NTC thermistors for temperature measurement

Probe assemblies

Series/Type: **M704/10k/A001**
Ordering code: **B57704M0103A001**

Date: 2021-10-15
Version: 1

Applications

- Surface temperature measurement

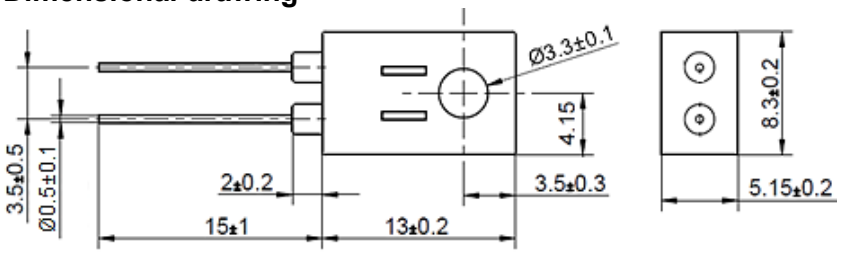
Features

- Usage in high voltage applications up to 4000 V AC
- Easy to mount screw-on NTC sensor eg. M3 screws
- 3.5 mm lead spacing
- Cu with tin plating, single-strand, Ø 0.5 mm (15 mm)

Delivery mode

- Bulk

Dimensional drawing



Dimensions in mm

General technical data

Climatic category	(IEC 60068-1)		40/125/42	
Maximum power	(at 25 °C)	P_{25}	60	mW
Resistance tolerance		$\Delta R_R/R_R$	±2	%
Rated temperature		T_R	25	°C
Dissipation factor	(in air)	δ_{th}	approx. 8	mW/K
Thermal constant time	(on metal plate)	τ_a	approx. 34	s
Test voltage	(t = 1s)	V_{test}	4000	V AC

Electrical specification and ordering code

R25 Ω	No. of R/T characteristic	$B_{25/100}$ K	Wire length in mm	Wire	Ordering code
10 k	8016	3988 ±1%	15 ±1	Copper with tin plated	B57704M0103A001

NTC resistance temperature curve

R/T curve = 8016 $B_{25/100}$ = 3988 ±1% K
R_{25} = 10000 ±2% Ω

Temp. [°C]	R_Nom [Ω]	R_Min [Ω]	R_Max [Ω]	ΔR [±%]
-40	336500	317050	355950	5.8
-35	242590	229440	255740	5.4
-30	177000	168020	185980	5.1
-25	130370	124180	136560	4.7
-20	97070	92772	101370	4.4
-15	72929	69923	75936	4.1
-10	55330	53211	57449	3.8
-5	42315	40814	43816	3.5
0	32650	31581	33719	3.3
5	25388	24623	26152	3.0
10	19900	19351	20449	2.8
15	15708	15313	16103	2.5
20	12490	12205	12775	2.3
25	**10000**	**9800.0**	**10200**	**2.0**
30	8057.0	7874.1	8239.9	2.3
35	6531.3	6369.1	6693.6	2.5
40	5327.0	5183.7	5470.3	2.7
45	4368.7	4242.4	4495.0	2.9
50	3603.0	3491.9	3714.1	3.1
55	2986.2	2888.5	3084.0	3.3
60	2488.0	2402.0	2574.0	3.5
65	2083.0	2007.4	2158.7	3.6
70	1752.0	1685.4	1818.6	3.8
75	1481.4	1422.5	1540.2	4.0
80	1258.0	1206.0	1310.0	4.1
85	1072.3	1026.3	1118.4	4.3
90	917.70	876.92	958.48	4.4
95	788.52	752.30	824.74	4.6
100	680.00	647.78	712.22	4.7
105	588.59	559.87	617.31	4.9
110	511.20	485.55	536.85	5.0
115	445.41	422.46	468.35	5.2
120	389.30	368.74	409.86	5.3
125	341.70	323.22	360.18	5.4

Reliability data

Test	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage in dry heat	Storage at upper category temperature in air Temperature: 125 °C Duration: 1000 h	< 3%	
Storage in coldness	Storage at lower category temperature in air Temperature: –40 °C duration: 1000 h	< 3%	
Storage in damp heat, steady state	Temperature of air: 85 °C Relative humidity of air: 85% Duration: 1000 h Applied voltage 3.3 V AC with pre-resistance 3000 Ω	< 5%	
Rapid change of temperature in air	Lower test temperature: –40 °C (time: ~30 min) Upper test temperature: +125 °C (time: ~30 min) Time to change from lower to upper temperature: < 30 s Number of cycling: 50	< 3%	
Endurance	Power maximum: 60 mW Duration: 1000 h	< 3%	
Voltage proof	The sensors placed in a vessel containing metallic balls (with total immersed head) at ambient temperature, max relative humidity 75%. The applied voltage is 4000 V AC/1 s/0.5 mA.	-	No flash over
Insulation test	The sensors placed in a vessel containing metallic balls (with total immersed head) at ambient temperature, max relative humidity 75%. The applied voltage is 500 V DC.	-	Above 100 MΩ

Cautions and warnings

Storage

- Store thermistors only in original packaging. Do not open the package prior to storage.
- 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 (SOx, Cl etc).
- Use the components as soon as possible after opening the factory seals, i.e. the polyvinyl-sealed packages.
- Solder thermistors within the time specified after shipment.
  For leaded components this is 24 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

- Bending on wire is permitted 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 eight times the wire's diameter.
- Twisting is prohibited as it may cause cracks and or reduce bonding between insulation and coating/potting material.

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.

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.
- Ensure that no significant thermo-mechanical stress occurs during operation due to the mounting situation. Fixtures must not overstress the sensor by an excessive mechanical preload.
- 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. 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 TDK Electronics.

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Important notes

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