

## 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

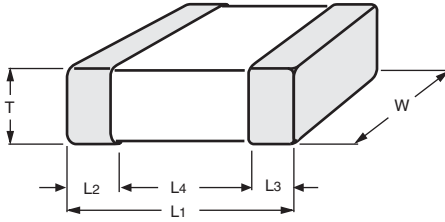
### ELECTRICAL DATA AND ORDERING INFORMATION

$R_{25}$ -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

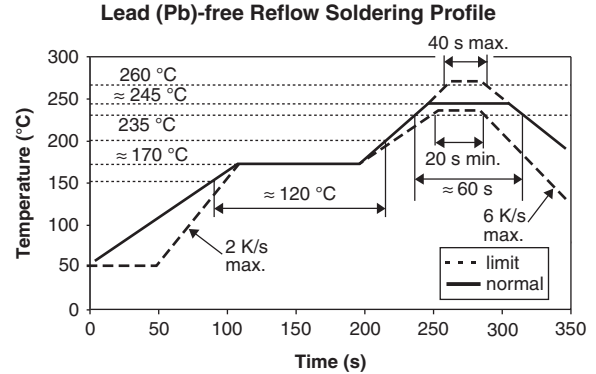
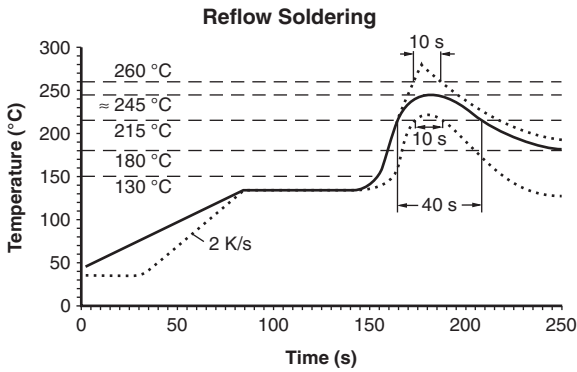


L <sub>1</sub>	W	T	L <sub>2</sub> AND L <sub>3</sub> MIN.	L <sub>4</sub> MIN.
1.0 ± 0.15	0.5 ± 0.15	0.5 ± 0.15	0.1	0.3

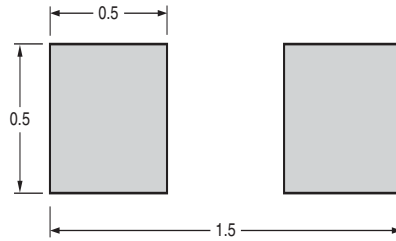
**SOLDERING CONDITIONS**

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.

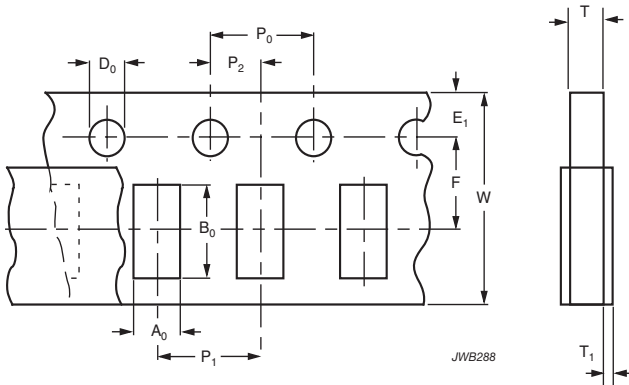


Recommended solder land pattern dimensions (mm)



**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  $R_{25}$  AT 4.7 k $\Omega$ , 10 k $\Omega$ , AND 15 k $\Omega$**

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> ( $\Omega$ )	TCR (%/K)	R <sub>T</sub> ( $\Omega$ )	TCR (%/K)	R <sub>T</sub> ( $\Omega$ )	TCR (%/K)	R <sub>T</sub> ( $\Omega$ )	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



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