NTC thermistors for temperature measurement

Probe assemblies

Series/Type: **B57500K, B57501K**
Date: January 2018

EPCOS AG is a TDK Group Company.

Applications

- Evaporator sensor for air conditioning systems
- Heating systems

Features

- Copper case
- Twin cable (black)
- PVC-insulated wires with tinned ends, T_{max} = 105 °C

Options

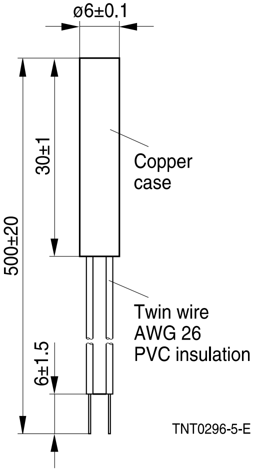
- Alternative resistance ratings, rated temperatures, resistance tolerances, wire lengths and AWG 22, AWG 24 or AWG 26 available on request.
  Also available as type K800 with improved humidity resistance for temperature measurement in heat pumps.

Delivery mode

Bulk

Dimensional drawings

K500



TNT

Dimensions in mm

General technical data

Climatic category	(IEC 60068-1)		30/100/56	
Max. power	(at 25 °C)	P_{25}	60	mW
Resistance tolerance		$\Delta R_R/R_R$	±3	%
Rated temperature		T_R	25	°C
Dissipation factor	(in air)	δ_{th}	approx. 7	mW/K
Thermal cooling time constant	(in air)	τ_c	approx. 130	s
Thermal time constant	(in water)	τ_a	approx. 8	s
Heat capacity		C_{th}	approx. 900	mJ/K
Insulation resistance	(V = 100 V DC)	R_{ins}	> 100	MΩ
Test voltage	(t = 1 s)	V_{test}	1.5	kV AC

Electrical specification and ordering codes

Type	AWG	R_{25} Ω	No. of R/T characteristic	$B_{25/100}$ K	Ordering code
K500	26	10 k	8016	3988 ±0.5%	B57500K0103A001
K501	24	6.8 k	8016	3988 ±0.5%	B57501K0682A002

Reliability data

Test	Standard	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage in dry heat	IEC 60068-2-2	Storage at upper category temperature T: 100 °C t: 1000 h	< 2%	No visible damage
Storage in damp heat, steady state	IEC 60068-2-78	Temperature of air: 40 °C Relative humidity of air: 93% Duration: 56 days	< 2%	No visible damage
Storage in coldness		Storage at lower category temperature T: −30 °C t: 1000 h	< 2%	No visible damage
Rapid temperature cycling (in fluid)	IEC 60068-2-14	Lower test temperature: 0 °C Upper test temperature: 100 °C Time to change from lower to upper temperature: <30 s Number of cycles: 1000 Medium: oil	< 2%	No visible damage
Vibration resistance	IEC 60068-2-6	Frequency range: 5 to 500 Hz Amplitude: 7.5 mm, 2 *g* Duration: 3 x 8 h	< 3%	No visible damage
Long-term stability (empirical value)		Temperature: 100 °C t: 10000 h	< 3%	No visible damage
Voltage proof test		1500 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). The applied voltage is 100 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.

R/T characteristics

R/T No.	**8016**							
T (°C)	$B_{25/100}$ = 3988 K		T (°C)	$B_{25/100}$ = 3988 K		T (°C)	$B_{25/100}$ = 3988 K	
	R_T/R_{25}	α (%/K)		R_T/R_{25}	α (%/K)		R_T/R_{25}	α (%/K)
−55.0	96.3	7.4	20.0	1.249	4.5	95.0	0.07885	3.0
−50.0	67.01	7.2	25.0	1.0000	4.4	100.0	0.068	2.9
−45.0	47.17	6.9	30.0	0.8057	4.3	105.0	0.05886	2.9
−40.0	33.65	6.7	35.0	0.6531	4.1	110.0	0.05112	2.8
−35.0	24.26	6.4	40.0	0.5327	4.0	115.0	0.04454	2.7
−30.0	17.7	6.2	45.0	0.4369	3.9	120.0	0.03893	2.6
−25.0	13.04	6.0	50.0	0.3603	3.8	125.0	0.03417	2.6
−20.0	9.707	5.8	55.0	0.2986	3.7	130.0	0.03009	2.5
−15.0	7.293	5.6	60.0	0.2488	3.6	135.0	0.02654	2.5
−10.0	5.533	5.5	65.0	0.2083	3.5	140.0	0.02348	2.4
−5.0	4.232	5.3	70.0	0.1752	3.4	145.0	0.02083	2.4
0.0	3.265	5.1	75.0	0.1481	3.3	150.0	0.01853	2.3
5.0	2.539	5.0	80.0	0.1258	3.2	155.0	0.01653	2.3
10.0	1.99	4.8	85.0	0.1072	3.2	–	–	–
15.0	1.571	4.7	90.0	0.09177	3.1	–	–	–

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	Fläche
AWG	American Wire Gauge	Amerikanische Norm für 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 Widerstandsmessungen bei 25 °C und 100 °C
C_{th}	Heat capacitance	Wärmekapazität
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	Oberflächentemperatur
V	Voltage	Spannung
V_{ins}	Insulation test voltage	Isolationsprüfspannung
V_{op}	Operating voltage	Betriebsspannung
V_{test}	Test voltage	Prüfspannung

Symbol	English	German
α	Temperature coefficient	Temperaturkoeffizient
Δ	Tolerance, change	Toleranz, Änderung
δ_{th}	Dissipation factor	Wärmeleitwert
τ_c	Thermal cooling time constant	Thermische Abkühlzeitkonstante
τ_a	Thermal time constant	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.

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products =**

Important notes

8. The trade names EPCOS, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, ThermoFuse, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.tdk-electronics.tdk.com/trademarks.

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