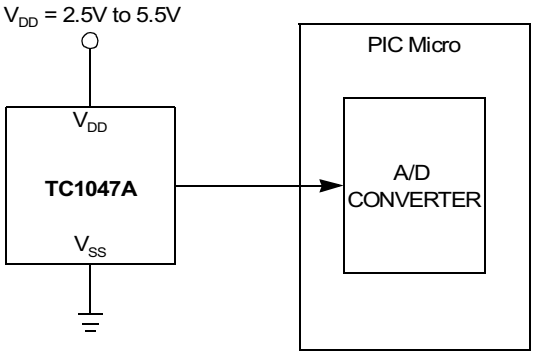
Package Type

3-Pin SOT-23B*



Note: * 3-Pin SOT-23B is equivalent to JEDEC TO-236

Block Diagram



Device Selection Table

Part No.	Package	Temp. Range
TC1047VNB	3-Pin SOT-23B	–40°C to +125°C
TC1047AVNB	3-Pin SOT-23B	–40°C to +125°C

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

***Notice:** 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.

PIN FUNCTION TABLE

Name	Function
V_{DD}	Input Supply Voltage
V_{OUT}	Temperature Sensor Output Terminal
V_{SS}	Ground Terminal

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, these specifications apply for the entire supply voltage range and for T_A = –40°C to +125°C

Parameter	Sym	Min	Typ	Max	Units	Test Conditions
Supply Voltage	V_{DD}	2.7 2.5	— —	4.4 5.5	V	TC1047 TC1047A
Supply Current, Operating	I_Q	—	35	60	µA	
Average Slope of Output Voltage	A_V	—	10	—	mV/°C	
Temperature Accuracy	TMP_{ACY}	–2 –3 —	±0.5 ±0.5 1.0	+2 +3 —	°C °C °C	T_A = 25°C T_A = +125°C T_A = –40°C
Output Voltage	V_{OUT}	— 730 1720	100 750 1750	— 770 1780	mV mV mV	T_A = –40°C T_A = 25°C T_A = +125°C
Output Source and Sink Current	I_{OUT}	100	—	—	µA	

2.0 DETAILED DESCRIPTION

The TC1047 and TC1047A have an output voltage that varies linearly with temperature in degrees Celsius. Figure 2-1 shows a plot of the output voltage versus temperature for the TC1047 and TC1047A. The temperature slope is fixed at 10 mV/°C, and the output voltage at 0°C is 500 mV.

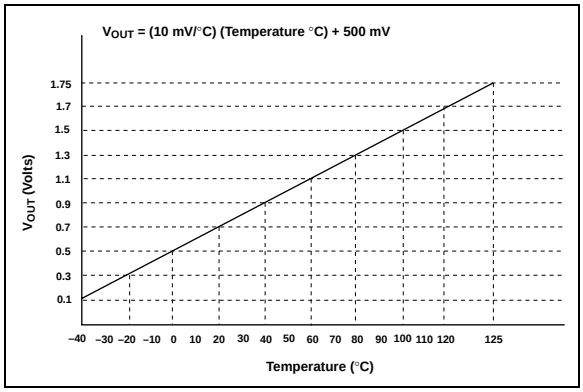


FIGURE 2-1: *Output Voltage vs. Temperature.*

3.0 TYPICAL PERFORMANCE CURVES

Note: The graphs 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, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

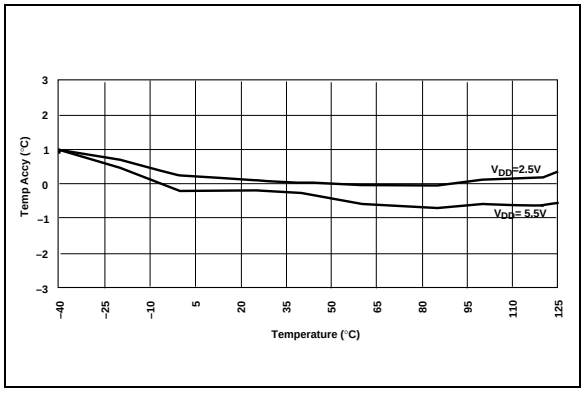


FIGURE 3-1: *Temperature Accuracy vs. Temperature.*

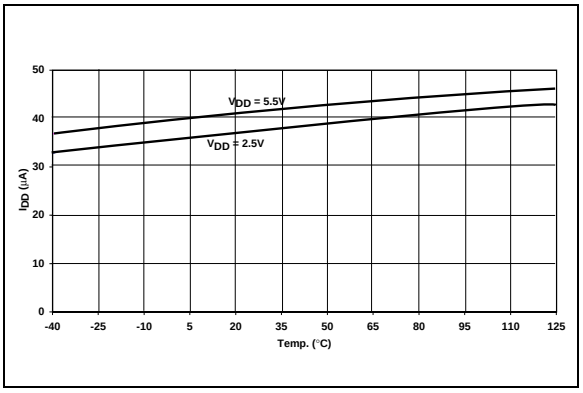
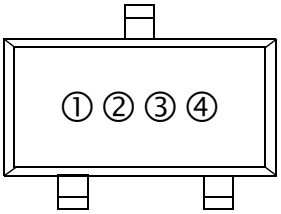


FIGURE 3-2: *Supply Current vs. Temperature.*

4.0 PACKAGE INFORMATION

4.1 Package Marking Information

3-Pin SOT-23B



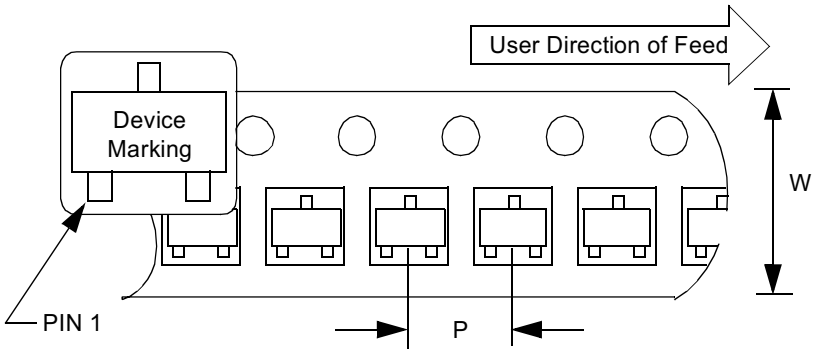
Part Number	SOT-23/SC-70
TCM1047	AL
TCM1047A	BL

Legend:	1	Part Number + temperature range and voltage (two-digit code)
	2	Part Number + temperature range and voltage (two-digit code)
	3	Year and two-month period code
	4	Lot ID number

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line thus limiting the number of available characters for customer specific information.

4.2 Package Dimensions

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

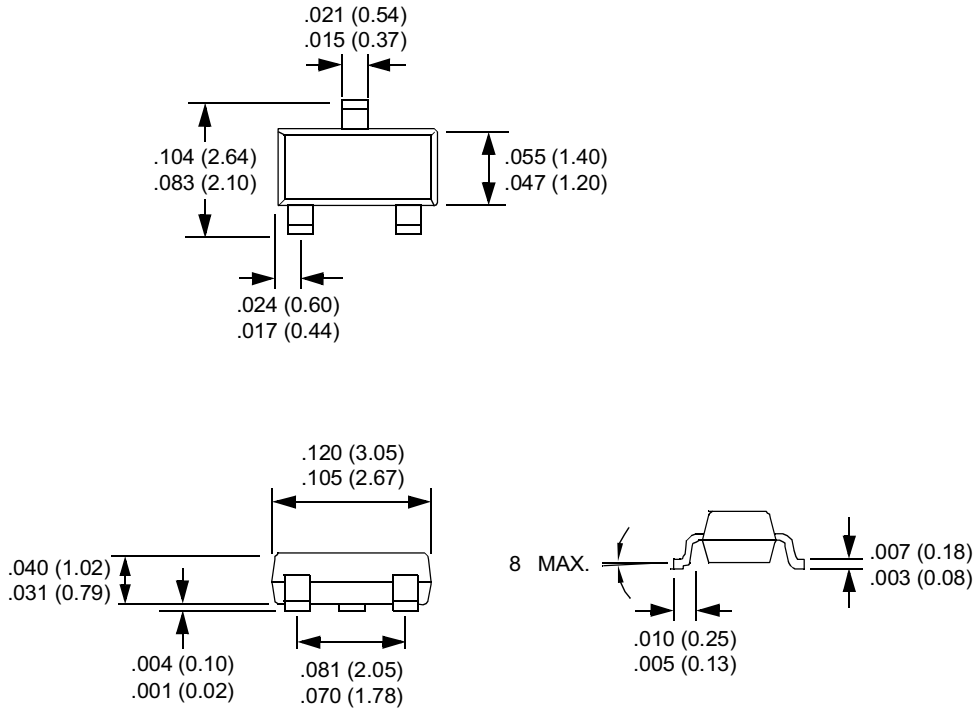


Standard Reel Component Orientation
for TR Suffix Device
(Mark Right Side Up)

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.

3-Pin SOT-23B



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PART NO.	X
Device	Temperature Range

Device:	TC1047:	High Precision Temp-to-Voltage Converter
	TC1047xTR:	High Precision Temp-to-Voltage Converter (Tape and Reel)
Temperature Range:	V =	-40°C to +125°C
Package:	NB =	3-pin SOT-23B

Examples:

a) TC1047VNBTR: High Precision Temp-to-Voltage Converter

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