

## High Precision Temperature- to-Voltage Converter

The NCT47 is linear output temperature sensor whose output voltage is directly proportional to measured temperature. The NCT47 can accurately measure temperature from  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

For the NCT47, the output voltage range is typically 100mV at  $-40^{\circ}\text{C}$ , 500mV at  $0^{\circ}\text{C}$ , 750mV at  $+25^{\circ}\text{C}$ , and 1.75V at  $+125^{\circ}\text{C}$ . A 10mV/ $^{\circ}\text{C}$  voltage slope allows for the wide temperature range. The NCT47 is packaged in space saving 3-Pin SOT-23B packages, making them ideal for space critical applications.

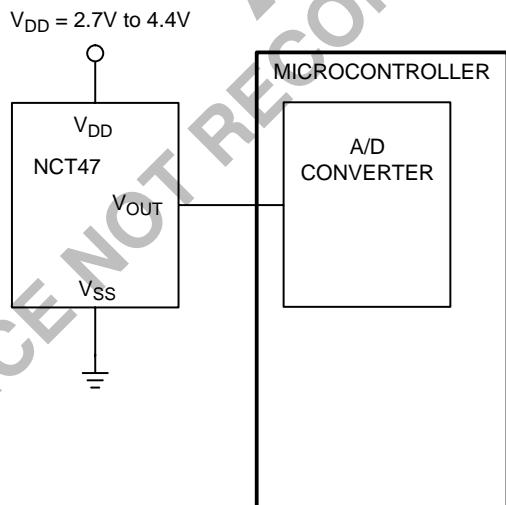
### Features

- Wide Temperature Measurement Range:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- High Temperature Converter Accuracy:  $\pm 2^{\circ}\text{C}$  Max at  $25^{\circ}\text{C}$
- Linear Temperature Slope: 10mV/ $^{\circ}\text{C}$
- 2.7V to 4.4V Operating Range
- 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 Electronic
- Portable Battery Powered Equipment

### FUNCTIONAL BLOCK DIAGRAM



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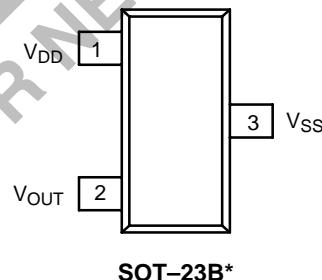
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SOT-23B  
(TO-236)  
CASE TBD

### PIN CONFIGURATION

(Top View)



NOTE: \*SOT-23B is equivalent to JEDEC (TO-236)

### ORDERING INFORMATION

Device	Package	Shipping
NCT47SNT1	SOT-23B	3000 Tape/Reel

## MAXIMUM RATINGS\*

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage	+7.0	V
$V_{SS}$	Voltage on Any Pin with Respect to Supplies	( $V_{SS} - 0.3$ ) to ( $V_{DD} + 0.3$ )	V
$T_A$	Operating Temperature Range	-40 to +125	°C
$T_{stg}$	Storage Temperature Range	-55 to +150	°C
$T_{sol}$	Lead Temperature (Soldering, 10 Seconds)	+260	°C

\* Maximum Ratings are those values beyond which damage to the device may occur.

ELECTRICAL CHARACTERISTICS ( $T_A = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ ,  $V_{DD} = 2.7\text{V}$  to  $4.4\text{V}$ , unless otherwise noted.)

Symbol	Characteristic	Min	Typ	Max	Unit
$V_{DD}$	Supply Voltage	2.7	—	4.4	V
$I_Q$	Supply Current, Operating	—	35	60	$\mu\text{A}$
$A_V$	Average Slope of Output Voltage	—	10	—	$\text{mV}/^\circ\text{C}$
$\text{TMP}_{\text{ACY}25}$	Temperature Accuracy at $25^\circ\text{C}$	$T_A = 25^\circ\text{C}$	-2.0	$\pm 0.5$	$\pm 2.0$
$\text{TMP}_{\text{ACY}125}$	Temperature Accuracy	$T_A = 125^\circ\text{C}$	-3.0	—	$\pm 3.0$
$\text{TMP}_{\text{ACY}-40}$	Temperature Accuracy	$T_A = -40^\circ\text{C}$	—	1.5	—
$V_{\text{OUT}-40}$	Output Voltage at $-40^\circ\text{C}$	—	100	—	mV
$V_{\text{OUT}+25}$	Output Voltage at $25^\circ\text{C}$	730	750	770	mV
$V_{\text{OUT}+125}$	Output Voltage at $125^\circ\text{C}$	1720	1750	1780	mV
$I_{\text{OUT}}$	Output Source and Sink Current	100	—	—	$\mu\text{A}$

## PIN DESCRIPTION

Pin No.	Symbol	Description
1	$V_{DD}$	Input Supply Voltage
2	$V_{\text{OUT}}$	Temperature Sensor Output Terminal
3	$V_{SS}$	Ground Terminal

## DETAILED DESCRIPTION

The NCT47 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 NCT47. The

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

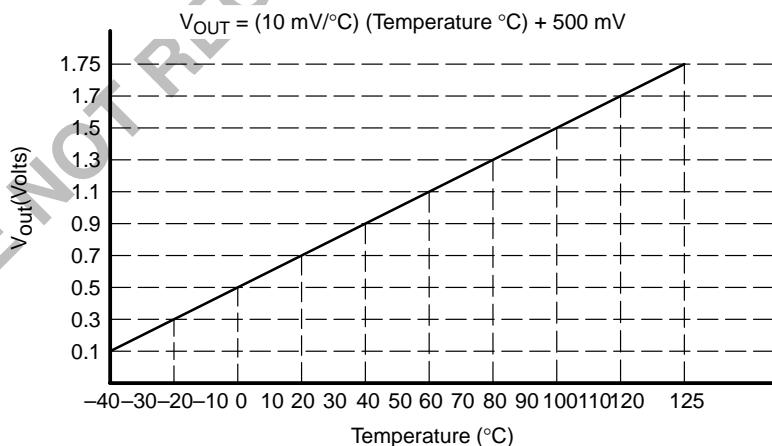


Figure 1. Output Voltage vs. Temperature

## TYPICAL CHARACTERISTICS

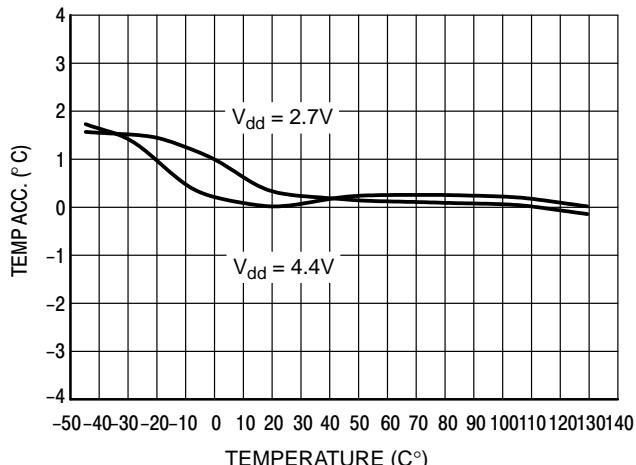


Figure 2. Temperature Accuracy vs Temperature

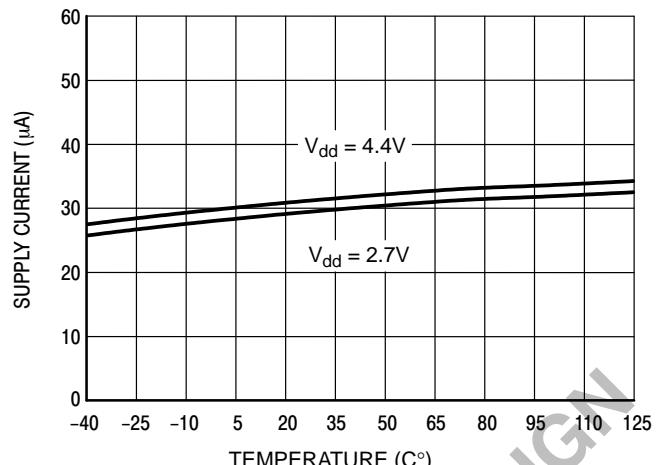
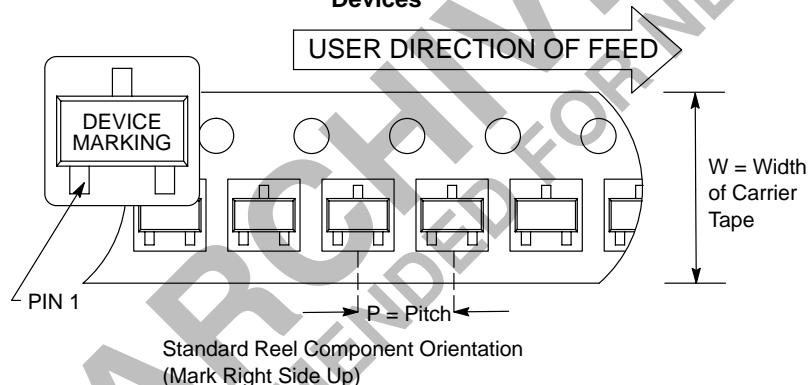


Figure 3. Supply Current vs Temperature

## TAPING FORM

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

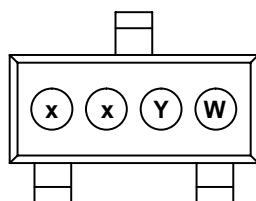


## Tape &amp; Reel Specifications Table

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

## MARKING DIAGRAM

## SOT-23B

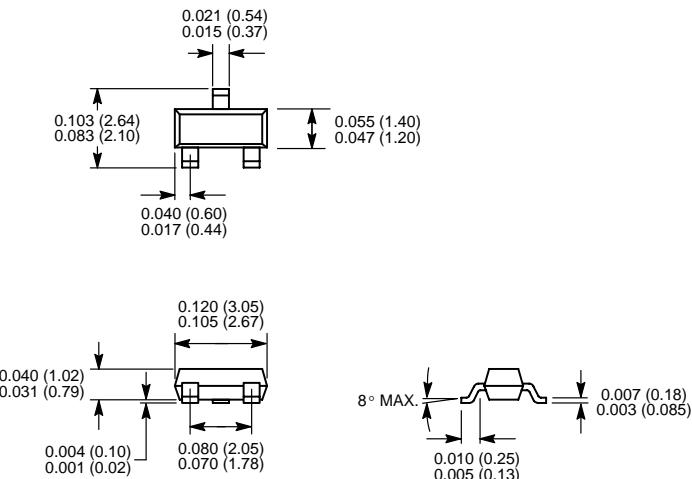


xx = part number code &amp; temperature range

YW = Date Code

## PACKAGE DIMENSIONS

3-Pin SOT-23B (JEDEC TO-236)



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