NTC thermistors for temperature measurement

Leadless NTCs

Series/Type: **B57820**
Date: March 2006

Applications

- Automotive electronics, e.g.
  - measurement of cooling water and oil temperature

Features

- Front surfaces silver-plated
- For clamp contacting
- UL approval (E69802)

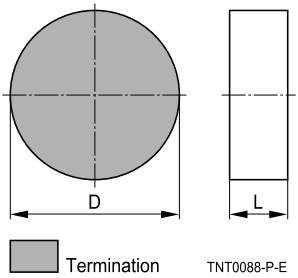
Options

Alternative resistance ratings, rated temperatures, resistance tolerances and disk geometries available on request.

Delivery mode

Bulk

Dimensional drawing



R100 (Ω)	D (mm)	L (mm)
39.6	5.1 −1.1	2.2 −1.4
77	5.3 ±0.3	1.3 ±0.2
92	5.1 −1.1	2.2 −1.4

Approx. weight 0.1 g

General technical data

Climatic category	(IEC 60068-1)		55/155/21	
Max. power	(at 25 °C)	P_{25}	180	mW
Resistance tolerance		$\Delta R_R/R_R$	±5	%
Rated temperature		T_R	100	°C
Dissipation factor	(in air)	δ_{th} [1)]	approx. 3	mW/K
Thermal cooling time constant	(in air)	τ_c [1)]	approx. 30	s
Heat capacity		C_{th} [1)]	approx. 90	mJ/K

Electrical specification and ordering codes

R_{100} Ω	R_{25} Ω	No. of R/T characteristic	$B_{25/100}$ K	Ordering code
39.6	560.2	1009	3930 ±1.5%	B57820M0561A005
77	843.2	1006	3550 ±1.5%	B57820M0841A004
92	1014	1008	3560 ±1.5%	B57820M0102A003

1) Depends on mounting situation

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: 155 °C t: 1000 h	< 3%	No visible damage
Storage in damp heat, steady state	IEC 60068-2-78	Temperature of air: 40 °C Relative humidity of air: 93% Duration: 21 days	< 3%	No visible damage
Rapid temperature cycling	IEC 60068-2-14	Lower test temperature: −55 °C Upper test temperature: 155 °C Number of cycles: 100	< 3%	No visible damage
Endurance		P_{max}: 180 mW t: 1000 h	< 3%	No visible damage
Long-term stability (empirical value)		Temperature: 125 °C t: 10000 h	< 5%	No visible damage

R/T characteristics

	B57820M0561A005					
R/T No.	1009					
T (°C)	$B_{25/100}$ = 3930 K ±1.5%, R_{25} = 560 Ω, T_R = 100 °C, $\Delta R_R/R_R$ = ± 2%					
	R_{nom}[Ω]	R_{min}[Ω]	R_{max}[Ω]	$\Delta R_R/R_R$[±%]	ΔT[±°C]	α (%/K)
−55.0	47854	40066	55642	16.3	2.4	6.8
−50.0	34050	28714	39385	15.7	2.3	6.7
−45.0	24453	20763	28143	15.1	2.3	6.5
−40.0	17719	15143	20294	14.5	2.3	6.4
−35.0	12951	11137	14765	14.0	2.3	6.2
−30.0	9546	8258	10834	13.5	2.2	6.0
−25.0	7086	6164	8008	13.0	2.2	5.9
−20.0	5314	4648	5981	12.5	2.2	5.7
−15.0	4008	3523	4492	12.1	2.2	5.5
−10.0	3052	2696	3408	11.7	2.2	5.4
−5.0	2338	2075	2601	11.2	2.2	5.2
0.0	1807	1611	2003	10.8	2.1	5.1
5.0	1409	1262	1556	10.4	2.1	4.9
10.0	1107	995.6	1219	10.1	2.1	4.8
15.0	876.6	791.5	961.8	9.7	2.1	4.6
20.0	699.2	633.8	764.7	9.4	2.1	4.5
25.0	560.2	509.6	610.8	9.0	2.1	4.3
30.0	453.5	414.1	493.0	8.7	2.1	4.2
35.0	368.2	337.3	399.1	8.4	2.0	4.1
40.0	300.8	276.5	325.1	8.1	2.0	4.0
45.0	247.4	228.2	266.7	7.8	2.0	3.9
50.0	204.7	189.3	220.0	7.5	2.0	3.8
55.0	169.9	157.6	182.2	7.2	2.0	3.7
60.0	141.8	132.0	151.7	6.9	2.0	3.5
65.0	119.2	111.2	127.1	6.7	1.9	3.5
70.0	100.6	94.15	107.1	6.4	1.9	3.4
75.0	85.26	79.98	90.53	6.2	1.9	3.3
80.0	72.54	68.23	76.85	5.9	1.9	3.2
85.0	62.00	58.46	65.54	5.7	1.8	3.1
90.0	53.19	50.27	56.11	5.5	1.8	3.0
95.0	45.81	43.40	48.22	5.3	1.8	2.9
100.0	**39.60**	**37.62**	**41.58**	**5.0**	**1.7**	**2.9**
105.0	34.39	32.58	36.20	5.3	1.9	2.8
110.0	29.96	28.33	31.60	5.5	2.0	2.7
115.0	26.18	24.70	27.66	5.7	2.1	2.7
120.0	22.94	21.60	24.29	5.9	2.2	2.6
125.0	20.17	18.95	21.39	6.0	2.4	2.5
130.0	17.78	16.68	18.89	6.2	2.5	2.5
135.0	15.74	14.73	16.75	6.4	2.6	2.4

	B57820M0561A005					
R/T No.	1009					
T (°C)	$B_{25/100}$ = 3930 K ±1.5%, R_{25} = 560 Ω, T_R = 100 °C, $\Delta R_R/R_R$ = ± 2%					
	R_{nom}[Ω]	R_{min}[Ω]	R_{max}[Ω]	$\Delta R_R/R_R$[±%]	ΔT[±°C]	α (%/K)
140.0	13.97	13.05	14.89	6.6	2.8	2.4
145.0	12.42	11.58	13.26	6.8	2.9	2.3
150.0	11.08	10.31	11.84	6.9	3.1	2.3
155.0	9.906	9.205	10.61	7.1	3.2	2.2

	B57820M0841A004					
R/T No.	1006					
T (°C)	$B_{25/100}$ = 3550 K, R_{25} = 843 Ω, T_R = 100 °C, $\Delta R_R/R_R$ = ± 2%					
	R_{nom}[Ω]	R_{min}[Ω]	R_{max}[Ω]	$\Delta R_R/R_R$[±%]	ΔT[±°C]	α (%/K)
−55.0	40898	34686	47110	15.2	2.7	5.6
−50.0	30797	26287	35306	14.6	2.6	5.6
−45.0	23305	20015	26596	14.1	2.6	5.5
−40.0	17725	15311	20139	13.6	2.5	5.5
−35.0	13550	11769	15330	13.1	2.4	5.4
−30.0	10411	9091	11732	12.7	2.4	5.3
−25.0	8037	7053	9020	12.2	2.4	5.1
−20.0	6255	5516	6994	11.8	2.4	5.0
−15.0	4872	4316	5428	11.4	2.3	4.9
−10.0	3826	3404	4247	11.0	2.3	4.8
−5.0	3015	2695	3336	10.6	2.3	4.6
0.0	2395	2149	2642	10.3	2.3	4.5
5.0	1917	1727	2108	9.9	2.3	4.4
10.0	1546	1397	1694	9.6	2.3	4.2
15.0	1255	1139	1371	9.3	2.2	4.1
20.0	1025	933.6	1117	8.9	2.2	4.0
25.0	843.2	770.3	916.1	8.6	2.2	3.9
30.0	696.7	638.6	754.9	8.3	2.2	3.8
35.0	578.4	531.8	625.1	8.1	2.2	3.7
40.0	482.8	445.2	520.3	7.8	2.2	3.6
45.0	405.2	374.7	435.6	7.5	2.2	3.5
50.0	341.6	316.8	366.4	7.3	2.1	3.4
55.0	288.5	268.3	308.7	7.0	2.1	3.3
60.0	244.8	228.3	261.4	6.8	2.1	3.2
65.0	209.4	195.8	223.1	6.5	2.1	3.1
70.0	180.0	168.6	191.3	6.3	2.1	3.0
75.0	154.9	145.5	164.3	6.1	2.1	3.0
80.0	133.8	126.0	141.7	5.9	2.0	2.9
85.0	116.0	109.4	122.5	5.6	2.0	2.8
90.0	100.9	95.37	106.3	5.4	2.0	2.7

	B57820M0841A004					
R/T No.	1006					
T (°C)	$B_{25/100}$ = 3550 K, R_{25} = 843 Ω, T_R = 100 °C, $\Delta R_R/R_R$ = ± 2%					
	R_{nom}[Ω]	R_{min}[Ω]	R_{max}[Ω]	$\Delta R_R/R_R$[±%]	ΔT[±°C]	α (%/K)
95.0	87.99	83.37	92.60	5.2	2.0	2.7
100.0	**77.00**	**73.15**	**80.85**	**5.0**	**1.9**	**2.6**
105.0	67.68	64.13	71.23	5.2	2.1	2.6
110.0	59.67	56.43	62.90	5.4	2.2	2.5
115.0	52.74	49.78	55.69	5.6	2.3	2.4
120.0	46.74	44.04	49.44	5.8	2.4	2.4
125.0	41.53	39.06	44.00	5.9	2.6	2.3
130.0	36.99	34.73	39.25	6.1	2.7	2.3
135.0	33.10	31.02	35.18	6.3	2.8	2.2
140.0	29.69	27.78	31.60	6.4	2.9	2.2
145.0	26.63	24.88	28.38	6.6	3.1	2.1
150.0	23.94	22.32	25.55	6.7	3.2	2.1
155.0	21.60	20.11	23.08	6.9	3.4	2.1

	B57820M0102A003					
R/T No.	1008					
T (°C)	$B_{25/100}$ = 3560 K, R_{25} = 1014 Ω, T_R = 100 °C, $\Delta R_R/R_R$ = ± 2%					
	R_{nom}[Ω]	R_{min}[Ω]	R_{max}[Ω]	$\Delta R_R/R_R$[±%]	ΔT[±°C]	α (%/K)
−55.0	53847	45653	62041	15.2	2.5	6.1
−50.0	39868	34020	45716	14.7	2.5	6.0
−45.0	29736	25530	33942	14.1	2.4	5.8
−40.0	22338	19291	25386	13.6	2.4	5.7
−35.0	16900	14675	19124	13.2	2.4	5.5
−30.0	12874	11238	14509	12.7	2.4	5.4
−25.0	9861	8652	11070	12.3	2.3	5.2
−20.0	7622	6720	8524	11.8	2.3	5.1
−15.0	5917	5241	6593	11.4	2.3	4.9
−10.0	4633	4121	5144	11.0	2.3	4.8
−5.0	3655	3266	4045	10.7	2.3	4.7
0.0	2907	2608	3206	10.3	2.3	4.5
5.0	2323	2092	2554	9.9	2.3	4.4
10.0	1870	1690	2049	9.6	2.2	4.3
15.0	1513	1373	1653	9.3	2.2	4.1
20.0	1232	1122	1343	9.0	2.2	4.0
25.0	1014	926.3	1102	8.6	2.2	3.9
30.0	841.4	771.1	911.7	8.4	2.2	3.8
35.0	696.0	639.8	752.1	8.1	2.2	3.7
40.0	579.0	533.9	624.1	7.8	2.2	3.6
45.0	486.9	450.2	523.5	7.5	2.1	3.5

	B57820M0102A003					
R/T No.	1008					
T (°C)	$B_{25/100}$ = 3560 K, R_{25} = 1014 Ω, T_R = 100 °C, $\Delta R_R/R_R$ = ± 2%					
	R_{nom}[Ω]	R_{min}[Ω]	R_{max}[Ω]	$\Delta R_R/R_R$[±%]	ΔT[±°C]	α (%/K)
50.0	411.1	381.3	441.0	7.3	2.1	3.4
55.0	346.5	322.2	370.8	7.0	2.1	3.3
60.0	293.6	273.7	313.4	6.8	2.1	3.2
65.0	250.6	234.2	267.0	6.5	2.1	3.1
70.0	214.8	201.3	228.3	6.3	2.1	3.1
75.0	184.5	173.3	195.7	6.1	2.0	3.0
80.0	159.0	149.7	168.3	5.9	2.0	2.9
85.0	137.8	130.0	145.6	5.6	2.0	2.8
90.0	119.9	113.4	126.4	5.4	2.0	2.8
95.0	104.8	99.35	110.3	5.2	1.9	2.7
100.0	**92.01**	**87.41**	**96.61**	**5.0**	**1.9**	**2.6**
105.0	80.76	76.53	84.99	5.2	2.0	2.6
110.0	71.08	67.23	74.94	5.4	2.2	2.5
115.0	62.76	59.24	66.27	5.6	2.3	2.4
120.0	55.55	52.34	58.76	5.8	2.4	2.4
125.0	49.39	46.45	52.33	5.9	2.5	2.3
130.0	44.02	41.33	46.71	6.1	2.7	2.3
135.0	39.26	36.80	41.73	6.3	2.8	2.2
140.0	35.10	32.84	37.36	6.4	3.0	2.2
145.0	31.48	29.41	33.56	6.6	3.1	2.1
150.0	28.30	26.39	30.21	6.7	3.2	2.1
155.0	25.55	23.79	27.31	6.9	3.4	2.0

Cautions and warnings

General

See "Important notes" at the end of this document.

Storage

- Store thermistors only in original packaging. Do not open the package before storage.
- Storage conditions in original packaging: storage temperature −25 °C ... +45 °C, relative humidity ≤75% annual mean, maximum 95%, dew precipitation is 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.
- Avoid storage of thermistor in harmful environments like corrosive gases (SOx, Cl etc).
- After opening the factory seals, such as polyvinyl-sealed packages, use the SMDs as soon as possible.
- Solder thermistors after shipment from EPCOS within the time specified:
  SMDs: 12 months
  Leaded components: 24 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.

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 overmolded with plastic material, the precautions given in chapter “Mounting instructions”, “Sealing, potting and overmolding” must be observed.
- Electrode must not be scratched before/during/after the mounting process.
- Contacts and housings used for assembly with thermistor have to be clean before mounting.
- During operation, the thermistor’s surface temperature can be very high (ICL). Ensure that adjacent components are placed at a sufficient distance from the thermistor to allow for proper cooling ot the thermistors.
- 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 this temperature.
- Make sure that thermistors (ICLs) are adequately ventilated to avoid overheating.
- Avoid contamination of thermistor surface during processing.

Operation

- Use thermistors only within the specified operating temperature range.
- Use thermistors only within the specified voltage and current ranges (ICLs).
- 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 thermistor (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).

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 for a particular customer application**. As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of passive electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of a passive electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of a passive electronic component.
3. **The warnings, cautions and product-specific notes must be observed**.
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as "hazardous")**. Useful information on this will be found in our Material Data Sheets on the Internet (www.epcos.com/material). Should you have any more detailed questions, please contact our sales offices.
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