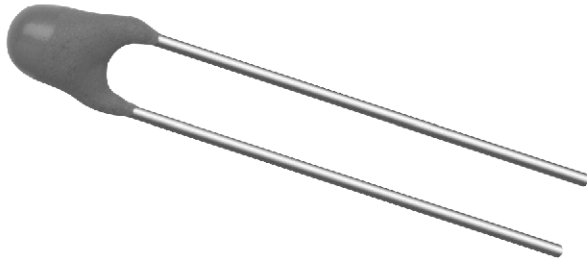


NTC Thermistors, Radial Leaded, Automotive Grade



FEATURES

- High accuracy over a wide temperature range
- High stability over a long life
- Exceptional thermal shock withstanding performance
- Approved according to the automotive norm AEC-Q200
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Fulfils the ELV 2000/53/EC



RoHS
COMPLIANT

QUICK REFERENCE DATA		
PARAMETER	VALUE	UNIT
Resistance value at 25 °C	2.06 to 30	kΩ
Temperature accuracy between 25 °C and 85 °C measurement	± 0.5	°C
B _{25/85} value	3528 to 4090	K
Tolerance on B _{25/85}	± 0.5 to ± 0.75	%
Maximum dissipation	100	mW
Response time (in stirred air)	7	s
Operating temperature range	- 55 to 150	°C
Climatic category acc IEC 60068-1	55/150/56	
Minimum dielectric withstanding voltage (tested according to IEC 539 §4.7.2 method 1)	500	V _{RMS}
Weight	0.1	g

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 (qty = 500 p). Tape and reel available on request.

DESIGN-IN SUPPORT

R_(T) table spreadsheet available on request at nlr@vishay.com.

MOUNTING

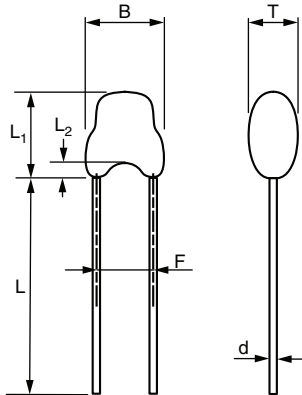
By soldering or welding in any position. The thermistors are fully suitable to be potted in epoxy or silicon resins.

ELECTRICAL DATA AND ORDERING INFORMATION										
12NC	SAP PART NUMBER	R at 25 °C (Ω)	α at 25 °C (%/K)	R ₂₅ Tol. (± %)	B _{25/85} (K)	B _{25/85} Tol. (± %)	ΔT max. ⁽¹⁾ 25 °C to 85 °C (± °C)	ΔT max. ⁽¹⁾ - 40 °C to 125 °C (± °C)	ΔT max. ⁽¹⁾ 125 °C to 150 °C (± °C)	
	2381 640 20202	NTCLE203E3202SB0	2060	3.86	1.93	3528	0.50	0.5	1	2
	2381 640 20222	NTCLE203E3222SB0	2252	4.39	2.20	3984	0.50	0.5	1	1
	2381 640 20272	NTCLE203E3272SB0	2780	4.51	2.20	4090	0.75	0.5	1	1
	2381 640 20302	NTCLE203E3302SB0	3000	4.39	2.20	3984	0.50	0.5	1	1
	2381 640 20502	NTCLE203E3502SB0	5000	4.39	2.20	3984	0.50	0.5	1	1
	2381 640 20103	NTCLE203E3103SB0	10 000	4.39	2.20	3984	0.50	0.5	1	1
	2381 640 20303	NTCLE203E3303SB0	30 000	4.30	2.20	3935	0.75	0.5	1	1

Note

⁽¹⁾ ΔT is the temperature measurement accuracy in the defined temperature range

DIMENSIONS in millimeters



B	4.2 max.
d	0.5 ± 0.05
L	41 ± 1
L ₁	6.0 max.
L ₂	2.0 ± 1.0
F	2.54
T	4.0 max.

RESISTANCE (TEMPERATURE) CHARACTERISTICS							
TEMP. (°C)	PART NUMBER 2381 640 20202/NTCLE203E3202SB0			α (%/K)	ΔT _{max.} (± °C)	R _{min.} (Ω)	R _{max.} (Ω)
	R _{(T)/R₂₅}	RESISTANCE (Ω)	ΔR/R (%)				
-55	61.2426	126 160	6.82	- 6.82	1	117 557	134 762
-50	43.8430	90 317	6.55	- 6.55	1	84 398	96 235
-45	31.7953	65 498	6.3	- 6.3	1	61 371	69 626
-40	23.3421	48 085	6.06	- 6.06	1	45 169	51 000
-35	17.3360	35 712	5.84	- 5.84	1	33 627	37 797
-30	13.0176	26 816	5.62	- 5.62	1	25 308	28 324
-25	9.87717	20 347	5.42	- 5.42	1	19 244	21 450
-20	7.56881	15 592	5.23	- 5.23	1	14 777	16 407
-15	5.85460	12 060	5.05	- 5.05	1	11 452	12 669
-10	4.56918	9412.5	4.87	- 4.87	1	8954.0	9871.1
-5	3.59635	7408.5	4.71	- 4.71	1	7059.8	7757.1
0	2.85356	5878.3	4.55	- 4.55	1	5610.9	6145.7
5	2.28163	4700.2	4.4	- 4.4	1	4493.4	4906.9
10	1.83772	3785.7	4.26	- 4.26	1	3624.6	3946.8
15	1.49054	3070.5	4.12	- 4.12	1	2944.0	3197.0
20	1.21701	2507.0	3.99	- 3.99	1	2407.0	2607.1
25	1.00000	2060.0	1.93	- 3.87	0.5	2020.2	2099.8
30	0.826620	1702.8	1.87	- 3.75	0.5	1671.0	1734.7
35	0.687330	1415.9	1.81	- 3.63	0.5	1390.2	1441.6
40	0.574577	1183.6	1.76	- 3.53	0.5	1162.8	1204.5
45	0.482694	994.35	1.71	- 3.42	0.5	977.36	1011.3
50	0.407353	839.15	1.66	- 3.32	0.5	825.23	853.07
55	0.345226	711.17	1.61	- 3.23	0.5	699.71	722.63
60	0.293724	605.07	1.57	- 3.14	0.5	595.60	614.55
65	0.250821	516.69	1.52	- 3.05	0.5	508.82	524.56
70	0.214918	442.73	1.48	- 2.97	0.5	436.18	449.29
75	0.184748	380.58	1.44	- 2.89	0.5	375.10	386.06
80	0.159294	328.15	1.4	- 2.81	0.5	323.55	332.75
85	0.137738	283.74	1.36	- 2.73	0.5	279.87	287.61
90	0.119422	246.01	2.66	- 2.66	1	239.46	252.56
95	0.103807	213.84	2.59	- 2.59	1	208.30	219.39
100	0.0904534	186.33	2.53	- 2.53	1	181.62	191.04
105	0.0790010	162.74	2.46	- 2.46	1	158.73	166.75
110	0.0691519	142.45	2.4	- 2.4	1	139.03	145.88
115	0.0606592	124.96	2.34	- 2.34	1	122.03	127.89
120	0.0533184	109.84	2.29	- 2.29	1	107.32	112.35
125	0.0469578	96.733	2.23	- 2.23	1	94.574	98.891
130	0.0414340	85.354	4.36	- 2.18	2	81.635	89.073
135	0.0366267	75.451	4.25	- 2.13	2	72.240	78.661
140	0.0324340	66.814	4.16	- 2.08	2	64.037	69.590
145	0.0287704	59.267	4.06	- 2.03	2	56.860	61.673
150	0.0255626	52.659	3.97	- 1.98	2	50.569	54.748

2381 640 20.../NTCLE203E3...SB0



Vishay BCcomponents NTC Thermistors, Radial Leaded,
Automotive Grade

RESISTANCE (TEMPERATURE) CHARACTERISTICS								
TEMP. (°C)	$R_{(T)}/R_{25}$	PART NUMBER 2381 640 20222 NTCLE203E3222SB0	PART NUMBER 2381 640 20302 NTCLE203E3302SB0	PART NUMBER 2381 640 20502 NTCLE203E3502SB0	PART NUMBER 2381 640 20103 NTCLE203E3103SB0	$\Delta R/R$ (%)	α (%/K)	$\Delta T_{max.}$ (± °C)
		RESISTANCE (Ω)	RESISTANCE (Ω)	RESISTANCE (Ω)	RESISTANCE (Ω)			
-55	95.3774	214 790	286 132	476 887	953 774	7.37	- 7.37	1.0
-50	66.4169	149 571	199 251	332 085	664 169	7.11	- 7.11	1.0
-45	46.8363	105 475	140 509	234 182	468 363	6.86	- 6.86	1.0
-40	33.4274	75 279	100 282	167 137	334 274	6.63	- 6.63	1.0
-35	24.1323	54 346	72 397	120 661	241 323	6.41	- 6.41	1.0
-30	17.6133	39 665	52 840	88 066	176 133	6.19	- 6.19	1.0
-25	12.9900	29 253	38 970	64 950	129 900	5.99	- 5.99	1.0
-20	9.67611	21 791	29 028	48 381	96 761	5.79	- 5.79	1.0
-15	7.27646	16 387	21 829	36 382	72 765	5.61	- 5.61	1.0
-10	5.52181	12 435	16 565	27 609	55 218	5.43	- 5.43	1.0
-5	4.22678	9518.7	12 680	21 134	42 268	5.26	- 5.26	1.0
0	3.26242	7347.0	9787.3	16 312	32 624	5.1	- 5.1	1.0
5	2.53814	5715.9	7614.4	12 691	25 381	4.94	- 4.94	1.0
10	1.98969	4480.8	5969.1	9948.5	19897	4.8	- 4.8	1.0
15	1.57113	3538.2	4713.4	7855.6	15711	4.65	- 4.65	1.0
20	1.24927	2813.4	3747.8	6246.4	12493	4.52	- 4.52	1.0
25	1.00000	2252.0	3000.0	5000.0	10000	2.19	- 4.39	0.5
30	0.805596	1814.2	2416.8	4028.0	8056.0	2.13	- 4.26	0.5
35	0.652974	1470.5	1958.9	3264.9	6529.7	2.07	- 4.14	0.5
40	0.532388	1198.9	1597.2	2661.9	5323.9	2.01	- 4.03	0.5
45	0.436527	983.06	1309.6	2182.6	4365.3	1.95	- 3.92	0.5
50	0.359872	810.43	1079.6	1799.4	3598.7	1.9	- 3.81	0.5
55	0.298227	671.61	894.68	1491.1	2982.3	1.85	- 3.71	0.5
60	0.248382	559.36	745.15	1241.9	2483.8	1.8	- 3.61	0.5
65	0.207865	468.11	623.60	1039.3	2078.7	1.75	- 3.51	0.5
70	0.174765	393.57	524.30	873.83	1747.7	1.71	- 3.42	0.5
75	0.147592	332.38	442.78	737.96	1475.9	1.67	- 3.34	0.5
80	0.125180	281.91	375.54	625.90	1251.8	1.62	- 3.25	0.5
85	0.106611	240.09	319.83	533.06	1066.1	1.58	- 3.17	0.5
90	0.0911586	205.29	273.48	455.79	911.59	3.09	- 3.09	1.0
95	0.0782457	176.21	234.74	391.23	782.46	3.02	- 3.02	1.0
100	0.0674111	151.81	202.23	337.06	674.11	2.94	- 2.94	1.0
105	0.0582845	131.26	174.85	291.42	582.85	2.87	- 2.87	1.0
110	0.0505675	113.88	151.70	252.84	505.68	2.81	- 2.81	1.0
115	0.0440186	99.130	132.06	220.09	440.19	2.74	- 2.74	1.0
120	0.0384411	86.569	115.32	192.21	384.41	2.68	- 2.68	1.0
125	0.0336748	75.836	101.02	168.37	336.75	2.62	- 2.62	1.0
130	0.0295881	66.632	88.764	147.94	295.88	2.56	- 2.56	1.0
135	0.0260729	58.716	78.219	130.37	260.73	2.5	- 2.5	1.0
140	0.0230400	51.886	69.120	115.20	230.40	2.45	- 2.45	1.0
145	0.0204152	45.975	61.246	102.08	204.15	2.39	- 2.39	1.0
150	0.0181370	40.845	54.411	90.685	181.37	2.34	- 2.34	1.0



2381 640 20.../NTCLE203E3...SB0

NTC Thermistors, Radial Leaded, Vishay BCcomponents
Automotive Grade

RESISTANCE (TEMPERATURE) CHARACTERISTICS							
PART NUMBER	2381 640 20272 NTCLE203E3272SB0						
TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	$\Delta T_{max.}$ (\pm °C)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
-55	109.223	303 640	7.57	- 7.57		280 661	326 619
-50	75.3012	209 337	7.31	- 7.31	1.0	194 035	224 639
-45	52.5754	146 159	7.06	- 7.06	1.0	135 838	156 481
-40	37.1560	103 294	6.82	- 6.82	1.0	96 244	110 343
-35	26.5657	73 853	6.6	- 6.6	1.0	68 981	78 725
-30	19.2065	53 394	6.38	- 6.38	1.0	49 988	56 800
-25	14.0347	39 017	6.17	- 6.17	1.0	36 609	41 424
-20	10.3608	28 803	5.97	- 5.97	1.0	27 083	30 523
-15	7.72365	21 472	5.78	- 5.78	1.0	20 231	22 713
-10	5.81188	16 157	5.6	- 5.6	1.0	15 253	17 061
-5	4.41266	12 267	5.42	- 5.42	1.0	11 602	12 932
0	3.37917	9394.1	5.25	- 5.25	1.0	8900.6	9887.6
5	2.60909	7253.3	5.09	- 5.09	1.0	6883.9	7622.7
10	2.03042	5644.6	4.94	- 4.94	1.0	5365.8	5923.3
15	1.59206	4425.9	4.79	- 4.79	1.0	4213.9	4638.0
20	1.25740	3495.6	4.65	- 4.65	1.0	3333.1	3658.1
25	1.00000	2780.0	2.25	- 4.51	0.5	2717.4	2842.6
30	0.800599	2225.7	2.19	- 4.38	0.5	2177.0	2274.4
35	0.645064	1793.3	2.13	- 4.26	0.5	1755.2	1831.4
40	0.522939	1453.8	2.07	- 4.14	0.5	1423.7	1483.8
45	0.426436	1185.5	2.01	- 4.02	0.5	1161.7	1209.3
50	0.349713	972.20	1.95	- 3.91	0.5	953.22	991.19
55	0.288355	801.63	1.9	- 3.81	0.5	786.40	816.86
60	0.239008	664.44	1.85	- 3.7	0.5	652.16	676.72
65	0.199102	553.50	1.8	- 3.6	0.5	543.54	563.46
70	0.166662	463.32	1.75	- 3.51	0.5	455.20	471.44
75	0.140158	389.64	1.71	- 3.42	0.5	382.99	396.29
80	0.118397	329.14	1.66	- 3.33	0.5	323.67	334.62
85	0.100446	279.24	1.62	- 3.25	0.5	274.72	283.77
90	0.0855723	237.89	3.16	- 3.16	1.0	230.36	245.42
95	0.0731928	203.48	3.09	- 3.09	1.0	197.20	209.76
100	0.0628464	174.71	3.01	- 3.01	1.0	169.45	179.97
105	0.0541637	150.58	2.94	- 2.94	1.0	146.15	155.00
110	0.0468486	130.24	2.87	- 2.87	1.0	126.51	133.97
115	0.0406622	113.04	2.8	- 2.8	1.0	109.88	116.20
120	0.0354108	98.442	2.73	- 2.73	1.0	95.752	101.133
125	0.0309378	86.007	2.67	- 2.67	1.0	83.711	88.303
130	0.0271140	75.377	2.61	- 2.61	1.0	73.411	77.343
135	0.0238349	66.261	2.55	- 2.55	1.0	64.572	67.950
140	0.0210137	58.418	2.49	- 2.49	1.0	56.962	59.873
145	0.0185784	51.648	2.44	- 2.44	1.0	50.390	52.906
150	0.0164705	45.788	2.38	- 2.38	1.0	44.697	46.879

2381 640 20.../NTCLE203E3...SBO



Vishay BCcomponents NTC Thermistors, Radial Leded,
Automotive Grade

RESISTANCE (TEMPERATURE) CHARACTERISTICS							
PART NUMBER	2381 640 20303 NTCLE203E3303SBO						
TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	$\Delta T_{max.}$ (\pm °C)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
-55	85.2426	2 557 277	5.91	- 7.1		2 406 241	2 708 314
-50	60.1277	1 803 830	5.6	- 6.87	1.0	1 702 851	1 904 810
-45	42.8970	1 286 911	5.3	- 6.64	1.0	1 218 665	1 355 156
-40	30.9401	928 204	5.02	- 6.43	1.0	881 605	974 803
-35	22.5513	676 539	4.75	- 6.22	1.0	644 409	708 670
-30	16.6032	498 097	4.49	- 6.03	1.0	475 737	520 457
-25	12.3427	370 280	4.24	- 5.84	1.0	354 583	385 977
-20	9.26083	277 825	4	- 5.66	1.0	266 714	288 936
-15	7.01053	210 316	3.77	- 5.48	1.0	202 390	218 242
-10	5.35248	160 574	3.55	- 5.31	1.0	154 880	166 269
-5	4.12014	123 604	3.33	- 5.15	1.0	119 485	127 723
0	3.19651	95 895	3.13	- 5	1.0	92 897	98 894
5	2.49868	74 960	2.93	- 4.85	1.0	72 766	77 155
10	1.96736	59 021	2.74	- 4.71	1.0	57 406	60 636
15	1.55980	46 794	2.55	- 4.58	1.0	45 600	47 988
20	1.24493	37 348	2.37	- 4.44	1.0	36 462	38 234
25	1.00000	30 000	2.2	- 4.32	0.5	29 340	30 660
30	0.808207	24 246	2.37	- 4.2	0.5	23 672	24 820
35	0.657066	19 712	2.53	- 4.08	0.5	19 214	20 210
40	0.537230	16 117	2.68	- 3.97	0.5	15 684	16 550
45	0.441654	13 250	2.84	- 3.86	0.5	12 874	13 625
50	0.364992	10 950	2.98	- 3.76	0.5	10 623	11 276
55	0.303164	9094.9	3.13	- 3.66	0.5	8810.7	9379.1
60	0.253036	7591.1	3.26	- 3.57	0.5	7343.4	7838.8
65	0.212188	6365.6	3.4	- 3.48	0.5	6149.4	6581.9
70	0.178738	5362.2	3.53	- 3.39	0.5	5173.0	5551.3
75	0.151217	4536.5	3.65	- 3.3	0.5	4370.8	4702.2
80	0.128470	3854.1	3.78	- 3.22	0.5	3708.6	3999.6
85	0.109587	3287.6	3.89	- 3.14	0.5	3159.6	3415.6
90	0.0938436	2815.3	4.01	- 3.06	1.0	2702.4	2928.2
95	0.0806646	2419.9	4.12	- 2.99	1.0	2320.2	2519.7
100	0.0695884	2087.7	4.23	- 2.92	1.0	1999.3	2176.0
105	0.0602436	1807.3	4.34	- 2.85	1.0	1728.9	1885.7
110	0.0523305	1569.9	4.44	- 2.78	1.0	1500.1	1639.7
115	0.0456055	1368.2	4.55	- 2.72	1.0	1306.0	1430.4
120	0.0398705	1196.1	4.64	- 2.66	1.0	1140.6	1251.7
125	0.0349633	1048.9	4.74	- 2.6	1.0	999.17	1098.6
130	0.0307507	922.52	4.83	- 2.54	1.0	877.92	967.12
135	0.0271231	813.69	4.93	- 2.48	1.0	773.61	853.78
140	0.0239896	719.69	5.02	- 2.43	1.0	683.59	755.79
145	0.0212750	638.25	5.1	- 2.38	1.0	605.68	670.82
150	0.0189166	567.50	5.19	- 2.32	1.0	538.05	596.94



RELIABILITY DATA		
TEST DENOMINATION	METHOD	$\Delta R_{25/R25}$ 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-meth 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

⁽¹⁾ Valid for 2381 640 20103



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All product specifications and data are subject to change without notice.

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