NTC Thermistors, Radial Leaded and Coated

FEATURES

- Small size - conformally coated
- Wide resistance range
- Available in 7 different R-T curves
- Available in point matched tolerances down to 1 % and curve tracking precision down to ± 0.2 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

APPLICATIONS

Temperature measurement, sensing and control in industrial, consumer and telecom applications. For on-board sensing or for accurate remote sensing in metal probes or housings.

DESCRIPTION

Models T, M, and C are conformally coated, leaded thermistors. 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.

DESIGN-IN SUPPORT

For complete Curve Computation, visit:
www.vishay.com/thermistors/curve-computation-list/

QUICK REFERENCE DATA		
PARAMETER	VALUE	UNIT
Resistance value at 25 °C	30 to 1M	Ω
Tolerance on R_{25}-value (point matched)	± 1, ± 2, ± 3, ± 5, ± 10	%
Temperature accuracy (curve tracking)	± 0.2, ± 0.5, ± 1	°C
$B_{25/75}$ -value	3477 to 4842	K
$B_{25/85}$ -value	3468 to 4875	K
Maximum dissipation	50 to 100	mW
Dissipation factor δ (for information only)	2 to 3.5	mW/K
Thermal time constant τ (for information only)	6 to 14	s
Response time (oil) (for information only)	1.3	s
Operating temperature range at zero power (short term)	-40 to +125 (150)	°C
Weight	≈ 0.075 to 0.15	g

T, M, C PRODUCT DATA AND R_{25} RESISTANCE RANGE AVAILABILITY							
CURVE	$B_{25/75}$ (K)	$B_{25/85}$ (K)	TCR_{25} (%/K)	T (kΩ)	M (kΩ)	C (kΩ)	R_{25} ± TOL. AVAILABILITY
2	3477	3486	-3.84	0.03 to 3.3			1, 2, 3, 5, 10
9	3679	3694	-4.03	10 to 56			1, 2, 3, 5, 10
8	3925	3943	-4.30	20 to 220			1, 2, 3, 5, 10
1	3964	3974	-4.39	0.2 to 18			1, 2, 3, 5, 10
4	4247	4262	-4.67	10 to 100			1, 2, 3, 5, 10
7	4437	4461	-4.83	10 to 270			1, 2, 3, 5, 10
12	4842	4875	-5.23	47 to 1000			1, 2, 3, 5, 10
Maximum dissipation at 25 °C in mW				50	75	100	
Dissipation factor in mW/K (1)				2.0	2.5	3.0	
Response time in s (1)				1.3	1.2	1.4	
Thermal time constant in s (1)				14	10	6	

Note

(1) For information only, dissipation factor, response time, and thermal time constant are wire type and product size dependent

STANDARD RESISTANCE VALUES at 25 °C in Ω									
33	82	270	680	2.2K	5.6K	18K	50K	150K	500K
39	100	330	820	2.7K	6.8K	22K	56K	220K	560K
47	120	390	1K	3.3K	8.2K	27K	68K	270K	680K
50	150	470	1.2K	3.9K	10K	33K	82K	330K	820K
56	180	500	1.5K	4.7K	12K	39K	100K	390K	1M
68	220	560	1.8K	5.0K	15K	47K	120K	470K	

Note

- Most popular and available values, intermediate resistance values and tolerances available on request

For technical questions, contact: thermistor1@vishay.com

GLOBAL PART NUMBER AND ORDERING INFORMATION

Global Part Numbering: 01C2001FP for POINT MATCHED THERMISTORS

0	1	C	2	0	0	1	F	P									

CURVE NR	GLOBAL MODEL	RESISTANCE VAL	POINT MATCH TOLERANCE	PACKAGING
01 **02** **04** **07** **08** **09** **12**	**T** **M** **C**	**2001** = 2K **1503** = 150K	**F** = ± 1 % **G** = ± 2 % **H** = ± 3 % **J** = ± 5 % **K** = ± 10 %	**F** = lead (Pb)-free, bulk **P** = tin / lead, bulk

Global Part Numbering: 01C2001SPC3 for CURVE TRACKING THERMISTORS

0	1	C	2	0	0	1	S	P	C	3							

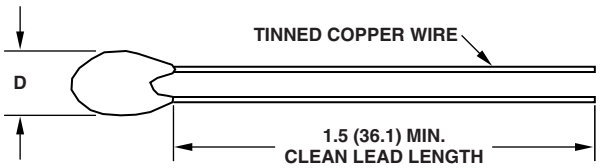
CURVE	GLOBAL MODEL	RESISTANCE VAL	CHARACTERISTICS	PACKAGING	CURVE TRACK TOLERANCE (1)			
01 **04** **08** **09**	**T** **M** **C**	**2001** = 2K	**S**	**F** = lead (Pb)-free, bulk **P** = tin / lead, bulk	**A3**	**A4**	**A5**	**A8**
					B3	**B4**	**B5**	**B8**
					C3		**C5**	**C8**

Note

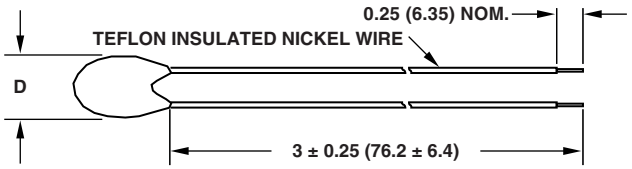
(1) See following pages for tolerance explanations and details

DIMENSIONS in inches (millimeters)

TYPE M, C



TYPE T



PRODUCT TYPE	WIRE GAUGE/DIAMETER (1)
Type M	AWG 30: 0.0100 (0.254)
Type C	AWG 28: 0.0126 (0.320)
Type T	Insulated AWG 30: 0.0100 (0.254)

Note

(1) Additional wire gauges (non-insulated) available as AWG24 (type E), AWG26 (type B) and AWG32 (type F). Please contact Vishay (thermistor1@vishay.com) for further details

CURVE NUMBER	R_{25} MIN. (Ω)	MAX. DIAMETER (INCH (mm))	STANDARD R_{25} RANGE (Ω)	MAX. DIAMETER (INCH (mm))
2	30	0.342 (8.69)	330 to 3K	0.095 (2.41) to 0.136 (3.45)
9	10K	0.150 (3.81)	10K to 56K	0.095 (2.41) to 0.150 (3.81)
8	20K	0.131 (3.33)	27K to 220K	0.095 (2.41) to 0.125 (3.18)
1	200	0.315 (8.00)	1.8K to 18K	0.095 (2.41) to 0.136 (3.45)
4	10K	0.136 (3.45)	10K to 100K	0.095 (2.41) to 0.136 (3.45)
7	10K	0.177 (4.50)	27K to 270K	0.095 (2.41) to 0.136 (3.45)
12	47K	0.252 (6.40)	330K to 1M	0.095 (2.41) to 0.136 (3.45)

Note

- Maximum body diameter is dependent on selected curve number and value, the lower resistance values have the largest diameter. For a specific part number within the given resistance ranges, please contact thermistor1@vishay.com for maximum diameter information

TOLERANCES AVAILABLE FOR TYPE T, M, AND C 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:

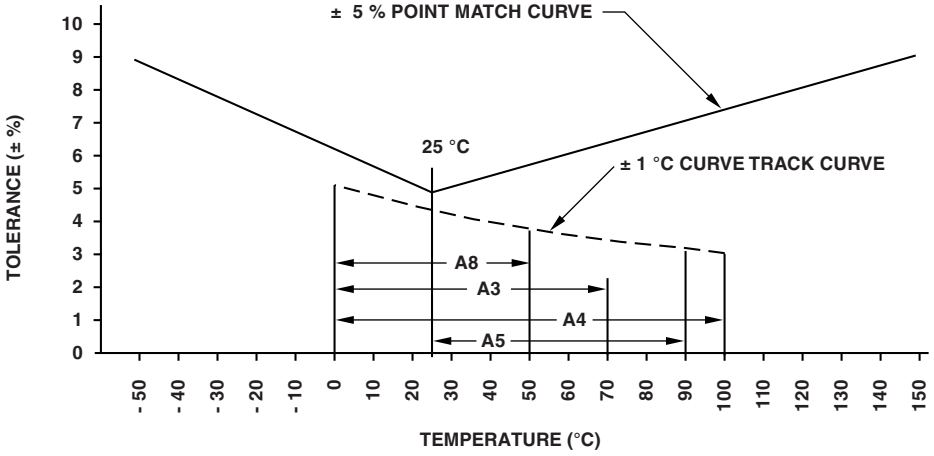


Fig. 1

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 "Standard Electrical Specifications for Curve Tracking Thermistors" table.

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

Example: 01M1002SFB3 = curve 1, 10 kΩ at +25 °C, curve tracking to ± 0.5 °C from 0 °C to +70 °C

STANDARD ELECTRICAL SPECIFICATIONS FOR CURVE TRACKING THERMISTORS

TEMPERATURE RANGE FOR SPECIFIED ACCURACY		0 °C to +70 °C			0 °C to +100 °C			25 °C to +90 °C			0 °C to +50 °C		
ACCURACY		± 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	- A4	- B4	- C4	- A5	- B5	- C5	- A8	- B8	- C8
CURVE NUMBER	01	X	X	X	X	X	n/a	X	X	X	X	X	X
	04	X	X	X	X	X	n/a	X	X	X	X	X	X
	08	X	X	X	X	X	n/a	X	X	X	X	X	X
	09	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 specific curve resistance vs. temperature ratio.

POINT MATCH TOLERANCES VS. TEMPERATURE

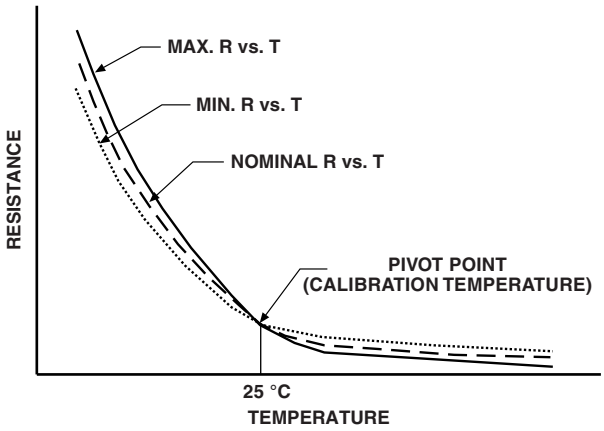


Fig. 1

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

The tolerance at any given temperature is the point match tolerance plus a manufacturing tolerance depending on the specific curve.

DESIGN-IN SUPPORT

A spreadsheet is available for the Vishay thermistor part numbers that gives you the resistance vs temperature data, the temperature coefficients and accuracy levels at any given temperature range and step. The Steinhart & Hart formula and coefficients A, B, and C are shown as well. This data can be obtained by visiting the Vishay NTC curve computation page at: www.vishay.com/thermistors/curve-computation-list/ or send your part number with required temperature range and step to thermistor1@vishay.com.

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