

Consumer Grade Temperature-to-Voltage Converters

FEATURES

- Linearized Temperature-to-Voltage Converters
- Direct Centigrade Output Voltage Scaling (TC1133)
- Wide Temperature Measurement Range (TC1132) - 20°C to +125°C
- Excellent Temperature Converter Linearity .. 0.8°C Over Temperature
- High Temperature Converter Accuracy at 25°C Guaranteed ±3°C
- Small Packages TO-92-3 and SOT-23B-3

APPLICATIONS

- Power Supply Thermal Shut-Down
- Temperature-Controlled Fans
- Temperature Measurement/Instrumentation
- Temperature Regulators
- Consumer Electronics

GENERAL DESCRIPTION

The TC1132/33 temperature sensors furnish a linearized output voltage directly proportional to measured temperature. The TC1133 has a temperature measurement range of - 20°C to +100°C. Its output voltage is directly calibrated in degrees Centigrade (i.e. $V_{OUT} = 10mV/°C \times \text{Temperature } °C$). An external pull-down resistor to a negative voltage source is required for temperature measurement below 0°C.

The TC1132 has a temperature measurement range of - 20°C to +125°C, and operates with a single supply. It has the same output voltage slope with temperature as the TC1133 (10mV/°C).

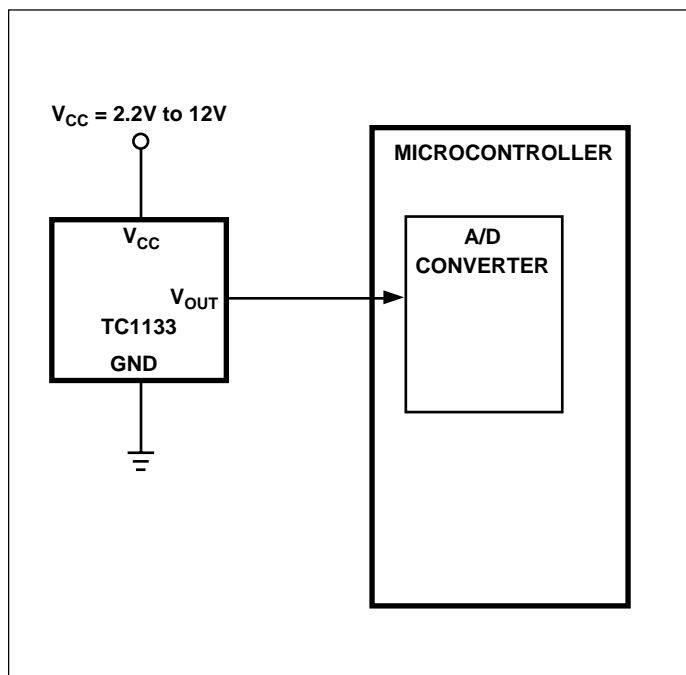
Small size, low cost and low power operation make the TC1132/33 suitable for a wide range of general purpose temperature measurement applications.

ORDERING INFORMATION

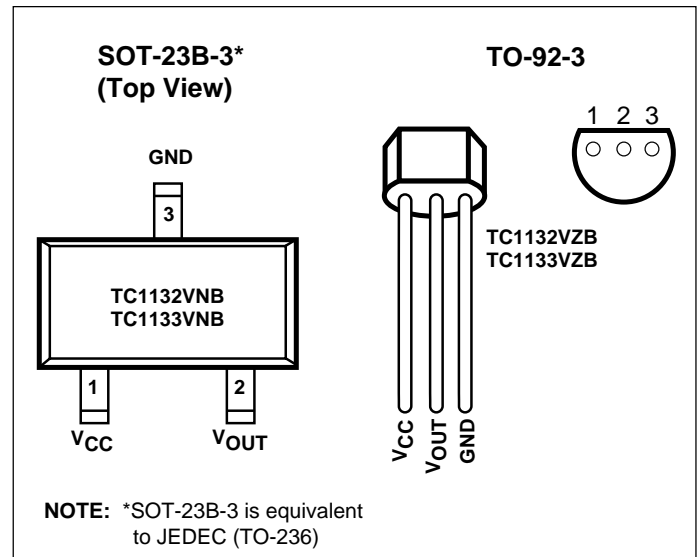
Part No.	Package	Output Voltage At 25°C	Temp. Range
TC1132VNB	SOT-23B-3	750mV	- 20°C to +125°C
*TC1132VZB	TO-92	750mV	- 20°C to +125°C
TC1133VNB	SOT-23B-3	250mV	- 20°C to +100°C
TC1133VZB	TO-92	250mV	- 20°C to +100°C

* Contact factory for availability.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



Consumer Grade Temperature-to-Voltage Converters

TC1132 TC1133

ABSOLUTE MAXIMUM RATINGS *

Supply Voltage	15V
Input Voltage, Any Terminal	- 1.0 to ($V_{CC} + 0.3V$)
Operating Temperature (TC1132)	- 20°C to +125°C
Operating Temperature (TC1133)	- 20°C to +100°C
Storage Temperature	- 65°C to +150°C
Lead Temperature (Soldering, 10 sec)	
SOT-23B-3	+260°C
TO-92-3	+300°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 : $T_A = -20^\circ\text{C}$ to $+125^\circ\text{C}$, $V_{CC} = 5V \pm 5\%$, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage (TC1132)		3.0	—	12	V
V_{CC}	Supply Voltage (TC1133)		2.2	—	12	V
I_S	Supply Current	Note 1	—	40	80	μA
I_{SRC}	V_{OUT} Output Source Current		—	—	1.0	mA
	Accuracy at Room Temperature	$T_A = 25^\circ\text{C}$ (Note 2)	- 3	± 0.5	+3	$^\circ\text{C}$
	Accuracy at Minimum Temperature	$T_A = -20^\circ\text{C}$	—	± 4	—	$^\circ\text{C}$
		(Note 2)				
	Accuracy at Maximum Temperature	TC1132: $T_A = +125^\circ\text{C}$ TC1133: $T_A = +100^\circ\text{C}$ (Note 2)	- 4 - 4	— —	+4 +4	$^\circ\text{C}$
	Nonlinearity	Note 3	- 0.8	—	+0.8	$^\circ\text{C}$
	Line Regulation		—	100	—	$\mu\text{V/V}$
A_V	Average Slope of Output Voltage		—	10	—	$\text{mV}/^\circ\text{C}$
V_{OUTMAX}	Maximum Output Voltage	TC1132: $3.0V \leq V_{CC} \leq 12V$ TC1133: $2.2V \leq V_{CC} \leq 12V$ (Note 1)	—	—	$V_{CC} - 1.2$	V

- Notes:**
1. V_{OUT} outputs open circuited.
 2. Accuracy = Difference between calculated output voltage ($10\text{mV}/^\circ\text{C} \times \text{Device case temperature at specified temperature and power supply}$) and measured output voltage expressed in $^\circ\text{C}$.
 3. Nonlinearity = deviation of output voltage versus temperature from the best-fit straight line over the device rated temperature range.
 4. Guaranteed by design.

DETAILED DESCRIPTION

A plot of output voltage versus temperature for both the TC1132 and TC1133 appears in Figure 1. The TC1133 can be used with single power supply to measure temperatures from 0°C to 100°C . A pull-down resistor (R_1 in Figure 2) must be added from V_{OUT} to the negative power supply for measuring temperatures less than 0°C . The value of the resistor must be chosen to limit the maximum current pulled from the output to the negative supply to $-50\mu\text{A}$ (i.e. $R_1 = V_{SS}/50\mu\text{A}$).

OUTPUT STAGE

Both the TC1132 and TC1133 have Class A output stages capable of sourcing 1mA. These devices have a limited ability to drive heavy capacitive loads. Loads of 50pF (to ground) can be driven directly. For heavier loads, a 2k Ω (or greater) resistor should be placed in series with the output for decoupling. If the TC1132/33 is used in a noisy electrical environment, a 0.1 μF bypass capacitor from V_{CC} to GND is recommended.

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TC1132
TC1133

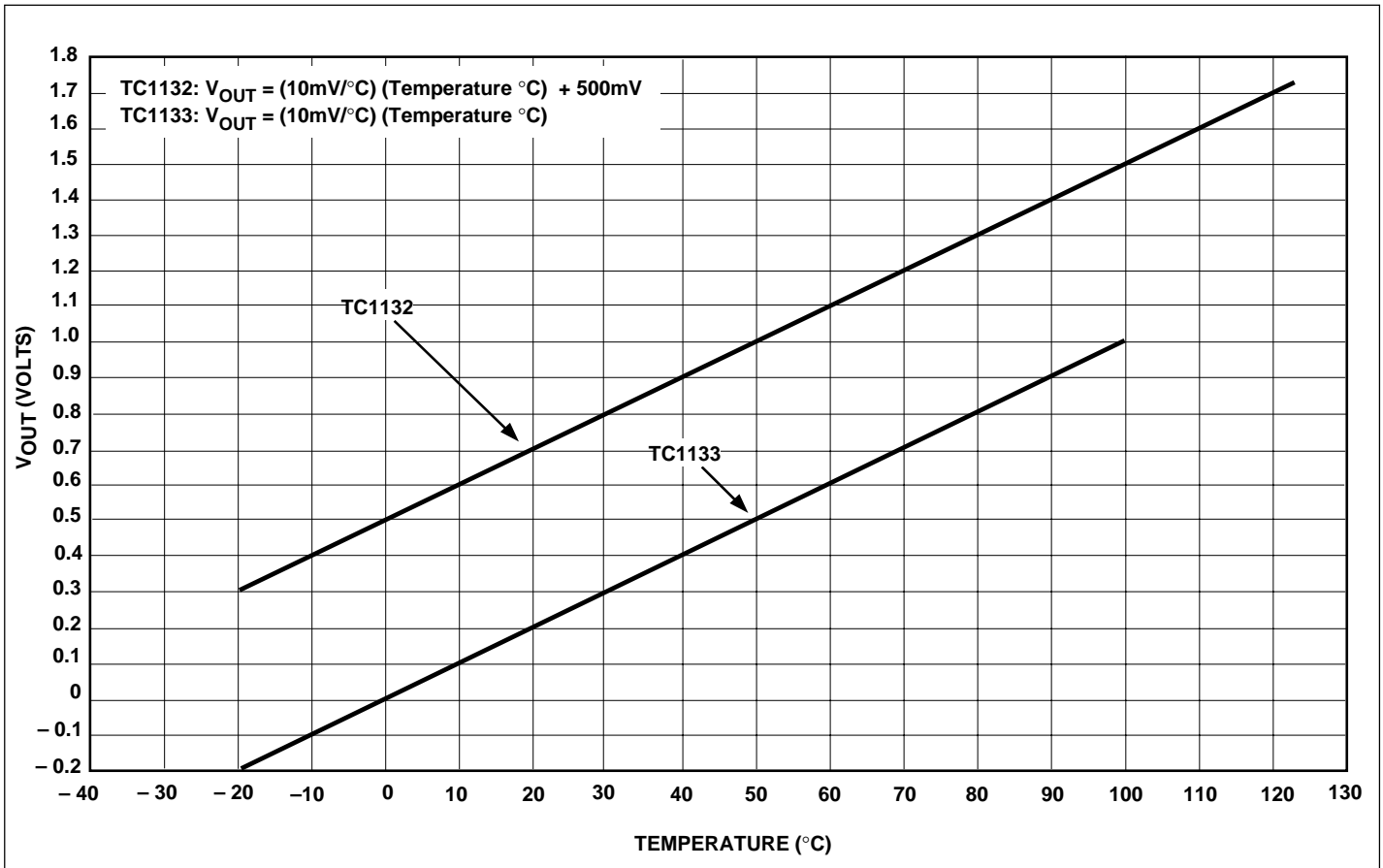


Figure 1. Output Voltage vs. Temperature

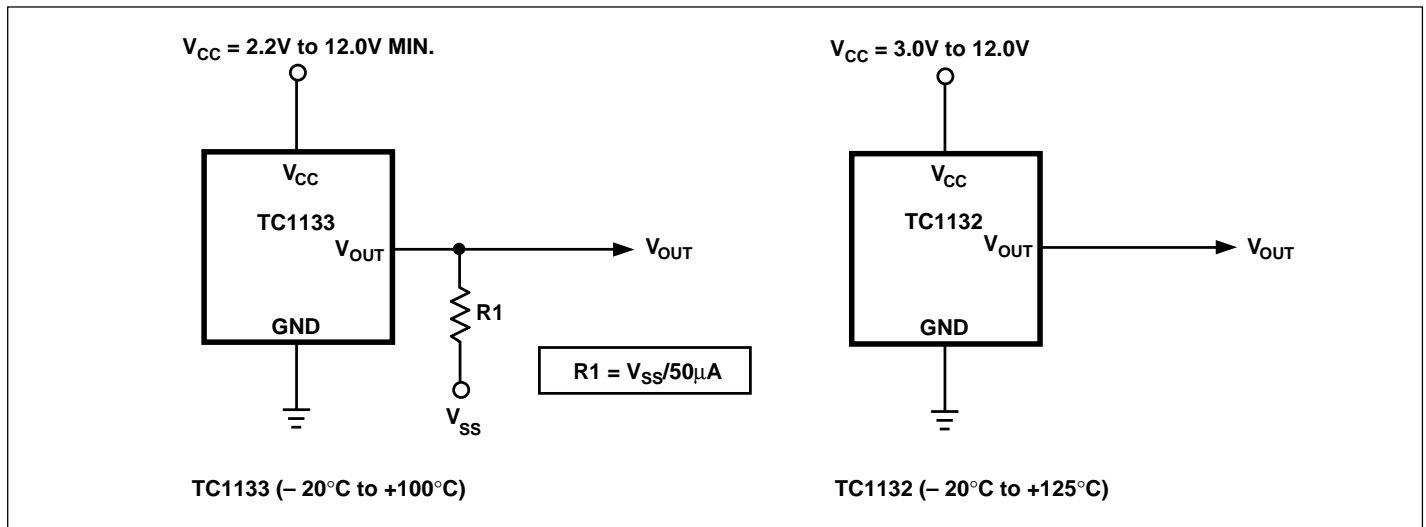
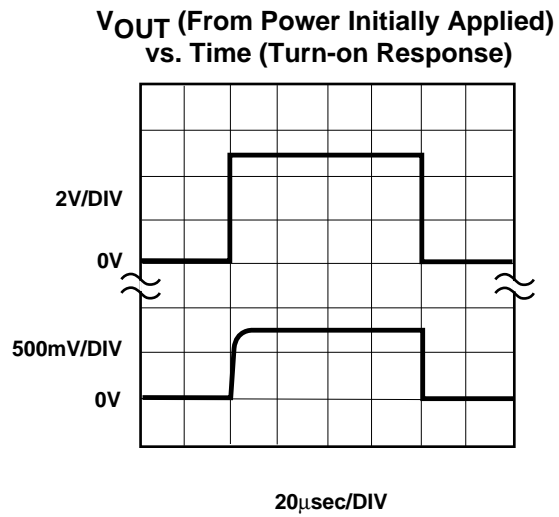
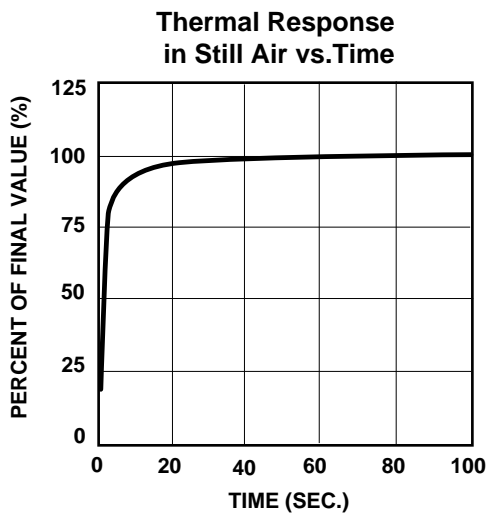
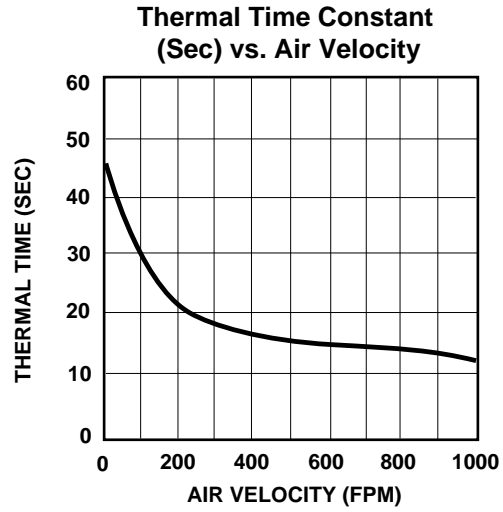
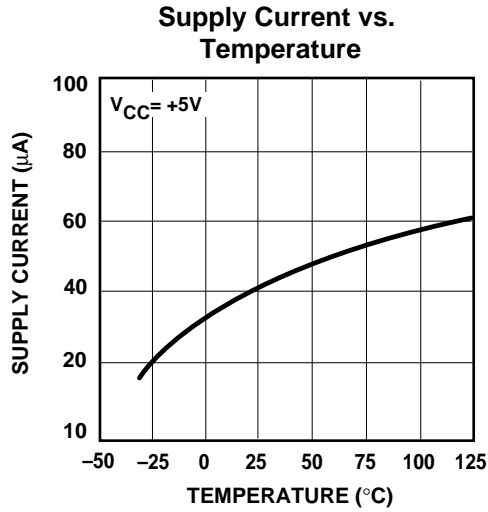


Figure 2. TC1132/33 Power Supply Connections for Full Scale Measurements

TC1132
TC1133

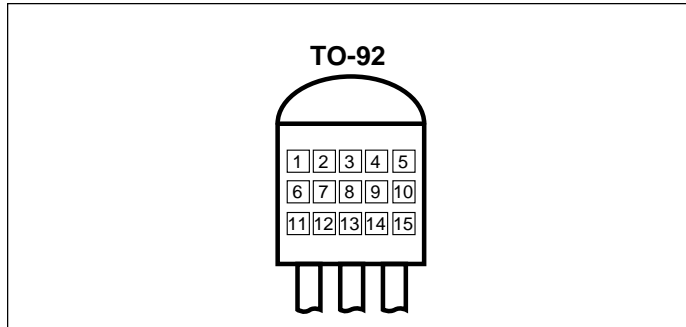
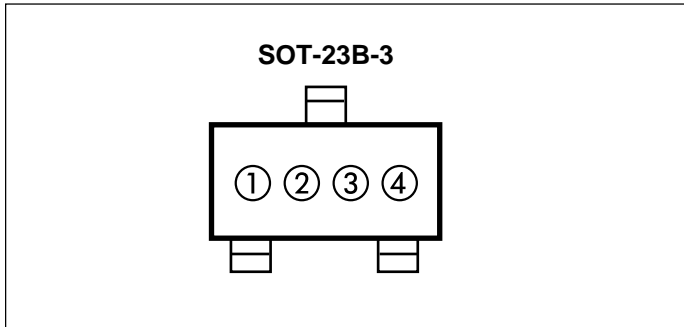
TYPICAL CHARACTERISTICS



Consumer Grade Temperature-to-Voltage Converters

TC1132
TC1133

MARKING



① & ② = part number code and temperature range
 TC1132 = AC - 20°C to 125°C
 TC1133 = AD - 20°C to 100°C

ex: 1132 = (A)(C)○○○
 ex: 1133 = (A)(D)○○○

③ = year and quarter

④ = lot ID

① & ② = TC (fixed)

③, ④ & ⑤ = blank

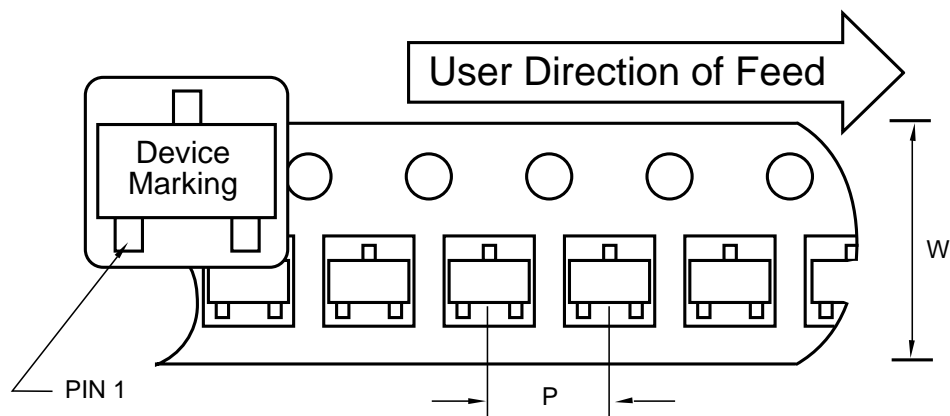
⑥, ⑦, ⑧ & ⑨ = part number

⑩ = temperature range
 C = - 20°C to +125°C
 D = - 20°C to +100°C

⑪, ⑫, ⑬, ⑭ & ⑮ = traceability code

TAPING FORMS

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



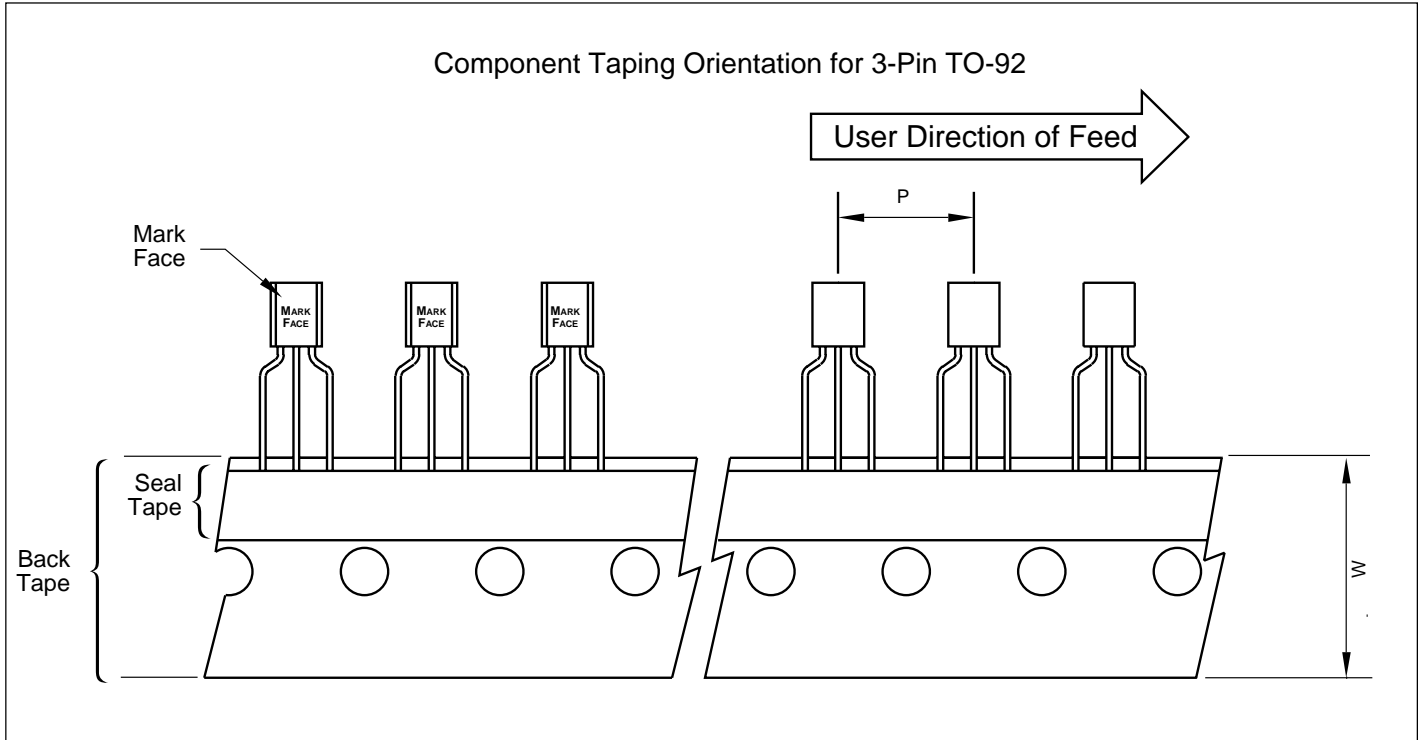
Standard Reel Component Orientation
 For TR Suffix Device
 (Mark Right Side Up)

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

TC1132
TC1133

TAPING FORMS (Cont.)

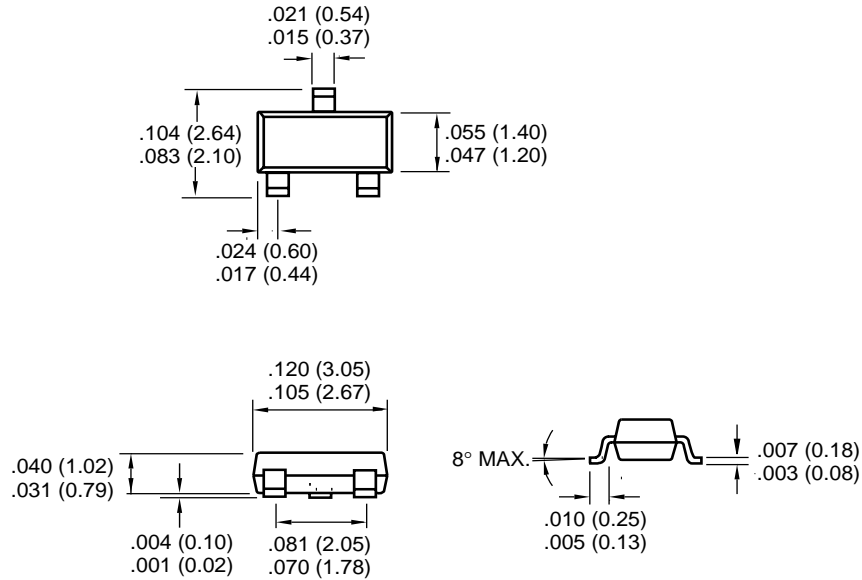


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TC1132
TC1133

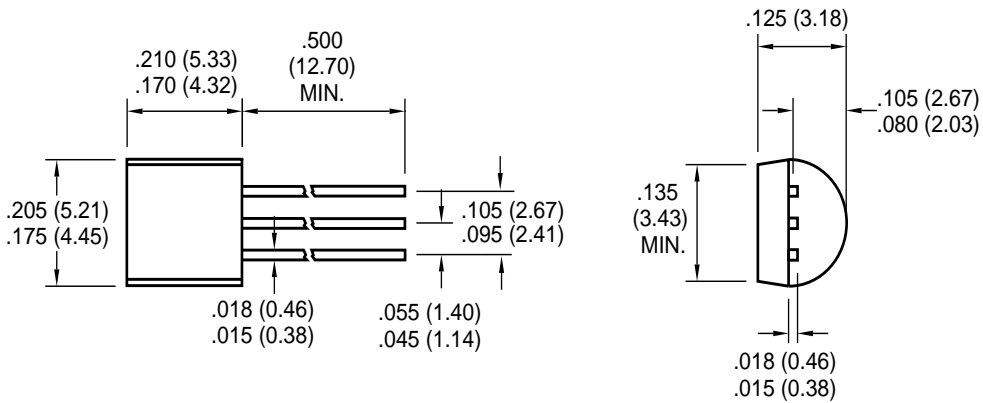
PACKAGE DIMENSIONS

SOT-23B-3*



*NOTE: SOT-23B-3 is equivalent to JEDEC (TO-236)

TO-92-3



Dimensions: inches (mm)



WORLDWIDE SALES AND SERVICE

AMERICAS

Corporate Office

2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200 Fax: 480-792-7277
Technical Support: 480-792-7627
Web Address: <http://www.microchip.com>

Rocky Mountain

2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7966 Fax: 480-792-7456

Atlanta

500 Sugar Mill Road, Suite 200B
Atlanta, GA 30350
Tel: 770-640-0034 Fax: 770-640-0307

Austin

Analog Product Sales
8303 MoPac Expressway North
Suite A-201
Austin, TX 78759
Tel: 512-345-2030 Fax: 512-345-6085

Boston

2 Lan Drive, Suite 120
Westford, MA 01886
Tel: 978-692-3848 Fax: 978-692-3821

Boston

Analog Product Sales
Unit A-8-1 Millbrook Tarry Condominium
97 Lowell Road
Concord, MA 01742
Tel: 978-371-6400 Fax: 978-371-0050

Chicago

333 Pierce Road, Suite 180
Itasca, IL 60143
Tel: 630-285-0071 Fax: 630-285-0075

Dallas

4570 Westgrove Drive, Suite 160
Addison, TX 75001
Tel: 972-818-7423 Fax: 972-818-2924

Dayton

Two Prestige Place, Suite 130
Miamisburg, OH 45342
Tel: 937-291-1654 Fax: 937-291-9175

Detroit

Tri-Atria Office Building
32255 Northwestern Highway, Suite 190
Farmington Hills, MI 48334
Tel: 248-538-2250 Fax: 248-538-2260

Los Angeles

18201 Von Karman, Suite 1090
Irvine, CA 92612
Tel: 949-263-1888 Fax: 949-263-1338

Mountain View

Analog Product Sales
1300 Terra Bella Avenue
Mountain View, CA 94043-1836
Tel: 650-968-9241 Fax: 650-967-1590

New York

150 Motor Parkway, Suite 202
Hauppauge, NY 11788
Tel: 631-273-5305 Fax: 631-273-5335

San Jose

Microchip Technology Inc.
2107 North First Street, Suite 590
San Jose, CA 95131
Tel: 408-436-7950 Fax: 408-436-7955

Toronto

6285 Northam Drive, Suite 108
Mississauga, Ontario L4V 1X5, Canada
Tel: 905-673-0699 Fax: 905-673-6509

ASIA/PACIFIC

China - Beijing

Microchip Technology Beijing Office
Unit 915
New China Hong Kong Manhattan Bldg.
No. 6 Chaoyangmen Beidajie
Beijing, 100027, No. China
Tel: 86-10-85282100 Fax: 86-10-85282104

China - Shanghai

Microchip Technology Shanghai Office
Room 701, Bldg. B
Far East International Plaza
No. 317 Xian Xia Road
Shanghai, 200051
Tel: 86-21-6275-5700 Fax: 86-21-6275-5060

Hong Kong

Microchip Asia Pacific
RM 2101, Tower 2, Metroplaza
223 Hing Fong Road
Kwai Fong, N.T., Hong Kong
Tel: 852-2401-1200 Fax: 852-2401-3431

India

Microchip Technology Inc.
India Liaison Office
Divyasree Chambers
1 Floor, Wing A (A3/A4)
No. 11, O'Shaughnessy Road
Bangalore, 560 025, India
Tel: 91-80-2290061 Fax: 91-80-2290062

Japan

Microchip Technology Intl. Inc.
Benex S-1 6F
3-18-20, Shinyokohama
Kohoku-Ku, Yokohama-shi
Kanagawa, 222-0033, Japan
Tel: 81-45-471-6166 Fax: 81-45-471-6122

Korea

Microchip Technology Korea
168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
Seoul, Korea
Tel: 82-2-554-7200 Fax: 82-2-558-5934

ASIA/PACIFIC (continued)

Singapore

Microchip Technology Singapore Pte Ltd.
200 Middle Road
#07-02 Prime Centre
Singapore, 188980
Tel: 65-334-8870 Fax: 65-334-8850

Taiwan

Microchip Technology Taiwan
11F-3, No. 207
Tung Hua North Road
Taipei, 105, Taiwan
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

EUROPE

Australia

Microchip Technology Australia Pty Ltd
Suite 22, 41 Rawson Street
Epping 2121, NSW
Australia
Tel: 61-2-9868-6733 Fax: 61-2-9868-6755

Denmark

Microchip Technology Denmark ApS
Regus Business Centre
Lautrup hof 1-3
Ballerup DK-2750 Denmark
Tel: 45 4420 9895 Fax: 45 4420 9910

France

Arizona Microchip Technology SARL
Parc d'Activite du Moulin de Massy
43 Rue du Saule Trapu
Batiment A - 1er Etage
91300 Massy, France
Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

Germany

Arizona Microchip Technology GmbH
Gustav-Heinemann Ring 125
D-81739 Munich, Germany
Tel: 49-89-627-144 0 Fax: 49-89-627-144-44

Germany

Analog Product Sales
Lochamer Strasse 13
D-82152 Martinsried, Germany
Tel: 49-89-895650-0 Fax: 49-89-895650-22

Italy

Arizona Microchip Technology SRL
Centro Direzionale Colleoni
Palazzo Taurus 1 V. Le Colleoni 1
20041 Agrate Brianza
Milan, Italy
Tel: 39-039-65791-1 Fax: 39-039-6899883

United Kingdom

Arizona Microchip Technology Ltd.
505 Eskdale Road
Winnersh Triangle
Wokingham
Berkshire, England RG41 5TU
Tel: 44 118 921 5869 Fax: 44-118 921-5820

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