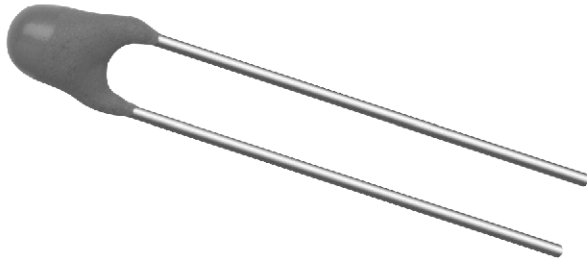


## NTC Thermistors, Radial Leaded, Automotive Grade



### 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 <sub>25/85</sub> value	3528 to 4090	K
Tolerance on B <sub>25/85</sub>	± 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 <sub>RMS</sub>
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<sub>(T)</sub> table spreadsheet available on request at [nlr@vishay.com](mailto:nlr@vishay.com).

### MOUNTING

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

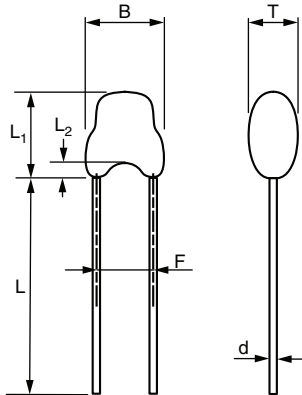
### ELECTRICAL DATA AND ORDERING INFORMATION

12NC	SAP PART NUMBER	R at 25 °C (Ω)	α at 25 °C (%/K)	R <sub>25</sub> Tol. (± %)	B <sub>25/85</sub> (K)	B <sub>25/85</sub> Tol. (± %)	ΔT max. <sup>(1)</sup> 25 °C to 85 °C (± °C)	ΔT max. <sup>(1)</sup> - 40 °C to 125 °C (± °C)	ΔT max. <sup>(1)</sup> 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

<sup>(1)</sup> 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 <sub>1</sub>	6.0 max.
L <sub>2</sub>	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 <sub>max.</sub> (± °C)	R <sub>min.</sub> (Ω)	R <sub>max.</sub> (Ω)
	R <sub>(T)/R<sub>25</sub></sub>	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	$\Delta R/R$ (%)	$\alpha$ (%/K)	$\Delta T_{max.}$ (± °C)
		RESISTANCE ( $\Omega$ )	RESISTANCE ( $\Omega$ )	RESISTANCE ( $\Omega$ )	RESISTANCE ( $\Omega$ )			
-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 ( $\Omega$ )	$\Delta R/R$ (%)	$\alpha$ (%/K)	$\Delta T_{max.}$ ( $\pm$ °C)	$R_{min.}$ ( $\Omega$ )	$R_{max.}$ ( $\Omega$ )
-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...SB0



Vishay BCcomponents NTC Thermistors, Radial Leded,  
Automotive Grade

RESISTANCE (TEMPERATURE) CHARACTERISTICS							
PART NUMBER	2381 640 20303 NTCLE203E3303SB0						
TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE ( $\Omega$ )	$\Delta R/R$ (%)	$\alpha$ (%/K)	$\Delta T_{max.}$ ( $\pm$ °C)	$R_{min.}$ ( $\Omega$ )	$R_{max.}$ ( $\Omega$ )
-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. <sup>(1)</sup>
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**

<sup>(1)</sup> Valid for 2381 640 20103



## Disclaimer

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

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.