

NTC Thermistors, Radial Leaded, Accuracy Line



FEATURES

- Accurate over a wide temperature range (tolerance on B-value down to 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
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC


RoHS
COMPLIANT

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/resistors-non-linear/curve-computation-list/

MARKING

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

MOUNTING

By soldering in any position.

QUICK REFERENCE DATA		
PARAMETER	VALUE	UNIT
Resistance value at 25 °C	2K to 470K	Ω
Tolerance on R_{25} -value	± 1; ± 2; ± 3; ± 5	%
$B_{25/85}$ -value	3528 to 4570	K
Tolerance on $B_{25/85}$ -value	± 0.5 to ± 2.0	%
Operating temperature range at: Zero dissipation (continuously)	- 40 to + 125	°C
Zero dissipation (for short periods) ⁽²⁾	≤ 150	
Maximum power dissipation	0 to + 55	
Maximum power dissipation	100	mW
Dissipation factor δ	2.2	mW/K
Response time ⁽¹⁾	≈ 1.7	s
Thermal time constant τ	13	
Climatic category (LCT/UCT/days)	40/125/56	
Mass	≈ 0.11	g

Notes

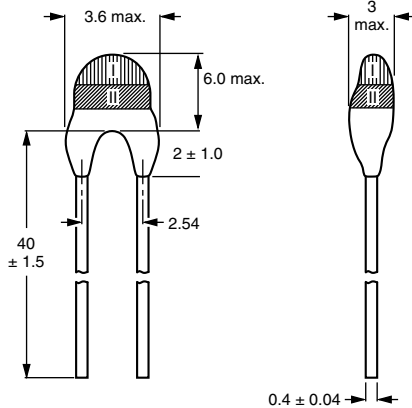
- ⁽¹⁾ Response time in silicone oil MS200/50. This is the time needed for the sensor to reach 63.2 % of the total temperature difference when subjected to a temperature change from 25 °C in air to 85 °C in oil.
- ⁽²⁾ Valid for all types with the exception of the R_{25} values 12 kΩ, 22 kΩ and 470 kΩ.

ELECTRICAL DATA AND ORDERING INFORMATION							
R_{25} (kΩ)	$B_{25/85}$ - VALUE		SAP MATERIAL AND ORDERING NUMBER NTCLE203E3..... ⁽⁴⁾	OLD 12NC CODE 2381 640 5.... ⁽³⁾	UL APPROVED	CODING (see dimensions)	
	(K)	(± %)				Y/N	I
2	3528	0.5	202*B0	*202	N	Orange	Orange
2.7	3977	0.75	272*B0	*272	Y	Red	Red
4.7	3977	0.75	472*B0	*472	Y	Green	Green
5	3977	0.75	502*B0	*502	Y	Black	White
10	3977	0.75	103*B0	*103	Y	Blue	Blue
12	3740	2	123*B0	*123	Y	Yellow	Yellow
22	3740	2	223*B0	*223	Y	White	White
47	4090	1.5	473*B0	*473	N	Black	Black
68	4190	1.5	683*B0	*683	N	Grey	Grey
100	4190	1.5	104*B0	*104	N	Brown	Brown
470	4570	1.5	474*B0	*474	N	Violet	Violet

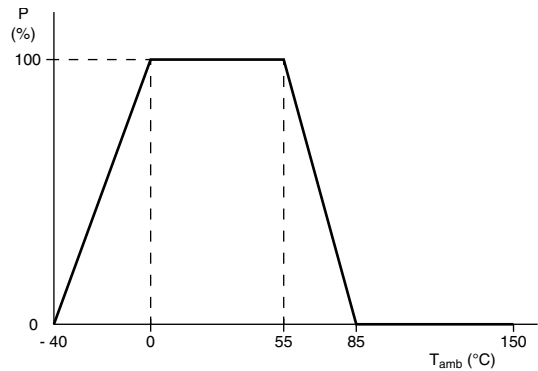
Notes

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

DIMENSIONS in millimeters



DERATING AND LONG TERM STABILITY

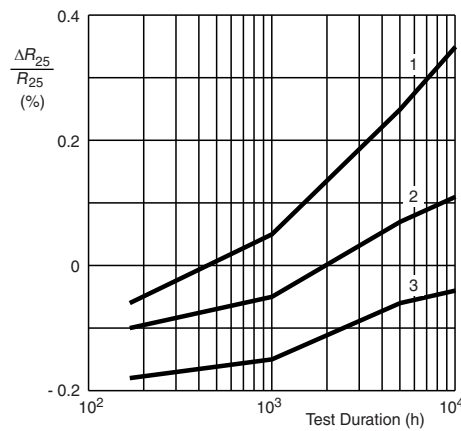


Power derating curve

Note

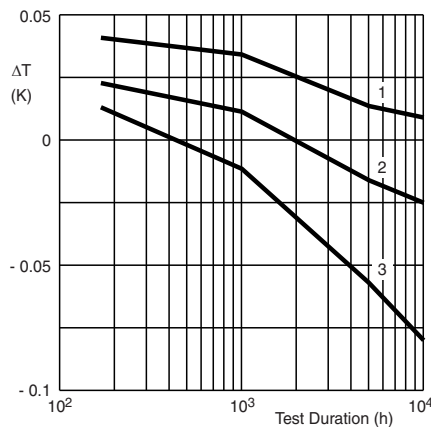
- Zero power is considered as measuring power max. 1 % of max. power

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.



For complete Curve Computation, visit: www.vishay.com/resistors-non-linear/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2 kΩ				
T_{OPER} (°C)	PART NUMBER NTCLE203E3202*B0		TCR (%/K)	$\Delta R/R$ DUE TO $B_{Tot.}$ (%)
	R_T (Ω)			
- 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



For complete Curve Computation, visit: www.vishay.com/resistors-non-linear/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2.7 kΩ, 4.7 kΩ, 5.0 kΩ, AND 10 kΩ						
T_{OPER} (°C)	PART NUMBER NTCLE203E3272*B0	PART NUMBER NTCLE203E3472*B0	PART NUMBER NTCLE203E3502*B0	PART NUMBER NTCLE203E3103*B0	TCR (%/K)	$\Delta R/R$ DUE TO $B_{Tot.}$ (%)
	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)		
- 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



For complete Curve Computation, visit: www.vishay.com/resistors-non-linear/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 12 kΩ AND 22 kΩ				
T_{OPER} (°C)	PART NUMBER NTCLE203E3123*B0	PART NUMBER NTCLE203E3223*B0	TCR (%/K)	$\Delta R/R$ DUE TO $B_{Tot.}$ (%)
	R_T (k Ω)	R_T (k Ω)		
- 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



For complete Curve Computation, visit: www.vishay.com/resistors-non-linear/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 47 kΩ			
T_{OPER} (°C)	PART NUMBER NTCLE203E3473*B0	TCR (%/K)	$\Delta R/R$ DUE TO $B_{Tot.}$ (%)
	R_T (k Ω)		
- 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



For complete Curve Computation, visit: www.vishay.com/resistors-non-linear/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 68 kΩ AND 100 kΩ				
T_{OPER} (°C)	PART NUMBER NTCLE203E3683*B0	PART NUMBER NTCLE203E3104*B0	TCR (%/K)	$\Delta R/R$ DUE TO $B_{Tot.}$ (%)
	R_T (k Ω)	R_T (k Ω)		
- 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



For complete Curve Computation, visit: www.vishay.com/resistors-non-linear/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 470 kΩ			
T_{OPER} (°C)	PART NUMBER NTCLE203E3474*B0	TCR (%/K)	$\Delta R/R$ DUE TO $B_{Tot.}$ (%)
	R_T (k Ω)		
- 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



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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 in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

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

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.