NTC thermistors for temperature measurement

NTC probes

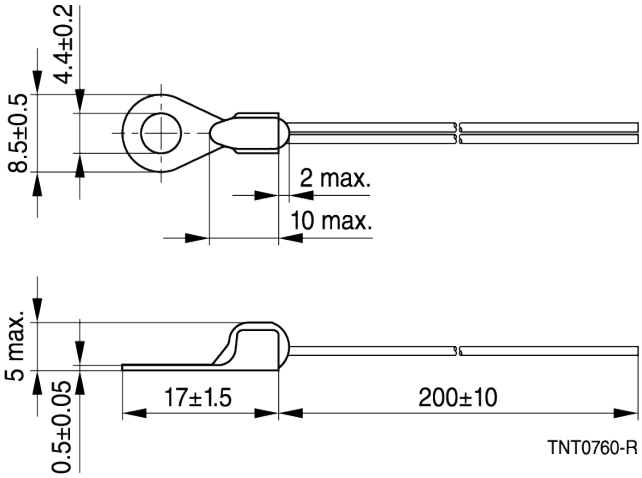
Series/Type: **M703/10k/A50**
Ordering code: **B57703M0103A050**

Date: 2025-04-24
Version: 2

Applications

Temperature sensors that can be used
in DC/DC converter automotive applications

Dimensional drawings



Dimensions in mm

Material

No	Item	Material	Properties	Remarks
1	Thermistor	Ceramic	TDK NTC	
2	Casting	Epoxy resin		
3	Ring tongue	Brass tinned		
4	Wire	Silver plated copper PTFE insulated	AWG 26, 7/0.16 mm	Black

Delivery mode

Bulk delivery in 20 bundles in cardboard (50 pcs./bundle).

General technical data

Climatic category		40/150/42	
Lower category temperature		–40	°C
Upper category temperature		+150	°C
Rated resistance R_R // tolerance	R_R	10000 // ±1	Ω // %
Rated temperature	T_R	+25	°C
B value: $B_{(25/100)}$ // tolerance	B	3988 // ±0.5	K // %
R/T curve no. // R_{25}		8016 // 10000	n // Ω
Max. power rating at 25 °C	P_{25}	150	mW
Dissipation factor (in air)	δ_{th}	approx. 5.7	mW/K
Thermal cooling time constant (in air)	τ_a	approx. 36	s
Insulation resistance (V = 500 V DC)	R_{ins}	> 500	MΩ
Voltage proof (t = 1s)	V_{ins}	2000	V AC

NTC resistance temperature curve

R/T curve 8016
R at 25 °C 10000 Ω
B(25/100) 3980 K ±0.5%
R_R at 25 °C 10000 Ω ±1%

Temp. [°C]	R Nom [Ω]	R Min [Ω]	R Max [Ω]	ΔR [±%]	ΔT [±°C]
–40	336500	326690	346310	2.9	0.4
–35	242590	235950	249220	2.7	0.4
–30	177000	172460	181540	2.6	0.4
–25	130370	127240	133500	2.4	0.4
–20	97070	94897	99243	2.2	0.4
–15	72929	71408	74451	2.1	0.4
–10	55330	54257	56403	1.9	0.4
–5	42315	41554	43076	1.8	0.3
0	32650	32107	33193	1.7	0.3
5	25388	24999	25776	1.5	0.3
10	19900	19621	20179	1.4	0.3
15	15708	15506	15909	1.3	0.3
20	12490	12345	12635	1.2	0.3
25	**10000**	**9900.0**	**10100**	**1.0**	**0.2**
30	8057.0	7963.5	8150.5	1.2	0.3
35	6531.3	6448.6	6614.1	1.3	0.3
40	5327.0	5254.0	5400.0	1.4	0.3
45	4368.7	4304.5	4432.9	1.5	0.4
50	3603.0	3546.5	3659.5	1.6	0.4
55	2986.2	2936.6	3035.8	1.7	0.4
60	2488.0	2444.4	2531.6	1.8	0.5
65	2083.0	2044.7	2121.4	1.8	0.5
70	1752.0	1718.2	1785.8	1.9	0.6
75	1481.4	1451.6	1511.2	2.0	0.6
80	1258.0	1231.7	1284.3	2.1	0.6
85	1072.3	1049.1	1095.6	2.2	0.7
90	917.70	897.08	938.32	2.2	0.7
95	788.52	770.21	806.82	2.3	0.8
100	680.00	663.72	696.28	2.4	0.8
105	588.59	574.08	603.10	2.5	0.9
110	511.20	498.25	524.15	2.5	0.9
115	445.41	433.82	456.99	2.6	1.0
120	389.30	378.92	399.68	2.7	1.0
125	341.70	332.37	351.03	2.7	1.1
130	300.90	292.50	309.30	2.8	1.1
135	265.44	257.87	273.01	2.9	1.2
140	227.96	234.80	241.64	2.9	1.2
145	202.14	208.32	214.51	3.0	1.3
150	179.69	185.30	190.91	3.0	1.3

Reliability data

Testing acc. to AEC-Q200 REV D by type representative

Test	Standard	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
High temperature exposure (storage) 1	MIL-STD-202, method 108	Storage at T = 150 °C t = 1000 h	< 2%	
High temperature exposure (storage) 2		Storage at T = 165 °C t = 168 h	< 2%	
Biased humidity	MIL-STD-202, method 103	T = 85 °C Relative humidity of air: 85% t = 1000 h Applied voltage max 0.3 V DC on NTC[1)]	< 2%	
Operational life	MIL-STD-202, method 108	T = 150 °C T = 1000 h Test voltage max 0.3 V DC on NTC[1)]	< 2%	
Temperature cycling	JESD 22, method JA-104	Lower test temperature: –40 °C Upper test temperature: 150 °C Number of cycles: 1000 cycles Dwell time: max. 30 minutes at each temperature. Transition time in air: max. 1 minute	< 2%	
Terminal strength (Leaded)	MIL-STD-202, method 211	Test leaded device integrity Condition A: 2.27 N[2)]	< 1%	
Mechanical shock	MIL-STD-202, method 213	Max. acceleration 100 g / 6 ms / half sine Duration: 3 shocks in each of 6 directions	< 2%	
Vibration	MIL-STD-202, method 204	Sinusoidal vibration f = 10 … 2000 Hz / 5 *g* cycle time 20 minutes. Duration: 12 cycles in each of 3 axes	< 2%	
Voltage proof test		The sensors are placed in a vessel containing metallic balls of 1 mm diameter (with total immersed head) at ambient temperature, max relative humidity 75%. The applied voltage is 2000 V AC / 0.2 mA / 1 s.	-	No flash over
Insulation test		The sensors are placed in a vessel containing metallic balls of 1 mm diameter (with total immersed head). The applied voltage is 500 V DC (at ambient temperature and max relative humidity 75%).	-	Above 500 MΩ

[1)] Self heating of the NTC thermistor must not exceed 0.2 K, steady state. Test condition deviating from AEC-Q200 REV D.
[2)] Deviating from AEC-Q200 REV D.

Cautions and warnings

Storage

- Store thermistors only in original packaging. Do not open the package prior to processing.
- Storage conditions in original packaging: storage temperature −25 °C to +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 original packaging.
- Solder thermistors within the time specified after shipment from TDK.
  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 over-molded 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.
- 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. 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 TDK.

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Important notes

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