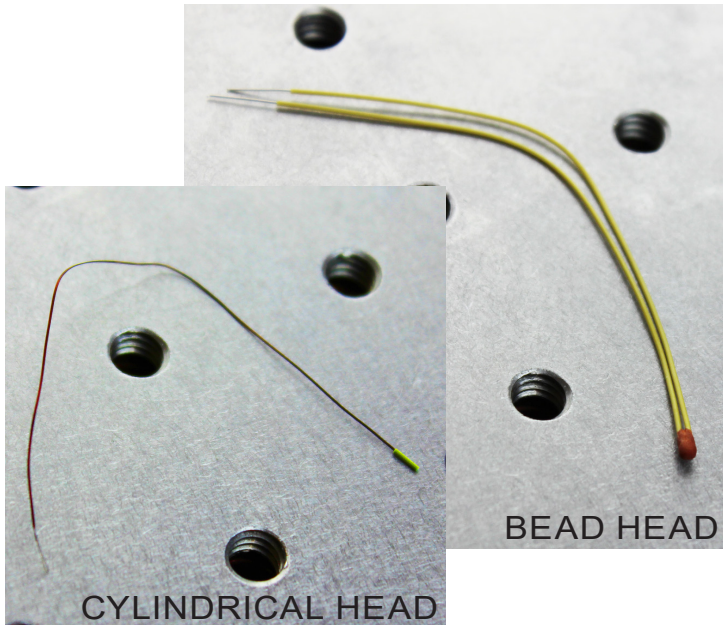


DATASHEET AND OPERATING GUIDE

TCS Series Thermistors



FEATURES AND BENEFITS

- Low Cost
- 1% Tolerance
- Cylindrical Head
 - » Ideal for Optical or Thin Surfaces & Small Laser Packages
 - » 3" Nickel Bifilar Leads
 - » Isolated Leads Provide Isolation from Metal Housing
- Bead Head
 - » Small Size - Conformally Coated
 - » Wide Resistance Range
 - » Available in Five Different R-T Curves
 - » 3" Solid Nickel Wire Leads
 - » Teflon® Insulation Provides Isolation from Metal Housing

CYLINDRICAL HEAD THERMISTOR

This $\pm 1\%$ thermistor is encapsulated in a polyimide tube, for assemblies where surface mounting or embedding the thermistor is required. Ideal for tight mounting spaces with 38 AWG nickel bifilar leads and a diameter of 0.5 mm by 3 mm.

Thermal Resistance or Dissipation Constant is 0.2 mW / °C.

Thermal Time Constant is 200 msec.

BEAD HEAD THERMISTOR

These $\pm 1\%$ thermistors are conformally coated, two-lead thermistors for applications where embedding the thermistor is required. The coating is baked on phenolic for durability and long term stability. They have solid nickel wires with Teflon® insulation to provide isolation when assembled in metal housings.

Thermal Resistance or Dissipation Constant is 2-3 mW / °C.

Thermal Time Constant is 6-14 seconds.

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ORDERING INFORMATION

| PART NO | DESCRIPTION |
|---------|------------------------------------|
| TCS10K5 | 10 kΩ Thermistor, Cylindrical Head |
| TCS610 | 10 kΩ Thermistor, Bead Head |
| TCS620 | 20 kΩ Thermistor, Bead Head |
| TCS650 | 50 kΩ Thermistor, Bead Head |
| TCS651 | 100 kΩ Thermistor, Bead Head |

THERMISTOR SELECTION GUIDE

Thermistors allow for precise temperature measurements across a wide range of temperatures. As seen below, temperatures from -45°C up to 114°C can be measured.

For a given thermistor, to accurately measure the voltage (which is related to the temperature, see the charts on the following pages), a bias current must be provided. Since the resistance of a thermistor varies as temperature changes, the bias current must be stable and consistent. In general, there are two commercially available bias current ranges, 10 or 100 µA.

Choose the bias current and thermistor combination such that the sensor voltage remains above 0.3 V for the temperature range under consideration. When the sensor voltage falls below 0.3 V, the sensitivity of the measurement is decreased. For more information, see [AN-TC14: Calibration Coefficients and Thermistor Selection](#).

For optimum performance, system operating temperature should fall in the middle of the thermistor operating range, and within a single bias current range.

Use the chart below to select the thermistor model best suited to your application.

The following pages include complete resistance vs. temperature response charts for each thermistor model, as well as the Steinhart-Hart coefficients for each bias current range.

Additional information about thermistors can be found in [AN-TC11: Thermistor Basics](#). Techniques for installing thermistors can be found in [AN-TC08: Mounting and Soldering Nickel-Lead Thermistors](#).

THERMISTOR SELECTION GUIDE

| MODEL | R @ 25°C | 10 µA BIAS CURRENT RANGE | 100 µA BIAS CURRENT RANGE |
|-----------|----------|--------------------------|---------------------------|
| TCS10K5 * | 10 kΩ | -45 to +13 °C | -8 to +50 °C |
| TCS610 | 10 kΩ | -45 to +13 °C | -8 to +50 °C |
| TCS620 | 20 kΩ | -35 to +28 °C | +6 to +69 °C |
| TCS650 | 50 kΩ | -18 to +49 °C | +25 to +92 °C |
| TCS651 | 100 kΩ | -6 to +67 °C | +41 to +114 °C |

* Cylindrical Head

STEINHART-HART CALCULATION

You can approximate the response of a thermistor with the Steinhart-Hart Equation. The A, B, and C values listed in the charts for each model apply to the following equation. The coefficients are optimized for the ranges covered by the reference currents.

$$\frac{1}{T} = A + B \times \ln R + C \times (\ln R)^3, \text{ where } R \text{ is in ohms and } T \text{ is in Kelvin}$$

TCS10K5 10 kΩ Cylindrical Head Thermistor @ 25°C

RESISTANCE VERSUS TEMPERATURE RESPONSE

10 μA Bias Current Temperature Range: -45 to +13°C

100 μA Bias Current Temperature Range: -8 to +50°C

| Steinhart-Hart Coefficients | | | |
|-----------------------------|------------|---------------------------|------------|
| 10 μA BIAS CURRENT RANGE | | 100 μA BIAS CURRENT RANGE | |
| A | 1.1235E-03 | A | 1.1279E-03 |
| B | 2.3500E-04 | B | 2.3429E-04 |
| C | 8.4538E-08 | C | 8.7298E-08 |

| TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) |
|-----------|--------------------|------------------|-------------------|-----------|--------------------|------------------|-------------------|-----------|--------------------|------------------|-------------------|
| -45 | 473200 | 4.732 | | -13 | 65260 | 0.652 | | 19 | 13070 | | 1.307 |
| -44 | 441800 | 4.418 | | -12 | 61750 | 0.617 | | 20 | 12490 | | 1.249 |
| -43 | 412600 | 4.126 | | -11 | 58450 | 0.584 | | 21 | 11940 | | 1.194 |
| -42 | 385600 | 3.856 | | -10 | 55340 | 0.553 | | 22 | 11420 | | 1.142 |
| -41 | 360500 | 3.605 | | -9 | 52420 | 0.524 | | 23 | 10920 | | 1.092 |
| -40 | 337200 | 3.372 | | -8 | 49670 | 0.496 | 4.967 | 24 | 10450 | | 1.045 |
| -39 | 315500 | 3.155 | | -7 | 47080 | 0.470 | 4.708 | 25 | 10000 | | 1.000 |
| -38 | 295400 | 2.954 | | -6 | 44640 | 0.446 | 4.464 | 26 | 9572 | | 0.957 |
| -37 | 276700 | 2.767 | | -5 | 42340 | 0.423 | 4.234 | 27 | 9165 | | 0.916 |
| -36 | 259300 | 2.593 | | -4 | 40170 | 0.401 | 4.017 | 28 | 8777 | | 0.877 |
| -35 | 243100 | 2.431 | | -3 | 38120 | 0.381 | 3.812 | 29 | 8408 | | 0.840 |
| -34 | 228000 | 2.280 | | -2 | 36200 | 0.362 | 3.620 | 30 | 8056 | | 0.805 |
| -33 | 213900 | 2.139 | | -1 | 34380 | 0.343 | 3.438 | 31 | 7721 | | 0.772 |
| -32 | 200800 | 2.008 | | 0 | 32660 | 0.326 | 3.266 | 32 | 7402 | | 0.740 |
| -31 | 188600 | 1.886 | | 1 | 31040 | 0.310 | 3.104 | 33 | 7098 | | 0.709 |
| -30 | 177200 | 1.772 | | 2 | 29510 | 0.295 | 2.951 | 34 | 6808 | | 0.680 |
| -29 | 166500 | 1.665 | | 3 | 28060 | 0.280 | 2.806 | 35 | 6531 | | 0.653 |
| -28 | 156600 | 1.566 | | 4 | 26690 | 0.266 | 2.669 | 36 | 6267 | | 0.626 |
| -27 | 147300 | 1.473 | | 5 | 25400 | 0.254 | 2.540 | 37 | 6015 | | 0.601 |
| -26 | 138600 | 1.386 | | 6 | 24180 | 0.241 | 2.418 | 38 | 5774 | | 0.577 |
| -25 | 130500 | 1.305 | | 7 | 23020 | 0.230 | 2.302 | 39 | 5545 | | 0.554 |
| -24 | 122900 | 1.229 | | 8 | 21920 | 0.219 | 2.192 | 40 | 5326 | | 0.532 |
| -23 | 115800 | 1.158 | | 9 | 20890 | 0.208 | 2.089 | 41 | 5116 | | 0.511 |
| -22 | 109200 | 1.092 | | 10 | 19900 | 0.199 | 1.990 | 42 | 4916 | | 0.491 |
| -21 | 103000 | 1.030 | | 11 | 18970 | 0.189 | 1.897 | 43 | 4725 | | 0.472 |
| -20 | 97130 | 0.971 | | 12 | 18090 | 0.180 | 1.809 | 44 | 4543 | | 0.454 |
| -19 | 91660 | 0.916 | | 13 | 17260 | 0.172 | 1.726 | 45 | 4368 | | 0.436 |
| -18 | 86540 | 0.865 | | 14 | 16470 | | 1.647 | 46 | 4201 | | 0.420 |
| -17 | 81730 | 0.817 | | 15 | 15710 | | 1.571 | 47 | 4041 | | 0.404 |
| -16 | 77220 | 0.772 | | 16 | 15000 | | 1.500 | 48 | 3888 | | 0.388 |
| -15 | 72980 | 0.729 | | 17 | 14320 | | 1.432 | 49 | 3742 | | 0.374 |
| -14 | 69000 | 0.690 | | 18 | 13680 | | 1.368 | 50 | 3602 | | 0.360 |

TCS610 10 kΩ Bead Head Thermistor @ 25°C

RESISTANCE VERSUS TEMPERATURE RESPONSE

10 μA Bias Current Temperature Range: -45 to +13°C

100 μA Bias Current Temperature Range: -8 to +50°C

| Steinhart-Hart Coefficients | | | |
|-----------------------------|------------|---------------------------|------------|
| 10 μA BIAS CURRENT RANGE | | 100 μA BIAS CURRENT RANGE | |
| A | 1.1235E-03 | A | 1.1279E-03 |
| B | 2.3500E-04 | B | 2.3429E-04 |
| C | 8.4538E-08 | C | 8.7298E-08 |

| TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) |
|-----------|--------------------|------------------|-------------------|-----------|--------------------|------------------|-------------------|-----------|--------------------|------------------|-------------------|
| -45 | 473200 | 4.732 | | -13 | 65260 | 0.652 | | 19 | 13070 | | 1.307 |
| -44 | 441800 | 4.418 | | -12 | 61750 | 0.617 | | 20 | 12490 | | 1.249 |
| -43 | 412600 | 4.126 | | -11 | 58450 | 0.584 | | 21 | 11940 | | 1.194 |
| -42 | 385600 | 3.856 | | -10 | 55340 | 0.553 | | 22 | 11420 | | 1.142 |
| -41 | 360500 | 3.605 | | -9 | 52420 | 0.524 | | 23 | 10920 | | 1.092 |
| -40 | 337200 | 3.372 | | -8 | 49670 | 0.496 | 4.967 | 24 | 10450 | | 1.045 |
| -39 | 315500 | 3.155 | | -7 | 47080 | 0.470 | 4.708 | 25 | 10000 | | 1.000 |
| -38 | 295400 | 2.954 | | -6 | 44640 | 0.446 | 4.464 | 26 | 9572 | | 0.957 |
| -37 | 276700 | 2.767 | | -5 | 42340 | 0.423 | 4.234 | 27 | 9165 | | 0.916 |
| -36 | 259300 | 2.593 | | -4 | 40170 | 0.401 | 4.017 | 28 | 8777 | | 0.877 |
| -35 | 243100 | 2.431 | | -3 | 38120 | 0.381 | 3.812 | 29 | 8408 | | 0.840 |
| -34 | 228000 | 2.280 | | -2 | 36200 | 0.362 | 3.620 | 30 | 8056 | | 0.805 |
| -33 | 213900 | 2.139 | | -1 | 34380 | 0.343 | 3.438 | 31 | 7721 | | 0.772 |
| -32 | 200800 | 2.008 | | 0 | 32660 | 0.326 | 3.266 | 32 | 7402 | | 0.740 |
| -31 | 188600 | 1.886 | | 1 | 31040 | 0.310 | 3.104 | 33 | 7098 | | 0.709 |
| -30 | 177200 | 1.772 | | 2 | 29510 | 0.295 | 2.951 | 34 | 6808 | | 0.680 |
| -29 | 166500 | 1.665 | | 3 | 28060 | 0.280 | 2.806 | 35 | 6531 | | 0.653 |
| -28 | 156600 | 1.566 | | 4 | 26690 | 0.266 | 2.669 | 36 | 6267 | | 0.626 |
| -27 | 147300 | 1.473 | | 5 | 25400 | 0.254 | 2.540 | 37 | 6015 | | 0.601 |
| -26 | 138600 | 1.386 | | 6 | 24180 | 0.241 | 2.418 | 38 | 5774 | | 0.577 |
| -25 | 130500 | 1.305 | | 7 | 23020 | 0.230 | 2.302 | 39 | 5545 | | 0.554 |
| -24 | 122900 | 1.229 | | 8 | 21920 | 0.219 | 2.192 | 40 | 5326 | | 0.532 |
| -23 | 115800 | 1.158 | | 9 | 20890 | 0.208 | 2.089 | 41 | 5116 | | 0.511 |
| -22 | 109200 | 1.092 | | 10 | 19900 | 0.199 | 1.990 | 42 | 4916 | | 0.491 |
| -21 | 103000 | 1.030 | | 11 | 18970 | 0.189 | 1.897 | 43 | 4725 | | 0.472 |
| -20 | 97130 | 0.971 | | 12 | 18090 | 0.180 | 1.809 | 44 | 4543 | | 0.454 |
| -19 | 91660 | 0.916 | | 13 | 17260 | 0.172 | 1.726 | 45 | 4368 | | 0.436 |
| -18 | 86540 | 0.865 | | 14 | 16470 | | 1.647 | 46 | 4201 | | 0.420 |
| -17 | 81730 | 0.817 | | 15 | 15710 | | 1.571 | 47 | 4041 | | 0.404 |
| -16 | 77220 | 0.772 | | 16 | 15000 | | 1.500 | 48 | 3888 | | 0.388 |
| -15 | 72980 | 0.729 | | 17 | 14320 | | 1.432 | 49 | 3742 | | 0.374 |
| -14 | 69000 | 0.690 | | 18 | 13680 | | 1.368 | 50 | 3602 | | 0.360 |

TCS620 20 kΩ Bead Head Thermistor @ 25°C

RESISTANCE VERSUS TEMPERATURE RESPONSE

10 μA Bias Current Temperature Range: -35 to +28°C

100 μA Bias Current Temperature Range: +6 to +69°C

| Steinhart-Hart Coefficients | | | |
|-----------------------------|------------|---------------------------|------------|
| 10 μA BIAS CURRENT RANGE | | 100 μA BIAS CURRENT RANGE | |
| A | 9.7142E-04 | A | 9.6542E-04 |
| B | 2.3268E-04 | B | 2.3356E-04 |
| C | 8.0591E-08 | C | 7.7781E-08 |

| TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) |
|-----------|--------------------|------------------|-------------------|-----------|--------------------|------------------|-------------------|-----------|--------------------|------------------|-------------------|
| -35 | 486200 | 4.862 | | 0 | 65320 | 0.653 | | 35 | 13062 | | 1.306 |
| -34 | 456000 | 4.560 | | 1 | 62080 | 0.620 | | 36 | 12534 | | 1.253 |
| -33 | 427800 | 4.278 | | 2 | 59020 | 0.590 | | 37 | 12030 | | 1.203 |
| -32 | 401600 | 4.016 | | 3 | 56120 | 0.561 | | 38 | 11548 | | 1.154 |
| -31 | 377200 | 3.772 | | 4 | 53380 | 0.533 | | 39 | 11090 | | 1.109 |
| -30 | 354400 | 3.544 | | 5 | 50800 | 0.508 | | 40 | 10652 | | 1.065 |
| -29 | 333000 | 3.330 | | 6 | 48360 | 0.483 | 4.836 | 41 | 10232 | | 1.023 |
| -28 | 313200 | 3.132 | | 7 | 46040 | 0.460 | 4.604 | 42 | 9832 | | 0.983 |
| -27 | 294600 | 2.946 | | 8 | 43840 | 0.438 | 4.384 | 43 | 9450 | | 0.945 |
| -26 | 277200 | 2.772 | | 9 | 41780 | 0.417 | 4.178 | 44 | 9086 | | 0.908 |
| -25 | 261000 | 2.610 | | 10 | 39800 | 0.398 | 3.980 | 45 | 8736 | | 0.873 |
| -24 | 245800 | 2.458 | | 11 | 37940 | 0.379 | 3.794 | 46 | 8402 | | 0.840 |
| -23 | 231600 | 2.316 | | 12 | 36180 | 0.361 | 3.618 | 47 | 8082 | | 0.808 |
| -22 | 218400 | 2.184 | | 13 | 34520 | 0.345 | 3.452 | 48 | 7776 | | 0.777 |
| -21 | 206000 | 2.060 | | 14 | 32940 | 0.329 | 3.294 | 49 | 7484 | | 0.748 |
| -20 | 194260 | 1.942 | | 15 | 31420 | 0.314 | 3.142 | 50 | 7204 | | 0.720 |
| -19 | 183320 | 1.833 | | 16 | 30000 | 0.300 | 3.000 | 51 | 6936 | | 0.693 |
| -18 | 173080 | 1.730 | | 17 | 28640 | 0.286 | 2.864 | 52 | 6680 | | 0.668 |
| -17 | 163460 | 1.634 | | 18 | 27360 | 0.273 | 2.736 | 53 | 6434 | | 0.643 |
| -16 | 154440 | 1.544 | | 19 | 26140 | 0.261 | 2.614 | 54 | 6198 | | 0.619 |
| -15 | 145960 | 1.459 | | 20 | 24980 | 0.249 | 2.498 | 55 | 5974 | | 0.597 |
| -14 | 138000 | 1.380 | | 21 | 23880 | 0.238 | 2.388 | 56 | 5756 | | 0.575 |
| -13 | 130520 | 1.305 | | 22 | 22840 | 0.228 | 2.284 | 57 | 5550 | | 0.555 |
| -12 | 123500 | 1.235 | | 23 | 21840 | 0.218 | 2.184 | 58 | 5350 | | 0.535 |
| -11 | 116900 | 1.169 | | 24 | 20900 | 0.209 | 2.090 | 59 | 5160 | | 0.516 |
| -10 | 110680 | 1.106 | | 25 | 20000 | 0.200 | 2.000 | 60 | 4978 | | 0.497 |
| -9 | 104840 | 1.048 | | 26 | 19144 | 0.191 | 1.914 | 61 | 4802 | | 0.480 |
| -8 | 99340 | 0.993 | | 27 | 18330 | 0.183 | 1.833 | 62 | 4634 | | 0.463 |
| -7 | 94160 | 0.941 | | 28 | 17554 | 0.175 | 1.755 | 63 | 4472 | | 0.447 |
| -6 | 89280 | 0.892 | | 29 | 16816 | | 1.681 | 64 | 4316 | | 0.431 |
| -5 | 84680 | 0.846 | | 30 | 16112 | | 1.611 | 65 | 4168 | | 0.416 |
| -4 | 80340 | 0.803 | | 31 | 15442 | | 1.544 | 66 | 4024 | | 0.402 |
| -3 | 76240 | 0.762 | | 32 | 14804 | | 1.480 | 67 | 3888 | | 0.388 |
| -2 | 72400 | 0.724 | | 33 | 14196 | | 1.419 | 68 | 3756 | | 0.375 |
| -1 | 68760 | 0.687 | | 34 | 13616 | | 1.361 | 69 | 3628 | | 0.362 |

TCS650 50 k Ω Bead Head Thermistor @ 25°C

RESISTANCE VERSUS TEMPERATURE RESPONSE

10 μ A Bias Current Temperature Range: -18 to +49°C100 μ A Bias Current Temperature Range: +25 to +92°C

| Steinhart-Hart Coefficients | | | |
|-------------------------------|------------|--------------------------------|------------|
| 10 μ A BIAS CURRENT RANGE | | 100 μ A BIAS CURRENT RANGE | |
| A | 9.5346E-04 | A | 9.6911E-04 |
| B | 2.1233E-04 | B | 2.1014E-04 |
| C | 8.1509E-08 | C | 8.8019E-08 |

| TEMP (°C) | R _T (Ω) | VOLT (V) (10 μ A) | VOLT (V) (100 μ A) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μ A) | VOLT (V) (100 μ A) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μ A) | VOLT (V) (100 μ A) |
|-----------|-----------------------------|-----------------------|------------------------|-----------|-----------------------------|-----------------------|------------------------|-----------|-----------------------------|-----------------------|------------------------|
| -18 | 489000 | 4.890 | | 19 | 66500 | 0.665 | | 56 | 13205 | | 1.320 |
| -17 | 460500 | 4.605 | | 20 | 63350 | 0.633 | | 57 | 12695 | | 1.269 |
| -16 | 434000 | 4.340 | | 21 | 60400 | 0.604 | | 58 | 12210 | | 1.221 |
| -15 | 409000 | 4.090 | | 22 | 57600 | 0.576 | | 59 | 11740 | | 1.174 |
| -14 | 385500 | 3.855 | | 23 | 54950 | 0.549 | | 60 | 11295 | | 1.129 |
| -13 | 364000 | 3.640 | | 24 | 52400 | 0.524 | | 61 | 10870 | | 1.087 |
| -12 | 343500 | 3.435 | | 25 | 50000 | 0.500 | 5.000 | 62 | 10460 | | 1.046 |
| -11 | 324000 | 3.240 | | 26 | 47725 | 0.477 | 4.772 | 63 | 10070 | | 1.007 |
| -10 | 306000 | 3.060 | | 27 | 45565 | 0.455 | 4.556 | 64 | 9695 | | 0.969 |
| -9 | 289000 | 2.890 | | 28 | 43510 | 0.435 | 4.351 | 65 | 9335 | | 0.933 |
| -8 | 273000 | 2.730 | | 29 | 41565 | 0.415 | 4.156 | 66 | 8990 | | 0.899 |
| -7 | 258000 | 2.580 | | 30 | 39710 | 0.397 | 3.971 | 67 | 8660 | | 0.866 |
| -6 | 244000 | 2.440 | | 31 | 37950 | 0.379 | 3.795 | 68 | 8345 | | 0.834 |
| -5 | 231000 | 2.310 | | 32 | 36280 | 0.362 | 3.628 | 69 | 8040 | | 0.804 |
| -4 | 218500 | 2.185 | | 33 | 34690 | 0.346 | 3.469 | 70 | 7750 | | 0.775 |
| -3 | 206500 | 2.065 | | 34 | 33180 | 0.331 | 3.318 | 71 | 7475 | | 0.747 |
| -2 | 195500 | 1.955 | | 35 | 31740 | 0.317 | 3.174 | 72 | 7205 | | 0.720 |
| -1 | 185500 | 1.855 | | 36 | 30370 | 0.303 | 3.037 | 73 | 6950 | | 0.695 |
| 0 | 175500 | 1.755 | | 37 | 29070 | 0.290 | 2.907 | 74 | 6705 | | 0.670 |
| 1 | 166500 | 1.665 | | 38 | 27830 | 0.278 | 2.783 | 75 | 6465 | | 0.646 |
| 2 | 157500 | 1.575 | | 39 | 26650 | 0.266 | 2.665 | 76 | 6240 | | 0.624 |
| 3 | 149500 | 1.495 | | 40 | 25525 | 0.255 | 2.552 | 77 | 6020 | | 0.602 |
| 4 | 142000 | 1.420 | | 41 | 24455 | 0.244 | 2.445 | 78 | 5815 | | 0.581 |
| 5 | 134500 | 1.345 | | 42 | 23430 | 0.234 | 2.343 | 79 | 5610 | | 0.561 |
| 6 | 127500 | 1.275 | | 43 | 22460 | 0.224 | 2.246 | 80 | 5420 | | 0.542 |
| 7 | 121500 | 1.215 | | 44 | 21530 | 0.215 | 2.153 | 81 | 5235 | | 0.523 |
| 8 | 115000 | 1.150 | | 45 | 20645 | 0.206 | 2.064 | 82 | 5055 | | 0.505 |
| 9 | 109500 | 1.095 | | 46 | 19805 | 0.198 | 1.980 | 83 | 4885 | | 0.488 |
| 10 | 103900 | 1.039 | | 47 | 19000 | 0.190 | 1.900 | 84 | 4720 | | 0.472 |
| 11 | 98800 | 0.988 | | 48 | 18230 | 0.182 | 1.823 | 85 | 4560 | | 0.456 |
| 12 | 93900 | 0.939 | | 49 | 17495 | 0.175 | 1.749 | 86 | 4410 | | 0.441 |
| 13 | 89350 | 0.893 | | 50 | 16795 | | 1.679 | 87 | 4260 | | 0.426 |
| 14 | 85000 | 0.850 | | 51 | 16125 | | 1.612 | 88 | 4120 | | 0.412 |
| 15 | 80850 | 0.808 | | 52 | 15490 | | 1.549 | 89 | 3985 | | 0.398 |
| 16 | 77000 | 0.770 | | 53 | 14880 | | 1.488 | 90 | 3855 | | 0.385 |
| 17 | 73300 | 0.733 | | 54 | 14295 | | 1.429 | 91 | 3730 | | 0.373 |
| 18 | 69800 | 0.698 | | 55 | 13740 | | 1.374 | 92 | 3605 | | 0.360 |

TCS651 100 kΩ Bead Head Thermistor @ 25°C

RESISTANCE VERSUS TEMPERATURE RESPONSE

10 μA Bias Current Temperature Range: -6 to +67°C

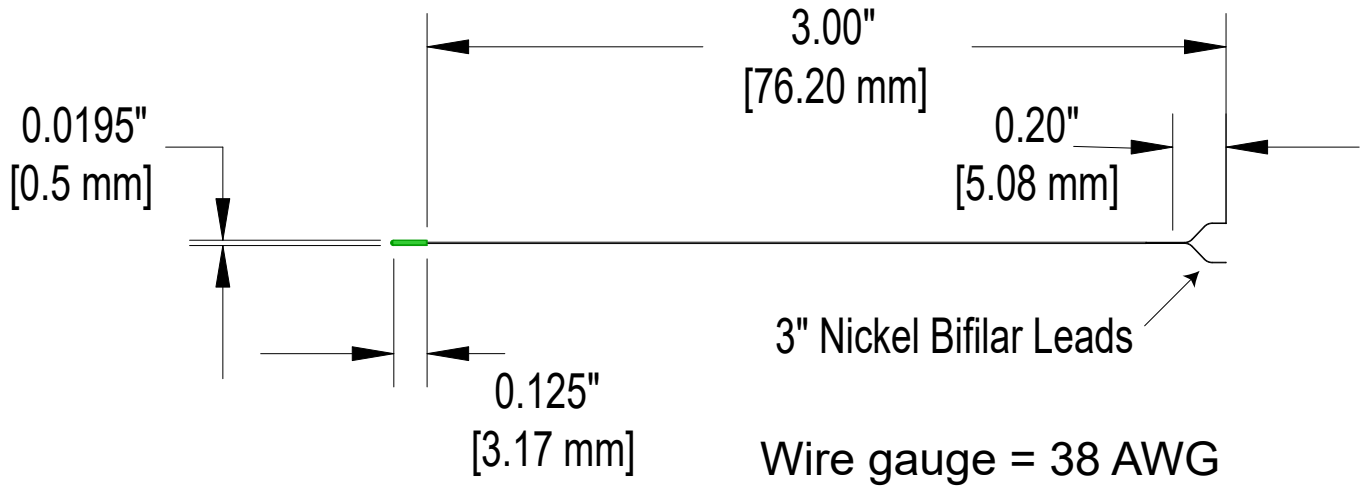
100 μA Bias Current Temperature Range: +41 to +114°C

| Steinhart-Hart Coefficients | | | |
|-----------------------------|------------|---------------------------|-------------|
| 10 μA BIAS CURRENT RANGE | | 100 μA BIAS CURRENT RANGE | |
| A | 8.2458E-04 | A | 8.47031E-04 |
| B | 2.0913E-04 | B | 2.0561E-04 |
| C | 7.9780E-08 | C | 9.2670E-08 |

| TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) | TEMP (°C) | R _T (Ω) | VOLT (V) (10 μA) | VOLT (V) (100 μA) |
|-----------|--------------------|------------------|-------------------|-----------|--------------------|------------------|-------------------|------------|--------------------|------------------|-------------------|
| -6 | 488000 | 4.880 | | 34 | 66360 | 0.665 | | 74 | 13410 | | 1.341 |
| -5 | 462000 | 4.620 | | 35 | 63480 | 0.633 | | 75 | 12930 | | 1.293 |
| -4 | 437000 | 4.370 | | 36 | 60740 | 0.604 | | 76 | 12480 | | 1.248 |
| -3 | 413000 | 4.130 | | 37 | 58140 | 0.576 | | 77 | 12040 | | 1.204 |
| -2 | 391000 | 3.910 | | 38 | 55660 | 0.549 | | 78 | 11630 | | 1.163 |
| -1 | 371000 | 3.710 | | 39 | 53300 | 0.524 | | 79 | 11220 | | 1.122 |
| 0 | 351000 | 3.510 | | 40 | 51050 | 0.500 | | 80 | 10840 | | 1.084 |
| 1 | 333000 | 3.330 | | 41 | 48910 | 0.477 | 4.891 | 81 | 10470 | | 1.047 |
| 2 | 315000 | 3.150 | | 42 | 46860 | 0.455 | 4.680 | 82 | 10110 | | 1.011 |
| 3 | 299000 | 2.990 | | 43 | 44920 | 0.435 | 4.492 | 83 | 9770 | | 0.977 |
| 4 | 284000 | 2.840 | | 44 | 43060 | 0.415 | 4.306 | 84 | 9440 | | 0.944 |
| 5 | 269000 | 2.690 | | 45 | 41290 | 0.397 | 4.129 | 85 | 9120 | | 0.912 |
| 6 | 255000 | 2.550 | | 46 | 39610 | 0.379 | 3.960 | 86 | 8820 | | 0.882 |
| 7 | 243000 | 2.430 | | 47 | 38000 | 0.362 | 3.800 | 87 | 8520 | | 0.852 |
| 8 | 230000 | 2.300 | | 48 | 36460 | 0.346 | 3.640 | 88 | 8240 | | 0.824 |
| 9 | 219000 | 2.190 | | 49 | 34990 | 0.331 | 3.499 | 89 | 7970 | | 0.797 |
| 10 | 207800 | 2.078 | | 50 | 33590 | 0.317 | 3.359 | 90 | 7710 | | 0.771 |
| 11 | 197600 | 1.976 | | 51 | 32250 | 0.303 | 3.225 | 91 | 7460 | | 0.746 |
| 12 | 187800 | 1.878 | | 52 | 30980 | 0.290 | 3.098 | 92 | 7210 | | 0.721 |
| 13 | 178700 | 1.787 | | 53 | 29760 | 0.278 | 2.976 | 93 | 6980 | | 0.698 |
| 14 | 170000 | 1.700 | | 54 | 28590 | 0.266 | 2.859 | 94 | 6760 | | 0.676 |
| 15 | 161700 | 1.617 | | 55 | 27480 | 0.255 | 2.748 | 95 | 6540 | | 0.654 |
| 16 | 154000 | 1.540 | | 56 | 26410 | 0.244 | 2.641 | 96 | 6330 | | 0.633 |
| 17 | 146600 | 1.466 | | 57 | 25390 | 0.234 | 2.539 | 97 | 6130 | | 0.613 |
| 18 | 139600 | 1.396 | | 58 | 24420 | 0.224 | 2.442 | 98 | 5940 | | 0.594 |
| 19 | 133000 | 1.330 | | 59 | 23480 | 0.215 | 2.348 | 99 | 5750 | | 0.575 |
| 20 | 126700 | 1.267 | | 60 | 22590 | 0.206 | 2.259 | 100 | 5570 | | 0.557 |
| 21 | 120800 | 1.208 | | 61 | 21740 | 0.198 | 2.174 | 101 | 5400 | | 0.540 |
| 22 | 115200 | 1.152 | | 62 | 20920 | 0.190 | 2.092 | 102 | 5230 | | 0.523 |
| 23 | 109900 | 1.099 | | 63 | 20140 | 0.182 | 2.014 | 103 | 5070 | | 0.507 |
| 24 | 104800 | 1.048 | | 64 | 19390 | 0.175 | 1.939 | 104 | 4910 | | 0.491 |
| 25 | 100000 | 1.000 | | 65 | 18670 | | 1.867 | 105 | 4760 | | 0.476 |
| 26 | 95450 | 0.954 | | 66 | 17980 | | 1.798 | 106 | 4620 | | 0.462 |
| 27 | 91130 | 0.911 | | 67 | 17320 | | 1.732 | 107 | 4480 | | 0.448 |
| 28 | 87020 | 0.870 | | 68 | 16690 | | 1.669 | 108 | 4340 | | 0.434 |
| 29 | 83130 | 0.831 | | 69 | 16080 | | 1.608 | 109 | 4210 | | 0.421 |
| 30 | 79420 | 0.794 | | 70 | 15500 | | 1.550 | 110 | 4080 | | 0.408 |
| 31 | 75900 | 0.759 | | 71 | 14950 | | 1.495 | 111 | 3960 | | 0.396 |
| 32 | 72560 | 0.725 | | 72 | 14410 | | 1.441 | 112 | 3840 | | 0.384 |
| 33 | 69380 | 0.693 | | 73 | 13900 | | 1.390 | 113 | 3730 | | 0.373 |
| | | | | | | | | 114 | 3620 | | 0.362 |

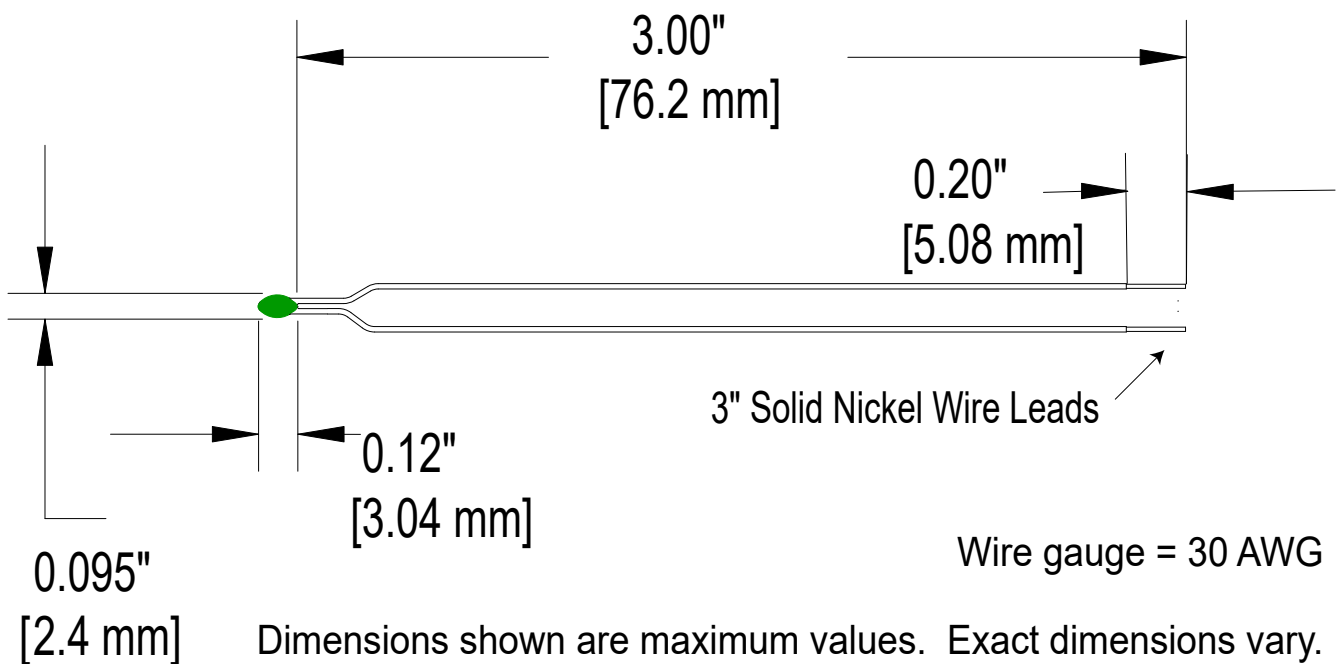
MECHANICAL SPECIFICATIONS

TCS10K5 CYLINDRICAL HEAD THERMISTOR



Dimensions shown are maximum. Exact dimensions vary.

TCS BEAD HEAD THERMISTORS



CERTIFICATION AND WARRANTY

CERTIFICATION

Wavelength Electronics, Inc. (Wavelength) certifies that this product met its published specifications at the time of shipment. Wavelength further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by that organization's calibration facilities, and to the calibration facilities of other International Standards Organization members.

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For warranty service or repair, this product must be returned to the factory. An RMA is required for products returned to Wavelength for warranty service. The Buyer shall prepay shipping charges to Wavelength and Wavelength shall pay shipping charges to return the product to the Buyer upon determination of defective materials or workmanship. However, the Buyer shall pay all shipping charges, duties, and taxes for products returned to Wavelength from another country.

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The warranty shall not apply to defects resulting from improper use or misuse of the product or operation outside published specifications. No other warranty is expressed or implied. Wavelength specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

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REVISION HISTORY

DOCUMENT NUMBER: TCS-00400

| REV. | DATE | CHANGE |
|------|--------------|-----------------|
| A | January 2019 | Initial Release |



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