

NTC thermistors for temperature measurement

Probe assemblies

Series/Type: B57703M1 Date: January 2018

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Applications

Measurement of high temperatures on surfaces, e.g. in ovens, on heat sinks and housings

Features

- NTC thermistor encapsulated in a brass metal-tag case
- Suitable for temperatures up to 300 °C at the sensor head
- Easy mounting and good thermal coupling
- Wire heat resistant up to 200 °C (PTFE-insulated wire AWG 26 coated with fiberglass sleeve),
 Molex connector operating temperature: -40 to 105 °C

Options

Alternative cable lengths, R/T characteristics and connectors available on request.

Delivery mode

Bulk

General technical data

Dimensional drawing



Dimensions in mm Approx. weight 8.1 g

Climatic category	(IEC 60068-1)		+10/200/56	
Upper category temperature			200	°C
Maximum operating temperature	(sensor head)	T _{op,max}	300	°C
Max. power	(at 25 °C)	P ₂₅	50	mW
Resistance tolerance		$\Delta R_R/R_R$	±3	%
Rated temperature		T _R	25	°C
Dissipation factor	(in air)	δ_{th}	approx. 2	mW/K
Thermal cooling time constant	(in air)	τ_{c}	approx. 20	s
Heat capacity		C _{th}	approx. 40	mJ/K
Test voltage	(t = 1 s)	Vtest	1250	V AC

Electrical specification and ordering codes

R ₂₅ Ω	No. of R/T characteristic	B _{25/100} K	B _{0/100} K	Ordering code
100 k	8404	4085	4036 ±1%	B57703M1104A002

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Reliability data

Test	Standard	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage at maximum operating temperature		Sensor head placed on metal plate. T: 300 °C t: 1000 h	< 3%	No visible damage
Storage in damp heat, steady state	IEC 60068-2-67	Temperature of air: 85 °C Relative humidity of air: 85% Duration: 56 days	< 3%	No visible damage
Rapid temperature cycling		Sensor tip is exposed to cold and hot air for 5 min duration each temperature. Lower test temperature: 10 °C Upper test temperature: 300 °C Number of cycles: 100	< 3%	No visible damage
Voltage proof test		The sensors are placed in a vessel containing metallic balls of 1 mm diameter (with total immersed head) at ambient temperature: 1250 V AC/1 s		No flashover
Insulation test		The sensors are placed in a vessel containing metallic balls of 1 mm diameter (with total immersed head) at ambient temperature. The applied voltage is 500 V DC.		Above 100 MΩ

Note

Contact of NTC thermistors with any liquids and solvents shall be prevented. It must be ensured that no water enters the NTC thermistors (e.g. through plug terminals).

Avoid dewing and condensation unless thermistor is specified for these conditions.

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R/T characteristics

R/T No.	8404							
T (°C)	B _{0/100} = 4036 k	<	T (°C)	°C) B _{0/100} = 4036 K		T (°C)	B _{0/100} = 4036 K	
	R _T /R ₂₅	α (%/K)		R _T /R ₂₅	α (%/K)		R _T /R ₂₅	α (%/K)
-55.0	98.775	7.4	50.0	0.35272	3.9	155.0	0.014691	2.4
-50.0	68.648	7.1	55.0	0.29119	3.8	160.0	0.013073	2.3
-45.0	48.337	6.9	60.0	0.24161	3.7	165.0	0.011662	2.3
-40.0	34.458	6.6	65.0	0.20144	3.6	170.0	0.010427	2.2
-35.0	24.852	6.4	70.0	0.16874	3.5	175.0	0.0093446	2.2
-30.0	18.124	6.2	75.0	0.14198	3.4	180.0	0.0083928	2.1
-25.0	13.356	6.0	80.0	0.11998	3.3	185.0	0.0075542	2.1
-20.0	9.9413	5.8	85.0	0.10181	3.2	190.0	0.0068135	2.0
-15.0	7.47	5.6	90.0	0.086744	3.2	195.0	0.0061578	2.0
-10.0	5.6639	5.4	95.0	0.074189	3.1	200.0	0.0055762	2.0
-5.0	4.3314	5.3	100.0	0.063688	3.0	205.0	0.0050592	1.9
0.0	3.3396	5.2	105.0	0.05487	2.9	210.0	0.0045986	1.9
5.0	2.585	5.0	110.0	0.047437	2.9	215.0	0.0041876	1.9
10.0	2.0166	4.9	115.0	0.041148	2.8	220.0	0.0038199	1.8
15.0	1.585	4.7	120.0	0.035808	2.7	225.0	0.0034906	1.8
20.0	1.2547	4.6	125.0	0.031259	2.7	230.0	0.0031949	1.8
25.0	1.0000	4.5	130.0	0.02737	2.6	235.0	0.002929	1.7
30.0	0.80223	4.3	135.0	0.024035	2.6	240.0	0.0026895	1.7
35.0	0.64759	4.2	140.0	0.021167	2.5	245.0	0.0024734	1.7
40.0	0.52589	4.1	145.0	0.018691	2.5	250.0	0.002278	1.6
45.0	0.42951	4.0	150.0	0.016549	2.4	—	-	-

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Cautions and warnings

General

See "Important notes" on page 2.

Storage

- Store thermistors only in original packaging. Do not open the package prior to processing.
- Storage conditions in original packaging: storage temperature -25 °C ... +45 °C, relative humidity ≤75% annual mean, <95% maximum 30 days per annum, dew precipitation is inadmissible.</p>
- Do not store thermistors where they are exposed to heat or direct sunlight. Otherwise, the packing material may be deformed or components may stick together, causing problems during mounting.
- Avoid contamination of thermistor surface during storage, handling and processing.
- Avoid storage of thermistors in harmful environments like corrosive gases (SO_x, Cl etc).
- Use the components as soon as possible after opening the original packaging.
- Solder thermistors within the time specified after shipment from EPCOS. For leaded components this is 24 months, for SMD components with nickel barrier termination 12 months, for leadless components this is 12 months, for SMD components with AgPd termination 6 months.

Handling

- NTC thermistors must not be dropped. Chip-offs or any other damage must not be caused during handling of NTCs.
- Do not touch components with bare hands. Gloves are recommended.
- Avoid contamination of thermistor surface during handling.
- Washing processes may damage the product due to the possible static or cyclic mechanical loads (e.g. ultrasonic cleaning). They may cause cracks to develop on the product and its parts, which might lead to reduced reliability or lifetime.

Bending / twisting leads

A lead (wire) may be bent at a minimum distance of twice the wire's diameter plus 4 mm from the component head or housing. When bending ensure the wire is mechanically relieved at the component head or housing. The bending radius should be at least 0.75 mm.

Soldering

- Use resin-type flux or non-activated flux.
- Insufficient preheating may cause ceramic cracks.
- Rapid cooling by dipping in solvent is not recommended.
- Complete removal of flux is recommended.

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Mounting

- Ensure that no thermo-mechanical stress occurs due to production processes (curing or overmolding processes) when thermistors are sealed, potted or overmolded or during their subsequent operation. The maximum temperature of the thermistor must not be exceeded. Ensure that the materials used (sealing/potting compound and plastic material) are chemically neutral.
- Electrodes/contacts must not be scratched or damaged before/during/after the mounting process.
- Contacts and housing used for assembly with the thermistor must be clean before mounting.
- Ensure that adjacent materials are designed for operation at temperatures comparable to the surface temperature of the thermistor. Be sure that surrounding parts and materials can withstand the temperature.
- Avoid contamination of the thermistor surface during processing.
- The connections of sensors (e.g. cable end, wire end, plug terminal) may only be exposed to an environment with normal atmospheric conditions.
- Tensile forces on cables or leads must be avoided during mounting and operation.
- Bending or twisting of cables or leads directly on the thermistor body is not permissible.
- Avoid using chemical substances as mounting aids. It must be ensured that no water or other liquids enter the NTC thermistors (e.g. through plug terminals). In particular, water based substances (e.g. soap suds) must not be used as mounting aids for sensors.
- The use of no-clean solder products is recommended. In any case mild, non-activated fluxes should be used. Flux residues after soldering should be minimized.

Operation

- Use thermistors only within the specified operating temperature range.
- Use thermistors only within the specified power range.
- Environmental conditions must not harm the thermistors. Only use the thermistors under normal atmospheric conditions or within the specified conditions.
- Contact of NTC thermistors with any liquids and solvents shall be prevented. It must be ensured that no water enters the NTC thermistors (e.g. through plug terminals). For measurement purposes (checking the specified resistance vs. temperature), the component must not be immersed in water but in suitable liquids (e.g. perfluoropolyethers such as Galden).
- Avoid dewing and condensation unless thermistor is specified for these conditions.
- Bending or twisting of cables and/or wires is not permissible during operation of the sensor in the application.
- Be sure to provide an appropriate fail-safe function to prevent secondary product damage caused by malfunction.

This listing does not claim to be complete, but merely reflects the experience of EPCOS AG.

Display of ordering codes for EPCOS products

The ordering code for one and the same EPCOS product can be represented differently in data



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sheets, data books, other publications, on the EPCOS website, or in order-related documents such as shipping notes, order confirmations and product labels. The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products. Detailed information can be found on the Internet under www.epcos.com/orderingcodes

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Symbols and terms

Symbol	English	German
A AWG	Area American Wire Gauge	Fläche Amerikanische Norm für Drahtquerschnitte
B B _{25/100}	B value B value determined by resistance measurement at 25 °C and 100 °C	B-Wert B-Wert, ermittelt durch Widerstands- messungen bei 25 °C und 100 °C
C _{th}	Heat capacitance	Wärmekapazität
I	Current	Strom
Ν	Number (integer)	Anzahl (ganzzahliger Wert)
P ₂₅ P _{diss} P _{el} P _{max}	Maximum power at 25 °C Power dissipation Electrical power Maximum power within stated temperature range	Maximale Leistung bei 25 °C Verlustleistung Elektrische Leistung Maximale Leistung im angegebenenTemperaturbereich
$\begin{array}{l} \Delta R_{\text{B}}/R_{\text{B}} \\ R_{\text{ins}} \\ R_{\text{P}} \\ R_{\text{R}} \\ \Delta R_{\text{R}}/R_{\text{R}} \\ R_{\text{S}} \\ R_{\text{T}} \end{array}$	Resistance tolerance caused by spread of B value Insulation resistance Parallel resistance Rated resistance Resistance tolerance Series resistance Resistance at temperature T (e.g. R_{25} = resistance at 25 °C)	Widerstandstoleranz, die durch die Streuung des B-Wertes verursacht wird Isolationswiderstand Parallelwiderstand Nennwiderstand Widerstandstoleranz Serienwiderstand Widerstand bei Temperatur T (z.B. R ₂₅ = Widerstand bei 25 °C)
$ \begin{array}{l} T \\ \Delta T \\ t \\ T_A \\ T_{max} \end{array} $	Temperature Temperature tolerance Time Ambient temperature Upper category temperature	Temperatur Temperaturtoleranz Zeit Umgebungstemperatur Obere Grenztemperatur (Kategorietemperatur)
T _{min}	Lower category temperature	Untere Grenztemperatur (Kategorietemperatur)
T _{op} T _R T _{surf}	Operating temperature Rated temperature Surface temperature	Betriebstemperatur Nenntemperatur Oberflächentemperatur
V V _{ins} V _{op} V _{test}	Voltage Insulation test voltage Operating voltage Test voltage	Spannung Isolationsprüfspannung Betriebsspannung Prüfspannung

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Symbol	English	German
α	Temperature coefficient	Temperaturkoeffizient
Δ	Tolerance, change	Toleranz, Änderung
δ_{th}	Dissipation factor	Wärmeleitwert
τ _c τ _a	Thermal cooling time constant Thermal time constant	Thermische Abkühlzeitkonstante Thermische Zeitkonstante

Abbreviations / Notes

Symbol	English	German
SMD	Surface-mounted devices	Oberflächenmontierbares Bauelement
*	To be replaced by a number in ordering codes, type designations etc.	Platzhalter für Zahl im Bestellnummern- code oder für die Typenbezeichnung.
+	To be replaced by a letter.	Platzhalter für einen Buchstaben.
	All dimensions are given in mm.	Alle Maße sind in mm angegeben.
	The commas used in numerical values denote decimal points.	Verwendete Kommas in Zahlenwerten bezeichnen Dezimalpunkte.



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Important notes

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