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sales@integrated-circuit.com



NTC thermistors for temperature measurement

Glass-encapsulated sensors
with insulation

Series/Type: **B57541**
Date: March 2006



Temperature measurement

B57541

Glass-encapsulated sensors with insulation

G541

Applications

- Automotive electronics
- Industrial electronics
- Home appliances

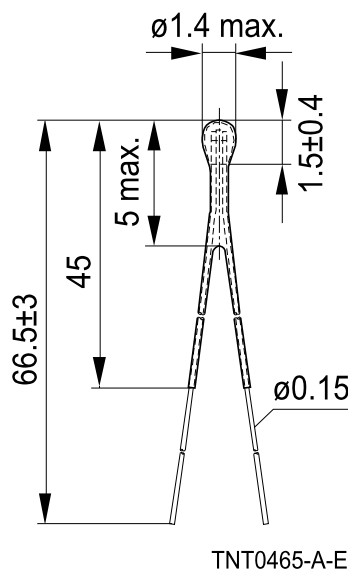
Features

- Glass-encapsulated NTC thermistor, heat-resistant and highly stable
- Coating of glass body and leads for electrical insulation
- For temperature measurement up to 250 °C
- Fast response
- Small dimensions
- Leads: dumet wires (copper-clad FeNi)

Options

Leads: nickel-plated dumet wires.
 Alternative dimensions available on request.

Dimensional drawing



Dimensions in mm

Delivery mode

Bulk

General technical data

Climatic category	(IEC 60068-1)		55/250/56	
Max. power	(at 25 °C)	P_{25}	18	mW
Resistance tolerance		$\Delta R_R / R_R$	$\pm 1, \pm 2, \pm 3, \pm 5$	%
Rated temperature		T_R	25	°C
Dissipation factor	(in air)	δ_{th}	approx. 0.5	mW/K
Thermal cooling time constant	(in air)	τ_c	approx. 4	s
Heat capacity		C_{th}	approx. 2	mJ/K
Insulation resistance ¹⁾	(V = 100 VDC)	R_{ins}	≥ 100	MΩ
Test voltage ¹⁾	(t = 1 s)	V_{test}	500	VDC

1) Medium: NaCl-solution; Temperature: Room temperature



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Electrical specification and ordering codes

R_{25} Ω	No. of R/T characteristic	$B_{25/85}$ K	$B_{0/100}$ K	$B_{25/100}$ K	Ordering code
10 k	8407	3480	3450 \pm 1%	3497	B57541G0103+00*

+ = Resistance tolerance

F = \pm 1%

G = \pm 2%

H = \pm 3%

J = \pm 5%

* = Leads

0 = dumet wires

2 = nickel-plated wires

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: 250 °C t: 1000 h	< 3%	No visible damage
Storage in damp heat, steady state	IEC 60068-2-67	Temperature of air: 85 °C Relative humidity of air: 85% Duration: 56 days	< 2%	No visible damage
Rapid temperature cycling	IEC 60068-2-14	Lower test temperature: -55 °C Upper test temperature: 200 °C Number of cycles: 1000	< 2%	No visible damage



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R/T characteristics

B57541G0103F000						
R/T No.	8407					
T (°C)	B _{0/100} = 3450 K, R ₂₅ = 10000 Ω, T _R = 25 °C, ΔR _R /R _R = ± 1%					
	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
-55.0	519910	491950	547870	5.4	0.8	6.4
-50.0	379890	360880	398910	5.0	0.8	6.2
-45.0	280700	267640	293750	4.7	0.8	5.9
-40.0	209600	200570	218640	4.3	0.8	5.7
-35.0	158090	151780	164390	4.0	0.7	5.5
-30.0	120370	115940	124800	3.7	0.7	5.4
-25.0	92484	89355	95612	3.4	0.7	5.2
-20.0	71668	69447	73889	3.1	0.6	5.0
-15.0	55993	54410	57576	2.8	0.6	4.9
-10.0	44087	42955	45218	2.6	0.5	4.7
-5.0	34971	34161	35780	2.3	0.5	4.6
0.0	27936	27356	28516	2.1	0.5	4.4
5.0	22468	22054	22882	1.8	0.4	4.3
10.0	18187	17892	18482	1.6	0.4	4.2
15.0	14813	14605	15021	1.4	0.3	4.0
20.0	12136	11991	12282	1.2	0.3	3.9
25.0	10000	9900	10100	1.0	0.3	3.8
30.0	8284	8186	8383	1.2	0.3	3.7
35.0	6899	6804	6994	1.4	0.4	3.6
40.0	5774	5684	5864	1.6	0.4	3.5
45.0	4856	4772	4940	1.7	0.5	3.4
50.0	4103	4024	4181	1.9	0.6	3.3
55.0	3482	3409	3554	2.1	0.6	3.2
60.0	2967	2901	3034	2.2	0.7	3.2
65.0	2539	2479	2600	2.4	0.8	3.1
70.0	2182	2126	2237	2.5	0.8	3.0
75.0	1882	1831	1932	2.7	0.9	2.9
80.0	1629	1583	1675	2.8	1.0	2.8
85.0	1415	1373	1457	3.0	1.1	2.8
90.0	1234	1195	1272	3.1	1.1	2.7
95.0	1079	1044	1114	3.2	1.2	2.6
100.0	946.6	914.6	978.6	3.4	1.3	2.6
105.0	833.1	803.9	862.3	3.5	1.4	2.5
110.0	735.5	708.8	762.1	3.6	1.5	2.5
115.0	651.1	626.7	675.5	3.7	1.6	2.4
120.0	578.1	555.8	600.4	3.9	1.6	2.4
125.0	514.6	494.2	535.1	4.0	1.7	2.3
130.0	459.4	440.6	478.1	4.1	1.8	2.2
135.0	411.1	393.8	428.3	4.2	1.9	2.2



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R/T No.	8407					
T (°C)	B _{0/100} = 3450 K, R ₂₅ = 10000 Ω, T _R = 25 °C, ΔR _R /R _R = ± 1%					
	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
140.0	368.8	352.9	384.6	4.3	2.0	2.1
145.0	331.6	317.0	346.2	4.4	2.1	2.1
150.0	298.9	285.4	312.3	4.5	2.2	2.1
155.0	270.0	257.5	282.4	4.6	2.3	2.0
160.0	244.4	232.9	255.9	4.7	2.4	2.0
165.0	221.7	211.1	232.4	4.8	2.5	1.9
170.0	201.6	191.7	211.5	4.9	2.6	1.9
175.0	183.6	174.5	192.8	5.0	2.7	1.8
180.0	167.6	159.1	176.1	5.1	2.8	1.8
185.0	153.3	145.4	161.2	5.2	2.9	1.8
190.0	140.4	133.1	147.8	5.3	3.0	1.7
195.0	128.9	122.0	135.8	5.3	3.1	1.7
200.0	118.5	112.1	124.9	5.4	3.3	1.7
205.0	109.1	103.1	115.1	5.5	3.4	1.6
210.0	100.7	95.05	106.3	5.6	3.5	1.6
215.0	93.01	87.76	98.27	5.7	3.6	1.6
220.0	86.08	81.14	91.01	5.7	3.7	1.5
225.0	79.78	75.15	84.41	5.8	3.9	1.5
230.0	74.05	69.70	78.40	5.9	4.0	1.5
235.0	68.83	64.74	72.93	5.9	4.1	1.4
240.0	64.08	60.22	67.93	6.0	4.2	1.4
245.0	59.73	56.09	63.36	6.1	4.4	1.4
250.0	55.75	52.32	59.18	6.2	4.5	1.4

B57541G0103G000						
R/T No.	8407					
T (°C)	B _{0/100} = 3450 K, R ₂₅ = 10000 Ω, T _R = 25 °C, ΔR _R /R _R = ± 2%					
	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
-55.0	519910	486530	553300	6.4	1.0	6.4
-50.0	379890	356930	402860	6.0	1.0	6.2
-45.0	280700	264740	296660	5.7	1.0	5.9
-40.0	209600	198400	220800	5.3	0.9	5.7
-35.0	158090	150160	166020	5.0	0.9	5.5
-30.0	120370	114710	126040	4.7	0.9	5.4
-25.0	92484	88409	96559	4.4	0.8	5.2
-20.0	71668	68716	74621	4.1	0.8	5.0
-15.0	55993	53839	58146	3.8	0.8	4.9
-10.0	44087	42508	45666	3.6	0.8	4.7
-5.0	34971	33806	36135	3.3	0.7	4.6



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	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
0.0	27936	27074	28798	3.1	0.7	4.4
5.0	22468	21827	23109	2.9	0.7	4.3
10.0	18187	17709	18665	2.6	0.6	4.2
15.0	14813	14456	15170	2.4	0.6	4.0
20.0	12136	11869	12404	2.2	0.6	3.9
25.0	10000	9800	10200	2.0	0.5	3.8
30.0	8284	8103	8466	2.2	0.6	3.7
35.0	6899	6735	7064	2.4	0.7	3.6
40.0	5774	5626	5922	2.6	0.7	3.5
45.0	4856	4723	4989	2.7	0.8	3.4
50.0	4103	3983	4222	2.9	0.9	3.3
55.0	3482	3374	3589	3.1	1.0	3.2
60.0	2967	2871	3064	3.2	1.0	3.2
65.0	2539	2453	2626	3.4	1.1	3.1
70.0	2182	2104	2259	3.6	1.2	3.0
75.0	1882	1812	1951	3.7	1.3	2.9
80.0	1629	1566	1692	3.9	1.4	2.8
85.0	1415	1358	1472	4.0	1.4	2.8
90.0	1234	1183	1285	4.1	1.5	2.7
95.0	1079	1033	1125	4.3	1.6	2.6
100.0	946.6	904.9	988.2	4.4	1.7	2.6
105.0	833.1	795.4	870.9	4.5	1.8	2.5
110.0	735.5	701.3	769.7	4.7	1.9	2.5
115.0	651.1	620.1	682.2	4.8	2.0	2.4
120.0	578.1	549.8	606.4	4.9	2.1	2.4
125.0	514.6	488.9	540.4	5.0	2.2	2.3
130.0	459.4	435.8	482.9	5.1	2.3	2.2
135.0	411.1	389.6	432.6	5.2	2.4	2.2
140.0	368.8	349.1	388.4	5.3	2.5	2.1
145.0	331.6	313.5	349.6	5.4	2.6	2.1
150.0	298.9	282.3	315.4	5.5	2.7	2.1
155.0	270.0	254.7	285.2	5.6	2.8	2.0
160.0	244.4	230.4	258.5	5.7	2.9	2.0
165.0	221.7	208.8	234.7	5.8	3.0	1.9
170.0	201.6	189.6	213.6	5.9	3.1	1.9
175.0	183.6	172.6	194.7	6.0	3.3	1.8
180.0	167.6	157.4	177.9	6.1	3.4	1.8
185.0	153.3	143.8	162.8	6.2	3.5	1.8
190.0	140.4	131.6	149.3	6.3	3.6	1.7
195.0	128.9	120.7	137.1	6.4	3.8	1.7



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T (°C)	B _{0/100} = 3450 K, R ₂₅ = 10000 Ω, T _R = 25 °C, ΔR _R /R _R = ± 2%					
	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
200.0	118.5	110.8	126.1	6.5	3.9	1.7
205.0	109.1	102.0	116.3	6.5	4.0	1.6
210.0	100.7	94.00	107.3	6.6	4.1	1.6
215.0	93.01	86.78	99.24	6.7	4.3	1.6
220.0	86.08	80.24	91.91	6.8	4.4	1.5
225.0	79.78	74.31	85.24	6.9	4.6	1.5
230.0	74.05	68.92	79.18	6.9	4.7	1.5
235.0	68.83	64.02	73.65	7.0	4.8	1.4
240.0	64.08	59.55	68.60	7.1	5.0	1.4
245.0	59.73	55.47	63.99	7.1	5.1	1.4
250.0	55.75	51.73	59.77	7.2	5.3	1.4

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R/T No.	8407					
T (°C)	B _{0/100} = 3450 K, R ₂₅ = 10000 Ω, T _R = 25 °C, ΔR _R /R _R = ± 3%					
	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
-55.0	519910	481100	558720	7.5	1.2	6.4
-50.0	379890	352980	406810	7.1	1.1	6.2
-45.0	280700	261830	299570	6.7	1.1	5.9
-40.0	209600	196240	222970	6.4	1.1	5.7
-35.0	158090	148530	167650	6.0	1.1	5.5
-30.0	120370	113470	127270	5.7	1.1	5.4
-25.0	92484	87462	97505	5.4	1.0	5.2
-20.0	71668	67984	75352	5.1	1.0	5.0
-15.0	55993	53269	58716	4.9	1.0	4.9
-10.0	44087	42060	46114	4.6	1.0	4.7
-5.0	34971	33452	36489	4.3	1.0	4.6
0.0	27936	26792	29081	4.1	0.9	4.4
5.0	22468	21601	23335	3.9	0.9	4.3
10.0	18187	17526	18848	3.6	0.9	4.2
15.0	14813	14307	15319	3.4	0.8	4.0
20.0	12136	11748	12525	3.2	0.8	3.9
25.0	10000	9700	10300	3.0	0.8	3.8
30.0	8284	8020	8549	3.2	0.9	3.7
35.0	6899	6665	7133	3.4	0.9	3.6
40.0	5774	5568	5980	3.6	1.0	3.5
45.0	4856	4674	5038	3.8	1.1	3.4
50.0	4103	3942	4264	3.9	1.2	3.3
55.0	3482	3339	3624	4.1	1.3	3.2



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T (°C)	B _{0/100} = 3450 K, R ₂₅ = 10000 Ω, T _R = 25 °C, ΔR _R /R _R = ± 3%					
	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
60.0	2967	2841	3094	4.3	1.3	3.2
65.0	2539	2427	2652	4.4	1.4	3.1
70.0	2182	2082	2282	4.6	1.5	3.0
75.0	1882	1793	1971	4.7	1.6	2.9
80.0	1629	1549	1708	4.9	1.7	2.8
85.0	1415	1344	1486	5.0	1.8	2.8
90.0	1234	1170	1297	5.2	1.9	2.7
95.0	1079	1022	1136	5.3	2.0	2.6
100.0	946.6	895.3	997.9	5.4	2.1	2.6
105.0	833.1	786.9	879.4	5.6	2.2	2.5
110.0	735.5	693.7	777.2	5.7	2.3	2.5
115.0	651.1	613.4	688.9	5.8	2.4	2.4
120.0	578.1	543.9	612.3	5.9	2.5	2.4
125.0	514.6	483.6	545.7	6.0	2.6	2.3
130.0	459.4	431.1	487.6	6.2	2.7	2.2
135.0	411.1	385.3	436.8	6.3	2.9	2.2
140.0	368.8	345.3	392.2	6.4	3.0	2.1
145.0	331.6	310.1	353.1	6.5	3.1	2.1
150.0	298.9	279.2	318.5	6.6	3.2	2.1
155.0	270.0	251.9	288.0	6.7	3.3	2.0
160.0	244.4	227.8	261.0	6.8	3.4	2.0
165.0	221.7	206.5	237.0	6.9	3.6	1.9
170.0	201.6	187.5	215.7	7.0	3.7	1.9
175.0	183.6	170.7	196.6	7.1	3.8	1.8
180.0	167.6	155.6	179.6	7.2	4.0	1.8
185.0	153.3	142.2	164.4	7.2	4.1	1.8
190.0	140.4	130.1	150.7	7.3	4.2	1.7
195.0	128.9	119.3	138.4	7.4	4.4	1.7
200.0	118.5	109.6	127.4	7.5	4.5	1.7
205.0	109.1	100.8	117.4	7.6	4.7	1.6
210.0	100.7	92.95	108.4	7.7	4.8	1.6
215.0	93.01	85.81	100.2	7.7	4.9	1.6
220.0	86.08	79.34	92.81	7.8	5.1	1.5
225.0	79.78	73.48	86.08	7.9	5.2	1.5
230.0	74.05	68.15	79.95	8.0	5.4	1.5
235.0	68.83	63.30	74.37	8.0	5.6	1.4
240.0	64.08	58.87	69.28	8.1	5.7	1.4
245.0	59.73	54.84	64.62	8.2	5.9	1.4
250.0	55.75	51.15	60.35	8.3	6.0	1.4



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	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
-55.0	519910	470250	569570	9.6	1.5	6.4
-50.0	379890	345080	414710	9.2	1.5	6.2
-45.0	280700	256010	305380	8.8	1.5	5.9
-40.0	209600	191910	227300	8.4	1.5	5.7
-35.0	158090	145270	170900	8.1	1.5	5.5
-30.0	120370	111000	129740	7.8	1.5	5.4
-25.0	92484	85569	99399	7.5	1.4	5.2
-20.0	71668	66521	76816	7.2	1.4	5.0
-15.0	55993	52129	59856	6.9	1.4	4.9
-10.0	44087	41164	47009	6.6	1.4	4.7
-5.0	34971	32744	37198	6.4	1.4	4.6
0.0	27936	26227	29645	6.1	1.4	4.4
5.0	22468	21147	23788	5.9	1.4	4.3
10.0	18187	17160	19214	5.6	1.4	4.2
15.0	14813	14010	15616	5.4	1.3	4.0
20.0	12136	11504	12768	5.2	1.3	3.9
25.0	10000	9500	10500	5.0	1.3	3.8
30.0	8284	7854	8715	5.2	1.4	3.7
35.0	6899	6527	7271	5.4	1.5	3.6
40.0	5774	5452	6097	5.6	1.6	3.5
45.0	4856	4576	5136	5.8	1.7	3.4
50.0	4103	3859	4347	5.9	1.8	3.3
55.0	3482	3269	3695	6.1	1.9	3.2
60.0	2967	2781	3154	6.3	2.0	3.2
65.0	2539	2376	2703	6.4	2.1	3.1
70.0	2182	2038	2326	6.6	2.2	3.0
75.0	1882	1754	2009	6.8	2.3	2.9
80.0	1629	1516	1741	6.9	2.4	2.8
85.0	1415	1315	1515	7.1	2.5	2.8
90.0	1234	1145	1322	7.2	2.7	2.7
95.0	1079	999.7	1158	7.3	2.8	2.6
100.0	946.6	875.9	1017	7.5	2.9	2.6
105.0	833.1	769.8	896.5	7.6	3.0	2.5
110.0	735.5	678.6	792.3	7.7	3.1	2.5
115.0	651.1	600.0	702.3	7.9	3.3	2.4
120.0	578.1	532.0	624.2	8.0	3.4	2.4
125.0	514.6	473.0	556.3	8.1	3.5	2.3
130.0	459.4	421.6	497.1	8.2	3.7	2.2
135.0	411.1	376.8	445.3	8.3	3.8	2.2



Temperature measurement

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B57541G0103J000						
R/T No.	8407					
T (°C)	B _{0/100} = 3450 K, R ₂₅ = 10000 Ω, T _R = 25 °C, ΔR _R /R _R = ± 5%					
	R _{nom} [Ω]	R _{min} [Ω]	R _{max} [Ω]	ΔR _R /R _R [±%]	ΔT[±°C]	α (%/K)
140.0	368.8	337.6	399.9	8.4	3.9	2.1
145.0	331.6	303.3	359.9	8.5	4.1	2.1
150.0	298.9	273.0	324.7	8.7	4.2	2.1
155.0	270.0	246.3	293.6	8.8	4.4	2.0
160.0	244.4	222.8	266.1	8.9	4.5	2.0
165.0	221.7	201.9	241.6	9.0	4.6	1.9
170.0	201.6	183.3	219.8	9.1	4.8	1.9
175.0	183.6	166.8	200.4	9.1	5.0	1.8
180.0	167.6	152.1	183.1	9.2	5.1	1.8
185.0	153.3	139.0	167.6	9.3	5.3	1.8
190.0	140.4	127.2	153.7	9.4	5.4	1.7
195.0	128.9	116.6	141.1	9.5	5.6	1.7
200.0	118.5	107.1	129.9	9.6	5.8	1.7
205.0	109.1	98.57	119.7	9.7	5.9	1.6
210.0	100.7	90.85	110.5	9.8	6.1	1.6
215.0	93.01	83.86	102.2	9.8	6.3	1.6
220.0	86.08	77.54	94.61	9.9	6.5	1.5
225.0	79.78	71.80	87.75	10.0	6.6	1.5
230.0	74.05	66.59	81.51	10.1	6.8	1.5
235.0	68.83	61.85	75.82	10.1	7.0	1.4
240.0	64.08	57.53	70.62	10.2	7.2	1.4
245.0	59.73	53.58	65.87	10.3	7.4	1.4
250.0	55.75	49.98	61.53	10.4	7.6	1.4



Temperature measurement

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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 $-25\text{ °C} \dots +45\text{ °C}$, relative humidity $\leq 75\%$ 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 (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 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 of 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.

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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.**
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