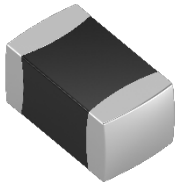
NTC thermistors for temperature measurement

SMD NTC thermistors for automotive applications

Series/Type:	**Soft termination series**
Ordering code:	**B57459V6473F262**
Date:	2025-05-19
Version:	1

Applications



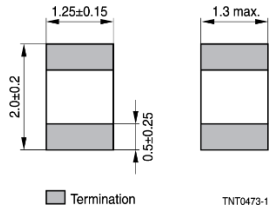
Temperature measurement and compensation in various automotive circuits, such as

- charging and temperature control of battery packs and battery management systems (BMS)
- electronic control units (ECUs), e.g., motor management, HVAC, electronic power steering (EPS), gearbox controls, ABS systems
- temperature sensor for air-conditioning
- LED lighting
- DC/DC converters, inverters, on-board chargers (OBC)
- thermal protection of semiconductors (GaN / SiC) in power modules

Features

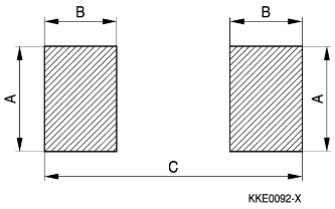
- Qualification based on AEC-Q200
- Multilayer SMD NTC thermistor with nickel barrier termination (NiSn)
- Soft termination provides improved resistance to mechanical stress compared to standard termination
- Accurate temperature measurement from -40 °C to 150 °C
- Excellent long-term aging stability in high temperature and high humidity environment
- Tight R tolerances and B tolerances; short response time
- High mechanical robustness
- Pb free, RoHS

Dimensional drawing



Dimensions in mm

Recommended geometry of solder pads



Case size [inch/mm]	A [mm]	B [mm]	C [mm]
0805/2012	1.3	1.2	3.4

Electrical specifications

Ordering code	Zero-power resistance (at 25 °C)	$B_{25/100}$	$B_{25/85}$	$B_{25/50}$
B57459V6473F262	47 kΩ ±1%	4131 K ±1.5%	(4108 K)	(4050 K)

General technical data

Operating temperature range	T_{op}	-40 … 150	°C
Maximum power (at 25 °C, on PCB)	P_{25} [1)]	210	mW
Rated temperature	T_R	25	°C
Dissipation factor (on PCB)	δ_{th} [1)]	approx. 3.5	mW/K
Thermal cooling time constant (on PCB)	τ_c [1)]	approx. 10	s
Heat capacity	C_{th} [1)]	approx. 35	mJ/K
Weight of component		approx. 13	mg

1) Depends on mounting situation

Resistance/temperature characteristic

NTC resistance temperature curve
R/T curve 8562
R at 25 °C 47000 [Ω] ± 1%
B (25/100) 4131 [K] ±1.5 [%]

Temp. [°C]	R Nom [Ω]	R Min [Ω]	R Max [Ω]	ΔR [±%]	ΔT [±°C]	α [%/K]
-40	1607642.211	1497612.800	1717671.622	6.8	1.0	6.6
-35	1160764.519	1087797.089	1233731.949	6.3	1.0	6.4
-30	847301.630	798572.414	896030.846	5.8	0.9	6.2
-25	624853.325	592125.876	657580.773	5.2	0.9	6.0
-20	465271.137	443196.722	487345.552	4.7	0.8	5.8
-15	349617.221	334687.435	364547.007	4.3	0.8	5.6
-10	264992.065	254884.622	275099.508	3.8	0.7	5.5
-5	202507.458	195672.483	209342.433	3.4	0.6	5.3
0	155972.837	151368.246	160577.427	3.0	0.6	5.1
5	121032.726	117953.187	124112.265	2.5	0.5	5.0
10	94593.436	92558.734	96628.139	2.2	0.4	4.9
15	74437.646	73119.160	75756.132	1.8	0.4	4.7
20	58962.526	58134.409	59790.643	1.4	0.3	4.6
25	47000.000	46530.000	47470.000	1.0	0.2	4.5
30	37692.214	37167.242	38217.187	1.4	0.3	4.4
35	30404.478	29880.168	30928.788	1.7	0.4	4.2
40	24663.878	24159.373	25168.382	2.0	0.5	4.1
45	20115.649	19641.624	20589.674	2.4	0.6	4.0
50	16491.922	16053.591	16930.254	2.7	0.7	3.9
55	13589.172	13188.288	13990.057	3.0	0.8	3.8
60	11251.828	10888.007	11615.648	3.2	0.9	3.7
65	9360.282	9031.881	9688.684	3.5	1.0	3.6
70	7822.066	7526.747	8117.385	3.8	1.1	3.5
75	6565.301	6300.404	6830.197	4.0	1.2	3.5
80	5533.822	5296.599	5771.046	4.3	1.3	3.4
85	4683.525	4471.279	4895.770	4.5	1.4	3.3
90	3979.601	3789.776	4169.427	4.8	1.5	3.2
95	3394.455	3224.674	3564.235	5.0	1.6	3.1
100	2906.102	2754.193	3058.011	5.2	1.7	3.1
105	2496.958	2360.954	2632.963	5.4	1.8	3.0
110	2152.891	2031.023	2274.758	5.7	1.9	2.9
115	1862.499	1753.189	1971.808	5.9	2.0	2.9
120	1616.546	1518.389	1714.703	6.1	2.2	2.8
125	1407.520	1319.270	1495.771	6.3	2.3	2.7
130	1229.289	1149.840	1308.737	6.5	2.4	2.7
135	1076.826	1005.203	1148.448	6.7	2.5	2.6
140	945.999	881.340	1010.657	6.8	2.7	2.6
145	833.397	774.940	891.854	7.0	2.8	2.5
150	736.196	683.267	789.124	7.2	2.9	2.5

Reliability data

- The tests of SMD NTC thermistors are based on AEC-Q200.
- The parts are mounted on standardized PCB.

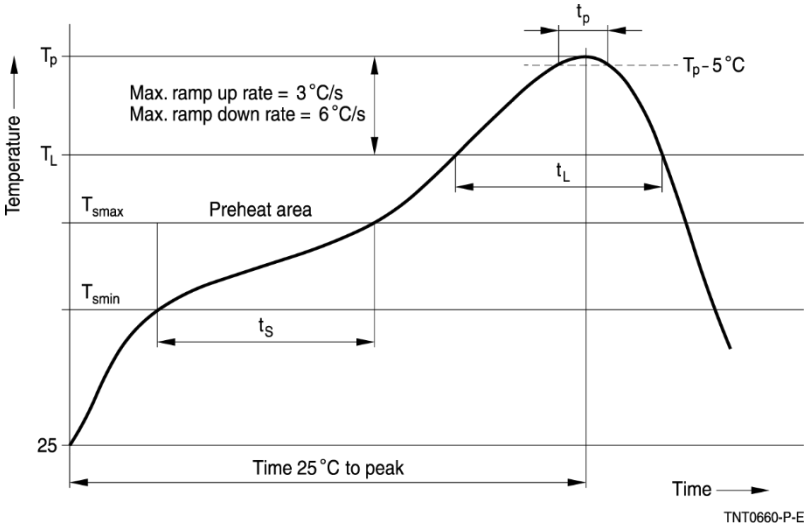
Test	Standard	Test conditions	ΔR_{25} / R_{25} (typical)	Remarks
Pre-stress and post-stress electrical test		Resistance at: 25 °C and 100 °C	-	
High temperature exposure (storage)	MIL-STD-202, method 108	Test temperature: 150 °C Duration: 1000 h Unpowered	< 1%	
Temperature cycling	JESD22, method JA-104	Lower test temperature: -40 °C Upper test temperature: 150 °C Number of cycles: 1000 Transfer time: < 10 s Dwell time: 15 min Air – Air	< 5%	Temperature cycling is performed acc. to MIL-STD-202, method 107. No warranty will be assumed for the reliability of the solder joint.
Biased humidity	MIL-STD-202, method 103	Test temperature: 85 °C Rel. humidity of air: 85% Duration: 1000 h Test voltage: V_{NTC} = 0.3 V DC	< 5%	
Operational life	MIL-STD-202, method 108	Test temperature: 150 °C P_{max} = 0.35 mW Duration: 1000 h	< 5%	
External visual	MIL-STD-883E, method 2009	Visual inspection		
Physical dimensions	JESD22, method JB-100	Measured with callipers		Within the specified values
Resistance to solvents	MIL-STD-202, method 215	Not applicable for SMD NTC thermistors (component has no marking, color coding, or coating)		
Mechanical shock	MIL-STD-202, method 213	Peak value: 1500 g Half sine Condition F	< 5%	
Vibration	MIL-STD-202, method 204	Acceleration: 5 *g* Sweep time: 20 min Frequency range: 10 … 2000 Hz 3 x 12 cycles	< 5%	

Test	Standard	Test conditions	$\Delta R_{25} / R_{25}$ (typical)	Remarks
Resistance to soldering heat	MIL-STD-202, method 210	Dip: 260 °C; 10 s 1 heat cycle	< 1%	
ESD	AEC-Q200-002, method -002	Discharge capacitance: 150 pF Discharge resistance: 2 kΩ Charging voltage: 6 kV Contact discharge 2 pulses in each polarity	< 5%	
Solderability	J-STD-002	a) Dip: 235 °C; 5 s: aging 4 h @ 155 °C b) Dip: 215 °C; 5 s: steam aging 8 h @ 92 °C c) Dip: 260 °C; 7 s: steam aging 8 h @ 92 °C		95% of termination wetted
Electrical characterization		R(25 °C). R(100 °C). B(25/100)		Within the specified values
Flammability	UL-94, V-0 or V-1	Not applicable for SMD NTC thermistors (component is not coated or encapsulated with plastic materials)		
Board flex	AEC-Q200-005, method -005	Max. bending: 5 mm Duration @ max. bending: 60 s	< 2%	
Terminal strength	AEC-Q200-006, method -006	Max. F: 17 N	< 5%	
Resistance drift after soldering		Reflow soldering profile	< 1%	

Recommended soldering profiles

Reflow soldering

Temperature ranges for reflow soldering acc. to IEC 60068-2-58 recommendations.



Profile feature		Sn-Pb eutectic assembly	Pb-free assembly
Preheat and soak - Temperature min - Temperature max - Time	 T_{smin} T_{smax} t_s	 100 °C 150 °C 60 … 120 s	 150 °C 200 °C 60 … 120 s
Average ramp-up rate	T_{smax} to T_p	3 °C/s max.	3 °C/s max.
Liquidous temperature Time at liquidous	T_L t_L	183 °C 40 … 150 s	217 °C 40 … 150 s
Peak package body temperature	T_p[1)]	215 °C … 260 °C	235 °C … 260 °C
Time (t_p) above (T_p -5 °C)	t_p	10 ... 40 s	10 … 40 s
Average ramp-down rate	T_p to T_{smax}	6 °C/s max.	6 °C/s max.
Time 25 °C to peak temperature		max. 8 minutes	max. 8 minutes

[1)]Depending on package thickness.

Note:

- All temperatures refer to topside of the package, measured on the package body surface.
- Number of reflow cycles: 3
- Iron soldering should be avoided. Hot air methods are recommended for repair purposes.

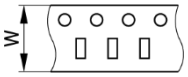
Recommended solder

Flux-less Pb-free Sn (95.1 … 96.0), Ag (3.0 … 4.0), Cu (0.5 … 0.9) solder is recommended.

Taping and packing

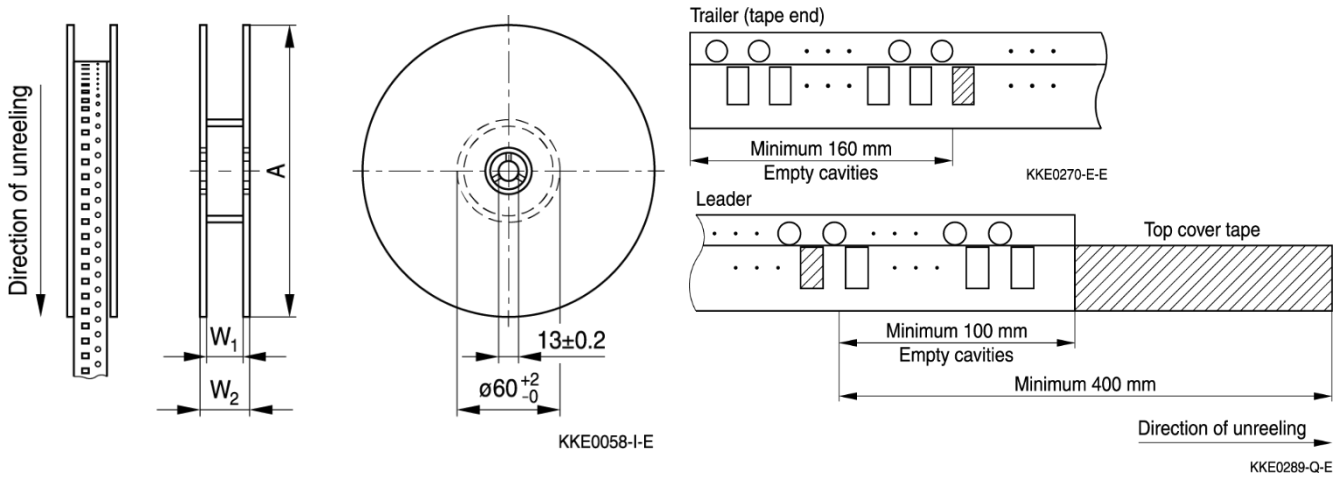
- Tape and reel packing according to IEC 60286-3
- Tape material: Blister

Tape dimensions and tolerances



Definition	Symbol	Dimension [mm]	Tolerance [mm]
Tape width	W	8.00	±0.30

Reel dimensions and tolerances



Definition	Symbol	Dimension [mm]	Tolerance [mm]
Reel diameter	A	180	+0/-3
Reel width (inside)	W1	8.4	+1.5/-0
Reel width (outside)	W2	14.4	max.

Packing unit: 4000 pcs./reel

Cautions and warnings

Storage

- Store thermistors only in original packaging. Do not open the package before storage.
- Storage conditions in original packaging: storage temperature –25 °C to +45 °C, relative humidity ≤ 75% annual mean, 95% on max. 30 days in a year, dew precipitation and wetness are inadmissible.
- Do not store SMDs where they are exposed to heat or direct sunlight. Otherwise, the packing material may be deformed or SMDs may stick together, causing problems during mounting.
- Avoid contamination of thermistors surface during storage, handling, and processing. Touching the metallization of unsoldered thermistors may change their soldering properties.
- Avoid storage of thermistor in harmful environments like corrosive gases (SO_x, Cl etc.)
- After opening the factory seals, such as polyvinyl-sealed packages, use the SMDs as soon as possible.
- Solder thermistors after shipment from TDK Electronics within the time specified:
  SMD NTC thermistors with nickel-barrier termination: 12 months

Handling

- NTC thermistors must not be dropped. Chip-offs must not be caused during handling of NTCs.
- Components must not be touched 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.

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

- When NTC thermistors are encapsulated with sealing material or over molded with plastic material, there must be no mechanical stress caused by thermal expansion during the production process (curing / over molding process) and during later operation. The upper category temperature of the thermistor must not be exceeded. Ensure that the materials used (sealing compound and plastic material) are chemically neutral.
- Electrode must not be scratched before/during/after the mounting process.
- Contacts and housing used for assembly with thermistor have to 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 thermistor surface during processing.

Operation

- Use thermistors only within the specified operating temperature range.
- Environmental conditions must not harm the thermistors. Use thermistors only in normal atmospheric conditions.
- Contact of NTC thermistors with any liquids and solvents should 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.
- Be sure to provide an appropriate fail-safe function to prevent secondary product damage caused by malfunction (e.g. use VDR for limitation of overvoltage condition).

This listing does not claim to be complete but merely reflects the experience of TDK Electronics AG.

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