NTC thermistors for temperature measurement

Probe assemblies

Series/Type: **B57504K**

Date: January 2018

EPCOS AG is a TDK Group Company.

Applications

- Temperature measurement in household appliances (e.g. dryers, dish washers, small appliances)

Features

- NTC thermistor potted in a medium-resistant stainless steel case
- Short thermal response time in water
- Wire heat-resistant up to 125 C (XLPE-insulated wire)

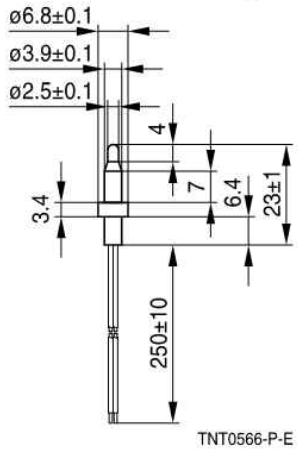
Options

- Alternative casing, cable lengths, cable material (PTFE), R/T characteristics and connectors available on request.

Delivery mode

Bulk

Dimensional drawing



Dimensions in mm
Approx. weight 2.3 g

General technical data

Climatic category	(IEC 60068-1)		20/125/42	
Upper category temperature	(wire)		125	C
Maximum operating temperature	(sensor head)	$T_{op,max}$	150	C
Resistance tolerance		$\Delta R_R/R_R$	⊿2	%
Rated temperature		T_R	70	C
Dissipation factor	(in air)	δ_{th}	approx. 2	mW/K
Thermal time constant	(in water)	τ_a	< 2	s
Insulation resistance	(V = 500 V DC)	R_{ins}	> 100	MΩ
Test voltage	(t = 1 s)	V_{test}	1250	V AC

Electrical specification and ordering codes

R_{70} Ω	R_{25} Ω	No. of R/T characteristic	$B_{25/100}$ K	Ordering code
2055	10000	7003	3625 ⊿0.8%	B57504K0103A009

Reliability data

Test	Standard	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage in dry heat	IEC 60068-2-2	Storage at max. operating temperature T: 150 C t: 168 h Medium: air	< 3%	No visible damage
Storage in coldness		Storage at lower category temperature T: −20 C t: 1000 h Medium: air	< 3%	No visible damage
Storage in damp heat, steady state		Temperature of air: 60 C Relative humidity of air: 93% Duration: 1000 h	< 3%	No visible damage
Rapid temperature cycling (in water)		Lower test temperature: 15 C Upper test temperature: 96 C Dwell time: 30 s Time to change from lower to upper temperature: <10 s Number of cycles: 1000 Medium: water	< 3%	No visible damage
Vibration resistance	IEC 60068-2-6	Frequency range: 10 to 2000 Hz Amplitude: 1.5 mm, 10 g Linear sweep; X, Y and Z direction Duration: 3 〈 2 h	< 3%	No visible damage
Natural falling test		Drop sensor 3 times from a height of 75 cm spontaneously onto hard surface	< 3%	No visible damage
Boiling test		Storage at 96 C in water for 6 h, then natural cooling for 16 h	< 3%	No visible damage

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.

R/T characteristics

R/T No.	7003							
T (C)	$B_{25/100}$ = 3625 K		T (C)	$B_{25/100}$ = 3625 K		T (C)	$B_{25/100}$ = 3625 K	
	R_T/R_{25}	α (%/K)		R_T/R_{25}	α (%/K)		R_T/R_{25}	α (%/K)
−55.0	63.225	6.7	65.0	0.24049	3.2	185.0	0.013448	1.8
−50.0	45.46	6.5	70.0	0.20553	3.1	190.0	0.012297	1.8
−45.0	33.07	6.3	75.0	0.17637	3.0	195.0	0.011265	1.7
−40.0	24.324	6.0	80.0	0.15195	2.9	200.0	0.010338	1.7
−35.0	18.081	5.8	85.0	0.13141	2.9	205.0	0.009504	1.7
−30.0	13.575	5.6	90.0	0.11406	2.8	210.0	0.0087516	1.6
−25.0	10.29	5.4	95.0	0.099352	2.7	215.0	0.0080718	1.6
−20.0	7.8716	5.3	100.0	0.086837	2.7	220.0	0.0074567	1.6
−15.0	6.0739	5.1	105.0	0.076149	2.6	225.0	0.0068989	1.5
−10.0	4.7258	4.9	110.0	0.066989	2.5	230.0	0.0063925	1.5
−5.0	3.7062	4.8	115.0	0.059112	2.5	235.0	0.0059318	1.5
0.0	2.9287	4.6	120.0	0.052316	2.4	240.0	0.005512	1.5
5.0	2.3311	4.5	125.0	0.046433	2.4	245.0	0.005129	1.4
10.0	1.8684	4.4	130.0	0.041327	2.3	250.0	0.004779	1.4
15.0	1.5075	4.2	135.0	0.03688	2.3	255.0	0.0044586	1.4
20.0	1.224	4.1	140.0	0.032998	2.2	260.0	0.004165	1.4
25.0	1.0000	4.0	145.0	0.029598	2.2	265.0	0.0038955	1.3
30.0	0.82176	3.9	150.0	0.026612	2.1	270.0	0.0036478	1.3
35.0	0.67909	3.8	155.0	0.023984	2.1	275.0	0.0034199	1.3
40.0	0.56422	3.7	160.0	0.021665	2.0	280.0	0.0032098	1.3
45.0	0.47122	3.6	165.0	0.019613	2.0	285.0	0.003016	1.2
50.0	0.3955	3.5	170.0	0.017793	1.9	290.0	0.002837	1.2
55.0	0.33355	3.4	175.0	0.016176	1.9	295.0	0.0026714	1.2
60.0	0.2826	3.3	180.0	0.014735	1.8	300.0	0.002518	1.2

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.
- 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.

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

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

Symbols and terms

Symbol	English	German
A	Area	Fl che
AWG	American Wire Gauge	Amerikanische Norm f r Drahtquerschnitte
B	B value	B-Wert
$B_{25/100}$	B value determined by resistance measurement at 25 C and 100 C	B-Wert, ermittelt durch Widerstands-messungen bei 25 C und 100 C
C_{th}	Heat capacitance	W rmekapazit t
I	Current	Strom
N	Number (integer)	Anzahl (ganzzahliger Wert)
P_{25}	Maximum power at 25 C	Maximale Leistung bei 25 C
P_{diss}	Power dissipation	Verlustleistung
P_{el}	Electrical power	Elektrische Leistung
P_{max}	Maximum power within stated temperature range	Maximale Leistung im angegebenenTemperaturbereich
$\Delta R_B/R_B$	Resistance tolerance caused by spread of B value	Widerstandstoleranz, die durch die Streuung des B-Wertes verursacht wird
R_{ins}	Insulation resistance	Isolationswiderstand
R_P	Parallel resistance	Parallelwiderstand
R_R	Rated resistance	Nennwiderstand
$\Delta R_R/R_R$	Resistance tolerance	Widerstandstoleranz
R_S	Series resistance	Serienwiderstand
R_T	Resistance at temperature T (e.g. R_{25} = resistance at 25 C)	Widerstand bei Temperatur T (z.B. R_{25} = Widerstand bei 25 C)
T	Temperature	Temperatur
ΔT	Temperature tolerance	Temperaturtoleranz
t	Time	Zeit
T_A	Ambient temperature	Umgebungstemperatur
T_{max}	Upper category temperature	Obere Grenztemperatur (Kategorietemperatur)
T_{min}	Lower category temperature	Untere Grenztemperatur (Kategorietemperatur)
T_{op}	Operating temperature	Betriebstemperatur
T_R	Rated temperature	Nenntemperatur
T_{surf}	Surface temperature	Oberfl chentemperatur
V	Voltage	Spannung
V_{ins}	Insulation test voltage	Isolationspr fspannung
V_{op}	Operating voltage	Betriebsspannung
V_{test}	Test voltage	Pr fspannung

Symbol	English	German
α	Temperature coefficient	Temperaturkoeffizient
Δ	Tolerance, change	Toleranz, ˜ nderung
δ_{th}	Dissipation factor	W rmeleitwert
τ_c	Thermal cooling time constant	Thermische Abk hlzeitkonstante
τ_a	Thermal time constant	Thermische Zeitkonstante

Abbreviations / Notes

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

Important notes

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