VISHAY INTERTECHNOLOGY, INC.

INTERACTIVE
data book

NTC THERMISTORS
VISHAY

VSE-DB0069-1009

Notes:

1. To navigate:
   a) Click on the Vishay logo on any datasheet to go to the Contents page for that section. Click on the Vishay logo on any Contents page to go to the main Table of Contents page.
   b) Click on the products within the Table of Contents to go directly to the datasheet.
   c) Use the scroll or page up/page down functions.
   d) Use the Adobe® Acrobat® page function in the browser bar.

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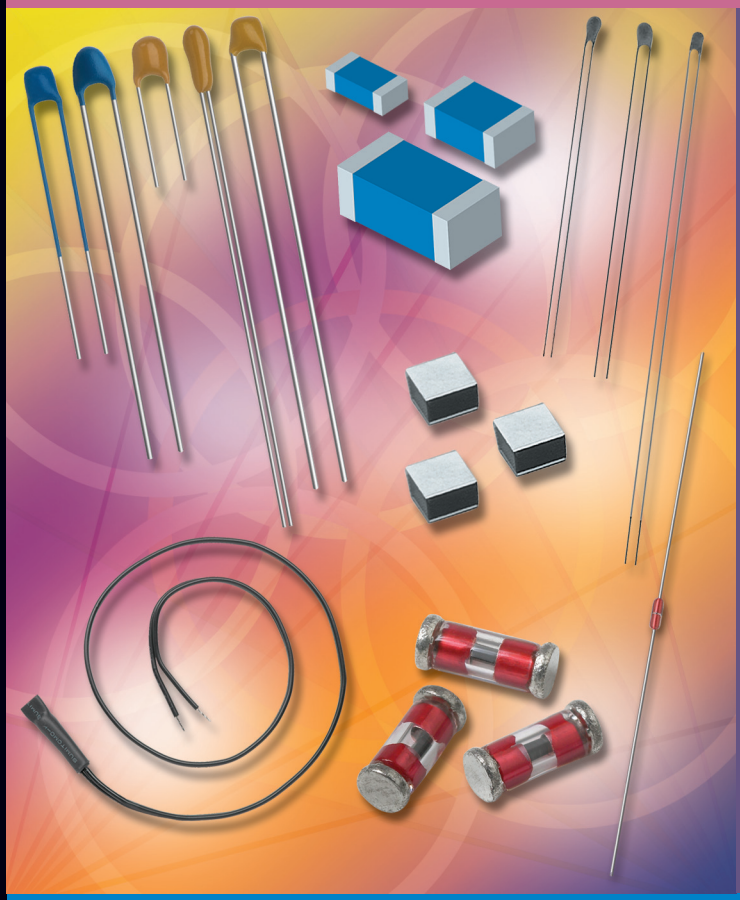
VISHAY INTERTECHNOLOGY, INC.



DATA BOOK

NTC THERMISTORS

www.vishay.com

SEMICONDUCTORS

RECTIFIERS

- Schottky (single, dual)
- Standard, Fast and Ultra-Fast Recovery (single, dual)
- Bridge
- Superectifier®
- Sinterglass Avalanche Diodes

HIGH-POWER DIODES AND THYRISTORS

- High-Power Fast-Recovery Diodes
- Phase-Control Thyristors
- Fast Thyristors

SMALL-SIGNAL DIODES

- Schottky and Switching (single, dual)
- Tuner/Capacitance (single, dual)
- Bandswitching
- PIN

ZENER AND SUPPRESSOR DIODES

- Zener (single, dual)
- TVS (TRANSZORB®, Automotive, ESD, Arrays)

FETs

- Low-Voltage TrenchFET® Power MOSFETs
- High-Voltage TrenchFET® Power MOSFETs
- High-Voltage Planar MOSFETs
- JFETs

OPTOELECTRONICS

- IR Emitters and Detectors, and IR Receiver Modules
- Optocouplers and Solid-State Relays
- Optical Sensors
- LEDs and 7-Segment Displays
- Infrared Data Transceiver Modules
- Custom Products

ICs

- Power ICs
- Analog Switches

MODULES

- Power Modules (contain power diodes, thyristors, MOSFETs, IGBTs)

PASSIVE COMPONENTS

RESISTIVE PRODUCTS

- Film Resistors
  - Metal Film Resistors
  - Thin Film Resistors
  - Thick Film Resistors
  - Metal Oxide Film Resistors
  - Carbon Film Resistors
- Wirewound Resistors
- Power Metal Strip® Resistors
- Chip Fuses
- Variable Resistors
  - Cermet Variable Resistors
  - Wirewound Variable Resistors
  - Conductive Plastic Variable Resistors
- Networks/Arrays
- Non-Linear Resistors
  - NTC Thermistors
  - PTC Thermistors
  - Varistors

MAGNETICS

- Inductors
- Transformers

CAPACITORS

- Tantalum Capacitors
  - Molded Chip Tantalum Capacitors
  - Coated Chip Tantalum Capacitors
  - Solid Through-Hole Tantalum Capacitors
  - Wet Tantalum Capacitors
- Ceramic Capacitors
  - Multilayer Chip Capacitors
  - Disc Capacitors
- Film Capacitors
- Power Capacitors
- Heavy-Current Capacitors
- Aluminum Capacitors

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NTC Thermistors

NTC SMD

Contents

NTC SMD

GENERAL ORDER INFORMATION

GLOBAL PART NUMBER: NTC S 0805 E3 103 F M T

N	T	C	S	0	8	0	5	E	3	1	0	3	F	M	T

PRODUCT FAMILY	EXECUTION	SIZE	RoHS COMPLIANCE TERMINATION TYPE	R_{25} VALUE	TOLERANCE ON R_{25}	$B_{25/85}$ VALUE	PACKAGING
NTC	**S** = SMD	**0805** **0603** **0402**	**E3** = NiSn **E4** = AgPd	**103** = 10 x 10^3 Ω **102** = 10 x 10^2 Ω **101** = 10 x 10^1 Ω **109** = 10 x 10^0 Ω **108** = 10 x 10^{-1} Ω see spec. for values	**F** = 1 % **G** = 2 % **H** = 3 % **J** = 5 % **K** = 10 %	**L** (low): 3000 ≤ $B_{25/85}$ < 3500 **M** (medium): 3500 ≤ $B_{25/85}$ < 3750 **H** (high): 3750 ≤ $B_{25/85}$ < 4000 **X** (very high): 4000 ≤ $B_{25/85}$ < 4250	**T** = Paper tape

OLD PRODUCT DESCRIPTION (12NC): 2381 615 5 3 103

2381	615	5	3	103
RoHS COMPLIANCE	EXECUTION	SIZE AND TYPE	TOLERANCE ON R_{25}	R_{25} VALUE
2381 = Yes **2322** = No	**615** = SMD NTC	**6** = Mix size NiSn **5** = 0805 NiSn **4** = 0402 NiSn **3** = 0603 NiSn **2** = 0603 AgPd **1** = 0805 AgPd	**5** = 1 % **4** = 2 % **6** = 3 % **3** = 5 % **2** = 10 %	**103** = 10 x 10^3 Ω **102** = 10 x 10^2 Ω **101** = 10 x 10^1 Ω **109** = 10 x 10^0 Ω **108** = 10 x 10^{-1} Ω see spec. for values

PRODUCT VALUE RANGE BY CASE SIZE-VISHAY BCC NTCS SERIES

0402 SIZE			0603 SIZE			0805 SIZE		
R_{25} (kΩ)	$B_{25/85}$ (K)	ORDERING PART NUMBER	R_{25} (kΩ)	$B_{25/85}$ (K)	ORDERING PART NUMBER	R_{25} (kΩ)	$B_{25/85}$ (K)	ORDERING PART NUMBER
4.7	3595 ± 3 %	NTCS0402E3472*MT	2	3420 ± 1 %	NTCS0603E3202*LT	2.2	3600 ± 1 %	NTCS0805E3222*MT
10	3490 ± 3 %	NTCS0402E3103*LT	2.2	3520 ± 1 %	NTCS0603E3222*MT	4.7	3500 ± 1 %	NTCS0805E3472*MT
10	3950 ± 3 %	NTCS0402E3103*HT	2.7	3600 ± 1 %	NTCS0603E3272*MT	10	3430 ± 3 %	NTCS0805E3103*LT
15	3600 ± 3 %	NTCS0402E3153*MT	4.7	3830 ± 1 %	NTCS0603E3472*HT	10	3570 ± 3 %	NTCS0805E3103*MT
22	3590 ± 3 %	NTCS0402E3223*MT	10	3430 ± 3 %	NTCS0603E3103*LT	10	3940 ± 1 %	NTCS0805E3103*HT
33	3670 ± 3 %	NTCS0402E3333*MT	10	3610 ± 1 %	NTCS0603E3103*MT	15	3700 ± 1 %	NTCS0805E3153*MT
47	4075 ± 3 %	NTCS0402E3473*XT	10	3960 ± 1 %	NTCS0603E3103*HT	22	3800 ± 1 %	NTCS0805E3223*HT
68	3910 ± 3 %	NTCS0402E3683*HT	15	3600 ± 1 %	NTCS0603E3153*MT	33	3920 ± 1 %	NTCS0805E3333*HT
100	3950 ± 3 %	NTCS0402E3104*HT	22	3730 ± 1 %	NTCS0603E3223*MT	47	3960 ± 1 %	NTCS0805E3473*HT
			33	3860 ± 1 %	NTCS0603E3333*HT	68	4100 ± 1 %	NTCS0805E3683*XT
			47	3960 ± 1 %	NTCS0603E3473*HT	100	3590 ± 1 %	NTCS0805E3104*MT
			68	3985 ± 1 %	NTCS0603E3683*HT	100	4100 ± 1 %	NTCS0805E3104*XT
			100	4100 ± 1 %	NTCS0603E3104*XT	330	3930 ± 1 %	NTCS0805E3334*HT
						470	4025 ± 1 %	NTCS0805E3474*XT
						680	4125 ± 1 %	NTCS0805E3684*XT

Note

- Replace * by F, G, H, J for respectively tolerances of 1 %, 2 %, 3 %, or 5 %

SMD 0402, Glass Protected NTC Thermistors

FEATURES

- TCR ranging from - 6.5 %/K at - 40 °C to - 2 %/K at 150 °C
- Tolerance on R_{25} down to 1 %, and on $B_{25/85}$ down to 3 %
- Suitable for wave or reflow soldering
- NiSn terminations
- Fully glass coated and protected
- Old part number was 2322 615 4....
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

- Temperature sensing, protection and compensation in automotive, industrial, telecom and consumer applications. Examples are:
  - Battery chargers
  - Power suppliers
  - Office equipment
  - LCD compensation
  - In-car entertainment

DESCRIPTION

Size 0402 chip thermistors with a negative temperature coefficient. The device has no marking.

PACKAGING

Available in 8 mm punched paper tape on reel package of 10 000 units.

DESIGN-IN SUPPORT

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

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at 25 °C	4.7 kΩ to 100 kΩ
Tolerance on R_{25} - value	± 1 %; ± 2 %; ± 3 %; ± 5 %
$B_{25/85}$ value	3490K to 4075K
Tolerance on $B_{25/85}$ - value	± 3 %
Maximum dissipation at 25 °C	70 mW
Thermal time constant τ	≈ 5 s
Dissipation factor D	≈ 2.0 mW/K
Operating temperature range at zero power	- 40 °C to + 150 °C
R/T values	See tables
Climatic category	40/125/56
Weight	≈ 0.0012 g

ELECTRICAL DATA AND ORDERING INFORMATION

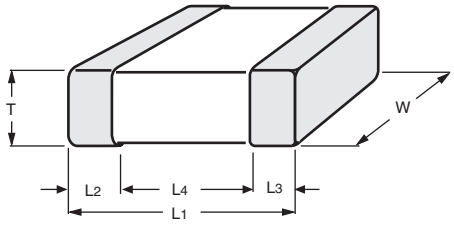
R_{25} - VALUE (kΩ)	$B_{25/85}$ - VALUE (K)	SAP MATERIAL AND ORDERING NUMBER NTCS0402E3... (1)	12NC OLD MATERIAL NUMBER 2381 615 4... (2)
4.7	3595	472*MT	*472
10	3490	103*LT	*103
10	3950	103*HT	-
15	3965	153*HT	*153
22	3590	223*MT	*223
33	3670	333*MT	*333
47	4075	473*XT	*473
68	3910	683*HT	*683
100	3950	104*HT	*104

Notes

(1) Replace * in SAP by J for ± 5 %, H for ± 3 %, G for ± 2 %, F for ± 1 % tolerance on R_{25}

(2) Replace * in 12NC by 3 for ± 5 %, 6 for ± 3 %, 4 for ± 2 %, 5 for ± 1 % tolerance on R_{25}

DIMENSIONS in millimeters



L_1	W	T	L_2 and L_3 MIN.	L_4 MIN.
1.0 ± 0.15	0.5 ± 0.15	0.5 ± 0.15	0.1	0.3

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 4.7 kΩ, 10 kΩ AND 15 kΩ

T_{OPER} (°C)	PART NUMBER NTCS0402E3472*MT		PART NUMBER NTCS0402E3103*HT		PART NUMBER NTCS0402E3103*LT		PART NUMBER NTCS0402E3153*HT		ΔR/R DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	117 852	- 6.08	356 276	- 6.74	214 064	- 5.72	347 696	- 5.86	11.22
- 35	87 377	- 5.89	255 727	- 6.53	161 527	- 5.55	260 574	- 5.68	10.14
- 30	65 415	- 5.69	185 491	- 6.32	122 938	- 5.38	197 004	- 5.51	9.10
- 25	49 435	- 5.51	135 931	- 6.12	94 353	- 5.21	150 213	- 5.34	8.11
- 20	37 700	- 5.33	100 611	- 5.92	73 003	- 5.05	115 482	- 5.18	7.15
- 15	29 003	- 5.16	75 193	- 5.73	56 928	- 4.90	89 489	- 5.02	6.24
- 10	22 501	- 4.99	56 726	- 5.54	44 729	- 4.75	69 880	- 4.87	5.35
- 5	17 599	- 4.83	43 185	- 5.37	35 402	- 4.61	54 973	- 4.73	4.50
0	13 873	- 4.68	33 166	- 5.19	28 217	- 4.47	43 555	- 4.59	3.68
5	11 019	- 4.53	25 688	- 5.03	22 643	- 4.33	34 747	- 4.45	2.89
10	8815.0	- 4.39	20 059	- 4.87	18 290	- 4.21	27 904	- 4.32	2.13
15	7101.0	- 4.26	15 787	- 4.71	14 867	- 4.08	22 552	- 4.20	1.40
20	5758.6	- 4.13	12 519	- 4.56	12 157	- 3.96	18 338	- 4.08	0.69
25	4700.0	- 4.00	10 000	- 4.42	10 000	- 3.85	15 000	- 3.96	0.00
30	3859.7	- 3.88	8044.1	- 4.28	8271.8	- 3.74	12 340	- 3.85	0.66
35	3188.4	- 3.76	6514.5	- 4.15	6879.3	- 3.63	10 207	- 3.74	1.31
40	2648.9	- 3.65	5310.0	- 4.03	5751.0	- 3.53	8487.0	- 3.64	1.93
45	2212.7	- 3.55	4355.3	- 3.90	4831.9	- 3.43	7092.9	- 3.54	2.53
50	1858.0	- 3.44	3593.7	- 3.79	4079.3	- 3.34	5956.9	- 3.44	3.11
55	1568.1	- 3.34	2982.4	- 3.67	3460.0	- 3.25	5026.4	- 3.35	3.68
60	1329.9	- 3.25	2488.8	- 3.56	2947.8	- 3.16	4260.5	- 3.26	4.23
65	1133.1	- 3.16	2088.0	- 3.46	2522.3	- 3.08	3627.1	- 3.18	4.76
70	969.76	- 3.07	1760.7	- 3.36	2167.2	- 2.99	3100.9	- 3.09	5.28
75	833.56	- 2.98	1492.1	- 3.26	1869.5	- 2.92	2661.8	- 3.01	5.78
80	719.47	- 2.90	1270.4	- 3.17	1618.9	- 2.84	2293.9	- 3.94	6.27
85	623.48	- 2.83	1086.7	- 3.08	1407.2	- 2.77	1984.3	- 3.86	6.74
90	542.38	- 2.75	933.57	- 2.99	1227.5	- 2.70	1722.7	- 2.79	7.20
95	473.58	- 2.68	805.43	- 2.91	1074.5	- 2.63	1500.9	- 2.72	7.65
100	414.98	- 2.61	697.71	- 2.83	943.67	- 2.56	1312.0	- 2.66	8.09
105	364.89	- 2.54	606.77	- 2.75	831.46	- 2.50	1150.7	- 2.59	8.51
110	321.91	- 2.47	529.68	- 2.68	734.86	- 2.44	1012.4	- 2.53	8.93
115	284.90	- 2.41	464.07	- 2.61	651.44	- 2.38	893.49	- 2.47	9.33
120	252.92	- 2.35	408.01	- 2.54	579.17	- 2.32	790.85	- 2.41	9.73
125	225.20	- 2.29	359.94	- 2.47	516.36	- 2.27	702.01	- 2.36	10.11
130	201.09	- 2.24	318.56	- 2.41	461.60	- 2.22	624.86	- 2.30	10.48
135	180.07	- 2.18	282.83	- 2.35	413.73	- 2.16	557.68	- 2.25	10.85
140	161.67	- 2.13	251.88	- 2.29	371.77	- 2.11	499.00	- 2.20	11.20
145	145.53	- 2.08	224.96	- 2.23	334.88	- 2.07	447.62	- 2.15	11.55
150	131.33	- 2.03	201.49	- 2.18	302.36	- 2.02	402.49	- 2.10	11.89

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 22 kΩ, 33 kΩ AND 47 kΩ

T_{OPER} (°C)	PART NUMBER NTCS0402E3223*MT		PART NUMBER NTCS0402E3333*MT		PART NUMBER NTCS0402E3473*XT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	501 412	- 5.84	831 939	- 6.14	1 514 773	- 6.19	11.22
- 35	376 174	- 5.66	615 449	- 5.92	1 114 829	- 6.07	10.14
- 30	284 754	- 5.48	460 194	- 5.71	825 417	- 5.95	9.10
- 25	217 417	- 5.31	347 596	- 5.51	615 030	- 5.82	8.11
- 20	167 386	- 5.15	265 065	- 5.33	461 300	- 5.69	7.15
- 15	129 900	- 4.99	203 964	- 5.15	348 340	- 5.55	6.24
- 10	101 585	- 4.84	158 295	- 4.99	264 846	- 5.41	5.35
- 5	80 030	- 4.70	123 854	- 4.83	202 753	- 5.27	4.50
0	63 497	- 4.56	97 656	- 4.68	156 285	- 5.14	3.68
5	50 725	- 4.43	77 566	- 4.54	121 288	- 5.00	2.89
10	40 787	- 4.30	62 041	- 4.40	94 762	- 4.87	2.13
15	33 004	- 4.17	49 955	- 4.27	74 529	- 4.74	1.40
20	26 868	- 4.06	40 479	- 4.15	58 997	- 4.61	0.69
25	22 000	- 3.94	33 000	- 3.03	47 000	- 4.48	0.00
30	18 115	- 3.83	27 059	- 3.91	37 675	- 4.36	0.66
35	14 997	- 3.73	22 311	- 3.81	30 384	- 4.24	1.31
40	12 480	- 3.62	18 494	- 3.70	24 649	- 4.13	1.93
45	10 437	- 3.53	15 408	- 3.60	20 111	- 4.01	2.53
50	8770.6	- 3.43	12 900	- 3.51	16 500	- 3.90	3.11
55	7404.3	- 3.34	10 850	- 3.41	13 611	- 3.80	3.68
60	6278.7	- 3.25	9167.3	- 3.33	11 286	- 3.69	4.23
65	5347.1	- 3.17	7778.9	- 3.24	9406.7	- 3.59	4.76
70	4572.5	- 3.09	6628.2	- 3.16	7878.8	- 3.50	5.28
75	3925.6	- 3.01	5670.2	- 3.08	6630.6	- 3.40	5.78
80	3383.3	- 2.94	4869.3	- 3.01	5606.0	- 3.31	6.27
85	2926.6	- 2.86	4197.0	- 2.94	4760.9	- 3.22	6.74
90	2540.7	- 2.79	3630.4	- 2.87	4060.8	- 3.14	7.20
95	2213.2	- 2.73	3151.1	- 2.80	3478.2	- 3.06	7.65
100	1934.4	- 2.66	2744.1	- 2.73	2991.2	- 2.98	8.09
105	1696.1	- 2.60	2397.3	- 2.67	2582.5	- 2.90	8.51
110	1491.8	- 2.54	2100.7	- 2.61	2238.1	- 2.83	8.93
115	1316.1	- 2.48	1846.4	- 2.55	1946.8	- 2.75	9.33
120	1164.4	- 2.42	1627.5	- 2.50	1699.4	- 2.68	9.73
125	1033.1	- 2.37	1438.5	- 2.44	1488.5	- 2.62	10.11
130	919.03	- 2.31	1274.9	- 2.39	1308.2	- 2.55	10.48
135	819.74	- 2.26	1132.8	- 2.34	1153.4	- 2.49	10.85
140	733.03	- 2.21	1009.1	- 2.29	1020.1	- 2.43	11.20
145	657.10	- 2.16	901.13	- 2.24	904.86	- 2.37	11.55
150	590.44	- 2.12	806.58	- 2.19	805.02	- 2.31	11.89

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 68 kΩ AND 100 kΩ

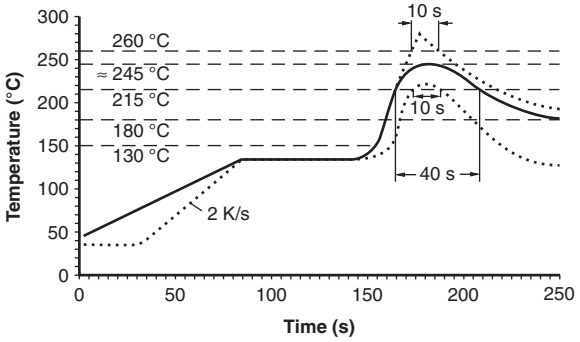
T_{OPER} (°C)	PART NUMBER NTCS0402E3683*HT		PART NUMBER NTCS0402E3104*HT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	2 179 612	- 6.65	3 238 142	- 6.57	11.22
- 35	1 573 200	- 6.40	2 344 882	- 6.35	10.14
- 30	1 149 311	- 6.16	1 716 473	- 6.13	9.10
- 25	849 224	- 5.94	1 269 493	- 5.93	8.11
- 20	634 231	- 5.74	948 194	- 5.74	7.15
- 15	478 461	- 5.54	714 901	- 5.56	6.24
- 10	364 399	- 5.35	543 869	- 5.38	5.35
- 5	280 036	- 5.18	417 320	- 5.21	4.50
0	217 046	- 5.01	322 855	- 5.05	3.68
5	169 589	- 4.86	251 741	- 4.90	2.89
10	133 529	- 4.71	197 771	- 4.75	2.13
15	105 906	- 4.56	156 492	- 4.61	1.40
20	84 582	- 4.43	124 685	- 4.48	0.69
25	68 000	- 4.30	100 000	- 4.35	0.00
30	55 015	- 4.18	80 711	- 4.22	0.66
35	44 778	- 4.06	65 539	- 4.11	1.31
40	36 656	- 3.95	53 530	- 3.99	1.93
45	30 173	- 3.84	43 967	- 3.88	2.53
50	24 968	- 3.74	36 306	- 3.78	3.11
55	20 766	- 3.64	30 135	- 3.68	3.68
60	17 354	- 3.54	25 138	- 3.58	4.23
65	14 570	- 3.45	21 069	- 3.48	4.76
70	12 288	- 3.36	17 740	- 3.39	5.28
75	10 407	- 3.28	15 003	- 3.31	5.78
80	8851.1	- 3.20	12 742	- 3.22	6.27
85	7557.3	- 3.12	10 867	- 3.14	6.74
90	6477.3	- 3.05	9303.8	- 3.07	7.20
95	5572.1	- 2.98	7996.1	- 2.99	7.65
100	4810.3	- 2.91	6897.4	- 2.92	8.09
105	4166.9	- 2.84	5970.8	- 2.85	8.51
110	3621.4	- 2.77	5186.3	- 2.78	8.93
115	3157.3	- 2.71	4519.8	- 2.72	9.33
120	2761.2	- 2.65	3951.5	- 2.66	9.73
125	2421.9	- 2.59	3465.3	- 2.60	10.11
130	2130.4	- 2.54	3048.0	- 2.54	10.48
135	1879.2	- 2.48	2688.7	- 2.48	10.85
140	1662.0	- 2.43	2378.3	- 2.43	11.20
145	1473.7	- 2.38	2109.4	- 2.37	11.55
150	1310.1	- 2.33	1875.8	- 2.32	11.89

SOLDERING CONDITIONS

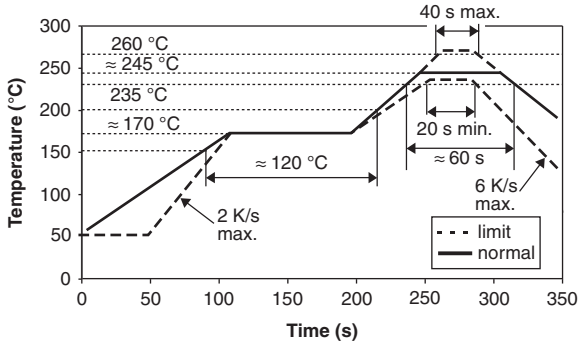
This SMD thermistor is suitable for wave or reflow soldering, in accordance with JEDEC J-STD-020. The maximum temperature of 260 °C during 40 s should not be exceeded.

Typical examples of a soldering processes that will provide reliable joints without damage, are shown below.

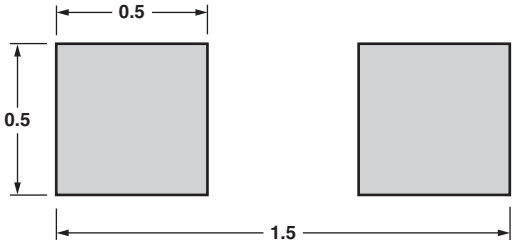
Reflow Soldering



Lead (Pb)-free Reflow Soldering Profile



Dimensions of the solder lands



TESTS AND REQUIREMENTS

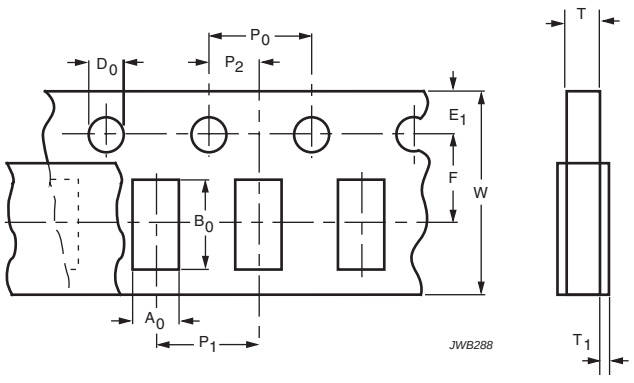
SOLDERABILITY AND RESISTANCE TO SOLDERING HEAT				
IEC 60068-2-58	TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
6	T_C	Solderability	2 s at 235 °C	Min. 95 % of surface wetted
		Resistance to soldering heat	10 s at 260 °C	$\Delta R/R < 5$ %

PACKAGING

TAPE SPECIFICATIONS

All tape specifications are in accordance with IEC 60286-3. Basic dimensions are given below. Carrier tape material is paper.

PAPER TAPE



DIMENSIONS OF PAPER TAPE in millimeters		
PARAMETER	DIMENSION	TOLERANCE
A_0 (1)	0.65	± 0.1
B_0 (1)	1.15	± 0.1
W	8.0	± 0.2
E_1	1.75	± 0.1
F	3.5	± 0.05
D_0	1.55	± 0.05
P_0 (2)	4.0	± 0.1
P_1	4.0	± 0.1
P_2	2.0	± 0.05
T tape thickness	0.8	max.
T_1 cover tape	< 0.1	-

Notes

(1) Measured 0.3 mm above base pocket

(2) P_0 pitch cumulative error over any 10 pitches ± 0.2 mm

SMD 0603, Glass Protected NTC Thermistors

FEATURES

- TCR ranging from - 7 %/K at - 40 °C to - 2 %/K at 150 °C
- Tolerance on R_{25} down to 1 %, and on $B_{25/85}$ down to 1 %
- Suitable for wave or reflow soldering
- NiSn terminations
- Fully glass coated and protected
- Old part number was 2322 615 3....
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

- Temperature sensing, protection and compensation in automotive, industrial, telecom and consumer applications. Examples are:
  - Battery chargers
  - Power suppliers
  - Office equipment
  - LCD compensation
  - In-car entertainment

DESCRIPTION

Size 0603 chip thermistors with a negative temperature coefficient. The device has no marking.

PACKAGING

Available in 8 mm punched paper tape on reel package of 4000 units.

DESIGN-IN SUPPORT

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

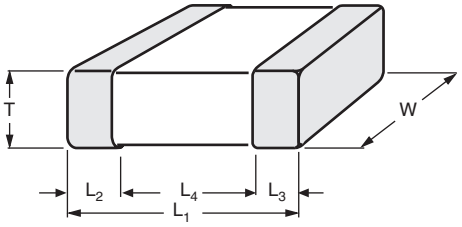
QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at 25 °C	2.2 kΩ to 100 kΩ
Tolerance on R_{25} - value	± 1 %; ± 2 %; ± 3 %; ± 5 %
$B_{25/85}$ value	3420K to 4100K
Tolerance on $B_{25/85}$ - value	± 1 %, ± 3 %
Maximum dissipation at 25 °C	125 mW
Thermal time constant τ	≈ 8 s
Dissipation factor D	3.0 mW/K
Operating temperature range at zero power	- 40 °C to + 150 °C
R/T values	See tables
Climatic category	40/125/56
Weight	≈ 0.006 g

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} - VALUE (kΩ)	$B_{25/85}$ - VALUE (K)	TOLERANCE ON $B_{25/85}$ (%)	SAP MATERIAL AND ORDERING NUMBER NTCS0603E3... (1)	12 NC 2381 615 3... (2)
2.0	3420	± 1	202*LT	*202
2.2	3520	± 1	222*MT	*222
2.7	3600	± 1	272*MT	*272
4.7	3830	± 1	472*HT	*472
10	3435	± 3	103*LT	-
10	3610	± 1	103*MT	*103
10	3960	± 1	103*HT	-
15	3600	± 1	153*MT	*153
22	3730	± 1	223*MT	*223
33	3860	± 1	333*HT	*333
47	3960	± 1	473*HT	*473
68	3985	± 1	683*HT	*683
100	4100	± 1	104*XT	*104

Notes
(1) Replace * in SAP by J for ± 5 %, H for ± 3 %, G for ± 2 %, F for ± 1 % tolerance on R_{25}
(2) Replace * in 12 NC by 3 for ± 5 %, 6 for ± 3 %, 4 for ± 2 %, 5 for ± 1 % tolerance on R_{25}

DIMENSIONS in millimeters



L_1	W	T	L_2 and L_3 MIN.	L_4 MIN.
1.6 ± 0.15	0.8 ± 0.15	0.8 ± 0.15	0.2	0.4

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2.0 kΩ, 2.2 kΩ AND 2.7 kΩ

T_{OPER} (°C)	PART NUMBER NTCS0603E3202*MT		PART NUMBER NTCS0603E3222*MT		PART NUMBER NTCS0603E3272*MT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	44 297	- 5.93	53 503	- 6.11	65 247	- 6.26	7.58
- 35	33 114	- 5.71	39 637	- 5.89	48 436	- 6.03	6.83
- 30	25 010	- 5.51	29 680	- 5.68	36 340	- 5.82	6.13
- 25	19 076	- 5.32	22 451	- 5.48	27 539	- 5.61	5.45
- 20	14 687	- 5.14	17 149	- 5.29	21 069	- 5.42	4.80
- 15	11 410	- 4.96	13 221	- 5.11	16 265	- 5.23	4.18
- 10	8940.4	- 4.80	10 283	- 4.94	12 664	- 5.06	3.58
- 5	7062.8	- 4.64	8066.2	- 4.77	9940.1	- 4.89	3.01
0	5623.4	- 4.48	6378.5	- 4.62	7862.7	- 4.72	2.46
5	4510.9	- 4.34	5083.1	- 4.47	6265.2	- 4.57	1.93
10	3644.4	- 4.20	4080.7	- 4.32	5027.3	- 4.42	1.42
15	2964.6	- 4.06	3299.2	- 4.18	4060.9	- 4.28	0.93
20	2427.4	- 3.94	2685.5	- 4.05	3301.2	- 4.14	0.46
25	2000.0	- 3.81	2200.0	- 3.93	2700.0	- 4.02	0.00
30	1657.7	- 3.70	1813.5	- 3.80	2221.1	- 3.89	0.22
35	1382.0	- 3.58	1503.7	- 3.69	1837.3	- 3.77	0.43
40	1158.4	- 3.48	1253.9	- 3.58	1528.0	- 3.66	0.64
45	976.12	- 3.37	1051.3	- 3.47	1277.2	- 3.55	0.84
50	826.68	- 3.27	886.05	- 3.37	1072.8	- 3.45	1.03
55	703.51	- 3.18	750.49	- 3.27	905.29	- 3.35	1.22
60	601.48	- 3.09	638.72	- 3.18	767.40	- 3.25	1.40
65	516.53	- 3.00	546.09	- 3.09	653.33	- 3.16	1.58
70	445.49	- 2.92	468.95	- 3.00	558.52	- 3.07	1.75
75	385.79	- 2.84	404.41	- 2.92	479.37	- 2.99	1.92
80	335.42	- 2.76	350.18	- 2.84	413.02	- 2.90	2.08
85	292.73	- 2.69	304.40	- 2.76	357.17	- 2.83	2.23
90	256.40	- 2.61	265.61	- 2.69	309.97	- 2.75	2.54
95	225.37	- 2.55	232.60	- 2.62	269.92	- 2.68	2.85
100	198.77	- 2.48	204.39	- 2.55	235.83	- 2.61	3.14
105	175.88	- 2.42	180.22	- 2.49	206.70	- 2.54	3.43
110	156.11	- 2.35	159.41	- 2.42	181.72	- 2.48	3.71
115	138.98	- 2.29	141.44	- 2.36	160.24	- 2.41	3.98
120	124.09	- 2.24	125.88	- 2.30	141.70	- 2.35	4.24
125	111.11	- 2.18	112.35	- 2.25	125.65	- 2.30	4.50
130	99.757	- 2.13	100.55	- 2.19	111.72	- 2.24	4.76
135	89.796	- 2.08	90.239	- 2.14	99.589	- 2.19	5.00
140	81.033	- 2.03	81.192	- 2.09	88.997	- 2.13	5.25
145	73.304	- 1.98	73.235	- 2.04	79.724	- 2.08	5.48
150	66.468	- 1.94	66.218		71.585	- 2.04	5.71

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 4.7 kΩ, 10 kΩ AND 15 kΩ

T_{OPER} (°C)	PART NUMBER NTCS0603E3472*HT		PART NUMBER NTCS0603E3103*LT		PART NUMBER NTCS0603E3103*MT		PART NUMBER NTCS0603E3103*HT		PART NUMBER NTCS0603E3153*MT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	152 832	- 6.66	170 762	- 5.03	243 448	- 6.06	347 116	- 6.66	362 484	- 6.07	7.58
- 35	110 192	- 6.43	133 132	- 4.93	180 772	- 5.85	250 089	- 6.45	269 089	- 5.85	6.83
- 30	80 369	- 6.20	104 307	- 4.83	135 623	- 5.65	182 023	- 6.25	201 888	- 5.64	6.13
- 25	59 267	- 5.98	82 140	- 4.73	102 751	- 5.46	133 804	- 6.06	152 997	- 5.45	5.45
- 20	44 170	- 5.78	65 020	- 4.62	78 576	- 5.28	99 313	- 5.87	117 051	- 5.26	4.80
- 15	33 252	- 5.58	51 737	- 4.52	60 623	- 5.10	74 408	- 5.68	90 361	- 5.09	4.18
- 10	25 276	- 5.39	41 385	- 4.41	47 168	- 4.94	56 257	- 5.50	70 354	- 4.92	3.58
- 5	19 392	- 5.21	33 277	- 4.31	36 995	- 4.78	42 910	- 5.33	55 223	- 4.76	3.01
0	15 009	- 5.04	26 896	- 4.21	29 240	- 4.63	33 009	- 5.16	43 682	- 4.61	2.46
5	11 716	- 4.87	21 851	- 4.10	23 280	- 4.49	25 602	- 5.00	34 807	- 4.47	1.93
10	9219.5	- 4.71	17 841	- 4.00	18 664	- 4.35	20 015	- 4.85	27 929	- 4.33	1.42
15	7311.4	- 4.56	14 639	- 3.91	15 064	- 4.22	15 767	- 4.70	22 561	- 4.20	0.93
20	5841.3	- 4.42	12 071	- 3.81	12 236	- 4.10	12 512	- 4.55	18 340	- 4.08	0.46
25	4700.0	- 4.28	10 000	- 3.72	10 000	- 3.98	10 000	- 4.41	15 000	- 3.96	0.00
30	3807.5	- 4.15	8323.0	- 3.63	8220.3	- 3.86	8046.8	- 4.28	12 340	- 3.85	0.22
35	3104.5	- 4.02	6958.5	- 3.54	6795.2	- 3.75	6517.6	- 4.15	10 207	- 3.74	0.43
40	2547.2	- 3.90	5843.4	- 3.45	5647.3	- 3.65	5312.5	- 4.03	8488.7	- 3.64	0.64
45	2102.4	- 3.78	4928.1	- 3.37	4717.5	- 3.55	4356.6	- 3.91	7095.4	- 3.54	0.84
50	1745.3	- 3.67	4173.5	- 3.28	3960.3	- 3.45	3593.6	- 3.79	5959.8	- 3.44	1.03
55	1456.8	- 3.56	3548.8	- 3.20	3340.4	- 3.36	2981.0	- 3.68	5029.4	- 3.35	1.22
60	1222.4	- 3.46	3029.5	- 3.13	2830.3	- 3.27	2486.2	- 3.58	4263.3	- 3.26	1.40
65	1030.9	- 3.36	2596.1	- 3.05	2408.6	- 3.18	2084.3	- 3.48	3629.6	- 3.18	1.58
70	873.61	- 3.26	2233.0	- 2.98	2058.4	- 3.10	1756.2	- 3.38	3102.9	- 3.10	1.75
75	743.79	- 3.17	1927.6	- 2.91	1766.2	- 3.02	1486.9	- 3.28	2663.2	- 3.02	1.92
80	636.11	- 3.08	1669.8	- 2.84	1521.4	- 2.95	1264.7	- 3.19	2294.6	- 2.94	2.08
85	546.36	- 3.00	1451.3	- 2.77	1315.4	- 2.87	1080.6	- 3.10	1984.3	- 2.87	2.23
90	471.22	- 2.92	1265.7	- 2.71	1141.4	- 2.80	927.23	- 3.02	1722.0	- 2.80	2.54
95	408.03	- 2.84	1107.3	- 2.64	993.91	- 2.73	798.94	- 2.94	1499.6	- 2.73	2.85
100	354.67	- 2.77	971.68	- 2.58	868.35	- 2.67	691.16	- 2.86	1310.2	- 2.67	3.14
105	309.43	- 2.69	855.26	- 2.52	761.11	- 2.61	600.23	- 2.78	1148.3	- 2.61	3.43
110	270.91	- 2.62	754.99	- 2.47	669.19	- 2.54	523.20	- 2.71	1009.6	- 2.55	3.71
115	238.01	- 2.56	668.36	- 2.41	590.14	- 2.48	457.68	- 2.64	890.23	- 2.49	3.98
120	209.79	- 2.49	593.29	- 2.36	521.94	- 2.43	401.76	- 2.57	787.23	- 2.43	4.24
125	185.50	- 2.43	528.06	- 2.30	462.92	- 2.37	353.85	- 2.51	698.07	- 2.38	4.50
130	164.53	- 2.37	471.21	- 2.25	411.68	- 2.32	312.65	- 2.44	620.67	- 2.32	4.76
135	146.36	- 2.31	421.53	- 2.20	367.08	- 2.27	277.10	- 2.38	553.27	- 2.27	5.00
140	130.57	- 2.26	378.00	- 2.16	328.14	- 2.22	246.34	- 2.32	494.43	- 2.22	5.25
145	116.80	- 2.20	339.77	- 2.11	294.05	- 2.17	219.62	- 2.27	442.91	- 2.18	5.48
150	104.76	- 2.15	306.11	- 2.06	264.12	- 2.12	196.35	- 2.21	397.69	- 2.13	5.71

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 22 kΩ, 33 kΩ AND 47 kΩ							
T_{OPER} (°C)	PART NUMBER NTCS0603E3223*MT		PART NUMBER NTCS0603E3333*HT		PART NUMBER NTCS0603E3473*HT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	603 212	- 6.28	1 061 183	- 6.70	1 643 693	- 6.85	7.58
- 35	443 043	- 6.06	764 125	- 6.44	1 174 859	- 6.59	6.83
- 30	328 858	- 5.86	557 158	- 6.20	850 461	- 6.34	6.13
- 25	246 572	- 5.66	411 058	- 5.97	623 018	- 6.11	5.45
- 20	186 661	- 5.47	306 646	- 5.75	461 557	- 5.89	4.80
- 15	142 608	- 5.29	231 157	- 5.55	345 583	- 5.69	4.18
- 10	109 910	- 5.12	175 977	- 5.36	261 354	- 5.49	3.58
- 5	85 420	- 4.96	135 223	- 5.18	199 536	- 5.31	3.01
0	66 919	- 4.80	104 827	- 5.01	153 714	- 5.13	2.46
5	52 827	- 4.66	81 946	- 4.84	119 427	- 4.97	1.93
10	42 007	- 4.51	64 569	- 4.69	93 541	- 4.81	1.42
15	33 638	- 4.38	51 262	- 4.54	73 832	- 4.66	0.93
20	27 117	- 4.25	40 989	- 4.40	58 703	- 4.52	0.46
25	22 000	- 4.12	33 000	- 4.27	47 000	- 4.38	0.00
30	17 958	- 4.00	26 741	- 4.14	37 881	- 4.25	0.22
35	14 746	- 3.89	21 804	- 4.02	30 726	- 4.13	0.43
40	12 176	- 3.77	17 884	- 3.91	25 073	- 4.01	0.64
45	10 109	- 3.67	14 751	- 3.80	20 579	- 3.89	0.84
50	8435.9	- 3.57	12 234	- 3.69	16 984	- 3.79	1.03
55	7075.0	- 3.47	10 198	- 3.59	14 092	- 3.68	1.22
60	5962.1	- 3.38	8543.9	- 3.49	11 751	- 3.58	1.40
65	5047.4	- 3.29	7191.9	- 3.40	9847.6	- 3.49	1.58
70	4292.0	- 3.20	6081.4	- 3.31	8290.7	- 3.40	1.75
75	3665.1	- 3.12	5164.9	- 3.22	7011.4	- 3.31	1.92
80	3142.6	- 3.04	4405.0	- 3.14	5955.0	- 3.22	2.08
85	2705.2	- 2.96	3772.0	- 3.06	5078.7	- 3.14	2.23
90	2337.6	- 2.88	3242.6	- 2.99	4348.7	- 3.07	2.54
95	2027.3	- 2.81	2797.8	- 2.91	3737.8	- 2.99	2.85
100	1764.3	- 2.74	2422.8	- 2.84	3224.6	- 2.92	3.14
105	1540.7	- 2.68	2105.3	- 2.78	2791.8	- 2.85	3.43
110	1349.9	- 2.61	1835.5	- 2.71	2425.3	- 2.87	3.71
115	1186.4	- 2.55	1605.4	- 2.65	2113.9	- 2.72	3.98
120	1045.9	- 2.49	1408.5	- 2.59	1848.4	- 2.65	4.24
125	924.73	- 2.43	1239.5	- 2.53	1621.2	- 2.59	4.50
130	819.95	- 2.38	1093.9	- 2.47	1426.1	- 2.54	4.76
135	729.04	- 2.32	968.07	- 2.42	1258.1	- 2.48	5.00
140	649.93	- 2.27	859.04	- 2.36	1112.9	- 2.42	5.25
145	580.89	- 2.22	764.28	- 2.31	987.19	- 2.37	5.48
150	520.48	- 2.17	681.69	- 2.26	877.91	- 2.32	5.71

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 68 kΩ AND 100 kΩ

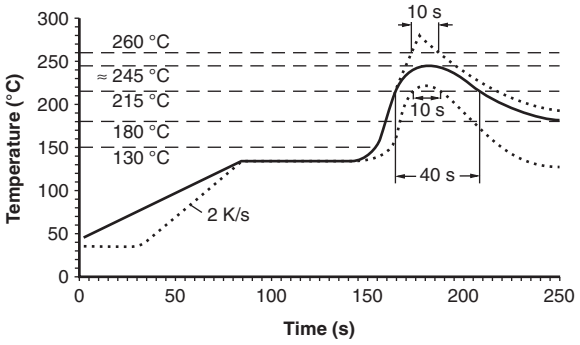
T_{OPER} (°C)	PART NUMBER NTCS0603E3683*HT		PART NUMBER NTCS0603E3104*XT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	2 324 376	- 6.77	3 921 252	- 7.03	7.58
- 35	1 667 529	- 6.52	2 774 565	- 6.77	6.83
- 30	1 211 148	- 6.28	1 988 706	- 6.52	6.13
- 25	889 917	- 6.05	1 442 861	- 6.28	5.45
- 20	661 047	- 5.84	1 058 901	- 6.06	4.80
- 15	496 103	- 5.64	785 573	- 5.85	4.18
- 10	375 941	- 5.45	588 793	- 5.65	3.58
- 5	287 504	- 5.28	445 602	- 5.47	3.01
0	221 786	- 5.11	340 346	- 5.29	2.46
5	172 502	- 4.95	262 229	- 5.12	1.93
10	135 221	- 4.79	203 723	- 4.96	1.42
15	106 786	- 4.65	159 522	- 4.80	0.93
20	84 928	- 4.51	125 851	- 4.66	0.46
25	68 000	- 4.38	100 000	- 4.52	0.00
30	54 796	- 4.26	80 003	- 4.39	0.22
35	44 427	- 4.14	64 422	- 4.26	0.43
40	36 232	- 4.02	52 200	- 4.14	0.64
45	29 714	- 3.91	42 548	- 4.02	0.84
50	24 499	- 3.81	34 879	- 3.91	1.03
55	20 304	- 3.71	28 749	- 3.80	1.22
60	16 909	- 3.61	23 820	- 3.70	1.40
65	14 149	- 3.52	19 835	- 3.60	1.58
70	11 893	- 3.43	16 597	- 3.51	1.75
75	10 041	- 3.34	13 951	- 3.42	1.92
80	8512.2	- 3.26	11 780	- 3.33	2.08
85	7245.5	- 3.18	9988.4	- 3.25	2.23
90	6191.1	- 3.11	8504.3	- 3.17	2.54
95	5310.0	- 3.03	7269.4	- 3.09	2.85
100	4570.7	- 2.96	6237.5	- 3.02	3.14
105	3948.0	- 2.90	5371.7	- 2.95	3.43
110	3421.5	- 2.83	4642.5	- 2.88	3.71
115	2974.8	- 2.77	4025.9	- 2.81	3.98
120	2594.5	- 2.71	3502.7	- 2.75	4.24
125	2269.6	- 2.65	3057.1	- 2.68	4.50
130	1991.2	- 2.59	2676.4	- 2.62	4.76
135	1751.9	- 2.53	2350.1	- 2.57	5.00
140	1545.5	- 2.48	2069.5	- 2.51	5.25
145	1367.1	- 2.43	1827.4	- 2.46	5.48
150	1212.3	- 2.38	1617.9	- 2.40	5.71

SOLDERING CONDITIONS

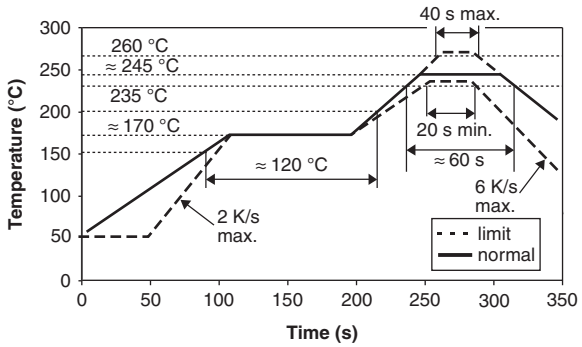
This SMD thermistor is only suitable for wave or reflow soldering, in accordance with JEDEC J-STD-020. The maximum temperature of 260 °C during 40 s should not be exceeded.

Typical examples of a soldering processes that will provide reliable joints without damage, are shown below.

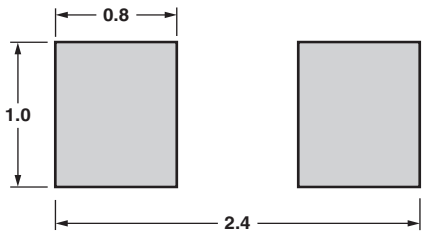
Reflow Soldering



Lead (Pb)-free Reflow Soldering Profile



Dimensions of the solder lands



TESTS AND REQUIREMENTS

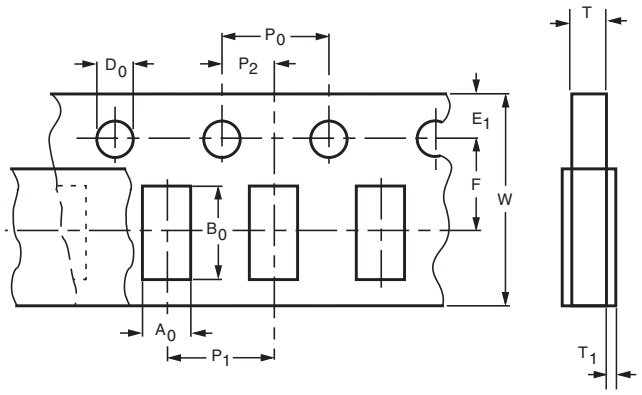
SOLDERABILITY AND RESISTANCE TO SOLDERING HEAT				
IEC 60068-2-58	**TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS**
6	T_C	Solderability	2 s at 235 °C	Min. 95 % of surface wetted
		Resistance to soldering heat	10 s at 260 °C	$\Delta R/R < 5$ %

PACKAGING

TAPE SPECIFICATIONS

All tape specifications are in accordance with IEC 60286-3. Basic dimensions are given below. Carrier tape material is paper.

PAPER TAPE



DIMENSIONS OF PAPER TAPE in millimeters		
PARAMETER	**DIMENSION**	**TOLERANCE**
A_0 (1)	1.15	± 0.1
B_0 (1)	1.9	± 0.1
W	8.0	± 0.2
E_1	1.75	± 0.1
F	3.5	± 0.05
D_0	1.55	± 0.05
P_0 (2)	4.0	± 0.1
P_1	4.0	± 0.1
P_2	2.0	± 0.05
T tape thickness	1.1	max.
T_1 cover tape	< 0.1	-

Notes

(1) Measured 0.3 mm above base pocket

(2) P_0 pitch cumulative error over any 10 pitches ± 0.2 mm

SMD 0805, Glass Protected NTC Thermistors

FEATURES

- TCR ranging from - 6 %/K at - 40 °C to - 2 %/K at 150 °C
- Tolerance on R_{25} down to 1 %, and on $B_{25/85}$ down to 1 %
- Suitable for wave or reflow soldering
- NiSn terminations
- Fully glass coated and protected
- Old part number was 2322 615 5....
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

- Temperature sensing, protection and compensation in automotive, industrial, telecom and consumer applications. Examples are:
  - Battery chargers
  - Power suppliers
  - Office equipment
  - LCD compensation
  - In-car entertainment

DESCRIPTION

Size 0805 chip thermistors with a negative temperature coefficient. The device has no marking.

PACKAGING

Available in 8 mm punched paper tape on reel package of 4000 units.

DESIGN-IN SUPPORT

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

QUICK REFERENCE DATA

PARAMETER	VALUE
Resistance value at 25 °C	2.2 kΩ to 680 kΩ
Tolerance on R_{25} - value	± 1 %; ± 2 %; ± 3 %; ± 5 %
$B_{25/85}$ value	3600K to 4125K
Tolerance on $B_{25/85}$ - value	± 1 %; ± 3 %
Maximum dissipation at 25 °C	210 mW
Thermal time constant τ	≈ 10 s
Dissipation factor D	3.5 mW/K
Operating temperature range at zero power	- 40 °C to + 150 °C
R/T values	See tables
Climatic category	40/125/56
Weight	≈ 0.008 g

ELECTRICAL DATA AND ORDERING INFORMATION

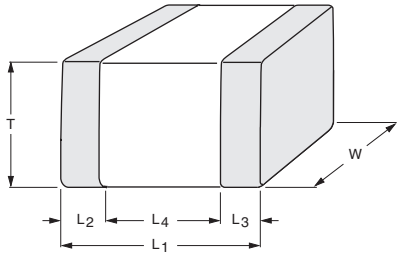
R_{25} - VALUE (kΩ)	$B_{25/85}$ - VALUE (K)	TOLERANCE ON $B_{25/85}$ (%)	SAP MATERIAL AND ORDERING NUMBER NTCS0805E3... (1)	12 NC OLD MATERIAL NUMBER 2381 615 5.... (2)
2.2	3600	± 1	222*MT	*222
4.7	3500	± 1	472*MT	*472
10	3430	± 3	103*LT	-
10	3570	± 3	103*MT	*103
10	3940	± 1	103*HT	-
15	3700	± 1	153*MT	*153
22	3800	± 1	223*HT	*223
33	3920	± 1	333*HT	*333
47	3960	± 1	473*HT	*473
68	4100	± 1	683*XT	*683
100	3590	± 1	104*MT	-
100	4100	± 1	104*XT	*104
330	3930	± 1	334*HT	*334
470	4025	± 1	474*XT	*474
680	4125	± 1	684*XT	*684

Notes

(1) Replace * in SAP part no by J for 5 %, H for 3 %, G for 2 %, F for 1 % tolerance on R_{25}

(2) Replace * in 12 NC by 3 for 5 %, 6 for 3 %, 4 for 2 %, 5 for 1 % tolerance on R_{25}

DIMENSIONS in millimeters



L_1	W	T	L_2 and L_3 min.	L_4 min.
2.0 ± 0.2	1.25 ± 0.15	0.8 ± 0.15	0.2	0.55

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2.2 kΩ AND 4.7 kΩ

T_{OPER} (°C)	PART NUMBER NTCS0805E3222*MT		PART NUMBER NTCS0805E3472*MT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	57 658	- 6.26	101 275	- 5.75	7.58
- 35	42 410	- 6.03	76 325	- 5.57	6.83
- 30	31 537	- 5.82	58 034	- 5.39	6.13
- 25	23 698	- 5.61	44 505	- 5.22	5.45
- 20	17 986	- 5.42	34 413	- 5.06	4.80
- 15	13 782	- 5.23	26 821	- 4.91	4.18
- 10	10 657	- 5.06	21 065	- 7.76	3.58
- 5	8312.0	- 4.89	16 667	- 4.61	3.01
0	6537.1	- 4.72	13 280	- 4.47	2.46
5	5182.1	- 4.57	10 654	- 4.34	1.93
10	4139.2	- 4.42	8603.2	- 4.21	1.42
15	3330.1	- 4.28	6991.1	- 4.09	0.93
20	2697.8	- 4.14	5715.6	- 3.97	0.46
25	2200.0	- 4.02	4700.0	- 3.86	0.00
30	1805.5	- 3.89	3886.6	- 3.75	0.22
35	1490.7	- 3.77	3231.2	- 3.64	0.43
40	1237.9	- 3.66	2700.3	- 3.54	0.64
45	1033.7	- 3.55	2267.9	- 3.44	0.84
50	867.85	- 3.45	1913.9	- 3.35	1.03
55	732.31	- 3.35	1622.6	- 3.26	1.22
60	620.96	- 3.25	1381.7	- 3.17	1.40
65	529.02	- 3.16	1181.7	- 3.09	1.58
70	452.73	- 3.07	1014.7	- 3.01	1.75
75	389.13	- 2.99	874.85	- 2.93	1.92
80	335.85	- 2.90	757.13	- 2.85	2.08
85	291.02	- 2.83	657.67	- 2.78	2.23
90	253.15	- 2.75	573.31	- 2.71	2.54
95	221.03	- 2.68	501.48	- 2.64	2.85
100	193.66	- 2.61	440.10	- 2.58	3.14
105	170.27	- 2.54	387.47	- 2.52	3.43
110	150.20	- 2.48	342.18	- 2.46	3.71
115	132.91	- 2.41	303.09	- 2.40	3.98
120	117.98	- 2.35	269.24	- 2.34	4.24
125	105.03	- 2.20	239.83	- 2.29	4.50
130	93.766	- 2.24	214.20	- 2.23	4.76
135	83.943	- 2.19	191.82	- 2.18	5.00
140	75.349	- 2.13	172.20	- 2.13	5.25
145	67.807	- 2.08	154.96	- 2.09	5.48
150	61.172	- 2.04	139.78	- 2.04	5.71

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 10 kΩ

T_{OPER} (°C)	PART NUMBER NTCS0805E3103*LT		PART NUMBER NTCS0805E3103*MT		PART NUMBER NTCS0805E3103*HT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	182 928	- 5.47	232 634	- 5.92	335 922	- 6.60	11.22
- 35	139 839	- 5.28	173 538	- 5.71	242 721	- 6.40	10.14
- 30	107 902	- 5.10	130 769	- 5.51	177 179	- 6.19	9.10
- 25	83 986	- 4.93	99 489	- 5.33	130 625	- 6.00	8.11
- 20	65 904	- 4.77	76 385	- 5.15	97 234	- 5.81	7.15
- 15	52 111	- 4.62	59 157	- 4.98	73 056	- 5.63	6.24
- 10	41 501	- 4.48	46 194	- 4.82	55 387	- 5.45	5.35
- 5	33 276	- 4.35	36 356	- 4.67	42 358	- 5.28	4.50
0	26 851	- 4.23	28 829	- 4.52	32 666	- 5.11	3.68
5	21 799	- 4.11	23 025	- 4.38	25 396	- 4.96	2.89
10	17 798	- 4.00	18 515	- 4.25	19 898	- 4.80	2.13
15	14 612	- 3.89	14 986	- 4.12	15 708	- 4.66	1.40
20	12 058	- 3.79	12 205	- 4.00	12 490	- 4.51	0.69
25	10 000	- 3.69	10 000	- 3.88	10 000	- 4.38	0.00
30	8332.5	- 3.60	8240.3	- 3.77	8060.1	- 4.25	0.66
35	6974.6	- 3.51	6827.5	- 3.66	6538.4	- 4.12	1.31
40	5863.2	- 3.43	5686.6	- 3.56	5336.7	- 4.00	1.93
45	4949.5	- 3.35	4760.3	- 3.46	4381.9	- 3.88	2.53
50	4194.8	- 3.27	4004.2	- 3.37	3618.5	- 3.77	3.11
55	3568.8	- 3.19	3383.8	- 3.28	3004.5	- 3.67	3.68
60	3047.5	- 3.12	2872.3	- 3.19	2507.9	- 3.56	4.23
65	2611.5	- 3.05	2448.5	- 3.11	2104.1	- 3.46	4.76
70	2245.5	- 2.99	2095.9	- 3.03	1774.0	- 3.37	5.28
75	1937.2	- 2.92	1801.2	- 2.95	1502.7	- 3.27	5.78
80	1676.6	- 2.86	1553.8	- 2.88	1278.7	- 3.18	6.27
85	1455.4	- 2.80	1345.3	- 2.81	1092.8	- 3.10	6.74
90	1267.2	- 2.74	1168.9	- 2.74	937.89	- 3.02	7.20
95	1106.5	- 2.68	1019.2	- 2.67	808.21	- 2.94	7.65
100	968.83	- 2.63	891.48	- 2.61	699.18	- 2.86	8.09
105	850.57	- 2.53	782.28	- 2.54	607.15	- 2.79	8.51
110	748.69	- 2.53	688.56	- 2.48	529.14	- 2.71	8.93
115	660.67	- 2.48	607.85	- 2.43	462.78	- 2.65	9.33
120	584.42	- 2.43	538.14	- 2.37	406.10	- 2.58	9.73
125	518.20	- 2.38	477.73	- 2.32	357.54	- 2.52	10.11
130	460.53	- 2.34	425.24	- 2.26	315.77	- 2.45	10.48
135	410.19	- 2.29	379.49	- 2.21	279.73	- 2.39	10.85
140	366.15	- 2.25	339.51	- 2.17	248.53	- 2.34	11.20
145	327.52	- 2.21	304.47	- 2.12	221.44	- 2.28	11.55
150	293.56	- 2.17	273.69	- 2.07	197.84	- 2.23	11.89

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 15 kΩ, 22 kΩ AND 33 kΩ

T_{OPER} (°C)	PART NUMBER NTCS0805E3153*MT		PART NUMBER NTCS0805E3223*HT		PART NUMBER NTCS0805E3333*MT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	391 251	- 6.14	641 004	- 6.40	1 104 739	- 6.79	7.58
- 35	289 245	- 5.94	468 038	- 6.18	793 249	- 6.53	6.83
- 30	215 960	- 5.75	345 469	- 5.97	576 683	- 6.28	6.13
- 25	162 779	- 5.56	257 644	- 5.77	424 161	- 6.05	5.45
- 20	123 815	- 5.38	194 045	- 5.57	315 430	- 5.84	4.80
- 15	95 001	- 5.21	147 521	- 5.39	237 022	- 5.63	4.18
- 10	73 505	- 5.05	113 159	- 5.22	179 865	- 5.44	3.58
- 5	57 329	- 4.89	87 544	- 5.05	137 767	- 5.26	3.01
0	45 058	- 4.74	68 281	- 4.89	106 459	- 5.08	2.46
5	35 674	- 4.60	53 672	- 4.74	82 958	- 4.92	1.93
10	28 445	- 4.46	42 503	- 4.59	65 162	- 4.76	1.42
15	22 834	- 4.33	33 898	- 4.46	51 572	- 4.61	0.93
20	18 450	- 4.20	27 220	- 4.32	41 112	- 4.47	0.46
25	15 000	- 4.08	22 000	- 4.20	33 000	- 4.34	0.00
30	12 268	- 3.96	17 892	- 4.07	26 663	- 4.21	0.22
35	10 092	- 3.85	14 638	- 3.96	21 678	- 4.08	0.43
40	8347.4	- 3.74	12 045	- 3.84	17 730	- 3.97	0.64
45	6941.1	- 3.64	9965.0	- 3.74	14 585	- 3.86	0.84
50	5801.1	- 3.54	8288.3	- 3.63	12 063	- 3.75	1.03
55	4872.1	- 3.44	6928.4	- 3.54	10 030	- 3.65	1.22
60	4111.1	- 3.35	5819.8	- 3.44	8381.6	- 3.55	1.40
65	3484.7	- 3.26	4911.4	- 3.35	7037.8	- 3.45	1.58
70	2966.6	- 3.18	4163.4	- 3.26	5936.8	- 3.36	1.75
75	2536.2	- 3.09	3544.6	- 3.18	5030.3	- 3.27	1.92
80	2176.9	- 3.02	3030.2	- 3.10	4280.4	- 3.19	2.08
85	1875.8	- 2.94	2600.9	- 3.02	3657.2	- 3.11	2.23
90	1622.5	- 2.87	2241.0	- 2.94	3137.1	- 3.03	2.54
95	1408.4	- 2.79	1938.0	- 2.87	2701.2	- 2.96	2.85
100	1226.8	- 2.73	1682.0	- 2.80	2334.4	- 2.89	3.14
105	1072.3	- 2.66	1464.9	- 2.73	2024.4	- 2.82	3.43
110	940.20	- 2.60	1280.0	- 2.67	1761.6	- 2.75	3.71
115	827.00	- 2.54	1122.0	- 2.60	1538.0	- 2.69	3.98
120	729.62	- 2.48	986.60	- 2.54	1346.9	- 2.63	4.24
125	645.60	- 2.42	870.11	- 2.48	1183.23	- 2.57	4.50
130	572.86	- 2.36	769.60	- 2.43	1042.4	- 2.51	4.76
135	509.71	- 2.31	682.59	- 2.37	921.02	- 2.45	5.00
140	454.71	- 2.26	607.05	- 2.32	815.99	- 2.40	5.25
145	406.69	- 2.21	541.28	- 2.27	724.85	- 2.35	5.48
150	364.64	- 2.16	483.86	- 2.22	645.54	- 2.30	5.71

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 47 kΩ, 68 kΩ AND 100 kΩ

T_{OPER} (°C)	PART NUMBER NTCS0805E3473*HT		PART NUMBER NTCS0805E3683*XT		PART NUMBER NTCS0805E3104*MT		PART NUMBER NTCS0805E3104*XT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	R_T (Ω)	TCR (%/K)	
- 40	1 536 095	- 6.60	2 596 437	- 6.92	2 245 445	- 5.82	3 833 689	- 6.96	7.58
- 35	1 110 020	- 6.37	1 848 208	- 6.68	1 686 623	- 5.63	2 724 206	- 6.71	6.83
- 30	811 212	- 6.15	1 331 164	- 6.45	1 278 403	- 5.45	1 959 612	- 6.47	6.13
- 25	599 204	- 5.94	969 559	- 6.23	977 431	- 5.28	1 426 014	- 6.25	5.45
- 20	447 111	- 5.74	713 753	- 6.02	753 552	- 5.12	1 049 150	- 6.03	4.80
- 15	336 851	- 5.56	530 805	- 5.82	585 597	- 4.97	779 950	- 5.83	4.18
- 10	256 116	- 5.38	398 593	- 5.64	458 561	- 4.82	585 575	- 5.64	3.58
- 5	196 435	- 5.21	302 091	- 5.45	361 719	- 4.67	443 786	- 5.45	3.01
0	151 917	- 5.05	230 981	- 5.28	287 337	- 4.54	339 343	- 5.28	2.46
5	118 422	- 4.89	178 104	- 5.12	229 790	- 4.40	261 695	- 5.11	1.93
10	93 012	- 4.74	138 441	- 4.96	184 958	- 4.28	203 455	- 4.96	1.42
15	73 583	- 4.60	108 442	- 4.81	149 796	- 4.16	159 402	- 4.81	0.93
20	58 615	- 4.47	85 571	- 4.67	122 043	- 4.04	125 811	- 4.66	0.46
25	47 000	- 4.34	68 000	- 4.53	100 000	- 3.93	100 000	- 4.52	0.00
30	37 925	- 4.22	54 403	- 4.40	82 389	- 3.82	80 021	- 4.39	0.22
35	30 788	- 4.10	43 806	- 4.27	68 238	- 3.72	64 447	- 4.27	0.43
40	25 139	- 3.99	35 493	- 4.15	56 805	- 3.62	52 224	- 4.15	0.64
45	20 641	- 3.88	28 928	- 4.03	47 518	- 3.52	42 570	- 4.03	0.84
50	17 038	- 3.78	23 712	- 3.92	39 936	- 3.43	34 897	- 3.92	1.03
55	14 136	- 3.68	19 543	- 3.81	33 716	- 3.34	28 763	- 3.81	1.22
60	11 786	- 3.58	16 192	- 3.71	28 589	- 3.26	23 830	- 3.71	1.40
65	9872.9	- 3.49	13 483	- 3.61	24 342	- 3.17	19 842	- 3.61	1.58
70	8308.1	- 3.40	11 282	- 3.52	20 811	- 3.10	16 601	- 3.52	1.75
75	7021.9	- 3.31	9484.2	- 3.43	17 861	- 3.02	13 954	- 3.43	1.92
80	5959.7	- 3.23	8008.8	- 3.34	15 386	- 2.95	11 781	- 3.34	2.08
85	5078.7	- 3.15	6792.1	- 3.25	13 303	- 2.87	9988.4	- 3.26	2.23
90	4344.9	- 3.08	5784.2	- 3.17	11 542	- 2.81	8503.6	- 3.18	2.54
95	3731.0	- 3.00	4945.7	- 3.09	10 048	- 2.74	7268.2	- 3.10	2.85
100	3215.5	- 2.93	4245.0	- 3.02	8775.2	- 2.68	6236.0	- 3.03	3.14
105	2781.0	- 2.86	3657.2	- 2.94	7688.1	- 2.61	5370.1	- 2.95	3.43
110	2413.2	- 2.80	3162.1	- 2.87	6756.2	- 2.55	4640.8	- 2.88	3.71
115	2101.0	- 2.73	2743.5	- 2.81	5954.7	- 2.50	4024.3	- 2.82	3.98
120	1834.9	- 2.67	2388.2	- 2.74	5263.2	- 2.44	3501.2	- 2.75	4.24
125	1607.3	- 2.61	2085.7	- 2.68	4664.8	- 2.39	3055.8	- 2.69	4.50
130	1412.2	- 2.55	1827.2	- 2.62	4145.4	- 2.33	2675.3	- 2.63	4.76
135	1244.2	- 2.50	1605.5	- 2.56	3693.3	- 2.28	2349.2	- 2.57	5.00
140	1099.3	- 2.44	1414.9	- 2.50	3298.7	- 2.24	2068.7	- 2.51	5.25
145	973.81	- 2.39	1250.4	- 2.44	2953.4	- 2.19	1826.8	- 2.46	5.48
150	864.87	- 2.34	1108.0	- 2.39	2650.5	- 2.14	1617.5	- 2.41	5.71

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 330 kΩ, 470 kΩ AND 680 kΩ

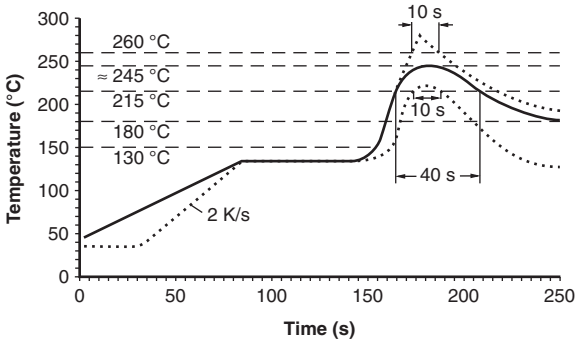
T_{OPER} (°C)	PART NUMBER NTCS0805E3334*HT		PART NUMBER NTCS0805E3474*XT		PART NUMBER NTCS0805E3684*XT		$\Delta R/R$ DUE TO $B_{tol.}$ (± %)
	R_T (kΩ)	TCR (%/K)	R_T (kΩ)	TCR (%/K)	R_T (kΩ)	TCR (%/K)	
- 40	10 488	- 6.53	16 325	- 6.70	23 477	- 6.58	7.58
- 35	7608.4	- 6.31	11 742	- 6.48	16 980	- 6.38	6.83
- 30	5579.1	- 6.10	8539.8	- 6.26	12 404	- 6.18	6.13
- 25	4133.1	- 5.90	6276.8	- 6.05	9147.1	- 6.00	5.45
- 20	3092.0	- 5.71	4660.3	- 5.86	6807.4	- 5.82	4.80
- 15	2334.8	- 5.53	3493.6	- 5.67	5110.7	- 5.65	4.18
- 10	1778.8	- 5.35	2643.2	- 5.49	3869.3	- 5.48	3.58
- 5	1366.9	- 5.19	2017.4	- 5.32	2953.2	- 5.33	3.01
0	1058.9	- 5.03	1552.8	- 5.15	2271.5	- 5.17	2.46
5	826.75	- 4.87	1204.7	- 5.00	1760.2	- 5.03	1.93
10	650.33	- 4.73	941.99	- 4.85	1373.89	- 4.89	1.42
15	515.22	- 4.59	741.96	- 4.70	1079.7	- 4.75	0.93
20	410.99	- 4.45	588.54	- 4.56	854.12	- 4.62	0.46
25	330.00	- 4.33	470.00	- 4.43	680.00	- 4.50	0.00
30	266.64	- 4.20	377.77	- 4.31	544.69	- 4.38	0.22
35	216.75	- 4.08	305.53	- 4.18	438.89	- 4.26	0.43
40	177.22	- 3.97	248.58	- 4.07	355.64	- 4.15	0.64
45	145.70	- 3.86	203.40	- 3.96	289.76	- 4.04	0.84
50	120.43	- 3.76	167.35	- 3.85	237.33	- 3.94	1.03
55	100.06	- 3.66	138.42	- 3.75	195.38	- 3.84	1.22
60	83.541	- 3.56	115.06	- 3.65	161.62	- 3.75	1.40
65	70.081	- 3.47	96.120	- 3.55	134.33	- 3.65	1.58
70	59.059	- 3.38	80.672	- 3.46	112.16	- 3.56	1.75
75	49.989	- 3.29	68.012	- 3.37	94.052	- 3.48	1.92
80	42.491	- 3.21	57.588	- 3.29	79.204	- 3.39	2.08
85	36.265	- 3.13	48.966	- 3.20	66.973	- 3.31	2.23
90	31.074	- 3.05	41.803	- 3.12	56.855	- 3.24	2.54
95	26.726	- 2.98	35.826	- 3.05	48.449	- 3.16	2.85
100	23.070	- 2.91	30.819	- 2.97	41.439	- 3.09	3.14
105	19.985	- 2.84	26.608	- 2.90	35.569	- 3.02	3.43
110	17.371	- 2.77	23.053	- 2.83	30.636	- 2.95	3.71
115	15.149	- 2.71	20.039	- 2.77	26.474	- 2.89	3.98
120	13.253	- 2.64	17.477	- 2.70	22.952	- 2.82	4.24
125	11.630	- 2.58	15.290	- 2.64	19.961	- 2.76	4.50
130	10.236	- 2.52	13.417	- 2.58	17.412	- 2.70	4.76
135	9.0345	- 2.47	11.808	- 2.53	15.233	- 2.65	5.00
140	7.9963	- 2.41	10.422	- 2.47	13.364	- 2.59	5.25
145	7.0964	- 2.36	9.2239	- 2.42	11.757	- 2.54	5.48
150	6.3142	- 2.31	8.1851	- 2.36	10.371	- 2.48	5.71

SOLDERING CONDITIONS

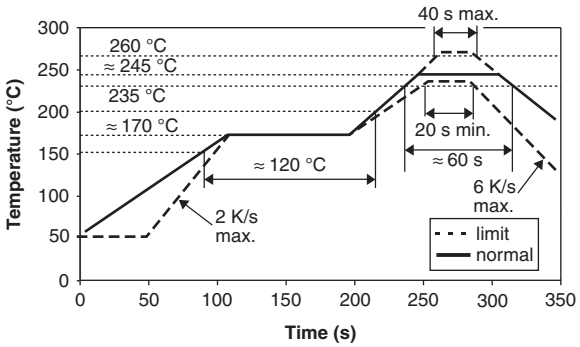
This SMD thermistor is only suitable for wave or reflow soldering, in accordance with JEDEC J-STD-020. The maximum temperature of 260 °C during 40 s should not be exceeded.

Typical examples of a soldering processes that will provide reliable joints without damage, are shown below.

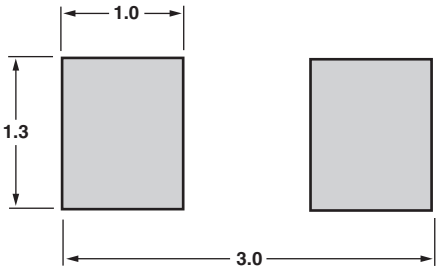
Reflow Soldering



Lead (Pb)-free Reflow Soldering Profile



Dimensions of the solder lands



TESTS AND REQUIREMENTS

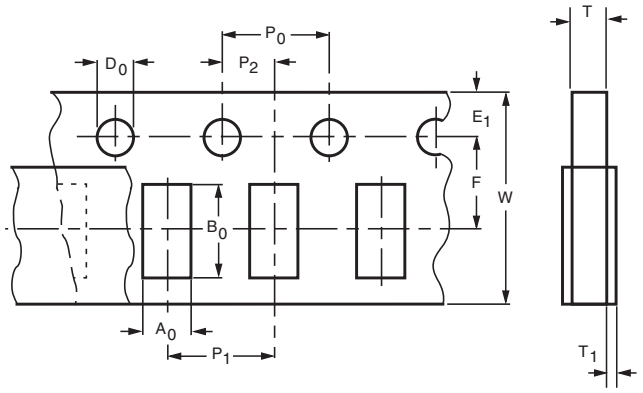
SOLDERABILITY AND RESISTANCE TO SOLDERING HEAT				
IEC 60068-2-58	**TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS**
6	TC	Solderability	2 s at 235 °C	Min. 95 % of surface wetted
		Resistance to soldering heat	10 s at 260 °C	$\Delta R/R < 5$ %

PACKAGING

TAPE SPECIFICATIONS

All tape specifications are in accordance with IEC 60286-3. Basic dimensions are given below. Carrier tape material is paper.

PAPER TAPE



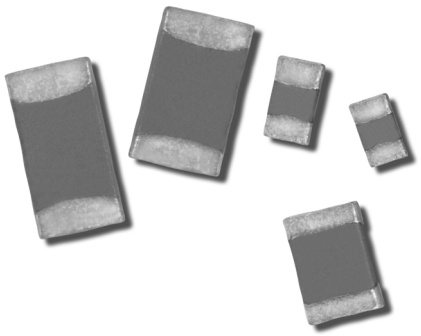
PAPER TAPE DIMENSIONS in millimeters		
PARAMETER	**DIMENSION**	**TOLERANCE**
A_0 (1)	1.7	± 0.2
B_0 (1)	2.35	± 0.1
W	8.0	± 0.2
E_1	1.75	± 0.1
F	3.5	± 0.05
D_0	1.55	± 0.05
P_0 (2)	4.0	± 0.1
P_1	4.0	± 0.1
P_2	2.0	± 0.05
T tape thickness	1.1	max.
T_1 cover tape	< 0.1	-

Notes

(1) Measured 0.3 mm above base pocket

(2) P_0 pitch cumulative error over any 10 pitches ± 1.0 mm

NTC Thermistors, SMD Chip



FEATURES

- Extended resistance values available in standard sizes
- Wraparound Ni barrier terminations with 100 % Sn (or Sn90Pb10)
- Allows design flexibility for use with hybrid circuitry
- Available in bulk or tape and reel packaging
- High-density monolithic construction with glass overcoat
- Compliant to RoHS directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition

e3
RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Temperature sensing, protection and compensation in automotive, industrial, telecom and consumer applications. Examples are:
  - Battery chargers
  - Power suppliers
  - Office equipment
  - LCD compensation
  - In-car entertainment

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at 25 °C	1.0 kΩ to 350 kΩ
Tolerance on R_{25} - value	± 1 %, ± 2 %, ± 3 %, ± 5 %, ± 10 %
$B_{25/75}$ value	3181K to 4247K
Tolerance on $B_{25/85}$ - value	± 3 %
Operating temperature range at zero power (intermittent)	- 40 °C to + 125 °C (150 °C)

NTHS PRODUCT DATA AND R_{25} RESISTANCE RANGE AVAILABILITY

CURVE	$B_{25/75}$ (K)	TCR (%/K)	NTHS0402 (kΩ)	NTHS0603 (kΩ)	NTHS0805 (kΩ)	NTHS1206 (kΩ)	R_{25} ± TOL. AVAILABILITY
3	3181	- 3.70	-	1 to 2	1 to 1.5	1 to 2	5, 10
6	3254	- 3.60	-	2.5 to 4.7	2 to 3.3	2.7 to 3.5	5, 10
2	3477	- 3.83	10 to 12	6.8 to 12	4.7 to 10	6 to 10	3, 5, 10
10	3500	- 3.90	18 to 25	12 to 20	6 to 12	10 to 20	3, 5, 10
11	3700	- 4.00	30 to 34	22 to 32	15 to 30	20 to 33	3, 5, 10
5	3890	- 4.30	47 to 50	38 to 57	35 to 50	30 to 44	3, 5, 10
1	3964	- 4.40	68 to 100	50 to 100	33 to 78	38 to 100	1, 2, 3, 5, 10
17	4064	- 4.54	250	150 to 220	100 to 200	100 to 220	3, 5, 10
4	4247	- 4.68	350	250 to 350	200 to 300	200 to 330	3, 5, 10
Maximum dissipation at 25 °C in mW			80	125	210	280	
Dissipation factor in mW/K			2.0	3.0	3.5	4.0	

Note
- Typical resistance vs. temperature conversion data can be found at www.vishay.com/doc?33011

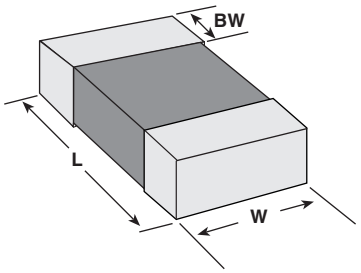
GLOBAL PART NUMBER INFORMATION

Global Part Numbering: NTHS1206N02N1002JE (preferred part number format)

N	T	H	S	1	2	0	6	N	0	2	N	1	0	0	2	J	E

GLOBAL MODEL	CONDUCTOR TYPE	CURVE	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING
NTHS0402 **NTHS0603** **NTHS0805** **NTHS1206**	Nickel barrier	**01** **02** **03** **04** **05** **06** **10** **11** **17**	**N**	**1002** = 10K	**F** = ± 1 % **G** = ± 2 % **H** = ± 3 % **J** = ± 5 % **K** = ± 10 %	**F** = Lead (Pb)-free, bulk **E** = Lead (Pb)-free, T/R (2K, full) **U** = Lead (Pb)-free, T/R (5K, full) **P** = Tin/lead, bulk **R** = Tin/lead, T/R (2K, full) **G** = Tin/lead, T/R (5K, full)

DIMENSIONS in inches (millimeters)



PART NUMBER	L	W	BW
NTHS0402	0.040 ± 0.004 (1.016 ± 0.102)	0.022 ± 0.006 (0.5 ± 0.051)	0.010 ± 0.004 (0.25 ± 0.102)
NTHS0603	0.063 ± 0.008 (1.6 ± 0.20)	0.031 ± 0.008 (0.80 ± 0.20)	0.010 ± 0.006 (0.25 ± 0.15)
NTHS0805	0.079 ± 0.008 (2.00 ± 0.20)	0.049 ± 0.008 (1.25 ± 0.20)	0.012 ± 0.006 (0.30 ± 0.15)
NTHS1206	0.126 ± 0.008 (3.20 ± 0.20)	0.063 ± 0.008 (1.60 ± 0.20)	0.018 ± 0.008 (0.46 ± 0.20)

Note

- Thickness of the part is depending on size and resistance value. Please consult the factory for more information on individual types at thermistor1@vishay.com

SMD 0805, NTC Thermistors AgPd Terminations

REMARK

Non preferred type
(replaced by NTCS0805E3.....T/2381 615 5....)

QUICK REFERENCE DATA	
PARAMETER	VALUE
Resistance value at 25 °C	2 kΩ to 470 kΩ
Tolerance on R_{25} - value (1)	± 5 %
Tolerance on $B_{25/85}$ - value	see Electrical Data and Ordering Information
Maximum dissipation at 25 °C	210 mW
Thermal time constant τ	≈ 10 s
Operating temperature range	- 55 °C to + 150 °C
R/T values	See tables
Climatic category	40/125/56
Mass	≈ 0.0155 g

Note

(1) Tighter tolerances are available upon request

FEATURES

- TCR from 6 %/K to 2 %/K even at high temperatures
- Tolerance on $B_{25/85}$ down to 1 %
- AgPd terminations
- Suitable for wave or reflow soldering
- Old part number was 2322 615 1...
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb e3 RoHS COMPLIANT

APPLICATIONS

- Temperature compensation, sensing and protection in, for example:
  - Battery chargers
  - Consumer equipment
  - Office equipment

DESCRIPTION

Size 0805 chip thermistors with a negative temperature coefficient. The device has no marking.

PACKAGING

Available in 8 mm punched paper tape on reel package of 4000 units.

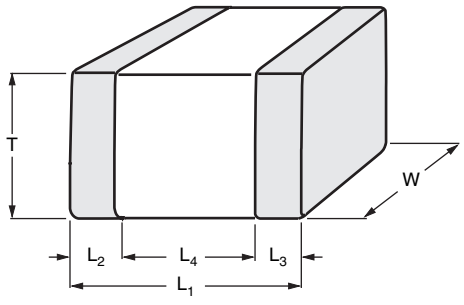
SOLDERABILITY AND RESISTANCE TO SOLDERING HEAT				
IEC 60068-2-20	TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
6	T_C	Solderability	3 s at 215 °C; 2 s at 235 °C	$\Delta R/R < 5$ %

ELECTRICAL DATA AND ORDERING INFORMATION					
R_{25} - VALUE (kΩ)	TOLERANCE ON R_{25} °C	$B_{25/85}$ - VALUE (K)	TOLERANCE ON $B_{25/85}$ (%)	12 NC ORDERING CODE 2381 615 13...	SAP MATERIAL NO. NTCS0805E4... (2)
2	5 %	3680	± 3	202	202JMT
2.2	5 %	3680	± 3	222	222JMT
4.7	5 %	3560	± 1	472	472JMT
10	5 %	3620	± 1	103	103JMT
15	5 %	3528	± 1	153	153JMT
22	5 %	3930	± 1.5	223	223JHT
33	5 %	3960	± 3	333	333JHT
47	5 %	4090	± 1.5	473	473JXT
68	5 %	3740	± 3	683	683JMT
100	5 %	3650	± 1	104	104JMT
330	5 %	4015	± 3	334	334JXT
470	5 %	4130	± 3	474	474JXT

Note

(2) Replace digit Y in SAP part no by J for 5 %

DIMENSIONS in millimeters



L_1	W	T MAX.	L_2 and L_3 MIN.	L_4 MIN.
2.0 ± 0.2	1.25 ± 0.2	1.25	0.5 ± 0.25	0.5

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2000 Ω

T_{OPER} (°C)	CATALOG NUMBER 2381 615 13202 OR SAP NO. NTCS0805E4202JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	27.23	- 6.21	54 462.6	15.94	2.57
- 35	20.06	- 6.02	40 118.4	14.88	2.47
- 30	14.92	- 5.83	29 834.5	13.87	2.38
- 25	11.20	- 5.65	22 393.8	12.89	2.28
- 20	8.481	- 5.47	16 961.6	11.95	2.19
- 15	6.480	- 5.29	12 960.5	11.05	2.09
- 10	4.994	- 5.13	9987.9	10.19	1.99
- 5	3.880	- 4.97	7760.8	9.36	1.89
0	3.393	- 4.81	6078.6	8.56	1.78
5	2.399	- 4.66	4797.7	7.79	1.67
10	1.908	- 4.51	3815.0	7.05	1.56
15	1.528	- 4.37	3055.3	6.34	1.45
20	1.232	- 4.24	2463.8	5.66	1.34
25	1.000	- 4.11	2000.0	5.00	1.22
30	0.8170	- 3.98	1633.9	5.64	1.42
35	0.6715	- 3.86	1343.1	6.26	1.62
40	0.5553	- 3.74	1110.5	6.87	1.83
45	0.4618	- 3.63	923.5	7.46	2.05
50	0.3861	- 3.53	772.2	8.04	2.28
55	0.3245	- 3.42	649.0	8.61	2.51
60	0.2742	- 3.32	548.3	9.16	2.76
65	0.2327	- 3.23	465.5	9.69	3.00
70	0.1985	- 3.14	397.0	10.22	3.26
75	0.1701	- 3.05	340.2	10.73	3.52
80	0.1464	- 2.96	292.7	11.23	3.79
85	0.1265	- 2.88	252.9	11.72	4.07
90	0.1097	- 2.80	219.4	12.20	4.35
95	0.0956	- 2.73	191.1	12.66	4.65
100	0.0835	- 2.65	167.1	13.12	4.95
105	0.0733	- 2.58	146.6	13.56	5.25
110	0.0645	- 2.51	129.1	14.00	5.57
115	0.0570	- 2.45	114.0	14.42	5.89
120	0.0505	- 2.38	101.0	14.84	6.22
125	0.0449	- 2.32	89.8	15.24	6.56
130	0.0400	- 2.26	80.1	15.64	6.91
135	0.0358	- 2.21	71.6	16.03	7.26
140	0.0321	- 2.15	64.2	16.41	7.62
145	0.0289	- 2.10	57.7	16.78	7.99
150	0.0260	- 2.05	52.1	17.15	8.37

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2200 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13222 OR SAP NO. NTCS0805E4222JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	27.23	- 6.21	59 909	15.94	2.57
- 35	20.06	- 6.02	44 130	14.88	2.47
- 30	14.92	- 5.83	12 818	13.87	2.38
- 25	11.20	- 5.65	24 633	12.89	2.28
- 20	8.481	- 5.47	18 658	11.95	2.19
- 15	6.480	- 5.29	14 257	11.05	2.09
- 10	4.994	- 5.13	10 987	10.19	1.99
- 5	3.880	- 4.97	8537	9.36	1.89
0	3.393	- 4.81	6686	8.56	1.78
5	2.399	- 4.66	5278	7.79	1.67
10	1.908	- 4.51	4196	7.05	1.56
15	1.528	- 4.37	3361	6.34	1.45
20	1.232	- 4.24	2710	5.66	1.34
25	1.000	- 4.11	2200	5.00	1.22
30	0.8170	- 3.98	1797	5.64	1.42
35	0.6715	- 3.86	1477	6.26	1.62
40	0.5553	- 3.74	1222	6.87	1.83
45	0.4618	- 3.63	1016	7.46	2.05
50	0.3861	- 3.53	849.4	8.04	2.28
55	0.3245	- 3.42	714.0	8.61	2.51
60	0.2742	- 3.32	603.2	9.16	2.76
65	0.2327	- 3.23	512.0	9.69	3.00
70	0.1985	- 3.14	436.7	10.22	3.26
75	0.1701	- 3.05	374.2	10.73	3.52
80	0.1464	- 2.96	322.0	11.23	3.79
85	0.1265	- 2.88	278.2	11.72	4.07
90	0.1097	- 2.80	241.4	12.20	4.35
95	0.0956	- 2.73	210.2	12.66	4.65
100	0.0835	- 2.65	183.8	13.12	4.95
105	0.0733	- 2.58	161.3	13.56	5.25
110	0.0645	- 2.51	142.0	14.00	5.57
115	0.0570	- 2.45	125.4	14.42	5.89
120	0.0505	- 2.38	111.2	14.84	6.22
125	0.0449	- 2.32	98.81	15.24	6.56
130	0.0400	- 2.26	88.10	15.64	6.91
135	0.0358	- 2.21	78.78	16.03	7.26
140	0.0321	- 2.15	70.65	16.41	7.62
145	0.0289	- 2.10	63.52	16.78	7.99
150	0.0260	- 2.05	57.26	17.15	8.37

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 4700 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13472 OR SAP NO. NTCS0805E4472JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	21.9261	- 5.75	103 053	8.50	1.48
- 35	16.5224	- 5.57	77 655	8.16	1.46
- 30	12.5583	- 5.40	59 024	7.84	1.45
- 25	9.62492	- 5.24	45 237	7.53	1.44
- 20	7.43618	- 5.08	34 950	7.23	1.42
- 15	5.78976	- 4.93	27 212	6.94	1.41
- 10	4.54158	- 4.78	21 345	6.67	1.39
- 5	3.58813	- 4.64	16 864	6.40	1.38
0	2.85449	- 4.51	13 416	6.15	1.36
5	2.28599	- 4.38	10 744	5.90	1.35

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 4700 Ω

T_{OPER} (°C)	CATALOG NUMBER 2381 615 13472 OR SAP NO. NTCS0805E4472JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
10	1.84245	- 4.25	8659.5	5.66	1.33
15	1.49414	- 4.13	7022.5	5.44	1.32
20	1.21887	- 4.01	5728.7	5.21	1.30
25	1.00	- 3.90	4700.0	5.00	1.28
30	0.82494	- 3.80	3877.2	5.21	1.37
35	0.68413	- 3.69	3215.4	5.41	1.46
40	0.57025	- 3.59	2680.2	5.60	1.56
45	0.47765	- 3.50	2245.0	5.79	1.66
50	0.40198	- 3.40	1889.3	5.97	1.75
55	0.33984	- 3.31	1597.2	6.15	1.85
60	0.28856	- 3.23	1356.2	6.32	1.96
65	0.24606	- 3.15	1156.5	6.48	2.06
70	0.21067	- 3.07	990.1	6.64	2.17
75	0.18108	- 2.99	851.06	6.80	2.28
80	0.15623	- 2.91	734.29	6.95	2.39
85	0.13529	- 2.84	635.86	7.10	2.50
90	0.11757	- 2.77	552.56	7.24	2.61
95	0.10251	- 2.71	481.81	7.38	2.73
100	0.08968	- 2.64	421.50	7.52	2.85
105	0.07871	- 2.58	369.91	7.65	2.97
110	0.06928	- 2.52	325.64	7.78	3.09
115	0.06117	- 2.46	287.51	7.91	3.21
120	0.05416	- 2.41	254.57	8.03	3.34
125	0.04809	- 2.35	226.03	8.15	3.47
130	0.04282	- 2.30	201.23	8.27	3.60
135	0.03822	- 2.25	179.62	8.38	3.73
140	0.0342	- 2.20	160.73	8.49	3.86
145	0.03068	- 2.15	144.17	8.60	4.00
150	0.02758	- 2.10	129.63	8.70	4.14

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 10 000 Ω

T_{OPER} (°C)	CATALOG NUMBER 2381 615 13103 OR SAP NO. NTCS0805E4103JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	23.0973	- 5.84	230 973	8.50	1.45
- 35	17.3222	- 5.67	173 222	8.16	1.44
- 30	13.1054	- 5.49	131 054	7.84	1.43
- 25	9.99934	- 5.33	99 993	7.53	1.41
- 20	7.69193	- 5.17	76 919	7.23	1.40
- 15	5.96369	- 5.01	59 637	6.94	1.38
- 10	4.6589	- 4.86	46 589	6.67	1.37
- 5	3.66623	- 4.72	36 662	6.40	1.36
0	2.9054	- 4.58	29 054	6.15	1.34
5	2.31806	- 4.45	23 181	5.90	1.33
10	1.86153	- 4.32	18 615.3	5.66	1.31
15	1.50429	- 4.20	15 042.9	5.44	1.29
20	1.22295	- 4.08	12 229.5	5.21	1.28
25	1.00	- 3.97	10 000.0	5.00	1.26
30	0.82227	- 3.86	8222.7	5.21	1.35
35	0.67977	- 3.75	6797.7	5.41	1.44
40	0.56487	- 3.65	5648.7	5.60	1.53
45	0.47174	- 3.55	4717.4	5.79	1.63
50	0.39585	- 3.46	3958.5	5.97	1.72
55	0.33371	- 3.37	3337.1	6.15	1.82

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 10 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13103 OR SAP NO. NTCS0805E4103JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
60	0.28258	- 3.28	2825.8	6.32	1.92
65	0.24031	- 3.20	2403.1	6.48	2.03
70	0.20521	- 3.12	2052.1	6.64	2.13
75	0.17594	- 3.04	1759.37	6.80	2.24
80	0.15142	- 2.96	1514.20	6.95	2.35
85	0.1308	- 2.89	1308.04	7.10	2.46
90	0.1134	- 2.82	1134.00	7.24	2.57
95	0.09865	- 2.75	986.53	7.38	2.68
100	0.08611	- 2.69	861.10	7.52	2.80
105	0.0754	- 2.62	754.04	7.65	2.92
110	0.06624	- 2.56	662.36	7.78	3.04
115	0.05836	- 2.50	583.58	7.91	3.16
120	0.05157	- 2.45	515.67	8.03	3.28
125	0.4569	- 2.39	456.94	8.15	3.41
130	0.0406	- 2.34	406.01	8.27	3.54
135	0.03617	- 2.29	361.71	8.38	3.67
140	0.03231	- 2.23	323.06	8.49	3.80
145	0.02893	- 2.19	289.26	8.60	3.93
150	0.02596	- 2.14	259.61	8.70	4.07

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 15 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13153 OR SAP NO. NTCS0805E4153JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	23.3421	- 6.06	350 131	8.46	1.40
- 35	17.336	- 5.84	260 040	8.13	1.39
- 30	13.0176	- 5.62	195 263	7.81	1.39
- 25	9.87717	- 5.42	148 158	7.50	1.38
- 20	7.56881	- 5.23	113 532	7.21	1.38
- 15	5.8546	- 5.05	87 819	6.93	1.37
- 10	4.56918	- 4.87	68 538	6.65	1.37
- 5	3.59635	- 4.71	53 945	6.39	1.36
0	2.85356	- 4.55	42 803	6.14	1.35
5	2.28163	- 4.40	34 224	5.89	1.34
10	1.83772	- 4.26	27 566	5.66	1.33
15	1.49054	- 4.12	22 358	5.43	1.32
20	1.21701	- 3.99	18 255	5.21	1.31
25	1.00	- 3.87	15 000	5.00	1.29
30	0.83154	- 3.75	12 473	5.20	1.39
35	0.69408	- 3.63	10 411	5.40	1.49
40	0.58149	- 3.53	8722.3	5.60	1.59
45	0.48893	- 3.42	7334.0	5.78	1.69
50	0.41256	- 3.32	6188.5	5.96	1.79
55	0.34933	- 3.23	5240.0	6.14	1.90
60	0.2968	- 3.14	4451.9	6.31	2.01
65	0.253	- 3.05	3794.9	6.47	2.12
70	0.21635	- 2.97	3245.3	6.63	2.24
75	0.1856	- 2.89	2784.0	6.78	2.35
80	0.15971	- 2.81	2395.7	6.94	2.47
85	0.13785	- 2.73	2067.7	7.08	2.59
90	0.11932	- 2.66	1789.8	7.22	2.71
95	0.10358	- 2.59	1553.7	7.36	2.84
100	0.09016	- 2.53	1352.4	7.50	2.97
105	0.0787	- 2.46	1180.5	7.63	3.10

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 15 000 Ω

T_{OPER} (°C)	CATALOG NUMBER 2381 615 13153 OR SAP NO. NTCS0805E4153JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
110	0.06887	- 2.40	1033.1	7.76	3.23
115	0.06043	- 2.34	906.41	7.88	3.36
120	0.05315	- 2.29	797.27	8.00	3.50
125	0.04687	- 2.23	702.99	8.12	3.64
130	0.04142	- 2.18	621.33	8.24	3.78
135	0.03669	- 2.13	550.42	8.35	3.92
140	0.03258	- 2.08	488.72	8.46	4.07
145	0.02899	- 2.03	434.88	8.57	4.22
150	0.02585	- 1.98	387.81	8.67	4.37

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 22 000 Ω

T_{OPER} (°C)	CATALOG NUMBER 2381 615 13223 OR SAP NO. NTCS0805E4223JHT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	30.7958	- 6.42	677 507.99	16.71	2.60
- 35	22.4562	- 6.21	494 036.94	15.59	2.51
- 30	16.5404	- 6.02	363 888.31	14.50	2.41
- 25	12.3010	- 5.83	270 622.69	13.47	2.31
- 20	9.2333	- 5.65	203 131.71	12.47	2.21
- 15	6.9923	- 5.47	153 831.44	11.51	2.10
- 10	5.3406	- 5.31	117 492.27	10.59	2.00
- 5	4.1124	- 5.15	90 473.18	9.70	1.88
0	3.1916	- 4.99	70 215.46	8.85	1.77
5	2.4957	- 4.85	54 904.79	8.02	1.66
10	1.9656	- 4.70	43 243.49	7.23	1.54
15	1.5589	- 4.57	34 295.62	6.46	1.41
20	1.2446	- 4.44	27 380.67	5.72	1.29
25	1.0000	- 4.31	22 000.00	5.00	1.16
30	0.8084	- 4.19	17 785.47	5.69	1.36
35	0.6574	- 4.08	14 463.33	6.36	1.56
40	0.5377	- 3.97	11 828.57	7.01	1.77
45	0.4421	- 3.86	9726.63	7.64	1.98
50	0.3655	- 3.76	8040.24	8.25	2.20
55	0.3036	- 3.66	6679.83	8.84	2.42
60	0.2535	- 3.56	5576.61	9.41	2.64
65	0.2126	- 3.47	4677.41	9.97	2.87
70	0.1791	- 3.38	3940.90	10.51	3.11
75	0.1516	- 3.30	3334.80	11.03	3.35
80	0.1288	- 3.22	2833.74	11.54	3.59
85	0.1099	- 3.14	2417.69	12.04	3.84
90	0.0941	- 3.06	2070.77	12.52	4.09
95	0.0809	- 2.99	1780.29	12.99	4.35
100	0.0698	- 2.92	1536.11	13.45	4.61
105	0.0605	- 2.85	1330.07	13.89	4.88
110	0.0525	- 2.78	1155.56	14.32	5.15
115	0.0458	- 2.72	1007.23	14.74	5.43
120	0.0400	- 2.65	880.71	15.15	5.71
125	0.0351	- 2.59	772.44	15.55	6.00
130	0.0309	- 2.54	679.48	15.94	6.29
135	0.0272	- 2.48	599.41	16.32	6.58
140	0.0241	- 2.43	530.24	16.70	6.88
145	0.0214	- 2.37	470.31	17.06	7.19
150	0.0190	- 2.32	418.23	17.41	7.50

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 33 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13333 OR SAP NO. NTCS0805E4333JHT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	32.68563	- 6.59	1 078 626	16.66	2.53
- 35	23.6478	- 6.36	780 377	15.54	2.44
- 30	17.29545	- 6.15	570 750	14.46	2.35
- 25	12.78101	- 5.95	421 773	13.43	2.26
- 20	9.538645	- 5.76	314 775	12.44	2.16
- 15	7.186265	- 5.57	237 147	11.48	2.06
- 10	5.463007	- 5.40	180 279	10.56	1.96
- 5	4.18889	- 5.23	138 233	9.68	1.85
0	3.238476	- 5.07	106 870	8.83	1.74
5	2.523488	- 4.91	83 275	8.01	1.63
10	1.9812223	- 4.77	65 380.4	7.22	1.51
15	1.566743	- 4.62	51 702.5	6.45	1.40
20	1.247561	- 4.49	41 169.5	5.71	1.27
25	1.00	- 4.36	33 000.0	5.00	1.15
30	0.806666	- 4.24	26 620.0	5.69	1.34
35	0.654682	- 4.12	21 604.5	6.36	1.54
40	0.534445	- 4.00	17 636.7	7.00	1.75
45	0.438742	- 3.89	14 478.5	7.63	1.96
50	0.362121	- 3.79	11 950.0	8.24	2.18
55	0.30043	- 3.68	9914.2	8.82	2.39
60	0.250491	- 3.59	8266.2	9.40	2.62
65	0.209854	- 3.49	6925.2	9.95	2.85
70	0.17662	- 3.40	5828.5	10.49	3.08
75	0.149308	- 3.32	4927.18	11.01	3.32
80	0.126759	- 3.23	4183.06	11.52	3.56
85	0.108058	- 3.15	3565.93	12.01	3.81
90	0.092482	- 3.07	3051.89	12.49	4.06
95	0.079453	- 3.00	2621.93	12.96	4.32
100	0.068511	- 2.93	2260.85	13.41	4.58
105	0.059286	- 2.86	1956.42	13.85	4.85
110	0.051479	- 2.79	1698.80	14.28	5.12
115	0.044848	- 2.73	1479.98	14.70	5.39
120	0.039196	- 2.66	1293.47	15.11	5.67
125	0.034363	- 2.60	1133.96	15.51	5.96
130	0.030215	- 2.54	997.09	15.90	6.25
135	0.026645	- 2.49	879.28	16.28	6.55
140	0.023562	- 2.43	777.55	16.65	6.84
145	0.020892	- 2.38	689.45	17.01	7.15
150	0.018573	- 2.33	612.93	17.36	7.46

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 47 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13473 OR SAP NO. NTCS0805E4473JXT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	37.156	- 6.82	1 746 331	11.02	1.62
- 35	26.5657	- 6.60	1 248 589	10.44	1.58
- 30	19.2065	- 6.38	902 705	9.89	1.55
- 25	14.0347	- 6.17	659 632	9.35	1.52
- 20	10.3608	- 5.97	486 956	8.84	1.48
- 15	7.72365	- 5.78	363 012	8.35	1.44
- 10	5.81188	- 5.60	273 158	7.87	1.41
- 5	4.41266	- 5.42	207 395	7.42	1.37
0	3.37917	- 5.25	158 821	6.98	1.33
5	2.60609	- 5.09	122 627	6.55	1.29

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 47 000 Ω

T_{OPER} (°C)	CATALOG NUMBER 2381 615 13473 OR SAP NO. NTCS0805E4473JXT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
10	2.03042	- 4.94	95 430	6.14	1.24
15	1.59206	- 4.79	74 827	5.75	1.20
20	1.2574	- 4.65	59 098	5.37	1.15
25	1.00	- 4.51	47 000	5.00	1.11
30	0.8006	- 4.38	37 628	5.36	1.22
35	0.64506	- 4.26	30 318	5.70	1.34
40	0.52294	- 4.14	24 578	6.04	1.46
45	0.42644	- 4.02	20 043	6.36	1.58
50	0.34971	- 3.91	16 437	6.67	1.71
55	0.28836	- 3.81	13 553	6.98	1.83
60	0.23901	- 3.70	11 233	7.27	1.96
65	0.1991	- 3.60	9358	7.56	2.10
70	0.16666	- 3.51	7833	7.83	2.23
75	0.14016	- 3.42	6587	8.10	2.37
80	0.1184	- 3.33	5565	8.37	2.51
85	0.10045	- 3.25	4721	8.62	2.66
90	0.08557	- 3.16	4022	8.87	2.80
95	0.07319	- 3.09	3440	9.11	2.95
100	0.06285	- 3.01	2954	9.34	3.10
105	0.05416	- 2.94	2546	9.57	3.26
110	0.04685	- 2.87	2202	9.79	3.42
115	0.04066	- 2.80	1911	10.01	3.58
120	0.03541	- 2.73	1664	10.22	3.74
125	0.03094	- 2.67	1454	10.43	3.91
130	0.02711	- 2.61	1274	10.63	4.08
135	0.02383	- 2.55	1120	10.82	4.25
140	0.02101	- 2.49	987.6	11.02	4.42
145	0.01858	- 2.44	873.2	11.20	4.60
150	0.01647	- 2.38	774.1	11.38	4.78

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 68 000 Ω

T_{OPER} (°C)	CATALOG NUMBER 2381 615 13683 OR SAP NO. NTCS0805E4683JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	25.783	- 6.07	1 753 245	16.02	2.64
- 35	19.1253	- 5.88	1 300 524	14.96	2.54
- 30	14.32	- 5.70	973 759.8	13.94	2.45
- 25	10.8187	- 5.52	735 674.7	12.96	2.35
- 20	8.24438	- 5.35	560 618	12.02	2.25
- 15	6.33489	- 5.19	430 772.3	11.12	2.14
- 10	4.90655	- 5.03	333 645.6	10.26	2.04
- 5	3.82943	- 4.88	260 401.1	9.42	1.93
0	3.01078	- 4.74	204 733.3	8.62	1.82
5	2.3839	- 4.60	162 105	7.84	1.70
10	1.90036	- 4.47	129 224.7	7.09	1.59
15	1.52479	- 4.34	103 686	6.37	1.47
20	1.23112	- 4.22	83 716.26	5.67	1.35
25	1.00	- 4.10	68 000	5.00	1.22
30	0.81697	- 3.99	55 554.14	5.65	1.42
35	0.67116	- 3.88	45 638.98	6.28	1.62
40	0.55433	- 3.77	37 694.27	6.89	1.83
45	0.46019	- 3.67	31 292.96	7.48	2.04
50	0.38393	- 3.58	26 107.56	8.06	2.25
55	0.32184	- 3.48	21 885.36	8.61	2.47

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 68 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13683 OR SAP NO. NTCS0805E4683JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
60	0.27103	- 3.39	18 430.3	9.15	2.70
65	0.22926	- 3.30	15 589.41	9.67	2.93
70	0.19475	- 3.22	13 242.67	10.18	3.16
75	0.16611	- 3.14	11 295.44	10.67	3.40
80	0.14225	- 3.06	9672.73	11.15	3.64
85	0.12228	- 2.99	8314.81	11.62	3.89
90	0.1055	- 2.92	7173.88	12.07	4.14
95	0.09135	- 2.85	6211.55	12.51	4.40
100	0.07936	- 2.78	5396.80	12.94	4.66
105	0.06918	- 2.71	4704.48	13.36	4.92
110	0.0605	- 2.65	4114.12	13.77	5.19
115	0.05307	- 2.59	3609	14.16	5.47
120	0.0467	- 2.53	3175.38	14.55	5.75
125	0.04121	- 2.47	2801.96	14.92	6.03
130	0.03646	- 2.42	2479.38	15.29	6.32
135	0.03235	- 2.37	2199.88	15.65	6.62
140	0.02878	- 2.31	1957.02	16.00	6.91
145	0.02567	- 2.26	1745.39	16.34	7.22
150	0.02295	- 2.22	1560.48	16.67	7.52

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 100 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13104 OR SAP NO. NTCS0805E4104JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	23.8997	- 5.92	2 389 969	8.58	1.45
- 35	17.8586	- 5.74	1 785 861	8.24	1.44
- 30	13.465	- 5.56	1 346 502	7.91	1.42
- 25	10.2407	- 5.39	1 024 071	7.59	1.41
- 20	7.85378	- 5.23	785 378.1	7.28	1.39
- 15	6.07181	- 5.07	607 181.2	6.99	1.38
- 10	4.73061	- 4.92	473 061.1	6.71	1.36
- 5	3.7132	- 4.77	371 319.7	6.44	1.35
0	2.93554	- 4.63	293 553.6	6.18	1.33
5	2.33677	- 4.50	233 677.1	5.92	1.32
10	1.87249	- 4.37	187 249.2	5.68	1.30
15	1.51004	- 4.24	151 003.9	5.45	1.28
20	1.22522	- 4.12	122 522.4	5.22	1.27
25	1.00	- 4.01	100 000	5.00	1.25
30	0.82081	- 3.89	82 081.36	5.21	1.34
35	0.67742	- 3.79	67 741.67	5.42	1.43
40	0.56201	- 3.68	56 201.1	5.62	1.52
45	0.46863	- 3.59	46 862.56	5.81	1.62
50	0.39266	- 3.49	39 266.09	5.99	1.72
55	0.33055	- 3.40	33 055.34	6.18	1.82
60	0.27953	- 3.31	27 952.66	6.35	1.92
65	0.23741	- 3.22	23 740.56	6.52	2.02
70	0.20248	- 3.14	20 247.74	6.69	2.13
75	0.17339	- 3.06	17 338.63	6.85	2.24
80	0.14905	- 2.99	14 905.37	7.00	2.34
85	0.12862	- 2.91	12 861.77	7.15	2.46
90	0.11139	- 2.84	11 138.64	7.30	2.57
95	0.0968	- 2.77	9680.13	7.44	2.68
100	0.08441	- 2.71	8441.05	7.58	2.80
105	0.07385	- 2.64	7384.60	7.72	2.92

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 100 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13104 OR SAP NO. NTCS0805E4104JMT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
110	0.06481	- 2.58	6480.76	7.85	3.04
115	0.05705	- 2.52	5704.87	7.98	3.17
120	0.05037	- 2.46	5036.67	8.11	3.29
125	0.04459	- 2.41	4459.40	8.23	3.42
130	0.03959	- 2.35	3959.18	8.35	3.55
135	0.03524	- 2.30	3524.43	8.46	3.68
140	0.03146	- 2.25	3145.52	8.58	3.81
145	0.02814	- 2.20	2814.35	8.69	3.95
150	0.02524	- 2.15	2524.15	8.80	4.09

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 330 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13334 OR SAP NO. NTCS0805E4334JXT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	33.3434	- 6.58	11 003.3	16.83	2.56
- 35	24.1285	- 6.36	7962.4	15.69	2.46
- 30	17.6422	- 6.16	5821.9	14.60	2.37
- 25	13.0283	- 5.97	4299.4	13.55	2.27
- 20	9.7132	- 5.78	3205.4	12.54	2.17
- 15	7.3081	- 5.60	2411.7	11.57	2.07
- 10	5.5470	- 5.43	1830.5	10.64	1.96
- 5	4.2457	- 5.27	1401.1	9.75	1.85
0	3.2760	- 5.11	1081.1	8.88	1.74
5	2.5474	- 4.96	840.63	8.05	1.62
10	1.9955	- 4.81	658.52	7.25	1.51
15	1.5744	- 4.67	519.55	6.47	1.39
20	1.2506	- 4.54	412.71	5.72	1.26
25	1.0000	- 4.41	330.00	5.00	1.13
30	0.8046	- 4.29	265.53	5.70	1.33
35	0.6514	- 4.17	214.95	6.38	1.53
40	0.5304	- 4.05	175.02	7.03	1.73
45	0.4343	- 3.94	143.31	7.67	1.94
50	0.3575	- 3.84	117.97	8.28	2.16
55	0.2958	- 3.74	97.62	8.88	2.36
60	0.2460	- 3.64	81.18	9.46	2.60
65	0.2056	- 3.55	67.83	10.02	2.83
70	0.1726	- 3.45	56.94	10.56	3.06
75	0.1455	- 3.37	48.02	11.09	3.29
80	0.1232	- 3.28	40.66	11.61	3.53
85	0.1048	- 3.20	34.57	12.11	3.78
90	0.0894	- 3.12	29.52	12.59	4.03
95	0.0767	- 3.05	25.30	13.07	4.29
100	0.0659	- 2.98	21.76	13.53	4.54
105	0.0569	- 2.91	18.78	13.97	4.81
110	0.0493	- 2.84	16.27	14.41	5.08
115	0.0429	- 2.77	14.14	14.84	5.35
120	0.0374	- 2.71	12.33	15.25	5.63
125	0.0327	- 2.65	10.79	15.65	5.91
130	0.0287	- 2.59	9.463	16.05	6.20
135	0.0252	- 2.53	8.326	16.43	6.49
140	0.0223	- 2.48	7.347	16.81	6.79
145	0.0197	- 2.42	6.500	17.17	7.09
150	0.0175	- 2.37	5.767	17.53	7.40

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 470 000 Ω					
T_{OPER} (°C)	CATALOG NUMBER 2381 615 13474 OR SAP NO. NTCS0805E4474JXT				
	R_T/R_{25}	TCR (%/K)	R_T (Ω)	5 % TOL. $\Delta R/R$ (%)	5 % TOL. ΔT (K)
- 40	37.1288	- 6.79	17450.5	17.16	2.53
- 35	26.5910	- 6.57	12497.8	15.99	2.44
- 30	19.2505	- 6.36	9047.8	14.87	2.34
- 25	14.0812	- 6.15	6618.2	13.79	2.24
- 20	10.4026	- 5.96	4889.2	12.76	2.14
- 15	7.7582	- 5.77	3646.4	11.76	2.04
- 10	5.8389	- 5.60	2744.3	10.80	1.93
- 5	4.4329	- 5.43	2083.5	9.88	1.82
0	3.3937	- 5.26	1595.0	8.99	1.71
5	2.6190	- 5.10	1230.93	8.14	1.59
10	2.0367	- 4.95	957.26	7.31	1.48
15	1.5956	- 4.81	749.94	6.51	1.35
20	1.2589	- 4.67	591.68	5.74	1.23
25	1.0000	- 4.54	470.00	5.00	1.10
30	0.7995	- 4.41	375.78	5.72	1.30
35	0.6433	- 4.29	302.34	6.42	1.50
40	0.5207	- 4.17	244.71	7.09	1.70
45	0.4239	- 4.06	199.22	7.74	1.91
50	0.3470	- 3.95	163.08	8.38	2.12
55	0.2856	- 3.84	134.22	8.99	2.34
60	0.2362	- 3.74	111.03	9.58	2.56
65	0.1964	- 3.65	92.30	10.16	2.79
70	0.1640	- 3.55	77.10	10.72	3.02
75	0.1377	- 3.46	64.70	11.27	3.25
80	0.1160	- 3.38	54.53	11.80	3.49
85	0.0982	- 3.29	46.16	12.31	3.74
90	0.0835	- 3.21	39.23	12.81	3.99
95	0.0712	- 3.13	33.48	13.30	4.24
100	0.0610	- 3.06	28.68	13.77	4.50
105	0.0525	- 2.99	24.66	14.23	4.77
110	0.0453	- 2.92	21.27	14.68	5.03
115	0.0392	- 2.85	18.42	15.12	5.31
120	0.0340	- 2.78	16.00	15.54	5.58
125	0.0297	- 2.72	13.94	15.96	5.87
130	0.0259	- 2.66	12.189	16.36	6.15
135	0.0227	- 2.60	10.688	16.76	6.45
140	0.0200	- 2.54	9.398	17.15	6.74
145	0.0176	- 2.49	8.288	17.52	7.05
150	0.0156	- 2.43	7.329	17.89	7.35

NTC Glass Encapsulated

Contents

SMD MELF SOD80, Glass Encapsulated NTC Thermistor

FEATURES

- Small diameter down to 1.7 mm
- Quick response time down to 0.9 s
- Wide temperature range from - 40 °C to + 150 °C
- Resistant to corrosive atmospheres and harsh environments
- Old part number was 2322 633 5....
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC
- Available on tape

RoHS COMPLIANT

APPLICATIONS

Temperature measurement, sensing and control:

- Domestic appliances
- Automotive systems
- Industrial process control

DESIGN-IN SUPPORT

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

DESCRIPTION

These thermistors have a negative temperature coefficient and are mounted in a glass envelope with two tinned electrodes.

MOUNTING

By soldering.

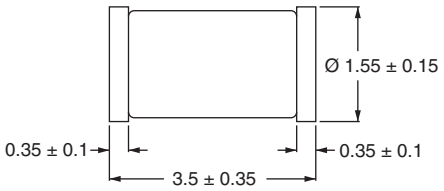
QUICK REFERANCE DATA	
PARAMETER	**VALUE**
	2381 633 5....
Temperature range	- 40 °C to + 150 °C
Resistance value at 25 °C (R_{25})	10 kΩ to 220 kΩ
Tolerance on R_{25} - value	± 5 %
$B_{25/85}$ - value	3977K
Tolerance on $B_{25/85}$ - value	± 1.3 %
Deviation in resistance value due to B-tolerance	See Resistance Values at Intermediate Temperatures table
Ratio R_T/R_{25}	
Rated dissipation	100 mW
Dissipation factor	2.5 mW/K
Response time	0.9 s
Thermal time constant τ	6 s
Temperature coefficient	See Resistance Values at Intermediate Temperatures table
Climatic category	40/155/56
Weight	≈ 0.03 g

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} (kΩ)	$B_{25/85}$ - VALUE	12NC ORDERING CODE 2381 633 53..	SAP MATERIAL NO. NTCSMELFE3...
10	3977K ± 1.3 %	103	103JT
20	3977K ± 1.3 %	203	203JT
30	3977K ± 1.3 %	303	303JT
100	3977K ± 1.3 %	104	104JT

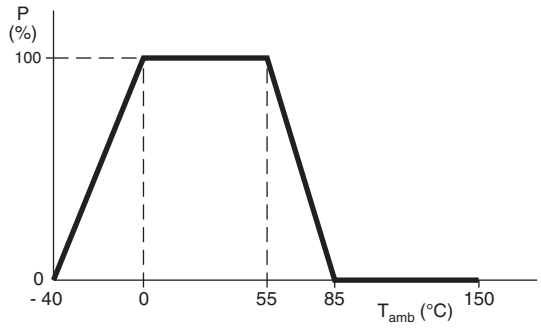
DIMENSIONS in millimeters

Component outline for 2381 633 5.... (SOD80)



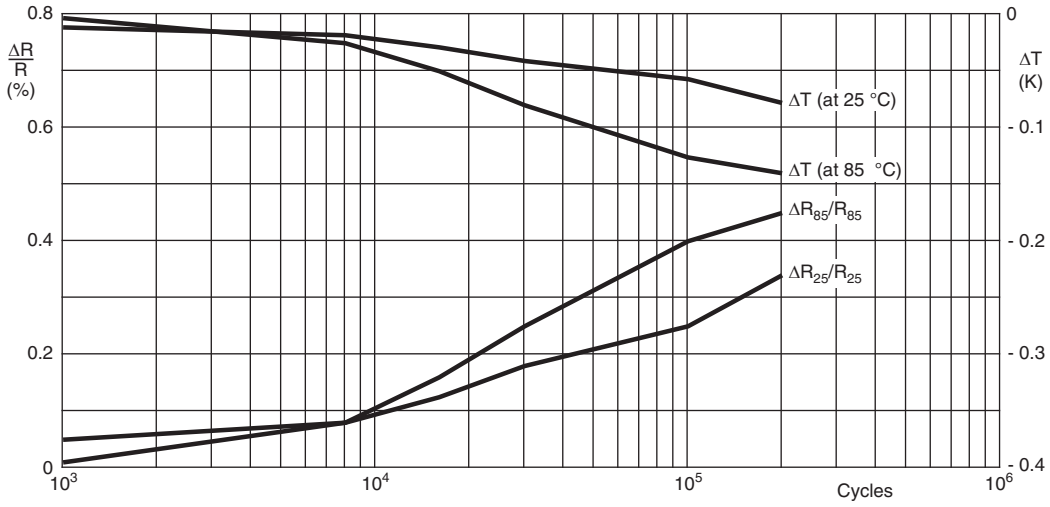
DERATING

Derating curve for 2381 633 5.... series



STABILITY CHARACTERISTICS

Stability of glass encapsulated NTCs in thermal shock test (200 000 cycles - 40 °C/+ 200 °C)



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

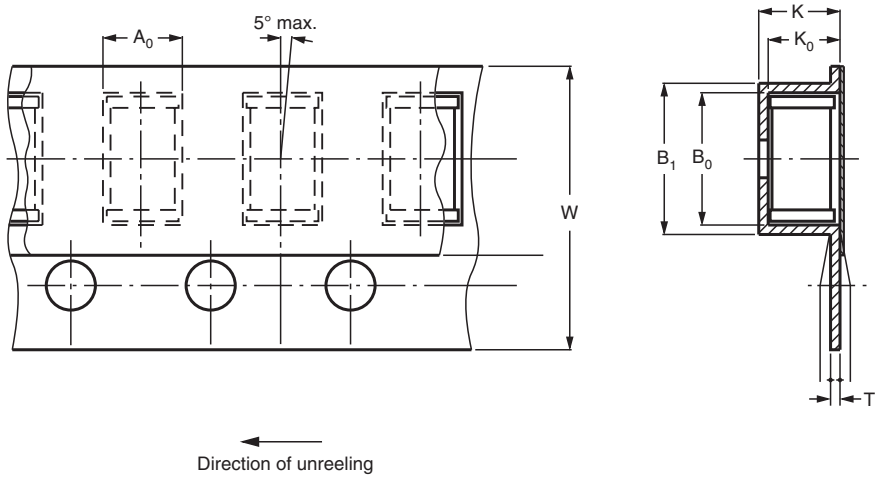
RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES FOR NTCSMELFE3.../2381 633 5....

TEMPERATURE (°C)	R_T/R_{25}	*R* for 10 kΩ	*R* for 20 kΩ	*R* for 30 kΩ	*R* for 100 kΩ	Δ*R*/*R* (± %)	α (%/K)	ΔT (± K)
- 40	33.21	332 094	664 187	996 281	3 320 936	10.08	- 6.62	1.52
- 35	23.99	239 900	479 799	719 699	2 398 996	9.59	- 6.39	1.50
- 30	17.52	175 200	350 399	525 599	1 751 996	9.12	- 6.18	1.48
- 25	12.93	129 287	258 574	387 861	1 292 869	8.67	- 5.98	1.45
- 20	9.636	96 358	192 716	289 074	963 582	8.24	- 5.78	1.42
- 15	7.250	72 500	145 001	217 501	725 004	7.82	- 5.60	1.40
- 10	5.505	55 046	110 092	165 138	550 459	7.42	- 5.42	1.37
- 5	4.216	42 157	84 314	126 471	421 570	7.04	- 5.25	1.34
0	3.255	32 554	65 108	97 663	325 542	6.67	- 5.09	1.31
5	2.534	25 339	50 677	76 016	253 386	6.31	- 4.93	1.28
10	1.987	19 872	39 744	59 617	198 722	5.96	- 4.79	1.25
15	1.570	15 698	31 397	47 095	156 985	5.63	- 4.64	1.21
20	1.249	12 488	24 975	37 463	124 877	5.31	- 4.51	1.18
25	1.000	10 000	20 000	30 000	100 000	5.00	- 4.38	1.14
30	0.8059	8059	16118	24 177	80 591	5.30	- 4.25	1.25
35	0.6535	6535	13069	19 604	65 347	5.59	- 4.13	1.35
40	0.5330	5330	10660	15 990	53 299	5.87	- 4.02	1.46
45	0.4372	4372	8743	13 115	43 717	6.14	- 3.91	1.57
50	0.3605	3605	7211	10 816	36 053	6.41	- 3.80	1.69
55	0.2989	2989	5977	8966	29887	6.66	- 3.70	1.80
60	0.2490	2490	4980	7470	24900	6.91	- 3.60	1.92
65	0.2084	2084	4169	6253	20844	7.15	- 3.51	2.04
70	0.1753	1753	3506	5259	17530	7.39	- 3.42	2.16
75	0.1481	1481	2962	4443	14809	7.61	- 3.33	2.29
80	0.1256	1256	2513	3769	12564	7.84	- 3.25	2.41
85	0.1070	1070	2141	3211	10703	8.05	- 3.17	2.54
90	0.09154	915.4	1831	2746	9154	8.26	- 3.09	2.67
95	0.07860	786.0	1572	2358	7860	8.46	- 3.01	2.81
100	0.06773	677.3	1355	2032	6773	8.66	- 2.94	2.95
105	0.05857	585.7	1171	1757	5857	8.85	- 2.87	3.08
110	0.05083	508.3	1017	1525	5083	9.04	- 2.80	3.23
115	0.04426	442.6	885.2	1328	4426	9.22	- 2.74	3.37
120	0.03866	386.6	773.2	1160	3866	9.40	- 2.67	3.52
125	0.03387	338.7	677.5	1016	3387	9.57	- 2.61	3.66
130	0.02977	297.7	595.4	893.1	2977	9.74	- 2.55	3.81
135	0.02624	262.4	524.8	787.2	2624	9.91	- 2.50	3.97
140	0.02319	231.9	463.8	695.7	2319	10.07	- 2.44	4.12
145	0.02055	205.5	411.1	616.6	2055	10.23	- 2.39	4.28
150	0.01826	182.6	365.3	547.9	1826	10.38	- 2.34	4.44

PACKAGING

BLISTER TAPE AND REEL (2381 633 5....)

Packed in an 8 mm wide blister tape, according to IEC 60286-3



BLISTER TAPE AND REEL DIMENSIONS				
SYMBOL	**PARAMETER**	**NOMINAL DIMENSIONS**	**TOLERANCE**	**UNIT**
Blister tape				
K	Overall thickness	< 2.5	-	mm
POCKET				
A_0	Length	2.1	+ 0.3	mm
B_0	Width	> 3.8	-	mm
K_0	Depth	2.1	+ 0.3	mm
B_1	Outside width	< 4.5	-	mm
TAPE				
T	Tape thickness	< 0.4	-	mm
W	Tape width	8.0	± 0.2	mm

NTC Thermistors, Glass Encapsulated High Temperature Sensors

FEATURES

- Small diameter down to 1.8 mm
- Quick response time down to 0.9 s
- Wide temperature range from - 40 °C to + 200 °C
- Resistant to corrosive atmospheres and harsh environments
- Old part number was 2322 633 3/8....
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC
- Available in bulk or on tape

RoHS COMPLIANT

APPLICATIONS

High temperature measurement, sensing and control:

- Domestic appliances
- Automotive systems
- Industrial process control

DESIGN-IN SUPPORT

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

DESCRIPTION

These thermistors have a negative temperature coefficient and are mounted in a glass envelope:

2381 633 8.... (SOD27) with tinned copper-clad steel leads in bulk
2381 633 3.... is the taped bandolier version of 2381 633 8.... series

MOUNTING

By soldering, clamping or welding. Bending of the leads should be done at least 3 mm from the glass body and without exerting forces on the glass body.

QUICK REFERANCE DATA	
PARAMETER	**VALUE**
Temperature range	- 40 °C to + 200 °C
Resistance value at 25 °C (R_{25})	10 kΩ to 220 kΩ
Tolerance on R_{25} - value	± 5 %
$B_{25/85}$ - value	3797K to 3977K
Tolerance on $B_{25/85}$ - value	± 1.3 % to ± 3 %
Deviation in resistance value due to B-tolerance	See Resistance Values at Intermediate Temperatures table for 2381 633 8.... series
Ratio R_T/R_{25}	
Rated dissipation	100 mW
Dissipation factor	2.5 mW/K
Response time	0.9 s
Thermal time constant τ	6 s
Temperature coefficient	See Resistance Values at Intermediate Temperatures table
Climatic category	40/200/56
Weight	≈ 0.14 g

ELECTRICAL DATA AND ORDERING INFORMATION

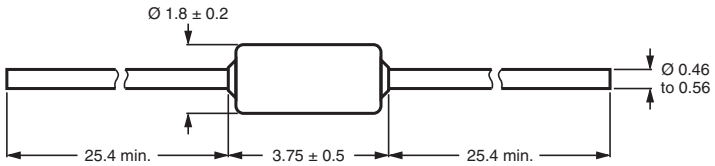
R_{25} (kΩ)	$B_{25/85}$ - VALUE	12NC ORDERING CODE 2381 633 3/8...	SAP MATERIAL NO. NTCLG100E2...
10	3977K ± 1.3 %	3103	103JB
20	3977K ± 1.3 %	3203	203JB
30	3977K ± 1.3 %	3303	303JB
100	3977K ± 1.3 %	3104	104JB
220	3797K ± 3.0 %	3224	224JB

Notes

- In 12NC the 8th digit stands for packing: 8 for bulk and 3 for taped components
- In SAP part replace last character by B for bulk and by T for taped components

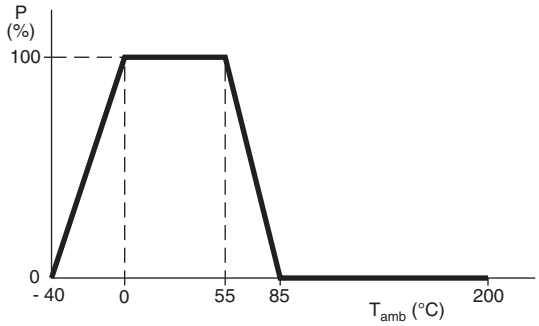
DIMENSIONS in millimeters

Component outline for 2381 633 8/3.... (SOD27)



DERATING

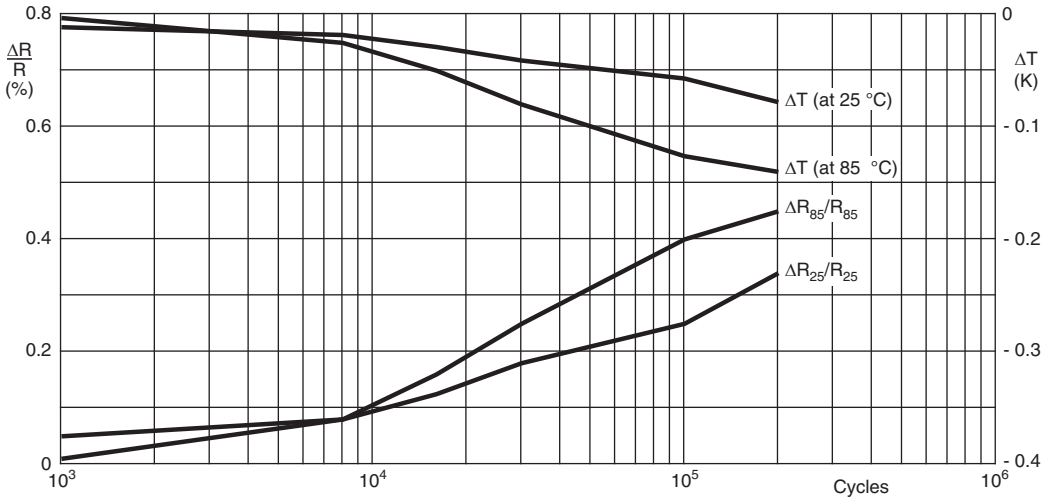
Power derating curve for 2381 633 8/3.... series



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

STABILITY CHARACTERISTICS

Stability of glass encapsulated NTCs in thermal shock test (200 000 cycles - 40 °C/+ 200 °C)



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

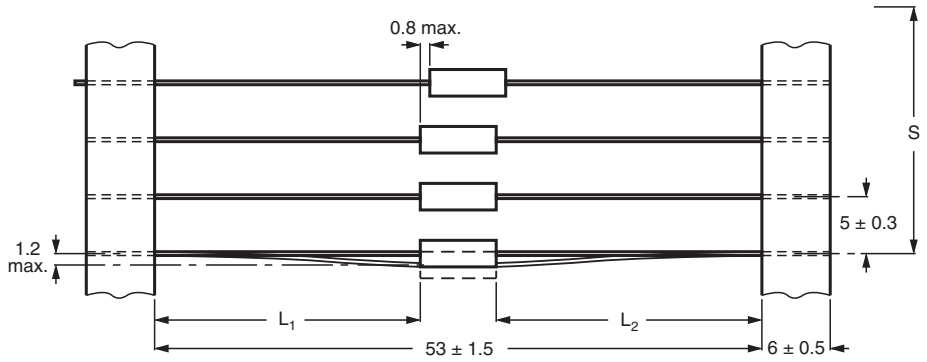
RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES FOR NTCLG100E2...../2381 633 3/8....								
TEMPERATURE (°C)	R_T/R_{25}	*R* for 10 kΩ	*R* for 20 kΩ	*R* for 30 kΩ	*R* for 100 kΩ	Δ*R*/*R* (± %)	α (%/K)	Δ*T* (± K)
- 40	33.21	332 094	664 187	996 281	3 320 936	10.08	- 6.62	1.52
- 35	23.99	239 900	479 799	719 699	2 398 996	9.59	- 6.39	1.50
- 30	17.52	175 200	350 399	525 599	1 751 996	9.12	- 6.18	1.48
- 25	12.93	129 287	258 574	387 861	1 292 869	8.67	- 5.98	1.45
- 20	9.636	96 358	192 716	289 074	963 582	8.24	- 5.78	1.42
- 15	7.250	72 500	145 001	217 501	725 004	7.82	- 5.60	1.40
- 10	5.505	55 046	110 092	165 138	550 459	7.42	- 5.42	1.37
- 5	4.216	42 157	84 314	126 471	421 570	7.04	- 5.25	1.34
0	3.255	32 554	65 108	97 663	325 542	6.67	- 5.09	1.31
5	2.534	25 339	50 677	76 016	253 386	6.31	- 4.93	1.28
10	1.987	19 872	39 744	59 617	198 722	5.96	- 4.79	1.25
15	1.570	15 698	31 397	47 095	156 985	5.63	- 4.64	1.21
20	1.249	12 488	24 975	37 463	124 877	5.31	- 4.51	1.18
25	1.000	10 000	20 000	30 000	100 000	5.00	- 4.38	1.14
30	0.8059	8059	16118	24 177	80 591	5.30	- 4.25	1.25
35	0.6535	6535	13069	19 604	65 347	5.59	- 4.13	1.35
40	0.5330	5330	10660	15 990	53 299	5.87	- 4.02	1.46
45	0.4372	4372	8743	13 115	43 717	6.14	- 3.91	1.57
50	0.3605	3605	7211	10 816	36 053	6.41	- 3.80	1.69
55	0.2989	2989	5977	8966	29887	6.66	- 3.70	1.80
60	0.2490	2490	4980	7470	24900	6.91	- 3.60	1.92
65	0.2084	2084	4169	6253	20844	7.15	- 3.51	2.04
70	0.1753	1753	3506	5259	17530	7.39	- 3.42	2.16
75	0.1481	1481	2962	4443	14809	7.61	- 3.33	2.29
80	0.1256	1256	2513	3769	12564	7.84	- 3.25	2.41
85	0.1070	1070	2141	3211	10703	8.05	- 3.17	2.54
90	0.09154	915.4	1831	2746	9154	8.26	- 3.09	2.67
95	0.07860	786.0	1572	2358	7860	8.46	- 3.01	2.81
100	0.06773	677.3	1355	2032	6773	8.66	- 2.94	2.95
105	0.05857	585.7	1171	1757	5857	8.85	- 2.87	3.08
110	0.05083	508.3	1017	1525	5083	9.04	- 2.80	3.23
115	0.04426	442.6	885.2	1328	4426	9.22	- 2.74	3.37
120	0.03866	386.6	773.2	1160	3866	9.40	- 2.67	3.52
125	0.03387	338.7	677.5	1016	3387	9.57	- 2.61	3.66
130	0.02977	297.7	595.4	893.1	2977	9.74	- 2.55	3.81
135	0.02624	262.4	524.8	787.2	2624	9.91	- 2.50	3.97
140	0.02319	231.9	463.8	695.7	2319	10.07	- 2.44	4.12
145	0.02055	205.5	411.1	616.6	2055	10.23	- 2.39	4.28
150	0.01826	182.6	365.3	547.9	1826	10.38	- 2.34	4.44
155	0.01627	162.7	325.4	488.1	1627	10.53	- 2.29	4.60
160	0.01453	145.3	290.6	435.9	1453	10.67	- 2.24	4.77
165	0.01301	130.1	260.1	390.2	1301	10.82	- 2.19	4.94
170	0.01167	116.7	233.4	350.1	1167	10.96	- 2.15	5.11
175	0.01049	104.9	209.9	314.8	1049	11.09	- 2.10	5.28
180	0.009457	94.57	189.1	283.7	945.7	11.23	- 2.06	5.45
185	0.008541	85.41	170.8	256.2	854.1	11.36	-2.02	5.63
190	0.007729	77.29	154.6	231.9	772.9	11.49	- 1.98	5.81
195	0.007009	70.09	140.2	210.3	700.9	11.61	- 1.94	5.99
200	0.006367	63.67	127.3	191.0	636.7	11.73	- 1.90	6.17

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES FOR NTCLG100E2...../2381 633 3/8....					
TEMPERATURE (°C)	R_T/R_{25}	R for 220 kΩ	$\Delta R/R$ (± %)	α (%/K)	ΔT (± K)
- 40	25.78	5 672 264	16.18	- 6.07	2.67
- 35	19.13	4 207 576	15.11	- 5.88	2.57
- 30	14.32	3 150 400	14.07	- 5.70	2.47
- 25	10.82	2 380 124	13.08	- 5.52	2.37
- 20	8.244	1 813 764	12.13	- 5.35	2.27
- 15	6.335	1 393 675	11.22	- 5.19	2.16
- 10	4.907	1 079 442	10.34	- 5.03	2.05
- 5	3.829	842 474	9.49	- 4.88	1.94
0	3.011	662 373	8.67	- 4.74	1.83
5	2.384	524 457	7.88	- 4.60	1.71
10	1.900	418 080	7.13	- 4.47	1.59
15	1.525	335 455	6.39	- 4.34	1.47
20	1.231	270 847	5.68	- 4.22	1.35
25	1.000	220 000	5.00	- 4.10	1.22
30	0.8170	179 734	5.66	- 3.99	1.42
35	0.6712	147 656	6.30	- 3.88	1.63
40	0.5543	121 952	6.92	- 3.77	1.83
45	0.4602	101 242	7.52	- 3.67	2.05
50	0.3839	84 466	8.10	- 3.58	2.27
55	0.3218	70 806	8.67	- 3.48	2.49
60	0.2710	59 627	9.21	- 3.39	2.72
65	0.2293	50 436	9.75	- 3.30	2.95
70	0.1947	42 844	10.26	- 3.22	3.19
75	0.1661	36 544	10.76	- 3.14	3.43
80	0.1422	31 294	11.25	- 3.06	3.67
85	0.1223	26 901	11.72	- 2.99	3.92
90	0.1055	23 210	12.18	- 2.92	4.18
95	0.09135	20 096	12.63	- 2.85	4.44
100	0.07936	17 460	13.06	- 2.78	4.70
105	0.06918	15 220	13.49	- 2.71	4.97
110	0.06050	13 310	13.90	- 2.65	5.24
115	0.05307	11 676	14.30	- 2.59	5.52
120	0.04670	10 273	14.69	- 2.53	5.81
125	0.04121	9065	15.08	- 2.47	6.09
130	0.03646	8022	15.45	- 2.42	6.39
135	0.03235	7117	15.81	- 2.37	6.68
140	0.02878	6332	16.17	- 2.31	6.99
145	0.02567	5647	16.51	- 2.26	7.29
150	0.02295	5049	16.85	- 2.22	7.61
155	0.02057	4525	17.18	- 2.17	7.92
160	0.01847	4064	17.50	- 2.12	8.24
165	0.01663	3659	17.82	- 2.08	8.57
170	0.01501	3301	18.13	- 2.04	8.90
175	0.01357	2985	18.43	- 2.00	9.24
180	0.01229	2704	18.72	- 1.95	9.58
185	0.01116	2455	19.01	- 1.92	9.92
190	0.01015	2233	19.29	- 1.88	10.27
195	0.009247	2034	19.57	- 1.84	10.63
200	0.008442	1857	19.84	- 1.81	10.99

THERMISTORS ON BANDOLIER (2381 633 3....)

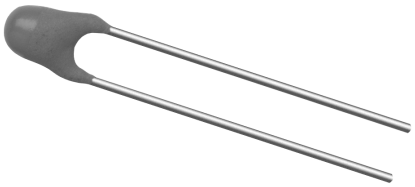
Bandolier taped according to IEC 60286-1



The components are centred so that $|L_1 - L_2| = 1.2$ mm max.

The cumulative space (S) measured over 10 spacings = 50 ± 2 mm

NTC Leaded



Contents

NTC Leaded

GENERAL ORDER INFORMATION

PART NUMBER: NTC L E100 E3 103 J B0

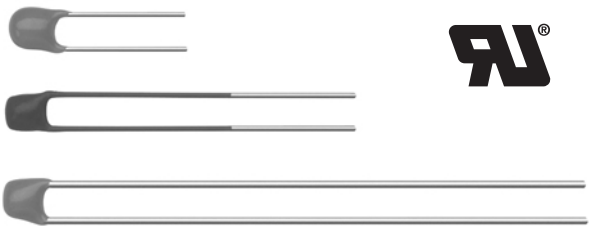
N	T	C	L	E	1	0	0	E	3	1	0	3	J	B	0

PRODUCT FAMILY	EXECUTION	TYPE	RoHS COMPLIANCE TERMINATION TYPE	R_{25} VALUE	TOLERANCE ON R_{25}	PACKAGING
NTC	**L** = Leaded	**E100** = Epoxy Cu 0.6 mm color coding **E101** = Epoxy Cu 0.6 mm no color coding **E203** = Epoxy Ni 0.4 mm **E300** = Epoxy ETFE AWG30 wires **E201** = Epoxy Ni 0.3 mm **E301** = Epoxy PEEK AWG30	**E3** = Sn **E4** = Silver	**103** = 10 x 10^3 Ω **102** = 10 x 10^2 Ω **101** = 10 x 10^1 Ω **109** = 10 x 10^0 Ω **108** = 10 x 10^{-1} Ω see spec. for values	**F** = 1 % **G** = 2 % **H** = 3 % **J** = 5 % **K** = 10 %	**B** or **B0** = Bulk **T1** = On TDK tape pitch 1e **T2** = On TDK tape pitch 2e

PRODUCT DESCRIPTION: 2381 640 6 3 103

2381	615	5	3	103
RoHS COMPLIANCE	EXECUTION	TYPE	TOLERANCE ON R_{25}	R_{25} VALUE
2381 = Yes **2322** = No	**640** = Sawn chip (R_{25} in E-series) **645** = Sawn chip (R_{25} not in E-series)	Lead epoxy **6** = Cu 0.6 mm color coding **5** = Ni 0.4 mm **4** = Cu 0.6 mm on tape 1e **3** = Cu 0.6 mm on tape 2e **10** = Ni 0.3 mm with special R_{25} tolerance **20** = Insulated Ni 0.25 mm with special tolerances **0** = Cu 0.6 mm without coding (R_{25} not in E-series)	**5** = 1 % **4** = 2 % **6** = 3 % **3** = 5 % **2** = 10 %	**103** = 10 x 10^3 Ω **102** = 10 x 10^2 Ω **101** = 10 x 10^1 Ω **109** = 10 x 10^0 Ω **108** = 10 x 10^{-1} Ω see spec. for values

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 δ	2.2 mW/K
Response time (1)	≈ 1.7 s
Thermal time constant τ	13 s
Operating temperature range at:	
Zero dissipation (continuously)	- 40 °C to + 125 °C
Zero dissipation (for short periods) (2)	≤ 150 °C
Maximum dissipation (100 mW)	0 °C to + 55 °C
Climatic category	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.

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/

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

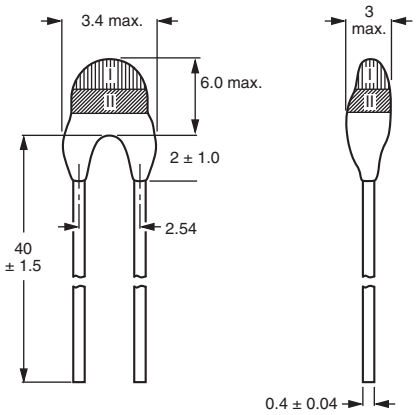
R_{25} (kΩ)	$B_{25/85}$ - VALUE (K)	$B_{25/85}$ - VALUE (± %)	12NC ORDERING CODE 2381 640 5.... (3)	SAP MATERIAL NO. NTCLE203E..... (4)	UL approved Y/N	CODING (see dimensions) I	CODING (see dimensions) II
2	3528	0.5	*202	202*B0	N	Orange	Orange
2.7	3977	0.75	*272	272*B0	Y	Red	Red
4.7	3977	0.75	*472	472*B0	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

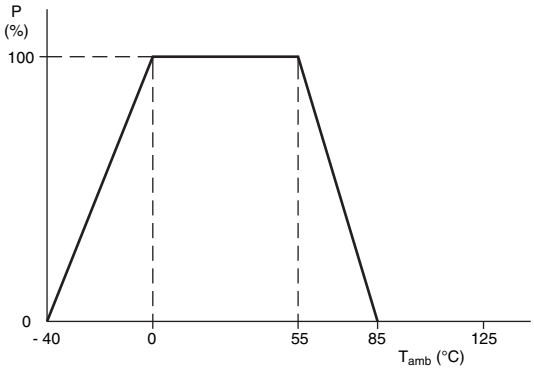
(3) Replace * in 12NC by 3 for ± 5 %, 6 for ± 3 %, 4 for ± 2 %, 5 for ± 1 %

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

DIMENSIONS in millimeters

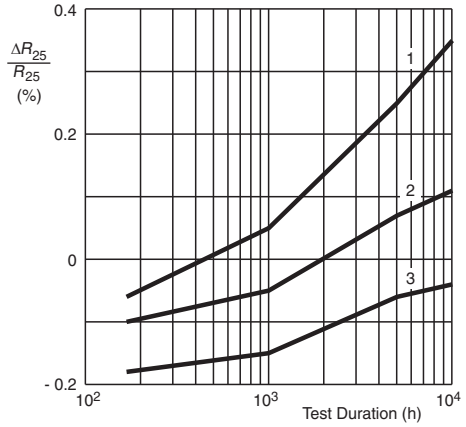


DERATING AND LONG TERM STABILITY



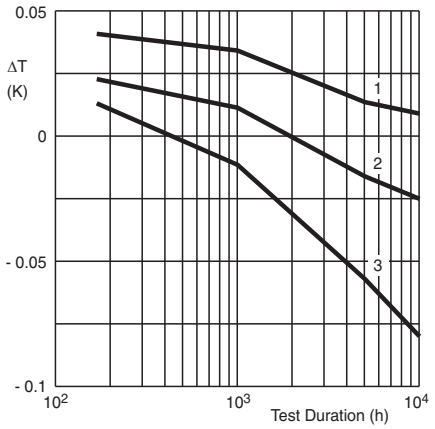
Power

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/thermistors/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2 kΩ			
T_{OPER} (°C)	PART NR. NTCLE203E3202*B0 2381 640 5*202 R_T (Ω)	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
- 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/thermistors/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 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 (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/thermistors/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 12 kΩ AND 22 kΩ				
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 (kΩ)	R_T (kΩ)		
- 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/thermistors/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 47 kΩ			
T_{OPER} (°C)	PART NR. NTCLE203E3473*B0 2381 640 5*473 R_T (kΩ)	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
- 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

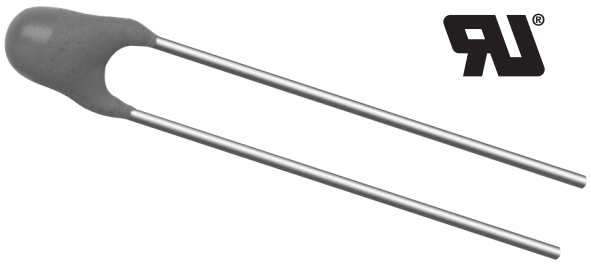
For complete Curve Computation, visit: www.vishay.com/thermistors/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 68 kΩ AND 100 kΩ				
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 (kΩ)	R_T (kΩ)		
- 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/thermistors/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 470 kΩ			
T_{OPER} (°C)	PART NR. NTCLE203E3474*B0 2381 640 5*474 R_T (kΩ)	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
- 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

NTC Thermistors, Radial Leaded, Standard Precision



FEATURES

- Accuracy over a wide temperature range
- High stability over a long life
- Excellent price/performance ratio
- UL recognized, file E148885
- Old part number was 2322 640 3/4/6....
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

- Temperature measurement, sensing and control, temperature compensation in industrial and consumer electronics

DESCRIPTION

These thermistors have a negative temperature coefficient. The device consists of a chip with two solid copper tin plated leads. It is grey lacquered and color coded, but not insulated.

PACKAGING

The thermistors are packed in bulk or tape on reel; see code numbers and relevant packaging quantities.

DESIGN-IN SUPPORT

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

MARKING

The thermistors are marked with colored bands; see dimensions drawing and “Electrical data and ordering information”.

MOUNTING

By soldering in any position.
Not intended for potted applications.

QUICK REFERENCE DATA

PARAMETER	VALUE
Resistance value at 25 °C	3.3 Ω to 470 kΩ
Tolerance on R_{25} - value	± 2 %; ± 3 %; ± 5 %
$B_{25/85}$ - value	2880K to 4570K
Tolerance on $B_{25/85}$ - value	± 0.5 % to ± 3 %
Maximum dissipation	500 mW
Dissipation factor δ (for information only)	7 mW/K 8.5 mW/K (for R_{25} value ≤ 680 Ω)
Response time (in oil)	≈ 1.2 s
Thermal time constant τ (for information only)	15 s
Operating temperature range:	
at zero dissipation; continuously	- 40 °C to + 125 °C
at zero dissipation; for short periods	≤ 150 °C
at maximum dissipation	0 °C to 55 °C
Climatic category acc. IEC 60068-1	40/125/56
Weight	≈ 0.3 g

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25}	$B_{25/85}$ - VALUE		UL APPROVED	12NC 2381 640 3/4/6.... (1)	SAP MATERIAL AND ORDERING NO. NTCLE100E3....B0/T1/T2 (2)	COLOR CODE (3)		
(Ω)	(K)	(± %)	(Y/N)			I	II	III
3.3	2880	3	N	*338	338*B0	Orange	Orange	Gold
4.7	2880	3	N	*478	478*B0	Yellow	Violet	Gold
6.8	2880	3	N	*688	688*B0	Blue	Grey	Gold
10	2990	3	N	*109	109*B0	Brown	Black	Black
15	3041	3	N	*159	159*B0	Brown	Green	Black
22	3136	3	N	*229	229*B0	Red	Red	Black
33	3390	3	Y	*339	339*B0	Orange	Orange	Black
47	3390	3	Y	*479	479*B0	Yellow	Violet	Black
68	3390	3	Y	*689	689*B0	Blue	Grey	Black
100	3560	1.5	Y	*101	101*B0	Brown	Black	Brown
150	3560	1.5	Y	*151	151*B0	Brown	Green	Brown
220	3560	1.5	Y	*221	221*B0	Red	Red	Brown
330	3560	1.5	Y	*331	331*B0	Orange	Orange	Brown
470	3560	1.5	Y	*471	471*B0	Yellow	Violet	Brown

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} (Ω)	$B_{25/85}$ - VALUE (K)	(± %)	UL APPROVED (Y/N)	12NC 2381 640 3/4/6.... (1)	SAP MATERIAL AND ORDERING NO. NTCLE100E3....B0/T1/T2 (2)	COLOR CODE (3) I	II	III
680	3560	1.5	Y	*681	681*B0	Blue	Grey	Brown
1000	3528	0.5	Y	*102	102*B0	Brown	Black	Red
1500	3528	0.5	Y	*152	152*B0	Brown	Green	Red
2000	3528	0.5	Y	*202	202*B0	Red	Black	Red
2200	3977	0.75	Y	*222	222*B0	Red	Red	Red
2700	3977	0.75	Y	*272	272*B0	Red	violet	Red
3300	3977	0.75	Y	*332	332*B0	Orange	Orange	Red
4700	3977	0.75	Y	*472	472*B0	Yellow	Violet	Red
5000	3977	0.75	Y	*502	502*B0	Green	Black	Red
6800	3977	0.75	Y	*682	682*B0	Blue	Grey	Red
10 000	3977	0.75	Y	*103	103*B0	Brown	Black	Orange
12 000	3740	2	Y	*123	123*B0	Brown	Red	Orange
15 000	3740	2	Y	*153	153*B0	Brown	Green	Orange
22 000	3740	2	Y	*223	223*B0	Red	Red	Orange
33 000	4090	1.5	Y	*333	333*B0	Orange	Orange	Orange
47 000	4090	1.5	Y	*473	473*B0	Yellow	Violet	Orange
50 000	4190	1.5	Y	*503	503*B0	Green	Black	Orange
68 000	4190	1.5	Y	*683	683*B0	Blue	Grey	Orange
100 000	4190	1.5	Y	*104	104*B0	Brown	Black	Yellow
150 000	4370	2.5	Y	*154	154*B0	Brown	Green	Yellow
220 000	4370	2.5	Y	*224	224*B0	Red	Red	Yellow
330 000	4570	1.5	N	*334	334*B0	Orange	Orange	Yellow
470 000	4570	1.5	N	*474	474*B0	Yellow	Violet	Yellow

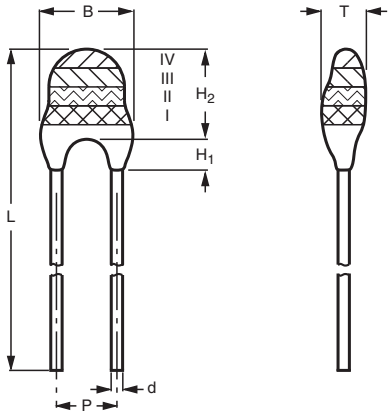
Notes

(1) Replace * in 12NC by 3 for 5 %, 6 for 3 %, 4 for 2 %

(2) Replace * in SAP by J for 5 %, H for 3 %, G for 2 %

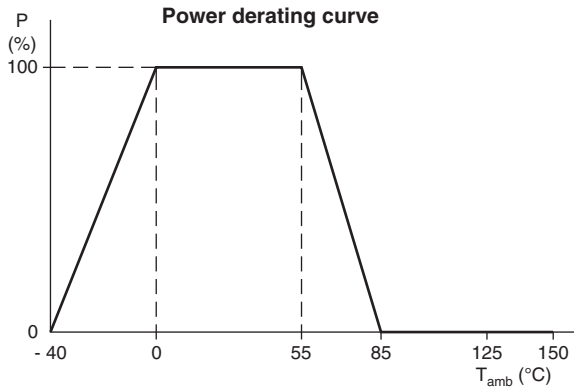
(3) For R_{25} ± 2 % band IV is red, ± 3 % band IV is orange, ± 5 % band IV is gold

DIMENSIONS in millimeters



2381 640 6.338 to 6.474

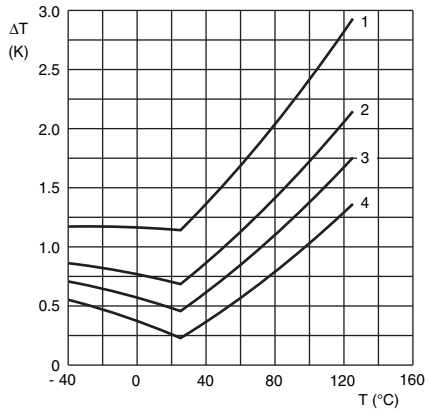
DERATING AND TEMPERATURE TOLERANCES



PHYSICAL DIMENSIONS FOR RELEVANT TYPE (all dimensions in millimeters)

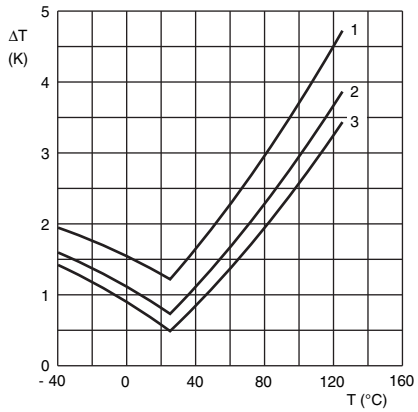
R_{25} VALUE	$B_{max.}$	d	H_1 Min.	H_1 Max.	$H_{2\ max.}$	L	P	$T_{max.}$
3.3 Ω to 220 Ω	5.0	0.6 ± 0.06	1.0	4.0	6.0	24 ± 1.5	2.54	4.0
330 Ω to 470 kΩ	3.3 ± 0.5	0.6 ± 0.06	1.0	3.0	6.0	24 ± 1.5	2.54	3.0

TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



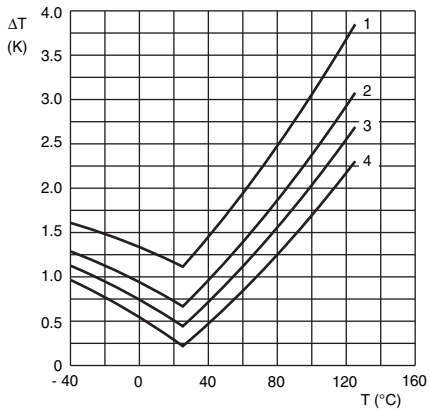
Curves valid for 2.2 to 10 kΩ
Curve 1: $\Delta R_{25}/R_{25}$ = 5 %
Curve 2: $\Delta R_{25}/R_{25}$ = 3 %
Curve 3: $\Delta R_{25}/R_{25}$ = 2 %
Curve 4: $\Delta R_{25}/R_{25}$ = 1 %
(for 2381 640 5.... series only)

TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



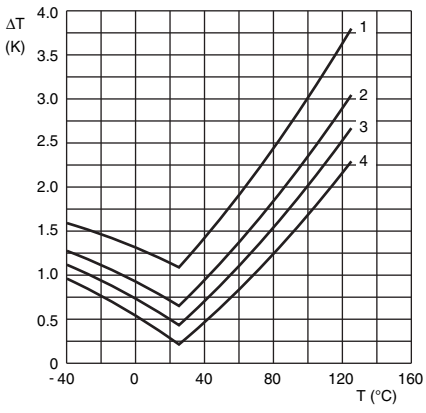
Curves valid for 12 to 22 kΩ
Curve 1: $\Delta R_{25}/R_{25}$ = 5 %
Curve 2: $\Delta R_{25}/R_{25}$ = 3 %
Curve 3: $\Delta R_{25}/R_{25}$ = 2 %

TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



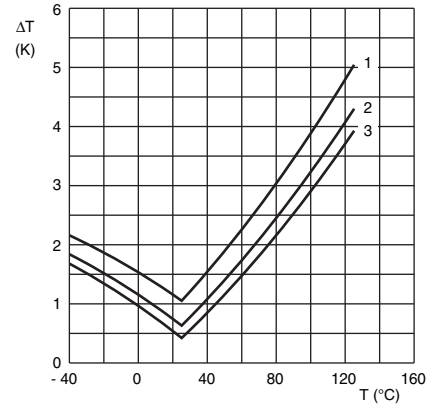
Curves valid for 33 to 47 kΩ
Curve 1: $\Delta R_{25}/R_{25}$ = 5 %
Curve 2: $\Delta R_{25}/R_{25}$ = 3 %
Curve 3: $\Delta R_{25}/R_{25}$ = 2 %
Curve 4: $\Delta R_{25}/R_{25}$ = 1 %
(for 2381 640 5.... series only)

TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



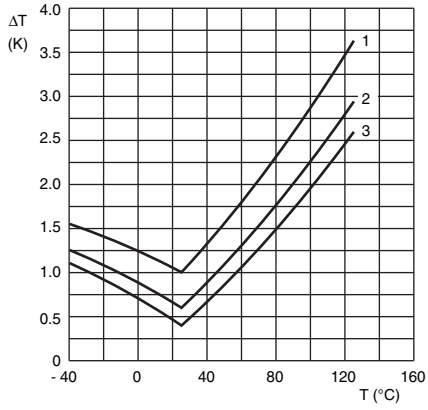
Curves valid for 68 to 100 kΩ
Curve 1: $\Delta R_{25}/R_{25}$ = 5 %
Curve 2: $\Delta R_{25}/R_{25}$ = 3 %
Curve 3: $\Delta R_{25}/R_{25}$ = 2 %
Curve 4: $\Delta R_{25}/R_{25}$ = 1 %
(for 2381 640 5.... series only)

TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



Curves valid for 150 to 220 kΩ
Curve 1: $\Delta R_{25}/R_{25}$ = 5 %
Curve 2: $\Delta R_{25}/R_{25}$ = 3 %
Curve 3: $\Delta R_{25}/R_{25}$ = 2 %

TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



Curves valid for 330 to 470 kΩ
Curve 1: $\Delta R_{25}/R_{25}$ = 5 %
Curve 2: $\Delta R_{25}/R_{25}$ = 3 %
Curve 3: $\Delta R_{25}/R_{25}$ = 2 %

R_T VALUE AND TOLERANCE

These thermistors have a narrow tolerance on the B-value, the result of which provides a very small tolerance on the nominal resistance value over a wide temperature range. For this reason the usual graphs of $R = f(T)$ are replaced by Resistance Values at Intermediate Temperatures Tables, together with a formula to calculate the characteristics with a high precision.

FORMULAE TO DETERMINE NOMINAL RESISTANCE VALUES

The resistance values at intermediate temperatures, or the operating temperature values, can be calculated using the following interpolation laws
(extended "*Steinhart and Hart*"):

$$R_{(T)} = R_{ref} \times e^{(A + B/T + C/T^2 + D/T^3)} \quad (1)$$

$$T_{(R)} = \left(A_1 + B_1 \ln\frac{R}{R_{ref}} + C_1 \ln^2\frac{R}{R_{ref}} + D_1 \ln^3\frac{R}{R_{ref}}\right)^{-1} \quad (2)$$

where:

A, B, C, D, A_1, B_1, C_1 and D_1 are constant values depending on the material concerned; see table below.

R_{ref} is the resistance value at a reference temperature (in this event 25 °C).

T is the temperature in K.

Formulae numbered and are interchangeable with an error of max. 0.005 °C in the range 25 °C to 125 °C and max. 0.015 °C in the range - 40 °C to + 25 °C.

DETERMINATION OF THE RESISTANCE/TEMPERATURE DEVIATION FROM NOMINAL VALUE

The total resistance deviation is obtained by combining the 'R_{25}-tolerance' and the 'resistance deviation due to B-tolerance'.

When:

X = R_{25}-tolerance
Y = resistance deviation due to B-tolerance
Z = complete resistance deviation,

then: $Z = \left[\left(1 + \frac{X}{100}\right) \times \left(1 + \frac{Y}{100}\right) - 1\right] \times 100\ \%$ or $Z \approx X + Y$

When:

TCR = temperature coefficient
ΔT = temperature deviation,

then: $\Delta T = \frac{Z}{TCR}$

The temperature tolerances are plotted in the graphs on the previous page.

Example: at 0 °C, assume X = 5 %, Y = 0.89 % and TCR = 5.08 %/K (see Table), then:

$$Z = \left\{\left[1 + \frac{5}{100}\right] \times \left[1 + \frac{0.89}{100}\right] - 1\right\} \times 100\%$$

$$= \{1.05 \times 1.0089 - 1\} \times 100\% = 5.93\dot{4}5\% \ (\approx 5.93\%)$$

$$\Delta T = \frac{Z}{TCR} = \frac{5.93}{5.08} = 1.167\ °C\ (\approx 1.17\ °C)$$

A NTC with a R_{25} - value of 10 kΩ has a value of 32.56 kΩ between - 1.17 and + 1.17 °C.

PARAMETER FOR DETERMINING NOMINAL RESISTANCE VALUES

NUMBER	$B_{25/85}$ (K)	NAME	TOL. B VALUE %	A	B (K)	C (K^2)	D (K^3)	A_1	B_1 (K^{-1})	C_1 (K^{-2})	D_1 (K^{-3})
1	2880	Mat O. with Bn = 2880K	3	- 9.094	2251.74	229098	- 2.744820E+07	3.354016E-03	3.495020E-04	2.095959E-06	4.260615E-07
2	2990	Mat P. with Bn = 3990K	3	- 10.2296	2887.62	132336	- 2.502510E+07	3.354016E-03	3.415560E-04	4.955455E-06	4.364236E-07
3	3041	Mat Q. with Bn = 3041K	3	- 11.1334	3658.73	- 102895	5.166520E+05	3.354016E-03	3.349290E-04	3.683843E-06	7.050455E-07
4	3136	Mat R. with Bn = 3136K	3	- 12.4493	4702.74	- 402687	3.196830E+07	3.354016E-03	3.243880E-04	2.658012E-06	- 2.701560E-07
5	3390	Mat S. with Bn = 3390K	3	- 12.6814	4391.97	- 232807	1.509643E+07	3.354016E-03	2.993410E-04	2.135133E-06	- 5.672000E-09
6	3528 (1)	Mat I. with Bn = 3528K	0.5	- 12.0596	3687.667	- 7617.13	- 5.914730E+06	3.354016E-03	2.909670E-04	1.632136E-06	7.192200E-08
	3528 (2)			- 21.0704	11903.95	- 2504699	2.470338E+08	3.354016E-03	2.933908E-04	3.494314E-06	- 7.712690E-07
7	3560	Mat H. with Bn = 3560K	1.5	- 13.0723	4190.574	- 47158.4	- 1.199256E+07	3.354016E-03	2.884193E-04	4.118032E-06	1.786790E-07
8	3740	Mat B. with Bn = 3740K	2	- 13.8973	4557.725	- 98275	- 7.522357E+06	3.354016E-03	2.744032E-04	3.666944E-06	1.375492E-07
9	3977	Mat A. with Bn =3977K	0.75	- 14.6337	4791.842	- 115334	- 3.730535E+06	3.354016E-03	2.569850E-04	2.620131E-06	6.383091E-08
10	4090	Mat C. with Bn = 4090K	1.5	- 15.5322	5229.973	- 160451	- 5.414091E+06	3.354016E-03	2.519107E-04	3.510939E-06	1.105179E-07
11	4190	Mat D. with Bn = 4190K	1.5	- 16.0349	5459.339	- 191141	- 3.328322E+06	3.354016E-03	2.460382E-04	3.405377E-06	1.034240E-07
12	4370	Mat E. with Bn = 4370K	2.5	- 16.8717	5759.15	- 194267	- 6.869149E+06	3.354016E-03	2.367720E-04	3.585140E-06	1.255349E-07
13	4570	Mat F. with Bn = 4570K	1.5	- 17.6439	6022.726	- 203157	- 7.183526E+06	3.354016E-03	2.264097E-04	3.278184E-06	1.097628E-07

Notes
(1) Temperature < 25 °C
(2) Temperature ≥ 25 °C

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 3.3 Ω, 4.7 Ω AND 6.8 Ω					
T_{OPER} (°C)	PART NUMBER NTCLE100E3338*** 2381 640 **338	PART NUMBER NTCLE100E3478*** 2381 640 **478	PART NUMBER NTCLE100E3688*** 2381 640 **688	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	R_T (Ω)	R_T (Ω)	R_T (Ω)		
- 40	45.00	64.09	92.73	- 4.97	8.08
- 35	35.25	50.20	72.63	- 4.80	7.30
- 30	27.84	39.64	57.36	- 4.64	6.55
- 25	22.16	31.56	45.66	- 4.48	5.84
- 20	17.78	25.32	36.63	- 4.33	5.15
- 15	14.37	20.46	29.60	- 4.19	4.49
- 10	11.69	16.65	24.09	- 4.05	3.85
- 5	9.582	13.65	19.74	- 3.92	3.24
0	7.904	11.26	16.29	- 3.79	2.65
5	6.560	9.344	13.52	- 3.66	2.08
10	5.479	7.803	11.29	- 3.55	1.54
15	4.602	6.554	9.482	- 3.43	1.01
20	3.886	5.535	8.008	- 3.32	0.49
25	3.300	4.700	6.800	- 3.22	0.00
30	2.816	4.011	5.803	- 3.12	0.48
35	2.415	3.440	4.977	- 3.02	0.94
40	2.081	2.964	4.289	- 2.93	1.39
45	1.801	2.566	3.712	- 2.84	1.82
50	1.566	2.230	3.227	- 2.76	2.24
55	1.367	1.947	2.817	- 2.68	2.65
60	1.198	1.706	2.469	- 2.60	3.04
65	1.054	1.501	2.172	- 2.52	3.43
70	0.9308	1.326	1.918	- 2.45	3.80
75	0.8248	1.175	1.700	- 2.38	4.16
80	0.7334	1.044	1.511	- 2.32	4.51
85	0.6542	0.9318	1.348	- 2.25	4.85
90	0.5854	0.8338	1.206	- 2.19	5.19
95	0.5255	0.7484	1.083	- 2.13	5.51
100	0.4730	0.6737	0.9748	- 2.07	5.82
105	0.4270	0.6082	0.8799	- 2.02	6.13
110	0.3865	0.5505	0.7965	- 1.97	6.43
115	0.3508	0.4996	0.7228	- 1.92	6.72
120	0.3192	0.4545	0.6576	- 1.87	7.00
125	0.2911	0.4145	0.5998	- 1.82	7.28
130	0.2661	0.3789	0.5483	- 1.77	7.55
135	0.2438	0.3472	0.5023	- 1.73	7.81
140	0.2238	0.3188	0.4612	- 1.69	8.07
145	0.2059	0.2933	0.4244	- 1.65	8.32
150	0.1899	0.2704	0.3912	- 1.61	8.56

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 10 Ω, 15 Ω AND 22 Ω

T_{OPER} (°C)	PART NUMBER NTCLE100E3109*** 2381 640 **109			PART NUMBER NTCLE100E3159*** 2381 640 **159			PART NUMBER NTCLE100E3229*** 2381 640 **229		
	R_T (Ω)	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)	R_T (Ω)	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)	R_T (Ω)	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
- 40	136.7	- 4.86	8.39	224.8	- 5.16	8.65	374.9	- 5.54	8.80
- 35	107.6	- 4.72	7.58	174.5	- 4.98	7.79	285.8	- 5.31	7.95
- 30	85.32	- 4.58	6.81	136.6	- 4.80	6.98	220.4	- 5.10	7.14
- 25	68.10	- 4.44	6.06	107.9	- 4.64	6.21	171.7	- 4.90	6.36
- 20	54.72	- 4.31	5.35	85.94	- 4.48	5.47	135.0	- 4.71	5.61
- 15	44.25	- 4.18	4.66	68.96	- 4.33	4.76	107.2	- 4.53	4.89
- 10	36.02	- 4.06	4.00	55.74	- 4.19	4.08	85.79	- 4.37	4.20
- 5	29.49	- 3.94	3.37	45.37	- 4.05	3.43	69.21	- 4.22	3.53
0	24.30	- 3.82	2.75	37.17	- 3.92	2.81	56.26	- 4.07	2.89
5	20.13	- 3.71	2.16	30.65	- 3.80	2.20	46.05	- 3.94	2.27
10	16.77	- 3.60	1.59	25.42	- 3.68	1.62	37.94	- 3.81	1.67
15	14.04	- 3.50	1.04	21.21	- 3.57	1.06	31.45	- 3.69	1.10
20	11.82	- 3.39	0.51	17.79	- 3.46	0.52	26.23	- 3.57	0.54
25	10.00	- 3.30	0.00	15.00	- 3.36	0.00	22.00	- 3.47	0.00
30	8.500	- 3.20	0.50	12.76	- 3.26	0.49	18.55	- 3.36	0.52
35	7.259	- 3.11	0.98	10.86	- 3.17	0.98	15.72	- 3.26	1.02
40	6.226	- 3.03	1.44	9.291	- 3.08	1.46	13.38	- 3.17	1.51
45	5.363	- 2.94	1.89	7.982	- 2.99	1.92	11.45	- 3.08	1.98
50	4.639	- 2.86	2.33	6.887	- 2.91	2.36	9.833	- 3.00	2.44
55	4.029	- 2.78	2.75	5.966	- 2.83	2.79	8.482	- 2.92	2.88
60	3.512	- 2.71	3.16	5.189	- 2.75	3.21	7.346	- 2.84	3.32
65	3.073	- 2.64	3.56	4.529	- 2.68	3.62	6.386	- 2.76	3.73
70	2.698	- 2.57	3.95	3.968	- 2.61	4.02	5.572	- 2.69	4.14
75	2.377	- 2.50	4.32	3.488	- 2.54	4.41	4.879	- 2.62	4.53
80	2.101	- 2.43	4.69	3.077	- 2.48	4.78	4.286	- 2.56	4.91
85	1.864	- 2.37	5.04	2.722	- 2.41	5.15	3.777	- 2.50	5.29
90	1.658	- 2.31	5.38	2.416	- 2.35	5.51	3.339	- 2.44	5.65
95	1.479	- 2.25	5.72	2.151	- 2.30	5.85	2.960	- 2.38	6.00
100	1.323	- 2.20	6.05	1.920	- 2.24	6.19	2.632	- 2.32	6.34
105	1.187	- 2.14	6.36	1.719	- 2.19	6.53	2.347	- 2.27	6.68
110	1.068	- 2.09	6.67	1.543	- 2.13	6.85	2.098	- 2.22	7.00
115	0.9635	- 2.04	6.98	1.389	- 2.08	7.17	1.880	- 2.17	7.32
120	0.8712	- 1.99	7.27	1.253	- 2.03	7.48	1.689	- 2.12	7.62
125	0.7897	- 1.94	7.56	1.133	- 1.99	7.78	1.521	- 2.07	7.93
130	0.7174	- 1.90	7.84	1.027	- 1.94	8.08	1.373	- 2.03	8.22
135	0.6533	- 1.85	8.11	0.9326	- 1.90	8.37	1.242	- 1.98	8.50
140	0.5961	- 1.81	8.37	0.8490	- 1.86	8.65	1.126	- 1.94	8.78
145	0.5451	- 1.77	8.63	0.7744	- 1.82	8.93	1.023	- 1.90	9.06
150	0.4995	- 1.73	8.89	0.7079	- 1.78	9.20	0.9309	- 1.86	9.32

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 33 Ω, 47 Ω AND 68 Ω					
T_{OPER} (°C)	PART NUMBER NTCLE100E3339*** 2381 640 **339	PART NUMBER NTCLE100E3479*** 2381 640 **479	PART NUMBER NTCLE100E3689*** 2381 640 **689	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	R_T (Ω)	R_T (Ω)	R_T (Ω)		
- 40	707.0	1007	1457	- 5.94	9.30
- 35	528.5	752.7	1089	- 5.70	8.44
- 30	399.5	569.0	823.3	- 5.49	7.60
- 25	305.3	434.8	629.1	- 5.28	6.79
- 20	235.6	335.6	485.5	- 5.09	6.01
- 15	183.5	261.4	378.2	- 4.90	5.25
- 10	144.3	205.5	297.3	- 4.73	4.51
- 5	114.3	162.8	235.6	- 4.57	3.80
0	91.34	130.1	188.2	- 4.42	3.11
5	73.51	104.7	151.5	- 4.27	2.45
10	59.59	84.87	122.8	- 4.13	1.80
15	48.63	69.26	100.2	- 4.00	1.18
20	39.94	56.88	82.29	- 3.88	0.58
25	33.00	47.00	68.00	- 3.76	0.00
30	27.43	39.06	56.51	- 3.64	0.56
35	22.92	32.64	47.23	- 3.54	1.11
40	19.26	27.42	39.68	- 3.43	1.63
45	16.26	23.16	33.50	- 3.34	2.14
50	13.79	19.65	28.42	- 3.24	2.63
55	11.76	16.74	24.23	- 3.15	3.11
60	10.06	14.33	20.74	- 3.07	3.57
65	8.652	12.32	17.83	- 2.98	4.02
70	7.468	10.64	15.39	- 2.90	4.45
75	6.471	9.216	13.33	- 2.83	4.87
80	5.628	8.015	11.60	- 2.76	5.27
85	4.912	6.996	10.12	- 2.69	5.66
90	4.302	6.127	8.865	- 2.62	6.04
95	3.780	5.384	7.790	- 2.55	6.41
100	3.332	4.746	6.867	- 2.49	6.77
105	2.946	4.196	6.071	- 2.43	7.11
110	2.613	3.721	5.384	- 2.37	7.45
115	2.324	3.310	4.788	- 2.32	7.77
120	2.072	2.951	4.270	- 2.26	8.09
125	1.853	2.639	3.818	- 2.21	8.39
130	1.661	2.365	3.422	- 2.16	8.69
135	1.492	2.125	3.075	- 2.11	8.97
140	1.344	1.914	2.770	- 2.07	9.25
145	1.213	1.728	2.500	- 2.02	9.52
150	1.098	1.564	2.262	- 1.98	9.79

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 100 Ω, 150 Ω, 220 Ω, 330 Ω, 470 Ω AND 680 Ω

T_{OPER} (°C)	PART NUMBER NTCLE100E3101*** 2381 640 **101	PART NUMBER NTCLE100E3151*** 2381 640 **151	PART NUMBER NTCLE100E3221*** 2381 640 **221	PART NUMBER NTCLE100E3331*** 2381 640 **331	PART NUMBER NTCLE100E3471*** 2381 640 **471	PART NUMBER NTCLE100E3681*** 2381 640 **681	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)		
- 40	2193	3289	4824	7236	10 305	14 910	- 5.75	4.99
- 35	1652	2478	3635	5452	7766	11 235	- 5.57	4.51
- 30	1256	1884	2763	4144	5902	8540	- 5.40	4.05
- 25	962.5	1444	2117	3176	4524	6545	- 5.24	3.61
- 20	743.6	1115	1636	2454	3495	5057	- 5.08	3.19
- 15	579.0	868.5	1274	1911	2721	3937	- 4.93	2.78
- 10	454.2	681.2	999.1	1499	2135	3088	- 4.78	2.38
- 5	358.8	538.2	789.4	1184	1686	2440	- 4.64	2.01
0	285.4	428.2	628.0	942.0	1342	1941	- 4.51	1.64
5	228.6	342.9	502.9	754.4	1074	1554	- 4.38	1.29
10	184.2	276.4	405.3	608.0	866.0	1253	- 4.25	0.95
15	149.4	224.1	328.7	493.1	702.2	1016	- 4.13	0.62
20	121.9	182.8	268.2	402.2	572.9	828.8	- 4.01	0.31
25	100.0	150.0	220.0	330.0	470.0	680.0	- 3.90	0.00
30	82.49	123.7	181.5	272.2	387.7	561.0	- 3.80	0.30
35	68.41	102.6	150.5	225.8	321.5	465.2	- 3.69	0.58
40	57.02	85.54	125.5	188.2	268.0	387.8	- 3.59	0.86
45	47.77	71.65	105.1	157.6	224.5	324.8	- 3.50	1.13
50	40.20	60.30	88.44	132.7	188.9	273.3	- 3.40	1.39
55	33.98	50.98	74.76	112.1	159.7	231.1	- 3.31	1.64
60	28.86	43.28	63.48	95.23	135.6	196.2	- 3.23	1.88
65	24.61	36.91	54.13	81.20	115.6	167.3	- 3.15	2.12
70	21.07	31.60	46.35	69.52	99.01	143.3	- 3.07	2.35
75	18.11	27.16	39.84	59.76	85.11	123.1	- 2.99	2.57
80	15.62	23.43	34.37	51.56	73.43	106.2	- 2.91	2.79
85	13.53	20.29	29.76	44.65	63.59	92.00	- 2.84	3.00
90	11.76	17.63	25.86	38.80	55.26	79.95	- 2.77	3.21
95	10.25	15.38	22.55	33.83	48.18	69.71	- 2.71	3.41
100	8.968	13.45	19.73	29.59	42.15	60.98	- 2.64	3.60
105	7.871	11.81	17.32	25.97	36.99	53.52	- 2.58	3.79
110	6.928	10.39	15.24	22.86	32.56	47.11	- 2.52	3.97
115	6.117	9.176	13.46	20.19	28.75	41.60	- 2.46	4.15
120	5.416	8.125	11.92	17.87	25.46	36.83	- 2.41	4.33
125	4.809	7.214	10.58	15.87	22.60	32.70	- 2.35	4.50
130	4.282	6.422	9.419	14.13	20.12	29.11	- 2.30	4.66
135	3.822	5.732	8.408	12.61	17.96	25.99	- 2.25	4.83
140	3.420	5.130	7.523	11.29	16.07	23.25	- 2.20	4.99
145	3.068	4.601	6.749	10.12	14.42	20.86	- 2.15	5.14
150	2.758	4.137	6.068	9.102	12.96	18.76	- 2.10	5.29

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 1 kΩ, 1.5 kΩ AND 2 kΩ					
T_{OPER} (°C)	PART NUMBER NTCLE100E3102*** 2381 640 **102	PART NUMBER NTCLE100E3152*** 2381 640 **152	PART NUMBER NTCLE100E3202*** 2381 640 **202	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	R_T (Ω)	R_T (Ω)	R_T (Ω)		
- 40	23 342	35 013	46 684	- 6.06	1.65
- 35	17 336	26 004	34 672	- 5.84	1.49
- 30	13 018	19 526	26 035	- 5.62	1.34
- 25	9877	14 816	19 754	- 5.42	1.19
- 20	7569	11 353	15 138	- 5.23	1.05
- 15	5855	8782	11 709	- 5.05	0.92
- 10	4569	6854	9138	- 4.87	0.79
- 5	3596	5395	7193	- 4.71	0.66
0	2854	4280	5707	- 4.55	0.54
5	2282	3422	4563	- 4.40	0.43
10	1838	2757	3675	- 4.26	0.31
15	1491	2236	2981	- 4.12	0.21
20	1217	1826	2434	- 3.99	0.10
25	1000	1500	2000	- 3.87	0.00
30	826.6	1240	1653	- 3.75	0.10
35	687.3	1031	1375	- 3.63	0.19
40	574.6	861.9	1149	- 3.53	0.28
45	482.7	724.0	965.4	- 3.42	0.37
50	407.4	611.0	814.7	- 3.32	0.46
55	345.2	517.8	690.5	- 3.23	0.54
60	293.7	440.6	587.4	- 3.14	0.62
65	250.8	376.2	501.6	- 3.05	0.70
70	214.9	322.4	429.8	- 2.97	0.78
75	184.7	277.1	369.5	- 2.89	0.86
80	159.3	238.9	318.6	- 2.81	0.93
85	137.7	206.6	275.5	- 2.73	1.01
90	119.4	179.1	238.8	- 2.66	1.08
95	103.8	155.7	207.6	- 2.59	1.15
100	90.45	135.7	180.9	- 2.53	1.22
105	79.00	118.5	158.0	- 2.46	1.29
110	69.15	103.7	138.3	- 2.40	1.35
115	60.66	90.99	121.3	- 2.34	1.42
120	53.32	79.98	106.6	- 2.29	1.48
125	46.96	70.44	93.92	- 2.23	1.55
130	41.43	62.15	82.87	- 2.18	1.61
135	36.63	54.94	73.25	- 2.13	1.67
140	32.43	48.65	64.87	- 2.08	1.73
145	28.77	43.16	57.54	- 2.03	1.79
150	25.56	38.34	51.12	- 1.98	1.85

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2.2 kΩ, 2.7 kΩ, 3.3 kΩ, 4.7 kΩ, 5.0 kΩ, 6.8 kΩ AND 10 kΩ

T_{OPER} (°C)	PART NUMBER NTCLE100E3222*** 2381 640 **222	PART NUMBER NTCLE100E3272*** 2381 640 **272	PART NUMBER NTCLE100E3332*** 2381 640 **332	PART NUMBER NTCLE100E3472*** 2381 640 **472	PART NUMBER NTCLE100E3502*** 2381 640 **502	PART NUMBER NTCLE100E3682*** 2381 640 **682	PART NUMBER NTCLE100E3103*** 2381 640 **103	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)		
- 40	73 061	89 665	109 591	156 084	166 047	225 824	332 094	- 6.62	2.79
- 35	52 778	64 773	79 167	112 753	119 950	163 132	239 900	- 6.39	2.52
- 30	38 544	47 304	57 816	82 344	87 600	119 136	175 200	- 6.18	2.26
- 25	28 443	34 907	42 665	60 765	64 643	87 915	129 287	- 5.98	2.02
- 20	21 199	26 017	31 798	45 288	48 179	65 524	96 358	- 5.78	1.78
- 15	15 950	19 575	23 925	34 075	36 250	49 300	72 500	- 5.60	1.55
- 10	12 110	14 862	18 165	25 872	27 523	37 431	55 046	- 5.42	1.33
- 5	9275	11 382	13 912	19 814	21 078	28 667	42 157	- 5.25	1.12
0	7162	8790	10 743	15 300	16 277	22 137	32 554	- 5.09	0.92
5	5574	6841	8362	11 909	12 669	17 230	25 339	- 4.93	0.72
10	4372	5365	6558	9340	9936	13 513	19 872	- 4.79	0.53
15	3454	4239	5180	7378	7849	10 675	15 698	- 4.64	0.35
20	2747	3372	4121	5869	6244	8492	12 488	- 4.51	0.17
25	2200	2700	3300	4700	5000	6800	10 000	- 4.38	0.00
30	1773	2176	2659	3788	4030	5480	8059	- 4.25	0.17
35	1438	1764	2156	3071	3267	4444	6535	- 4.13	0.32
40	1173	1439	1759	2505	2665	3624	5330	- 4.02	0.48
45	961.8	1180	1443	2055	2186	2973	4372	- 3.91	0.63
50	793.2	973.4	1190	1694	1803	2452	3605	- 3.80	0.77
55	657.5	806.9	986.3	1405	1494	2032	2989	- 3.70	0.91
60	547.8	672.3	821.7	1170	1245	1693	2490	- 3.60	1.05
65	458.6	562.8	687.9	979.7	1042	1417	2084	- 3.51	1.18
70	385.7	473.3	578.5	823.9	876.5	1192	1753	- 3.42	1.31
75	325.8	399.8	488.7	696.0	740.5	1007	1481	- 3.33	1.44
80	276.4	339.2	414.6	590.5	628.2	854.3	1256	- 3.25	1.56
85	235.5	289.0	353.2	503.0	535.2	727.8	1070	- 3.17	1.68
90	201.4	247.2	302.1	430.2	457.7	622.5	915.4	- 3.09	1.79
95	172.9	212.2	259.4	369.4	393.0	534.5	786.0	- 3.01	1.90
100	149.0	182.9	223.5	318.3	338.6	460.6	677.3	- 2.94	2.01
105	128.9	158.2	193.3	275.3	292.9	398.3	585.7	- 2.87	2.12
110	111.8	137.2	167.7	238.9	254.2	345.7	508.3	- 2.80	2.22
115	97.37	119.5	146.1	208.0	221.3	301.0	442.6	- 2.74	2.32
120	85.05	104.4	127.6	181.7	193.3	262.9	386.6	- 2.67	2.42
125	74.52	91.46	111.8	159.2	169.4	230.3	338.7	- 2.61	2.51
130	65.49	80.38	98.24	139.9	148.8	202.4	297.7	- 2.55	2.61
135	57.72	70.84	86.59	123.3	131.2	178.4	262.4	- 2.50	2.70
140	51.02	62.62	76.53	109.0	116.0	157.7	231.9	- 2.44	2.78
145	45.22	55.49	67.83	96.60	102.8	139.8	205.5	- 2.39	2.87
150	40.18	49.31	60.27	85.84	91.32	124.2	182.6	- 2.34	2.96

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 12 kΩ, 15 kΩ AND 22 kΩ					
T_{OPER} (°C)	PART NUMBER NTCLE100E3123*** 2381 640 **123	PART NUMBER NTCLE100E3153*** 2381 640 **153	PART NUMBER NTCLE100E3223*** 2381 640 **223	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	R_T (kΩ)	R_T (kΩ)	R_T (kΩ)		
- 40	309.4	386.7	567.2	- 6.07	7.00
- 35	229.5	286.9	420.8	- 5.88	6.32
- 30	171.8	214.8	315.0	- 5.70	5.68
- 25	129.8	162.3	238.0	- 5.52	5.06
- 20	98.93	123.7	181.4	- 5.35	4.46
- 15	76.02	95.02	139.4	- 5.19	3.89
- 10	58.88	73.60	107.9	- 5.03	3.34
- 5	45.95	57.44	84.25	- 4.88	2.81
0	36.13	45.16	66.24	- 4.74	2.30
5	28.61	35.76	52.45	- 4.60	1.80
10	22.80	28.51	41.81	- 4.47	1.33
15	18.30	22.87	33.55	- 4.34	0.87
20	14.77	18.47	27.08	- 4.22	0.43
25	12.00	15.00	22.00	- 4.10	0.00
30	9.804	12.25	17.97	- 3.99	0.41
35	8.054	10.07	14.77	- 3.88	0.81
40	6.652	8.315	12.20	- 3.77	1.20
45	5.522	6.903	10.12	- 3.67	1.58
50	4.607	5.759	8.447	- 3.58	1.94
55	3.862	4.828	7.081	- 3.48	2.29
60	3.252	4.066	5.963	- 3.39	2.64
65	2.751	3.439	5.044	- 3.30	2.97
70	2.337	2.921	4.284	- 3.22	3.29
75	1.993	2.492	3.654	- 3.14	3.60
80	1.707	2.134	3.129	- 3.06	3.91
85	1.467	1.834	2.690	- 2.99	4.20
90	1.266	1.582	2.321	- 2.92	4.49
95	1.096	1.370	2.010	- 2.85	4.77
100	0.9524	1.190	1.746	- 2.78	5.04
105	0.8302	1.038	1.522	- 2.71	5.31
110	0.7260	0.9075	1.331	- 2.65	5.56
115	0.6369	0.7961	1.168	- 2.59	5.82
120	0.5604	0.7005	1.027	- 2.53	6.06
125	0.4945	0.6181	0.9065	- 2.47	6.30
130	0.4375	0.5469	0.8022	- 2.42	6.53
135	0.3882	0.4853	0.7117	- 2.37	6.76
140	0.3454	0.4317	0.6332	- 2.31	6.98
145	0.3080	0.3850	0.5647	- 2.26	7.20
150	0.2754	0.3442	0.5049	- 2.22	7.41

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 33 kΩ, 47 kΩ, 50 kΩ, 68 kΩ AND 100 kΩ

T_{OPER} (°C)	PART NUMBER NTCLE100E3 2381 640								
	333*** **333	473*** **473	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)	503*** **503	683*** **683	104*** **104	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	R_T (kΩ)	R_T (kΩ)			R_T (kΩ)	R_T (kΩ)	R_T (kΩ)		
- 40	1116	1589	- 6.54	5.74	1833	2493	3666	- 6.69	5.88
- 35	808.6	1152	- 6.34	5.19	1319	1794	2638	- 6.49	5.31
- 30	591.7	842.8	- 6.15	4.66	958.3	1303	1917	- 6.29	4.77
- 25	437.1	622.6	- 5.96	4.15	703.1	956.2	1406	- 6.10	4.25
- 20	325.9	464.1	- 5.79	3.66	520.6	708.0	1041	- 5.92	3.75
- 15	245.0	349.0	- 5.62	3.19	388.9	528.9	777.8	- 5.75	3.27
- 10	185.8	264.6	- 5.45	2.74	293.0	398.5	586.1	- 5.58	2.80
- 5	142.0	202.3	- 5.30	2.30	222.6	302.8	445.3	- 5.42	2.36
0	109.4	155.8	- 5.14	1.88	170.5	231.8	340.9	- 5.26	1.93
5	84.91	120.9	- 5.00	1.48	131.5	178.9	263.1	- 5.11	1.52
10	66.37	94.53	- 4.86	1.09	102.2	139.0	204.4	- 4.97	1.12
15	52.24	74.40	- 4.72	0.71	80.01	108.8	160.0	- 4.83	0.73
20	41.39	58.95	- 4.59	0.35	63.04	85.74	126.1	- 4.70	0.36
25	33.00	47.00	- 4.47	0.00	50.00	68.00	100.0	- 4.57	0.00
30	26.47	37.71	- 4.35	0.34	39.90	54.27	79.81	- 4.45	0.35
35	21.37	30.43	- 4.23	0.67	32.04	43.57	64.08	- 4.33	0.68
40	17.34	24.70	- 4.12	0.99	25.87	35.19	51.75	- 4.22	1.01
45	14.15	20.15	- 4.01	1.29	21.01	28.57	42.02	- 4.11	1.33
50	11.61	16.53	- 3.91	1.59	17.15	23.33	34.31	- 4.00	1.63
55	9.572	13.63	- 3.81	1.88	14.08	19.15	28.16	- 3.90	1.93
60	7.931	11.30	- 3.71	2.16	11.61	15.79	23.22	- 3.80	2.21
65	6.603	9.404	- 3.62	2.43	9.623	13.09	19.25	- 3.71	2.49
70	5.522	7.865	- 3.53	2.70	8.012	10.90	16.02	- 3.62	2.76
75	4.639	6.607	- 3.44	2.95	6.701	9.114	13.40	- 3.53	3.03
80	3.913	5.573	- 3.36	3.20	5.629	7.655	11.26	- 3.45	3.28
85	3.315	4.721	- 3.28	3.45	4.748	6.457	9.496	- 3.36	3.53
90	2.819	4.015	- 3.20	3.68	4.021	5.469	8.042	- 3.28	3.77
95	2.406	3.427	- 3.13	3.91	3.419	4.649	6.837	- 3.21	4.01
100	2.062	2.936	- 3.05	4.13	2.918	3.968	5.835	- 3.13	4.24
105	1.773	2.525	- 2.98	4.35	2.499	3.399	4.998	- 3.06	4.46
110	1.530	2.179	- 2.92	4.56	2.148	2.921	4.296	- 2.99	4.68
115	1.324	1.886	- 2.85	4.77	1.853	2.519	3.705	- 2.93	4.89
120	1.150	1.638	- 2.79	4.97	1.603	2.180	3.206	- 2.86	5.09
125	1.002	1.427	- 2.73	5.17	1.392	1.892	2.783	- 2.80	5.29
130	0.8757	1.247	- 2.67	5.36	1.212	1.648	2.423	- 2.74	5.49
135	0.7675	1.093	- 2.61	5.54	1.058	1.439	2.116	- 2.68	5.68
140	0.6746	0.9608	- 2.55	5.73	0.9269	1.261	1.854	- 2.62	5.87
145	0.5946	0.8468	- 2.50	5.90	0.8141	1.107	1.628	- 2.57	6.05
150	0.5254	0.7483	- 2.45	6.08	0.7170	0.9752	1.434	- 2.51	6.23

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

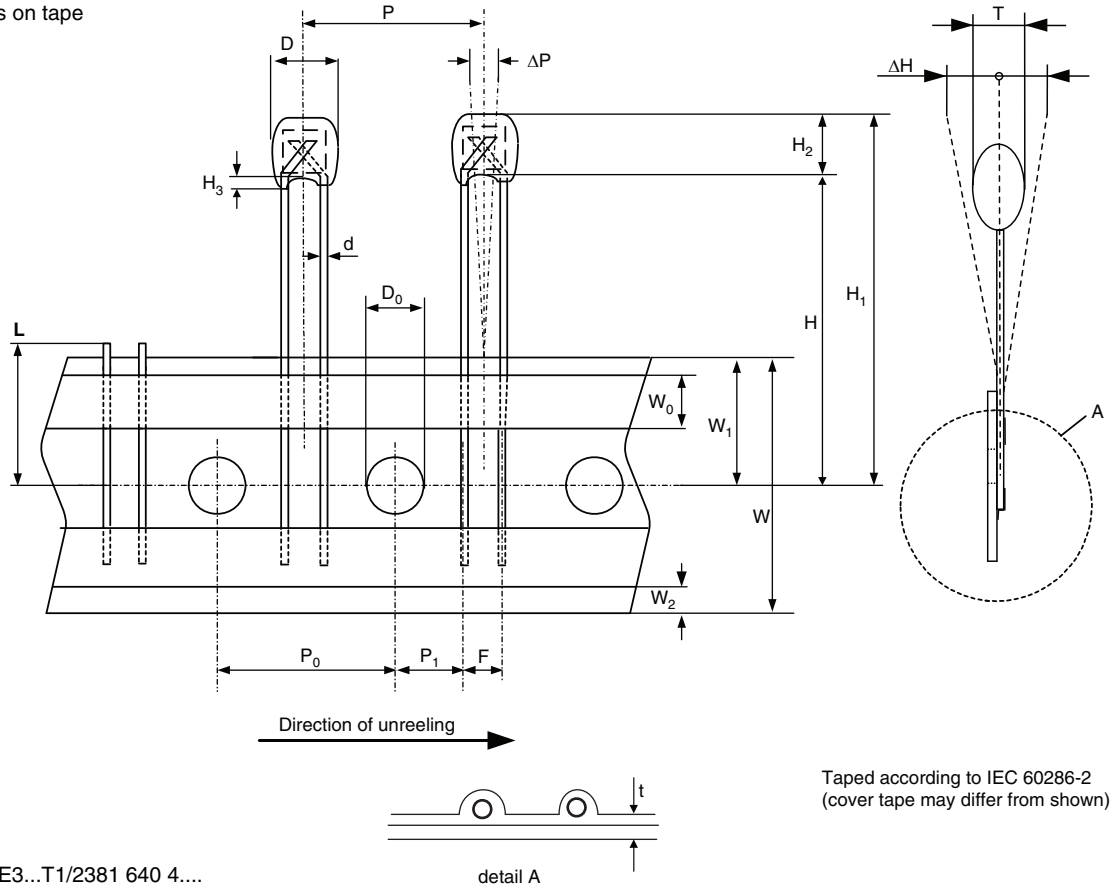
RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 150 kΩ, 220 kΩ, 330 kΩ AND 470 kΩ

T_{OPER} (°C)	PART NUMBER NTCLE100E3 2381 640							
	154*** **154	224*** **224	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)	334*** **334	474*** **474	TCR (%/K)	$\Delta R/R$ DUE TO $B_{tol.}$ (%)
	R_T (kΩ)	R_T (kΩ)			R_T (kΩ)	R_T (kΩ)		
- 40	6153	9024	- 6.83	10.22	16 044	22 850	- 7.14	6.41
- 35	4394	6444	- 6.64	9.24	11 282	16 068	- 6.94	5.80
- 30	3168	4646	- 6.45	8.29	8013	11 413	- 6.74	5.20
- 25	2305	3381	- 6.27	7.39	5747	8185	- 6.55	4.64
- 20	1693	2483	- 6.09	6.52	4161	5926	- 6.37	4.09
- 15	1254	1839	- 5.92	5.68	3040	4329	- 6.19	3.57
- 10	936.4	1373	- 5.75	4.88	2240	3190	- 6.02	3.06
- 5	705.0	1034	- 5.60	4.10	1665	2371	- 5.85	2.57
0	535.0	784.7	- 5.44	3.36	1248	1777	- 5.69	2.11
5	409.1	600.0	- 5.29	2.64	942.3	1342	- 5.54	1.65
10	315.1	462.1	- 5.15	1.94	717.1	1021	- 5.39	1.22
15	244.4	358.4	- 5.01	1.27	549.8	783.0	- 5.24	0.80
20	190.8	279.9	- 4.88	0.63	424.5	604.6	- 5.10	0.39
25	150.0	220.0	- 4.75	0.00	330.0	470.0	- 4.97	0.00
30	118.6	174.0	- 4.63	0.60	258.2	367.8	- 4.84	0.38
35	94.42	138.5	- 4.51	1.19	203.4	289.6	- 4.72	0.75
40	75.58	110.9	- 4.39	1.76	161.1	229.5	- 4.59	1.10
45	60.85	89.24	- 4.28	2.30	128.4	182.9	- 4.48	1.45
50	49.25	72.24	- 4.17	2.83	103.0	146.7	- 4.37	1.78
55	40.08	58.78	- 4.07	3.35	83.00	118.2	- 4.26	2.10
60	32.78	48.08	- 3.97	3.85	67.26	95.80	- 4.15	2.41
65	26.94	39.51	- 3.87	4.33	54.79	78.04	- 4.05	2.72
70	22.25	32.63	- 3.78	4.80	44.85	63.88	- 3.95	3.01
75	18.46	27.07	- 3.69	5.26	36.90	52.55	- 3.86	3.30
80	15.38	22.56	- 3.60	5.70	30.49	43.43	- 3.77	3.58
85	12.87	18.88	- 3.52	6.14	25.31	36.05	- 3.68	3.85
90	10.82	15.87	- 3.44	6.56	21.10	30.06	- 3.59	4.11
95	9.129	13.39	- 3.36	6.96	17.67	25.16	- 3.51	4.37
100	7.732	11.34	- 3.28	7.36	14.85	21.15	- 3.43	4.62
105	6.574	9.642	- 3.21	7.75	12.53	17.85	- 3.35	4.86
110	5.610	8.228	- 3.14	8.13	10.62	15.12	- 3.28	5.10
115	4.804	7.046	- 3.07	8.49	9.029	12.86	- 3.21	5.33
120	4.128	6.054	- 3.00	8.85	7.704	10.97	- 3.14	5.55
125	3.559	5.219	- 2.94	9.20	6.597	9.396	- 3.07	5.77
130	3.078	4.514	- 2.87	9.54	5.668	8.072	- 3.00	5.99
135	2.670	3.916	- 2.81	9.87	4.885	6.958	- 2.94	6.20
140	2.323	3.408	- 2.75	10.20	4.224	6.016	- 2.88	6.40
145	2.028	2.974	- 2.69	10.52	3.663	5.217	- 2.82	6.60
150	1.774	2.603	- 2.64	10.83	3.186	4.538	- 2.76	6.79

PACKAGING

TAPE SPECIFICATIONS

Thermistors on tape



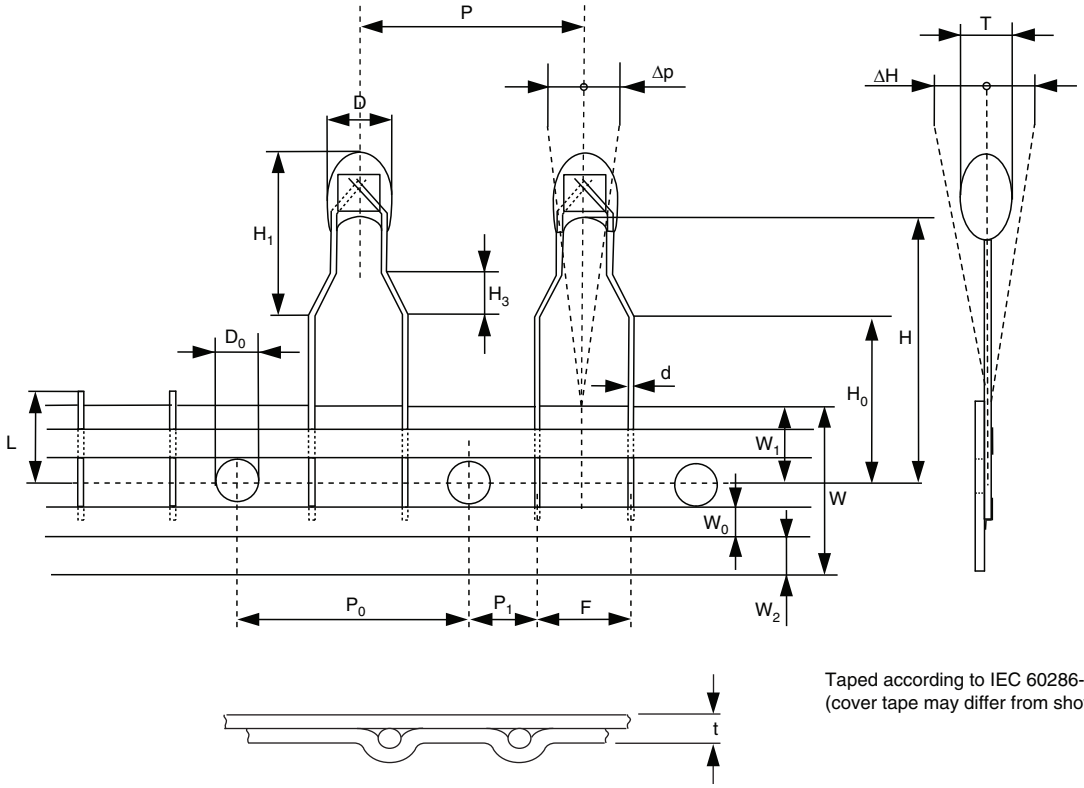
Taped according to IEC 60286-2
(cover tape may differ from shown)

1E pitch

NTCLE100E3...T1/2381 640 4....

DIMENSIONS in millimeters				
DETAILS	**SYMBOL**	**DIMENSIONS NOMINAL**	**TOLERANCE**	**REMARKS**
Body diameter Lead diameter Feed hole diameter	D d D_0	3.3 0.6 4.0	± 0.5 ± 10 % ± 0.2	5 max. for 3.3 Ω to 220 Ω
Lead to lead distance	F	2.54	± 0.3	Guaranteed between component and tape
Distance component to tape centre Component height Component alignment Distance top/bottom of components Length of lacquer under the comp. bottom	H H_1 Δh H_2 H_3	22.0 32.2 0 6 2	± 1.0 max. ± 2.0 max. ± 1	 1 to 4 max. for 3.3 Ω to 220 Ω
Length of snipped lead	L	11.0	max.	
Pitch between thermistors Feed hole pitch Feed hole center to lead center Component alignment	P P_0 P_1 Δp	12.7 12.7 5.08 0	± 1.0 ± 0.3 ± 0.7 ± 1.3	Cumulative pitch error ± 1 mm/20 pitches guaranteed between component and tape
Total thickness Total tape thickness	T t	3.0 0.9	max. max.	4 max. for 3.3 Ω to 220 Ω with cardboard tape 0.5 ± 0.1
Tape width Hold down tape width Hole position Hold down tape position	W W_0 W_1 W_2	18.0 5.0 9.0 1.5	± 1.0 - 0.5 ± 0.3 ± 0.5 ± 1	None of the hold down tapes may cover the holes

Thermistors on tape



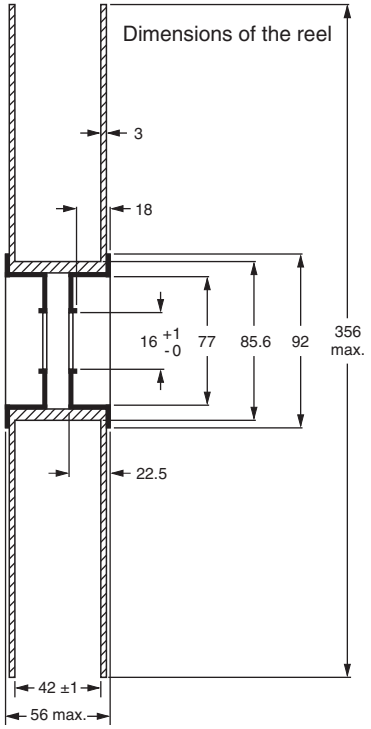
Taped according to IEC 60286-2
(cover tape may differ from shown)

2E pitch

NTCLE100E3...T2/2381 640 3....

DIMENSIONS in millimeters				
DETAILS	**SYMBOL**	**DIMENSIONS NOMINAL**	**TOLERANCE**	**REMARKS**
Body diameter Lead diameter Feed hole diameter	D d D_0	3.3 0.6 4.0	± 0.5 ± 10 % ± 0.2	5 max. for 3.3 Ω to 220 Ω
Lead to lead distance	F	5.0	+ 0.6 - 0.1	Guaranteed between component and tape
Distance component to tape centre Component height Compinent top to seating plane Component alignment Distance top - bottom lead clinch	H H_0 H_1 Δh H3	20.0 16.0 10.0 0.0	± 2 ± 0.5 max. ± 2.0	 12 max. for 100 Ω to 220 Ω Not defined
Length of snipped lead	L	11.0	max.	
Pitch between thermistors Feed hole pitch Feed hole center to lead center Component alignment	P P_0 P_1 Δp	12.7 12.7 3.81 0.0	± 1.0 ± 0.3 ± 0.7 ± 1.3	Cumulative pitch error ± 1 mm/20 pitches guaranteed between component and tape
Total thickness Total tape thickness	T t	3.0 0.9	max. max.	4 max. for 3.3 Ω to 220 Ω with cardboard tape 0.5 ± 0.1
Tape width Hold down tape width Hole position Hold down tape position	W W_0 W_1 W_2	18.0 5.0 9.0 1.5	± 1.0 - 0.5 ± 0.3 ± 0.5 ± 1.0	None of the hold down tapes may cover the holes

REEL SPECIFICATIONS



CODE NUMBERS AND RELEVANT PACKAGING QUANTITIES			
PARAMETER	BULK	TAPE AND REEL (1) 1E PITCH	TAPE AND REEL (1) 2E PITCH
	2381 640 6..../ NTCLE100E3....B0	2381 640 4..../ NTCLE100E3....T1	2381 640 3..../ NTCLE100E3....T2
Quantity	500	1500 per reel, 2 reels per box	1500 per reel, 2 reels per box

Note

(1) Taped according IEC 60286-2

CHARACTERISTICS OF TAPED PRODUCTS

Minimum pull-out force of the component: 5 N

Minimum peel-off force of adhesive tape: 6 N

Minimum tearing force tape: 15 N

Minimum pull-off force of tape-reel: 5 N

STORAGE CONDITIONS

Storage temperature range: - 25 °C to + 40 °C

Maximum relative humidity: 80 %, non-condensing

TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with “IEC publication 60068-2; Environmental testing”, except where indicated.

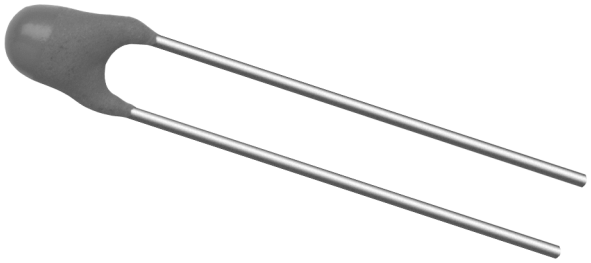
STABILITY TESTS				
CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
D3; 4.20.1		Endurance	25 °C; 1000 h	$\Delta R/R < 1$ %
	1	Endurance	- 40 °C; 1000 h	$\Delta R/R < 1$ %
	539	Endurance	500 mW; 55 °C; 1000 h	$\Delta R/R < 3$ % (1)
	2	Dry heat, (steady state)	125 °C; 1000 h	$\Delta R/R < 3$ %
D1; 4.19	3	Damp heat (steady state)	56 days at 40 °C; 90 to 95 % RH	$\Delta R/R < 3$ %
C2; 4.14	14	Rapid change of temperature	- 40 °C to + 125 °C; 50 cycles	$\Delta R/R < 2$ %
Other applicable tests				
	21	Robustness of leads: Tensile strength Bending	 Loading force 10 N Loading force 5 N	$\Delta R/R \leq 1$ %
	58	Soldering: Solderability Resistance to heat	 240 °C max.; duration 4 s max. 265 °C max.; duration 5 s max.	$\Delta R/R \leq 1$ % (2)
	27	Impact	Free fall; 1 m	$\Delta R/R \leq 1$ %
	29	Shock	490 m/s; half sinewave	$\Delta R/R \leq 1$ %
	45	Resistance to solvent (isopropanol)	Ambient temp for 5 minutes; 5 N with hydrophylic cotton wool	No traces of lacquer on cotton wool
	6	Vibration	1.5 mm peak to peak: 10 Hz to 58 Hz 10 gp: 50 Hz to 500 Hz 1 octave/min. 2 h in each direction in three orthogonal directions	No visible damage $\Delta R/R < 1$ %
	60695-2-2	Inflammability	1980, needle flame test	Non-flammable

Notes

(1) For $R_{25} \geq 100$ kΩ the drift requirement is $\Delta R/R < 5$ %

(2) For R_{25} from 2.2 kΩ to 10 kΩ, requirement is ± 2 % max.

NTC Thermistors, Radial Leaded Special Accuracy



FEATURES

- Excellent accuracy between 25 °C and 85 °C
- High stability over a long life
- Old part number was 2322 640 10...
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb e3 RoHS COMPLIANT

APPLICATIONS

- Temperature measurement, sensing and control

DESCRIPTION

These thermistors have a negative temperature coefficient. The device consists of a chip with two tin-plated copper leads. It is grey lacquered and not insulated. These thermistors are very accurate (± 0.5 °C) over a trajectory from 25 °C to 85 °C.

PACKAGING

The thermistors are packed in cardboard boxes, each box contains 500 units.

MARKING

Grey lacquered body.

MOUNTING

By soldering in any position.

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance at 25 °C (1)	4.7 kΩ to 100 kΩ
Temperature measurement accuracy (between 25 °C and 85 °C)	± 0.5 °C
Climatic category	40/125/56
Maximum dissipation	250 mW
Dissipation factor δ (for information only)	7 mW/K
Response time (for information only) (2)	1.2 s
Thermal time constant τ (for information only)	11 s
Operating temperature range:	
at zero dissipation (continuously)	- 40 °C to + 125 °C
at maximum dissipation	0 °C to + 55 °C
Weight	≈ 0.22 g

Notes

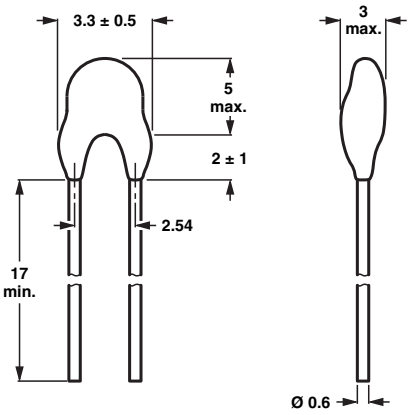
(1) For values of nominal resistance value and tolerance at intermediate temperatures; see resistance values tables.

(2) Response time in silicone oil MS 200/50. 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.

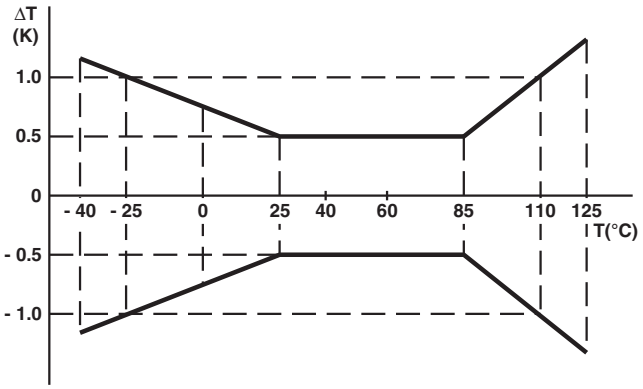
ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} (Ω)	$\Delta R_{25}/R_{25}$ (%)	R_{85} (Ω)	$\Delta R_{85}/R_{85}$ (%)	$B_{25/85}$ (K)	ΔB/B (%)	CATALOG NUMBER 2381 640	SAP MATERIAL NO. NTCLE101E3.....
4700	2.19	503.1	1.58	3977	0.75	10472	472SB0
10 000	2.19	1070	1.58	3977	0.75	10103	103SB0
47 000	2.23	4721	1.64	4090	1.5	10473	473SB0
100 000	2.29	9496	1.72	4190	1.5	10104	104SB0

DIMENSIONS in millimeters



TOLERANCE CURVE



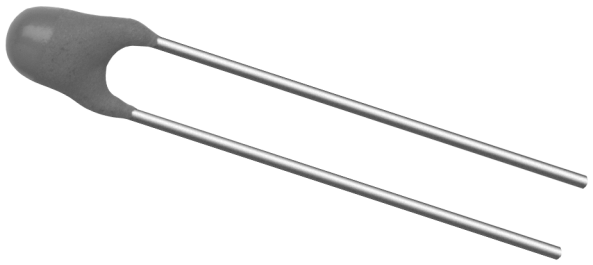
RESISTANCE VALUES AT INTERMEDIATE VALUES WITH R_{25} AT 4.7 kΩ AND 10 kΩ

T_{OPER} (°C)	R_T/R_{25}	TCR (%/K)	R_T (kΩ)	
			NTCLE101E3472SB0 2381 640 10472	NTCLE101E3103SB0 2381 640 10103
- 40	33.21	6.57	156.1	332.1000
- 35	23.99	6.36	112.8	240.0
- 30	17.52	6.15	82.35	175.2
- 25	12.93	5.95	60.77	129.3
- 20	9.636	5.76	45.30	96.36
- 15	7.250	5.58	34.08	72.50
- 10	5.505	5.40	25.87	55.05
- 5	4.216	5.24	19.81	42.16
0	3.255	5.08	15.30	32.56
5	2.534	4.92	11.91	25.34
10	1.987	4.78	9.340	19.87
15	1.570	4.64	7.378	15.70
20	1.249	4.50	5.869	12.49
25	1.000	4.37	4.700	10.00
30	0.8059	4.25	3.788	8.059
35	0.6535	4.13	3.072	6.535
40	0.5330	4.02	2.505	5.330
45	0.4372	3.91	2.055	4.372
50	0.3605	3.80	1.694	3.606
55	0.2989	3.70	1.405	2.989
60	0.2490	3.60	1.170	2.490
65	0.2084	3.51	0.9797	2.084
70	0.1753	3.42	0.8239	1.753
75	0.1481	3.33	0.6960	1.481
80	0.1256	3.25	0.5905	1.256
85	0.1070	3.16	0.5031	1.070
90	0.09154	3.09	0.4303	0.9154
95	0.07860	3.01	0.3694	0.7860
100	0.06773	2.94	0.3183	0.6773
105	0.05858	2.87	0.2753	0.5858
110	0.05083	2.80	0.2389	0.5083
115	0.04426	2.73	0.2080	0.4426
120	0.03866	2.67	0.1817	0.3866
125	0.03387	2.61	0.1592	0.3387
130	0.02977	2.55	0.1399	0.2977
135	0.02624	2.49	0.1233	0.2624
140	0.02319	2.43	0.1090	0.2319
145	0.02055	2.38	0.0966	0.2055
150	0.01826	2.33	0.0858	0.1826

RESISTANCE VALUES AT INTERMEDIATE VALUES WITH R_{25} AT 47 kΩ			
T_{OPER} (°C)	R_T/R_{25}	TCR (%/K)	R_T (kΩ)
			NTCLE101E3473SB0 2381 640 10473
- 40	33.81	6.55	1589
- 35	24.50	6.34	1151
- 30	17.93	6.15	842.8
- 25	13.25	5.96	622.6
- 20	9.875	5.78	464.1
- 15	7.425	5.61	349.0
- 10	5.630	5.45	264.6
- 5	4.304	5.29	202.3
0	3.315	5.14	155.8
5	2.573	4.99	120.9
10	2.011	4.85	94.53
15	1.583	4.72	74.40
20	1.254	4.59	58.95
25	1.000	4.46	47.00
30	0.8024	4.34	37.71
35	0.6474	4.23	30.43
40	0.5255	4.12	24.70
45	0.4288	4.01	20.15
50	0.3518	3.91	16.53
55	0.2901	3.81	13.63
60	0.2403	3.71	11.30
65	0.2001	3.62	9.404
70	0.1674	3.53	7.865
75	0.1406	3.44	6.607
80	0.1186	3.36	5.573
85	0.1004	3.28	4.721
90	0.08542	3.20	4.015
95	0.07292	3.13	3.427
100	0.06248	3.06	2.936
105	0.05372	2.98	2.525
110	0.04635	2.92	2.179
115	0.04013	2.85	1.886
120	0.03485	2.79	1.638
125	0.03037	2.73	1.427
130	0.02654	2.67	1.247
135	0.02326	2.61	1.093
140	0.02044	2.55	0.9608
145	0.01802	2.50	0.8468
150	0.01592	2.44	0.7483

RESISTANCE VALUES AT INTERMEDIATE VALUES WITH R_{25} AT 100 kΩ			
T_{OPER} (°C)	R_T/R_{25}	TCR (%/K)	R_T (kΩ)
			NTCLE101E3104SB0 2381 640 10104
- 40	36.66	6.70	3666
- 35	26.38	6.49	2638
- 30	19.17	6.29	1917
- 25	14.06	6.10	1406
- 20	10.41	5.92	1041
- 15	7.779	5.74	777.9
- 10	5.861	5.57	586.1
- 5	4.453	5.41	445.3
0	3.409	5.26	340.9
5	2.631	5.11	263.1
10	2.044	4.97	204.4
15	1.600	4.83	160.0
20	1.261	4.70	126.1
25	1.000	4.57	100.0
30	0.7981	4.45	79.81
35	0.6408	4.35	64.08
40	0.5175	4.22	51.74
45	0.4202	4.11	42.02
50	0.3431	4.00	34.31
55	0.2816	3.90	28.16
60	0.2322	3.80	23.22
65	0.1925	3.71	19.25
70	0.1602	3.62	16.03
75	0.1340	3.53	13.40
80	0.1126	3.45	11.26
85	0.09496	3.36	9.496
90	0.08042	3.28	8.042
95	0.06837	3.21	6.837
100	0.05835	3.13	5.835
105	0.04998	3.06	4.998
110	0.04296	2.99	4.296
115	0.03705	2.92	3.705
120	0.03206	2.86	3.206
125	0.02783	2.80	2.783

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
- AEC-Q200 qualified
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Fulfils the ELV 2000/53/EC

RoHS COMPLIANT

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.

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

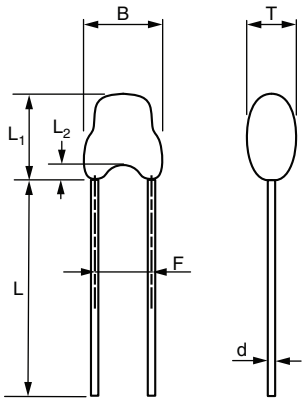
ELECTRICAL DATA AND ORDERING INFORMATION

SAP PART NUMBER	12NC	*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)
NTCLE203E3202SB0	2381 640 20202	2060	3.86	1.93	3528	0.50	0.5	1	2
NTCLE203E3222SB0	2381 640 20222	2252	4.39	2.20	3984	0.50	0.5	1	1
NTCLE203E3272SB0	2381 640 20272	2780	4.51	2.20	4090	0.75	0.5	1	1
NTCLE203E3302SB0	2381 640 20302	3000	4.39	2.20	3984	0.50	0.5	1	1
NTCLE203E3502SB0	2381 640 20502	5000	4.39	2.20	3984	0.50	0.5	1	1
NTCLE203E3103SB0	2381 640 20103	10 000	4.39	2.20	3984	0.50	0.5	1	1
NTCLE203E3303SB0	2381 640 20303	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

PART NUMBER	NTCLE203E3202SB0/2381 640 20202						
TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	$\Delta T_{max.}$ (± °C)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 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

RESISTANCE (TEMPERATURE) CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	PART NUMBER NTCLE203E3222SB0 2381 640 20222 RESISTANCE (Ω)	PART NUMBER NTCLE203E3302SB 2381 640 20302 RESISTANCE (Ω)	PART NUMBER NTCLE203E3502SB0 2381 640 20502 RESISTANCE (Ω)	PART NUMBER NTCLE203E3103SB0 2381 640 20103 RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	$\Delta T_{max.}$ (± °C)
- 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

RESISTANCE (TEMPERATURE) CHARACTERISTICS

PART NUMBER	NTCLE203E3272SB0/2381 640 20272						
TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	$\Delta T_{max.}$ (± °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

RESISTANCE (TEMPERATURE) CHARACTERISTICS

PART NUMBER	NTCLE203E3303SB0/2381 640 20303						
TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	$\Delta T_{max.}$ (± °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 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
(1) Valid for 2381 640 20103

NTC Thermistors, Long Insulated Leads

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at:	
0 °C	9000 Ω
25 °C	2769 Ω
Tolerance on R_{25} - value:	
0 °C	± 2 %
25 °C	± 3.82 %
$B_{25/85}$ - value	3977 K
Maximum dissipation	100 mW
Dissipation factor δ	1.35 mW/K
Minimum dielectric withstanding voltage (RMS) between leads and coating	500 V
Response time	1.25 s
Operating temperature range:	
at zero power	- 40 °C to + 125 °C
at maximum power	0 °C to + 55 °C
Climatic category	40/125/56
Mass	≈ 0.16 g

FEATURES

- Long and flexible leads for special mounting or assembly requirements
- Insulated leads for prevention of short circuits
- Electrical features of 'accuracy line' sensors
- Small diameter
- Old part number was 2322 640 90059
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

- Temperature measurement, sensing and control in automotive and industrial applications

DESCRIPTION

These negative temperature ceofficient thermistors consist of a mini-chip soldered between two insulated nickel leads and coated with ochre-colored epoxy lacquer.

PACKAGING

The thermistors are packed in cardboard boxes; the smallest packing quantity is 1000 units.

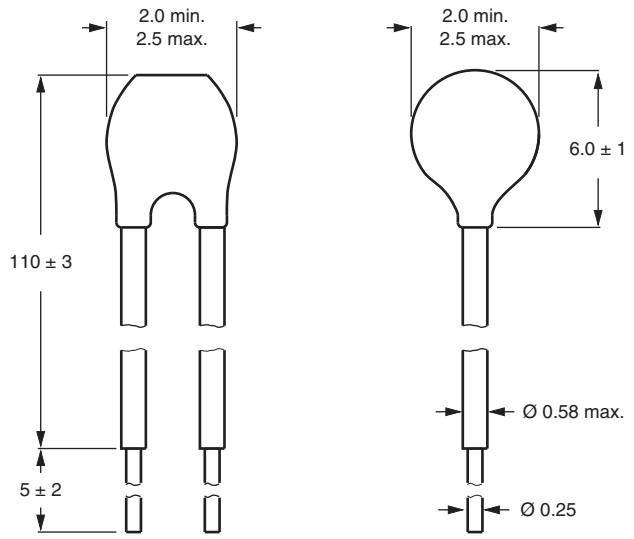
MARKING

The component is not marked.

MOUNTING

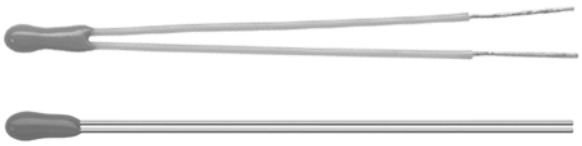
By soldering in any position.
Part can be potted in suitable resins.

DIMENSIONS in millimeters



RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES			
T_{OPER} (°C)	RESISTANCE (Ω)	TCR (%/K)	RESISTANCE TOLERANCE (%)
- 40	90 923	6.57	± 5.60
- 35	65 808	6.35	± 5.09
- 30	48 141	6.15	± 4.60
- 25	35 578	5.95	± 4.13
- 20	26 550	5.76	± 3.67
- 15	19 998	5.58	± 3.23
- 10	15 197	5.40	± 2.81
- 5	11 648	5.24	± 2.40
0	9000	5.08	± 2.00
5	7008.6	4.92	± 2.38
10	5498.8	4.78	± 2.76
15	4345.1	4.64	± 3.12
20	3457.2	4.50	± 3.47
25	2769.0	4.37	± 3.82
30	2231.7	4.25	± 4.16
35	1809.6	4.13	± 4.48
40	1476.0	4.02	± 4.80
45	1210.6	3.91	± 5.12
50	998.37	3.80	± 5.42
55	827.59	3.70	± 5.72
60	689.46	3.60	± 6.01
65	577.15	3.51	± 6.29
70	485.38	3.42	± 6.57
75	410.02	3.33	± 6.84
80	347.86	3.25	± 7.10
85	296.35	3.16	± 7.36
90	253.47	3.09	± 7.61
95	217.64	3.01	± 7.86
100	187.57	2.94	± 8.10
105	162.24	2.87	± 8.33
110	140.81	2.80	± 8.56
115	122.63	2.73	± 8.79
120	107.14	2.67	± 9.01
125	93.90	2.61	± 9.22

NTC Thermistors, Long Lead Sensors



FEATURES

- Accuracy of 0.5 °C between 0 °C and 50 °C
- Small diameter
- High stability over a long life
- Long and flexible leads for special mounting or assembly requirements
- Old part number was 2322 645 10/20....
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

- Temperature measurement, sensing and control in automotive, industrial and consumer electronic equipment

DESCRIPTION

These negative temperature ceofficient thermistors consist of a mini-chip soldered between two insulated (LE300) or non-insulated (LE201) nickel leads and coated with a solid ochre epoxy lacquer.

PACKAGING

The thermistors are packed in cardboard boxes; the smallest packing quantity is 1000 units.

MARKING

The body is colored with ochre lacquer and not marked.

MOUNTING

By soldering in any position.

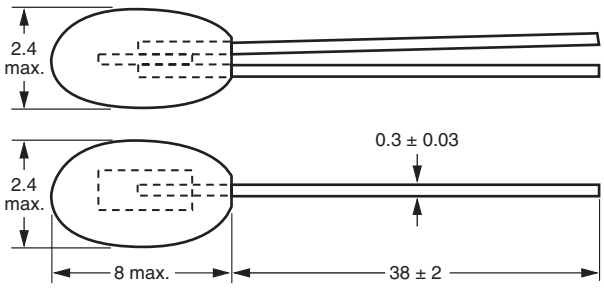
QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at: 0 °C 50 °C	 See Resistance Values table See Resistance Values table
$B_{25/85}$ - value	3977K
Max. ΔT measured between 0 °C and 50 °C	± 0.5 °C
Temperature coefficient	See Resistance Values table
Maximum dissipation	100 mW
Minimum dielectric withstanding voltage (RMS) between leads and coating	500 V
Operating temperature range	- 40 °C to + 125 °C
Climatic category	40/125/56
Mass	≈ 0.2 g

ELECTRICAL DATA AND ORDERING INFORMATION

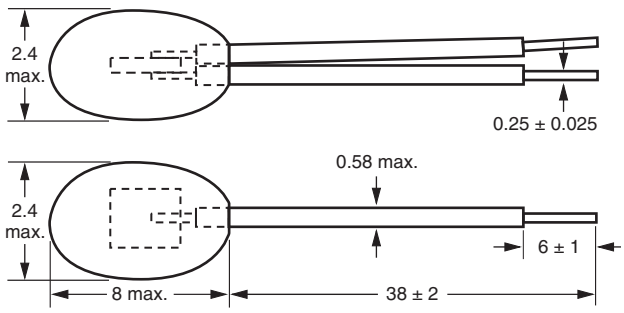
R_{25} - VALUE (kΩ)	$B_{25/85}$ - VALUE (K)	SAP MATERIAL NO. NTCLE201E3...	12NC ORDERING CODE 2381 645....
3	3977	302SB	10302
5	3977	502SB	10502
10	3977	103SB	10103
R_{25} - VALUE (kΩ)	**$B_{25/85}$ - VALUE (K)**	**SAP MATERIAL NO. NTCLE300E3...**	**12NC ORDERING CODE 2381 645....**
3	3977	302SB	20302
5	3977	502SB	20502
10	3977	103SB	20103

DIMENSIONS in millimeters

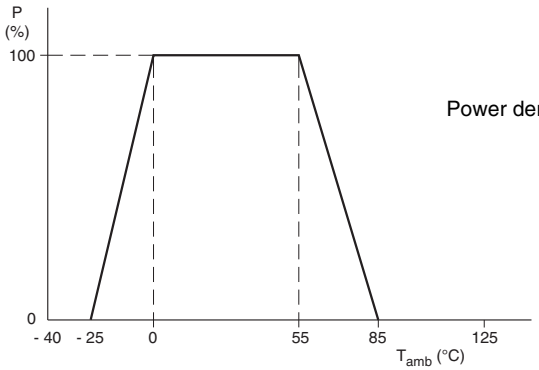
Component outline for NTCLE201E3.../2381 645 10 series



Component outline for NTCLE300E3.../2381 645 20 series



DERATING



Power derating curve

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

T_{OPER} (°C)	R_T/R_{25}	ΔT (K)	TCR (%/K)	R_{25} -VALUE (kΩ)		
				NTCLE201E3...SB (2381 645 10...) OR NTCLE300E3...SB (2381 645 20...)		
				302	502	103
- 40	33.21	0.68	6.57	99.63	166.1	332.1
- 35	23.99	0.66	6.36	71.97	120.0	239.9
- 30	17.52	0.64	6.15	52.56	87.60	175.2
- 25	12.93	0.62	5.95	38.79	64.65	129.3
- 20	9.636	0.59	5.76	28.91	48.18	96.36
- 15	7.250	0.57	5.58	21.75	36.25	72.50
- 10	5.505	0.55	5.40	16.51	27.52	55.05
- 5	4.216	0.52	5.24	12.65	21.08	42.16
0	3.255	0.50	5.08	9.766	16.28	32.56
5	2.534	0.50	4.92	7.602	12.67	25.34
10	1.987	0.50	4.78	5.962	9.936	19.87
15	1.570	0.50	4.64	4.710	7.849	15.70
20	1.249	0.50	4.50	3.746	6.244	12.49
25	1.000	0.50	4.37	3.000	5.000	10.00
30	0.8059	0.50	4.25	2.418	4.030	8.059
35	0.6535	0.50	4.13	1.960	3.267	6.535
40	0.5330	0.50	4.02	1.599	2.665	5.330
45	0.4372	0.50	3.91	1.312	2.186	4.372
50	0.3605	0.50	3.80	1.082	1.803	3.606
55	0.2989	0.55	3.70	0.8966	1.494	2.989
60	0.2490	0.61	3.60	0.7470	1.245	2.490
65	0.2084	0.66	3.51	0.6253	1.042	2.084
70	0.1753	0.72	3.42	0.5259	0.8765	1.753
75	0.1481	0.77	3.33	0.4443	0.7405	1.481
80	0.1256	0.83	3.25	0.3769	0.6282	1.256
85	0.1070	0.89	3.16	0.3211	0.5352	1.070
90	0.09154	0.95	3.09	0.2746	0.4577	0.9154
95	0.07860	1.02	3.01	0.2358	0.3930	0.7860
100	0.06773	1.08	2.94	0.2032	0.3387	0.6773
105	0.05858	1.14	2.87	0.1757	0.2929	0.5858
110	0.05083	1.21	2.80	0.1525	0.2542	0.5083
115	0.04426	1.27	2.73	0.1328	0.2213	0.4426
120	0.03866	1.34	2.67	0.1160	0.1933	0.3866
125	0.03387	1.41	2.61	0.1016	0.1694	0.3387

NTC Thermistors, Long Non-Insulated Leads

FEATURES

- Long and flexible leads for special mounting or assembly requirements
- Fast response time of less then 0.5 s
- Small diameter
- Old part number was 2322 645 90028
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at 25 °C	10 kΩ
Tolerance on R_{25} - value	± 5 %
$B_{25/100}$ - value	3993 K
Tolerance on $B_{25/100}$ - value	± 1.2 %
Rated dissipation	100 mW
Response time	0.45 s
Dissipation factor τ	1.4 mW/K
Operating temperature range: at zero dissipation at maximum dissipation	 - 40 °C to + 125 °C 0 °C to + 55 °C
Weight	≈ 0.16 g

APPLICATIONS

- Temperature measurement, sensing and control

DESCRIPTION

These negative temperature coefficient thermistors consist of a mini-chip soldered between two tinned solid nickel leads. The body of the device is coated with an ochre colored epoxy lacquer.

PACKAGING

The thermistors are packed in cardboard boxes; each box containing 1000 units (10 plastic bags, each containing 100 units).

MARKING

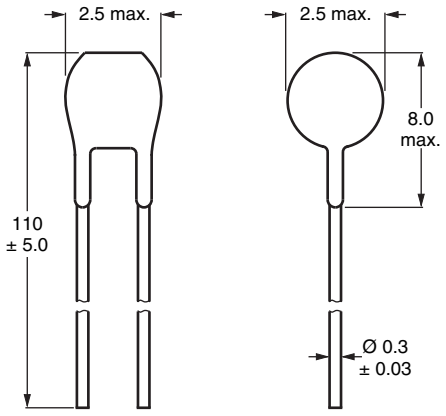
The thermistor body has no marking.

MOUNTING

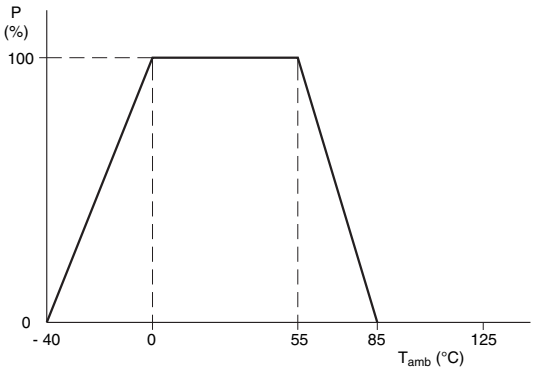
By soldering in any position.

Not suitable for potted application.

DIMENSIONS in millimeters



DERATING



Power derating curve

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES			
T_{OPER} (°C)	RESISTANCE (kΩ)	TCR (%/K)	RESISTANCE TOLERANCE (%)
- 40	328.4	6.57	± 9.5
- 35	237.7	-	-
- 30	173.9	6.15	± 8.7
- 25	128.5	-	-
- 20	95.89	5.76	± 7.9
- 15	72.23	-	-
- 10	54.89	5.40	± 7.2
- 5	42.07	-	-
0	32.51	5.08	± 6.5
5	25.31	-	-
10	19.86	4.78	± 5.9
15	15.69	-	-
20	12.49	4.50	± 5.3
25	10.00	4.37	± 5.0
30	8.060	4.25	± 5.3
35	6.536	-	-
40	5.331	4.02	± 5.8
45	4.372	-	-
50	3.606	3.80	± 6.3
55	2.989	-	-
60	2.490	3.60	± 6.8
65	2.085	-	-
70	1.753	3.42	± 7.2
75	1.481	-	-
80	1.256	3.25	± 7.6
85	1.070	-	-
90	0.9155	3.09	± 8.0
95	0.7861	-	-
100	0.6775	2.94	± 8.4
105	0.5860	-	-
110	0.5086	2.80	± 8.8
115	0.4429	-	-
120	0.3870	2.67	± 9.2
125	0.3392	-	-

NTC Thermistors, Micro Chip Sensor Insulated Leads

FEATURES

- Flexible insulated leads for special mounting or assembly
- Miniature sized very fast reacting
- Accurate over a wide temperature range
- High stability over a long life
- Exceptional withstanding in thermal shocks
- AEC-Q200 qualified
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Fulfils the ELV 2000/53/EC

RoHS COMPLIANT

APPLICATIONS

- Temperature measurement, sensing and control in automotive and industrial applications

QUICK REFERENCE DATA		
PARAMETER	VALUE	UNIT
Resistance value at 25 °C	2060 to 10 000	Ω
Accuracy of temperature measurement	± 0.5 between 25 and 85 ± 1.0 between - 40 and + 125	°C
$B_{25/85}$ - value	3511 to 3984	K
Tolerance on $B_{25/85}$	± 0.5 to ± 1	%
Maximum dissipation	50	mW
Dissipation factor δ (in still air)	≈ 0.8	mW/K
Response time (in stirred air) (in oil)	≈ 3 ≈ 0.7	s
Operating temperature range	- 40 to 125	°C
Climatic category	40/125/56	
Minimum dielectric withstanding voltage between leads and coated body (tested according to IEC 60539 §4.7.2 method 1)	100	V_{RMS}
Weight	0.05	g

DESCRIPTION

These negative temperature coefficient thermistors consist of a micro NTC chip with two insulated solid silver plated nickel wires and coated with a ochre-colored epoxy lacquer.

PACKAGING

The thermistors are packed in cardboard boxes; the smallest packing quantity is 1000 pieces.

MARKING

The components are not marked.

DESIGN IN SUPPORT

R(T) tables spreadsheet available on request at nlr@vishay.com.

MOUNTING

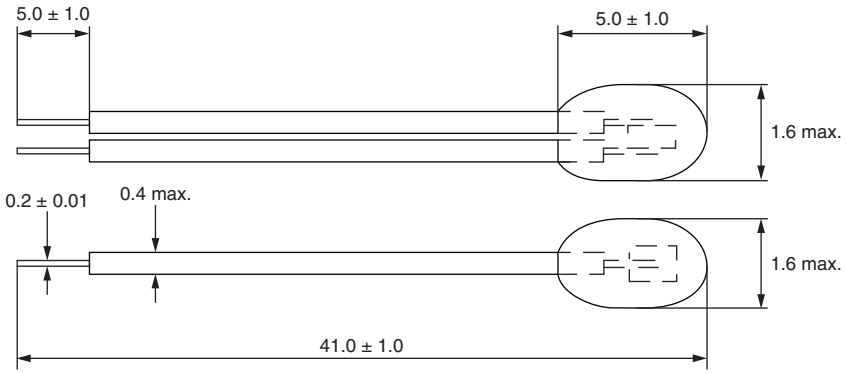
By soldering or welding in any position.
The parts can be potted in suitable resins.

ELECTRICAL DATA AND ORDERING INFORMATION

SAP PART AND ORDERING NUMBER	R_{25} (1) (Ω)	α (25 °C) (%/K)	R_{25} Tol. (%)	$B_{25/85}$ (1) (K)	$B_{25/85}$ Tol. (%)	$\Delta T_{max.}$ (2) 25 to 85 (°C)	$\Delta T_{max.}$ (2) - 40 to 125 (°C)
NTCLE305E4202SB	2060	- 3.85	1.93	3511	1.0	± 0.5	± 1
NTCLE305E4502SB	5000	- 4.39	2.2	3984	0.5	± 0.5	± 1
NTCLE305E4103SB	10 000	- 4.39	2.2	3984	0.5	± 0.5	± 1

Notes
(1) Other R_{25} and B-values available on request.
(2) ΔT is the temperature measurement accuracy in the defined temperature ranges.

DIMENSIONS in millimeters



RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

SAP PART AND ORDERING NUMBER: NTCLE305E4202SB

TEMPERATURE (°C)	R_T/R_{25}	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	22.975	47 326	6.03	- 6.03	1.0	45 284	49 369
- 35	17.089	35 203	5.81	- 5.81	1.0	33 796	36 610
- 30	12.851	26 473	5.60	- 5.60	1.0	25 496	27 449
- 25	9.7647	20 115	5.39	- 5.39	1.0	19 431	20 798
- 20	7.4928	15 435	5.20	- 5.20	1.0	14 954	15 915
- 15	5.8033	11 954	5.02	- 5.02	1.0	11 615	12 294
- 10	4.5348	9341.4	4.85	- 4.85	1.0	9100.2	9582.6
- 5	3.5736	7361.4	4.68	- 4.68	1.0	7189.8	7532.9
0	2.8388	5847.7	4.53	- 4.53	1.0	5725.6	5969.9
5	2.2724	4680.9	4.38	- 4.38	1.0	4594.1	4767.8
10	1.8323	3774.3	4.24	- 4.24	1.0	3712.8	3835.8
15	1.4877	3064.4	4.10	- 4.10	1.0	3021.1	3107.7
20	1.2159	2504.6	3.97	- 3.97	1.0	2474.5	2534.7
25	1.0000	2060.0	1.92	- 3.85	0.5	2039.4	2080.6
30	0.82743	1704.4	1.86	- 3.73	0.5	1684.1	1724.8
35	0.68863	1418.5	1.81	- 3.62	0.5	1398.9	1438.2
40	0.57617	1186.9	1.75	- 3.51	0.5	1168.2	1205.5
45	0.48445	997.92	1.70	- 3.41	0.5	980.48	1015.4
50	0.40917	842.86	1.65	- 3.31	0.5	826.67	859.04
55	0.34704	714.88	1.61	- 3.21	0.5	699.96	729.80
60	0.29550	608.71	1.56	- 3.12	0.5	595.01	622.40
65	0.25253	520.19	1.52	- 3.04	0.5	507.67	532.71
70	0.21654	446.06	1.48	- 2.95	0.5	434.64	457.47
75	0.18627	383.71	1.44	- 2.87	0.5	373.32	394.10
80	0.16072	331.07	1.40	- 2.79	0.5	321.63	340.51
85	0.13907	286.46	1.36	- 2.72	0.5	277.89	295.04
90	0.12065	248.53	2.65	- 2.65	1.0	240.76	256.31
95	0.10494	216.17	2.58	- 2.58	1.0	209.12	223.22
100	0.091500	188.48	2.52	- 2.52	1.0	182.09	194.87
105	0.079963	164.72	2.45	- 2.45	1.0	158.93	170.51
110	0.070035	144.27	2.39	- 2.39	1.0	139.02	149.52
115	0.061469	126.62	2.33	- 2.33	1.0	121.86	131.38
120	0.054060	111.36	2.28	- 2.28	1.0	107.05	115.67
125	0.047637	98.128	2.22	- 2.22	1.0	94.215	102.04

Note

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

SAP PART AND ORDERING NUMBER: NTCLE305E4502SB

TEMPERATURE (°C)	R_T/R_{25}	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	167 137	6.63	- 6.63	1.0	156 057	178 217
- 35	24.132	120 661	6.41	- 6.41	1.0	112 932	128 390
- 30	17.613	88 066	6.19	- 6.19	1.0	82 613	93 519
- 25	12.990	64 950	5.99	- 5.99	1.0	61 061	68 839
- 20	9.6761	48 381	5.79	- 5.79	1.0	45 577	51 184
- 15	7.2765	36 382	5.61	- 5.61	1.0	34 342	38 423
- 10	5.5218	27 609	5.43	- 5.43	1.0	26 110	29 108
- 5	4.2268	21 134	5.26	- 5.26	1.0	20 022	22 246
0	3.2624	16 312	5.10	- 5.10	1.0	15 480	17 144
5	2.5381	12 691	4.94	- 4.94	1.0	12 063	13 318
10	1.9897	9948.5	4.80	- 4.80	1.0	9471.4	10 426
15	1.5711	7855.6	4.65	- 4.65	1.0	7490.1	8221.2
20	1.2493	6246.4	4.52	- 4.52	1.0	5964.2	6528.5
25	1.0000	5000.0	2.19	- 4.39	0.5	4890.5	5109.5
30	0.80560	4028.0	2.13	- 4.26	0.5	3942.3	4113.7
35	0.65297	3264.9	2.07	- 4.14	0.5	3197.4	3332.4
40	0.53239	2661.9	2.01	- 4.03	0.5	2608.4	2715.4
45	0.43653	2182.6	1.95	- 3.92	0.5	2140.0	2225.3
50	0.35987	1799.4	1.90	- 3.81	0.5	1765.1	1833.6
55	0.29823	1491.1	1.85	- 3.71	0.5	1463.5	1518.7
60	0.24838	1241.9	1.80	- 3.61	0.5	1219.5	1264.3
65	0.20787	1039.3	1.75	- 3.51	0.5	1021.1	1057.6
70	0.17477	873.83	1.71	- 3.42	0.5	858.89	888.76
75	0.14759	737.96	1.67	- 3.34	0.5	725.67	750.25
80	0.12518	625.90	1.62	- 3.25	0.5	615.74	636.06
85	0.10661	533.06	1.58	- 3.17	0.5	524.62	541.49
90	0.0911586	455.79	3.09	- 3.09	1.0	441.70	469.89
95	0.0782458	391.23	3.02	- 3.02	1.0	379.42	403.03
100	0.067411	337.06	2.94	- 2.94	1.0	327.13	346.98
105	0.0582844	291.42	2.87	- 2.87	1.0	283.05	299.80
110	0.0505676	252.84	2.81	- 2.81	1.0	245.74	259.94
115	0.0440186	220.09	2.74	- 2.74	1.0	214.06	226.13
120	0.0384412	192.21	2.68	- 2.68	1.0	187.06	197.35
125	0.0336748	168.37	2.62	- 2.62	1.0	163.97	172.78

Note

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

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

SAP PART AND ORDERING NUMBER: NTCLE305E4103SB

TEMPERATURE (°C)	R_T/R_{25}	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	334 274	6.63	- 6.63	1	312 114	356 434
- 35	24.132	241 323	6.41	- 6.41	1	225 865	256 781
- 30	17.613	176 133	6.19	- 6.19	1	165 226	187 039
- 25	12.990	129 900	5.99	- 5.99	1	122 121	137 679
- 20	9.6761	96 761	5.79	- 5.79	1	91 155	102 367
- 15	7.2765	72 765	5.61	- 5.61	1	68 684	76 845
- 10	5.5218	55 218	5.43	- 5.43	1	52 219	58 217
- 5	4.2268	42 268	5.26	- 5.26	1	40 044	44 492
0	3.2624	32 624	5.10	- 5.10	1	30 961	34 288
5	2.5381	25 381	4.94	- 4.94	1	24 127	26 636
10	1.9897	19 897	4.80	- 4.80	1	18 943	20 851
15	1.5711	15 711	4.65	- 4.65	1	14 980	16 442
20	1.2493	12 493	4.52	- 4.52	1	11 928	13 057
25	1.0000	10 000	2.19	- 4.39	0.5	9781.0	10 219
30	0.80560	8056.0	2.13	- 4.26	0.5	7884.6	8227.3
35	0.65297	6529.7	2.07	- 4.14	0.5	6394.8	6664.7
40	0.53239	5323.9	2.01	- 4.03	0.5	5216.9	5430.9
45	0.43653	4365.3	1.95	- 3.92	0.5	4280.0	4450.6
50	0.35987	3598.7	1.90	- 3.81	0.5	3530.3	3667.2
55	0.29823	2982.3	1.85	- 3.71	0.5	2927.1	3037.5
60	0.24838	2483.8	1.80	- 3.61	0.5	2439.1	2528.6
65	0.20787	2078.7	1.75	- 3.51	0.5	2042.2	2115.1
70	0.17477	1747.7	1.71	- 3.42	0.5	1717.8	1777.5
75	0.14759	1475.9	1.67	- 3.34	0.5	1451.3	1500.5
80	0.12518	1251.8	1.62	- 3.25	0.5	1231.5	1272.1
85	0.10661	1066.1	1.58	- 3.17	0.5	1049.2	1083.0
90	0.091159	911.59	3.09	- 3.09	1	883.39	939.78
95	0.078246	782.46	3.02	- 3.02	1	758.85	806.07
100	0.067411	674.11	2.94	- 2.94	1	654.26	693.96
105	0.058285	582.85	2.87	- 2.87	1	566.09	599.60
110	0.050568	505.68	2.81	- 2.81	1	491.48	519.87
115	0.044019	440.19	2.74	- 2.74	1	428.12	452.25
120	0.038441	384.41	2.68	- 2.68	1	374.12	394.71
125	0.033675	336.75	2.62	- 2.62	1	327.93	345.56

Note

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

NTC Thermistors, Radial Leaded and Coated

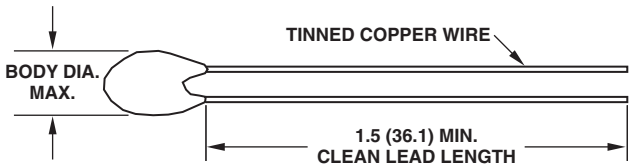
FEATURES

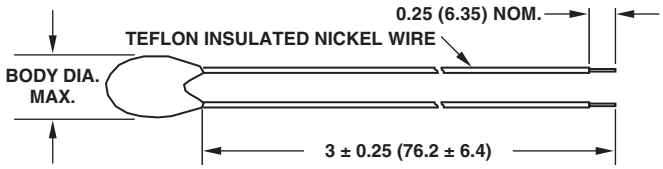
- Small size - conformally coated
- Wide resistance range
- Available in 11 different R-T curves
- Available in point matched and curve tracking precision down to ± 0.2 °C

DESCRIPTION

Models M, C, and T are conformally coated, leaded thermistors for standard PC board mounting or assembly in probes. The coating is baked-on phenolic for durability and long-term stability. Models M and C have tinned solid copper leads. Model T has solid nickel wires with Teflon® insulation to provide isolation when assembled in metal probes or housings.

DIMENSIONS in inches (millimeters)





PRODUCT TYPE	WIRE GAUGE/DIAMETER
Type M	AWG 30: 0.0100 (0.254)
Type C	AWG 28: 0.0126 (0.320)
Type T	AWG 30: 0.0100 (0.254)

GLOBAL PART NUMBER INFORMATION

Global Part Numbering: 01C2001FP for POINT MATCHED THERMISTORS

0	1	C	2	0	0	1	F	F										

CURVE	GLOBAL MODEL	RESISTANCE VALUE	POINT MATCH TOLERANCE	PACKAGING
01 02 03 04 07 08 09 12 13 14 17	C M T	**2001** = 2K	**F** = ± 1 % **J** = ± 5 % **K** = ± 10 %	**F** = Lead (Pb)-free, bulk **P** = Tin/Lead, bulk

Global Part Numbering: 01C2001SPC3 for CURVE TRACKING THERMISTORS

0	1	C	2	0	0	1	S	F	C	3								

CURVE	GLOBAL MODEL	RESISTANCE VALUE	CHARACTERISTICS	PACKAGING	CURVE TRACK TOLERANCE (1)
01 02 04 08 09 17	C M T	**2001** = 2K	S	**F** = Lead (Pb)-free, bulk **P** = Tin/Lead, bulk	**A2** **B2** **C2** **A3** **B3** **C3** **A4** **B4** **A5** **B5** **C5** **A8** **B8** **C8**

Note

(1) See following pages for tolerance explanations and details.

SELECTION GUIDE FOR TYPE M, C, AND T THERMISTORS

R_{25} (Ω)	CURVE NUMBER									
	1	2	3	4	7	8	9	12	14	17
27									•	
33									••	
50									•••	
56									•••	
68			•						•••	
82			••						•••	
100			••						•••	
120			••						•••	
150			•••						•••	
180			•••						•••	
220			•••						•••	
270			•••							
330		•	•••							
390		••	•••							
470		••	•••							
500		••	•••							
560		••	•••							
680		•••								
820		•••								
1K		•••								
1.2K		•••								
1.5K		•••								
1.8K	•	•••								
2.2K	•	•••								
2.7K	••	•••								
3.3K	••	•••								
3.9K	•••									
4.7K	•••									
5K	•••									
5.6K	•••									
6.8K	•••									•
8.2K	•••						•			•
10K	•••			•			••			••
12K	•••			•			••			••
15K	•••			••			•••			•••
18K	•••			••			•••			•••
22K				••			•••			•••
27K				••	•	•	•••			•••
33K				•••	•	••	•••			•••
39K				•••	••	••	•••			•••
47K				•••	••	•••	•••			•••
50K				•••	••	•••	•••			•••
56K				•••	•••	•••	•••			
68K				•••	•••	•••				
82K				•••	•••	•••				
100K				•••	•••	•••				
120K					•••	•••				
150K					•••	•••				
180K					•••	•••				
220K					•••	•••				
270K					•••					
330K								•		
390K								••		
470K								••		
500K								•••		
560K								•••		
680K								•••		
820K								•••		
1M								•••		

MAXIMUM BODY DIAMETER

•	0.125 [3.2]
••	0.110 [2.8]
•••	0.095 [2.4]

DISSIPATION CONSTANT

2 mW/°C to 3 mW/°C

THERMAL TIME CONSTANT

6 s to 14 s

Notes

1. Intermediate resistance values between the standard value series are available. Size would be the same as the color grouping.

2. Other body diameter available. Bead diameter increases as Res. decreases. (consult factory)

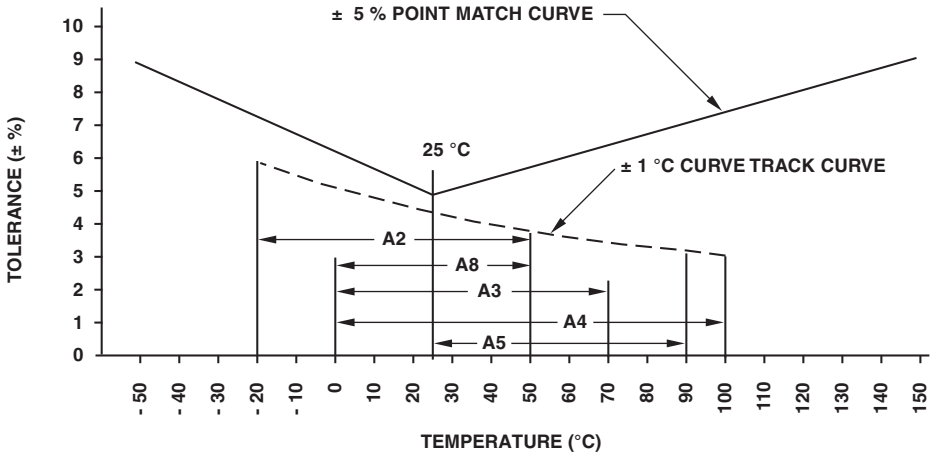
3. Leaded series of thermistors includes additional styles: (consult factory)

   Type B: 26AWG Lead, 0.0159 [0.40]
   Type F: 32AWG Lead, 0.008 [0.20]
   Type E: 24AWG Lead, 0.020 [0.51]
   Type D: 22AWG Lead, 0.025 [0.64]
   Type G: 20AWG Lead, 0.032 [0.81]
   Type H: 18AWG Lead, 0.040 [1.02]

TOLERANCES AVAILABLE FOR TYPE M, C AND T THERMISTORS

DESCRIPTION OF THERMISTOR TOLERANCES

The many applications of thermistors have mandated the need for two basic tolerance schemes for these products - curve tracking and point match thermistors. An example of the resistance tolerance at various temperatures for the two different tolerancing methods is described in the following graph:



CURVE TRACKING TOLERANCE

Thermistors are calibrated at the high temperature of the curve track range and then final tested at the low temperature of the curve track range. This ensures that the thermistor will meet the specified temperature accuracy at every temperature within the desired temperature range. Several temperature ranges are available and the accuracy of the thermistor may be ± 0.2 °C, ± 0.5 °C, and ± 1.0 °C. The curve tracking temperature ranges and their code designators are shown in figure 1 and table 1.

To specify, add the appropriate suffix from the following table to the part number.

Example: 01M1002SFB3 = Curve 1, 10 kΩ at + 25 °C, curve tracking to ± 0.5 °C from 0 °C to + 70 °C

STANDARD ELECTRICAL SPECIFICATIONS FOR CURVE TRACKING THERMISTORS

TEMP. RANGE		0 °C to + 70 °C			- 20 °C to + 50 °C			0 °C to + 100 °C			25 °C to + 90 °C			0 °C to + 50 °C		
TOLERANCE		± 1 °C	± 0.5 °C	± 0.2 °C	± 1 °C	± 0.5 °C	± 0.2 °C	± 1 °C	± 0.5 °C	± 0.2 °C	± 1 °C	± 0.5 °C	± 0.2 °C	± 1 °C	± 0.5 °C	± 0.2 °C
PART NO. SUFFIX		- A3	- B3	- C3	- A2	- B2	- C2	- A4	- B4	- C4	- A5	- B5	- C5	- A8	- B8	- C8
CURVE	01	X	X	X	X	X	X	X	X	N/A	X	X	X	X	X	X
	02	X	X	X	X	X	X	X	X	N/A	X	X	X	X	X	X
	04	X	X	X	X	X	X	X	X	N/A	X	X	X	X	X	X
	08	X	X	X	X	X	X	X	X	N/A	X	X	X	X	X	X
	09	X	X	X	X	X	X	X	X	N/A	X	X	X	X	X	X

POINT MATCH TOLERANCE

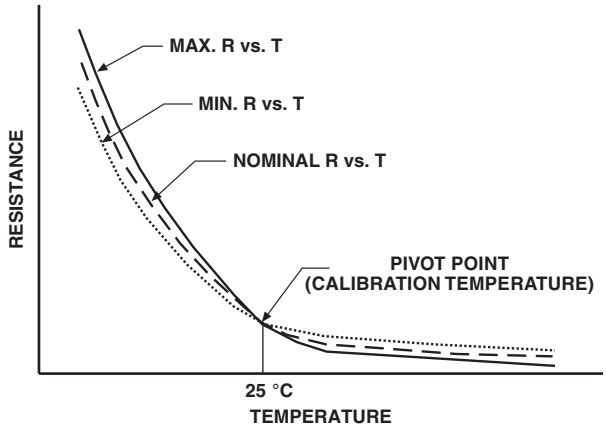
The standard leaded thermistors are calibrated and tested at 25 °C to a tolerance of ± 5 % or ± 10 %; however, tighter tolerance, point matched thermistors are readily available as are special point match temperatures to fit your application.

Since these thermistors have only one controlled point of reference (the point match temperature), the resistance at other temperatures is given by the “Resistance vs. Temperature Conversion Tables” for the appropriate material curve. The resistance value at any temperature is the ratio factor times the resistance at 25 °C. The resistance vs. temperature conversion tables can be found at: www.vishay.com/doc?33004 and www.vishay.com/doc?33011.

Example: 09M1002JF, + 70 °C resistance = (Resistance factor for curve 9 at 70 °C is 0.1990) x (10 000 Ω resistance at 25 °C) = 1990 Ω.

The tolerance of the resistance at any temperature is described by figure 2.

FIGURE 2
POINT MATCH TOLERANCES VS. TEMPERATURE



Point match resistance tolerances at temperatures other than 25 ºC are not the same as the calibration temperature. This difference is presented in figure 2.

The tolerance at any given temperature is the point match tolerance + the MT ± % (manufacturing tolerance).

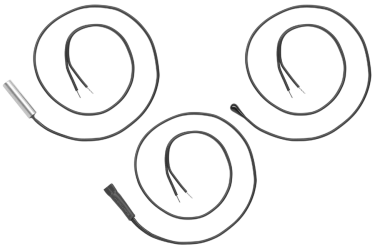
The MT ± % may be obtained from the R vs. T conversion tables (see www.vishay.com/doc?33004) and is added to the point match temperature, i.e., ± 1 % Tol. at 25 ºC + ± 2.6 % at - 30 ºC for Curve 1 equals a total tolerance of ± 3.6 % at - 30 ºC.

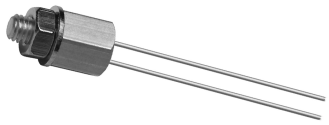
COMPUTER AIDS FOR THERMISTOR SELECTION

A spreadsheet is available for the Vishay thermistor materials that calculates beta, Steinhart-Hart equation constants A, B, and C, the resistance at any temperature based upon the Steinhart constants or beta, the temperature equivalent of the resistance reading, and resistance temperature coefficients.

This spread sheet will also calculate the total resistance tolerance of any point matched thermistor for temperatures in 10 ºC increments, and the resistance tolerance at any temperature within the calibrated range of curve tracking thermistors. Please contact factory if interested in this Excel™ spreadsheet at thermistor1@vishay.com.

NTC Assemblies





Contents

NTC Assemblies 1

GENERAL ORDER INFORMATION

PART NUMBER: NTC L P100 E3 103 H

N	T	C	L	P	1	0	0	E	3	1	0	3	H

PRODUCT FAMILY	EXECUTION	TYPE	RoHS COMPLIANCE TERMINATION TYPE	R_{25} VALUE	TOLERANCE ON R_{25}
NTC	**L** = Leaded	**E400** = Epoxy, PVC AWG24, 80 °C **S100** = Sleeved, PVC AWG24, 80 °C **P100** = Pipe, PVC AWG24, 80 °C	**E2**: Sn alloy **E3**: Pure Sn **E4**: Silver **CL**: Not RoHS	**103** = 10 x 10^3 Ω **102** = 10 x 10^2 Ω **101** = 10 x 10^1 Ω **109** = 10 x 10^0 Ω **108** = 10 x 10^{-1} Ω see spec. for values	**H** = 3 %

PRODUCT DESCRIPTION: 2381 641 4 6 103

2381	641	4	6	103
RoHS COMPLIANCE	EXECUTION	TYPE	TOLERANCE ON R_{25}	R_{25} VALUE
2381 = Yes **2322** = No	**641** = Insulated leads, standard PVC series	**2** = Epoxy, PVC AWG24, 80 °C **3** = Sleeved, PVC AWG24, 80 °C **4** = Pipe, PVC AWG24, 80 °C	**6** = 3 %	**103** = 10 x 10^3 Ω **102** = 10 x 10^2 Ω **101** = 10 x 10^1 Ω **109** = 10 x 10^0 Ω **108** = 10 x 10^{-1} Ω see spec. for values

NTC Assemblies 2

GENERAL ORDER INFORMATION

PART NUMBER: NTC A SCW E3 103 J

N	T	C	A	S	C	W	E	3	1	0	3	J				

PRODUCT FAMILY

NTC

EXECUTION

A = Assemblies

TYPE

IMM = Immersion type
CAP = Plastic cap
LUG = Lug, ring tongue (refer to page 2)
SCW = Screw
PIP = Pipe
EPX = Epoxy
KIT = Kit, grouping of sensors
SRF = Surface sensors
SLV = Sleeve
SPE = Special

RoHS COMPLIANCE TERMINATION TYPE

E2 = Sn alloy
E3 = Pure Sn
E4 = Silver
CL = Not RoHS

R_{25} VALUE

103 = 10 x 10^3 Ω
102 = 10 x 10^2 Ω
101 = 10 x 10^1 Ω
109 = 10 x 10^0 Ω
108 = 10 x 10^{-1} Ω
See spec. for values

Cxxxxx = Customized

TOLERANCE ON R_{25}

F = 1 %
G = 2 %
H = 3 %
J = 5 %
K = 10 %

PRODUCT DESCRIPTION: 2381 640 7 3 103

2381

RoHS COMPLIANCE

2381 = Yes
2322 = No

640

EXECUTION

640 = Standard NTC assemblies

641 = NTC insulated leads, customized PVC series

645 = NTC assemblies, sensors

7

TYPE

7 = Screw type

9..... = Customized

3

TOLERANCE ON R_{25}

5 = 1 %
4 = 2 %
6 = 3 %
3 = 5 %
2 = 10 %

103

R_{25} VALUE

103 = 10 x 10^3 Ω
102 = 10 x 10^2 Ω
101 = 10 x 10^1 Ω
109 = 10 x 10^0 Ω
108 = 10 x 10^{-1} Ω
See spec. for values

EXAMPLES:

NTC A SCW E3 103 J	NTC assemblies screw type e3 termination 10 kΩ 5 %
NTC A CAP E3 C90066	NTC assemblies plastic cap type e3 customized

GENERAL ORDER INFORMATION

PART NUMBER: NTC A LUG E3 C90169

N	T	C	A	L	U	G	E	3	C	9	0	1	6	9			

PRODUCT FAMILY	EXECUTION	TYPE	TERMINATION	CUSTOMIZED
NTC	**A** = Assemblies	**LUG** = Lug ring tongue terminal	**e2** = Sn alloy **e3** = Sn **e4** = Pure metal other than Sn	**Cxxxxx**

PART NUMBER: NTC A LUG03A 103 H 151 C

N	T	C	A	L	U	G	0	3	A	1	0	3	H	1	5	1	C

PRODUCT FAMILY	EXECUTION	LUG SIZE AND CABLE TYPE	R_{25} VALUE	TOLERANCE ON R_{25}	LEAD LENGTH 'abc'	OPTIONAL
NTC	**A** = Assemblies	See table below	**103** = 10 x 10^3 Ω **102** = 10 x 10^2 Ω **101** = 10 x 10^1 Ω **109** = 10 x 10^0 Ω See spec. for values Cxxxxx = Customized	**F** = ± 1 % **G** = ± 2 % **H** = ± 3 % **J** = ± 5 %	**'abc'** = Blank: Standard length **'abc'** = ab x 10^c (in millimeters) Examples: **520** = 52 x 10^0 = 52 mm **251** = 25 x 10^1 = 250 mm **152** = 15 x 10^2 = 1500 mm ...	**x** = Blank **C** = With connector

LUG SIZE AND CABLE TYPE

TYPE	STUD SCREW SIZE (METRIC)	STUD SCREW SIZE (INCH)	HOLE Ø (mm)	WIDTH (mm)	LENGTH (mm)	APPLICABLE WIRE SIZE	CONDUCTOR SIZE (1)	INSULATION TYPE	CABLE INSULATION Ø (mm)
LUG01A	3.5	5 to 6	3.70	7.20	15.70	awg#30 to awg#24	awgt#24 TPC	PTFE	1.12
LUG01B	3.5	5 to 6	3.70	7.20	15.70	awg#30 to awg#24	awgt#30 TPC	UL2651 PVC	1.00
LUG91A	M4	8	4.30	7.20	15.70	awg#30 to awg#24	awgt#24 TPC	PTFE	1.12
LUG02A	3.5	5 to 6	3.70	8.50	16.80	awg#30 to awg#26	awgt#30 SPNi	PEEK	0.56
LUG03A MINI LUG	M2	1 to 2	2.20	5.50	11.50	awg#32	awgt#32 SPNi	PEI	0.35
LUG39A MINI LUG	M3	3 to 4	3.20	5.50	11.50	awg#32	awgt#32 SPNi	PEI	0.35
LUG04A	3.5	5 to 6	3.70	7.20	15.70	awg#30 to awg#24	Ø 0.50 TPNi	N/A	N/A

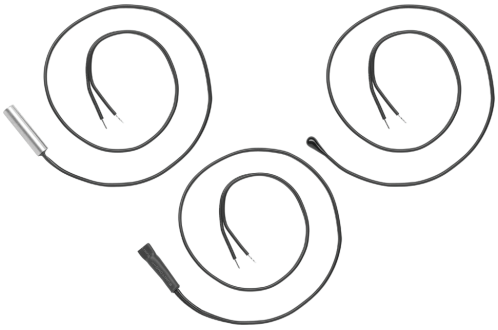
Note

(1) AWG = American wire gage, TPC = Tin plated copper, SPNi = Silver plated nickel

EXAMPLES:

NTC A LUG03A 103 H	NTC Mini LUG 10K 3 % 70 mm (standard length)
NTC A LUG03A 103 H 201	NTC Mini LUG 10K 3 % 200 mm
NTC A LUG E2 C90169	NTC LUG customized

NTC Thermistors, Special Long Lead Sensors



QUICK REFERENCE DATA

PARAMETER	VALUE	UNIT
Resistance value at 25 °C (R_{25})	2.2 to 100	kΩ
Tolerance on R_{25} - value [3]	± 3	%
Tolerance on $B_{25/85}$ - value	± 1.5 or ± 0.75	%
$B_{25/85}$ - value	3977 to 4190	K
Maximum dissipation	250	mW
Dissipation factor:		
NTCLE400...	6.0	mW/K
NTCLS100...	8.0	mW/K
NTCLP100...	6.0	mW/K
Response time [1]:		
NTCLE400...	≈ 7	s
NTCLS100...	≈ 15	s
NTCLP100...	≈ 10	s
Operating temperature range:		
at zero dissipation (continuously)	- 40 to + 85	°C
at maximum dissipation	0 to + 50	°C
Climatic category	40/085/56	
Weight		
NTCLE400...	≈ 4	g
NTCLS100...	≈ 6	g
NTCLP100...	≈ 6	g

Notes

[1] Response time in silicone oil MS 200/50. 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] Wire length and wire type are optional on request. The products can be provided with a connector on request.

[3] Tighter tolerances on R_{25} are available upon request.

FEATURES

- Accurate over wide temperature range
- High stability
- Excellent price/performance ratio
- High adhesive strength between PVC wire and the encapsulating laquer
- Old part number was 2322 641 2/3/4....
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

Temperature measurement, sensing and control in remote locations and for various environmental conditions.

DESCRIPTION

These sensors exist of a small NTC chip reflow soldered between two AWG24 UL-2468 wires. They are lacquered and insulated with black epoxy (NTCLE/641-2 type), sleeved (NTCLS/641-3 type) or potted into a brass pipe (NTCLP/641-4 type).

MARKING

UL mark on wire, no mark on body.

PACKAGING

The thermistors are packed in cardboard boxes; each box containing 500 pieces.

DESIGN-IN SUPPORT

Also available with UL-2651 PVC 105 °C
For complete curve computation, visit:
www.vishay.com/thermistors/curve-computation-list/

MOUNTING

By soldering or clamping the wire ends, in any position. Body can be inserted or taped attached. Not intended for fluid immersed applications.

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} (kΩ)	$B_{25/85}$ - VALUE	SAP PART AND ORDERING NUMBER [4][5]			12NC NUMBER 2381 641		
		EPOXY TYPE	SLEEVED TYPE	PIPE TYPE	EPOXY-COATED TYPE	SLEEVED TYPE	BRASS-PIPE TYPE
2.2	3977K ± 0.75 %	NTCLE400E3222H	NTCLS100E3222H	NTCLP100E3222H	26222	36222	46222
4.7	3977K ± 0.75 %	NTCLE400E3472H	NTCLS100E3472H	NTCLP100E3472H	26472	36472	46472
5	3977K ± 0.75 %	NTCLE400E3502H	NTCLS100E3502H	NTCLP100E3502H	26502	36502	46502
10	3977K ± 0.75 %	NTCLE400E3103H	NTCLS100E3103H	NTCLP100E3103H	26103	36103	46103
47	4090K ± 1.5 %	NTCLE400E3473H	NTCLS100E3473H	NTCLP100E3473H	26473	36473	46473
100	4190K ± 1.5 %	NTCLE400E3104H	NTCLS100E3104H	NTCLP100E3104H	26104	36104	46104

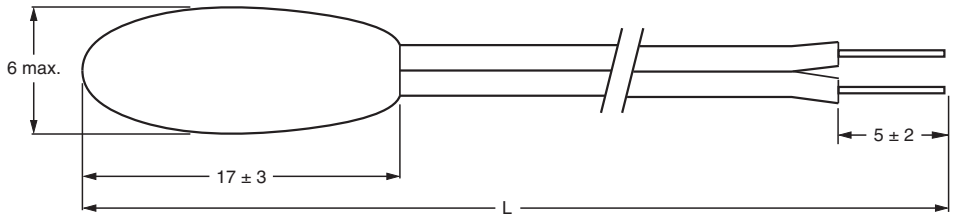
Notes

[4] Other values based on the NTCC100E4.... series are available on request.

[5] The specified catalog numbers refer to products with L = 400 mm, without connector and adopt UL-2468.AWG24 wire.

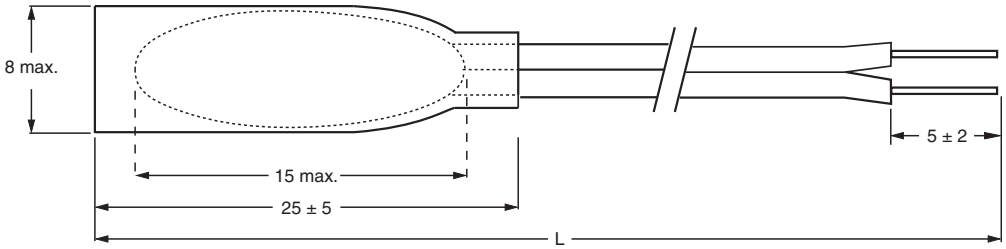
DIMENSIONS in millimeters

Epoxy-coated type 2381 641 2..../NTCLE400E....



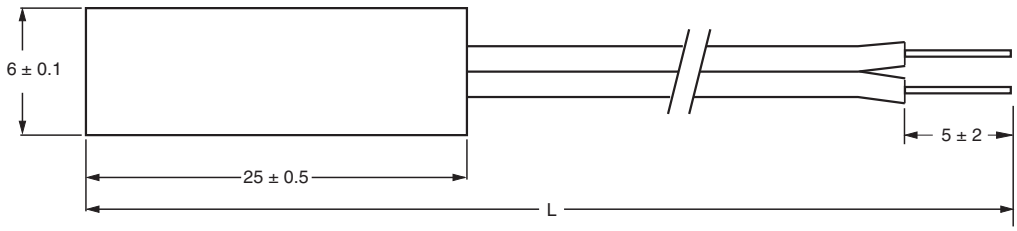
L = 400 mm + 15/- 0
Other wire lengths available on request.

Sleeved type 2381 641 3..../NTCLS100E....



L = 400 mm + 15/- 0
Other wire lengths available on request.

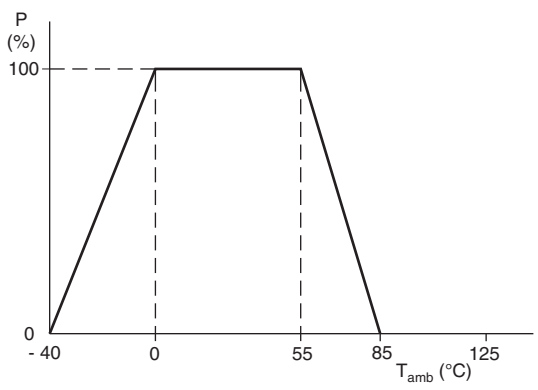
Brass-pipe type 2381 641 4..../NTCLP100E....



L = 400 mm + 15/- 0
Other wire lengths available on request.

DERATING

Power derating curve.



RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 2.2 kΩ, 4.7 kΩ, 5.0 kΩ AND 10 kΩ							
T_{OPER} (°C)	PART NR. NTCL**00E3222H 2381 641 *6222	PART NR. NTCL**00E3472H 2381 641 *6472	PART NR. NTCL**00E3502H 2381 641 *6502	PART NR. NTCL**00E3103H 2381 641 *6103	$\Delta R/R$ (%)	TCR (%/K)	$\Delta T_{max.}$ (± K)
	R_T (Ω)	R_T (Ω)	R_T (Ω)	R_T (Ω)			
- 40	73 061	156 084	166 047	332 094	5.87	- 6.62	0.89
- 35	52 778	112 753	119 950	239 900	5.60	- 6.39	0.88
- 30	38 544	82 344	87 600	175 200	5.33	- 6.18	0.86
- 25	28 443	60 765	64 643	129 287	5.08	- 5.98	0.85
- 20	21 199	45 288	48 179	96 358	4.83	- 5.78	0.84
- 15	15 950	34 075	36 250	72 500	4.60	- 5.60	0.82
- 10	12 110	25 872	27 523	55 046	4.37	- 5.42	0.81
- 5	9275	19 814	21 078	42 157	4.15	- 5.25	0.79
0	7162	15 300	16 277	32 554	3.94	- 5.09	0.77
5	5574	11 909	12 669	25 339	3.74	- 4.93	0.76
10	4372	9340	9936	19 872	3.55	- 4.79	0.74
15	3454	7378	7849	15 698	3.36	- 4.64	0.72
20	2747	5869	6244	12 488	3.18	- 4.51	0.70
25	2200	4700	5000	10 000	3.00	- 4.38	0.69
30	1773	3788	4030	8059	3.17	- 4.25	0.75
35	1438	3071	3267	6535	3.33	- 4.13	0.81
40	1173	2505	2665	5330	3.49	- 4.02	0.87
45	961.8	2055	2186	4372	3.65	- 3.91	0.93
50	793.2	1694	1803	3605	3.80	- 3.80	1.00
55	657.5	1405	1494	2989	3.94	- 3.70	1.07
60	547.8	1170	1245	2490	4.08	- 3.60	1.13
65	458.6	979.7	1042	2084	4.22	- 3.51	1.20
70	385.7	823.9	876.5	1753	4.35	- 3.42	1.27
75	325.8	696.0	740.5	1481	4.48	- 3.33	1.35
80	276.4	590.5	628.2	1256	4.60	- 3.25	1.42
85	235.5	503.0	585.2	1070	4.73	- 3.17	1.49

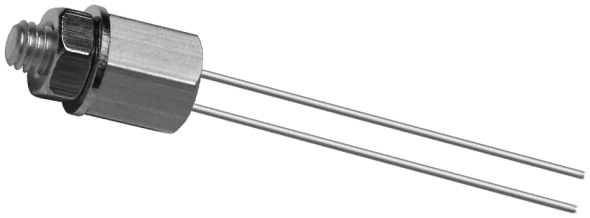
RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 47 kΩ				
T_{OPER} (°C)	PART NR. NTCL**00E3473H 2381 641 *6473	$\Delta R/R$ (%)	TCR (%/K)	$\Delta T_{max.}$ (± K)
	R_T (Ω)			
- 40	1 589 068	8.91	- 6.54	1.36
- 35	1 151 627	8.34	- 6.34	1.32
- 30	842 790	7.79	- 6.15	1.27
- 25	622 597	7.27	- 5.96	1.22
- 20	464 110	6.77	- 5.79	1.17
- 15	348 989	6.28	- 5.62	1.12
- 10	264 628	5.82	- 5.45	1.07
- 5	202 280	5.37	- 5.30	1.01
0	155 823	4.94	- 5.14	0.96
5	120 932	4.52	- 5.00	0.91
10	94 528	4.12	- 4.86	0.85
15	74 399	3.74	- 4.72	0.79
20	58 945	3.36	- 4.59	0.73
25	47 000	3.00	- 4.47	0.67
30	37 706	3.35	- 4.35	0.77
35	30 429	3.69	- 4.23	0.87
40	24 696	4.02	- 4.12	0.97
45	20 154	4.33	- 4.01	1.08
50	16 534	4.64	- 3.91	1.19
55	13 633	4.94	- 3.81	1.30
60	11 296	5.23	- 3.71	1.41
65	9404	5.51	- 3.62	1.52
70	7865	5.78	- 3.53	1.64
75	6607	6.04	- 3.44	1.75
80	5573	6.30	- 3.36	1.87
85	4721	6.55	- 3.28	2.00

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 100 kΩ				
T_{OPER} (°C)	PART NR. NTCL**00E3104H 2381 641 *6104 R_T (Ω)	$\Delta R/R$ (%)	TCR (%/K)	$\Delta T_{max.}$ (± K)
- 40	3 666 299	9.05	- 6.69	1.35
- 35	2 637 588	8.47	- 6.49	1.31
- 30	1 916 576	7.91	- 6.29	1.26
- 25	1 406 111	7.37	- 6.10	1.21
- 20	1 041 184	6.86	- 5.92	1.16
- 15	777 846	6.36	- 5.75	1.11
- 10	586 097	5.89	- 5.58	1.06
- 5	445 257	5.43	- 5.42	1.00
0	340 942	4.99	- 5.26	0.95
5	263 054	4.56	- 5.11	0.89
10	204 446	4.15	- 4.97	0.84
15	160 014	3.75	- 4.83	0.78
20	126 087	3.37	- 4.70	0.72
25	100 000	3.00	- 4.57	0.66
30	79 808	3.36	- 4.45	0.75
35	64 077	3.70	- 4.33	0.86
40	51 745	4.04	- 4.22	0.96
45	42 021	4.36	- 4.11	1.06
50	34 308	4.68	- 4.00	1.17
55	28 156	4.98	- 3.90	1.28
60	23 222	5.28	- 3.80	1.39
65	19 246	5.57	- 3.71	1.50
70	16 025	5.85	- 3.62	1.62
75	13 402	6.12	- 3.53	1.73
80	11 258	6.38	- 3.45	1.85
85	9496	6.64	- 3.36	1.97

TESTS AND REQUIREMENTS

STABILITY TESTS				
IEC	CECC	TEST	PROCEDURE	DRIFT REQUIREMENT
	D3; 4.20.1	Endurance	85 °C; 1000 h	$\Delta R/R$ < 5 %
60068-2-1		Endurance	- 40 °C; 1000 h	$\Delta R/R$ < 5 %
60539		Endurance	250 mW; 55 °C; 1000 h	$\Delta R/R$ < 5 %
60068-2-3	D1; 4.19	Damp heat, steady state	56 days at 40 °C; 90 % to 95 % RH	$\Delta R/R$ < 7 %
60068-20-14	C2; 4.14	Rapid change of temperature	- 40 °C to + 85 °C; 50 cycles	$\Delta R/R$ < 5 %

NTC Thermistors, Screw Threaded Sensors



FEATURES

- Easy mounting
- Rugged construction
- Replaces the serie 2322 640 7....
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

Temperature measurement, sensing and control.

Suitable for many applications, especially when a good electrical insulation and a good thermal contact with the chassis is required.

DESCRIPTION

The thermistors are made of NTC ceramic material reflow soldered between two solid tinned copper or nickel wires and potted in the head of passivated aluminum srew size M4.

PACKAGING

The thermistors are packed in cardboard boxes; the smallest packaging quantity is 100 units.

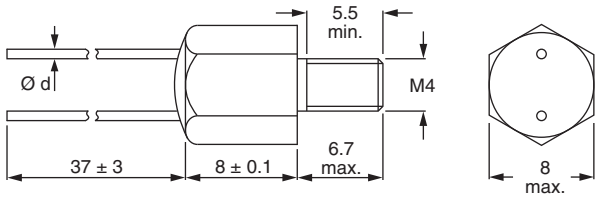
MARKING

The last 4 digits of the catalog number are printed on the stud in accordance with the information in Electrical Data and Ordering Information Table.

MOUNTING

By means of a washer and M4 nut supplied with the device or in a threaded screw hole. Applied torque shall not exceed 1.2 Nm. Leads to be soldered or crimped.

DIMENSIONS in millimeters



Component outline

QUICK REFERENCE DATA

PARAMETER	VALUE
Resistance value at 25 °C	1.0 kΩ to 470 kΩ
Tolerance on R_{25} - value	± 1 %, ± 2 %, ± 5 %
Tolerance on $B_{25/85}$ - value	± 0.5 % to ± 2.5 %
$B_{25/85}$ - value	3740K to 4570K
Maximum dissipation	500 mW
Dissipation factor (1)	≈ 23 mW/K
Thermal time constant (1)	≈ 7.5 s
Operating temperature range at:	
Zero dissipation	- 40 °C to + 100 °C
Maximum dissipation	0 °C to + 55 °C
Weight	≈ 1.5 g
Min. dielectric withstanding voltage between terminals and Al case	1500 V_{ac} (1 s)
Insulation resistance between terminals and Al case	min. 100 MΩ

Notes

(1) Measured with screw mounted on an aluminium heatsink of 100 cm^2, thickness 1.5 mm, in still air at T_{amb} = + 25 °C

- Other R_{25} values based on 640 0 series are available upon request
- Other tolerances on R_{25} are available upon request
- Insulated leads available upon request

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} (kΩ)	TOLERANCE ON R_{25}	$B_{25/85}$ - VALUE	LEADS DIAMETER Ø d (mm)	TCR (%/K)	SAP MATERIAL NO.	12 NC ORDERING CODE
1.0	± 5 %	3528K ± 0.5 %	0.6	- 3.87	NTCASCWE3102J	2381 640 73102
2.2	± 5 %	3977K ± 0.75 %	0.6	- 4.37	NTCASCWE3222J	2381 640 73222
4.7	± 5 %	3977K ± 0.75 %	0.6	- 4.37	NTCASCWE3472J	2381 640 73472
10	± 5 %	3977K ± 0.75 %	0.6	- 4.37	NTCASCWE3103J	2381 640 73103
12	± 5 %	3740K ± 1.5 %	0.6	- 4.10	NTCASCWE3123J	2381 640 73123
15	± 5 %	3740K ± 1.5 %	0.6	- 4.10	NTCASCWE3153J	2381 640 73153
47	± 5 %	4090K ± 1.5 %	0.6	- 4.46	NTCASCWE3473J	2381 640 73473
100	± 1 %	4190K ± 1.5 %	0.5	- 4.57	NTCASCWE3104F	2381 640 75104
100	± 2 %	4190K ± 1.5 %	0.5	- 4.57	NTCASCWE3104G	2381 640 74104
100	± 5 %	4190K ± 1.5 %	0.6	- 4.57	NTCASCWE3104J	2381 640 73104
150	± 5 %	4370K ± 2.5 %	0.6	- 4.75	NTCASCWE3154J	2381 640 73154
470	± 5 %	4570K ± 2 %	0.6	- 4.95	NTCASCWE3474J	2381 640 73474

Notes

- R_{25} - values, temperature coefficients and catalog numbers
- The thermistors have a 12-digit catalog number starting with 2381 640 7. The subsequent 4 digits indicate the resistance value and tolerance.

NTC Thermistors, Steel Capped Sensors

FEATURES

- High mechanical strength
- AMP connectors for easy connection
- Excellent accuracy over a wide temperature range
- Old part number was 2322 640 90042
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

APPLICATIONS

- Sensors for water temperature control in, for example:
  - Washing machines
  - Dish washers
  - Heat pumps
  - Electric boilers

DESCRIPTION

These thermistors have a negative temperature coefficient. The device consists of a ceramic material which is mounted in a capsule of stainless steel and provided with two 6.3 mm tinned bronze spade connectors.

The device is non-flammable and the housing is stainless steel in accordance with "DIN 1.4301" (x 5 CrNi 18 9).

MOUNTING

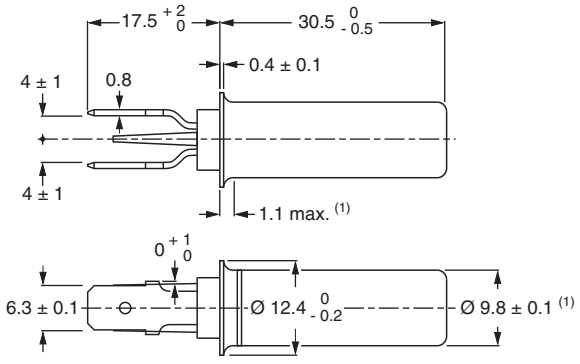
Connect to two FASTONS 6.3 x 0.8 or equivalent.

PACKAGING

The thermistors are packed in cardboard boxes; the smallest packaging quantity is 50 units.

DIMENSIONS in millimeters

Component outline



QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at:	
0 °C	35 875 Ω ± 7 %
25 °C	12 000 Ω ± 4 %
85 °C	1475 Ω ± 3 %
100 °C	963 Ω ± 4.2 %
$B_{25/85}$ - value	3730 K
Temperature coefficient	- 4.2 %/K
Maximum dissipation	250 mW
Dissipation factor:	
in still air (for information only) (1)	7.5 mW/K
in still water (for information only) (1)	18 mW/K
Thermal time constant (τ) in still air (1)	285 s
Response time (2)	13 s to 16 s
Temperature gradient (3)	≤ 0.02 K/K
Operating temperature range:	
at zero power; continuously	- 25 °C to + 110 °C
at zero power; peak	130 °C
at maximum power	0 °C to + 55 °C
Minimum dielectric withstanding voltage (RMS) between terminals and capsule during:	
1 min	1500 V
10 s	1650 V
Minimum insulation resistance between terminals and capsule at 100 V_{DC}	100 MΩ
Weight	≈ 8 g

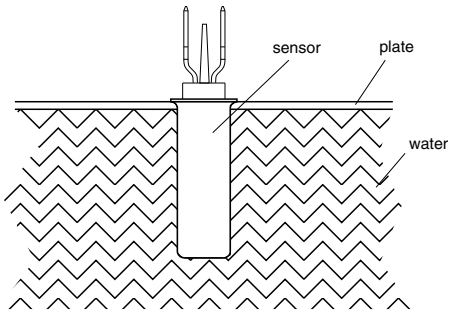
Notes

(1) Measured with AMP connectors in still air with solid copper wires of 1 mm diameter.

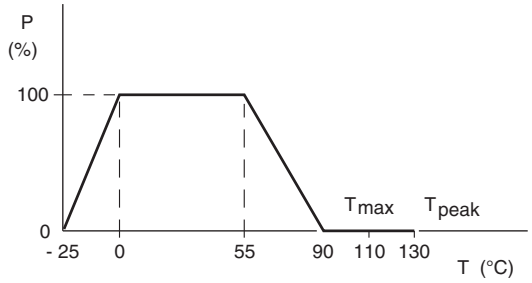
(2) The response time is the time necessary to change 63.2 % of the total difference between the initial and the final body temperature, when subjected to a step function change in ambient temperature.
Step change:
a) Initial temperature: air at 25 °C
b) Final temperature: water at 100 °C

(3) The temperature gradient is the difference per degree Celsius between the true temperature of the liquid (water) and the temperature measured by the sensor.

METHOD OF APPLICATION



DERATING



Power derating curve

NTC Thermistor Sensor - Pipe Type With Fast Time Response

TIME RESPONSE TO TEMPERATURE CHANGE

Response time to temperature change 25 °C to 85 °C, sensor dipped in silicone oil at 85 °C.

	0 % to 63.2 % (typical)	10 % to 90 % (typical)
NTCAPIP...101 3.2 x 15 mm	3.5 s	9.5 s
NTCLPIPE 6 x 25 mm (standard)	6 s	17 s

QUICK REFERENCE DATA		
PARAMETER	**VALUE**	**UNIT**
Resistance at 25 °C (R_{25})	100	kΩ
Tolerance on R_{25}	± 3	%
$B_{25/85}$	4190	K
Tolerance on $B_{25/85}$	± 1.5	%
Minimum dielectric withstand	1500	V_{rms}
Maximum dissipation	250	mW
Operating temperature range	- 40 to + 105	°C
Mass	1.6	g

CUSTOMIZATIONS

1. The electrical resistance and $B_{25/85}$ values can be changed based on the series 2381 645 50xxx mini-chip NTC series refer to Vishay's NTC curve computation files
2. The tolerances can be adapted
3. The wire length can be changed on request
4. A connector housing and terminal can be added, or ferrules can be crimped (wire end)
5. 3D Solid Model can be obtained

FEATURES

- Fast time response vs. industry standards
- High stability
- High resistance to humidity
- Accurate over wide temperature range
- High encapsulating strength between the PVC wire and the encapsulated lacquer
- Compliant to RoHS directive 2002/95/EC

Pb e3 RoHS COMPLIANT

APPLICATIONS

Electronic component used for temperature measurement, sensing and control.

The thermistors have a negative temperature coefficient.

Typical applications include, for example:

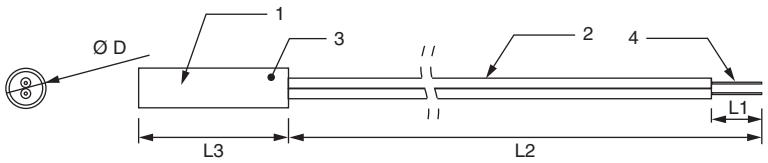
- Airconditioning sensors
- Evaporator sensors
- Industrial sensors
- Heating systems sensors
- Indoor and outdoor sensor

MOUNTING

The sensor can be clipsed, glued or attached to a surface or pipe.

The sensor can be connected by soldering, or a connector can be added.

DIMENSIONS



DIMENSIONS in millimeter		
	VALUE	**TOLERANCE**
L1	3.5	+ 0/- 2
L2	300	+ 20/- 10
L3	15	± 0.3
D	3.2	± 0.3

1. Vishay NTC chip
2. Lead wires, 105 °C PVC, tin plated copper, AWG#30
3. Nickel plated brass pipe
4. Conductor stripped

ORDERING INFORMATION

SAP ORDERING NUMBER
NTCAPIPE3104H101

Ordering Information:
www.vishay.com/doc?33036

3D Solid Model:
www.vishay.com/doc?29106

NTC Curve computation:
www.vishay.com/thermistors/curve-computation-list/

R-T CHARACTERISTICS

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

TEMP. (°C)	R_T/R_{25}	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (± K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	36.663	3 666 299	9.05	- 6.69	1.35	3 334 382	3 998 217
- 35	26.376	2 637 588	8.47	- 6.49	1.31	2 414 177	2 860 998
- 30	19.166	1 916 576	7.91	- 6.29	1.26	1 764 950	2 068 202
- 25	14.061	1 406 111	7.37	- 6.10	1.21	1 302 413	1 509 810
- 20	10.412	1 041 184	6.86	- 5.92	1.16	969 762	1 112 605
- 15	7.778	77 7846	6.36	- 5.75	1.11	728 341	827 350
- 10	5.861	586 097	5.89	- 5.58	1.06	551 588	620 605
- 5	4.453	445 257	5.43	- 5.42	1.00	421 083	469 431
0	3.409	340 942	4.99	- 5.26	0.95	323 938	357 945
5	2.631	263 054	4.56	- 5.11	0.89	251 055	275 052
10	2.044	204 446	4.15	- 4.97	0.84	195 961	212 931
15	1.600	160 014	3.75	- 4.83	0.78	154 008	166 020
20	1.261	126 087	3.37	- 4.70	0.72	121 837	130 336
25	1.000	100 000	3.00	- 4.57	0.66	97 000	103 000
30	0.798	79 808	3.36	- 4.45	0.75	77 128	82 488
35	0.641	64 077	3.70	- 4.33	0.86	61 703	66 451
40	0.517	51 745	4.04	- 4.22	0.96	49 655	53 836
45	0.420	42 021	4.36	- 4.11	1.06	40 187	43 855
50	0.343	34 308	4.68	- 4.00	1.17	32 702	35 913
55	0.282	28 156	4.98	- 3.90	1.28	26 752	29 559
60	0.232	23 222	5.28	- 3.80	1.39	21 996	24 449
65	0.192	19 246	5.57	- 3.71	1.50	18 174	20 318
70	0.160	16 025	5.85	- 3.62	1.62	15 088	16 962
75	0.134	13 402	6.12	- 3.53	1.73	12 582	14 222
80	0.113	11 258	6.38	- 3.45	1.85	10 539	11 976
85	0.095	9496	6.64	- 3.36	1.97	8866	10 126
90	0.080	8042	6.89	- 3.28	2.10	7488	8596
95	0.068	6837	7.13	- 3.21	2.22	6350	7325
100	0.058	5835	7.36	- 3.13	2.35	5405	6265
105	0.050	4998	7.59	- 3.06	2.48	4618	5377

TESTS AND REQUIREMENTS

STABILITY TESTS

IEC	CECC	TEST	PROCEDURE	DRIFT REQUIREMENT
	D3; 4.20.1	Endurance	+ 105 °C; 1000 h	$\Delta R/R$ < 5 %
68-2-1		Endurance	- 40 °C; 1000 h	$\Delta R/R$ < 5 %
539		Endurance	250 mW; 55 °C; 1000 h	$\Delta R/R$ < 5 %
68-2-3	D1; 4.19	Damp heat, steady state	56 days at 40 °C; 90 % to 95 % RH	$\Delta R/R$ < 7 %
68-2-14	C2; 4.14	Rapid change of temperature	- 40 °C to + 105 °C; 500 cycles	$\Delta R/R$ < 5 %

NTC Thermistors, Long Immersion Sensor with Connector

FEATURES

- Rugged construction
- Temperature measurement accuracy better then ± 1 °C between 50 °C and 100 °C
- Stainless steel housing
- Housing is 100 % watertight
- High number of thermal cycles resistant (minimum 100 000 cycles)
- Withstanding voltage 500 V (between outer case and terminals/NTC)
- Male terminals 6.3 x 0.8. type IDC rast 5 mm, or solderless terminals FASTON (IEC 760 flat quick connections)
- Compliant to RoHS directive 2002/95/EC
- PVC-free

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

Thermistor NTC sensor, with a negative temperature coefficient, measured in accordance with IEC 60539.

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at 25 °C (for information)	11 979 Ω
Resistance at 80 °C	1704 Ω
Tolerance on R_{80} - value	± 2 %
$B_{25/85}$ - value	3740K
Tolerance on $B_{25/85}$ - value	± 0.75 %
Thermal time constant τ 63.2 % (25 °C to oil 85 °C)	15 s
Operating temperature range at zero power	- 25 °C to + 125 °C
Min. dielectric withstanding voltage between the metallic housing and the terminals/NTC	500 V_{AC}
Max. Power	150 mW
R/T values	Refer to table
Climatic category (IEC 60539)	25/125/56
Weight	19 g

APPLICATIONS

Sensor used for temperature measurement, sensing and control in:

- Water boilers
- Heating system
- Water and used water systems
- Water and oil tanks
- Consumer appliances
- Industrial appliances
- Solar heating systems

MOUNTING

- O-Ring
- U-Clip or spring
- Rast 5 mm 2 poles connector (refer to polarisation detail), or female FASTON for 6.3 x 0.8 terminals or equivalents

ELECTRICAL DATA AND ORDERING INFORMATION				
SAP MATERIAL NO.	**12NC**	**R_{25} - VALUE (kΩ)**	**$B_{25/85}$ - VALUE (K)**	**SPQ (Pieces)**
NTCAIMME3C90080	2381 645 90080	11 979	3740	100

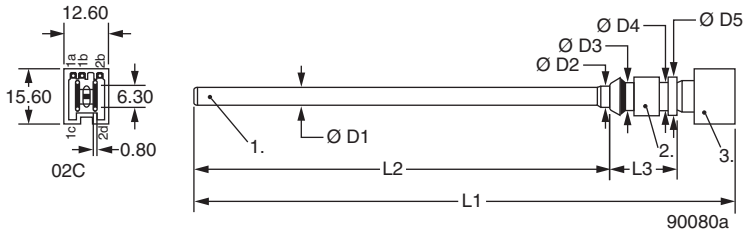
Ordering information can be found on: www.vishay.com/doc?33036

NTCAIMME3C90080/2381 645 90080

Vishay BCcomponents

NTC Thermistors, Long Immersion Sensor with Connector

DIMENSIONS in millimeters



1.	2.	3.	L1	L2	L3	Ø D1	Ø D2	Ø D3	Ø D4	Ø D5
Thermistor NTC position	Stainless steel housing	Connector	153.5 ± 3	118	19	5 + 0.05/- 0.02	6	8.1 ± 0.1 (O-Ring)	8 (Clip)	11 + 0.05/- 0.02

R/T TABLE

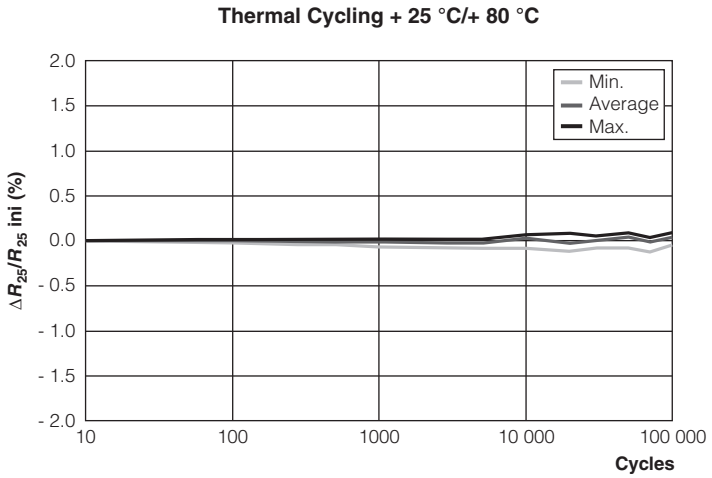
TEMP. (°C)	R_T/R_{25}	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 25	10.819	129 600	8.86	- 5.52	1.60	118 123	141 078
- 20	8.244	98 762	8.40	- 5.35	1.57	90 465	107 058
- 15	6.335	75 887	7.96	- 5.19	1.53	69 844	81 930
- 10	4.907	58 777	7.54	- 5.03	1.50	54 344	63 210
- 5	3.829	45 874	7.14	- 4.88	1.46	42 600	49 147
0	3.011	36 067	6.75	- 4.74	1.42	33 634	38 500
5	2.384	28 557	6.37	- 4.60	1.38	26 738	30 376
10	1.900	22 765	6.01	- 4.47	1.34	21 398	24 132
15	1.525	18 266	5.66	- 4.34	1.30	17 233	19 299
20	1.231	14 748	5.32	- 4.22	1.26	13 964	15 532
25	1.000	11 979	4.99	- 4.10	1.22	11 382	12 577
30	0.8170	9787	4.67	- 3.99	1.17	9329	10 244
35	0.6712	8040	4.37	- 3.88	1.13	7689	8391
40	0.5543	6640	4.07	- 3.77	1.08	6370	6911
45	0.4602	5513	3.78	- 3.67	1.03	5304	5721
50	0.3839	4599	3.50	- 3.58	0.98	4438	4760
55	0.3218	3855	3.23	- 3.48	0.93	3731	3980
60	0.2710	3247	2.97	- 3.39	0.88	3150	3343
65	0.2293	2746	2.72	- 3.30	0.82	2672	2821
70	0.1947	2333	2.47	- 3.22	0.77	2275	2391
75	0.1661	1990	2.23	- 3.14	0.71	1945	2034
80	0.1422	1704	2.00	- 3.06	0.65	1670	1738
85	0.1223	1465	2.23	- 2.99	0.75	1432	1497
90	0.1055	1264	2.45	- 2.92	0.84	1233	1295
95	0.09135	1094	2.66	- 2.85	0.93	1065	1123
100	0.07936	950.7	2.87	- 2.78	1.03	920.7	980.7
105	0.06918	828.8	3.07	- 2.71	1.13	800.4	857.2
110	0.06050	724.8	3.27	- 2.65	1.23	698.0	751.5
115	0.05307	635.8	3.46	- 2.59	1.34	610.7	660.9
120	0.0467	559.4	3.65	- 2.53	1.44	535.9	582.9
125	0.04121	493.6	3.83	- 2.47	1.55	471.7	515.5

Notes

- Other resistance and tolerances values available
- Other connector polarisations available on request
- Available with insulated leads instead of connector
- Detail mounting drawing or 3D solid model available on request
- Available with platinum elements Pt500 or Pt1000 sensor

RELIABILITY DATA		
TEST	**CONDITIONS**	**$\Delta R_{25}/R_{25}$ (typical)**
Dry heat storage (steady state) IEC 60068-2-2	T = 125 °C t = 1000 h	< 1 %
Damp heat storage (steady state) IEC 60068-2-78	T = 85 C (air) 85 % RH t = 56 days	< 1 %
Rapid temperature cycling (air) IEC 60068-2-14	T1 = - 40 °C T2 = 125 °C t < 15 s 10 000 cycles	< 1 %
Rapid temperature cycling (oil)	T1 = 25 °C T2 = 80 °C 100 000 cycles	< 1 %

TYPICAL THERMAL CYCLING RELIABILITY



NTC Thermistors, Refrigerator Sensors

FEATURES

- Key component for temperature sensing and electronic control
- Accurate Vishay NTC chips, enabling class A to class A+++ refrigerator grades
- Sensor design following class II insulation (principal + supplementary insulation for the sensor head)
- High adhesive strength between PVC wire and encapsulating lacquer
- Specifically developed design allows for a very good water, moisture and ice resistance: 6000 h in water immersion under voltage
- Suitable for evaporater temperature measurement. Very high number of thermal cycles resistant: 100 000 cycles
- The cables jackets are suitable for back-panel polyurethane foaming process (max. 100 °C, 5 min)
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- The plastic is not FDA grade
- UL certification on request
- The sensors are also available with single insulated cables, and with PVC-free cable

APPLICATIONS

Temperature measurement, sensing and control:

- White goods
- Refrigerators
- Freezers, deep-freezers
- Ice cube makers
- Counter drinks coolers
- Backbar and catering coolers
- Display fridges
- Wine coolers

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Climatic category (IEC 60539)	55/60/56
Resistance value at 25 °C (1)	2000 Ω to 47 000 Ω
Tolerance on R_{25} - value (1)	± 1 % to 2 %
$B_{25/85}$ - value (1)	3984K (1)
Tolerance on $B_{25/85}$ - value	± 0.5 %
Operating temperature range at zero power	- 55 °C to + 60 °C
Min. dielectric withstanding voltage (imjmersed in water)	3750 V_{AC}
Max. Power	150 mW
R/T values	Refer to table
Weight	16 g

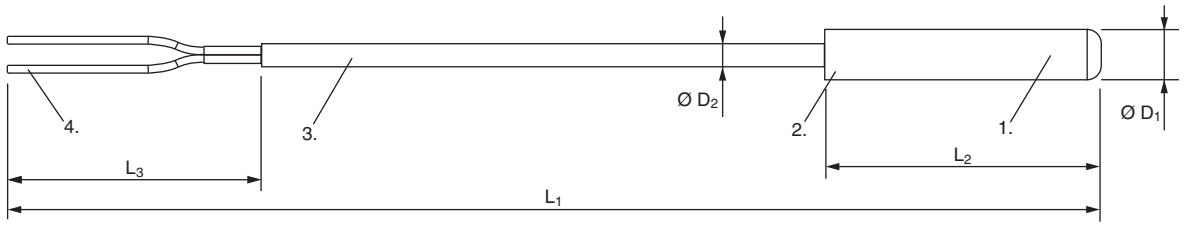
Note

(1) Other resistances and B values available

ELECTRICAL DATA AND ORDERING INFORMATION

VISHAY SAP	CAP. DIA. Ø D1 (mm)	CAP. LENGTH L2 (mm)	CABLE INSULATION	CABLE LENGTH L1 (mm)	R_{25} - VALUE (Ω)	R_{25} - TOL.	$B_{25/85}$ - VALUE (K)	$B_{25/85}$ - TOL.	c UL us	CONNECTOR
NTCACAPE3C90193	7	25	Single	300	10 000	± 2 %	3984K	± 0.5 %	-	-
NTCACAPE3C90144	7	25	Double	500	10 000	± 2 %	3984K	± 0.5 %	-	-
NTCACAPE3C90066	7	25	Double	500	2700	± 2 %	3984K	± 0.5 %	UL	-
NTCACAPE3C90191	8	30	Double	900	5000	± 1 %	3984K	± 0.5 %	-	-
NTCACAPE3C90125	9	49	Double	1250	10 000	± 2 %	3984K	± 0.5 %	UL	Rast 2.5 (**) PCB Edge

DIMENSIONS in millimeters



L_1, L_2, D_1: See table Electrical Data
D_2 = 4 mm, L_3 = 50 mm

Notes
(1) Vishay NTC Thermistor chip with epoxy coatings and special potting resins
(2) ABS plastic cap of refrigerator white color
(3) Double insulated cable, cylindrical, PVC/PVC, 2 x 0.35 mm^2
(4) Conductors' end insulation non stripped

PACKAGING

SPQ: 250 items

MOUNTING

The plastic housing can be inserted in a pocket inside the refrigerator cabinet.
The plastic housing can be assembled with the refrigerator cabinet backside, with the help of adhesive tape, then foamed.
The plastic housing can be inserted on a pipe welded on the evaporator tube.
The plastic housing can be clamped on the evaporator tube with the help of a clip.
Suitable for PCB Edge connection, or plugged in a wire-to-wire connector, or assembled in a terminal block.

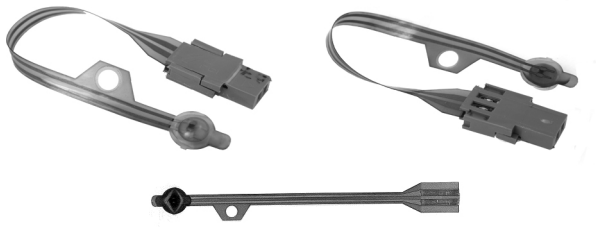
DESIGNERS CORNER

- Other Resistance-Temperature curves are available, based on Vishay 2381 640 0xxxx series, or specific customer's curve.
- Other lead length and other standard plastic caps, like Ø 6 mm x 25 mm, Ø 7 mm x 25 mm, Ø 8 mm x 30 mm, Ø 9 mm x 30 mm, Ø 9 mm x 49 mm, 7 mm x 7.5 mm x 25 mm or customer specific sensor shapes, are available on request.
- Single insulated cables and Class I sensors can also be supplied.
- The sensors can be supplied without connector, with end-wire stripped,with crimped connectors, sealed connectors,or insulation displacement connectors (e.g. rast 2.5 mm). Consult Vishay for the list of available connectors.
- Several sensors can be grouped on the same connector, with the same or different shape.
- Additional features, like connection to the door switch, can also be included on the grouping connector.
- Visual aids, like cable jacket colours or position markers can be added to optimize customer's assembling process.
- The cable harness associated with the sensor can be provided as a total solution.

DESIGNERS TOOLS

- 3D Solid Models (STEP or IGES) or 2D Models (DXF, DWG) are available
- 3D solid models: www.vishay.com/doc?29106
- NTC curve computation: www.vishay.com/thermistors/curve-computation-list/

NTC Thermistors, Flex Foil Sensors



QUICK REFERENCE DATA

PARAMETER	VALUE
Resistance value at 25 °C	47 kΩ
Tolerance on R_{25} value	± 3 %
$B_{25/85}$ value	3960K
Tolerance on $B_{25/85}$ value	± 1 %
Operating temperature range at zero power	- 40 °C to 125 °C
Climatic category (IEC 60539)	40/125/56
Thermal time constant on heating (1)	2 s
Minimum dielectric withstanding voltage	500 V_{AC}
Minimum insulation resistance	10 MΩ
Maximum dissipation at 25 °C	60 mW
Weight (without connector)	0.13 g
Weight (with connector)	0.53 g

Note

- Measured from 25 °C air to 125 °C heated plate, pressed on the surface

DESIGNERS OPTIONS

- The sensor can be delivered with a FFC/FPC connector
- The connector termination can be tin or gold plated
- Other dimensions and various shapes of the flex circuit are available on request
- A 3D solid model is available on request

Note

- FFC/FPC = Flexible Film Circuit/Flexible Printed Circuit

FEATURES

- Rapid response time
- Suitable for narrow space applications
- High flexibility of the foil
- Insulated and humidity resistant
- A strain relief hole is included in the flex design to avoid traction to the sensor head
- e3 - Sn
- Compliant to RoHS directive 2002/95/EC

RoHS COMPLIANT

APPLICATIONS

- Consumer appliances and white goods
- Power supply (aluminum fins)
- Battery, displays
- Industrial applications
- Boilers

DESCRIPTION

- Miniature NTC temperature sensor on flex foil, insulated used for temperature sensing and control
- Surface temperature sensor with low thermal mass and rapid response time on surface

MOUNTING

- The sensor head can be pressed on the surface with means of insulating material (silicone foam) or spring
- The sensor head can also be glued wih a double-face temperature resistant adhesive
- The sensor end can be connected to PCB counter-connector or wire-to-wire connector or soldered to conductors, or crimped with FFC connectors
- The strain relief hole can allow a screw mounting, or be included within a melted plastic pin
- Remark: The response time and thermal gradient are dependant of the application and of the way of mounting the sensor in place

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} VALUE (kΩ)	R_{25} TOL. (%)	$B_{25/85}$ VALUE (K)	$B_{25/85}$ TOL. (%)	SAP MATERIAL NO.	DESCRIPTION	R/T TABLE
47	3	3960	1	NTCAFLEX01473HH	NTC Flex 47K 3 %	Table 1
47	3	3960	1	NTCAFLEX01473HHC	NTC Flex 47K 3 % Connector	Table 1

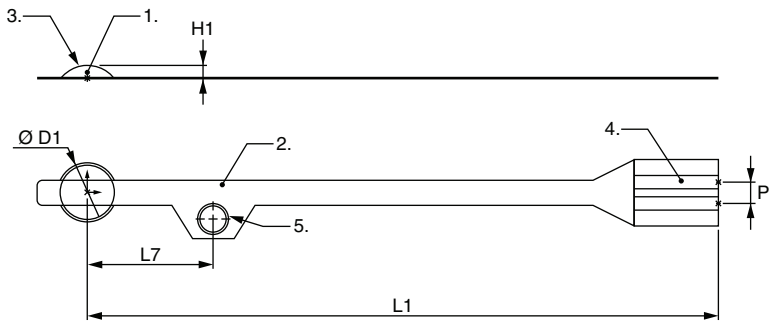
SAP CODIFICATION

Part Number: NTCAFLEX01473HH

N	T	C	A	F	L	E	X	0	1	4	7	3	H	H	

MODEL	ASSEMBLY	FLEX SENSOR	MECHANICAL EXECUTION	RESISTANCE VALUE	TOLERANCE ON R_{25}	B-VALUE RANGE	CONNECTOR OPTION
NTC	**A**	**FLEX**	**01**	**473** = 47 x 10^3 Ω	**H** = ± 3 %	**L** (low) = 3000 ≤ $B_{25/85}$ < 3500 **M** (medium) = 3500 ≤ $B_{25/85}$ < 3750 **H** (high) = 3750 ≤ $B_{25/85}$ < 4000 **X** (very high) = 4000 ≤ $B_{25/85}$ < 4250	**Blank** = No connector **C** = With connector tin plated

MECHANICAL DATA



DIMENSIONS in millimeters			
L1	**L7**	**Ø D1**	**H1**
75 ± 1	15 ± 1	7 ± 0.5	1.55 ± 0.2

1. NTC SMD soldered on flex foil circuit
2. Flex foil circuit
3. High quality modified epoxy glob top
4. Conductive tracks
5. Hole for strain relief

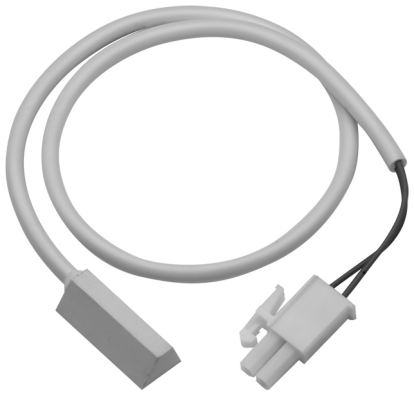
REFERENCE

Connector 2 positions, 2.54 mm (0.1").
The connector mates with industry standard headers or wire-to-wire connectors.

R/T TABLE 1				
R_{25} VALUE (kΩ)	R_{25} TOL. (%)	$B_{25/85}$ VALUE (K)	$B_{25/85}$ TOL. (%)	SAP MATERIAL NO.
47	3	3960	1	NTCAFLEX01473HH
47	3	3960	1	NTCAFLEX01473HHC

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	34.97	1 643 693	10.80	- 6.85	1.58	1 466 123	1 821 262
- 35	25.00	1 174 859	10.04	- 6.59	1.52	1 056 912	1 292 806
- 30	18.09	850 461	9.31	- 6.34	1.47	771 290	929 633
- 25	13.26	623 018	8.61	- 6.11	1.41	569 370	676 666
- 20	9.82	461 557	7.94	- 5.89	1.35	424 898	498 216
- 15	7.35	345 583	7.30	- 5.69	1.28	320 350	370 816
- 10	5.56	261 354	6.69	- 5.49	1.22	243 877	278 831
- 5	4.25	199 536	6.10	- 5.31	1.15	187 370	211 702
0	3.27	153 714	5.53	- 5.13	1.08	145 213	162 215
5	2.54	119 427	4.99	- 4.97	1.00	113 473	125 381
10	1.99	93 541	4.46	- 4.81	0.93	89 369	97 714
15	1.57	73 832	3.96	- 4.66	0.85	70 911	76 752
20	1.25	58 703	3.47	- 4.52	0.77	56 666	60 739
25	1.00	47 000	3.00	- 4.38	0.69	45 590	48 410
30	0.81	37 881	3.23	- 4.25	0.76	36 659	39 103
35	0.65	30 726	3.45	- 4.13	0.84	29 667	31 784
40	0.53	25 073	3.66	- 4.01	0.91	24 156	25 990
45	0.44	20 579	3.86	- 3.89	0.99	19 784	21 374
50	0.36	16 984	4.06	- 3.79	1.07	16 294	17 674
55	0.30	14 092	4.26	- 3.68	1.16	13 492	14 692
60	0.25	11 751	4.44	- 3.58	1.24	11 229	12 274
65	0.21	9848	4.63	- 3.49	1.33	9392	10 303
70	0.18	8291	4.80	- 3.40	1.41	7893	8689
75	0.15	7011	4.97	- 3.31	1.50	6663	7360
80	0.13	5955	5.14	- 3.22	1.59	5649	6261
85	0.11	5079	5.30	- 3.14	1.69	4809	5348
90	0.09	4349	5.62	- 3.07	1.83	4104	4593
95	0.08	3738	5.93	- 2.99	1.98	3516	3960
100	0.07	3225	6.23	- 2.92	2.14	3024	3426
105	0.06	2792	6.53	- 2.85	2.29	2610	2974
110	0.05	2425	6.82	- 2.78	2.45	2260	2591
115	0.04	2114	7.10	- 2.72	2.61	1964	2264
120	0.04	1848	7.37	- 2.65	2.78	1712	1985
125	0.03	1621	7.64	- 2.59	2.95	1497	1745

NTC Thermistors, Ice Cube Sensors



QUICK REFERENCE DATA

PARAMETER	VALUE
Climatic category (IEC 60539)	55/50/56
Resistance value at 25 °C (1)	9965 Ω
Resistance value at 0 °C	32 510 Ω ± 1.30 %
$B_{25/85}$ - value (1)	3984K (1)
Tolerance on $B_{25/85}$ - value	± 0.5 %
Operating temperature range at zero power	- 55 °C to + 50 °C
Min. dielectric withstanding voltage (immersed in water)	3750 V_{AC}
Max. Power	150 mW
R/T values	Refer to R/T table 1
Weight	10 g

Note
(1) Other resistances and B values available

FEATURES

- Key component for temperature sensing and electronic control
- Accurate Vishay NTC chips, enabling class A to class A+++ refrigerator grades
- Sensor design following class II insulation (principal + supplementary insulation for the sensor head)
- High adhesive strength between silicone cable and encapsulating lacquer
- Specifically developed design allows for a very good water, moisture and ice resistance (min. 1000 h water immersion)
- Suitable for evaporator temperature measurement. Very high number of thermal cycles resistant (min. 100 000 cycles)
- The cables jackets are suitable for back-panel polyurethane foaming process (max. 100 °C, 5 min)
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Surface temperature sensors
- The housing and cable are cold flexible at - 60 °C
- The housing plastic is FDA grade

RoHS COMPLIANT

APPLICATIONS

Temperature measurement, sensing and control:

- Ice cube makers
- White goods
- Refrigerators
- Freezers, deep-freezers
- Counter drinks coolers
- Backbar and catering coolers
- Display fridges
- Wine coolers

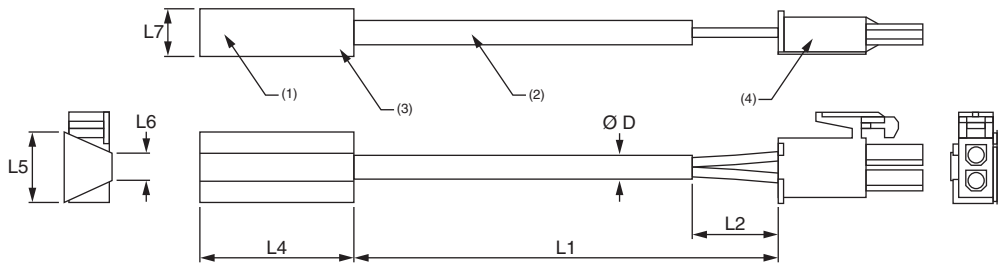
DESIGN-IN SUPPORT

- Other resistance curves and tolerances are available on request
- Consult Vishay for other lead length, other connector, or other features
- 3D solid models: www.vishay.com/doc?29106
- NTC curve computation: www.vishay.com/thermistors/curve-computation-list/

ORDERING INFORMATION

SAP	DESCRIPTION	L1 (mm)	SPQ
NTCASRFE3C90406	NTC ice cube 10K 380 mm	380 mm + 20/- 10	1000 pieces

DIMENSIONS in millimeters

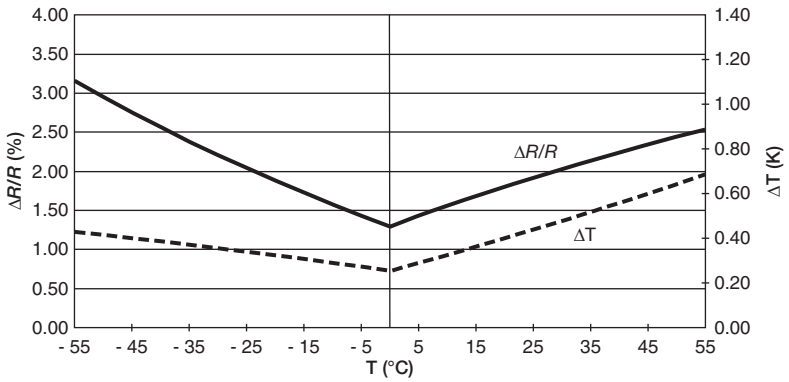


ØD	4 mm
L2	35 mm ± 10 mm
L4	25 mm ± 0.3 mm
L5	11.5 mm ± 0.2 mm
L6	4.5 mm ± 0.2 mm
L7	8 mm ± 0.2 mm

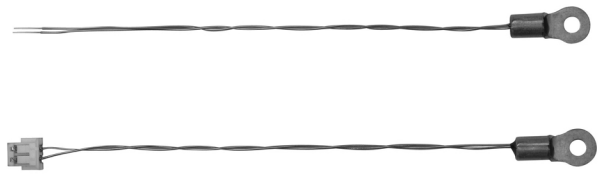
RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

TEMPERATURE (°C)	R_T/R_{25}	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 55	95.377	950 434	3.16	- 7.37	0.43	920 376	980 492
- 50	66.417	661 844	2.96	- 7.11	0.42	642 284	681 403
- 45	46.836	466 723	2.76	- 6.86	0.40	453 855	479 591
- 40	33.427	333 104	2.57	- 6.63	0.39	324 552	341 656
- 35	24.132	240 478	2.39	- 6.41	0.37	234 741	246 215
- 30	17.613	175 516	2.21	- 6.19	0.36	171 634	179 397
- 25	12.990	129 445	2.04	- 5.99	0.34	126 799	132 091
- 20	9.676	96 422	1.88	- 5.79	0.33	94 606	98 239
- 15	7.276	72 510	1.73	- 5.61	0.31	71 256	73 764
- 10	5.522	55 025	1.58	- 5.43	0.29	54 155	55 895
- 5	4.227	42 120	1.44	- 5.26	0.27	41 514	42 725
0	3.262	32 510	1.30	- 5.10	0.25	32 087	32 933
5	2.538	25 292	1.43	- 4.94	0.29	24 930	25 655
10	1.990	19 827	1.56	- 4.80	0.33	19 518	20 137
15	1.571	15 656	1.68	- 4.65	0.36	15 393	15 920
20	1.249	12 449	1.80	- 4.52	0.40	12 224	12 674
25	1.000	9965	1.92	- 4.39	0.44	9774	10 156
30	0.806	8028	2.03	- 4.26	0.48	7865	8191
35	0.653	6507	2.14	- 4.14	0.52	6368	6646
40	0.532	5305	2.24	- 4.03	0.56	5186	5424
45	0.437	4350	2.34	- 3.92	0.60	4248	4452
50	0.360	3586	2.44	- 3.81	0.64	3499	3674
55	0.298	2972	2.54	- 3.71	0.68	2896	3047
60	0.248	2475	2.63	- 3.61	0.73	2410	2540
65	0.208	2071	2.72	- 3.51	0.77	2015	2128
70	0.175	1742	2.81	- 3.42	0.82	1693	1790
75	0.148	1471	2.89	- 3.34	0.87	1428	1513
80	0.125	1247	2.97	- 3.25	0.91	1210	1285
85	0.107	1062	3.05	- 3.17	0.96	1030	1095

RESISTANCE AND TEMPERATURE TOLERANCE



NTC Thermistors, Mini Lug Sensors



FEATURES

- Fast time response for surface applications compared to industry standard NTC lug sensors
- Reduced thermal gradient, due to the use of small dimensions and nickel conductor, allowing for an accurate surface temperature measurement
- The sensor is not suitable for being permanently in contact with water or liquids
- Small size connector and small lug ring tongue terminal, allowing for temperature sensing at locations where only limited space is available
- Connector ZHR-2 (optional)
- Compliant to RoHS directive 2002/95/EC

RoHS COMPLIANT

APPLICATIONS

Thermistors used for surface temperature sensing and control in:

- Computer equipment
- MOSFETS, IC's, Power Electronics, heatsink temperature control
- Consumer appliances
- Industrial equipment
- Automotive equipment

DESCRIPTION

Miniature insulated chip thermistor with a negative temperature coefficient in accordance with IEC 60539. The device has no marking.

MOUNTING

- The sensor can be mounted by means of a screw. For stud size, metric 2 mm M2/american stud #1 or #2
- The end wire can be soldered, welded or crimped to a connector
- Optional connector for Wire-to-Wire or Wire-to-Board connections

QUICK REFERENCE DATA

PARAMETER	VALUE
Resistance value at 25 °C	10 kΩ to 47 kΩ
Tolerance on R_{25} - value	± 2 % to ± 3 %
$B_{25/85}$ value	3740K to 3984K
Tolerance on $B_{25/85}$ - value	± 0.5 % to ± 1.5 %
Maximum dissipation at 25 °C	100 mW
Thermal time constant τ	≈ 5 s
Dissipation factor	10 mW/K
Operating temperature range at zero power	- 40 °C to 125 °C
Min. dielectric withstanding voltage between terminals and lug	1000 V_{AC}
R/T values	See table
Climatic category (IEC 60539)	40/125/56
Weight (without connector)	0.5 g
Weight (with connector)	0.6 g

Note

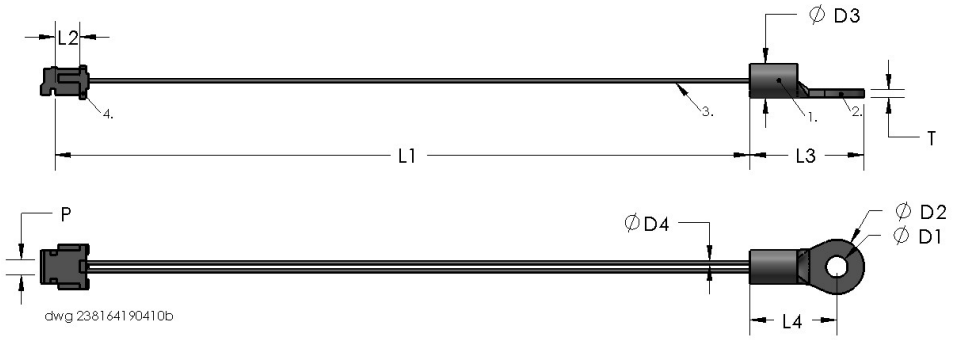
- Other R_{25} values and tolerances available upon request

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} - VALUE (kΩ)	R_{25} - TOL.	$B_{25/85}$ - VALUE (K)	$B_{25/85}$ - TOL.	SAP MATERIAL NO.	DESCRIPTION	R/T TABLE
10	± 3 %	3984	± 0.5 %	NTCALUG03A103H	NTC Mini Lug 10K 3 % 3984 K 0.5 %	Table 1
10	± 3 %	3984	± 0.5 %	NTCALUG03A103HC	NTC Mini Lug 10K 3 % 3984 K 0.5 % with connector	Table 1
10	± 2 %	3984	± 0.5 %	NTCALUG03A103G	NTC Mini Lug 10K 2 % 3984 K 0.5 %	Table 2
10	± 2 %	3984	± 0.5 %	NTCALUG03A103GC	NTC Mini Lug 10K 2 % 3984 K 0.5 % with connector	Table 2
12	± 3 %	3740	± 1.5 %	NTCALUG03A123H	NTC Mini Lug 12K 3 %	Table 3
12	± 3 %	3740	± 1.5 %	NTCALUG03A123HC	NTC Mini Lug 12K 3 % with connector	Table 3
47	± 3 %	3740	± 1.5 %	NTCALUG03A473H	NTC Mini Lug 47K 3 %	Table 4
47	± 3 %	3740	± 1.5 %	NTCALUG03A473HC	NTC Mini Lug 47 kΩ 3 % with connector	Table 4

Ordering information can be found on: www.vishay.com/doc?33036

DIMENSIONS in millimeters



L_1	L_2	L_3	L_4	$L_1 + L_3$ (item without connector)	Ø D_1	Ø D_2	Ø D_3	Ø D_4	T	Pitch P
70 ± 5	4 ± 1	11.5 ± 0.3	8.8 ± 0.3	81.5 ± 5	2.2 ± 0.3	5.5 ± 0.3	3.4 ± 0.3	0.35 ± 0.1	0.8 ± 0.1	1.5 ± 0.3

Notes

(1) Vishay Thermistor chip NTC, with epoxy coating and middle buffer layer

(2) Metal ring lug, tin plated

(3) Insulated leads: AWG#32, monostranded, diam 0.20 mm, silver plated Nickel, PEI insulation, diameter 0.35 mm

(4) End wire stripped or 2-poles connector crimped (optional)

MOUNTING

- With screw size metric M2, or American stud 1-2
- For the type without connector ('103'), the electrical connection can be made by soldering or crimping or welding.
- For the type with connector ('103C'), the connector can mate with following counter-connectors (5):

A) One of the PCB Board connector - Through Hole:
- JST B 2B-ZR (top entry)
- JST S 2B-ZR (side entry)
- JST B 2B-ZR-3.4 (top entry, for 1.6 mm board)
- JST S 2B-ZR-3.4 (side entry, for 1.6 mm board)

B) One of the PCB Board connector - SMT Surface Mount:
- JST S 2B-ZR-SM2-TF (SM2 side entry)
- JST B 2B-ZR-SM3-TF (SM3 top entry)
- JST S 2B-ZR-SM3A-TF (SM3 side entry)
- JST B 2B-ZR-SM4-TF (SM4 top entry)
- JST S 2B-ZR-SM4A-TF (SM4 side entry)

C) The Wire-to-wire connector:
- JST ZMR-02 housing (x 1) + JST SMM-033T-P0.5 terminals (x 2)

Note

(5) Additional details and dimensions can be found in JST ZH and JST ZM datasheets.

PACKAGING

Available in plastic bags of 250 pieces. SPQ = 2000 pieces

DESIGN-IN SUPPORT

- Other resistance curves and tolerances are available on request
- Consult Vishay for other lead length, other connector crimping or other features
- Other applicable screw size are available, for example stud size metric 3 mm/American 3 to 4
- 3D Solid models: www.vishay.com/doc?29106
- NTC curve computation: www.vishay.com/thermistors/curve-computation-list/

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

TABLE 1

NTCALUG03A103H	NTC Mini Lug 10K 3 % 3984 K 0.5 %
NTCALUG03A103HC	NTC Mini Lug 10K 3 % 3984 K 0.5 % with connector

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	334 274	4.92	- 6.63	0.74	317 833	350 716
- 35	24.132	241 323	4.73	- 6.41	0.74	229 899	252 747
- 30	17.613	176 133	4.56	- 6.19	0.74	168 107	184 158
- 25	12.990	129 900	4.39	- 5.99	0.73	124 202	135 598
- 20	9.676	96 761	4.22	- 5.79	0.73	92 675	100 848
- 15	7.276	72 765	4.07	- 5.61	0.73	69 806	75 723
- 10	5.522	55 218	3.92	- 5.43	0.72	53 056	57 380
- 5	4.227	42 268	3.77	- 5.26	0.72	40 674	43 861
0	3.262	32 624	3.63	- 5.10	0.71	31 440	33 808
5	2.538	25 381	3.49	- 4.94	0.71	24 494	26 268
10	1.990	19 897	3.36	- 4.80	0.70	19 227	20 566
15	1.571	15 711	3.24	- 4.65	0.70	15 202	16 220
20	1.249	12 493	3.12	- 4.52	0.69	12 103	12 882
25	1.000	10 000	3.00	- 4.39	0.68	9700.0	10 300
30	0.806	8056.0	3.11	- 4.26	0.73	7805.1	8306.8
35	0.653	6529.7	3.22	- 4.14	0.78	6319.3	6740.2
40	0.532	5323.9	3.33	- 4.03	0.83	5146.6	5501.1
45	0.437	4365.3	3.43	- 3.92	0.88	4215.4	4515.1
50	0.360	3598.7	3.53	- 3.81	0.93	3471.6	3725.8
55	0.298	2982.3	3.63	- 3.71	0.98	2874.0	3090.5
60	0.248	2483.8	3.72	- 3.61	1.03	2391.3	2576.3
65	0.208	2078.7	3.81	- 3.51	1.09	1999.4	2157.9
70	0.175	1747.7	3.90	- 3.42	1.14	1679.5	1815.9
75	0.148	1475.9	3.99	- 3.34	1.20	1417.1	1534.8
80	0.125	1251.8	4.07	- 3.25	1.25	1200.8	1302.8
85	0.107	1066.1	4.15	- 3.17	1.31	1021.8	1110.4
90	0.091	911.59	4.23	- 3.09	1.37	873.01	950.16
95	0.078	782.46	4.31	- 3.02	1.43	748.75	816.17
100	0.067	674.11	4.38	- 2.94	1.49	644.56	703.66
105	0.058	582.84	4.46	- 2.87	1.55	556.87	608.82
110	0.051	505.68	4.53	- 2.81	1.61	482.79	528.57
115	0.044	440.19	4.60	- 2.74	1.68	419.96	460.42
120	0.038	384.41	4.66	- 2.68	1.74	366.49	402.34
125	0.034	336.75	4.73	- 2.62	1.81	320.83	352.67

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

TABLE 2

NTCALUG03A103G	NTC Mini Lug 10K 2 % 3984 K 0.5 %
NTCALUG03A103GC	NTC Mini Lug 10K 2 % 3984 K 0.5 % with connector

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	334 274	3.90	- 6.63	0.59	321 238	347 311
- 35	24.132	241 323	3.72	- 6.41	0.58	232 353	250 293
- 30	17.613	176 133	3.54	- 6.19	0.57	169 895	182 370
- 25	12.990	129 900	3.37	- 5.99	0.56	125 518	134 282
- 20	9.676	96 761	3.21	- 5.79	0.55	93 654	99 869
- 15	7.276	72 765	3.06	- 5.61	0.54	70 541	74 988
- 10	5.522	55 218	2.91	- 5.43	0.54	53 613	56 823
- 5	4.227	42 268	2.76	- 5.26	0.53	41 100	43 435
0	3.262	32 624	2.62	- 5.10	0.51	31 768	33 480
5	2.538	25 381	2.49	- 4.94	0.50	24 749	26 013
10	1.990	19 897	2.36	- 4.80	0.49	19 427	20 367
15	1.571	15 711	2.24	- 4.65	0.48	15 360	16 063
20	1.249	12 493	2.12	- 4.52	0.47	12 228	12 757
25	1.000	10 000	2.00	- 4.39	0.46	9800.0	10 200
30	0.806	8056.0	2.11	- 4.26	0.50	7885.8	8226.1
35	0.653	6529.7	2.22	- 4.14	0.54	6384.7	6674.8
40	0.532	5323.9	2.33	- 4.03	0.58	5200.0	5447.7
45	0.437	4365.3	2.43	- 3.92	0.62	4259.3	4471.3
50	0.360	3598.7	2.53	- 3.81	0.66	3507.8	3689.7
55	0.298	2982.3	2.62	- 3.71	0.71	2904.0	3060.5
60	0.248	2483.8	2.72	- 3.61	0.75	2416.4	2551.3
65	0.208	2078.7	2.81	- 3.51	0.80	2020.3	2137.0
70	0.175	1747.7	2.89	- 3.42	0.85	1697.1	1798.2
75	0.148	1475.9	2.98	- 3.34	0.89	1432.0	1519.9
80	0.125	1251.8	3.06	- 3.25	0.94	1213.5	1290.1
85	0.107	1066.1	3.14	- 3.17	0.99	1032.6	1099.6
90	0.091	911.59	3.22	- 3.09	1.04	882.23	940.94
95	0.078	782.46	3.30	- 3.02	1.09	756.67	808.25
100	0.067	674.11	3.37	- 2.94	1.14	651.40	696.83
105	0.058	582.84	3.44	- 2.87	1.20	562.79	602.90
110	0.051	505.68	3.51	- 2.81	1.25	487.92	523.43
115	0.044	440.19	3.58	- 2.74	1.31	424.43	455.95
120	0.038	384.41	3.65	- 2.68	1.36	370.39	398.43
125	0.034	336.75	3.71	- 2.62	1.42	324.25	349.25

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

TABLE 3

NTCALUG03A123H	NTC Mini Lug 12K 3 %
NTCALUG03A123HC	NTC Mini Lug 12K 3 % with connector

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	25.783	309 396	8.40	- 6.07	1.38	283 397	335 395
- 35	19.125	229 504	7.88	- 5.88	1.34	211 413	247 595
- 30	14.320	171 840	7.38	- 5.70	1.30	159 152	184 528
- 25	10.819	129 825	6.90	- 5.52	1.25	120 861	138 789
- 20	8.244	98 933	6.45	- 5.35	1.20	92 556	105 309
- 15	6.335	76 019	6.00	- 5.19	1.16	71 455	80 582
- 10	4.907	58 879	5.58	- 5.03	1.11	55 595	62 163
- 5	3.829	45 953	5.17	- 4.88	1.06	43 578	48 328
0	3.011	36 129	4.77	- 4.74	1.01	34 405	37 854
5	2.384	28 607	4.39	- 4.60	0.95	27 350	29 864
10	1.900	22 804	4.03	- 4.47	0.90	21 886	23 723
15	1.525	18 298	3.67	- 4.34	0.85	17 626	18 970
20	1.231	14 773	3.33	- 4.22	0.79	14 281	15 265
25	1.000	12 000	3.00	- 4.10	0.73	11 640	12 360
30	0.817	9803.7	3.32	- 3.99	0.83	9478.2	10 129
35	0.671	8053.9	3.63	- 3.88	0.94	7761.7	8346.2
40	0.554	6651.9	3.93	- 3.77	1.04	6390.6	6913.2
45	0.460	5522.3	4.22	- 3.67	1.15	5289.3	5755.2
50	0.384	4607.2	4.50	- 3.58	1.26	4399.9	4814.5
55	0.322	3862.1	4.77	- 3.48	1.37	3677.8	4046.4
60	0.271	3252.4	5.04	- 3.39	1.48	3088.6	3416.2
65	0.229	2751.1	5.29	- 3.30	1.60	2605.5	2896.7
70	0.195	2336.9	5.54	- 3.22	1.72	2207.4	2466.4
75	0.166	1993.3	5.78	- 3.14	1.84	1878.0	2108.6
80	0.142	1707.0	6.02	- 3.06	1.96	1604.2	1809.7
85	0.122	1467.3	6.25	- 2.99	2.09	1375.7	1559.0
90	0.105	1266.0	6.47	- 2.92	2.22	1184.1	1347.9
95	0.091	1096.2	6.69	- 2.85	2.35	1022.9	1169.4
100	0.079	952.38	6.90	- 2.78	2.48	886.71	1018.0
105	0.069	830.20	7.10	- 2.71	2.62	771.26	889.15
110	0.061	726.02	7.30	- 2.65	2.75	673.03	779.02
115	0.053	636.88	7.49	- 2.59	2.89	589.16	684.61
120	0.047	560.36	7.68	- 2.53	3.04	517.31	603.41
125	0.041	494.46	7.87	- 2.47	3.18	455.56	533.37

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

TABLE 4

NTCALUG03A473H	NTC Mini Lug 47K 3 %
NTCALUG03A473HC	NTC Mini Lug 47K 3 % with connector

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	25.783	1 211 802	8.40	- 6.07	1.38	1 109 973	1 313 631
- 35	19.125	898 891	7.88	- 5.88	1.34	828 034	969 749
- 30	14.320	673 040	7.38	- 5.70	1.30	623 344	722 736
- 25	10.819	508 481	6.90	- 5.52	1.25	473 370	543 592
- 20	8.244	387 486	6.45	- 5.35	1.20	362 512	412 460
- 15	6.335	297 740	6.00	- 5.19	1.16	279 866	315 613
- 10	4.907	230 608	5.58	- 5.03	1.11	217 745	243 471
- 5	3.829	179 983	5.17	- 4.88	1.06	170 681	189 285
0	3.011	141 507	4.77	- 4.74	1.01	134 752	148 262
5	2.384	112 043	4.39	- 4.60	0.95	107 121	116 966
10	1.900	89 317	4.03	- 4.47	0.90	85 721	92 914
15	1.525	71 665	3.67	- 4.34	0.85	69 033	74 297
20	1.231	57 863	3.33	- 4.22	0.79	55 936	59 790
25	1.000	47 000	3.00	- 4.10	0.73	45 590	48 410
30	0.817	38 398	3.32	- 3.99	0.83	37 123	39 672
35	0.671	31 545	3.63	- 3.88	0.94	30 400	32 689
40	0.554	26 053	3.93	- 3.77	1.04	25 030	27 077
45	0.460	21 629	4.22	- 3.67	1.15	20 717	22 541
50	0.384	18 045	4.50	- 3.58	1.26	17 233	18 857
55	0.322	15 127	4.77	- 3.48	1.37	14 405	15 848
60	0.271	12 739	5.04	- 3.39	1.48	12 097	13 380
65	0.229	10 775	5.29	- 3.30	1.60	10 205	11 345
70	0.195	9153.0	5.54	- 3.22	1.72	8645.8	9660.2
75	0.166	7807.1	5.78	- 3.14	1.84	7355.6	8258.7
80	0.142	6685.6	6.02	- 3.06	1.96	6283.2	7087.9
85	0.122	5747.0	6.25	- 2.99	2.09	5388.0	6106.0
90	0.105	4958.4	6.47	- 2.92	2.22	4637.7	5279.2
95	0.091	4293.3	6.69	- 2.85	2.35	4006.3	4580.3
100	0.079	3730.1	6.90	- 2.78	2.48	3472.9	3987.3
105	0.069	3251.6	7.10	- 2.71	2.62	3020.8	3482.5
110	0.061	2843.6	7.30	- 2.65	2.75	2636.0	3051.2
115	0.053	2494.5	7.49	- 2.59	2.89	2307.5	2681.4
120	0.047	2194.7	7.68	- 2.53	3.04	2026.1	2363.4
125	0.041	1936.6	7.87	- 2.47	3.18	1784.3	2089.0

NTC Thermistors, Lug Sensors

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at 25 °C	10 kΩ
Tolerance on R_{25} - value	± 5 %
$B_{25/85}$ - value	3984
$B_{25/85}$ tolerance	± 0.5 %
Climatic Category (IEC 60539)	55/150/56
Dissipation factor (1)	≈ 23 mW/K
Thermal time constant (1)	≈ 7.5 s
Operating temperature range at:	
zero dissipation	- 40 °C to + 150 °C
maximum dissipation	0 °C to + 55 °C
Min. dielectric withstanding voltage between terminals and lug	1500 V_{ac} (1 s)
Insulation resistance between terminals and lug at 500 V_{DC}	min. 100 MΩ
Weight	≈ 2 g

Notes
(1) Measured with screw mounted on an aluminium heatsink of 100 cm^2, thickness 1.5 mm, in still air at T_{amb} = + 25 °C.
(2) Other R_{25} values based on 2381 640 0.. series are available upon request.
(3) Other tolerances on R_{25} are available upon request
(4) Other lead length and insulation, available on request

PACKAGING

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

MOUNTING

By means of M3 screw. Leads to be soldered or crimped.

FEATURES

- Easy mounting using ring tongue terminal
- Rugged construction
- PTFE insulation, AWG # 24
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

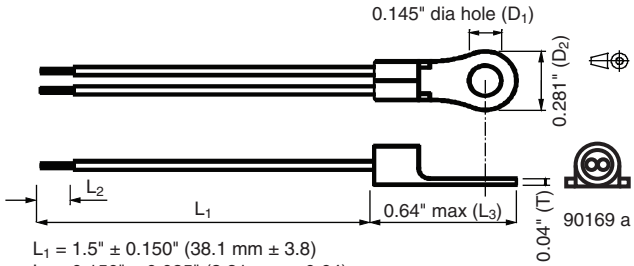
APPLICATIONS

Suitable for surface sensing applications, especially when a good electrical insulation and a good thermal contact with the chassis is required.

Thermistor with negative temperature coefficient and two stranded PTFE insulated copper leads.

The device is mounted inside the barrel of the ring tongue terminal.

DIMENSIONS in millimeters



L_1 = 1.5" ± 0.150" (38.1 mm ± 3.8)
L_2 = 0.150" ± 0.025" (3.81 mm ± 0.64)
For info: D_1 = 3.68 mm, D_2 = 7.14 mm, L_3 = 16.26 mm, T = 1.016 mm

Notes
(1) The non dimensioned details do not affect the performance of the device
(2) The device is suitable for screwing e.g. on metal surface
(3) The device is suitable for soldering e.g. on PBC
(4) Thermistors chip NTC with epoxy coating and middle buffer layer
(5) Metal ring lug
(6) Insulated leads: AWG # 24 stranded, PTFE insulation
(7) Lead wire end twisted and then tinned

DESIGNERS TOOL

- Other resistance curves and tolerances are available on request
- Consult Vishay for other lead length, other connector crimping or other features
- 3D solid models: www.vishay.com/doc?29106
- NTC curve computation: www.vishay.com/thermistors/curve-computation-list/

ELECTRICAL DATA AND ORDERING INFORMATION				
R_{25} (kΩ)	$B_{25/85}$ - VALUE	TCR (%/K)	SAP MATERIAL NO. NTCALUGE2.....	12NC ORDERING CODE 2381 645 .....
10	3984K ± 0.5 %	- 4.37	C90169	90169

Note
- R_{25} - values, temperature coefficients and catalog numbers

NTC Thermistors, Low Thermal Gradient Lug Sensors

FEATURES

- Thermistor used for surface temperature sensing and control (1)
- Good reduced thermal gradient due to the use of nickel conductor and low profile ring tongue
- AEC-Q200 qualified
- Compliant to RoHS directive 2002/95/EC

RoHS COMPLIANT

QUICK REFERENCE DATA	
PARAMETER	**VALUE**
Resistance value at 25 °C	4.7 kΩ to 10 kΩ
Tolerance on R_{25} - value	± 1 %, ± 2 %
$B_{25/85}$ value	3984K
Tolerance on $B_{25/85}$ - value	± 0.5 %
Maximum dissipation at 25 °C	100 mW
Thermal time constant τ	≈ 5 s
Dissipation factor	10 mW/K
Operating temperature range at zero power	- 55 °C to 125 °C
Min. dielectric withstanding voltage between terminals and lug	1000 V_{AC}
Climatic category (IEC 60539)	55/125/56
Weight	≈ 1.0 g

Note

(1) Consult Vishay for automotive applications

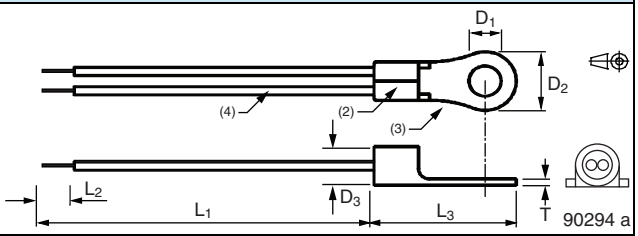
PACKAGING

The thermistors are packed in cardboard boxes; the smallest packaging quantity is 250 units.

MOUNTING

The device is suitable for screwing e.g. on a metal surface through means of an M3 screw. The connections are suitable for soldering on a PCB or for connector insertion. The sensor is not suitable for being in permanent contact with water or liquids.

DIMENSIONS in millimeters



L_1	L_2	Ø D_1	Ø D_2	Ø D_3	L_3	T
45 ± 3	6 ± 1	3.7	8.5	4.1	16.8	0.8

Notes

(2) Vishay thermistor chip NTC with epoxy coating and middle buffer layer

(3) Metal ring lug

(4) Insulated leads: AWG#30, monostranded, Ø 0.254 mm, silver-plated nickel, PEEK insulated (insulation Ø 0.56 mm)

- The non dimensioned details do not affect the performance of the device

DESIGNERS TOOL

- NTC thermistor curve computation (Resistance/ Temperature) is available at: www.vishay.com/thermistors/curve-computation-list/
- Other applicable screw size are available, for example stud size metric 3 mm/American 3 to 4.
- 3D or 2D solid models are available. Refer to www.vishay.com/doc?29106.
- Other resistance curves and tolerances, e.g. based on 2381 645 2x series, are available on reques.
- Other lead length, insulation or connector crimping available on request.
- AWG#28 or AWG#26 wires available on request.

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} (kΩ)	R_{25} TOL.	$B_{25/85}$ - VALUE (K)	$B_{25/85}$ TOL.	12NC ORDERING CODE	SAP MATERIAL NO.
4.7	± 2 %	3984	± 0.5 %	-	NTCALUG02A472G
4.7	± 1 %	3984	± 0.5 %	-	NTCALUG02A472F
5	± 2 %	3984	± 0.5 %	-	**NTCALUG02A502G**
10	± 2 %	3984	± 0.5 %	2381 645 90294	**NTCALUG02A103G**
10	± 1 %	3984	± 0.5 %	-	NTCALUG02A103F

NTCALUG02A472G	NTC LUG02A 4.7K 2 % 3984K 0.5 %

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	157 109	3.90	- 6.63	0.59	150 982	163 236
- 35	24.132	113 422	3.72	- 6.41	0.58	109 206	117 638
- 30	17.613	82 782	3.54	- 6.19	0.57	79 851	85714
- 25	12.990	61 053	3.37	- 5.99	0.56	58 994	63 112
- 20	9.676	45 478	3.21	- 5.79	0.55	44 017	46 938
- 15	7.276	34 199	3.06	- 5.61	0.54	33 154	35 244
- 10	5.522	25 953	2.91	- 5.43	0.54	25 198	26 707
- 5	4.227	19 866	2.76	- 5.26	0.53	19 317	20 415
0	3.262	15 333	2.62	- 5.10	0.51	14 931	15 736
5	2.538	11 929	2.49	- 4.94	0.50	11 632	12 226
10	1.990	9352	2.36	- 4.80	0.49	9131	9572
15	1.571	7384	2.24	- 4.65	0.48	7219	7549
20	1.249	5872	2.12	- 4.52	0.47	5747	5996
25	1.000	4700	2.00	- 4.39	0.46	4606	4794
30	0.806	3786	2.11	- 4.26	0.50	3706	3866
35	0.653	3069	2.22	- 4.14	0.54	3001	3137
40	0.532	2502	2.33	- 4.03	0.58	2444	2560
45	0.437	2052	2.43	- 3.92	0.62	2002	2102
50	0.360	1691	2.53	- 3.81	0.66	1649	1734
55	0.298	1402	2.62	- 3.71	0.71	1365	1438
60	0.248	1167	2.72	- 3.61	0.75	1136	1199
65	0.208	977.0	2.81	- 3.51	0.80	949.6	1004
70	0.175	821.4	2.89	- 3.42	0.85	797.6	845.2
75	0.148	693.7	2.98	- 3.34	0.89	673.0	714.3
80	0.125	588.3	3.06	- 3.25	0.94	570.3	606.4
85	0.107	501.1	3.14	- 3.17	0.99	485.3	516.8
90	0.091	428.4	3.22	- 3.09	1.04	414.7	442.2
95	0.078	367.8	3.30	- 3.02	1.09	355.6	379.9
100	0.067	316.8	3.37	- 2.94	1.14	306.2	327.5
105	0.058	273.9	3.44	- 2.87	1.20	264.5	283.4
110	0.051	237.7	3.51	- 2.81	1.25	229.3	246.0
115	0.044	206.9	3.58	- 2.74	1.31	199.5	214.3
120	0.038	180.7	3.65	- 2.68	1.36	174.1	187.3
125	0.034	158.3	3.71	- 2.62	1.42	152.4	164.1

NTCALUG02A472F	NTC LUG02A 4.7K 1 % 3984K 0.5 %

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	157 109	2.88	- 6.63	0.43	152 582	161 636
- 35	24.132	113 422	2.70	- 6.41	0.42	110 359	116 484
- 30	17.613	82 782	2.53	- 6.19	0.41	80 691	84 874
- 25	12.990	61 053	2.36	- 5.99	0.39	59 612	62 494
- 20	9.676	45 478	2.20	- 5.79	0.38	44 477	46 478
- 15	7.276	34 199	2.05	- 5.61	0.36	33 500	34 899
- 10	5.522	25 953	1.90	- 5.43	0.35	25 460	26 445
- 5	4.227	19 866	1.75	- 5.26	0.33	19 517	20 215
0	3.262	15 333	1.62	- 5.10	0.32	15 085	15 581
5	2.538	11 929	1.49	- 4.94	0.30	11 752	12 106
10	1.990	9352	1.36	- 4.80	0.28	9225	9478
15	1.571	7384	1.23	- 4.65	0.27	7293	7475
20	1.249	5872	1.12	- 4.52	0.25	5806	5937
25	1.000	4700	1.00	- 4.39	0.23	4653	4747
30	0.806	3786	1.11	- 4.26	0.26	3744	3828
35	0.653	3069	1.22	- 4.14	0.29	3032	3106
40	0.532	2502	1.32	- 4.03	0.33	2469	2535
45	0.437	2052	1.42	- 3.92	0.36	2022	2081
50	0.360	1691	1.52	- 3.81	0.40	1666	1717
55	0.298	1402	1.62	- 3.71	0.44	1379	1424
60	0.248	1167	1.71	- 3.61	0.47	1147	1187
65	0.208	977.0	1.80	- 3.51	0.51	959.4	994.5
70	0.175	821.4	1.88	- 3.42	0.55	805.9	836.9
75	0.148	693.7	1.97	- 3.34	0.59	680.0	707.3
80	0.125	588.3	2.05	- 3.25	0.63	576.3	600.4
85	0.107	501.1	2.13	- 3.17	0.67	490.4	511.7
90	0.091	428.4	2.21	- 3.09	0.71	419.0	437.9
95	0.078	367.8	2.28	- 3.02	0.76	359.4	376.2
100	0.067	316.8	2.36	- 2.94	0.80	309.4	324.3
105	0.058	273.9	2.43	- 2.87	0.84	267.3	280.6
110	0.051	237.7	2.50	- 2.81	0.89	231.7	243.6
115	0.044	206.9	2.56	- 2.74	0.94	201.6	212.2
120	0.038	180.7	2.63	- 2.68	0.98	175.9	185.4
125	0.034	158.3	2.69	- 2.62	1.03	154.0	162.5

NTCALUG02A502G	NTC LUG02A 5K 2 % 3984K 0.5 %

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	167 137	3.90	- 6.63	0.59	160 619	173 655
- 35	24.132	120 661	3.72	- 6.41	0.58	116 177	125 146
- 30	17.613	88 066	3.54	- 6.19	0.57	84 947	91 185
- 25	12.990	64 950	3.37	- 5.99	0.56	62 759	67 141
- 20	9.676	48 381	3.21	- 5.79	0.55	46 827	49 934
- 15	7.276	36 382	3.06	- 5.61	0.54	35 270	37 494
- 10	5.522	27 609	2.91	- 5.43	0.54	26 807	28 411
- 5	4.227	21 134	2.76	- 5.26	0.53	20 550	21 718
0	3.262	16 312	2.62	- 5.10	0.51	15 884	16 740
5	2.538	12 691	2.49	- 4.94	0.50	12 375	13 007
10	1.990	9948	2.36	- 4.80	0.49	9714	10 183
15	1.571	7856	2.24	- 4.65	0.48	7680	8031
20	1.249	6246	2.12	- 4.52	0.47	6114	6379
25	1.000	5000	2.00	- 4.39	0.46	4900	5100
30	0.806	4028	2.11	- 4.26	0.50	3943	4113
35	0.653	3265	2.22	- 4.14	0.54	3192	3337
40	0.532	2662	2.33	- 4.03	0.58	2600	2724
45	0.437	2183	2.43	- 3.92	0.62	2130	2236
50	0.360	1799	2.53	- 3.81	0.66	1754	1845
55	0.298	1491	2.62	- 3.71	0.71	1452	1530
60	0.248	1242	2.72	- 3.61	0.75	1208	1276
65	0.208	1039	2.81	- 3.51	0.80	1010	1068
70	0.175	873.8	2.89	- 3.42	0.85	848.5	899.1
75	0.148	738.0	2.98	- 3.34	0.89	716.0	759.9
80	0.125	625.9	3.06	- 3.25	0.94	606.7	645.1
85	0.107	533.1	3.14	- 3.17	0.99	516.3	549.8
90	0.091	455.8	3.22	- 3.09	1.04	441.1	470.5
95	0.078	391.2	3.30	- 3.02	1.09	378.3	404.1
100	0.067	337.1	3.37	- 2.94	1.14	325.7	348.4
105	0.058	291.4	3.44	- 2.87	1.20	281.4	301.5
110	0.051	252.8	3.51	- 2.81	1.25	244.0	261.7
115	0.044	220.1	3.58	- 2.74	1.31	212.2	228.0
120	0.038	192.2	3.65	- 2.68	1.36	185.2	199.2
125	0.034	168.4	3.71	- 2.62	1.42	162.1	174.6

NTCALUG02A103G	NTC LUG02A 10K 2 % 3984K 0.5 %

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	334 274	3.90	- 6.63	0.59	321 238	347 311
- 35	24.132	241 323	3.72	- 6.41	0.58	232 353	250 293
- 30	17.613	176 133	3.54	- 6.19	0.57	169 895	182 370
- 25	12.990	129 900	3.37	- 5.99	0.56	125 518	134 282
- 20	9.676	96 761	3.21	- 5.79	0.55	93 654	99 869
- 15	7.276	72 765	3.06	- 5.61	0.54	70 541	74 988
- 10	5.522	55 218	2.91	- 5.43	0.54	53 613	56 823
- 5	4.227	42 268	2.76	- 5.26	0.53	41 100	43 435
0	3.262	32 624	2.62	- 5.10	0.51	31 768	33 480
5	2.538	25 381	2.49	- 4.94	0.50	24 749	26 013
10	1.990	19 897	2.36	- 4.80	0.49	19 427	20 367
15	1.571	15 711	2.24	- 4.65	0.48	15 360	16 063
20	1.249	12 493	2.12	- 4.52	0.47	12 228	12 757
25	1.000	10 000	2.00	- 4.39	0.46	9800	10 200
30	0.806	8056	2.11	- 4.26	0.50	7886	8226
35	0.653	6530	2.22	- 4.14	0.54	6385	6675
40	0.532	5324	2.33	- 4.03	0.58	5200	5448
45	0.437	4365	2.43	- 3.92	0.62	4259	4471
50	0.360	3599	2.53	- 3.81	0.66	3508	3690
55	0.298	2982	2.62	- 3.71	0.71	2904	3060
60	0.248	2484	2.72	- 3.61	0.75	2416	2551
65	0.208	2079	2.81	- 3.51	0.80	2020	2137
70	0.175	1748	2.89	- 3.42	0.85	1697	1798
75	0.148	1476	2.98	- 3.34	0.89	1432	1520
80	0.125	1252	3.06	- 3.25	0.94	1213	1290
85	0.107	1066	3.14	- 3.17	0.99	1033	1100
90	0.091	911.6	3.22	- 3.09	1.04	882.2	940.9
95	0.078	782.5	3.30	- 3.02	1.09	756.7	808.2
100	0.067	674.1	3.37	- 2.94	1.14	651.4	696.8
105	0.058	582.8	3.44	- 2.87	1.20	562.8	602.9
110	0.051	505.7	3.51	- 2.81	1.25	487.9	523.4
115	0.044	440.2	3.58	- 2.74	1.31	424.4	455.9
120	0.038	384.4	3.65	- 2.68	1.36	370.4	398.4
125	0.034	336.7	3.71	- 2.62	1.42	324.2	349.2

NTCALUG02A103F	NTC LUG02A 10K 1 % 3984K 0.5 %

RESISTANCE TEMPERATURE CHARACTERISTICS

TEMP. (°C)	$R_{(T)}/R_{25}$	SYMBOLRESISTANCE (Ω)	$\Delta R/R$ (%)	SYMBOLα (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
- 40	33.427	334 274	2.88	- 6.63	0.43	324 643	343 906
- 35	24.132	241 323	2.70	- 6.41	0.42	234 807	247 839
- 30	17.613	176 133	2.53	- 6.19	0.41	171 683	180 582
- 25	12.990	129 900	2.36	- 5.99	0.39	126 835	132 965
- 20	9.676	96 761	2.20	- 5.79	0.38	94 633	98 889
- 15	7.276	72 765	2.05	- 5.61	0.36	71 276	74 253
- 10	5.522	55 218	1.90	- 5.43	0.35	54 170	56 266
- 5	4.227	42 268	1.75	- 5.26	0.33	41 526	43 010
0	3.262	32 624	1.62	- 5.10	0.32	32 096	33 152
5	2.538	25 381	1.49	- 4.94	0.30	25 004	25 758
10	1.990	19 897	1.36	- 4.80	0.28	19 627	20 167
15	1.571	15 711	1.23	- 4.65	0.27	15 517	15 905
20	1.249	12 493	1.12	- 4.52	0.25	12 353	12 632
25	1.000	10 000	1.00	- 4.39	0.23	9900	10 100
30	0.806	8056	1.11	- 4.26	0.26	7966	8145
35	0.653	6530	1.22	- 4.14	0.29	6450	6609
40	0.532	5324	1.32	- 4.03	0.33	5253	5394
45	0.437	4365	1.42	- 3.92	0.36	4303	4427
50	0.360	3599	1.52	- 3.81	0.40	3544	3653
55	0.298	2982	1.62	- 3.71	0.44	2934	3030
60	0.248	2484	1.71	- 3.61	0.47	2441	2526
65	0.208	2079	1.80	- 3.51	0.51	2041	2116
70	0.175	1748	1.88	- 3.42	0.55	1715	1781
75	0.148	1476	1.97	- 3.34	0.59	1447	1505
80	0.125	1252	2.05	- 3.25	0.63	1226	1277
85	0.107	1066	2.13	- 3.17	0.67	1043	1089
90	0.091	911.6	2.21	- 3.09	0.71	891.5	931.7
95	0.078	782.5	2.28	- 3.02	0.76	764.6	800.3
100	0.067	674.1	2.36	- 2.94	0.80	658.2	690.0
105	0.058	582.8	2.43	- 2.87	0.84	568.7	597.0
110	0.051	505.7	2.50	- 2.81	0.89	493.0	518.3
115	0.044	440.2	2.56	- 2.74	0.94	428.9	451.5
120	0.038	384.4	2.63	- 2.68	0.98	374.3	394.5
125	0.034	336.7	2.69	- 2.62	1.03	327.7	345.8

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