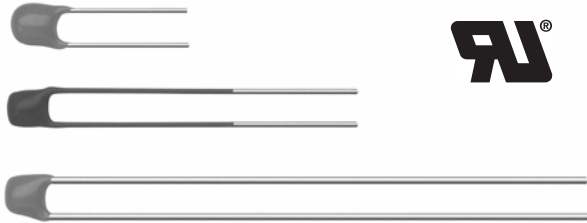


## NTC Thermistors, Radial Leaded, Accuracy Line



### FEATURES

- Accurate over a wide temperature range (tolerance on B-value between 2.0 % and 0.5 %)
- Good stability over a long life
- Excellent price/performance ratio
- Low heat conductivity through 0.4 mm Ni-leads
- UL recognized, file E148885
- Old part number was 2322 640 5....
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


**RoHS**  
COMPLIANT

### QUICK REFERENCE DATA

PARAMETER	VALUE
Resistance value at 25 °C	2 kΩ to 470 kΩ
Tolerance on $R_{25}$ - value	± 5 %; ± 3 %; ± 2 %; ± 1 %
Tolerance on $B_{25/85}$ - value	± 2.0 % to 0.5 %
Maximum dissipation	100 mW
Dissipation factor $\delta$	2.2 mW/K
Response time <sup>(1)</sup>	≈ 1.7 s
Thermal time constant $\tau$	13 s
Operating temperature range at:	
Zero dissipation (continuously)	- 40 °C to + 125 °C
Zero dissipation (for short periods) <sup>(2)</sup>	≤ 150 °C
Maximum dissipation (100 mW)	0 °C to + 55 °C
Climatic category	40/125/56
Mass	≈ 0.11 g

### Notes

- <sup>(1)</sup> Response time in silicone oil MS200/50. This is the time needed for the sensor to reach 63.2 % of the total temperature difference when subjected to a temperature change from 25 °C in air to 85 °C in oil.
- <sup>(2)</sup> Valid for all types with the exception of the  $R_{25}$  values 12 kΩ, 22 kΩ and 470 kΩ.

### APPLICATIONS

Temperature measurement, sensing and control in industrial, consumer and telecom applications. For on-board sensing or accurate remote sensing.

### DESCRIPTION

These thermistors are made of NTC ceramic material. The device consists of a chip with two tinned nickel leads. The parts are coated and color band marked.

### PACKAGING

The thermistors are packed in cardboard boxes; the smallest packing quantity is 500 units.

### DESIGN-IN SUPPORT

For complete Curve Computation, visit:

[www.vishay.com/thermistors/curve-computation-list/](http://www.vishay.com/thermistors/curve-computation-list/)

### MARKING

The thermistors are marked with colored bands on a grey epoxy base coating; see Dimensions and “Electrical Data and Ordering Information”.

### MOUNTING

By soldering in any position.

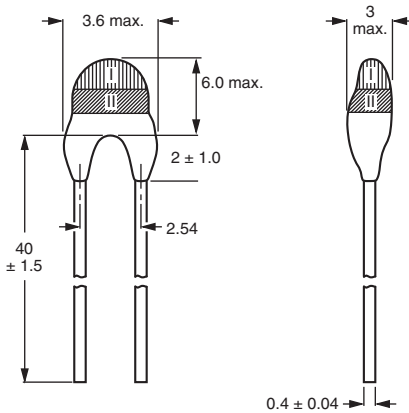
### ELECTRICAL DATA AND ORDERING INFORMATION

$R_{25}$ (kΩ)	$B_{25/85}$ - VALUE		12NC ORDERING CODE 2381 640 5.... <sup>(3)</sup>	SAP MATERIAL NO. NTCLE203E3..... <sup>(4)</sup>	UL approved Y/N	CODING (see dimensions)	
	(K)	(± %)				I	II
2	3528	0.5	*202	202*B0	N	Orange	Orange
2.7	3977	0.75	*272	272*B0	Y	Red	Red
4.7	3977	0.75	*472	472*B0	Y	Green	Green
5	3977	0.75	*502	502*B0	Y	Black	White
10	3977	0.75	*103	103*B0	Y	Blue	Blue
12	3740	2	*123	123*B0	Y	Yellow	Yellow
22	3740	2	*223	223*B0	Y	White	White
47	4090	1.5	*473	473*B0	N	Black	Black
68	4190	1.5	*683	683*B0	N	Grey	Grey
100	4190	1.5	*104	104*B0	N	Brown	Brown
470	4570	1.5	*474	474*B0	N	Violet	Violet

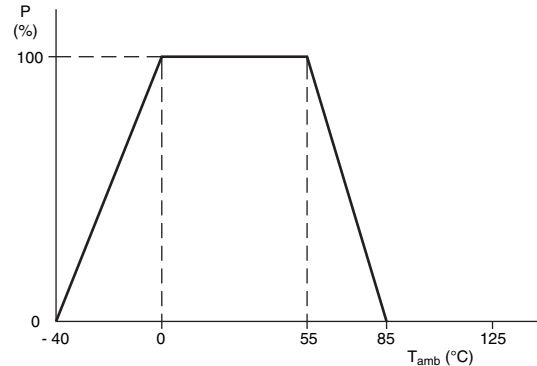
### Notes

- <sup>(3)</sup> Replace \* in 12NC by 3 for ± 5 %, 6 for ± 3 %, 4 for ± 2 %, 5 for ± 1 %
- <sup>(4)</sup> Replace \* in SAP by J for ± 5 %, H for ± 3 %, G for ± 2 %, F for ± 1 %

**DIMENSIONS** in millimeters

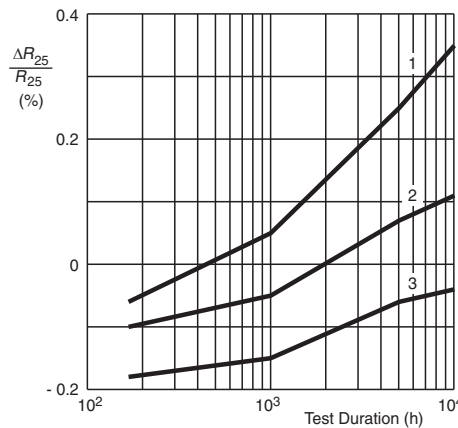


**DERATING AND LONG TERM STABILITY**



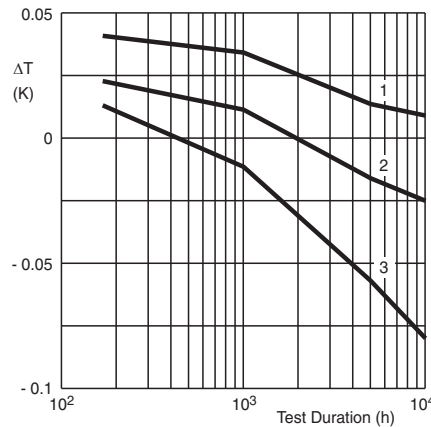
Power

**LONG TERM STABILITY OF  $R_{25}$  AS A FUNCTION OF TEST DURATION AT MAXIMUM TEMPERATURE (150 °C)**



Curves valid for  
2.2 kΩ to 10 kΩ  
Curve 1: Maximum deviation  
Curve 2: Average deviation  
Curve 3: Minimum deviation

**LONG TERM STABILITY OF T AS A FUNCTION OF TEST DURATION AT MAXIMUM TEMPERATURE (150 °C)**



Curves valid for  
2.2 kΩ to 10 kΩ  
Curve 1: Minimum deviation  
Curve 2: Average deviation



# NTCLE203E3.../2381 640 5....

NTC Thermistors, Radial Leaded,  
Accuracy Line

Vishay BCcomponents

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RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 2 k $\Omega$			
$T_{OPER}$ (°C)	PART NR. NTCLE203E3202*B0 2381 640 5*202	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	$R_T$ ( $\Omega$ )		
-40	46 684	- 6.06	1.65
-35	34 672	- 5.84	1.49
-30	26 035	- 5.62	1.34
-25	19 754	- 5.42	1.19
-20	15 138	- 5.23	1.05
-15	11 709	- 5.05	0.92
-10	9138	- 4.87	0.79
-5	7193	- 4.71	0.66
0	5707	- 4.55	0.54
5	4563	- 4.40	0.43
10	3675	- 4.26	0.31
15	2981	- 4.12	0.21
20	2434	- 3.99	0.10
25	2000	- 3.87	0.00
30	1653	- 3.75	0.10
35	1375	- 3.63	0.19
40	1149	- 3.53	0.28
45	965.4	- 3.42	0.37
50	814.7	- 3.32	0.46
55	690.5	- 3.23	0.54
60	587.4	- 3.14	0.62
65	501.6	- 3.05	0.70
70	429.8	- 2.97	0.78
75	369.5	- 2.89	0.86
80	318.6	- 2.81	0.93
85	275.5	- 2.73	1.01
90	238.8	- 2.66	1.08
95	207.6	- 2.59	1.15
100	180.9	- 2.53	1.22
105	158.0	- 2.46	1.29
110	138.3	- 2.40	1.35
115	121.3	- 2.34	1.42
120	106.6	- 2.29	1.48
125	93.92	- 2.23	1.55
130	82.87	- 2.18	1.61
135	73.25	- 2.13	1.67
140	64.87	- 2.08	1.73
145	57.54	- 2.03	1.79
150	51.12	- 1.98	1.85

# NTCLE203E3..../2381 640 5....



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RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 2.7 k $\Omega$ , 4.7 k $\Omega$ , 5.0 k $\Omega$ AND 10 k $\Omega$						
$T_{OPER}$ (°C)	PART NR. NTCLE203E3272*B0 2381 640 5*272	PART NR. NTCLE203E3472*B0 2381 640 5*472	PART NR. NTCLE203E3502*B0 2381 640 5*502	PART NR. NTCLE203E3103*B0 2381 640 5*103	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol}$ . (%)
	$R_T$ ( $\Omega$ )	$R_T$ ( $\Omega$ )	$R_T$ ( $\Omega$ )	$R_T$ ( $\Omega$ )		
- 40	89 665	156 084	166 047	332 094	- 6.62	2.79
- 35	64 773	112 753	119 950	239 900	- 6.39	2.52
- 30	47 304	82 344	87 600	175 200	- 6.18	2.26
- 25	34 907	60 765	64 643	129 287	- 5.98	2.02
- 20	26 017	45 288	48 179	96 358	- 5.78	1.78
- 15	19 575	34 075	36 250	72 500	- 5.60	1.55
- 10	14 862	25 872	27 523	55 046	- 5.42	1.33
- 5	11 382	19 814	21 078	42 157	- 5.25	1.12
0	8790	15 300	16 277	32 554	- 5.09	0.92
5	6841	11 909	12 669	25 339	- 4.93	0.72
10	5365	9340	9936	19 872	- 4.79	0.53
15	4239	7378	7849	15 698	- 4.64	0.35
20	3372	5869	6244	12 488	- 4.51	0.17
25	2700	4700	5000	10 000	- 4.38	0.00
30	2176	3788	4030	8059	- 4.25	0.17
35	1764	3071	3267	6535	- 4.13	0.32
40	1439	2505	2665	5330	- 4.02	0.48
45	1180	2055	2186	4372	- 3.91	0.63
50	973.4	1694	1803	3605	- 3.80	0.77
55	806.9	1405	1494	2989	- 3.70	0.91
60	672.3	1170	1245	2490	- 3.60	1.05
65	562.8	979.7	1042	2084	- 3.51	1.18
70	473.3	823.9	876.5	1753	- 3.42	1.31
75	399.8	696.0	740.5	1481	- 3.33	1.44
80	339.2	590.5	628.2	1256	- 3.25	1.56
85	289.0	503.0	535.2	1070	- 3.17	1.68
90	247.2	430.2	457.7	915.4	- 3.09	1.79
95	212.2	369.4	393.0	786.0	- 3.01	1.90
100	182.9	318.3	338.6	677.3	- 2.94	2.01
105	158.2	275.3	292.9	585.7	- 2.87	2.12
110	137.2	238.9	254.2	508.3	- 2.80	2.22
115	119.5	208.0	221.3	442.6	- 2.74	2.32
120	104.4	181.7	193.3	386.6	- 2.67	2.42
125	91.46	159.2	169.4	338.7	- 2.61	2.51
130	80.38	139.9	148.8	297.7	- 2.55	2.61
135	70.84	123.3	131.2	262.4	- 2.50	2.70
140	62.62	109.0	116.0	231.9	- 2.44	2.78
145	55.49	96.60	102.8	205.5	- 2.39	2.87
150	49.31	85.84	91.32	182.6	- 2.34	2.96



# NTCLE203E3.../2381 640 5....

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<b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 12 k<math>\Omega</math> AND 22 k<math>\Omega</math></b>				
$T_{OPER}$ (°C)	PART NR. NTCLE203E3123*B0 2381 640 5*123	PART NR. NTCLE203E3223*B0 2381 640 5*223	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	$R_T$ (k $\Omega$ )	$R_T$ (k $\Omega$ )		
-40	309.4	567.2	-6.07	7.00
-35	229.5	420.8	-5.88	6.32
-30	171.8	315.0	-5.70	5.68
-25	129.8	238.0	-5.52	5.06
-20	98.93	181.4	-5.35	4.46
-15	76.02	139.4	-5.19	3.89
-10	58.88	107.9	-5.03	3.34
-5	45.95	84.25	-4.88	2.81
0	36.13	66.24	-4.74	2.30
5	28.61	52.45	-4.60	1.80
10	22.80	41.81	-4.47	1.33
15	18.30	33.55	-4.34	0.87
20	14.77	27.08	-4.22	0.43
25	12.00	22.00	-4.10	0.00
30	9.804	17.97	-3.99	0.41
35	8.054	14.77	-3.88	0.81
40	6.652	12.20	-3.77	1.20
45	5.522	10.12	-3.67	1.58
50	4.607	8.447	-3.58	1.94
55	3.862	7.081	-3.48	2.29
60	3.252	5.963	-3.39	2.64
65	2.751	5.044	-3.30	2.97
70	2.337	4.284	-3.22	3.29
75	1.993	3.654	-3.14	3.60
80	1.707	3.129	-3.06	3.91
85	1.467	2.690	-2.99	4.20
90	1.266	2.321	-2.92	4.49
95	1.096	2.010	-2.85	4.77
100	0.9524	1.746	-2.78	5.04
105	0.8302	1.522	-2.71	5.31
110	0.7260	1.331	-2.65	5.56
115	0.6369	1.168	-2.59	5.82
120	0.5604	1.027	-2.53	6.06
125	0.4945	0.9065	-2.47	6.30

# NTCLE203E3..../2381 640 5....



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Accuracy Line

For complete Curve Computation, visit: [www.vishay.com/thermistors/curve-computation-list/](http://www.vishay.com/thermistors/curve-computation-list/)

<b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 47 k<math>\Omega</math></b>			
$T_{OPER}$ (°C)	PART NR. NTCLE203E3473*B0 2381 640 5*473	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	$R_T$ (k $\Omega$ )		
- 40	1589	- 6.54	5.74
- 35	1152	- 6.34	5.19
- 30	842.8	- 6.15	4.66
- 25	622.6	- 5.96	4.15
- 20	464.1	- 5.79	3.66
- 15	349.0	- 5.62	3.19
- 10	264.6	- 5.45	2.74
- 5	202.3	- 5.30	2.30
0	155.8	- 5.14	1.88
5	120.9	- 5.00	1.48
10	94.53	- 4.86	1.09
15	74.40	- 4.72	0.71
20	58.95	- 4.59	0.35
25	47.00	- 4.47	0.00
30	37.71	- 4.35	0.34
35	30.43	- 4.23	0.67
40	24.70	- 4.12	0.99
45	20.15	- 4.01	1.29
50	16.53	- 3.91	1.59
55	13.63	- 3.81	1.88
60	11.30	- 3.71	2.16
65	9.404	- 3.62	2.43
70	7.865	- 3.53	2.70
75	6.607	- 3.44	2.95
80	5.573	- 3.36	3.20
85	4.721	- 3.28	3.45
90	4.015	- 3.20	3.68
95	3.427	- 3.13	3.91
100	2.936	- 3.05	4.13
105	2.525	- 2.98	4.35
110	2.179	- 2.92	4.56
115	1.886	- 2.85	4.77
120	1.638	- 2.79	4.97
125	1.427	- 2.73	5.17
130	1.247	- 2.67	5.36
135	1.093	- 2.61	5.54
140	0.9608	- 2.55	5.73
145	0.8468	- 2.50	5.90
150	0.7483	- 2.45	6.08



# NTCLE203E3.../2381 640 5....

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<b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 68 k<math>\Omega</math> AND 100 k<math>\Omega</math></b>				
$T_{OPER}$ (°C)	PART NR. NTCLE203E3683*B0 2381 640 5*683	PART NR. NTCLE203E3104*B0 2381 640 5*104	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	$R_T$ (k $\Omega$ )	$R_T$ (k $\Omega$ )		
-40	2493	3666	-6.69	5.88
-35	1794	2638	-6.49	5.31
-30	1303	1917	-6.29	4.77
-25	956.2	1406	-6.10	4.25
-20	708.0	1041	-5.92	3.75
-15	528.9	777.8	-5.75	3.27
-10	398.5	586.1	-5.58	2.80
-5	302.8	445.3	-5.42	2.36
0	231.8	340.9	-5.26	1.93
5	178.9	263.1	-5.11	1.52
10	139.0	204.4	-4.97	1.12
15	108.8	160.0	-4.83	0.73
20	85.74	126.1	-4.70	0.36
25	68.00	100.0	-4.57	0.00
30	54.27	79.81	-4.45	0.35
35	43.57	64.08	-4.33	0.68
40	35.19	51.75	-4.22	1.01
45	28.57	42.02	-4.11	1.33
50	23.33	34.31	-4.00	1.63
55	19.15	28.16	-3.90	1.93
60	15.79	23.22	-3.80	2.21
65	13.09	19.25	-3.71	2.49
70	10.90	16.02	-3.62	2.76
75	9.114	13.40	-3.53	3.03
80	7.655	11.26	-3.45	3.28
85	6.457	9.496	-3.36	3.53
90	5.469	8.042	-3.28	3.77
95	4.649	6.837	-3.21	4.01
100	3.968	5.835	-3.13	4.24
105	3.399	4.998	-3.06	4.46
110	2.921	4.296	-2.99	4.68
115	2.519	3.705	-2.93	4.89
120	2.180	3.206	-2.86	5.09
125	1.892	2.783	-2.80	5.29
130	1.648	2.423	-2.74	5.49
135	1.439	2.116	-2.68	5.68
140	1.261	1.854	-2.62	5.87
145	1.107	1.628	-2.57	6.05
150	0.9752	1.434	-2.51	6.23

# NTCLE203E3..../2381 640 5....



Vishay BCcomponents NTC Thermistors, Radial Leaded,  
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<b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 470 k<math>\Omega</math></b>			
$T_{OPER}$ (°C)	PART NR. NTCLE203E3474*B0 2381 640 5*474	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	$R_T$ (k $\Omega$ )		
- 40	22 850	- 7.14	6.41
- 35	16 068	- 6.94	5.80
- 30	11 413	- 6.74	5.20
- 25	8185	- 6.55	4.64
- 20	5926	- 6.37	4.09
- 15	4329	- 6.19	3.57
- 10	3190	- 6.02	3.06
- 5	2371	- 5.85	2.57
0	1777	- 5.69	2.11
5	1342	- 5.54	1.65
10	1021	- 5.39	1.22
15	783.0	- 5.24	0.80
20	604.6	- 5.10	0.39
25	470.0	- 4.97	0.00
30	367.8	- 4.84	0.38
35	289.6	- 4.72	0.75
40	229.5	- 4.59	1.10
45	182.9	- 4.48	1.45
50	146.7	- 4.37	1.78
55	118.2	- 4.26	2.10
60	95.80	- 4.15	2.41
65	78.04	- 4.05	2.72
70	63.88	- 3.95	3.01
75	52.55	- 3.86	3.30
80	43.43	- 3.77	3.58
85	36.05	- 3.68	3.85
90	30.06	- 3.59	4.11
95	25.16	- 3.51	4.37
100	21.15	- 3.43	4.62
105	17.85	- 3.35	4.86
110	15.12	- 3.28	5.10
115	12.86	- 3.21	5.33
120	10.97	- 3.14	5.55
125	9.396	- 3.07	5.77





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