DATA SHEET

General Description

EPCOS offers a new series of surface mountable NTC thermistors with the smallest chip sizes available on the market today. These high quality SMD thermistors in multilayer technology with inner electrodes with almost no change (<1%) of resistance value after soldering offer a superior resistance stability. They were developed for a variety of applications for the specific demands of our customers in the telecom and automotive industry.

Features

- Multilayer SMD NTC with inner electrodes
- Ni - Barrier termination (Ag/Ni/Sn)
- Standard EIA chip sizes 0402, 0603, 0805
- High accuracy: ±5% in resistance, B-value tolerance down to ±1,5% available
- Excellent long term ageing stability in high temperature and high humidity environment
- Superior resistance stability during soldering, therefore almost no change (<1%) during soldering

Applications

- Temperature measurement and compensation for telecom, automotive and data systems

Ni - Barrier Series

$B_{25/50}$ / K

R25 / Ω	0402	0603	0805
47		3470	3470
100	3470		
150			
220			
330			
470		3940	3940
680			
1k	3940		
1,5k			
2,2k		4390	4390
3,3k			
4,7k			
6,8k			
10k	4390		
15k			
22k			
33k			
47k			
68k			
100k			

$B_{25/85}$ / K

R25 / Ω	0402	0603	0805
47		3540	3540
100	3540		
150			
220			
330			
470		3980	3980
680			
1k	3980		
1,5k			
2,2k		4470	4470
3,3k			
4,7k			
6,8k			
10k	4470		
15k			
22k			
33k			
47k			
68k			
100k			

$B_{25/100}$ /K (specified)

R25 / Ω	0402	0603	0805
47		3550	3550
100	3550		
150			
220			
330			
470		4000	4000
680			
1k	4000		
1,5k			
2,2k		4500	4500
3,3k			
4,7k			
6,8k			
10k	4500		
15k			
22k			
33k			
47k			
68k			
100k			

The B-value is calculated between two specified ambient temperatures. This B-characteristic is indicated by the slope of the linear plot. Therefore the given B-values in the three tables above represent one and the same part measured at different temperature references (25/50°C; 25/85°C; 25/100°C).

How to order

e.g. case size 0603, R_{25}=10kΩ ± 5%, $B_{25/100}$=4500 K ± 3%, paper taped, Ø180 mm reel
➔ ordering code: B57331- V2103-J60

B57 3 31 - V 2 103 - J 60

NTC thermistor

2 = EIA Chip Size 0402
3 = EIA Chip Size 0603
4 = EIA Chip Size 0805

$B_{25/100}$- value / tolerance code:

		B – tolerance		
		3%	2%	1.5%
B-value	3550 K	11	12	13
	4000 K	21	22	23
	4500 K	31	32	33

Multilayer SMD NTC

Termination type: 2 = Ag/Ni/Sn
(1 = AgPt)
(0 = AgPd)

Resistance at rated temp. (25°C): 103 = 10 x 10^3 Ω = 10 kΩ

Resistance Tolerance: J = ± 5 %
K = ± 10 %
M = ± 20 %

Option

Packaging codes:
60 = cardboard tape, 180mm reel
70 = cardboard tape, 330mm reel
62 = blister tape, 180mm reel
72 = blister tape, 330mm reel

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Case Size	Resistance	$B_{25/50}$	$B_{25/85}$	$B_{25/100}$	Part Number
0402	100 Ω	3470 K	3450 K	3550 K	B57211-V2101-*60
	150 Ω				B57211-V2151-*60
	220 Ω				B57211-V2221-*60
	330 Ω				B57211-V2331-*60
	470 Ω				B57211-V2471-*60
	1 kΩ	3940 K	3980 K	4000 K	B57221-V2102-*60
	1,5 kΩ				B57221-V2152-*60
	2,2 kΩ				B57221-V2222-*60
	3,3 kΩ				B57221-V2332-*60
	4,7 kΩ				B57221-V2472-*60
	10 kΩ	4390 K	4470 K	4500 K	B57231-V2103-*60
	15 kΩ				B57231-V2153-*60
	22 kΩ				B57231-V2223-*60
	33 kΩ				B57231-V2333-*60
	47 kΩ				B57231-V2473-*60
0603	47 Ω	3470 K	3450 K	3550 K	B57311-V2470-*60
	100 Ω				B57311-V2101-*60
	150 Ω				B57311-V2151-*60
	220 Ω				B57311-V2221-*60
	330 Ω				B57311-V2331-*60
	470 Ω	3940 K	3980 K	4000 K	B57321-V2471-*60
	680 Ω				B57321-V2681-*60
	1 kΩ				B57321-V2102-*60
	1,5 kΩ				B57321-V2152-*60
	2,2 kΩ	4390 K	4470 K	4500 K	B57331-V2222-*60
	3,3 kΩ				B57331-V2332-*60
	4,7 kΩ				B57331-V2472-*60
	6,8 kΩ				B57331-V2682-*60
	10 kΩ				B57331-V2103-*60
	15 kΩ				B57331-V2153-*60
	22 kΩ				B57331-V2223-*60
	33 kΩ				B57331-V2333-*60
	47 kΩ				B57331-V2473-*60
	68 kΩ				B57331-V2683-*60
	100 kΩ				B57331-V2104-*60

* = Resistance Tolerance: J for $\Delta R/R_{25} = \pm 5\%$ M for $\Delta R/R_{25} = \pm 20\%$
K for $\Delta R/R_{25} = \pm 10\%$

Alternative resistance ratings, resistance tolerance < 5% and B-value tolerance < 3% on request.

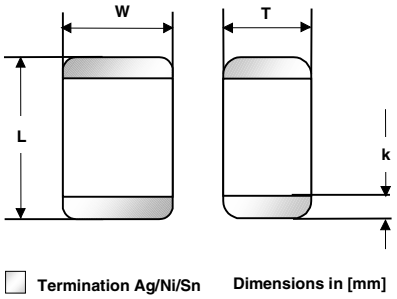
Case Size	Resistance	$B_{25/50}$	$B_{25/85}$	$B_{25/100}$	Part Number
0805	47 Ω	3470 K	3540 K	3550 K	B57411-V2470-*62
	100 Ω				B57411-V2101-*62
	150 Ω				B57411-V2151-*62
	220 Ω				B57411-V2221-*62
	330 Ω				B57411-V2331-*62
	470 Ω	3940K	3980 K	4000 K	B57421-V2471-*62
	680 Ω				B57421-V2681-*62
	1 kΩ				B57421-V2102-*62
	1,5 kΩ				B57421-V2152-*62
	2,2 kΩ	4390 K	4470K	4500 K	B57431-V2222-*62
	3,3 kΩ				B57431-V2332-*62
	4,7 kΩ				B57431-V2472-*60
	6,8 kΩ				B57431-V2682-*62
	10 kΩ				B57431-V2103-*62
	15 kΩ				B57431-V2153-*62
	22 kΩ				B57431-V2223-*62
	33 kΩ				B57431-V2333-*62
	47 kΩ				B57431-V2473-*62
	68 kΩ				B57431-V2683-*62
	100 kΩ				B57431-V2104-*62

* = Resistance Tolerance: J for $\Delta R/R_{25} = \pm 5\%$ M for $\Delta R/R_{25} = \pm 20\%$
K for $\Delta R/R_{25} = \pm 10\%$

Alternative resistance ratings, resistance tolerance < 5% and B-value tolerance < 3% on request.

Series in 0402

• Part Dimensions



Dimensions in mm

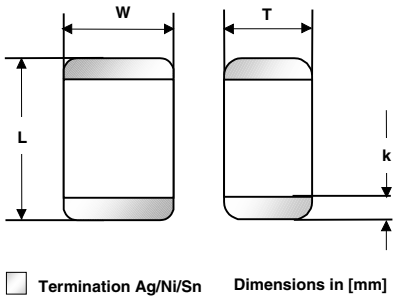
Type	L	W	T	k
0402	1.0±0.1	0.5±0.05	0.6 max.	0.25±0.15

Climatic Category (IEC 60068-1, JIS C 0010)		**55/125/56**
Lower category temperature (LCT)		**-55°C**
Upper category temperature (UCT)		**125°C**
Power rating at 25°C	P_{25}	**150mW** [1]
Dissipation factor (on PCB)	G_{th}	**approx. 2.5mW/K** [1]
Thermal cooling time constant (on PCB)	T_{th}	**approx. 3.0s** [1]
Heat capacity	C_{th}	**approx. 7.5mJ/K** [1]
Weight of component		**approx. 4.5mg**

[1] Depends on mounting situation

Series in 0603

• Part Dimensions



Dimensions in mm

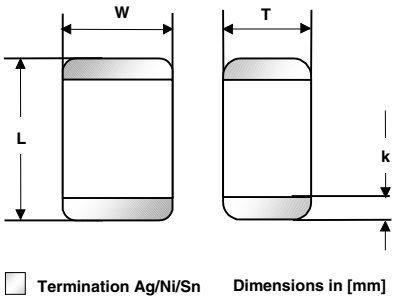
Type	L	W	T	k
0603	1.6±0.15	0.8±0.15	0.9 max.	0.35±0.15

Climatic Category (IEC 60068-1, JIS C 0010)		**55/125/56**
Lower category temperature (LCT)		**-55°C**
Upper category temperature (UCT)		**125°C**
Power rating at 25°C	P_{25}	**180mW** [1]
Dissipation factor (on PCB)	G_{th}	**approx. 3.0 mW/K** [1]
Thermal cooling time constant (on PCB)	T_{th}	**approx. 4.0 s** [1]
Heat capacity	C_{th}	**approx. 12 mJ/K** [1]
Weight of component		**approx. 6 mg**

[1] Depends on mounting situation

Series in 0805

• Part Dimensions



Dimensions in mm

Type	L	W	T	k
0805	2.0±0.2	1.25±0.15	1.25 max.	0.5±0.25
0805 SL*)	2.0±0.2	1.25±0.15	0.9 max.	0.5±0.25

*) slimline version optionally available on request

Climatic Category (IEC 60068-1, JIS C 0010)		**55/125/56**
Lower category temperature (LCT)		**-55°C**
Upper category temperature (UCT)		**125°C**
Power rating at 25°C	P_{25}	**210 mW** 1)
Dissipation factor (on PCB)	G_{th}	**approx. 3.5 mW/K** 1)
Thermal cooling time constant (on PCB)	T_{th}	**approx. 10 s** 1)
Heat capacity	C_{th}	**approx. 35 mJ/K** 1)
Weight of component		**approx. 13 mg**

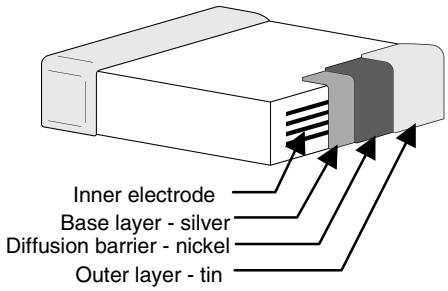
1) Depends on mounting situation

MOUNTING INSTRUCTIONS

1. Termination

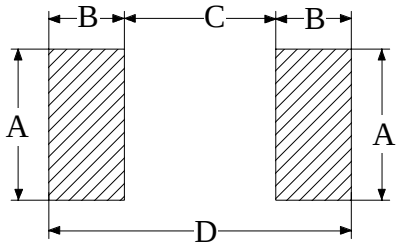
Ni-barrier termination (Ag/Ni/Sn)

Optional: AgPd or AgPt - termination available on request



2. Recommended geometry of solder pads

Size	A [mm]	B [mm]	C [mm]	D [mm]
0402	0,6	0,6	0,5	1,7
0603	1,0	1,0	1,0	3,0
0805	1,3	1,2	1,0	3,4

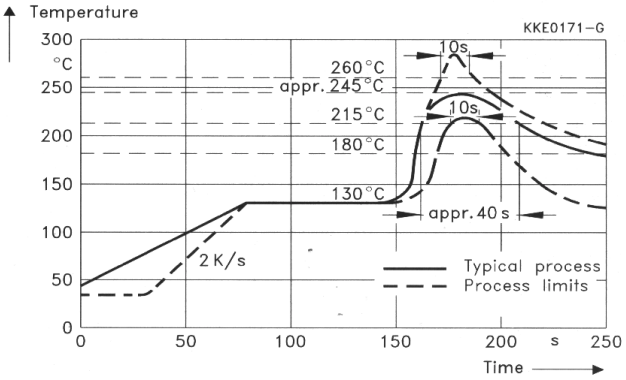


3. Recommended soldering profiles

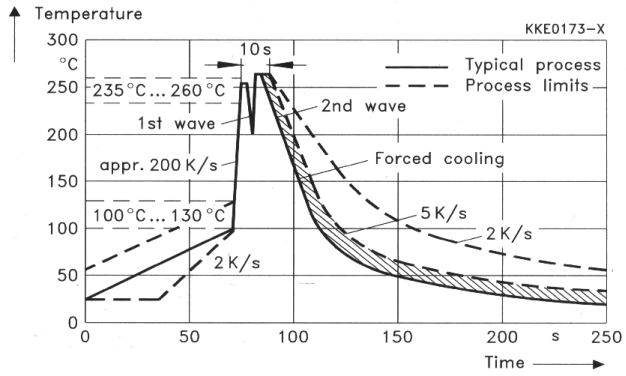
- Wettability test in accordance with IEC 60068-2-58 (= JIS C 0054) :
  Preconditioning: Immersion into flux F-SW 32.
  Evaluation criteria: Wetting of soldering areas ≥ 95%.
  Solder: SnPb 60/40.
  Bath temperature (°C): 215 ± 3.
  Dwell time (s): 4

- Soldering heat resistance test in accordance with IEC 60068-2-58 (= JIS C 0054) :
  Preconditioning: Immersion into flux F-SW 32.
  Evaluation criteria: Leaching of side edges ≤ 1/3.
  Solder: SnPb 60/40.
  Bath temperature (°C): 260 ± 5.
  Dwell time (s): 10

Infrared reflow soldering profile: (according to CECC 00802)
Temperature characteristics at component terminals during infrared reflow soldering (two cycles are permitted).



Wave soldering profile: (for case sizes 0603 and 0805 only)
Temperature characteristics at component terminals during wave soldering can be recommended once in general.



4. Storage conditions

Solderability is guaranteed for 12 months from date of delivery for types with Ni-barrier termination, provided that the components are stored in the original packages.

Storage temperature: -25 ... +45°C
Relative humidity: < 75% annual average, < 95% on max. 30 days in a year, dew precipitation and wetness are inadmissible.

For more detailed information please refer to the MLCC databook 2001.

RELIABILITY

Tests of SMD NTC thermistors are made according to IEC 60068. The parts are mounted on standardized PCB in accordance with IEC 60539-1.

Test	Standard	Test conditions	$\Delta R_{25} / R_{25}$ (typical)	Remarks
Resistance drift after soldering	-	reflow soldering profile (all sizes) wave soldering profile (for sizes 0603 and 0805 only)	**< 1%**	Excellent resistance stability during soldering due to unique inner electrode design
Cold test	IEC 60068-2-1 (=JIS C 0020)	Storage at lower category temperature T= -55°C Duration: 1000h	**< 2%**	
Storage in dry heat	IEC 60068-2-2 (=JIS C 0021)	Storage at upper category temperature T=125°C Duration: 1000h	**< 2%**	
Storage in damp heat, steady state	IEC 60068-2-3 (=JIS C 0022)	Temperature of air: 40°C relative humidity of air: 93% Duration: 56days	**< 2%**	
Rapid temperature cycling	IEC 60068-2-14 (=JIS C 0025)	Lower test temperature: -55°C Upper test temperature: 125°C Number of cycles: 100	**< 2%**	
Endurance at P_{max}	-	P_{max}=150mW (for size 0402) P_{max}=180mW (for size 0603) P_{max}=210mW (for size 0805) Duration: 1000h	**< 2%**	
Solderability	IEC 60068-2-58 (=JIS C 0054)	Solderability: 215°C ± 3°C / 3s Resistance to soldering heat: 260°C± 5°C / 10s	**< 1%**	95% of terminations wetted

Standardized R/T Characteristics

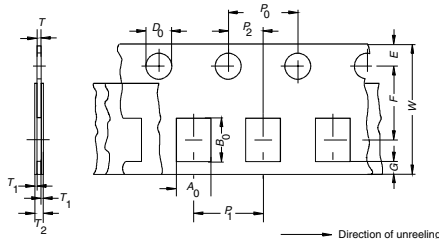
No / $B_{25/100}$	1 / 3550 K		2 / 4000 K		3 / 4500 K	
Temp. (°C)	R_T/R_{25} (Ω)	α (%/K)	R_T/R_{25} (Ω)	α (%/K)	R_T/R_{25} (Ω)	α (%/K)
-55,00	56,633	6,5	96,158	7,4	132,52	7,8
-50,00	41,134	6,3	66,892	7,1	90,523	7,5
-45,00	30,209	6,1	47,127	6,9	62,637	7,2
-40,00	22,420	5,9	33,606	6,6	43,867	7,0
-35,00	16,807	5,7	24,243	6,4	31,071	6,8
-30,00	12,721	5,5	17,681	6,2	22,244	6,6
-25,00	9,7156	5,3	13,032	6,0	16,087	6,4
-20,00	7,4854	5,1	9,7020	5,8	11,746	6,2
-15,00	5,8152	5,0	7,2923	5,6	8,6553	6,0
-10,00	4,5537	4,8	5,5314	5,4	6,4337	5,8
-5,00	3,5931	4,7	4,2325	5,3	4,8223	5,7
0,00	2,8558	4,5	3,2657	5,1	3,6435	5,5
5,00	2,2857	4,4	2,5400	4,9	2,7739	5,4
10,00	1,8416	4,3	1,9907	4,8	2,1274	5,2
15,00	1,4934	4,1	1,5716	4,7	1,6431	5,1
20,00	1,2184	4,0	1,2494	4,5	1,2777	5,0
25,00	1,0000	3,9	1,0000	4,4	1,0000	4,8
30,00	0,82537	3,8	0,80552	4,3	0,78759	4,7
35,00	0,68495	3,7	0,65288	4,1	0,62406	4,6
40,00	0,57139	3,6	0,53229	4,0	0,49737	4,5
45,00	0,47905	3,5	0,43645	3,9	0,39863	4,4
50,00	0,40358	3,4	0,35981	3,8	0,32123	4,3
55,00	0,34158	3,3	0,29819	3,7	0,26022	4,2
60,00	0,29040	3,2	0,24837	3,6	0,21186	4,1
65,00	0,24795	3,1	0,20787	3,5	0,17334	4,0
70,00	0,21259	3,0	0,17479	3,4	0,14249	3,9
75,00	0,18300	3,0	0,14763	3,3	0,11767	3,8
80,00	0,15813	2,9	0,12523	3,2	0,097598	3,7
85,00	0,13715	2,8	0,10667	3,2	0,081300	3,6
90,00	0,11938	2,7	0,09123	3,1	0,068004	3,5
95,00	0,10427	2,7	0,07832	3,0	0,057111	3,5
100,00	0,091375	2,6	0,06749	2,9	0,048150	3,4
105,00	0,080333	2,5	0,05836	2,9	0,040747	3,3
110,00	0,070846	2,5	0,05065	2,8	0,034609	3,2
115,00	0,062666	2,4	0,044098	2,7	0,029500	3,2
120,00	0,055592	2,4	0,038520	2,7	0,025231	3,1
125,00	0,049454	2,3	0,033752	2,6	0,021651	3,0

The tabulated resistance characteristics have been standardized for the resistance value at 25°C. The actual resistance values of a particular NTC thermistor are obtained by multiplying the ratio R_T/R_{25} (tabulated values) by the resistance value at 25°C (specified in the data sheets).

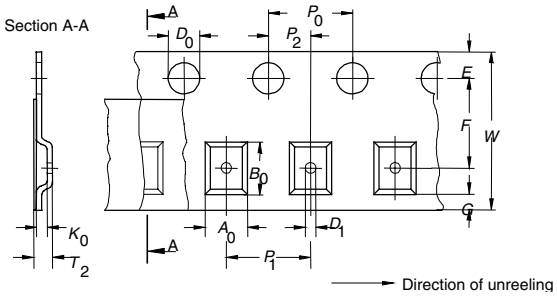
TAPING AND PACKING

Taping: Tape and reel packing comply with specifications of IEC 60286-3

Cardboard tape
(for sizes 0402 and 0603):



Blister tape
(for size 0805)

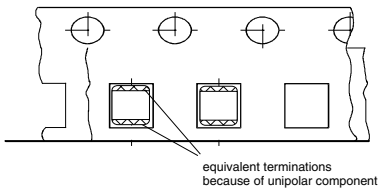


Dimensions and tolerances:

Definition	Symbol	Dimension (mm)	Dimension (mm)	Dimension (mm)	Tol. (mm)
		Size 0402	Size 0603	Size 0805	
Compartment width x Compartments length	A_0 x B_0	0.6 x 1,15	0.95 x 1.8	1.6 x 2.4	± 0.2
Compartment height	K_0	-	-	1.3	max.
Overall thickness	T_2	0.7	1.1	2.5	max.
	T	0.6	0.9	0.3	max.
Sprocket hole diameter	D_0	1.5	1.5	1.5	+0.1/-0
Compartment hole diameter	D_1	-	-	1.0	min.
Sprocket hole pitch	P_0	4.0	4.0	4.0	± 0.1[1)]
Distance centre hole to centre compartment	P_2	2.0	2.0	2.0	± 0.05
Pitch of the component compartments	P_1	4.0	4.0	4.0	± 0.1
Tape width	W	8.0	8.0	8.0	± 0.3
Distance edge to centre of hole	E	1.75	1.75	1.75	± 0.1
Distance centre hole to centre compartment	F	3.5	3.5	3.5	± 0.05
Distance edge to centre compartment	G	0.75	0.75	0.75	min.

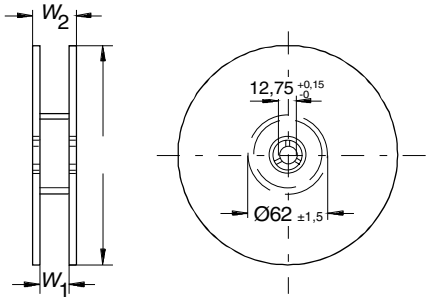
[1)] ≤ 0.2 mm over 10 sprocket holes.

Part orientation in tape pocket



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Reel Packing:



Reel material: PS.

Tape material: Blister / Cardboard

Tape break force: min. 10N

Top cover tape peel force: 0.1 - 0.65N at a peel speed of 300 mm/min, angle between top cover tape and the direction of feed during peel off: 165 -180°.

Top cover tape strength: min. 10N

Length of tape:
Leader section: additional top cover tape, length min 400 mm, before component section (including carrier tape with empty cavities, length min. 150 mm or min. 20 pcs. of empty cavities).
Trailer section: length min. 40 mm.
Empty part cavities at leader and trailer section on tape is sealed with top cover tape.

Cavity play:
Each part rests in the cavity so that the angle between the part centreline and the cavity centreline is no more than 20°.

Weight of loaded reel: max. 1500 g

Package 8 mm tape

Definition	Symbol	Dim. (mm)	Tol. (mm)
Reel diameter	A	180	-2/+0
Reel width (inside)	W_1	8.4	+1.5/-0
Reel width (outside)	W_2	14.4	max.
Reel diameter	A	330	±2.0
Reel width (inside)	W_1	12.4	+1.5/-0
Reel width (outside)	W_2	18.4	max.

Packing units

				Units /reel	
Size inch / mm	**Chip thickness**	**Cardboard tape**	**Blister tape**	**Reel Ø 180mm**	**Reel Ø 330mm**
0402/1005	0.5 mm	8 mm	-	10000	-
0603/1608	0.8 mm	8 mm	-	4000	16000
0805/2012	0.8 mm 1.2 mm	- -	8 mm 8 mm	4000 3000	16000 12000

DATA SHEET

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