

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

QUICK REFERENCE DATA		
PARAMETER	VALUE	UNIT
Resistance value at 25 °C	2.0K to 100K	$\Omega$
Tolerance on $R_{25}$ -value	$\pm 1$ ; $\pm 2$ ; $\pm 3$ ; $\pm 5$	%
$B_{25/85}$ -value	3420 to 4100	K
Tolerance on $B_{25/85}$ -value	$\pm 1$	%
Maximum dissipation at 25 °C	125	mW
Thermal time constant $\tau$	$\approx 8$	s
Dissipation factor D	3.0	mW/K
Operating temperature range at zero power	- 40 to + 150	°C
Weight	$\approx 0.006$	g

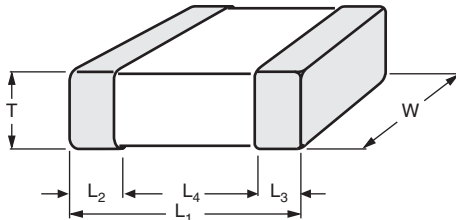
ELECTRICAL DATA AND ORDERING INFORMATION			
$R_{25}$ -VALUE (k $\Omega$ )	$B_{25/85}$ -VALUE (K)	TOLERANCE ON $B_{25/85}$ (%)	SAP MATERIAL AND ORDERING NUMBER <sup>(1)</sup>
2.0	3420	$\pm 1$	NTCS0603E3202*LT <sup>(2)</sup>
2.2	3520	$\pm 1$	NTCS0603E3222*MT
2.7	3600	$\pm 1$	NTCS0603E3272*MT
4.7	3830	$\pm 1$	NTCS0603E3472*HT
10	3435	$\pm 1$	NTCS0603E3103*LT
10	3610	$\pm 1$	NTCS0603E3103*MT
10	3960	$\pm 1$	NTCS0603E3103*HT
15	3600	$\pm 1$	NTCS0603E3153*MT <sup>(3)</sup>
22	3730	$\pm 1$	NTCS0603E3223*MT
33	3860	$\pm 1$	NTCS0603E3333*HT
47	3960	$\pm 1$	NTCS0603E3473*HT
68	3985	$\pm 1$	NTCS0603E3683*HT
100	4100	$\pm 1$	NTCS0603E3104*XT

#### Notes

<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  $R_{25}$

<sup>(2)</sup> Type NTCS0603E3202\*LT only available in 5 % tolerance on  $R_{25}$

<sup>(3)</sup> Type NTCS0603E3153\*MT is not UL recognized

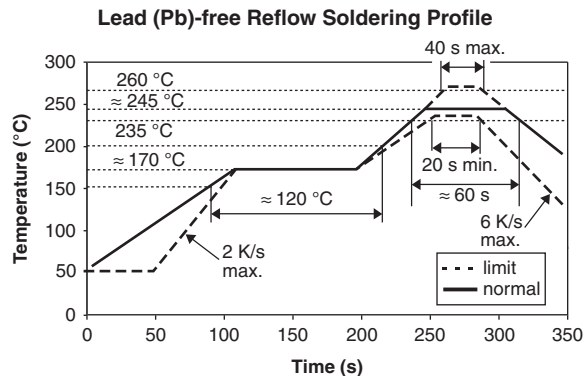
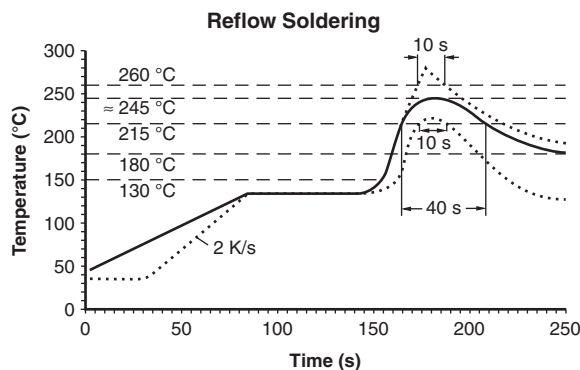
**DIMENSIONS** in millimeters


L <sub>1</sub>	W	T	L <sub>2</sub> AND L <sub>3</sub> MIN.	L <sub>4</sub> MIN.
1.6 ± 0.15	0.8 ± 0.15	0.8 ± 0.15	0.2	0.4

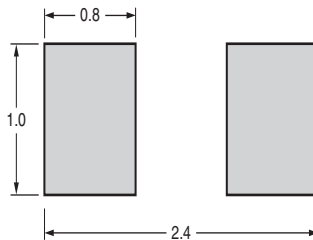
**SOLDERING CONDITIONS**

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.

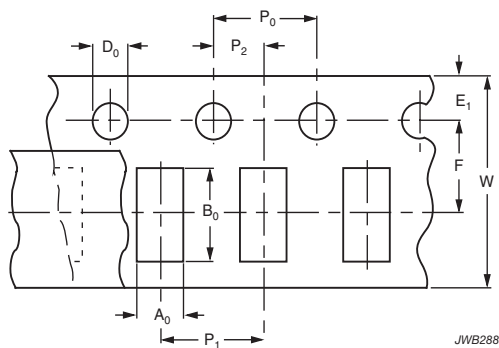
Typical examples of a soldering processes that will provide reliable joints without damage, are shown below.



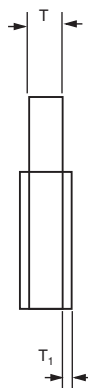
Recommended solder land pattern dimensions (mm)


**PACKAGING TAPE SPECIFICATIONS**

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

**PAPER TAPE**


JWB288


**DIMENSIONS OF PAPER TAPE** in millimeters

PARAMETER	DIMENSION	TOLERANCE
A <sub>0</sub> <sup>(1)</sup>	1.15	± 0.1
B <sub>0</sub> <sup>(1)</sup>	1.9	± 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	1.1	Max.
T <sub>1</sub> cover tape	< 0.1	-

**Notes**

- (1) Measured 0.3 mm above base pocket
- (2) 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/curve-computation-list/](http://www.vishay.com/resistors-non-linear/curve-computation-list/)

<b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 2.0 k<math>\Omega</math>, 2.2 k<math>\Omega</math>, 2.7 k<math>\Omega</math>, AND 4.7 k<math>\Omega</math></b>								
$T_{OPER}$ (°C)	PART NUMBER NTCS0603E3202*MT		PART NUMBER NTCS0603E3222*MT		PART NUMBER NTCS0603E3272*MT		PART NUMBER NTCS0603E3472*HT	
	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)
- 40	44 297	- 5.93	53 503	- 6.11	65 247	- 6.26	152 832	- 6.66
- 35	33 114	- 5.71	39 637	- 5.89	48 436	- 6.03	110 192	- 6.43
- 30	25 010	- 5.51	29 680	- 5.68	36 340	- 5.82	80 369	- 6.20
- 25	19 076	- 5.32	22 451	- 5.48	27 539	- 5.61	59 267	- 5.98
- 20	14 687	- 5.14	17 149	- 5.29	21 069	- 5.42	44 170	- 5.78
- 15	11 410	- 4.96	13 221	- 5.11	16 265	- 5.23	33 252	- 5.58
- 10	8940.4	- 4.80	10 283	- 4.94	12 664	- 5.06	25 276	- 5.39
- 5	7062.8	- 4.64	8066.2	- 4.77	9940.1	- 4.89	19 392	- 5.21
0	5623.4	- 4.48	6378.5	- 4.62	7862.7	- 4.72	15 009	- 5.04
5	4510.9	- 4.34	5083.1	- 4.47	6265.2	- 4.57	11 716	- 4.87
10	3644.4	- 4.20	4080.7	- 4.32	5027.3	- 4.42	9219.5	- 4.71
15	2964.6	- 4.06	3299.2	- 4.18	4060.9	- 4.28	7311.4	- 4.56
20	2427.4	- 3.94	2685.5	- 4.05	3301.2	- 4.14	5841.3	- 4.42
<b>25</b>	<b>2000.0</b>	<b>- 3.81</b>	<b>2200.0</b>	<b>- 3.93</b>	<b>2700.0</b>	<b>- 4.02</b>	<b>4700.0</b>	<b>- 4.28</b>
30	1657.7	- 3.70	1813.5	- 3.80	2221.1	- 3.89	3807.5	- 4.15
35	1382.0	- 3.58	1503.7	- 3.69	1837.3	- 3.77	3104.5	- 4.02
40	1158.4	- 3.48	1253.9	- 3.58	1528.0	- 3.66	2547.2	- 3.90
45	976.12	- 3.37	1051.3	- 3.47	1277.2	- 3.55	2102.4	- 3.78
50	826.68	- 3.27	886.05	- 3.37	1072.8	- 3.45	1745.3	- 3.67
55	703.51	- 3.18	750.49	- 3.27	905.29	- 3.35	1456.8	- 3.56
60	601.48	- 3.09	638.72	- 3.18	767.40	- 3.25	1222.4	- 3.46
65	516.53	- 3.00	546.09	- 3.09	653.33	- 3.16	1030.9	- 3.36
70	445.49	- 2.92	468.95	- 3.00	558.52	- 3.07	873.61	- 3.26
75	385.79	- 2.84	404.41	- 2.92	479.37	- 2.99	743.79	- 3.17
80	335.42	- 2.76	350.18	- 2.84	413.02	- 2.90	636.11	- 3.08
85	292.73	- 2.69	304.40	- 2.76	357.17	- 2.83	546.36	- 3.00
90	256.40	- 2.61	265.61	- 2.69	309.97	- 2.75	471.22	- 2.92
95	225.37	- 2.55	232.60	- 2.62	269.92	- 2.68	408.03	- 2.84
100	198.77	- 2.48	204.39	- 2.55	235.83	- 2.61	354.67	- 2.77
105	175.88	- 2.42	180.22	- 2.49	206.70	- 2.54	309.43	- 2.69
110	156.11	- 2.35	159.41	- 2.42	181.72	- 2.48	270.91	- 2.62
115	138.98	- 2.29	141.44	- 2.36	160.24	- 2.41	238.01	- 2.56
120	124.09	- 2.24	125.88	- 2.3	141.70	- 2.35	209.79	- 2.49
125	111.11	- 2.18	112.35	- 2.25	125.65	- 2.30	185.50	- 2.43
130	99.757	- 2.13	100.55	- 2.19	111.72	- 2.24	164.53	- 2.37
135	89.796	- 2.08	90.239	- 2.14	99.589	- 2.19	146.36	- 2.31
140	81.033	- 2.03	81.192	- 2.09	88.997	- 2.13	130.57	- 2.26
145	73.304	- 1.98	73.235	- 2.04	79.724	- 2.08	116.80	- 2.20
150	66.468	- 1.94	66.218	- 1.99	71.585	- 2.04	104.76	- 2.15



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

<b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 10 k<math>\Omega</math>, 15 k<math>\Omega</math>, AND 22 k<math>\Omega</math></b>										
$T_{OPER}$ (°C)	PART NUMBER NTCS0603E3103*LT		PART NUMBER NTCS0603E3103*MT		PART NUMBER NTCS0603E3103*HT		PART NUMBER NTCS0603E3153*MT		PART NUMBER NTCS0603E3223*MT	
	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)
-40	183 402	-5.54	243 448	-6.06	347 116	-6.66	362 484	-6.07	603 212	-6.28
-35	139 680	-5.35	180 772	-5.85	250 089	-6.45	269 089	-5.85	443 043	-6.06
-30	107 381	-5.17	135 623	-5.65	182 023	-6.25	201 888	-5.64	328 858	-5.86
-25	83 297	-4.99	102 751	-5.46	133 804	-6.06	152 997	-5.45	246 572	-5.66
-20	65 175	-4.82	78 576	-5.28	99 313	-5.87	117 051	-5.26	186 661	-5.47
-15	51 419	-4.66	60 623	-5.10	74 408	-5.68	90 361	-5.09	142 608	-5.29
-10	40 889	-4.51	47 168	-4.94	56 257	-5.50	70 354	-4.92	109 910	-5.12
-5	32 763	-4.36	36 995	-4.78	42 910	-5.33	55 223	-4.76	85 420	-4.96
0	26 444	-4.21	29 240	-4.63	33 009	-5.16	43 682	-4.61	66 919	-4.80
5	21 493	-4.08	23 280	-4.49	25 602	-5.00	34 807	-4.47	52 827	-4.66
10	17 586	-3.95	18 664	-4.35	20 015	-4.85	27 929	-4.33	42 007	-4.51
15	14 482	-3.82	15 064	-4.22	15 767	-4.70	22 561	-4.20	33 638	-4.38
20	11 999	-3.70	12 236	-4.10	12 512	-4.55	18 340	-4.08	27 117	-4.25
<b>25</b>	<b>10 000</b>	<b>-3.59</b>	<b>10 000</b>	<b>-3.98</b>	<b>10 000</b>	<b>-4.41</b>	<b>15 000</b>	<b>-3.96</b>	<b>22 000</b>	<b>-4.12</b>
30	8355.2	-3.56	8220.3	-3.86	8046.8	-4.28	12 340	-3.85	17 958	-4.00
35	7004.1	-3.49	6795.2	-3.75	6517.6	-4.15	10 207	-3.74	14 746	-3.89
40	5891.3	-3.43	5647.3	-3.65	5312.5	-4.03	8488.7	-3.64	12 176	-3.77
45	4972.5	-3.36	4717.5	-3.55	4356.6	-3.91	7095.4	-3.54	10 109	-3.67
50	4211.6	-3.29	3960.3	-3.45	3593.6	-3.79	5959.8	-3.44	8435.9	-3.57
55	3579.7	-3.22	3340.4	-3.36	2981.0	-3.68	5029.4	-3.35	7075.0	-3.47
60	3053.3	-3.15	2830.3	-3.27	2486.2	-3.58	4263.3	-3.26	5962.1	-3.38
65	2613.3	-3.08	2408.6	-3.18	2084.3	-3.48	3629.6	-3.18	5047.4	-3.29
70	2244.5	-3.01	2058.4	-3.10	1756.2	-3.38	3102.9	-3.10	4292.0	-3.20
75	1934.4	-2.94	1766.2	-3.02	1486.9	-3.28	2663.2	-3.02	3665.1	-3.12
80	1672.8	-2.87	1521.4	-2.95	1264.7	-3.19	2294.6	-2.94	3142.6	-3.04
85	1451.3	-2.81	1315.4	-2.87	1080.6	-3.10	1984.3	-2.87	2705.2	-2.96
90	1263.4	-2.74	1141.4	-2.80	927.23	-3.02	1722.0	-2.80	2337.6	-2.88
95	1103.3	-2.68	993.91	-2.73	798.94	-2.94	1499.6	-2.73	2027.3	-2.81
100	966.49	-2.62	868.35	-2.67	691.16	-2.86	1310.2	-2.67	1764.3	-2.74
105	849.29	-2.55	761.11	-2.61	600.23	-2.78	1148.3	-2.61	1540.7	-2.68
110	748.56	-2.50	669.19	-2.54	523.20	-2.71	1009.6	-2.55	1349.9	-2.61
115	661.73	-2.44	590.14	-2.48	457.68	-2.64	890.23	-2.49	1186.4	-2.55
120	586.65	-2.38	521.94	-2.43	401.76	-2.57	787.23	-2.43	1045.9	-2.49
125	521.56	-2.32	462.92	-2.37	353.85	-2.51	698.07	-2.38	924.73	-2.43
130	464.96	-2.27	411.68	-2.32	312.65	-2.44	620.67	-2.32	819.95	-2.38
135	415.62	-2.22	367.08	-2.27	277.10	-2.38	553.27	-2.27	729.04	-2.32
140	372.48	-2.17	328.14	-2.22	246.34	-2.32	494.43	-2.22	649.93	-2.27
145	334.66	-2.12	294.05	-2.17	219.62	-2.27	442.91	-2.18	580.89	-2.22
150	301.43	-2.07	264.12	-2.12	196.35	-2.21	397.69	-2.13	520.48	-2.17



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

<b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 33 k<math>\Omega</math>, 47 k<math>\Omega</math>, 68 k<math>\Omega</math>, AND 100 k<math>\Omega</math></b>								
$T_{OPER}$ (°C)	PART NUMBER NTCS0603E3333*HT		PART NUMBER NTCS0603E3473*HT		PART NUMBER NTCS0603E3683*HT		PART NUMBER NTCS0603E3104*XT	
	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)	$R_T$ ( $\Omega$ )	TCR (%/K)
-40	1 061 183	- 6.70	1 643 693	- 6.85	2 324 376	- 6.77	3 921 252	- 7.03
-35	764 125	- 6.44	1 174 859	- 6.59	1 667 529	- 6.52	2 774 565	- 6.77
-30	557 158	- 6.20	850 461	- 6.34	1 211 148	- 6.28	1 988 706	- 6.52
-25	411 058	- 5.97	623 018	- 6.11	889 917	- 6.05	1 442 861	- 6.28
-20	306 646	- 5.75	461 557	- 5.89	661 047	- 5.84	1 058 901	- 6.06
-15	231 157	- 5.55	345 583	- 5.69	496 103	- 5.64	785 573	- 5.85
-10	175 977	- 5.36	261 354	- 5.49	375 941	- 5.45	588 793	- 5.65
-5	135 223	- 5.18	199 536	- 5.31	287 504	- 5.28	445 602	- 5.47
0	104 827	- 5.01	153 714	- 5.13	221 786	- 5.11	340 346	- 5.29
5	81 946	- 4.84	119 427	- 4.97	172 502	- 4.95	262 229	- 5.12
10	64 569	- 4.69	93 541	- 4.81	135 221	- 4.79	203 723	- 4.96
15	51 262	- 4.54	73 832	- 4.66	106 786	- 4.65	159 522	- 4.80
20	40 989	- 4.40	58 703	- 4.52	84 928	- 4.51	125 851	- 4.66
<b>25</b>	<b>33 000</b>	<b>- 4.27</b>	<b>47 000</b>	<b>- 4.38</b>	<b>68 000</b>	<b>- 4.38</b>	<b>100 000</b>	<b>- 4.52</b>
30	26 741	- 4.14	37 881	- 4.25	54 796	- 4.26	80 003	- 4.39
35	21 804	- 4.02	30 726	- 4.13	44 427	- 4.14	64 422	- 4.26
40	17 884	- 3.91	25 073	- 4.01	36 232	- 4.02	52 200	- 4.14
45	14 751	- 3.80	20 579	- 3.89	29 714	- 3.91	42 548	- 4.02
50	12 234	- 3.69	16 984	- 3.79	24 499	- 3.81	34 879	- 3.91
55	10 198	- 3.59	14 092	- 3.68	20 304	- 3.71	28 749	- 3.80
60	8543.9	- 3.49	11 751	- 3.58	16 909	- 3.61	23 820	- 3.70
65	7191.9	- 3.40	9847.6	- 3.49	14 149	- 3.52	19 835	- 3.60
70	6081.4	- 3.31	8290.7	- 3.40	11 893	- 3.43	16 597	- 3.51
75	5164.9	- 3.22	7011.4	- 3.31	10 041	- 3.34	13 951	- 3.42
80	4405.0	- 3.14	5955.0	- 3.22	8512.2	- 3.26	11 780	- 3.33
85	3772.0	- 3.06	5078.7	- 3.14	7245.5	- 3.18	9988.4	- 3.25
90	3242.6	- 2.99	4348.7	- 3.07	6191.1	- 3.11	8504.3	- 3.17
95	2797.8	- 2.91	3737.8	- 2.99	5310.0	- 3.03	7269.4	- 3.09
100	2422.8	- 2.84	3224.6	- 2.92	4570.7	- 2.96	6237.5	- 3.02
105	2105.3	- 2.78	2791.8	- 2.85	3948.0	- 2.90	5371.7	- 2.95
110	1835.5	- 2.71	2425.3	- 2.87	3421.5	- 2.83	4642.5	- 2.88
115	1605.4	- 2.65	2113.9	- 2.72	2974.8	- 2.77	4025.9	- 2.81
120	1408.5	- 2.59	1848.4	- 2.65	2594.5	- 2.71	3502.7	- 2.75
125	1239.5	- 2.53	1621.2	- 2.59	2269.6	- 2.65	3057.1	- 2.68
130	1093.9	- 2.47	1426.1	- 2.54	1991.2	- 2.59	2676.4	- 2.62
135	968.07	- 2.42	1258.1	- 2.48	1751.9	- 2.53	2350.1	- 2.57
140	859.04	- 2.36	1112.9	- 2.42	1545.5	- 2.48	2069.5	- 2.51
145	764.28	- 2.31	987.19	- 2.37	1367.1	- 2.43	1827.4	- 2.46
150	681.69	- 2.26	877.91	- 2.32	1212.3	- 2.38	1617.9	- 2.40



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