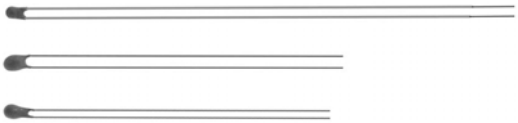
# NTC Thermistors, Coated



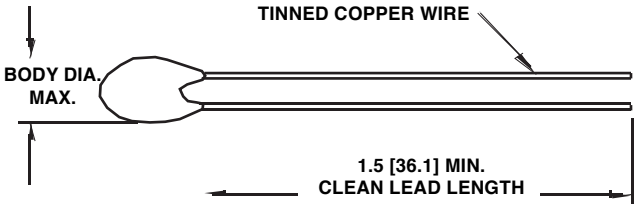
## FEATURES

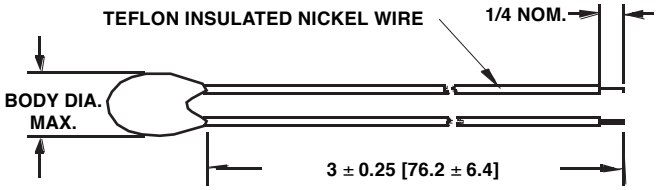
- Small size - conformally coated.
- Wide resistance range.
- Available in 11 different R-T curves.

## DESCRIPTION

Models M, C, and T are conformally coated, leaded thermistors for standard PC board mounting or assembly in probes. The coating is baked-on phenolic for durability and long-term stability. Models M and C have tinned solid copper leads. Model T has solid nickel wires with Teflon® insulation to provide isolation when assembled in metal probes or housings.

## DIMENSIONS in inches [millimeters]




| LD DIAMETER | WIRE SIZE |
|---|---|
| Type M | AWG 30: 0.0100 [0.254] |
| Type C | AWG 28: 0.0126 [0.320] |
| Type T | AWG 30: 0.0100 [0.254] |

## GLOBAL PART NUMBER INFORMATION

**New Global Part Numbering: 01C2001FP (preferred part numbering format)**

| 0 | 1 | C | 2 | 0 | 0 | 1 | F | P | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| CURVE | GLOBAL MODEL | RESISTANCE VALUE | POINT MATCH TOLERANCE | PACKAGING |
|---|---|---|---|---|
| 01<br>02<br>03<br>04<br>07<br>08<br>09<br>12<br>13<br>14<br>17 | C<br>M<br>T | **2001** = 2K | **F** = ± 1 %<br>**J** = ± 5 %<br>**K** = ± 10 % | **F** = Lead (Pb)-free, Bulk<br>**P** = Tin/Lead, Bulk |

**Historical Part Number example: 1C2001FP (will continue to be accepted)**

| 01 | C | 2001 | F | P |
|---|---|---|---|---|
| HISTORICAL CURVE | GLOBAL MODEL | RESISTANCE VALUE | TOLERANCE CODE | PACKAGING |

**New Global Part Numbering: 01C2001SPC3 (preferred part numbering format)**

| 0 | 1 | C | 2 | 0 | 0 | 1 | S | P | C | 3 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| CURVE | GLOBAL MODEL | RESISTANCE VALUE | CHARACTERISTICS | PACKAGING | CURVE TRACK TOLERANCE* |
|---|---|---|---|---|---|
| 01<br>02<br>03<br>04<br>07<br>08<br>09<br>12<br>13<br>14<br>17 | C<br>M<br>T | **2001** = 2K | S | **F** = Lead (Pb)-free, Bulk<br>**P** = Tin/Lead, Bulk | A3<br>B3<br>C3<br>A2<br>B2<br>C2<br>A4<br>B4<br>A5<br>B5<br>C5<br>A8<br>B8<br>C8 |

*See following pages for Tolerance explanations and details.

**Historical Part Number example: 1C2001SPC3 (will continue to be accepted)**

| 1 | C | 2001 | S | P | C3 |
|---|---|---|---|---|---|
| HISTORICAL CURVE | GLOBAL MODEL | RESISTANCE VALUE | CHARACTERISTIC | PACKAGING | CURVE TRACK TOLERANCE |

## SELECTION GUIDE FOR TYPE M, C, AND T THERMISTORS

| $R_{25}$ (Ohms) | CURVE NUMBER | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 7 | 8 | 9 | 12 | 14 | 17 |
| 27 | | | | | | | | | • | |
| 33 | | | | | | | | | •• | |
| 50 | | | | | | | | | ••• | |
| 56 | | | | | | | | | ••• | |
| 68 | | | • | | | | | | ••• | |
| 82 | | | •• | | | | | | ••• | |
| 100 | | | •• | | | | | | ••• | |
| 120 | | | •• | | | | | | ••• | |
| 150 | | | ••• | | | | | | ••• | |
| 180 | | | ••• | | | | | | ••• | |
| 220 | | | ••• | | | | | | ••• | |
| 270 | | | ••• | | | | | | | |
| 330 | | • | ••• | | | | | | | |
| 390 | | •• | ••• | | | | | | | |
| 470 | | •• | ••• | | | | | | | |
| 500 | | •• | ••• | | | | | | | |
| 560 | | •• | ••• | | | | | | | |
| 680 | | ••• | | | | | | | | |
| 820 | | ••• | | | | | | | | |
| 1K | | ••• | | | | | | | | |
| 1.2K | | ••• | | | | | | | | |
| 1.5K | | ••• | | | | | | | | |
| 1.8K | • | ••• | | | | | | | | |
| 2.2K | • | ••• | | | | | | | | |
| 2.7K | •• | ••• | | | | | | | | |
| 3.3K | •• | ••• | | | | | | | | |
| 3.9K | ••• | | | | | | | | | |
| 4.7K | ••• | | | | | | | | | |
| 5K | ••• | | | | | | | | | |
| 5.6K | ••• | | | | | | | | | |
| 6.8K | ••• | | | | | | | | | • |
| 8.2K | ••• | | | | | | • | | | • |
| 10K | ••• | | | • | | | •• | | | •• |
| 12K | ••• | | | • | | | •• | | | •• |
| 15K | ••• | | | •• | | | ••• | | | ••• |
| 18K | ••• | | | •• | | | ••• | | | ••• |
| 22K | | | | •• | | | ••• | | | ••• |
| 27K | | | | •• | • | • | ••• | | | ••• |
| 33K | | | | ••• | • | •• | ••• | | | ••• |
| 39K | | | | ••• | •• | •• | ••• | | | ••• |
| 47K | | | | ••• | •• | ••• | ••• | | | ••• |
| 50K | | | | ••• | •• | ••• | ••• | | | ••• |
| 56K | | | | ••• | ••• | ••• | ••• | | | |
| 68K | | | | ••• | ••• | ••• | | | | |
| 82K | | | | ••• | ••• | ••• | | | | |
| 100K | | | | ••• | ••• | ••• | | | | |
| 120K | | | | | ••• | ••• | | | | |
| 150K | | | | | ••• | ••• | | | | |
| 180K | | | | | ••• | ••• | | | | |
| 220K | | | | | ••• | | | | | |
| 270K | | | | | ••• | | | | | |
| 330K | | | | | | | | • | | |
| 390K | | | | | | | | •• | | |
| 470K | | | | | | | | •• | | |
| 500K | | | | | | | | ••• | | |
| 560K | | | | | | | | ••• | | |
| 680K | | | | | | | | ••• | | |
| 820K | | | | | | | | ••• | | |
| 1 Meg | | | | | | | | ••• | | |

**MAXIMUM BODY DIAMETER**

| | |
|---|---|
| • | 0.125 [3.2] |
| •• | 0.110 [2.8] |
| ••• | 0.095 [2.4] |

**DISSIPATION CONSTANT**
2 - 3 mWatts/°C

**THERMAL TIME CONSTANT**
6 - 14 Seconds

**NOTE:**

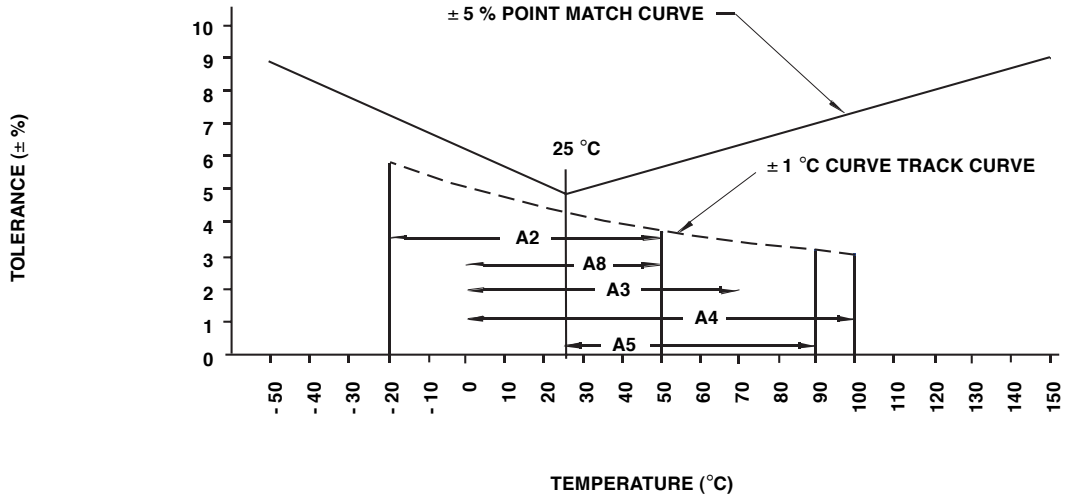
1. Intermediate resistance values between the standard value series are available. Size would be the same as the color grouping.
2. Other body diameters available. Bead diameter increases as Res. decreases. (Consult Factory)
3. Leaded series of thermistors includes additional styles: (Consult Factory)

   Type B: 26AWG lead, 0.0159 [0.40]
   Type F: 32AWG lead, 0.008 [0.20]
   Type E: 24AWG lead, 0.020 [0.51]
   Type D: 22AWG lead, 0.025 [0.64]
   Type G: 20AWG lead, 0.032 [0.81]
   Type H: 18AWG lead, 0.040 [1.02]

## TOLERANCES AVAILABLE FOR TYPE M, C AND T THERMISTORS

### DESCRIPTION OF THERMISTOR TOLERANCES

The many applications of thermistors have mandated the need for two basic tolerance schemes for these products - Curve Tracking and Point Match Thermistors. An example of the resistance tolerance at various temperatures for the two different tolerancing methods is described in the following graph:




### CURVE TRACKING TOLERANCE

Thermistors are calibrated at the high temperature of the curve track range and then final tested at the low temperature of the curve track range. This ensures that the thermistor will meet the specified temperature accuracy at every temperature within the desired temperature range. Several temperature ranges are available and the accuracy of the thermistor may be ± 0.2 °C, ± 0.5 °C, and ± 1.0 °C. The Curve Tracking temperature ranges and their code designators are shown in Figure 1 and Table 1.

To specify, add the appropriate suffix from the following table to the part number.

Example: 1M1002-B3 = Curve 1, 10 kilohms at + 25 °C, curve tracking to ± 0.5 °C from 0 °C to + 70 °C

**STANDARD ELECTRICAL SPECIFICATIONS FOR CURVE TRACKING THERMISTORS**

| TEMP. RANGE | | 0 °C to + 70 °C | | | - 20 °C to + 50 °C | | | 0 °C to + 100 °C | | | 25 °C to + 90 °C | | | 0 °C to + 50 °C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOLERANCE | | ± 1 °C | ± 0.5 °C | ± 0.2 °C | ± 1 °C | ± 0.5 °C | ± 0.2 °C | ± 1 °C | ± 0.5 °C | ± 0.2 °C | ± 1 °C | ± 0.5 °C | ± 0.2 °C | ± 1 °C | ± 0.5 °C | ± 0.2 °C |
| PART NO. SUFFIX | | - A3 | - B3 | - C3 | - A2 | - B2 | - C2 | - A4 | - B4 | - C4 | - A5 | - B5 | - C5 | - A8 | - B8 | - C8 |
| C | 1 | X | X | X | X | X | X | X | X | N/A | X | X | X | X | X | X |
| U | 2 | X | X | X | X | X | X | X | X | N/A | X | X | X | X | X | X |
| R | 4 | X | X | X | X | X | X | X | X | N/A | X | X | X | X | X | X |
| V | 8 | X | X | X | X | X | X | X | X | N/A | X | X | X | X | X | X |
| E | 9 | X | X | X | X | X | X | X | X | N/A | X | X | X | X | X | X |

## POINT MATCH TOLERANCE

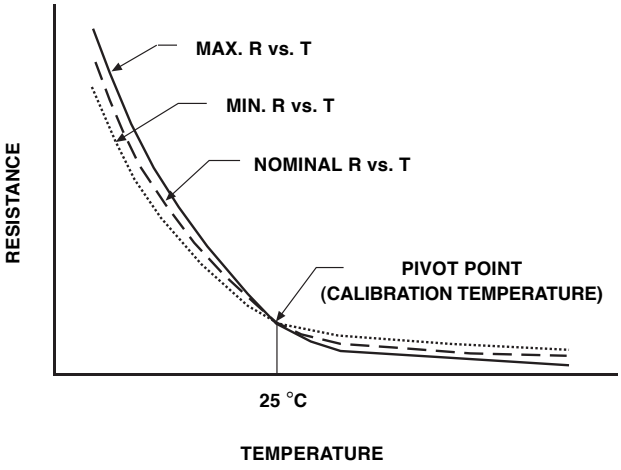
The standard leaded thermistors are calibrated and tested at 25 °C to a tolerance of ± 5 % or ± 10 %; however, tighter tolerance, point matched thermistors are readily available as are special point match temperatures to fit your application.

Since these thermistors have only one controlled point of reference (the point match temperature), the resistance at other temperatures is given by the "Resistance vs. Temperature Conversion Tables" for the appropriate material curve. The resistance value at any temperature is the ratio factor times the resistance at 25 °C.

Example: 1M1002-5, +70 °C resistance = (Resistance factor for curve 1 at 70 °C is 0.1990) X (10000 ohm resistance at 25 °C) = 1990 ohms.

The tolerance of the resistance at any temperature is described by Figure 2.

### FIGURE 2
### POINT MATCH TOLERANCES VS. TEMPERATURE




Point match resistance tolerances at temperatures other than 25 ºC are not the same as the calibration temperature. This difference is presented in Figure 2.

The tolerance at any given temperature is the point match tolerance + the MT ± % (Manufacturing Tolerance).

The MT ± % may be obtained from the R vs. T Conversion tables and is added to the point match temperature, i.e., ± 1 % Tol. at 25 ºC + ± 2.6 % at - 30 ºC for Curve 1 equals a total tolerance of ± 3.6 % at - 30 ºC.

## COMPUTER AIDS FOR THERMISTOR SELECTION

A spreadsheet is available for the Vishay Thermistor Materials that calculates Beta, Steinhart-Hart Equation Constants A, B, and C, the resistance at any temperature based upon the Steinhart constants or Beta, the temperature equivalent of the resistance reading, and resistance temperature coefficients.

This spread sheet will also calculate the total resistance tolerance of any point matched thermistor for temperatures in 10 ºC increments, and the resistance tolerance at any temperature within the calibrated range of curve tracking thermistors. Please contact factory if interested in this Excel™ spreadsheet.

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**Как с нами связаться**

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