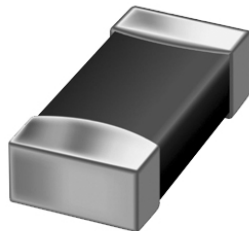


SMD 0402, Glass Protected NTC Thermistors



FEATURES

- TCR ranging from - 6.5 %/K at - 40 °C to - 2 %/K at 150 °C
- Tolerance on R_{25} down to 3 %
- Suitable for wave or reflow soldering
- NiSn terminations
- Fully glass coated and protected
- cUL recognized for safety applications (file E148885)
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21 definition



RoHS
COMPLIANT
HALOGEN
FREE

QUICK REFERENCE DATA

PARAMETER	VALUE	UNIT
Resistance value at 25 °C	4.7K to 100K	Ω
Tolerance on R_{25} -value	± 3 ; ± 5	%
$B_{25/85}$ -value	3490 to 4075	K
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 to + 150	°C
Weight	≈ 1.2	mg

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/curve-computation-list/

ELECTRICAL DATA AND ORDERING INFORMATION

R_{25} -VALUE (k Ω)	$B_{25/85}$ -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 %

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

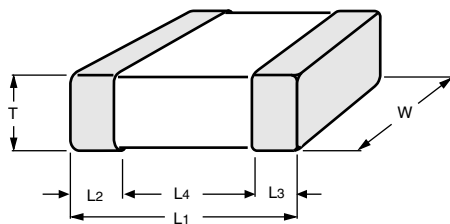
NTCS0402E3.....T



Vishay BCcomponents

SMD 0402, Glass Protected
NTC Thermistors

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

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

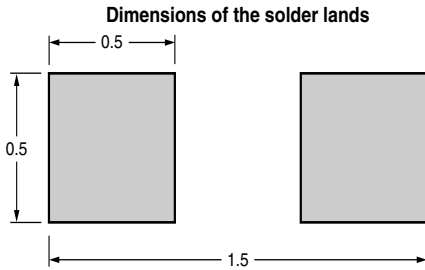
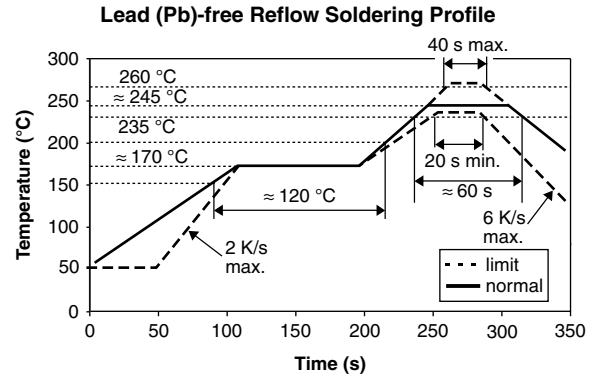
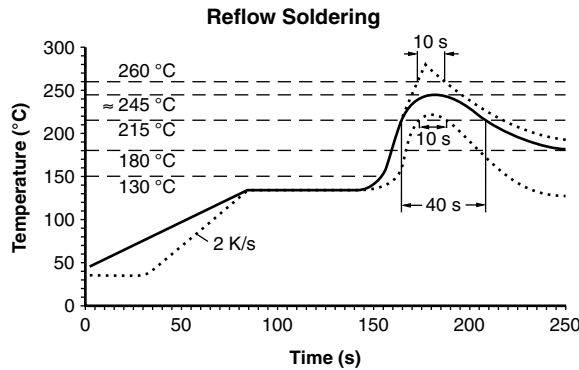
For complete Curve Computation, visit: www.vishay.com/resistors-non-linear/curve-computation-list/

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R_{25} AT 68 k Ω , AND 100 k Ω					
T_{OPER} (°C)	PART NUMBER NTCS0402E3683*HT		PART NUMBER NTCS0402E3104*HT		$\Delta R/R$ DUE TO $B_{tol.}$ (\pm %)
	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 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.



TESTS AND REQUIREMENTS

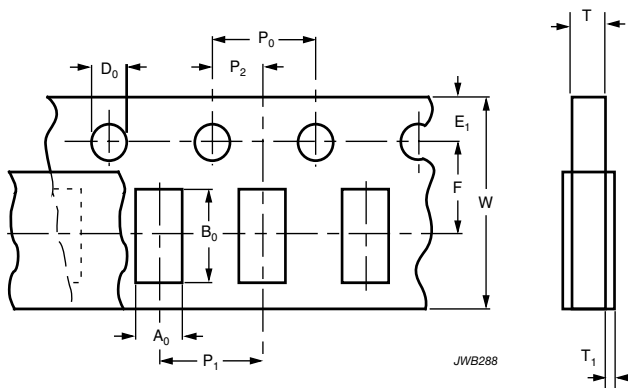
SOLDERABILITY AND RESISTANCE TO SOLDERING HEAT				
IEC 60068-2-58	TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
6	T _C	Solderability	2 s at 235 °C	Min. 95 % of surface wetted
		Resistance to soldering heat	10 s at 260 °C	$\Delta R/R < 5\%$

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⁾ P₀ pitch cumulative error over any 10 pitches ± 0.2 mm



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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.