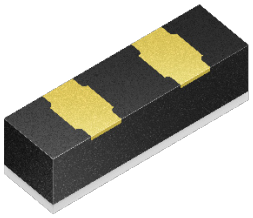
NTC thermistors for temperature measurement

Small-Outline No-Lead NTC

Series/Type:	**T850/10k/F**
Ordering code:	**B57850T0103F000**
Date:	2022-09-05
Version:	1

Applications

Surface temperature measurement



Features

- Lead free
- Halogen free
- NTC is fully sealed with epoxy
- High humidity resistance
- High degree of electrical insulation between measurement surface and NTC
- Wider sensing area
- Phosphor bronze electrodes
- Automation friendly processing

Ratings and characteristics

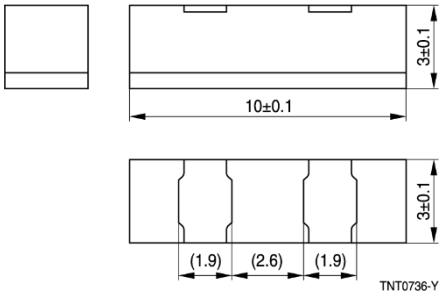
Climatic category (IEC 60068-1) (test without voltage)	-	-	40/155/56
Lower category temperature	-	°C	–40
Upper category temperature	-	°C	155
Rated resistance R_R // Tolerance	R_R	Ω // %	10000 // ±1
Rated temperature	T_R	°C	25
B-value: $B_{(25/100)}$ // Tolerance	B	K // %	3988 // ±1
R/T curve no. // R_{25}		n // Ω	8016 // 10000
Dissipation factor (in air)	δ_{th}	mW/K	4.2
Heat capacity	C_{th}	mJ/K	178
Thermal time constant – t(0.63)[1)] Response time	τ_a	s	approx. 2
Voltage proof	V_{is}	V_{AC} // t	2500 // 60 s

[1)] NTC sensor, from ambient temperature, is pressed to metal surface with temperature of 85 °C.

Delivery mode

According to typical semiconductor packaging tube 272 x 11 x 4.5 mm (drawing on page # 3).
50 components as packaging unit per tube.
Other options on request, e.g.: According to JEDEC standard tray 12.7 x 5.35 inches, 294 components per tray.

Dimensional drawing



Dimensions in mm

Ordering code

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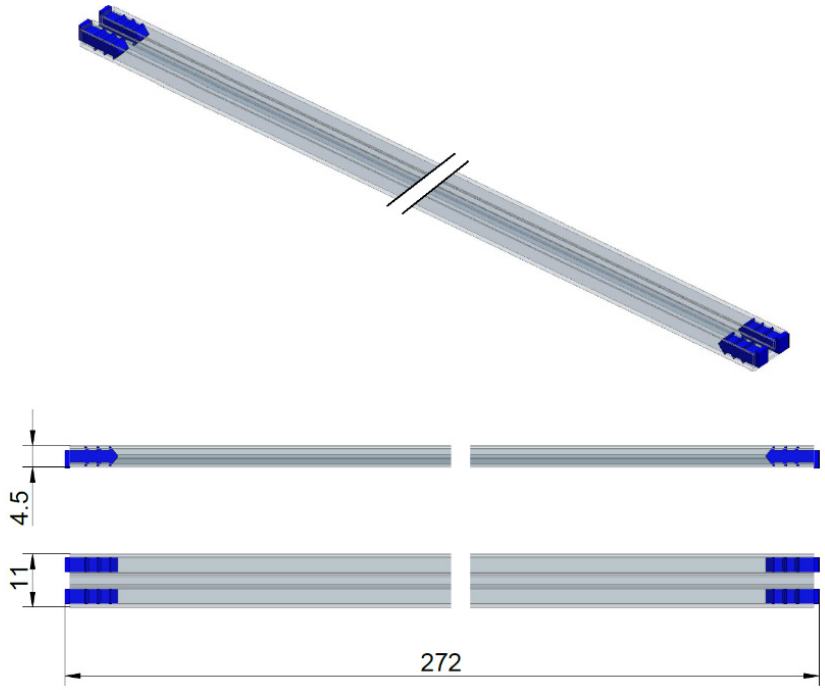
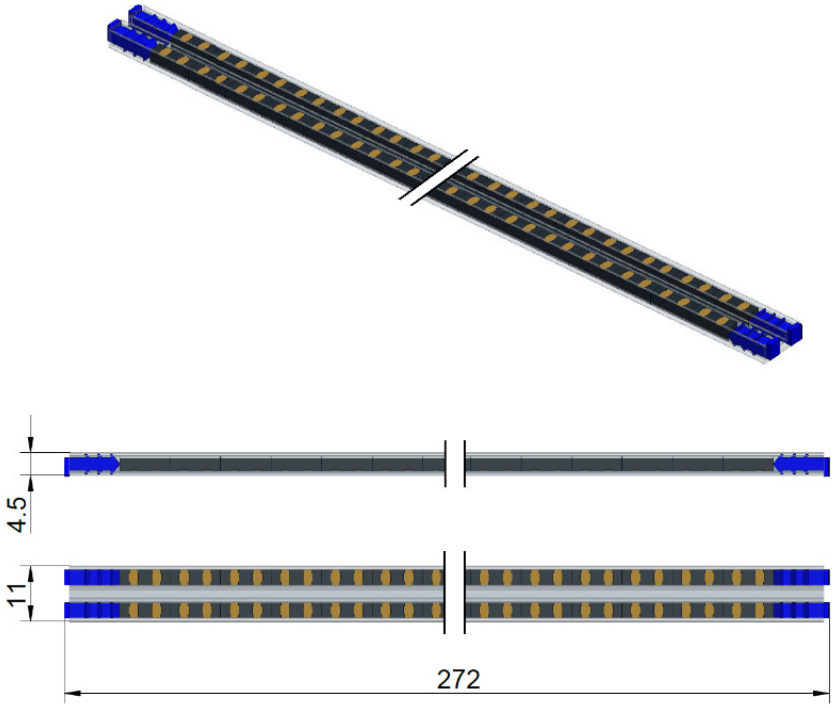
Tube drawing

Empty tube



50 components packed inside one IC tube



NTC resistance temperature curve

R/T curve 8016 / A01 **$B_{(25/100)}$** 3988 K ±1%

R at 25 °C 10000 Ω **R_R at 25 °C** 10000 Ω ±1%

T °C	R_{Nom} Ω	R_{Min} Ω	R_{Max} Ω	ΔR ±%	ΔT ±°C
-40	336500	320419	352582	4.8	0.7
-35	242589	231867	253311	4.4	0.7
-30	177000	169786	184214	4.1	0.7
-25	130370	125487	135252	3.7	0.6
-20	97070	93743	100397	3.4	0.6
-15	72929	70652	75206	3.1	0.6
-10	55330	53765	56895	2.8	0.5
-5	42315	41237	43393	2.5	0.5
0	32650	31907	33393	2.3	0.4
5	25388	24877	25898	2.0	0.4
10	19900	19550	20250	1.8	0.4
15	15708	15470	15946	1.5	0.3
20	12490	12330	12650	1.3	0.3
25	**10000**	**9900**	**10100**	**1.0**	**0.2**
30	8057.0	7954.6	8159.4	1.3	0.3
35	6531.3	6434.4	6628.2	1.5	0.4
40	5327.0	5236.9	5417.1	1.7	0.4
45	4368.7	4286.1	4451.3	1.9	0.5
50	3603.0	3527.9	3678.1	2.1	0.5
55	2986.2	2918.3	3054.1	2.3	0.6
60	2488.0	2426.9	2549.1	2.5	0.7
65	2083.0	2028.2	2137.9	2.6	0.8
70	1752.0	1702.9	1801.1	2.8	0.8
75	1481.4	1437.4	1525.4	3.0	0.9
80	1258.0	1218.6	1297.4	3.1	1.0
85	1072.3	1037.1	1107.6	3.3	1.0
90	917.70	886.09	949.31	3.4	1.1
95	788.52	760.18	816.85	3.6	1.2
100	680.00	654.58	705.42	3.7	1.3
105	588.59	565.76	611.43	3.9	1.4
110	511.20	490.66	531.74	4.0	1.4
115	445.41	426.92	463.90	4.2	1.5
120	389.30	372.63	405.97	4.3	1.6
125	341.70	326.63	356.77	4.4	1.7
130	300.90	287.26	314.54	4.5	1.8
135	265.44	253.09	277.80	4.7	1.9
140	234.80	223.59	246.01	4.8	2.0
145	208.32	198.14	218.50	4.9	2.1
150	185.30	176.03	194.57	5.0	2.2
155	165.35	156.90	173.80	5.1	2.3

Reliability data

Test	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage in dry heat	Storage at T = 155 °C, Duration: 1000 h	< 3%	No visible damage
Storage in coldness	Storage at T = -40 °C, Duration: 1000 h	< 3%	No visible damage
Storage in damp heat, steady state with test voltage	Temperature of air: 85 °C; Relative humidity of air: 85% Duration: 56 days Voltage across NTC: 0.3 V_{DC}	< 2%	No visible damage
Rapid change of temperature in air	Lower test temperature: –40 °C Upper test temperature: 155 °C Dwell time: 10 min; Transition time: < 30 s Number of cycles: 1000	< 3%	No visible damage
Voltage proof test	The sensors are placed on a metal plate surface at ambient temperature, max relative humidity 75% The applied voltage, between metal plate and NTC electrodes, is 2500 V_{AC}/60 s/1 mA		No flash over
Insulation test	The sensors are placed on a metal plate surface at ambient temperature, max relative humidity 75% The applied voltage, between metal plate and NTC electrodes, is 500 V_{DC}		Above 100 MΩ

For information only

Achievable performance, indicated as a design reference for applications

Test	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Immersion test	Medium: Deionized water Temperature: 80 °C; Voltage across NTC: 0.3 V_{DC} Tested on NTC assembly with extension wires, soldered onto electrodes. Solder joints and electrodes are sealed with a hydrophobic coating material. Duration: 1000 h	< 2%	No visible damage
Rapid change of temperature in water (T-shock)	Medium: Deionized water Lower test temperature: 5 °C Upper test temperature: 95 °C Dwell time: 10 min; Transition time: < 30 s 5 V_{DC} applied with series resistor 10 kΩ Tested on NTC assembly with extension wires, soldered onto electrodes. Solder joints and electrodes are sealed with a hydrophobic coating material. Number of cycles: 500	< 2%	No visible damage

Reliability data according to AEC-Q200, Rev. D

Test	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
High temperature exposure (storage)	Storage at T = 125 °C t = 1000 h	< 2%	No visible damage
Biased humidity	T = 85 °C Relative humidity of air: 85% t = 1000 h Test voltage 0.3 V_{DC} on NTC[1)]	< 2%	No visible damage
Operational life	T = 125 °C t = 1000 h Test voltage 0.3 V_{DC} on NTC[1)]	< 2%	No visible damage
Temperature cycling	Lower test temperature: –55 °C Upper test temperature: 125 °C Dwell time: max. 30 min. at each temperature Transition time in air: max. 1 min Number of cycles: 1000	< 2%	No visible damage
Mechanical shock	Acceleration: 40 *g*[2)] Pulse duration: 6 ms Number of bumps: 3, each direction	< 1%	No visible damage
Vibration	Acceleration: 5 *g* t = 20 min. 12 cycles in each of 3 directions Frequency range: 10 ... 2000 Hz	< 1%	No visible damage

1) Self Heating of the NTC thermistor must not exceed 0.2 K, steady state. Test conditions 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 storage.
- 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 factory seals, i.e. the polyvinyl-sealed packages.
- Solder thermistors within the time specified after shipment.
  For leadless components this is 12 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.

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