Obsolete Device

TC07

3V Logic Output Temperature Sensor with Programmable Hysteresis

Features

- User Programmable Hysteresis and Temperature Set Point
- Easily Programs with Two External Resistors
- Wide Temperature Detection Range
  - TC07CXA: -0°C to +70°C
  - TC07EXA: -40°C to +85°C
  - TC07VXA: -40°C to +125°C
- 8-Pin MSOP and 8-Pin SOIC Packages
- Cost Effective

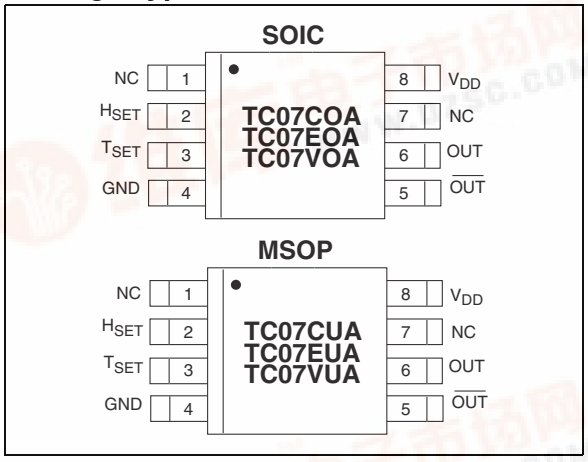
Applications

- Power Supply Over-Temperature Detection
- Consumer Equipment
- Temperature Regulators

Device Selection Table

Part Number	Package	Temperature Range
TC07COA	8-Pin SOIC	0°C to +70°C
TC07CUA	8-Pin MSOP	0°C to +70°C
TC07EOA	8-Pin SOIC	-40°C to +85°C
TC07EUA	8-Pin MSOP	-40°C to +85°C
TC07VOA	8-Pin SOIC	-40°C to +125°C
TC07VUA	8-Pin MSOP	-40°C to +125°C

Package Type



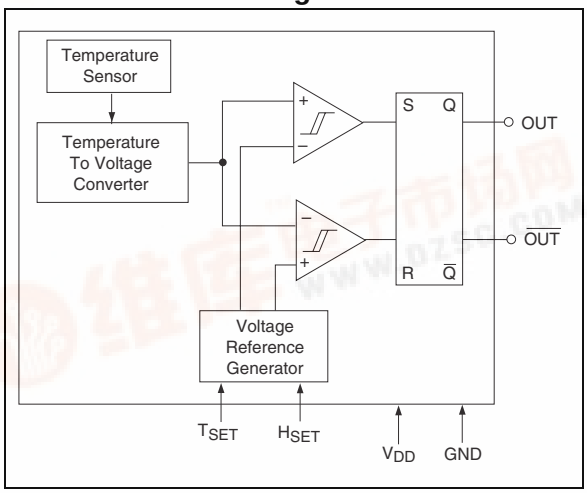
General Description

The TC07 is a programmable, logic output temperature detector that operates from power supply levels as low as 2.7V. Programming is accomplished with external resistors connected from the temperature set point input (T_{SET}) and the hysteresis control input (H_{SET}) to V_{DD}.

Complementary outputs (OUT and $\overline{OUT}$) are driven active when temperature exceeds the temperature threshold programmed by the resistor on T_{SET}. The states of these outputs are maintained (latched) until temperature falls below threshold programmed by the resistor on H_{SET}.

The TC07 has an operating temperature range of -40°C to +125°C (TC07VXA). It features low (<130µA) supply current and with 8-pin MSOP and 8-pin SOIC packages, making it suitable for a wide variety of applications.

Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings*

Supply Voltage 7V
Input Voltage Any Input .(GND – 0.3V) to (V_{DD} + 0.3V)
Operating Temperature .....-40°C to +125°C
Storage Temperature, T_J .....-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.

TC07 ELECTRICAL SPECIFICATIONS

Electrical Characteristics: T_A = Over operational temperature range, unless otherwise specified.

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V_{DD}	Supply Voltage Range	2.7	–	5.5	V	
I_{DD}	Supply Current	–	130	300	µA	2.7V < V_{CC} < 5.5V
V_{OH}	Output Voltage (High)	0.8 x V_{DD}	–	–	V	I_{OUT} = 500µA
V_{OL}	Output Voltage (Low)	–	–	0.25 x V_{DD}	V	I_{OUT} = 1mA
H	Minimum Hysteresis	-5	–	–	°C	H_{SET} < T_{SET}
T_{SET}	Absolute Accuracy	T - 3	T ± 1	T + 3	°C	T = Programmed Temperature
H_{SET}	Absolute Accuracy	T - 5	T ± 1	T + 5	°C	T = Programmed Temperature

2.0 PIN DESCRIPTIONS

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

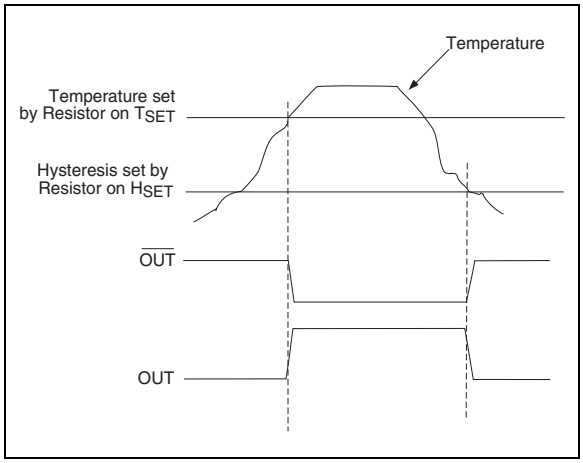
TABLE 2-1: PIN FUNCTION TABLE

Pin No. (8-Pin SOIC) (8-Pin MSOP)	Symbol	Description
1	NC	No Internal Connection
2	H_{SET}	Absolute Accuracy
3	T_{SET}	Absolute Accuracy
4	GND	Ground
5	$\overline{OUT}$	Minimum Hysteresis
6	OUT	Absolute Accuracy
7	NC	No Internal Connection
8	V_{DD}	Supply Voltage Range

3.0 DETAILED DESCRIPTION

The TC07 programs with resistors connected from the T_{SET} and H_{SET} inputs to V_{DD}. Output pins OUT and $\overline{OUT}$ are driven active when the temperature exceeds the setting determined by the programming resistor on T_{SET}. The outputs are maintained (latched) in their active states until temperature drops below the setting determined by the programming resistor on H_{SET} (Figure 3-1).

FIGURE 3-1: TC07 OUTPUT WAVEFORMS



4.0 TYPICAL APPLICATIONS

4.1 Trip Point Programming

The resistor values required to achieve the desired trip point temperatures on T_{SET} and H_{SET} are calculated using the formula below:

$$R_{TRIP} = 0.6 \times T^{2.13}$$

Where:

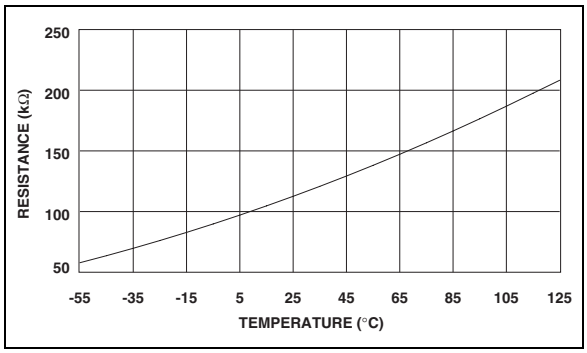
R_{TRIP} = Programming resistor value in Ohms
T = Desired trip point temperature in degrees Kelvin.

For example, to program the TC07 outputs to go active at 50°C and inactive at 30°C, the R_T and R_H programming resistors are calculated as follows:

$$R_T = 0.6 \times ((50 + 273.15)^{2.13}) = 132.8k\Omega$$
$$R_H = 0.6 \times ((30 + 273.15)^{2.13}) = 115.9k\Omega$$

Resistance values for T_{SET} and H_{SET} can be approximated using Figure 4-1. Care must be taken to ensure the H_{SET} programming resistor is a smaller value than the T_{SET} programming resistor. The temperature programmed on H_{SET} must be at least 5°C lower than the temperature value programmed by T_{SET}.

FIGURE 4-1: PROGRAMMING RESISTOR VALUES VS. TEMPERATURE



4.2 Cooling and Heating Applications

The TC07 can be used to control a DC fan as shown in Figure 4-2. The fan turns on when the sensed temperature rises above the temperature set at T_{SET} and remains on until the temperature falls below the temperature set at H_{SET}. The amount of “cooling" performed by the fan is dependent on the programmed hysteresis.

Figure 4-3 shows the TC07 acting as a heater thermostat. Circuit operation is identical to that of the cooling fan application in Figure 4-2.

FIGURE 4-2: TC07 AS A FAN CONTROLLER

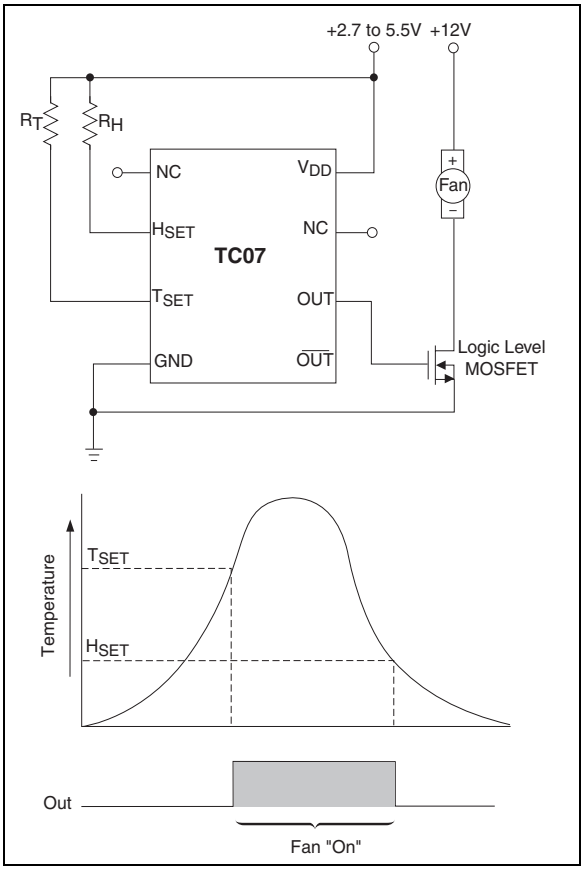
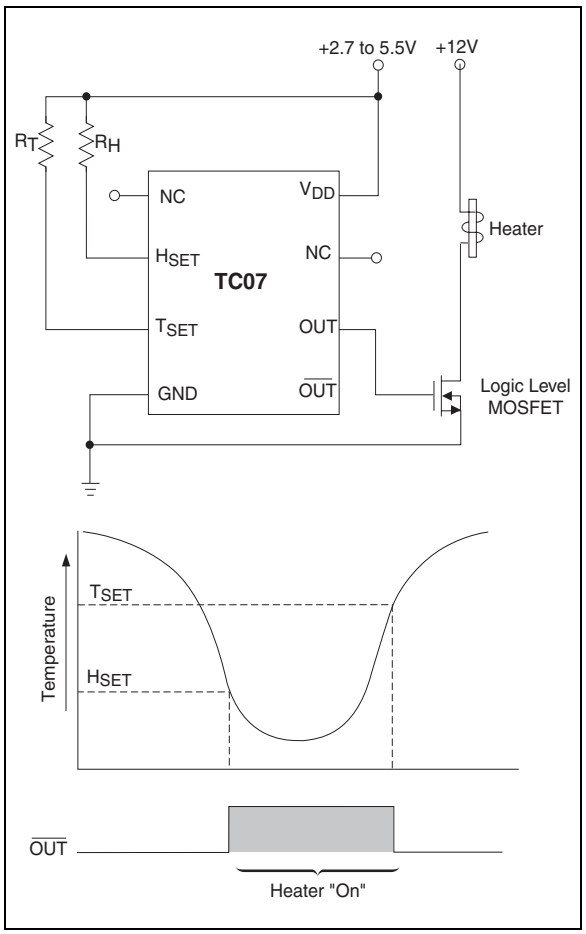


FIGURE 4-3: TC07 AS A HEATER THERMOSTAT



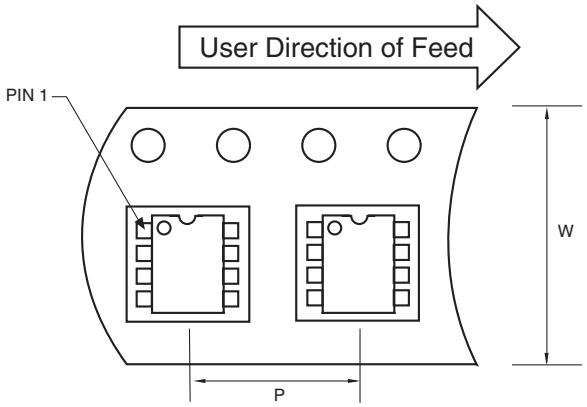
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

Package marking data not available at this time.

5.2 Taping Form

Component Taping Orientation for 8-Pin MSOP Devices

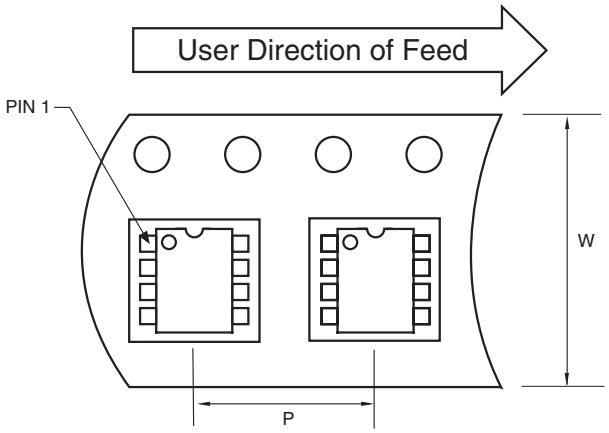


Standard Reel Component Orientation
for TR Suffix Device

Carrier Tape, Number of Components Per Reel and Reel Size

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

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



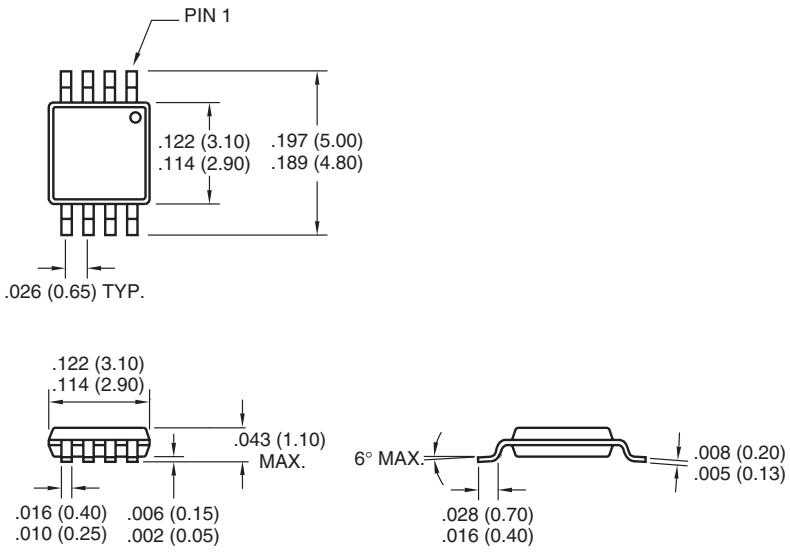
Standard Reel Component Orientation
for TR Suffix Device

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

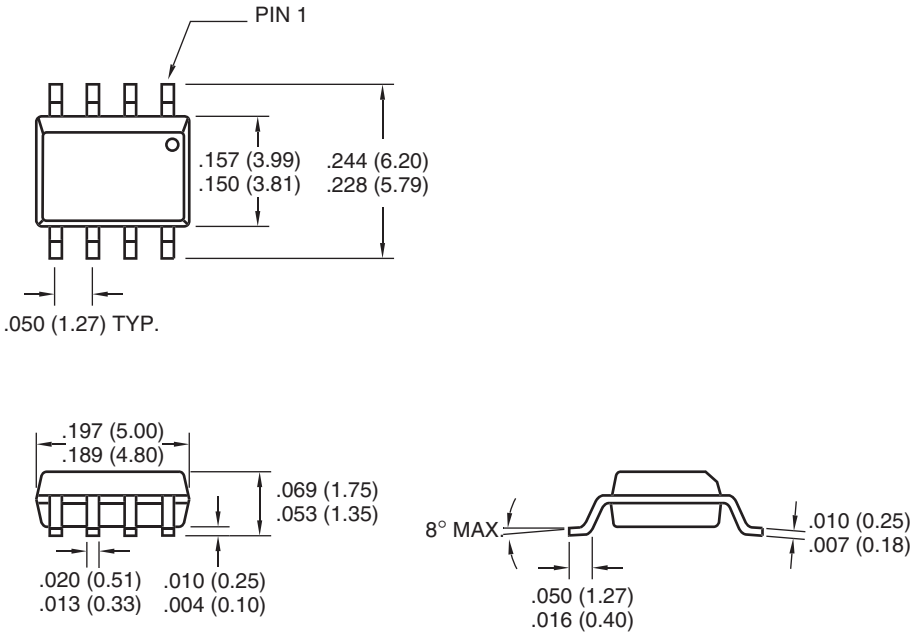
5.3 Package Dimensions

8-Pin MSOP



Dimensions: inches (mm)

8-Pin SOIC



Dimensions: inches (mm)

NOTES:

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Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

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