

3V, Dual Trip Point Temperature Sensor

Features

- Integrated Temp Sensor and Detector Operate from a Supply Voltage as Low as 2.7V
- Replaces Mechanical Thermostats and Switches
- On-Chip Temperature Sense
- 8-Pin DIP or SOIC for Direct PCB Mounting
- 2 User Programmable Temperature Set Points
- 2 Independent Temperature Limit Outputs
- Heat/Cool Regulate Output

Applications

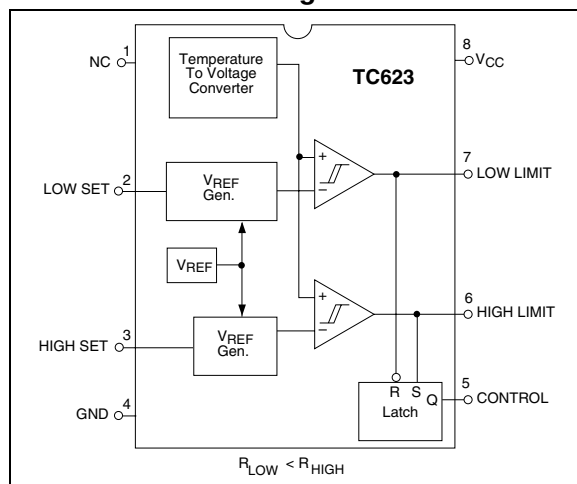
- CPU Thermal Management
- System Over or Under Temperature Shutdown
- Advanced Thermal Warning
- Fan Speed Control Circuits
- Accurate Appliance Temperature Sensing
- Environmental Control

Device Selection Table

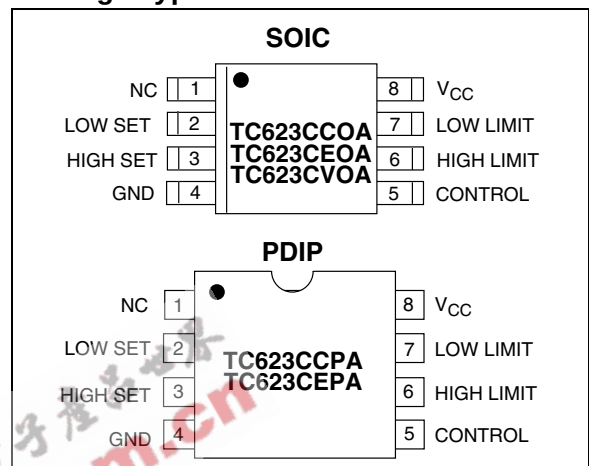
Part Number	Package	Temp. Range
TC623CCOA	8-Pin SOIC	0°C to +70°C
TC623CCPA	8-Pin PDIP	0°C to +70°C
TC623CEOA	8-Pin SOIC	-40°C to +85°C
TC623CEPA	8-Pin PDIP	-40°C to +85°C
TC623CVOA	8-Pin SOIC	-40°C to +125°C

NOTE: Latch Output (C option), is a Standard Device. Contact Factory for Latch Q Output (H option).

Functional Block Diagram



Package Type



General Description

The TC623 is a 3V solid-state, programmable temperature sensor designed for use in thermal management applications. It features dual thermal interrupt outputs (LOW LIMIT and HIGH LIMIT) each of which are set with an external resistor. The HIGH LIMIT and LOW LIMIT outputs are driven active (high) when measured temperature equals the user programmed limits. The CONTROL output is driven active (high) when temperature equals the HIGH LIMIT set point and turned off when temperature falls below the LOW LIMIT set point. The CONTROL output can be used to provide simple ON/OFF control to a cooling fan if so desired.

Low voltage operation, easy set point programming, small size and low cost make the TC623 an ideal choice for many thermal management applications.

TC623

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings*

Supply Voltage	5.5V
Input Voltage Any Input .. (GND – 0.3V) to (V _{DD} +0.3V)	
Package Power Dissipation (T _A ≤ 70°C)	
Plastic DIP	730mW
SOIC	470mW
Derating Factors	
Plastic DIP	8mW/°C
SOIC	6mW/°C
Operating Temperature	
V Version	-40°C to +125°C
E Version	-40°C to +85°C
C Version	0°C to +70°C
Storage Temperature	-65°C to +150°C

*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.

TC623 ELECTRICAL SPECIFICATIONS

Electrical Characteristics: Over Operating Temperature Range, V _{DD} = 2.7V to 4.5V, unless otherwise specified.						
Symbol	Parameter	Min	Typ.	Max	Unit	Test Conditions
V _{DD}	Supply Voltage Range	2.7	—	4.5	V	
I _{DD}	Supply Current	—	150	250	μA	2.7V ≤ V _{DD} ≤ 4.5V
T _{SET}	Absolute Accuracy	T - 3	T ±1	T + 3	°C	T = Programmed Temperature
V _{OH}	Output Voltage High	0.9 × V _{DD}	—	—	V	I _{OH} = 250μA
		0.8 × V _{DD}	—	—	V	I _{OH} = 500μA
V _{OL}	Output Voltage Low	—	—	0.1 × V _{DD}	V	I _{OL} = 500 μA
		—	—	0.2 × V _{DD}	V	I _{OL} = 1mA
HYS	Hysteresis	—	—	-2	°C	Falling Temperature

2.0 PIN DESCRIPTION

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Pin No. (8-Pin SOIC) (8-Pin PDIP)	Symbol	Description
1	NC	No Internal Connection.
2	LOW SET	Low temperature set point. Connect an external 1% resistor from LOW SET to V_{DD} to set trip point.
3	HIGH SET	High temperature set point. Connect an external 1% resistor from HIGH SET to V_{DD} to set trip point.
4	GND	Ground Terminal.
5	CONTROL	Control output.
6	HIGH LIMIT	High temperature push/pull output.
7	LOW LIMIT	Low temperature push/pull output.
8	V_{CC}	Power supply input.

TC623

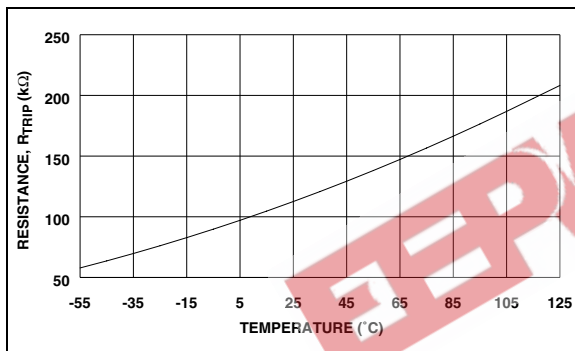
3.0 DETAILED DESCRIPTION

3.1 TC623 Operation

The TC623 has a positive temperature coefficient (Silicon) temperature sensor and dual threshold detector. Temperature set point programming is accomplished with external resistors from the HIGH SET and LOW SET inputs to V_{CC} . The HIGH LIMIT and LOW LIMIT outputs remain inactive (low) as long as the measured temperature is below set point values. As temperature increases, the LOW LIMIT is driven high when temperature equals the LOW LIMIT set point ($\pm 3^\circ\text{C}$). If temperature continues to climb, the HIGH LIMIT output is driven high when temperature equals the HIGH LIMIT set point ($\pm 3^\circ\text{C}$).

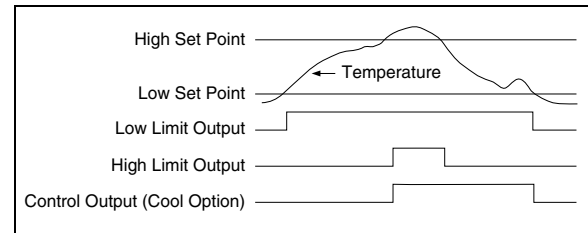
Figure 3-1 shows the relationship between the sense resistance values and trip point temperature.

FIGURE 3-1: TC623 SENSE RESISTORS VS. TRIP TEMPERATURE



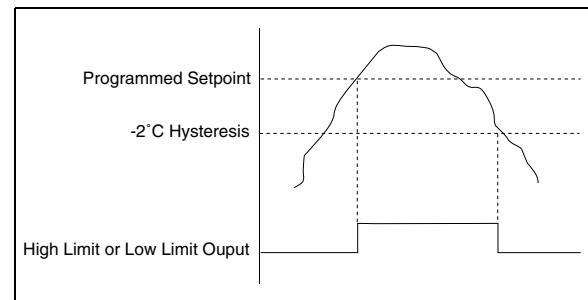
The CONTROL output is driven high when the HIGH LIMIT output goes high and is RESET low when the LOW LIMIT output goes low. This output provides the logic for simple ON/OFF fan control. Figure 3-2 shows overall TC623 operation.

FIGURE 3-2: TC623 TEMPERATURE VS. OUTPUT



To prevent output "chattering" when measured temperature is at (or near) the trip point values, the LOW SET and HIGH SET inputs each have a built-in hysteresis of -2°C max. As a result, the HIGH LIMIT and LOW LIMIT outputs remain active until the measured temperature falls a maximum of 2°C below the programmed HIGH SET and LOW SET thresholds as shown in Figure 3-3. The programmed setting threshold of Figure 3-3 is user programmed temperature trip points of either the LOW SET or HIGH SET inputs. The LOW LIMIT or HIGH LIMIT output is driven active when temperature equals the set point value (to within 3°C). The output remains active until the temperature falls an additional 2°C below the set point due to hysteresis.

FIGURE 3-3: HIGH SET AND LOW SET THRESHOLDS



4.0 TYPICAL APPLICATIONS

4.1 Mounting

If the TC623 is used to measure the temperature of another device, it is important that the top surface of the TC623 package be in intimate contact with the measured device. Good thermal conductivity and no air space is critical to accurate temperature measurement in applications of this type.

4.2 Trip Point Programming

The resistance values required for the HIGH SET and LOW SET inputs are calculated using the formula below:

$$R_{TRIP} = 0.5997 \times T^{2.1312}$$

Where;

R_{TRIP} = Programming resistor value in Ohms
 T = Desired trip temperature in degrees Kelvin.

For example, to program a trip point of 50°C, the programming resistor is:

$$R_{TRIP} = 0.5997 \times (50 + 273.15)^{2.1312} = 133.65k\Omega$$

TC623

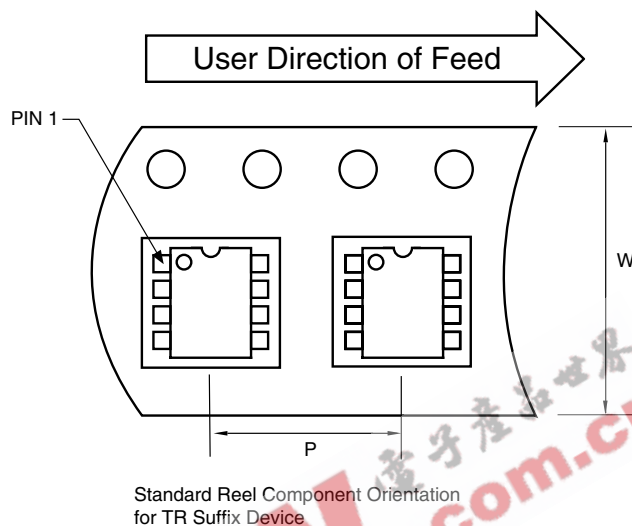
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

Package marking data not available at this time.

5.2 Taping Form

Component Taping Orientation for 8-Pin SOIC (Narrow) Devices

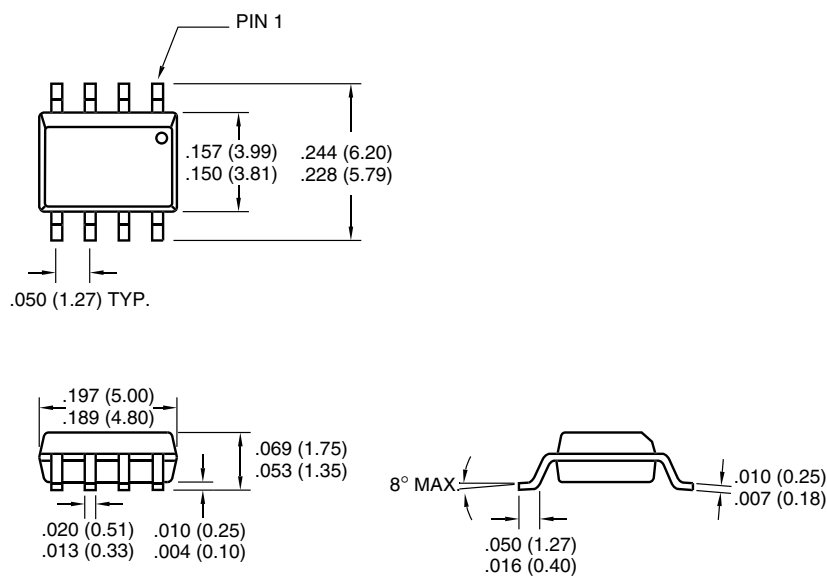


Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
8-Pin SOIC (N)	12 mm	8 mm	2500	13 in

5.3 Package Dimensions

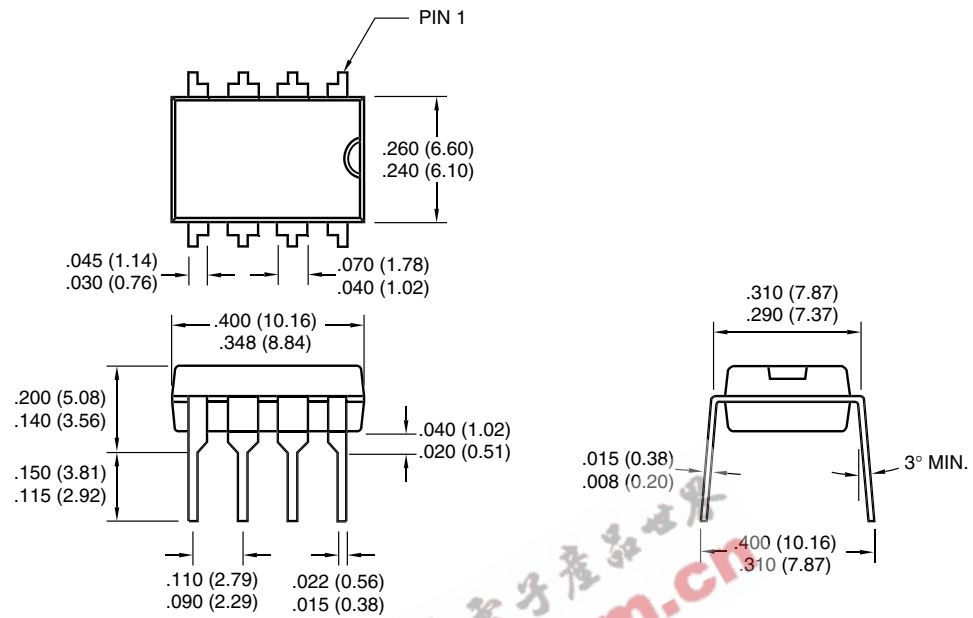
8-Pin SOIC



Dimensions: inches (mm)

Package Dimensions (Continued)

8-Pin Plastic DIP



Dimensions: inches (mm)

TC623

NOTES:

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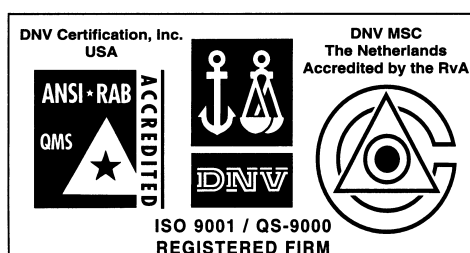
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WORLDWIDE SALES AND SERVICE

AMERICAS

Corporate Office

2355 West Chandler Blvd.
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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

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Detroit

Tri-Atria Office Building
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Tel: 248-538-2250 Fax: 248-538-2260

Kokomo

2767 S. Albright Road
Kokomo, Indiana 46902
Tel: 765-864-8360 Fax: 765-864-8387

Los Angeles

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

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

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

China - Beijing

Microchip Technology Consulting (Shanghai)
Co., Ltd., Beijing Liaison Office
Unit 915
Bei Hai Wan Tai Bldg.
No. 6 Chaoyangmen Beidajie
Beijing, 100027, No. China
Tel: 86-10-85282100 Fax: 86-10-85282104

China - Chengdu

Microchip Technology Consulting (Shanghai)
Co., Ltd., Chengdu Liaison Office
Rm. 2401, 24th Floor,
Ming Xing Financial Tower
No. 88 TIDU Street
Chengdu 610016, China
Tel: 86-28-6766200 Fax: 86-28-6766599

China - Fuzhou

Microchip Technology Consulting (Shanghai)
Co., Ltd., Fuzhou Liaison Office
Unit 28F, World Trade Plaza
No. 71 Wusi Road
Fuzhou 350001, China
Tel: 86-591-7503506 Fax: 86-591-7503521

China - Shanghai

Microchip Technology Consulting (Shanghai)
Co., Ltd.
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

China - Shenzhen

Microchip Technology Consulting (Shanghai)
Co., Ltd., Shenzhen Liaison Office
Rm. 1315, 13/F, Shenzhen Kerry Centre,
Renminnan Lu
Shenzhen 518001, China
Tel: 86-755-2350361 Fax: 86-755-2366086

Hong Kong

Microchip Technology Hongkong Ltd.
Unit 901-6, 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 Japan K.K.
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 135-882
Tel: 82-2-554-7200 Fax: 82-2-558-5934

Singapore

Microchip Technology Singapore Pte Ltd.
200 Middle Road
#07-02 Prime Centre
Singapore, 188980
Tel: 65-6334-8870 Fax: 65-6334-8850

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

Denmark

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

France

Microchip Technology SARL
Parc d'Activite du Moulin de Massy
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Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

Germany

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

Italy

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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