

## SMD 0402, Glass Protected NTC Thermistors



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### FEATURES

- TCR ranging from - 6.5 %/K at - 40 °C to - 2 %/K at 150 °C
- Tolerance on  $R_{25}$  down to 1 %
- Suitable for wave or reflow soldering
- NiSn terminations
- Fully glass coated and protected
- cUL recognized for safety applications (file E148885)
- AEC-Q200 qualified
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### 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/resistors-non-linear/ntc-curve-list/](http://www.vishay.com/resistors-non-linear/ntc-curve-list/)

QUICK REFERENCE DATA		
PARAMETER	VALUE	UNIT
Resistance value at 25 °C	4.7K to 100K	$\Omega$
Tolerance on $R_{25}$ -value	$\pm 1; \pm 2; \pm 3; \pm 5$	%
$B_{25/85}$ -value	3490 to 4075	K
Tolerance on $B_{25/85}$ -value	$\pm 3$	%
Maximum dissipation at 25 °C	70	mW
Thermal time constant $\tau$	$\approx 5$	s
Dissipation factor D	$\approx 2.0$	mW/K
Operating temperature range at zero power	- 40 to + 150	°C
Weight	$\approx 1.2$	mg

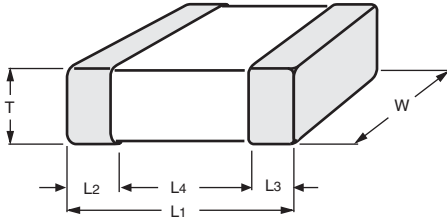
### ELECTRICAL DATA AND ORDERING INFORMATION

$R_{25}$ -VALUE (k $\Omega$ )	TOLERANCE ON $R_{25}$ (%)	$B_{25/85}$ -VALUE (K)	SAP MATERIAL AND ORDERING NUMBER ... <sup>(1)</sup>
4.7	$\pm 3; \pm 5$	3595	NTCS0402E3472*MT
10	$\pm 1; \pm 2; \pm 3; \pm 5$	3490	NTCS0402E3103*LT
10	$\pm 3; \pm 5$	3950	NTCS0402E3103*HT
15	$\pm 3; \pm 5$	3965	NTCS0402E3153*HT
22	$\pm 3; \pm 5$	3590	NTCS0402E3223*MT
33	$\pm 3; \pm 5$	3670	NTCS0402E3333*MT
47	$\pm 1; \pm 2; \pm 3; \pm 5$	4075	NTCS0402E3473*XT
68	$\pm 3; \pm 5$	3910	NTCS0402E3683*HT
100	$\pm 1; \pm 2; \pm 3; \pm 5$	3950	NTCS0402E3104*HT

#### Note

<sup>(1)</sup> Replace \* in SAP by J for  $\pm 5$  %, H for  $\pm 3$  %, G for  $\pm 2$  %, F for  $\pm 1$  % tolerance on  $R_{25}$ .

**DIMENSIONS** in millimeters

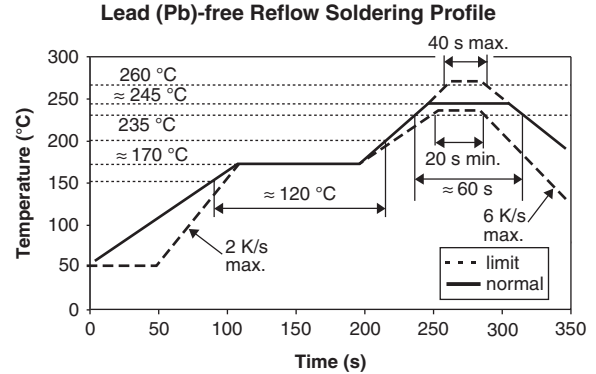
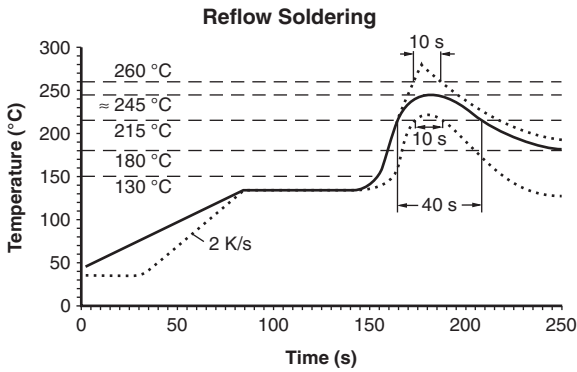


L <sub>1</sub>	W	T	L <sub>2</sub> AND L <sub>3</sub> MIN.	L <sub>4</sub> MIN.
1.0 ± 0.15	0.5 ± 0.15	0.5 ± 0.15	0.1	0.3

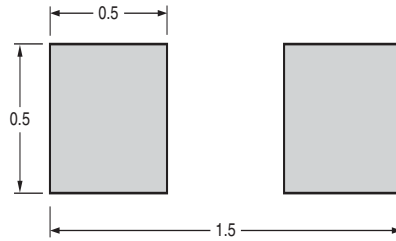
**SOLDERING CONDITIONS**

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.

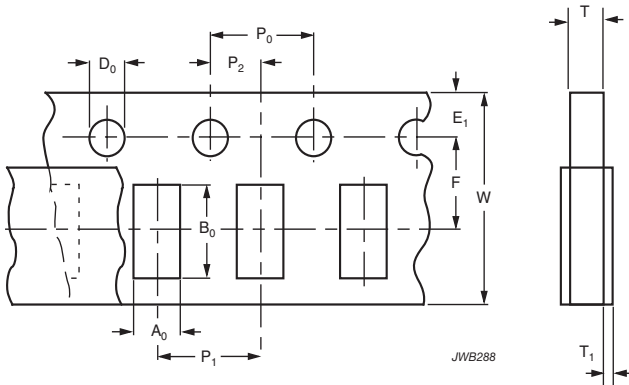


Recommended solder land pattern dimensions (mm)



**PACKAGING**  
**TAPE SPECIFICATIONS**

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



DIMENSIONS OF PAPER TAPE in millimeters		
PARAMETER	DIMENSION	TOLERANCE
A <sub>0</sub> <sup>(1)</sup>	0.65	± 0.1
B <sub>0</sub> <sup>(1)</sup>	1.15	± 0.1
W	8.0	± 0.2
E <sub>1</sub>	1.75	± 0.1
F	3.5	± 0.05
D <sub>0</sub>	1.55	± 0.05
P <sub>0</sub> <sup>(2)</sup>	4.0	± 0.1
P <sub>1</sub>	4.0	± 0.1
P <sub>2</sub>	2.0	± 0.05
T tape thickness	0.8	Max.
T <sub>1</sub> cover tape	< 0.1	-

**Notes**

- <sup>(1)</sup> Measured 0.3 mm above base pocket
- <sup>(2)</sup> P<sub>0</sub> pitch cumulative error over any 10 pitches ± 0.2 mm



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/ntc-curve-list/](http://www.vishay.com/resistors-non-linear/ntc-curve-list/)

**RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R<sub>25</sub> AT 4.7 kΩ, 10 kΩ, AND 15 kΩ**

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



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/ntc-curve-list/](http://www.vishay.com/resistors-non-linear/ntc-curve-list/)

**RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R<sub>25</sub> AT 22 kΩ, 33 kΩ, AND 47 kΩ**

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



For complete Curve Computation, visit: [www.vishay.com/resistors-non-linear/ntc-curve-list/](http://www.vishay.com/resistors-non-linear/ntc-curve-list/)

**RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R<sub>25</sub> AT 68 kΩ , AND 100 kΩ**

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



## Disclaimer

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

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

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

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

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

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## Material Category Policy

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

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

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