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NTC thermistors for temperature measurement

Leaded NTC thermistors,
lead spacing 5 mm

Series/Type: **B57164K**
Date: January 2018

EPCOS AG is a TDK Group Company.

Applications

- Temperature measurement and compensation

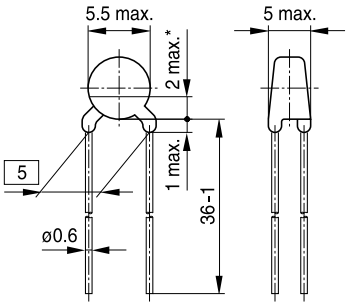
Features

- Wide resistance range
- Cost-effective
- Lacquer-coated thermistor disk
- Tinned copper leads
- Lead spacing 5 mm
- Marked with resistance and tolerance

Delivery mode

Bulk (standard), cardboard tape, reeled or in Ammo pack on request

Dimensional drawing



* May be free of lacquer

Dimensions in mm
Approx. weight 370 mg

General technical data

Climatic category	(IEC 60068-1)		55/125/21	
Max. power	(at 25 °C)	P_{25}	450	mW
Resistance tolerance		$\Delta R_R/R_R$	±5, ±10	%
Rated temperature		T_R	25	°C
Dissipation factor	(in air)	δ_{th}	approx. 7.5	mW/K
Thermal cooling time constant	(in air)	τ_c	approx. 20	s
Heat capacity		C_{th}	approx. 150	mJ/K

Electrical specification and ordering codes

R_{25} Ω	No. of R/T characteristic	$B_{25/100}$ K	Ordering code
22	1203	2900 ±3%	B57164K0220+000
33	1203	2900 ±3%	B57164K0330+000
47	1302	3000 ±3%	B57164K0470+000
68	1303	3050 ±3%	B57164K0680+000
100	1305	3200 ±3%	B57164K0101+000
150	1305	3200 ±3%	B57164K0151+000
220	1305	3200 ±3%	B57164K0221+000
330	1306	3450 ±3%	B57164K0331+000
470	1306	3450 ±3%	B57164K0471+000
680	1307	3560 ±3%	B57164K0681+000
1 k	1011	3730 ±3%	B57164K0102+000
1.5 k	1013	3900 ±3%	B57164K0152+000
2.2 k	1013	3900 ±3%	B57164K0222+000
3.3 k	4001	3950 ±3%	B57164K0332+000
4.7 k	4001	3950 ±3%	B57164K0472+000
6.8 k	2903	4200 ±3%	B57164K0682+000
10 k	2904	4300 ±3%	B57164K0103+000
15 k	1014	4250 ±3%	B57164K0153+000
22 k	1012	4300 ±3%	B57164K0223+000
33 k	1012	4300 ±3%	B57164K0333+000
47 k	4003	4450 ±3%	B57164K0473+000
68 k	2005	4600 ±3%	B57164K0683+000
100 k	2005	4600 ±3%	B57164K0104+000
150 k	2005	4600 ±3%	B57164K0154+000
220 k	2007	4830 ±3%	B57164K0224+000
330 k	2006	5000 ±3%	B57164K0334+000
470 k	2006	5000 ±3%	B57164K0474+000

+ = Resistance tolerance
J = ±5%
K = ±10%

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: 125 °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: 125 °C Number of cycles: 10	< 3%	No visible damage
Endurance		P_{max}: 450 mW t: 1000 h	< 3%	No visible damage
Long-term stability (empirical value)		Temperature: 70 °C t: 10000 h	< 5%	No visible damage

Note

- 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).
- Avoid dewing and condensation unless thermistor is specified for these conditions.

R/T characteristics

R/T No.	1011		1012		1013	
T (°C)	$B_{25/100}$ = 3730 K		$B_{25/100}$ = 4300 K		$B_{25/100}$ = 3900 K	
	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)
−55.0	70.014	6.9	87.237	6.8	77.285	7.0
−50.0	49.906	6.7	62.264	6.7	54.938	6.7
−45.0	36.015	6.4	44.854	6.5	39.507	6.5
−40.0	26.296	6.2	32.599	6.3	28.722	6.3
−35.0	19.411	6.0	23.893	6.1	21.099	6.1
−30.0	14.479	5.8	17.654	6.0	15.652	5.9
−25.0	10.903	5.6	13.098	5.8	11.715	5.7
−20.0	8.2923	5.4	9.8059	5.7	8.8541	5.6
−15.0	6.3591	5.2	7.4266	5.5	6.7433	5.4
−10.0	4.9204	5.1	5.6677	5.4	5.1815	5.2
−5.0	3.8279	4.9	4.3213	5.3	4.0099	5.1
0.0	3.0029	4.8	3.3208	5.1	3.1283	4.9
5.0	2.3773	4.6	2.5842	5.0	2.4569	4.8
10.0	1.8959	4.5	2.0238	4.9	1.9438	4.6
15.0	1.5207	4.3	1.5858	4.8	1.5475	4.5
20.0	1.228	4.2	1.2507	4.7	1.2403	4.4
25.0	1.0000	4.1	1.0000	4.5	1.0000	4.3
30.0	0.81779	3.9	0.7964	4.4	0.81104	4.1
35.0	0.67341	3.8	0.64053	4.3	0.66146	4.0
40.0	0.55747	3.7	0.51772	4.2	0.54254	3.9
45.0	0.46357	3.6	0.41958	4.1	0.44727	3.8
50.0	0.3874	3.6	0.34172	4.1	0.37067	3.7
55.0	0.32368	3.5	0.27877	4.0	0.30865	3.6
60.0	0.272	3.4	0.22861	3.9	0.25825	3.5
65.0	0.23041	3.3	0.18872	3.8	0.21707	3.4
70.0	0.19604	3.2	0.15645	3.7	0.18323	3.3
75.0	0.16735	3.1	0.13012	3.6	0.15535	3.3
80.0	0.14342	3.0	0.10863	3.6	0.13223	3.2
85.0	0.12347	3.0	0.091115	3.5	0.11302	3.1
90.0	0.10668	2.8	0.0767	3.4	0.096951	3.0
95.0	0.092734	2.8	0.064867	3.3	0.083487	3.0
100.0	0.080903	2.8	0.055047	3.3	0.072139	2.9
105.0	0.070616	2.7	0.046797	3.2	0.062559	2.8
110.0	0.061826	2.6	0.039904	3.1	0.054425	2.8
115.0	0.054282	2.6	0.034255	3.1	0.047508	2.7
120.0	0.047793	2.5	0.029498	3.0	0.041594	2.6
125.0	0.042249	2.4	0.025448	3.0	0.036532	2.6

R/T characteristics

R/T No.	1014		1203		1302	
T (°C)	$B_{25/100}$ = 4250 K		$B_{25/100}$ = 2900 K		$B_{25/100}$ = 3000 K	
	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)
−55.0	83.935	6.8	30.252	5.6	33.701	5.9
−50.0	60.228	6.6	22.966	5.4	25.252	5.7
−45.0	43.593	6.4	17.612	5.2	19.149	5.4
−40.0	31.815	6.3	13.65	5.0	14.684	5.2
−35.0	23.404	6.1	10.671	4.8	11.38	5.0
−30.0	17.349	6.0	8.4216	4.7	8.9067	4.8
−25.0	12.946	5.8	6.7001	4.5	7.0357	4.6
−20.0	9.7439	5.7	5.3757	4.3	5.6065	4.5
−15.0	7.3737	5.5	4.3443	4.2	4.5044	4.3
−10.0	5.6247	5.4	3.5376	4.1	3.6471	4.2
−5.0	4.3063	5.3	2.8995	3.9	2.9746	4.0
0.0	3.3221	5.2	2.3929	3.8	2.4429	3.9
5.0	2.5779	5.0	1.9866	3.7	2.0194	3.8
10.0	2.0144	4.9	1.6596	3.5	1.6797	3.6
15.0	1.5848	4.8	1.3941	3.4	1.4053	3.5
20.0	1.2547	4.6	1.1777	3.3	1.1823	3.4
25.0	1.0000	4.6	1.0000	3.2	1.0000	3.3
30.0	0.79913	4.4	0.85337	3.1	0.85007	3.2
35.0	0.64287	4.3	0.7317	3.0	0.72608	3.1
40.0	0.51991	4.2	0.63032	2.9	0.623	3.0
45.0	0.42299	4.1	0.54534	2.9	0.53685	2.9
50.0	0.34573	4.1	0.47384	2.8	0.46453	2.9
55.0	0.28298	4.0	0.41336	2.7	0.40357	2.8
60.0	0.23277	3.8	0.36201	2.6	0.35193	2.7
65.0	0.19262	3.8	0.31822	2.5	0.30799	2.6
70.0	0.16005	3.7	0.28073	2.5	0.27047	2.6
75.0	0.13349	3.6	0.2485	2.4	0.23832	2.5
80.0	0.11175	3.5	0.22069	2.3	0.21067	2.4
85.0	0.093934	3.5	0.19663	2.3	0.18677	2.4
90.0	0.079231	3.4	0.17572	2.2	0.16607	2.3
95.0	0.067054	3.3	0.1575	2.2	0.14805	2.3
100.0	0.056932	3.2	0.14157	2.1	0.13233	2.2
105.0	0.048591	3.1	0.1276	2.1	0.11862	2.2
110.0	0.041605	3.1	0.11531	2.0	0.1066	2.1
115.0	0.035653	3.1	0.10447	2.0	0.096009	2.1
120.0	0.030636	3.0	0.094881	1.9	0.086667	2.0
125.0	0.026454	2.9	0.086371	1.9	0.078398	2.0

R/T characteristics

R/T No.	1303		1305		1306	
T (°C)	$B_{25/100}$ = 3050 K		$B_{25/100}$ = 3200 K		$B_{25/100}$ = 3450 K	
	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)
−55.0	34.363	5.8	42.131	6.2	49.935	6.3
−50.0	25.827	5.6	31.129	5.9	36.64	6.1
−45.0	19.635	5.4	23.273	5.7	27.18	5.9
−40.0	15.089	5.2	17.592	5.5	20.37	5.7
−35.0	11.712	5.0	13.438	5.3	15.416	5.5
−30.0	9.1774	4.8	10.366	5.0	11.775	5.3
−25.0	7.2552	4.6	8.1005	4.9	9.0698	5.1
−20.0	5.7835	4.5	6.3856	4.8	7.0497	5.0
−15.0	4.6467	4.3	5.0364	4.7	5.5187	4.8
−10.0	3.7611	4.2	4.0067	4.4	4.3558	4.7
−5.0	3.0547	4.1	3.2217	4.3	3.4609	4.5
0.0	2.4986	4.0	2.6097	4.2	2.7705	4.4
5.0	2.0575	3.8	2.126	4.0	2.2313	4.3
10.0	1.7051	3.7	1.7438	3.9	1.8098	4.1
15.0	1.421	3.6	1.4415	3.8	1.4762	4.0
20.0	1.191	3.6	1.1987	3.7	1.2116	3.9
25.0	1.0000	3.3	1.0000	3.5	1.0000	3.8
30.0	0.85053	3.3	0.84185	3.4	0.82984	3.7
35.0	0.72386	3.2	0.7108	3.3	0.6922	3.6
40.0	0.61897	3.1	0.60317	3.2	0.58042	3.5
45.0	0.53134	3.0	0.51419	3.1	0.48899	3.4
50.0	0.45814	2.9	0.44037	3.1	0.41395	3.3
55.0	0.39637	2.9	0.37824	3.0	0.35197	3.2
60.0	0.34439	2.7	0.32636	2.9	0.3006	3.1
65.0	0.30081	2.7	0.28333	2.8	0.2578	3.0
70.0	0.26372	2.6	0.24697	2.7	0.22197	3.0
75.0	0.23212	2.5	0.21573	2.7	0.19189	2.9
80.0	0.20501	2.5	0.18908	2.6	0.16648	2.8
85.0	0.1815	2.4	0.16649	2.5	0.14498	2.7
90.0	0.16117	2.4	0.14709	2.5	0.12669	2.7
95.0	0.1433	2.3	0.13021	2.4	0.11109	2.6
100.0	0.12775	2.2	0.1156	2.3	0.097717	2.5
105.0	0.11458	2.1	0.10301	2.3	0.086235	2.5
110.0	0.10306	2.1	0.092038	2.2	0.076325	2.4
115.0	0.092752	2.1	0.082442	2.2	0.06776	2.4
120.0	0.083677	2.0	0.074035	2.1	0.06032	2.3
125.0	0.075739	2.0	0.066701	2.1	0.053852	2.2

R/T characteristics

R/T No.	1307		2005		2006	
T (°C)	$B_{25/100}$ = 3560 K		$B_{25/100}$ = 4600 K		$B_{25/100}$ = 5000 K	
	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)
−55.0	51.115	5.7	120.22	7.0	200.55	8.7
−50.0	38.3	5.7	85.48	6.9	131.02	8.3
−45.0	28.847	5.6	61.004	6.8	87.171	8.0
−40.0	21.842	5.5	43.712	6.7	58.988	7.7
−35.0	16.627	5.4	31.459	6.6	40.545	7.4
−30.0	12.725	5.3	22.746	6.6	28.272	7.1
−25.0	9.7859	5.2	16.49	6.4	19.997	6.9
−20.0	7.5902	5.1	12.071	6.3	14.292	6.6
−15.0	5.8918	5.0	8.8455	6.1	10.35	6.4
−10.0	4.6124	4.8	6.5446	6.0	7.5614	6.4
−5.0	3.6247	4.7	4.8852	5.8	5.5343	6.2
0.0	2.8717	4.6	3.6781	5.6	4.086	6.0
5.0	2.2929	4.4	2.7944	5.4	3.0374	5.9
10.0	1.8442	4.3	2.1391	5.3	2.276	5.7
15.0	1.4941	4.2	1.6507	5.1	1.7188	5.6
20.0	1.2183	4.0	1.2823	5.1	1.3074	5.5
25.0	1.0000	3.9	1.0000	5.0	1.0000	5.3
30.0	0.82246	3.8	0.78393	4.8	0.76988	5.2
35.0	0.68231	3.7	0.61822	4.7	0.5954	5.1
40.0	0.56909	3.6	0.49053	4.6	0.46341	4.9
45.0	0.4767	3.5	0.39116	4.5	0.36327	4.8
50.0	0.40133	3.4	0.31371	4.3	0.28636	4.8
55.0	0.33894	3.3	0.25338	4.2	0.2262	4.7
60.0	0.28769	3.2	0.20565	4.2	0.17974	4.5
65.0	0.24573	3.1	0.16762	4.1	0.1438	4.4
70.0	0.21081	3.0	0.13726	4.0	0.1156	4.3
75.0	0.18147	3.0	0.11279	3.9	0.093296	4.3
80.0	0.15682	2.9	0.093053	3.8	0.075623	4.2
85.0	0.13601	2.8	0.077177	3.7	0.061619	4.1
90.0	0.11838	2.7	0.064263	3.6	0.050414	3.9
95.0	0.10342	2.7	0.053678	3.6	0.041532	3.8
100.0	0.090648	2.6	0.044996	3.5	0.034355	3.8
105.0	0.079672	2.5	0.037917	3.4	0.028525	3.7
110.0	0.070236	2.5	0.032063	3.4	0.023774	3.7
115.0	0.062118	2.4	0.027161	3.3	0.019852	3.6
120.0	0.055093	2.4	0.023079	3.2	0.016632	3.5
125.0	0.048901	2.3	0.01968	3.2	0.014016	3.4

R/T characteristics

R/T No.	2007		2903		2904	
T (°C)	$B_{25/100}$ = 4830 K		$B_{25/100}$ = 4200 K		$B_{25/100}$ = 4300 K	
	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)
−55.0	185.87	8.4	120.03	7.7	121.46	7.4
−50.0	123.23	8.1	82.38	7.4	84.439	7.2
−45.0	82.888	7.8	57.248	7.2	59.243	7.1
−40.0	56.544	7.6	40.255	7.0	41.938	6.9
−35.0	39.061	7.3	28.627	6.7	29.947	6.7
−30.0	27.321	7.1	20.577	6.6	21.567	6.6
−25.0	19.326	6.8	14.876	6.4	15.641	6.3
−20.0	13.823	6.6	10.88	6.1	11.466	6.2
−15.0	10.001	6.4	8.0808	5.9	8.451	6.0
−10.0	7.3067	6.4	6.0612	5.8	6.2927	5.9
−5.0	5.3454	6.2	4.5649	5.6	4.7077	5.7
0.0	3.9484	5.9	3.4708	5.4	3.5563	5.5
5.0	2.9595	5.7	2.6625	5.2	2.7119	5.3
10.0	2.2358	5.6	2.0599	5.1	2.086	5.1
15.0	1.7001	5.4	1.6069	4.9	1.6204	5.0
20.0	1.3021	5.4	1.2631	4.8	1.2683	4.8
25.0	1.0000	5.2	1.0000	4.6	1.0000	4.7
30.0	0.7756	5.0	0.79593	4.5	0.7942	4.6
35.0	0.60507	4.9	0.63796	4.4	0.63268	4.5
40.0	0.47498	4.8	0.51467	4.2	0.5074	4.3
45.0	0.37533	4.7	0.41887	4.1	0.41026	4.2
50.0	0.29823	4.6	0.34272	4.0	0.33363	4.1
55.0	0.23763	4.5	0.28081	3.9	0.27243	4.0
60.0	0.19041	4.4	0.23141	3.8	0.2237	3.9
65.0	0.15356	4.3	0.19211	3.7	0.18459	3.8
70.0	0.12442	4.2	0.16027	3.6	0.15305	3.7
75.0	0.10131	4.1	0.13421	3.5	0.12755	3.6
80.0	0.08286	4.0	0.11288	3.4	0.10677	3.5
85.0	0.068004	3.9	0.095326	3.3	0.089928	3.4
90.0	0.056032	3.8	0.080828	3.2	0.076068	3.3
95.0	0.046379	3.8	0.068916	3.2	0.064524	3.3
100.0	0.038533	3.7	0.058989	3.1	0.054941	3.2
105.0	0.032169	3.6	0.050701	3.0	0.047003	3.1
110.0	0.026952	3.5	0.043735	3.0	0.040358	3.0
115.0	0.022658	3.4	0.037778	2.9	0.034743	3.0
120.0	0.019111	3.3	0.032736	2.8	0.030007	2.9
125.0	0.016201	3.3	0.028513	2.7	0.026006	2.8
130.0	–	–	–	–	0.022609	2.8
135.0	–	–	–	–	0.01972	2.7
140.0	–	–	–	–	0.017251	2.6
145.0	–	–	–	–	0.015139	2.6
150.0	–	–	–	–	0.013321	2.5
155.0	–	–	–	–	0.011754	2.5

R/T characteristics

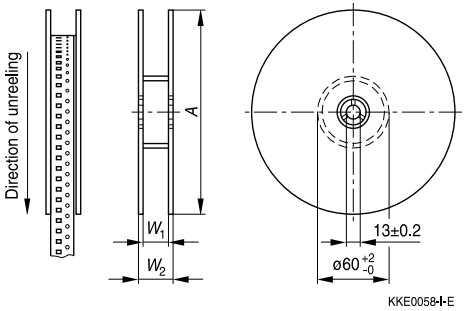
R/T No.	4001		4003	
T (°C)	$B_{25/100}$ = 3950 K		$B_{25/100}$ = 4450 K	
	R_T/R_{25}	α (%/K)	R_T/R_{25}	α (%/K)
−55.0	88.052	7.3	103.81	6.8
−50.0	61.65	7.0	73.707	6.7
−45.0	43.727	6.8	52.723	6.6
−40.0	31.395	6.5	37.988	6.5
−35.0	22.802	6.3	27.565	6.4
−30.0	16.742	6.2	20.142	6.2
−25.0	12.367	6.0	14.801	6.1
−20.0	9.2353	5.6	10.976	5.9
−15.0	7.0079	5.4	8.1744	5.8
−10.0	5.3654	5.4	6.1407	5.7
−5.0	4.126	5.2	4.6331	5.5
0.0	3.2	5.0	3.5243	5.4
5.0	2.4986	4.9	2.6995	5.3
10.0	1.9662	4.7	2.0831	5.1
15.0	1.5596	4.6	1.6189	5.0
20.0	1.2457	4.5	1.2666	4.9
25.0	1.0000	4.4	1.0000	4.7
30.0	0.80355	4.2	0.78351	4.6
35.0	0.65346	4.1	0.62372	4.5
40.0	0.53456	4.0	0.49937	4.4
45.0	0.43966	3.9	0.40218	4.3
50.0	0.36357	3.8	0.32557	4.2
55.0	0.30183	3.7	0.26402	4.1
60.0	0.25189	3.6	0.21527	4.0
65.0	0.21136	3.5	0.17693	3.9
70.0	0.17819	3.4	0.14616	3.8
75.0	0.15089	3.3	0.12097	3.7
80.0	0.12833	3.2	0.10053	3.7
85.0	0.10948	3.1	0.083761	3.6
90.0	0.093748	3.0	0.070039	3.5
95.0	0.080764	2.9	0.058937	3.4
100.0	0.069842	2.9	0.049777	3.4
105.0	0.060455	2.9	0.042146	3.3
110.0	0.052498	2.8	0.035803	3.2
115.0	0.04574	2.7	0.030504	3.2
120.0	0.039972	2.7	0.026067	3.1
125.0	0.034984	2.6	0.022332	3.0
130.0	–	–	0.019186	3.0
135.0	–	–	0.016515	2.9
140.0	–	–	0.014253	2.9
145.0	–	–	0.012367	2.8
150.0	–	–	0.010758	2.8
155.0	–	–	0.0093933	2.7

Taping and packing

1 Taping of SMD NTC thermistors

Tape and reel packing according to IEC 60286-3.
Tape material: Cardboard or blister, tape width 8 ±0.30 mm

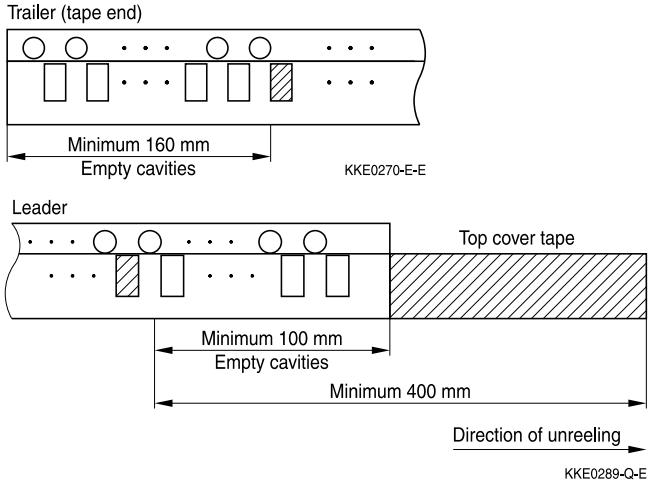
2 Reel packing



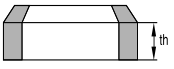
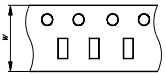
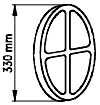
Dimensions in mm

	8-mm tape	
	180-mm reel	330-mm reel
A	180 +0/−3	330 +0/−2.0
W_1	8.4 +1.5/−0	8.4 +1.5/−0
W_2	14.4 max.	14.4 max.

Leader, trailer



Packing units for discrete chip

					
Case size	Chip thickness	Cardboard tape	Blister tape	∅ 180-mm reel	∅ 330-mm reel
inch/mm	th	W	W	pcs.	pcs.
0402/1005	0.5 mm	8 mm	–	10000	50000
0603/1608	0.8 mm	8 mm	8 mm	4000	16000
0805/2012	0.8 mm	–	8 mm	2000/ 4000	16000
	1.2 mm	–	8 mm	3000	12000
1206/3216	0.8 mm	–	8 mm	2000	12000
	1.2 mm	–	8 mm	4000	12000

3 Packing codes

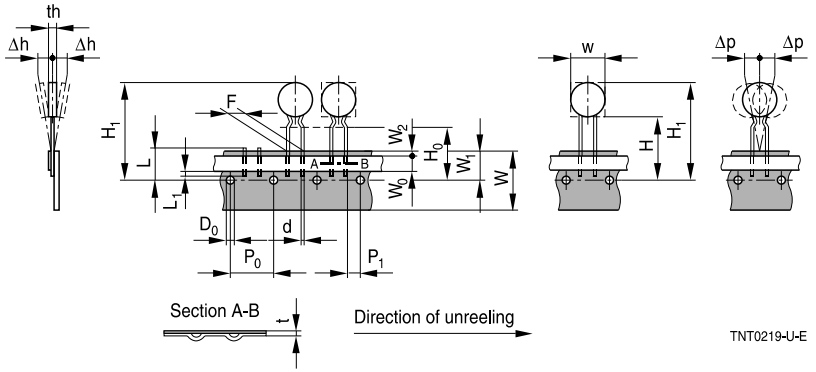
The last two digits of the complete ordering code state the packing mode:

Last two digits			
60	SMD	Cardboard tape	180-mm reel packing
62	SMD	Blister tape	180-mm reel packing
70	SMD	Cardboard tape	330-mm reel packing
72	SMD	Blister tape	330-mm reel packing

4 Taping of radial leaded NTC thermistors

Dimensions and tolerances

Lead spacing F = 2.5 mm and 5.0 mm (taping to IEC 60286-2)

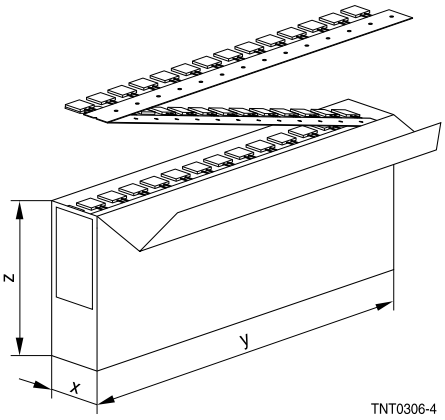


Dimensions (mm)

	Lead spacing 2.5 mm	Lead spacing 5 mm	Tolerance of lead spacing 2.5/5 mm	Remarks
w	11.0	11.5	max.	
th	5.0	6.0	max.	
d	0.5/0.6	0.5/0.6	±0.05	
P_0	12.7	12.7	±0.3	±1 mm / 20 sprocket holes
P_1	5.1	3.85	±0.7	
F	2.5	5.0	+0.6/−0.1	
Δh	0	0	±2.0	measured at top of component body
Δp	0	0	±1.3	
W	18.0	18.0	±0.5	
W_0	5.5	5.5	min.	peel-off force ≥5 N
W_1	9.0	9.0	+0.75/−0.5	
W_2	3.0	3.0	max.	
H	18.0	18.0	+2.0/−0	
H_0	16.0	16.0	±0.5	
H_1	32.2	32.2	max.	
D_0	4.0	4.0	±0.2	
t	0.9	0.9	max.	without wires
L	11.0	11.0	max.	
L_1	4.0	4.0	max.	

Types of packing

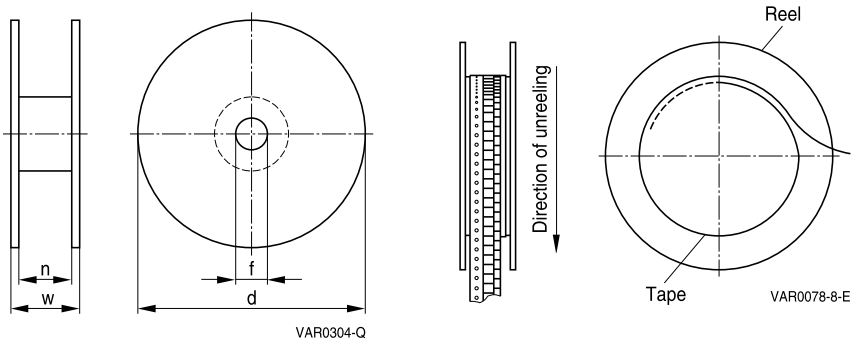
Ammo packing



Ammo type	x	y	z
I	80	240	210

Packing unit: 1000 - 2000 pcs./reel

Reel packing

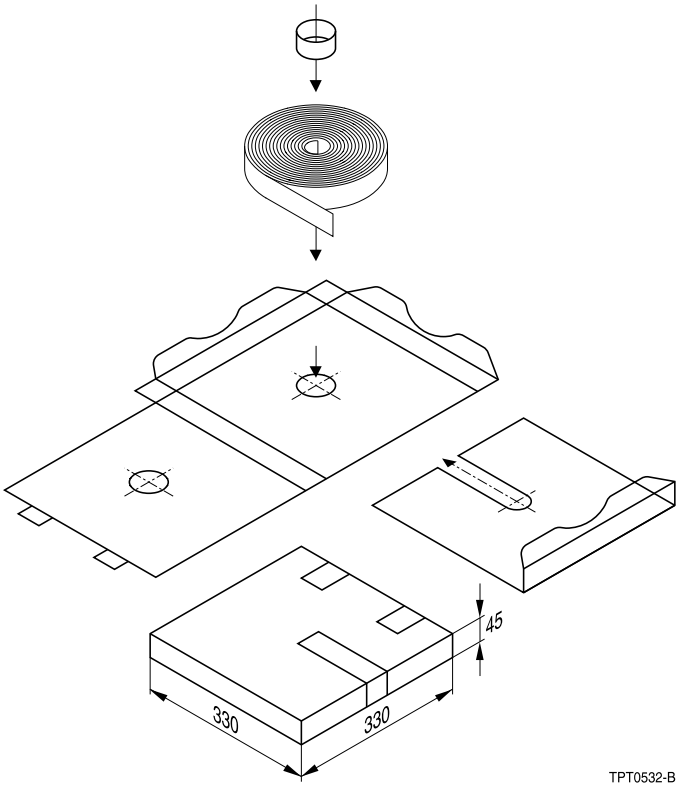


Packing unit: 1000 - 2000 pcs./reel

Reel dimensions (in mm)

Reel type	d	f	n	w
I	360 max.	31 ±1	approx. 45	54 max.

Cassette packing



Packing unit: 1000 - 2000 pcs./cassette

Bulk packing
The components are packed in cardboard boxes, the size of which depends on the order quantity.

5 Packing codes

The last two digits of the complete ordering code state the packing mode:

Last two digits			
00, 01, 02, 03,04, 05, 06, 07, 08	–	Bulk	–
40, 41	–	Bulk	–
45	–	Bulk	–
50	Radial leads, kinked	Cardboard tape	Cassette packing
51	Radial leads, kinked	Cardboard tape	360-mm reel packing
52	Radial leads, straight	Cardboard tape	Cassette packing
53	Radial leads, straight	Cardboard tape	360-mm reel packing
54	Radial leads, kinked	Cardboard tape	AMMO packing
55	Radial leads, straight	Cardboard tape	AMMO packing

(If no packing code is indicated, this corresponds to 40)

Example 1:	B57164K0102J000	Bulk
	B57164K0102J052	Cardboard tape, cassette packing
Example 2:	B57881S0103F002	Bulk
	B57881S0103F251	Cardboard tape, reel packing

Mounting instructions

1 Soldering

1.1 Leaded NTC thermistors

Leaded thermistors comply with the solderability requirements specified by CECC.

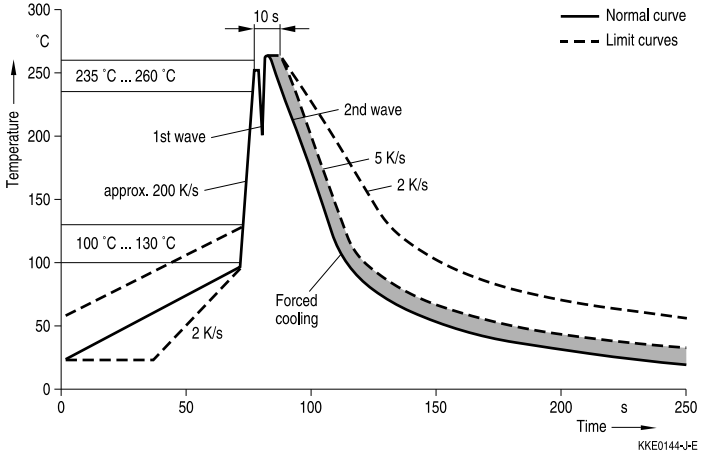
When soldering, care must be taken that the NTC thermistors are not damaged by excessive heat. The following maximum temperatures, maximum time spans and minimum distances have to be observed:

	Dip soldering	*Iron soldering*
Bath temperature	max. 260 °C	max. 360 °C
Soldering time	max. 4 s	max. 2 s
Distance from thermistor	min. 6 mm	min. 6 mm

Under more severe soldering conditions the resistance may change.

1.1.1 Wave soldering

Temperature characteristic at component terminal with dual wave soldering



1.2 Leadless NTC thermistors

In case of NTC thermistors without leads, soldering is restricted to devices which are provided with a solderable metallization. The temperature shock caused by the application of hot solder may produce fine cracks in the ceramic, resulting in changes in resistance.

To prevent leaching of the metallization, solder with silver additives or with a low tin content

should be used. In addition, soldering methods should be employed which permit short soldering times.

1.3 SMD NTC thermistors

SMD NTC thermistors can be provided with a nickel barrier termination or on special request with silver-palladium termination. The use of no-clean solder products is recommended. In any case mild, non-activated fluxes should be used. Flux residues after soldering should be minimized.

- SMD NTCs with AgPd termination are not approved for lead-free soldering.
- Nickel barrier termination

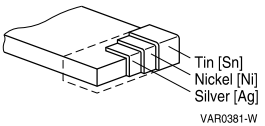


Figure 1
SMD NTC thermistors, structure of nickel barrier termination

The nickel barrier layer of the silver/nickel/tin termination (see figure 1) prevents leaching of the silver base metallization layer. This allows great flexibility in the selection of soldering parameters.

The tin prevents the nickel layer from oxidizing and thus ensures better wetting by the solder. The nickel barrier termination is tested for all commonly-used soldering methods according to IEC 60068-2-58. Insufficient preheating may cause ceramic cracks. Rapid cooling by dipping in solvent is not recommended.

The following test and process conditions apply for nickel barrier termination.

1.3.1 Solderability (test to IEC 60068-2-58)

Preconditioning: Immersion into flux F-SW 32.
Evaluation criterion: Wetting of soldering areas ≥95%.

Solder	Bath temperature (°C)	Dwell time (s)
SnPb 60/40	215 ±3	3 ±0.3
SnAg (3.0 ... 4.0), Cu (0.5 ... 0.9)	245 ±3	3 ±0.3

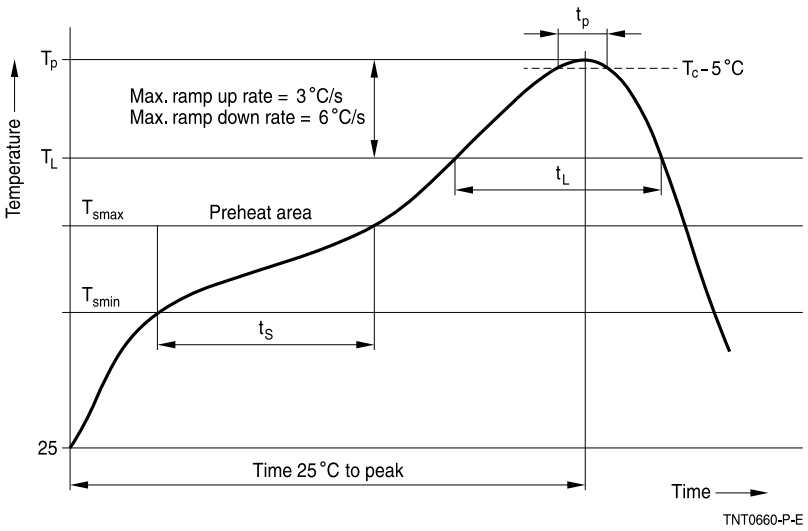
1.3.2 Resistance to soldering heat (test to IEC 60068-2-58)

Preconditioning: Immersion into flux F-SW 32.
Evaluation criterion: Leaching of side edges ≤1/3.

Solder	Bath temperature (°C)	Dwell time (s)
SnPb 60/40	260 ±5	10 ±1
SnAg (3.0 ... 4.0), Cu (0.5 ... 0.9)	260 ±5	10 ±1

1.3.3 Reflow soldering

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

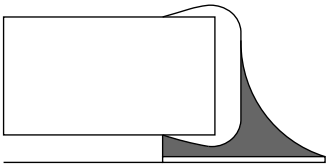


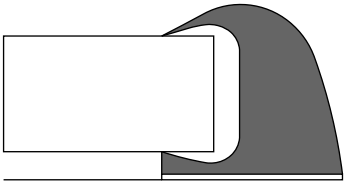
Profile feature		Sn-Pb eutectic assembly	Pb-free assembly
Preheat and soak			
- Temperature min	T_{smin}	100 °C	150 °C
- Temperature max	T_{smax}	150 °C	200 °C
- Time	t_{smin} to t_{smax}	60 ... 120 s	60 ... 120 s
Average ramp-up rate	T_{smax} to T_p	3 °C/ s max.	3 °C/ s max.
Liquidous temperature	T_L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

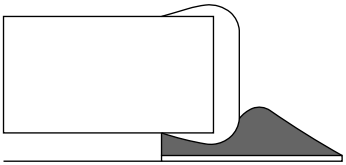
1) Depending on package thickness.

Notes: 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.

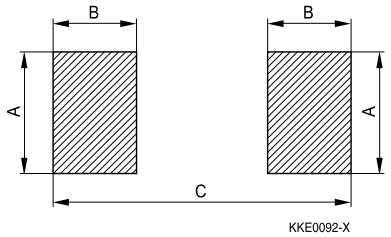
Solder joint profiles for silver/nickel/tin terminations


Good solder joint TNT0565-G-E


Too much solder
Pad geometry too large KKE0071-A-E


Poor wetting KKE0072-I-E

1.3.4 Recommended geometry of solder pads



Recommended maximum dimensions (mm)

Case size inch/mm	A	B	C
0402/1005	0.6	0.6	1.7
0603/1608	1.0	1.0	3.0
0805/2012	1.3	1.2	3.4
1206/3216	1.8	1.2	4.5

2 Conductive adhesion

An alternative to soldering for silver-palladium terminated components is the gluing of thermistors with conductive adhesives. The benefit of this method is that it involves no thermal stress. The adhesives used must be chemically inert.

3 Clamp contacting

Pressure contacting by means of clamps is particularly suitable for applications involving frequent switching and high turn-on powers.

4 Robustness of terminations (leaded types)

The leads meet the requirements of IEC 60068-2-21. They may not be bent closer than 4 mm from the solder joint on the thermistor body or from the point at which they leave the feed-throughs. During bending, any mechanical stress at the outlet of the leads must be removed. The bending radius should be at least 0.75 mm.

Tensile strength: Test Ua1:

Value of applied force for Ua1 test:

Diameter (d) of corresponding round leads	Force with tolerance of ±10%
∅ ≤ 0.25 mm	1.0 N
0.25 < ∅ ≤ 0.35 mm	2.5 N
0.35 < ∅ ≤ 0.50 mm	5.0 N
0.50 < ∅ ≤ 0.80 mm	10.0 N

Bending strength: Test Ub:

Two 90°-bends in opposite directions

Value of applied force for Ub test:

Diameter (d) of corresponding round leads	Force with tolerance of ±10%
∅ ≤ 0.25 mm	0.5 N
0.25 < ∅ ≤ 0.35 mm	1.25 N
0.35 < ∅ ≤ 0.50 mm	2.5 N
0.50 < ∅ ≤ 0.80 mm	5 N

Torsional strength: Test Uc: severity 2

The lead is bent by 90° at a distance of 6 to 6.5 mm from the thermistor body.

The bending radius of the leads should be approx. 0.75 mm. Two torsions of 180° each (severity 2).

When subjecting leads to mechanical stress, the following should be observed:

Tensile stress on leads

During mounting and operation tensile forces on the leads are to be avoided.

Bending of leads

Bending of the leads directly on the thermistor body is not permissible.

A lead may be bent at a minimum distance of twice the wire's diameter +4 mm from the solder joint on the thermistor body. During bending the wire must be mechanically relieved at its outlet. The bending radius should be at least 0.75 mm.

5 Sealing and potting

Sealing or potting processes can affect the reliability of the component.

When thermistors are sealed, potted or overmolded, there must be no mechanical stress caused by thermal expansion during the production process (curing / overmolding process) and during later operation. The upper category temperature of the thermistor must not be exceeded. Ensure that the materials used (sealing / potting compound and plastic material) are chemically neutral. As thermistors are temperature sensitive components it should be considered that molding can affect the thermal surrounding and may influence e.g. the response time.

Extensive testing is encouraged in order to determine whether overmolding or potting influences the functionality and/ or reliability of the component.

6 Cleaning

Cleaning processes can affect the reliability of the component.

If cleaning is necessary, mild cleaning agents are recommended. Cleaning agents based on water are not allowed. Washing processes may damage the product due to the possible static or cyclic mechanical loads (e.g. ultrasonic cleaning). They may cause cracks which might lead to reduced reliability and/ or lifetime.

7 Storage

In order to maintain their solderability, thermistors must be stored in a non-corrosive atmosphere. Humidity, temperature and container materials are critical factors.

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. After opening the factory seals, such as polyvinyl-sealed packages, use the SMDs as soon as possible.

The components should be left in the original packing. Touching the metallization of unsoldered thermistors may change their soldering properties.

Storage temperature:	−25 °C up to 45 °C
Relative humidity (without condensation):	≤75% annual mean
	<95%, maximum 30 days per annum

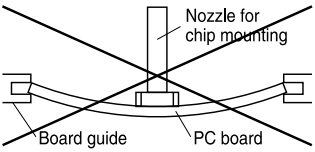
Solder the thermistors listed in this data book after shipment from EPCOS within the time specified:

SMDs with AgPd termination:	6 months
SMDs with nickel barrier termination:	12 months
Leadless components:	12 months
Leaded components:	24 months

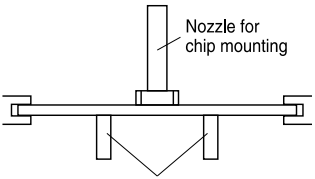
8 Placement and orientation of SMD NTC thermistors on PCB

a) Component placement

Incorrect



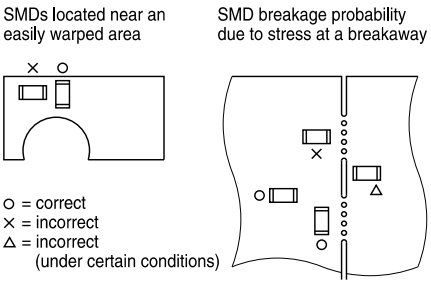
Correct



KKE0267-U-E

It is recommended that the PC board should be held by means of some adequate supporting pins such as shown left to prevent the SMDs from being damaged or cracked.

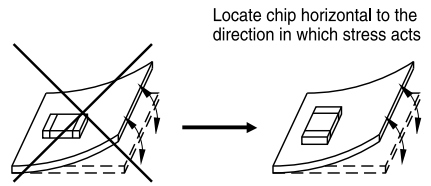
b) Cracks



KKE0268-3-E

When placing a component near an area which is apt to bend or a grid groove on the PC board, it is advisable to have both electrodes subjected to uniform stress, or to position the component's electrodes at right angles to the grid groove or bending line (see c) Component orientation).

c) Component orientation



KKE0269-B-E

Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.

Cautions and warnings

General

See "Important notes" on page 2.

Storage

- Store thermistors only in original packaging. Do not open the package prior to processing.
- Storage conditions in original packaging: storage temperature −25 °C ... +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 (SO_x, Cl etc).
- Use the components as soon as possible after opening the original packaging.
- Solder thermistors within the time specified after shipment from EPCOS.
  For leaded components this is 24 months, for SMD components with nickel barrier termination 12 months, for leadless components this is 12 months, for SMD components with AgPd termination 6 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 leads

- A lead (wire) may be bent 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 0.75 mm.

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.