

# Honeywell

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**Sensing and Control**  
Honeywell Inc.  
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Freeport, Illinois 61032



## FEATURES

- Interchangeable without sensor-to-sensor recalibration
- Very small thermal mass for fast response
- Air or liquid temperature sensing
- Linear temperature sensitivity
- Proven thin film processing reliability
- Low cost
- Long term stability
- 2000 ohms nominal resistance at 20°C

## TYPICAL APPLICATIONS

- HVAC – room, duct and refrigerant temperature
- Motors – overload protection
- Electronic circuits – semiconductor protection
- Process control – temperature regulation
- Automotive – air or oil temperature
- Appliances – cooking temperature

The sensing element is a silicon chip, 0.040 × 0.050" with a thin film resistive network pattern. The chips are individually laser trimmed to provide 2000 ohms nominal resistance at room temperature (20°C), accurate to ±0.7°C. Maximum error over the entire operating range of -40 to +150°C (-40 to +302°F) is ±2.5°C. This extremely accurate trimming provides true sensor-to-sensor interchangeability without recalibration of the user circuit.

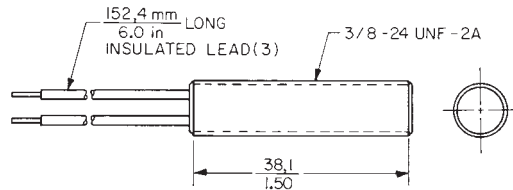
## TD4A Liquid temperature sensor

TD4A liquid temperature sensor is a two-terminal threaded anodized aluminum housing. The environmentally sealed liquid temperature sensors are designed for simplicity of installation, such as in the side of a truck. TD4A sensors are not designed for total immersion. Typical response time (for one time constant) is 4 minutes in still air and 15 seconds in still water (unmounted position). The temperature rise is 0.12°C/milliwatt suspended by leads in still air, and 0.08°C/milliwatt when mounted on 1 square foot 0.25" thick aluminum foil.

## TD5A Miniature temperature sensor

The TD5A is a subminiature temperature sensor with three leads (center not connected). It has response times of 11.0 seconds and a temperature rise of .23°C per milliwatt in still air.

## TD4A

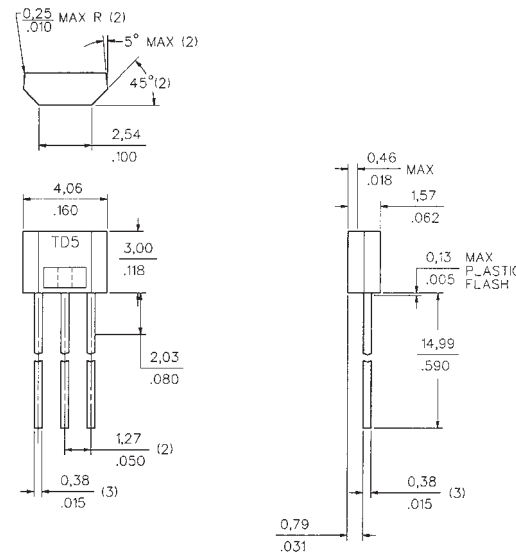


## TD ORDER GUIDE

Catalog Listing	Description
TD4A	Liquid temperature sensor, 1.5° threaded (3/8-24 UNF-2A) anodized aluminum housing, two six inch black insulated leads
TD5A	Subminiature package, low cost, fast response time (TO-92)

## MOUNTING DIMENSIONS (for reference only)

### TD5A



Center lead  
not connected

Temperature

-20°C (-4°F)	1715 ± 10 (1.5°C)	+80°C (176°F)	2482 ± 12 (1.4°C)
-10°C (14°F)	1784 ± 9 (1.3°C)	+90°C (194°F)	2569 ± 14 (1.6°C)
0°C (32°F)	1854 ± 8 (1.1°C)	+100°C (212°F)	2658 ± 16 (1.8°C)
+10°C (50°F)	1926 ± 6 (0.8°C)	+110°C (230°F)	2748 ± 18 (2.0°C)
+20°C (68°F)	2000 ± 5 (0.7°C)	+120°C (248°F)	2840 ± 19 (2.0°C)
+30°C (86°F)	2076 ± 5 (0.7°C)	+130°C (266°F)	2934 ± 21 (2.2°C)
+40°C (104°F)	2153 ± 6 (0.8°C)	+140°C (284°F)	3030 ± 23 (2.4°C)
+50°C (122°F)	2233 ± 7 (0.9°C)	+150°C (302°F)	3128 ± 25 (2.5°C)

It is recommended that resistance measurements be made at 100  $\mu$ A or less to minimize internal heating of the sensor. Measurements at currents up to 1mA will not damage the sensor, but the resistance characteristics should be adjusted for internal heating.

#### Equation for computing resistance:

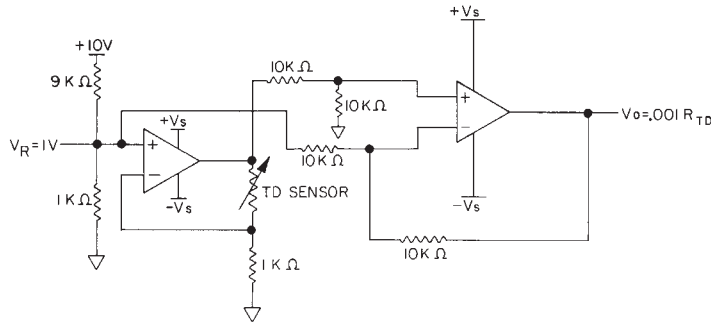
$$R_T = R_0 + (3.84 \times 10^{-3} \times R_0 \times T) + (4.94 \times 10^{-6} \times R_0 \times T^2)$$

$R_T$  = Resistance at temperature T

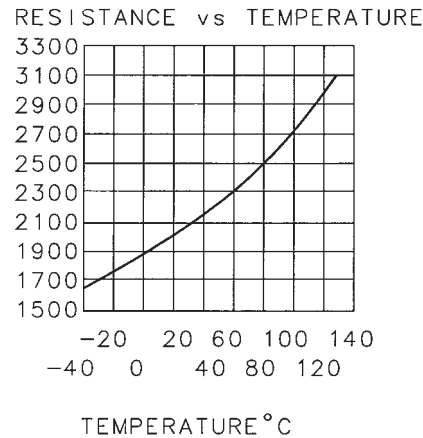
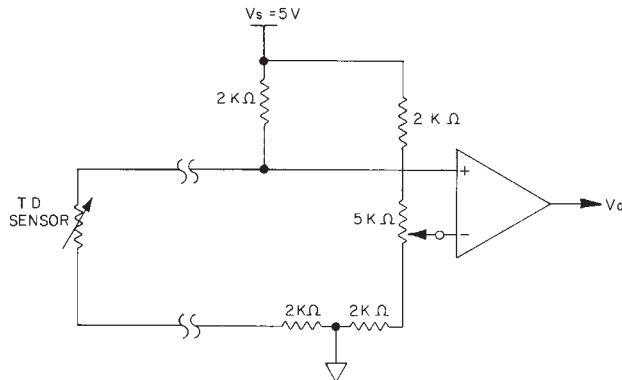
$R_0$  = Resistance at 0°C

T = Temperature in °C

**Figure 2**  
Linear Output Voltage Circuit



**Figure 3**  
Adjustable Point (Comparator) Interface



#### ELECTRICAL INTERFACING

The high nominal resistance, positive temperature coefficient and linear sensitivity characteristics of the TD Series temperature sensors simplifies the task of designing the electrical interface. Figure 2 is a simple circuit that can be used to linearize the voltage output to within 0.2% or a  $\pm 0.4^\circ\text{C}$  error over a range of  $-40^\circ$  to  $+150^\circ\text{C}$  ( $-40^\circ$  to  $+302^\circ\text{F}$ ).

In some applications, it may be desirable to detect one particular temperature. Figure 3 illustrates one way this can be accomplished. In the comparator circuit shown, the potentiometer can be adjusted to correspond to the desired temperature.

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