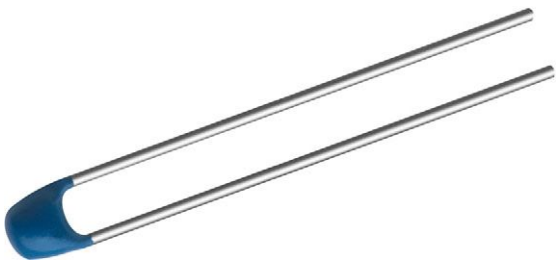
NTC Thermistors, 2-Point Radial Leaded, Automotive Grade



FEATURES

- High accuracy over a wide temperature range
- High stability over a long life
- Exceptional thermal shock withstanding performance
- AEC-Q200 qualified
- Mounting: radial
- Fulfills the ELV 2000/53/EC
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free Available

RoHS COMPLIANT

LINKS TO ADDITIONAL RESOURCES

Design Tools | SPICE Models | Related Documents | 3D Models

QUICK REFERENCE DATA

PARAMETER	VALUE	UNIT
Resistance value at 25 °C	2.06K to 30K	Ω
Tolerance on R_{25}-value	± 1.93 to ± 2.20	%
$B_{25/85}$-value	3528 to 4090	K
Tolerance on $B_{25/85}$-value	± 0.5 to ± 0.75	%
Operating temperature range	-55 to +150	°C
Temperature accuracy between 25 °C and 85 °C	± 0.5	°C
Maximum dissipation	100	mW
Response time (in stirred air)	7	s
Min. dielectric withstanding voltage between terminals and body	500	V_{RMS}
Weight	0.1	g

AGENCY APPROVALS

- cUL certificate
- ULus certificate

Note

- Agency approval documents, please see: www.vishay.com/ppg?29118&documents

APPLICATIONS

- Temperature measurement, sensing and control, temperature compensation in automotive and industrial applications
- Applications as EGR, ECT, IAT, and TMAP sensors

DESCRIPTION

These thermistors consist of a NTC ceramic chip with two solid tin plated nickel leads. The thermistor body is coated with a blue insulating lacquer.

PACKAGING

The thermistors are packed in bulk (quantity = 500 pieces). Tape and reel available on request.

DESIGN-IN SUPPORT

For complete curve computation, please visit: www.vishay.com/thermistors/ntc-curve-list/.

MOUNTING

Important mounting and handling instructions: see www.vishay.com/doc?29222

By soldering or welding in any position. The thermistors are fully suitable to be potted in epoxy or silicon resins.

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} (Ω)	R_{25}-TOL. (± %)	$B_{25/85}$ (K)	$B_{25/85}$-TOL. (± %)	UL RECOG.	SAP MATERIAL AND ORDERING NUMBER	
					RoHS-COMPLIANT WITH EXEMPTION (1)	RoHS-COMPLIANT
2060	1.93	3528	0.50		NTCLE203E3202SB0	NTCLE203E3202SB0A
2252	2.20	3984	0.50		NTCLE203E3222SB0	NTCLE203E3222SB0A
2780	2.20	4090	0.75		NTCLE203E3272SB0	NTCLE203E3272SB0A
3000	2.20	3984	0.50		NTCLE203E3302SB0	NTCLE203E3302SB0A
5000	2.20	3984	0.50		NTCLE203E3502SB0	NTCLE203E3502SB0A
10 000	2.20	3984	0.50	✓	NTCLE203E3103SB0	NTCLE203E3103SB0A
30 000	2.20	3935	0.75		NTCLE203E3303SB0	NTCLE203E3303SB0A

Notes

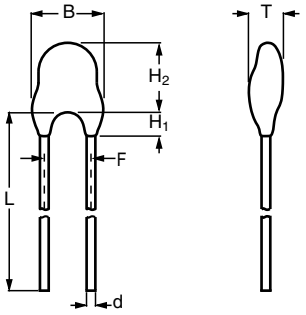
Preferred versions for new designs

(1) RoHS exemption 7(c)-I: electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezo-electronic devices, or in a glass or ceramic matrix compound

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DIMENSIONS in millimeters



B max.	4.2
T max.	4.0
H_1	2.0 ± 1.0
H_2 max.	6.0
L	41 ± 1
d	0.5 ± 0.05
F	2.54

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2060 Ω

PART NUMBER: NTCLE203E3202SB0

TEMP. (°C)	RESISTANCE (Ω)	R_T/R_{25}	R-TOL. (± %)	α (%/K)	T-TOL. (± °C)	$R_{MIN.}$ (Ω)	$R_{MAX.}$ (Ω)
-55.0	126 160	61.243	4.14	-6.82	0.61	120 931	131 389
-50.0	90 317	43.843	3.96	-6.55	0.60	86 740	93 893
-45.0	65 498	31.795	3.78	-6.30	0.60	63 020	67 976
-40.0	48 085	23.342	3.61	-6.06	0.60	46 347	49 823
-35.0	35 712	17.336	3.45	-5.84	0.59	34 479	36 945
-30.0	26 816	13.018	3.30	-5.62	0.59	25 932	27 700
-25.0	20 347	9.8772	3.15	-5.42	0.58	19 706	20 988
-20.0	15 592	7.5688	3.01	-5.23	0.57	15 123	16 060
-15.0	12 060	5.8546	2.87	-5.05	0.57	11 715	12 406
-10.0	9412.5	4.5692	2.74	-4.87	0.56	9155.1	9670.0
-5.0	7408.5	3.5963	2.61	-4.71	0.55	7215.3	7601.7
0.0	5878.3	2.8536	2.49	-4.55	0.55	5732.2	6024.4
5.0	4700.2	2.2816	2.37	-4.40	0.54	4588.9	4811.4
10.0	3785.7	1.8377	2.25	-4.26	0.53	3700.4	3871.0
15.0	3070.5	1.4905	2.14	-4.12	0.52	3004.7	3136.3
20.0	2507.0	1.2170	2.04	-3.99	0.51	2456.0	2558.1
25.0	2060.0	1.0000	1.93	-3.87	0.50	2020.2	2099.8
30.0	1702.9	0.82666	1.87	-3.75	0.50	1671.0	1734.8
35.0	1416.0	0.68736	1.82	-3.64	0.50	1390.2	1441.7
40.0	1183.7	0.57461	1.77	-3.53	0.50	1162.8	1204.6
45.0	994.40	0.48272	1.72	-3.44	0.50	977.30	1011.5
50.0	839.19	0.40737	1.68	-3.35	0.50	825.13	853.25
55.0	711.20	0.34524	1.63	-3.27	0.50	699.57	722.83
60.0	605.10	0.29374	1.60	-3.19	0.50	595.44	614.76
65.0	516.72	0.25083	1.56	-3.12	0.50	508.65	524.78
70.0	442.75	0.21493	1.53	-3.06	0.50	435.99	449.52
75.0	380.60	0.18476	1.50	-2.99	0.50	374.90	386.30
80.0	328.16	0.15930	1.47	-2.94	0.50	323.34	332.98
85.0	283.76	0.13775	1.44	-2.88	0.50	279.67	287.84
90.0	246.02	0.11943	1.44	-2.83	0.51	242.49	249.55
95.0	213.85	0.10381	1.50	-2.78	0.54	210.64	217.07
100.0	186.34	0.090458	1.57	-2.73	0.57	183.42	189.26
105.0	162.75	0.079005	1.63	-2.68	0.61	160.10	165.40
110.0	142.46	0.069155	1.69	-2.64	0.64	140.05	144.87
115.0	124.96	0.060662	1.75	-2.60	0.67	122.77	127.15
120.0	109.84	0.053321	1.81	-2.56	0.71	107.85	111.83
125.0	96.737	0.046960	1.87	-2.52	0.74	94.930	98.545
130.0	85.358	0.041436	1.92	-2.48	0.77	83.715	87.000
135.0	75.454	0.036628	1.98	-2.45	0.81	73.961	76.947
140.0	66.817	0.032436	2.03	-2.41	0.84	65.460	68.175
145.0	59.269	0.028772	2.08	-2.38	0.88	58.035	60.504
150.0	52.661	0.025564	2.13	-2.35	0.91	51.537	53.785

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RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2252 Ω, 3 kΩ, 5 kΩ AND 10 kΩ								
TEMP. (°C)	PART NUMBER NTCLE203E3222SB0	PART NUMBER NTCLE203E3302SB	PART NUMBER NTCLE203E3502SB0	PART NUMBER NTCLE203E3103SB0	R_T/R_{25}	*R*-TOL. (± %)	α (%/K)	T-TOL. (± °C)
	RESISTANCE (Ω)	RESISTANCE (Ω)	RESISTANCE (Ω)	RESISTANCE (Ω)				
-55.0	214 790	286 132	476 887	953 774	95.377	4.70	-7.37	0.64
-50.0	149 571	199 251	332 085	664 169	66.417	4.49	-7.11	0.63
-45.0	105 475	140 509	234 182	468 363	46.836	4.29	-6.86	0.62
-40.0	75 279	100 282	167 137	334 274	33.427	4.10	-6.63	0.62
-35.0	54 346	72 397	120 661	241 323	24.132	3.91	-6.41	0.61
-30.0	39 665	52 840	88 066	176 133	17.613	3.74	-6.19	0.60
-25.0	29 253	38 970	64 950	129 900	12.9900	3.57	-5.99	0.60
-20.0	21 791	29 028	48 381	96 761	9.6761	3.41	-5.79	0.59
-15.0	16 387	21 829	36 382	72 765	7.2765	3.25	-5.61	0.58
-10.0	12 435	16 565	27 609	55 218	5.5218	3.10	-5.43	0.57
-5.0	9518.7	12 680	21 134	42 268	4.2268	2.96	-5.26	0.56
0.0	7347.0	9787.3	16 312	32 624	3.2624	2.82	-5.10	0.55
5.0	5715.9	7614.4	12 691	25 381	2.5381	2.68	-4.94	0.54
10.0	4480.8	5969.1	9948.4	19 897	1.9897	2.55	-4.80	0.53
15.0	3538.2	4713.4	7855.6	15 711	1.5711	2.43	-4.65	0.52
20.0	2813.4	3747.8	6246.4	12 493	1.2493	2.31	-4.52	0.51
25.0	2252.0	3000.0	5000.0	10 000	1.0000	2.19	-4.39	0.50
30.0	1814.2	2416.8	4028.0	8056.0	0.80560	2.13	-4.26	0.50
35.0	1470.5	1958.9	3264.9	6529.7	0.65297	2.07	-4.14	0.50
40.0	1198.9	1597.2	2661.9	5323.9	0.53239	2.01	-4.03	0.50
45.0	983.06	1309.6	2182.6	4365.3	0.43653	1.96	-3.92	0.50
50.0	810.43	1079.6	1799.4	3598.7	0.35987	1.90	-3.81	0.50
55.0	671.61	894.68	1491.1	2982.3	0.29823	1.85	-3.71	0.50
60.0	559.36	745.14	1241.9	2483.8	0.24838	1.80	-3.61	0.50
65.0	468.11	623.60	1039.3	2078.7	0.20787	1.76	-3.51	0.50
70.0	393.57	524.30	873.83	1747.7	0.17477	1.71	-3.42	0.50
75.0	332.38	442.78	737.96	1475.9	0.14759	1.67	-3.34	0.50
80.0	281.91	375.54	625.90	1251.8	0.12518	1.63	-3.25	0.50
85.0	240.09	319.83	533.05	1066.1	0.10661	1.59	-3.17	0.50
90.0	205.29	273.48	455.79	911.59	0.091159	1.66	-3.09	0.54
95.0	176.21	234.74	391.23	782.46	0.078246	1.74	-3.02	0.58
100.0	151.81	202.23	337.06	674.11	0.067411	1.81	-2.94	0.62
105.0	131.26	174.85	291.42	582.84	0.058284	1.88	-2.87	0.66
110.0	113.88	151.70	252.84	505.68	0.050568	1.95	-2.81	0.70
115.0	99.130	132.06	220.09	440.19	0.044019	2.02	-2.74	0.74
120.0	86.569	115.32	192.21	384.41	0.038441	2.09	-2.68	0.78
125.0	75.836	101.02	168.37	336.748	0.033675	2.15	-2.62	0.82
130.0	66.632	88.764	147.94	295.881	0.029588	2.22	-2.56	0.87
135.0	58.716	78.219	130.36	260.729	0.026073	2.28	-2.50	0.91
140.0	51.886	69.120	115.20	230.400	0.023040	2.34	-2.45	0.96
145.0	45.975	61.246	102.08	204.152	0.020415	2.40	-2.39	1.00
150.0	40.845	54.411	90.685	181.370	0.018137	2.45	-2.34	1.05

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RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2780 Ω

PART NUMBER: NTCLE203E3272SB0

TEMP. (°C)	RESISTANCE (Ω)	R_T/R_{25}	R-TOL. (± %)	α (%/K)	T-TOL. (± °C)	$R_{MIN.}$ (Ω)	$R_{MAX.}$ (Ω)
-55.0	303 640	109.22	6.11	-7.57	0.81	285 073	322 207
-50.0	209 337	75.301	5.79	-7.31	0.79	197 211	221 464
-45.0	146 159	52.575	5.48	-7.06	0.78	138 143	154 176
-40.0	103 294	37.156	5.19	-6.82	0.76	97 933	108 654
-35.0	73 853	26.566	4.91	-6.60	0.74	70 228	77 477
-30.0	53 394	19.206	4.64	-6.38	0.73	50 918	55 870
-25.0	39 017	14.035	4.38	-6.17	0.71	37 309	40 724
-20.0	28 803	10.361	4.13	-5.97	0.69	27 614	29 992
-15.0	21 472	7.7237	3.89	-5.78	0.67	20 637	22 306
-10.0	16 157	5.8119	3.66	-5.60	0.65	15 566	16 748
-5.0	12 267	4.4127	3.43	-5.42	0.63	11 846	12 688
0.0	9394.1	3.3792	3.22	-5.25	0.61	9091.6	9696.6
5.0	7253.3	2.6091	3.01	-5.09	0.59	7034.7	7471.8
10.0	5644.6	2.0304	2.81	-4.94	0.57	5485.7	5803.4
15.0	4425.9	1.5921	2.62	-4.79	0.55	4309.9	4542.0
20.0	3495.6	1.2574	2.44	-4.65	0.52	3410.4	3580.7
25.0	2780.0	1.0000	2.26	-4.51	0.50	2717.3	2842.7
30.0	2225.7	0.80060	2.19	-4.38	0.50	2176.9	2274.4
35.0	1793.3	0.64506	2.13	-4.26	0.50	1755.1	1831.5
40.0	1453.8	0.52294	2.07	-4.14	0.50	1423.7	1483.8
45.0	1185.5	0.42644	2.01	-4.02	0.50	1161.6	1209.3
50.0	972.20	0.34971	1.96	-3.91	0.50	953.19	991.22
55.0	801.63	0.28836	1.90	-3.81	0.50	786.38	816.88
60.0	664.44	0.23901	1.85	-3.70	0.50	652.14	676.74
65.0	553.50	0.19910	1.80	-3.60	0.50	543.53	563.48
70.0	463.32	0.16666	1.75	-3.51	0.50	455.19	471.45
75.0	389.64	0.14016	1.71	-3.42	0.50	382.98	396.30
80.0	329.14	0.11840	1.67	-3.33	0.50	323.66	334.62
85.0	279.24	0.10045	1.62	-3.25	0.50	274.71	283.77
90.0	237.89	0.08557	1.74	-3.16	0.55	233.74	242.04
95.0	203.48	0.07319	1.86	-3.09	0.60	199.69	207.26
100.0	174.71	0.062846	1.97	-3.01	0.66	171.27	178.16
105.0	150.58	0.054164	2.08	-2.94	0.71	147.44	153.71
110.0	130.24	0.046849	2.19	-2.87	0.76	127.39	133.09
115.0	113.04	0.040662	2.30	-2.80	0.82	110.45	115.64
120.0	98.44	0.035411	2.40	-2.73	0.88	96.082	100.80
125.0	86.007	0.030938	2.50	-2.67	0.94	83.859	88.155
130.0	75.377	0.027114	2.59	-2.61	0.99	73.421	77.333
135.0	66.261	0.023835	2.69	-2.55	1.06	64.479	68.043
140.0	58.418	0.021014	2.78	-2.49	1.12	56.792	60.043
145.0	51.648	0.018578	2.87	-2.44	1.18	50.165	53.132
150.0	45.788	0.016471	2.96	-2.38	1.24	44.433	47.144

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RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 30 kΩ

PART NUMBER: NTCLE203E3303SB0

TEMP. (°C)	RESISTANCE (Ω)	R_T/R_{25}	R-TOL. (± %)	α (%/K)	T-TOL. (± °C)	$R_{MIN.}$ (Ω)	$R_{MAX.}$ (Ω)
-55.0	2 557 277	85.243	5.87	-7.10	0.83	2 407 214	2 707 340
-50.0	1 803 830	60.128	5.56	-6.87	0.81	1 703 566	1 904 094
-45.0	1 286 911	42.897	5.26	-6.64	0.79	1 219 190	1 354 632
-40.0	928 204	30.940	4.98	-6.43	0.77	881 990	974 418
-35.0	676 539	22.551	4.71	-6.22	0.76	644 692	708 387
-30.0	498 097	16.603	4.45	-6.03	0.74	475 947	520 248
-25.0	370 280	12.343	4.20	-5.84	0.72	354 739	385 821
-20.0	277 825	9.2608	3.96	-5.66	0.70	266 831	288 819
-15.0	210 316	7.0105	3.73	-5.48	0.68	202 478	218 154
-10.0	160 574	5.3525	3.50	-5.31	0.66	154 947	166 202
-5.0	123 604	4.1201	3.29	-5.15	0.64	119 536	127 672
0.0	95 895	3.1965	3.09	-5.00	0.62	92 937	98 854
5.0	74 960	2.4987	2.89	-4.85	0.59	72 797	77 124
10.0	59 021	1.9674	2.70	-4.71	0.57	57 430	60 612
15.0	46 794	1.5598	2.51	-4.58	0.55	45 619	47 969
20.0	37 348	1.2449	2.33	-4.44	0.52	36 477	38 219
25.0	30 000	1.0000	2.16	-4.32	0.50	29 352	30 648
30.0	24 246	0.80821	2.10	-4.20	0.50	23 737	24 755
35.0	19 712	0.65707	2.04	-4.08	0.50	19 310	20 114
40.0	16 117	0.53723	1.99	-3.97	0.50	15 797	16 437
45.0	13 250	0.44165	1.93	-3.86	0.50	12 994	13 506
50.0	10 950	0.36499	1.88	-3.76	0.50	10 744	11 156
55.0	9094.9	0.30316	1.83	-3.66	0.50	8928.3	9261.5
60.0	7591.1	0.25304	1.78	-3.57	0.50	7455.7	7726.5
65.0	6365.6	0.21219	1.74	-3.48	0.50	6255.0	6476.3
70.0	5362.2	0.17874	1.69	-3.39	0.50	5271.3	5453.0
75.0	4536.5	0.15122	1.65	-3.30	0.50	4461.6	4611.4
80.0	3854.1	0.12847	1.61	-3.22	0.50	3792.1	3916.2
85.0	3287.6	0.10959	1.57	-3.14	0.50	3236.0	3339.2
90.0	2815.3	0.09384	1.69	-3.06	0.55	2767.9	2862.8
95.0	2419.9	0.08066	1.80	-2.99	0.60	2376.4	2463.4
100.0	2087.7	0.069588	1.91	-2.92	0.65	2047.8	2127.5
105.0	1807.3	0.060244	2.01	-2.85	0.71	1770.9	1843.7
110.0	1569.9	0.052330	2.12	-2.78	0.76	1536.7	1603.1
115.0	1368.2	0.045605	2.22	-2.72	0.82	1337.8	1398.5
120.0	1196.1	0.039870	2.32	-2.66	0.87	1168.4	1223.8
125.0	1048.9	0.034963	2.41	-2.60	0.93	1023.6	1074.2
130.0	922.52	0.030751	2.50	-2.54	0.99	899.42	945.62
135.0	813.69	0.027123	2.60	-2.48	1.05	792.57	834.81
140.0	719.69	0.023990	2.68	-2.43	1.11	700.37	739.01
145.0	638.25	0.021275	2.77	-2.38	1.17	620.56	655.94
150.0	567.50	0.018917	2.86	-2.32	1.23	551.29	583.70

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RELIABILITY DATA BASED ON AEC-Q200 COMPLIANCE		
TEST DENOMINATION	**METHOD**	$\Delta R_{25}/R_{25\ max.}$ (1)
High temperature storage	MIL-STD-202 method 108	± 1 %
Thermal cycling	JESD22 method JA-104	± 2 %
Operational life	MIL-STD-202 method 108	± 1 %
Soldering heat	MIL-STD-202 method 204	± 3 %
Moisture resistance	MIL-STD-202 method 106	± 1 %
Vibration	MIL-STD-202 method 204	± 1 %
Biased humidity (85 °C, 85 % RH)	MIL-STD-202 method 108	± 2 %
Thermal shock	MIL-STD-202 method 107	± 2 %
Mechanical shocks	MIL-STD-202-213	± 1 %

Note

- Valid for NTCLE203E3103SB0

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