

# NCT47

## 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.

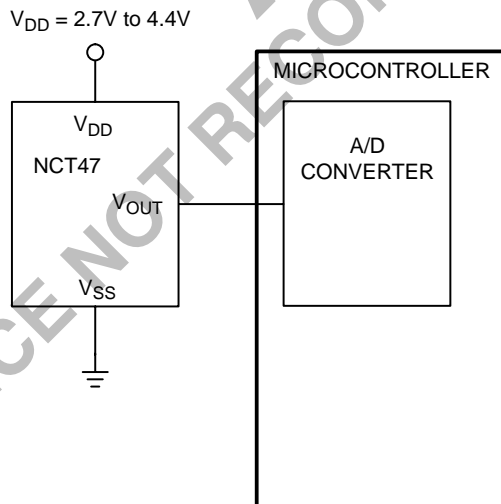
### Features

- 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

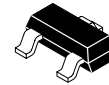
- Cellular Phones
- Power Supply Thermal Shutdown
- Temperature-Controlled Fans
- Temperature Measurement / Instrumentation
- Temperature Regulators
- Consumer Electronic
- Portable Battery Powered Equipment

### FUNCTIONAL BLOCK DIAGRAM



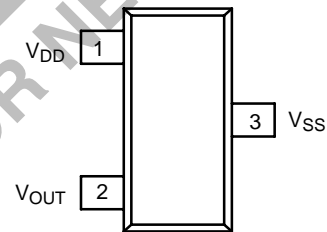
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SOT-23B  
(TO-236)  
CASE TBD

### PIN CONFIGURATION (Top View)



SOT-23B\*

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

### ORDERING INFORMATION

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

# NCT47

## MAXIMUM RATINGS\*

Symbol	Parameter	Value	Unit
V <sub>DD</sub>	Supply Voltage	+7.0	V
V <sub>SS</sub>	Voltage on Any Pin with Respect to Supplies	(V <sub>SS</sub> - 0.3) to (V <sub>DD</sub> + 0.3)	V
T <sub>A</sub>	Operating Temperature Range	-40 to +125	°C
T <sub>stg</sub>	Storage Temperature Range	-55 to +150	°C
T <sub>sol</sub>	Lead Temperature (Soldering, 10 Seconds)	+260	°C

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

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = -40°C to +125°C, V<sub>DD</sub> = 2.7V to 4.4V, unless otherwise noted.)

Symbol	Characteristic	Min	Typ	Max	Unit	
V <sub>DD</sub>	Supply Voltage	2.7	—	4.4	V	
I <sub>Q</sub>	Supply Current, Operating	—	35	60	μA	
A <sub>V</sub>	Average Slope of Output Voltage	—	10	—	mV/°C	
TMP <sub>ACY25</sub>	Temperature Accuracy at 25°C	T <sub>A</sub> = 25°C	-2.0	±0.5	+2.0	°C
TMP <sub>ACY125</sub>	Temperature Accuracy	T <sub>A</sub> = 125°C	-3.0	—	+3.0	°C
TMP <sub>ACY-40</sub>	Temperature Accuracy	T <sub>A</sub> = -40°C	—	1.5	—	°C
V <sub>OUT-40</sub>	Output Voltage at -40°C	—	100	—	mV	
V <sub>OUT+25</sub>	Output Voltage at 25°C	730	750	770	mV	
V <sub>OUT+125</sub>	Output Voltage at 125°C	1720	1750	1780	mV	
I <sub>OUT</sub>	Output Source and Sink Current	100	—	—	μA	

## PIN DESCRIPTION

Pin No.	Symbol	Description
1	V <sub>DD</sub>	Input Supply Voltage
2	V <sub>OUT</sub>	Temperature Sensor Output Terminal
3	V <sub>SS</sub>	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 mV/°C, and the output voltage at 0°C is 500 mV.

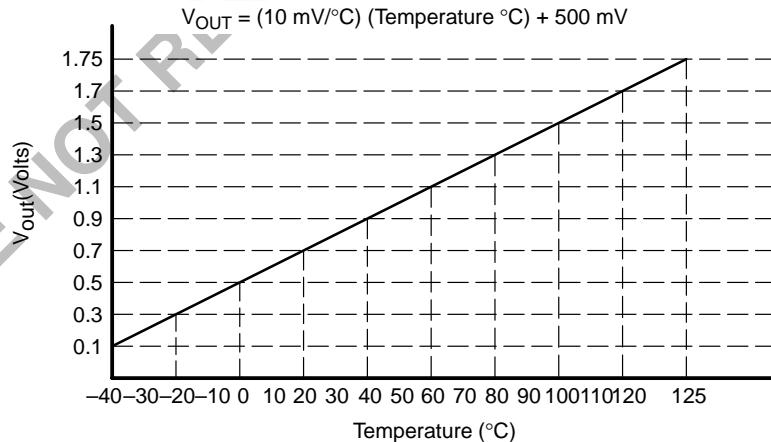


Figure 1. Output Voltage vs. Temperature

# NCT47

## TYPICAL CHARACTERISTICS

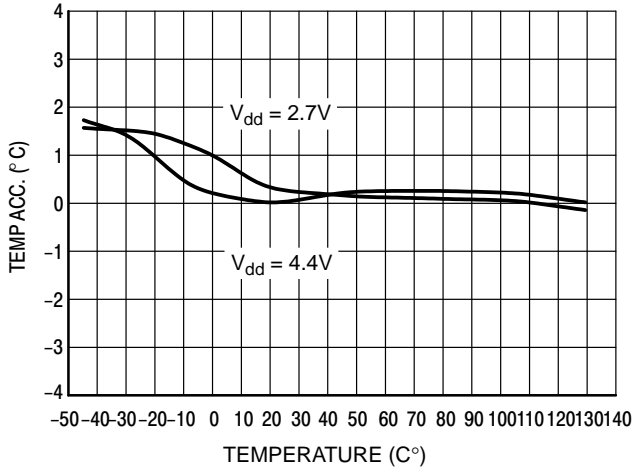


Figure 2. Temperature Accuracy vs Temperature

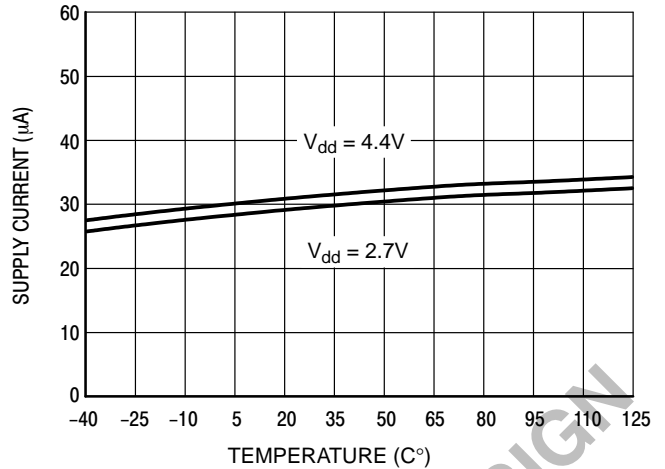
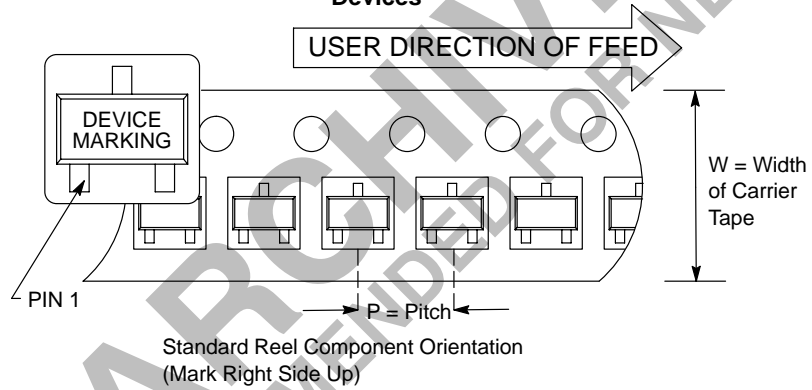


Figure 3. Supply Current vs Temperature

## TAPING FORM

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

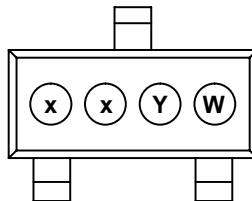


Tape & Reel Specifications Table

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

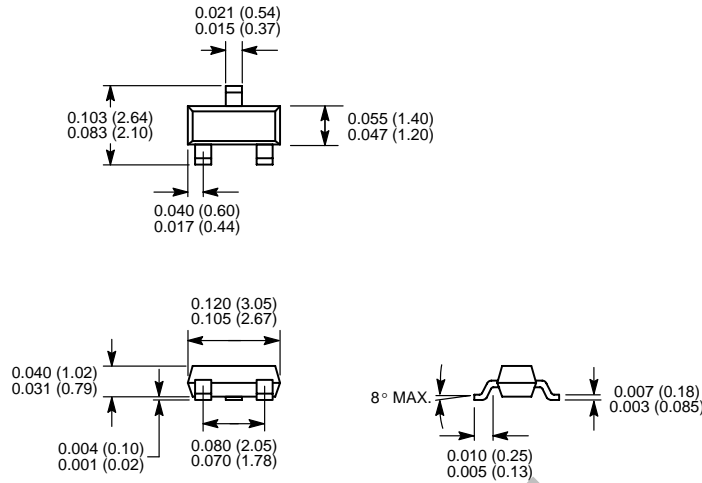



xx = part number code & temperature range  
YW = Date Code

# NCT47

## PACKAGE DIMENSIONS

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



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