

FEATURES

- Interchangeable without sensor-tosensor 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

GENERAL INFORMATION

TD Series temperature sensors from MICRO SWITCH respond rapidly to temperature changes, and are accurate to $\pm 0.7^{\circ}\text{C}$ at 20°C —completely interchangeable without recalibration. They are RTD (resistance temperature detector) sensors, and provide 8 $\Omega/^{\circ}\text{C}$ sensitivity, with inherently near linear outputs.

The sensing element is a silicon chip, $0.040\times0.050''$ 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 $\pm0.7^{\circ}$ C. Maximum error over the entire operating range of -40 to $+150^{\circ}$ C (-40 to $+302^{\circ}$ F) is $\pm2.5^{\circ}$ C. This extremely accurate trimming provides true sensor-to-sensor interchangeability without recalibration of the user circuit

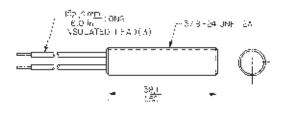
TD4A Liquid temperature sensor

TD4A liquid temperature sensor is a twoterminal 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

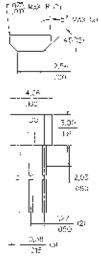


TD ORDER GUIDE

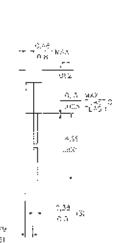
Catalog Listing	Description
TD4A	Liquid temperature sensor, 1.5° threaded (3/8-24 UNF-2A) anodized aluminum housing, two six inch black insulated leads
TD5A	Subminiature package, low cost, fast response time (TO-92)

MOUNTING DIMENSIONS (for reference only)

TD5A







emperature

Temperature Sensors

ABSOLUTE MAXIMUM RATINGS

Operating temperature range	-40 to +150°C (-40 to +302°F)	
Storage temperature range	-55 to 165°C (-67 to +338°F)	
Voltage	10 VDC Continuous (24 hours)	

INTERCHANGEABILITY (with 100 mA maximum current)

Temperature	Resistance (Ohms)	Temperature	Resistance (Ohms)	
-40°C (-40°F)	1584 ± 12 (1.9°C)	+60°C (140°F)	2314 ± 9 (1.1°C)	
-30°C (−22°F)	1649 ± 11 (1.7°C)	+70°C (158°F)	2397 ± 10 (1.2°C)	
-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 μ 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:

 $R_T = R_O + (3.84 \times 10^3 \times R_O \times T) + (4.94 \times 10^6 \times R_O \times T^2)$

R_T = Resistance at temperature T

 R_O = Resistance at 0°C

T = Temperature in °C

Figure 2 Linear Output Voltage Circuit

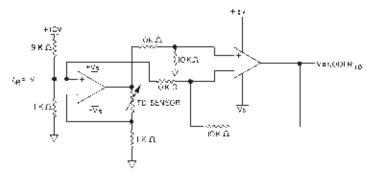
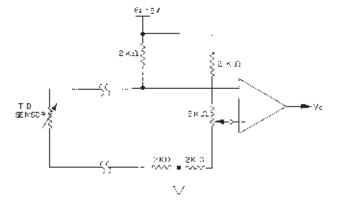


Figure 3
Adjustable Point (Comparator) Interface



Linearity

±2% (-25 to 85°C)

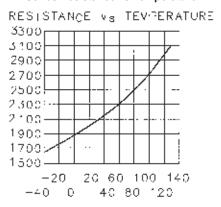
±3% (-40 to 150°C)

TD sensors can be linearized to within $\pm 0.2\%$.

Repeatability

 $\pm 1~\Omega$

Figure 1 TD Series Resistance vs Temperature



TEMPERATURE®C

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 ± 0.4 °C error over a range of -40° to +150°C (-40° to +302°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.