

# Chip NTC Thermistor

## Features

- = 5000 h
- O = 10000 h
- k = 1000 h
- o = 100 h

## Applications

- U = Automotive
- " = Industrial
- u = Consumer
- @ = Medical

## PART NUMBER

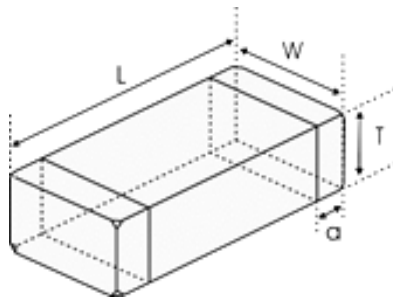
Example: RND 155QN0805X103F3435FA

RND 155QN0805	X	103	F	3435	F	A
Type	Delimiter	Nominal Resistance	Tolerance	B Constant	Tolerance of B Constant	B Constant Calculation Method
RND 155QN0402: 0402 RND 155QN0603: 0603 RND 155QN0805: 0805		472 = 4.7 kΩ 103 = 10 kΩ 104 = 100 kΩ	F = ± 1% G = ± 2% H = ± 3% J = ± 5 %	3435 = 3435 K 3950 = 3950 K 4050 = 4050 K 4500 = 4500 K	F = ± 1% H = ± 3%	A = 25 °C & 85 °C B = 25 °C & 50 °C

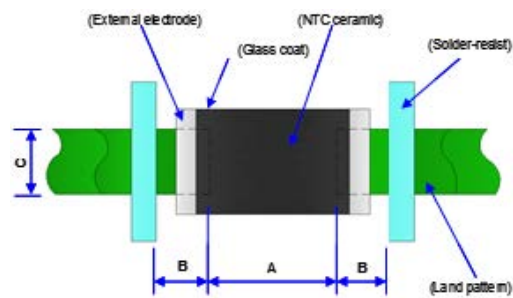
## Electrical Characteristics

Type	Resistance @ 25 °C	B Constant @ 25 / 50 °C	B Constant @ 25 / 85 °C	Permissible Operating Current @ 25 °C	Dissipation Factor	Thermal Time Constant	Rated Electric Power @ 25 °C	Operating Ambient Temperature
RND 155QN0805X103F3435FA	10 kΩ ±1%	3380 K	3435 K±1%	0.44 mA	2 mW / °C	<5 s	100 mW	-40 ... 125 °C

## Shape and Dimensions



Dimensions



Recommended PCB pattern for reflow soldering

Type	L	W	T	a	A	B	#
0402	1 mm	0.5 mm	0.5 mm	0.25 mm	0.45 ... 0.55 mm	0.4 ... 0.5 mm	...
0603	1.6 mm	0.8 mm	0.8 mm	0.3 mm	0.6 ... 0.8 mm	0.6 ... 0.7 mm	...
0805	2 mm	1.25 mm	0.85 mm	0.5 mm	1 ... 1.1 mm	0.6 ... 0.7 mm	... mm

## Test and Measurement Procedures

Unless otherwise specified, the standard atmospheric conditions for measurement/test as

- Ambient Temperature: 20±15°C
- Relative Humidity: 65±20%
- Air Pressure: 86 kPa to 106 kPa

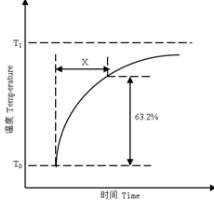
If any doubt on the results, measurements/tests should be made within the following limits

- Ambient Temperature: 20±2°C
- Relative Humidity: 65±5%
- Air Pressure: 86 kPa to 106 kPa

Inspection Equipment

- Visual Examination: 20x magnifier
- Resistance value test: Thermistor resistance tester

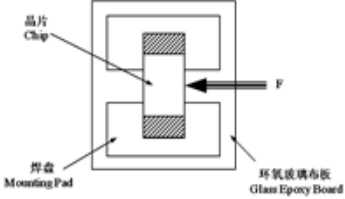
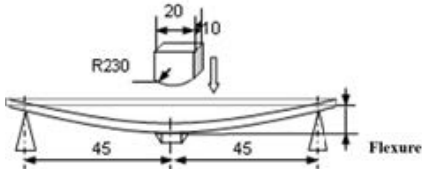
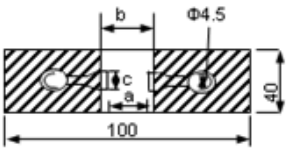
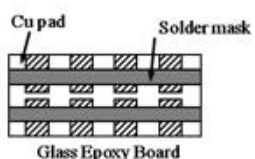
## Electrical Test

Item	Test Methods and Remarks
Nominal Zero-Power Resistance at 25 °C (R25)	Ambient temperature: 25 ± 0.05°C Measuring electric power: ≤0.1 mW
Nominal B Constant	25 ± 0.05°C, 50 ± 0.05°C, 85 ± 0.05°C Measure the resistance at the ambient temperature of 25 ± 0.05°C, 50 ± 0.05°C or 85 ± 0.05°C $B(25-50^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{50}}{1/T_{25} - 1/T_{50}} \quad B(25-85^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{85}}{1/T_{25} - 1/T_{85}}$ T: (K) Absolute temperature (K)
Thermal Time Constant	The total time for the temperature of the thermistor to change by 63.2% of the difference from ambient temperature T0 (°C) to T1 (°C) by the drastic change of the power applied to thermistor from non-zero Power to Zero-Power state, normally expressed in second (S) 

Item	Test Methods and Remarks
Dissipation Factor	The required power which makes the NTC thermistor body temperature raise 1°C through self-heated, normally expressed in milliwatts per degree Celsius (mW/°C). It can be calculated by the following formula $\delta = WT - T_0$
Rated Power	The necessary electric power makes thermistor's temperature rise 100°C by self-heating at ambient temperature 25°C
Permissible Operating Current	The current that keep body temperature of chip NTC on the PC board in still air rising 1°C by self-heating

# Chip NTC Thermistor

## Reliability Test

Item	Standard	Test Methods and Remarks	Requirements																										
Terminal Strength	IEC 60068-2-21	<p>Solder the chip to the testing jig (glass epoxy board shown in the right) using eutectic solder. Then apply a force in the direction of the arrow.</p> <table border="1"> <thead> <tr> <th>Size</th> <th>F</th> <th>Duration</th> </tr> </thead> <tbody> <tr> <td>0402, 0603</td> <td>5N</td> <td rowspan="2">10 ± 1 s</td> </tr> <tr> <td>0805</td> <td>10N</td> </tr> </tbody> </table>	Size	F	Duration	0402, 0603	5N	10 ± 1 s	0805	10N	<p>No removal or split of the termination or other defects shall occur</p> 																		
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0402, 0603	5N	10 ± 1 s																											
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Resistance to Flexure	IEC 60068-2-21	<p>Solder the chip to the test jig (glass epoxy board shown in the right) using a eutectic solder. Then apply a force in the direction shown as follow</p>  <table border="1"> <thead> <tr> <th>Size</th> <th>Flexure</th> <th>Pressurizing Speed</th> <th>Duration</th> </tr> </thead> <tbody> <tr> <td>0402, 0603</td> <td>1 mm</td> <td rowspan="2">&lt;0.5 mm/s</td> <td rowspan="2">10 ± 1 s</td> </tr> <tr> <td>0805</td> <td>2 mm</td> </tr> </tbody> </table>	Size	Flexure	Pressurizing Speed	Duration	0402, 0603	1 mm	<0.5 mm/s	10 ± 1 s	0805	2 mm	<p>1. No visible damage 2.   ΔR25/R25   ≤5%</p> <table border="1"> <thead> <tr> <th>Size</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>0402</td> <td>0.4 mm</td> <td>1.5 mm</td> <td>0.5 mm</td> </tr> <tr> <td>0603</td> <td>1 mm</td> <td>3 mm</td> <td>1.2 mm</td> </tr> <tr> <td>0805</td> <td>1.2 mm</td> <td>4 mm</td> <td>1.65 mm</td> </tr> </tbody> </table> 	Size	a	b	c	0402	0.4 mm	1.5 mm	0.5 mm	0603	1 mm	3 mm	1.2 mm	0805	1.2 mm	4 mm	1.65 mm
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0805	1.2 mm	4 mm	1.65 mm																										
Vibration	IEC 60068-2-80	<p>1. Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder</p> <p>2. The chip shall be subjected to a simple harmonic motion having total amplitude of 1.5 mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz</p> <p>3. The frequency ranges from 10 to 55 Hz and return to 10 Hz shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours)</p>	<p>No visible damage</p> 																										
Dropping	IEC 60068-2-32	Drop a chip 10 times on a concrete floor from a height of 1 meter	No visible damage																										

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Item	Standard	Test Methods and Remarks	Requirements															
Solderability	IEC 60068-2-58	<ul style="list-style-type: none"> <li>Solder temperature: <math>245 \pm 5^{\circ}\text{C}</math></li> <li>Duration: <math>10 \pm 1\text{s}</math></li> <li>Solder: Sn/3.0Ag/0.5Cu</li> <li>Flux: 25% resin and 75% ethanol in weight</li> </ul>	<ol style="list-style-type: none"> <li>No visible damage</li> <li>Wetting shall exceed 95% coverage</li> </ol>															
Resistance to Soldering Heat	IEC 60068-2-58	<ul style="list-style-type: none"> <li>Solder temperature: <math>245 \pm 5^{\circ}\text{C}</math></li> <li>Duration: <math>10 \pm 1\text{s}</math></li> <li>Solder: Sn/3.0Ag/0.5Cu</li> <li>Flux: 25% resin and 75% ethanol in weight</li> <li>The chip shall be stabilized at normal condition for 1~2 hours before measuring</li> </ul>	<ol style="list-style-type: none"> <li>No visible damage</li> <li><math> \Delta R_{25}/R_{25}  \leq 5\%</math></li> <li><math> \Delta B/B  \leq 2\%</math></li> </ol>															
Temperature Cycling	IEC 60068-2-14	<p>5 cycles of following sequence without loading</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>-40 \pm 5^{\circ}\text{C}</math></td> <td><math>30 \pm 3\text{min}</math></td> </tr> <tr> <td>2</td> <td><math>25 \pm 2^{\circ}\text{C}</math></td> <td><math>5 \pm 3\text{min}</math></td> </tr> <tr> <td>3</td> <td><math>125 \pm 2^{\circ}\text{C}</math></td> <td><math>30 \pm 3\text{min}</math></td> </tr> <tr> <td>4</td> <td><math>25 \pm 2^{\circ}\text{C}</math></td> <td><math>5 \pm 3\text{min}</math></td> </tr> </tbody> </table>	Step	Temperature	Time	1	$-40 \pm 5^{\circ}\text{C}$	$30 \pm 3\text{min}$	2	$25 \pm 2^{\circ}\text{C}$	$5 \pm 3\text{min}$	3	$125 \pm 2^{\circ}\text{C}$	$30 \pm 3\text{min}$	4	$25 \pm 2^{\circ}\text{C}$	$5 \pm 3\text{min}$	<ol style="list-style-type: none"> <li>No visible damage</li> <li><math> \Delta R_{25}/R_{25}  \leq 3\%</math></li> <li><math> \Delta B/B  \leq 2\%</math></li> </ol>
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4	$25 \pm 2^{\circ}\text{C}$	$5 \pm 3\text{min}$																
Resistance to Dry Heat	IEC 60068-2-2	<ol style="list-style-type: none"> <li><math>125 \pm 5^{\circ}\text{C}</math> in air, for <math>1000 \pm 24</math> hours without loading</li> <li>The chip shall be stabilized at normal condition for 1~2 hours before measuring</li> </ol>	<ol style="list-style-type: none"> <li>No visible damage</li> <li><math> \Delta R_{25}/R_{25}  \leq 5\%</math></li> <li><math> \Delta B/B  \leq 2\%</math></li> </ol>															
Resistance to Cold	IEC 60068-2-1	<ol style="list-style-type: none"> <li><math>-40 \pm 3^{\circ}\text{C}</math> in air, for <math>1000 \pm 24</math> hours without loading</li> <li>The chip shall be stabilized at normal condition for 1~2 hours before measuring</li> </ol>	<ol style="list-style-type: none"> <li>No visible damage</li> <li><math> \Delta R_{25}/R_{25}  \leq 5\%</math></li> <li><math> \Delta B/B  \leq 2\%</math></li> </ol>															
Resistance to Damp Heat	IEC 60068-2-78	<ol style="list-style-type: none"> <li><math>40 \pm 2^{\circ}\text{C}</math>, 90~95%RH in air, for <math>1000 \pm 24</math> hours without loading</li> <li>The chip shall be stabilized at normal condition for 1~2 hours before measuring</li> </ol>	<ol style="list-style-type: none"> <li>No visible damage</li> <li><math> \Delta R_{25}/R_{25}  \leq 3\%</math></li> <li><math> \Delta B/B  \leq 2\%</math></li> </ol>															
Resistance to high temperature load	IEC 60539-1 5.25.4	<ol style="list-style-type: none"> <li><math>85 \pm 2^{\circ}\text{C}</math> in air with permissive operating current for <math>1000 \pm 48</math> hours</li> <li>The chip shall be stabilized at normal condition for 1~2 hours before measuring</li> </ol>	<ol style="list-style-type: none"> <li>No visible damage</li> <li><math> \Delta R_{25}/R_{25}  \leq 5\%</math></li> <li><math> \Delta B/B  \leq 2\%</math></li> </ol>															

## Storage

### Storage Conditions

- Storage Temperature:  $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$
- Relative Humidity:  $\leq 75\%RH$
- Keep away from corrosive atmosphere and sunlight
- Period of Storage: 6 Months after delivery

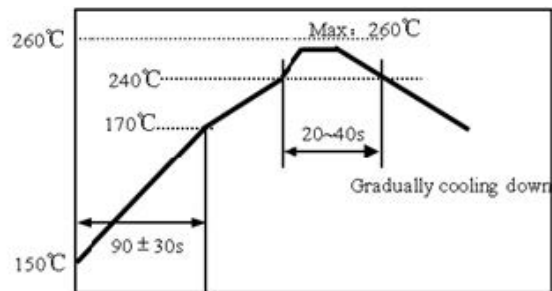
## Notes & Warnings

The RND 155QN series thermistors shall not be operated and stored under the following environmental conditions:

- Corrosive or deoxidized atmospheres (such as chlorine, sulfurated hydrogen, ammonia, sulfuric acid, nitric oxide and so on)
- Volatile or inflammable atmospheres
- Dusty condition
- Excessively high or low pressure condition
- Humid site
- Places with brine, oil, chemical liquid or organic solvent
- Intense vibration
- Places with analogously deleterious conditions
- The ceramic body of the RND 155QN series thermistors is fragile, no excessive pressure or impact shall be exerted on it
- The RND 155QN series thermistors shall not be operated beyond the specified "Operating Temperature Range" in the catalog

## Re-Flowing Profile

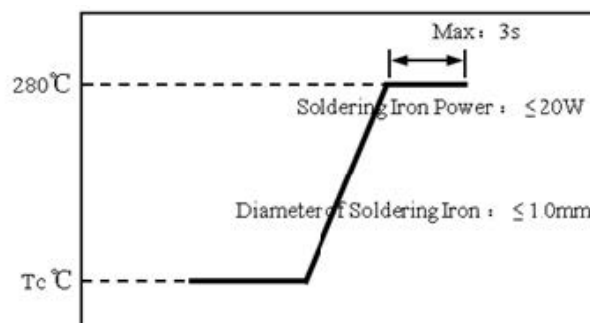
- 1~2°C/sec. Ramp
- Pre-heating: 150~170°C/90±30 sec.
- Time above 240°C: 20~40 sec.
- Peak temperature: 260°C Max./10 sec.
- Solder paste: Sn/3.0Ag/0.5Cu
- Max.2 times for re-flowing



## Iron Soldering Profile

- Iron soldering power: Max.20W
- Pre-heating: 150°C/60sec.
- Soldering Tip temperature: 280°C Max.
- Soldering time: 3 sec Max.
- Solder paste: Sn/3.0Ag/0.5Cu
- Max.1 times for iron soldering

Note: Take care not to apply the tip of the soldering iron to the terminal electrodes



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R-T Table

Temp. (°C)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(°C)
-40	189.674	197.390	205.400	4.06%	0.69
-39	179.349	186.540	194.000	4.00%	0.69
-38	169.647	176.350	183.299	3.94%	0.68
-37	160.550	166.800	173.276	3.88%	0.68
-36	151.990	157.820	163.857	3.83%	0.67
-35	143.951	149.390	155.019	3.77%	0.67
-34	136.431	141.510	146.763	3.71%	0.66
-33	129.347	134.090	138.993	3.66%	0.66
-32	122.680	127.110	131.687	3.60%	0.65
-31	116.391	120.530	124.804	3.55%	0.65
-30	110.472	114.340	118.332	3.49%	0.64
-29	104.913	108.530	112.260	3.44%	0.64
-28	99.658	103.040	106.526	3.38%	0.63
-27	94.706	97.870	101.129	3.33%	0.63
-26	90.029	92.989	96.037	3.28%	0.62
-25	85.611	88.381	91.231	3.23%	0.62
-24	81.443	84.036	86.702	3.17%	0.61
-23	77.504	79.931	82.426	3.12%	0.60
-22	73.779	76.052	78.387	3.07%	0.60
-21	70.256	72.384	74.569	3.02%	0.59
-20	66.922	68.915	70.961	2.97%	0.59
-19	63.767	65.634	67.549	2.92%	0.58
-18	60.779	62.529	64.323	2.87%	0.58
-17	57.949	59.589	61.269	2.82%	0.57
-16	55.268	56.804	58.377	2.77%	0.56
-15	52.726	54.166	55.640	2.72%	0.56
-14	50.315	51.665	53.046	2.67%	0.55
-13	48.029	49.294	50.588	2.62%	0.55
-12	45.860	47.046	48.258	2.58%	0.54
-11	43.801	44.913	46.049	2.53%	0.53
-10	41.846	42.889	43.953	2.48%	0.53
-9	39.989	40.967	41.964	2.43%	0.52
-8	38.225	39.142	40.077	2.39%	0.51
-7	36.549	37.408	38.284	2.34%	0.51
-6	34.955	35.761	36.582	2.30%	0.50
-5	33.440	34.196	34.965	2.25%	0.49
-4	31.998	32.707	33.428	2.20%	0.49
-3	30.627	31.291	31.966	2.16%	0.48
-2	29.322	29.945	30.578	2.11%	0.47
-1	28.080	28.664	29.257	2.07%	0.47
0	26.898	27.445	28.001	2.02%	0.46
1	25.770	26.283	26.804	1.98%	0.45

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2	24.696	25.177	25.665	1.94%	0.45
3	23.673	24.124	24.581	1.89%	0.44
4	22.699	23.121	23.549	1.85%	0.43
5	21.769	22.165	22.566	1.81%	0.42
6	20.882	21.253	21.628	1.76%	0.42
7	20.037	20.384	20.735	1.72%	0.41
8	19.230	19.555	19.883	1.68%	0.40
9	18.460	18.764	19.071	1.64%	0.39
10	17.725	18.010	18.297	1.60%	0.39
11	17.024	17.290	17.559	1.55%	0.38
12	16.353	16.602	16.853	1.51%	0.37
13	15.713	15.946	16.181	1.47%	0.36
14	15.101	15.319	15.538	1.43%	0.36
15	14.517	14.720	14.925	1.39%	0.35
16	13.958	14.148	14.339	1.35%	0.34
17	13.424	13.601	13.779	1.31%	0.33
18	12.913	13.078	13.244	1.27%	0.32
19	12.424	12.578	12.733	1.23%	0.32
20	11.955	12.099	12.243	1.19%	0.31
21	11.508	11.642	11.776	1.15%	0.30
22	11.079	11.204	11.329	1.11%	0.29
23	10.669	10.785	10.901	1.08%	0.28
24	10.276	10.384	10.492	1.04%	0.27
25	9.900	10.000	10.100	1.00%	0.27
26	9.532	9.632	9.732	1.04%	0.28
27	9.180	9.280	9.380	1.08%	0.29
28	8.843	8.943	9.042	1.11%	0.30
29	8.520	8.619	8.718	1.15%	0.31
30	8.211	8.309	8.408	1.19%	0.33
31	7.914	8.012	8.110	1.22%	0.34
32	7.630	7.727	7.824	1.26%	0.35
33	7.357	7.453	7.550	1.30%	0.36
34	7.096	7.191	7.287	1.33%	0.37
35	6.845	6.939	7.034	1.37%	0.39
36	6.604	6.698	6.792	1.41%	0.40
37	6.373	6.466	6.559	1.44%	0.41
38	6.152	6.243	6.335	1.48%	0.43
39	5.939	6.029	6.120	1.51%	0.44
40	5.735	5.824	5.914	1.55%	0.45
41	5.538	5.627	5.716	1.58%	0.46
42	5.350	5.437	5.525	1.62%	0.48
43	5.169	5.255	5.342	1.65%	0.49
44	4.995	5.080	5.165	1.69%	0.50
45	4.828	4.911	4.996	1.72%	0.52
46	4.667	4.749	4.832	1.75%	0.53
47	4.512	4.593	4.675	1.79%	0.54

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48	4.363	4.443	4.524	1.82%	0.56
49	4.220	4.299	4.379	1.86%	0.57
50	4.083	4.160	4.239	1.89%	0.58
51	3.950	4.027	4.104	1.92%	0.60
52	3.823	3.898	3.974	1.96%	0.61
53	3.700	3.774	3.849	1.99%	0.63
54	3.582	3.654	3.728	2.02%	0.64
55	3.468	3.539	3.612	2.05%	0.65
56	3.358	3.429	3.500	2.09%	0.67
57	3.252	3.322	3.392	2.12%	0.68
58	3.151	3.219	3.288	2.15%	0.70
59	3.052	3.119	3.188	2.18%	0.71
60	2.958	3.024	3.091	2.22%	0.72
61	2.867	2.931	2.997	2.25%	0.74
62	2.779	2.842	2.907	2.28%	0.75
63	2.694	2.756	2.820	2.31%	0.77
64	2.612	2.673	2.736	2.34%	0.78
65	2.533	2.593	2.655	2.37%	0.80
66	2.457	2.516	2.576	2.40%	0.81
67	2.383	2.441	2.501	2.43%	0.83
68	2.312	2.369	2.428	2.46%	0.84
69	2.244	2.300	2.357	2.50%	0.86
70	2.177	2.233	2.289	2.53%	0.87
71	2.113	2.168	2.223	2.56%	0.89
72	2.052	2.105	2.159	2.59%	0.90
73	1.992	2.044	2.098	2.62%	0.92
74	1.934	1.986	2.038	2.65%	0.93
75	1.879	1.929	1.981	2.68%	0.95
76	1.825	1.874	1.925	2.71%	0.96
77	1.773	1.821	1.871	2.73%	0.98
78	1.722	1.770	1.819	2.76%	1.00
79	1.673	1.720	1.768	2.79%	1.01
80	1.626	1.673	1.720	2.82%	1.03
81	1.581	1.626	1.672	2.85%	1.04
82	1.537	1.581	1.627	2.88%	1.06
83	1.494	1.538	1.582	2.91%	1.08
84	1.453	1.496	1.540	2.94%	1.09
85	1.413	1.455	1.498	2.97%	1.11
86	1.374	1.416	1.458	2.99%	1.13
87	1.337	1.377	1.419	3.02%	1.14
88	1.300	1.340	1.381	3.05%	1.16
89	1.265	1.304	1.345	3.08%	1.17
90	1.231	1.270	1.309	3.11%	1.19
91	1.198	1.236	1.275	3.13%	1.21
92	1.167	1.204	1.242	3.16%	1.23
93	1.136	1.172	1.209	3.19%	1.24



# Chip NTC Thermistor



94	1.106	1.141	1.178	3.22%	1.26
95	1.076	1.112	1.148	3.24%	1.28
96	1.048	1.083	1.118	3.27%	1.29
97	1.021	1.055	1.090	3.30%	1.31
98	0.995	1.028	1.062	3.32%	1.33
99	0.969	1.002	1.035	3.35%	1.35
100	0.944	0.976	1.009	3.38%	1.36
101	0.920	0.951	0.984	3.40%	1.38
102	0.897	0.927	0.959	3.43%	1.40
103	0.874	0.904	0.935	3.46%	1.42
104	0.852	0.882	0.912	3.48%	1.43
105	0.830	0.860	0.890	3.51%	1.45
106	0.810	0.838	0.868	3.53%	1.47
107	0.790	0.818	0.847	3.56%	1.49
108	0.770	0.798	0.826	3.59%	1.50
109	0.751	0.778	0.806	3.61%	1.52
110	0.733	0.759	0.787	3.64%	1.54
111	0.715	0.741	0.768	3.66%	1.56
112	0.697	0.723	0.750	3.69%	1.58
113	0.680	0.706	0.732	3.71%	1.60
114	0.664	0.689	0.715	3.74%	1.61
115	0.648	0.673	0.698	3.76%	1.63
116	0.633	0.657	0.682	3.79%	1.65
117	0.618	0.641	0.666	3.81%	1.67
118	0.603	0.626	0.650	3.84%	1.69
119	0.589	0.612	0.635	3.86%	1.71
120	0.575	0.598	0.621	3.89%	1.73
121	0.562	0.584	0.607	3.91%	1.75
122	0.549	0.570	0.593	3.93%	1.77
123	0.536	0.557	0.579	3.96%	1.79
124	0.524	0.545	0.566	3.98%	1.80
125	0.512	0.532	0.554	4.01%	1.82