

Chip NTC Thermistor

Features

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Applications

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PART NUMBER

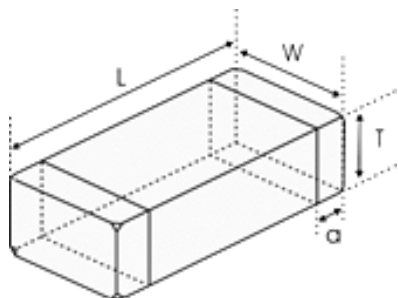
Example: RND 155QN0805X472F3450FB

RND 155QN0805	X	472	F	3450	F	B
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 333 = 33 kΩ 334 = 330 kΩ	F = ± 1% G = ± 2% H = ± 3% J = ± 5 %	3450 = 3450 K 3950 = 3950 K 4050 = 4050 K 4500 = 4500 K	F = ± 1% H = ± 3%	A = 25 °C & 85 °C B = 25 °C & 50 °C

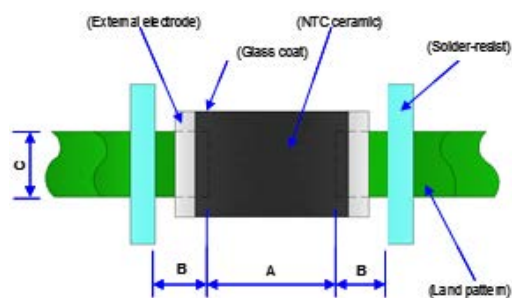
Electrical Characteristics

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 155QN0805X472F3450FB	4.7 kΩ ±1%	3450 K±1%	3500 K	0.65 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

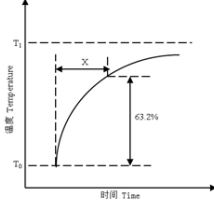
If any doubt on the results, measurements/tests should be made within the following limits

- 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

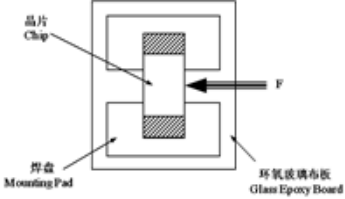
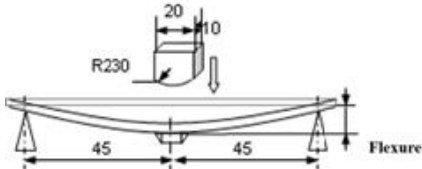
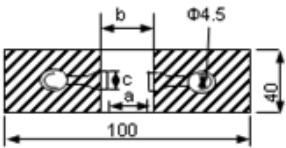
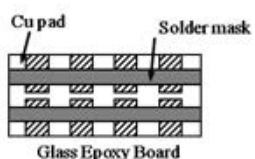
Electrical Test

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 T ₀ (°C) to T ₁ (°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

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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> 																		
Size	F	Duration																											
0402, 0603	5N	10 ± 1 s																											
0805	10N																												
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"><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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0603	1 mm	3 mm	1.2 mm																										
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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"> Solder temperature: $245 \pm 5^{\circ}\text{C}$ Duration: $10 \pm 1\text{s}$ Solder: Sn/3.0Ag/0.5Cu Flux: 25% resin and 75% ethanol in weight 	1. No visible damage 2. Wetting shall exceed 95% coverage															
Resistance to Soldering Heat	IEC 60068-2-58	<ul style="list-style-type: none"> Solder temperature: $245 \pm 5^{\circ}\text{C}$ Duration: $10 \pm 1\text{s}$ Solder: Sn/3.0Ag/0.5Cu Flux: 25% resin and 75% ethanol in weight The chip shall be stabilized at normal condition for 1~2 hours before measuring 	1. No visible damage 2. $ \Delta R_{25}/R_{25} \leq 5\%$ 3. $ \Delta B/B \leq 2\%$															
Temperature Cycling	IEC 60068-2-14	5 cycles of following sequence without loading <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>$-40 \pm 5^{\circ}\text{C}$</td> <td>$30 \pm 3\text{min}$</td> </tr> <tr> <td>2</td> <td>$25 \pm 2^{\circ}\text{C}$</td> <td>$5 \pm 3\text{min}$</td> </tr> <tr> <td>3</td> <td>$125 \pm 2^{\circ}\text{C}$</td> <td>$30 \pm 3\text{min}$</td> </tr> <tr> <td>4</td> <td>$25 \pm 2^{\circ}\text{C}$</td> <td>$5 \pm 3\text{min}$</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	$25 \pm 2^{\circ}\text{C}$	$5 \pm 3\text{min}$	1. No visible damage 2. $ \Delta R_{25}/R_{25} \leq 3\%$ 3. $\Delta B/B \leq 2\%$
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	$25 \pm 2^{\circ}\text{C}$	$5 \pm 3\text{min}$																
Resistance to Dry Heat	IEC 60068-2-2	1. $125 \pm 5^{\circ}\text{C}$ in air, for 1000 ± 24 hours without loading 2. The chip shall be stabilized at normal condition for 1~2 hours before measuring	1. No visible damage 2. $ \Delta R_{25}/R_{25} \leq 5\%$ 3. $ \Delta B/B \leq 2\%$															
Resistance to Cold	IEC 60068-2-1	1. $-40 \pm 3^{\circ}\text{C}$ in air, for 1000 ± 24 hours without loading 2. The chip shall be stabilized at normal condition for 1~2 hours before measuring	1. No visible damage 2. $ \Delta R_{25}/R_{25} \leq 5\%$ 3. $ \Delta B/B \leq 2\%$															
Resistance to Damp Heat	IEC 60068-2-78	1. $40 \pm 2^{\circ}\text{C}$, 90~95%RH in air, for 1000 ± 24 hours without loading 2. The chip shall be stabilized at normal condition for 1~2 hours before measuring	1. No visible damage 2. $ \Delta R_{25}/R_{25} \leq 3\%$ 3. $ \Delta B/B \leq 2\%$															
Resistance to high temperature load	IEC 60539-1 5.25.4	1. $85 \pm 2^{\circ}\text{C}$ in air with permissive operating current for 1000 ± 48 hours 2. The chip shall be stabilized at normal condition for 1~2 hours before measuring	1. No visible damage 2. $ \Delta R_{25}/R_{25} \leq 5\%$ 3. $ \Delta B/B \leq 2\%$															

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

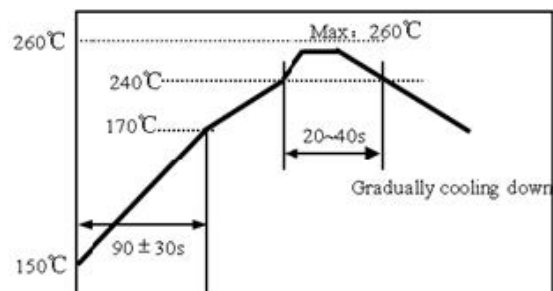
Notes & Warnings

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

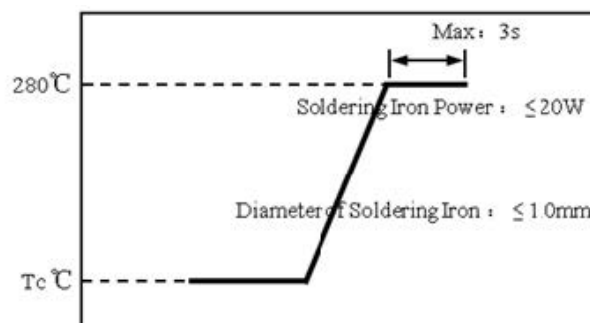
- 1~2°C/sec. Ramp
- Pre-heating: 150~170°C/90±30 sec.
- Time above 240°C: 20~40 sec.
- Peak temperature: 260°C Max./10 sec.
- Solder paste: Sn/3.0Ag/0.5Cu
- Max.2 times for re-flowing



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	92.019	95.793	99.712	4.09%	0.69
-39	87.118	90.641	94.298	4.03%	0.69
-38	82.504	85.793	89.205	3.98%	0.68
-37	78.158	81.229	84.413	3.92%	0.68
-36	74.062	76.931	79.903	3.86%	0.67
-35	70.203	72.883	75.657	3.81%	0.67
-34	66.564	69.068	71.659	3.75%	0.66
-33	63.133	65.473	67.892	3.70%	0.66
-32	59.896	62.083	64.343	3.64%	0.65
-31	56.842	58.886	60.998	3.59%	0.65
-30	53.960	55.871	57.844	3.53%	0.64
-29	51.238	53.025	54.869	3.48%	0.63
-28	48.669	50.340	52.063	3.42%	0.63
-27	46.241	47.804	49.415	3.37%	0.62
-26	43.947	45.410	46.916	3.32%	0.62
-25	41.779	43.147	44.556	3.26%	0.61
-24	39.730	41.010	42.327	3.21%	0.61
-23	37.791	38.989	40.221	3.16%	0.60
-22	35.958	37.079	38.231	3.11%	0.60
-21	34.223	35.272	36.350	3.06%	0.59
-20	32.581	33.563	34.572	3.01%	0.58
-19	31.026	31.946	32.890	2.95%	0.58
-18	29.554	30.415	31.299	2.90%	0.57
-17	28.160	28.966	29.793	2.85%	0.57
-16	26.838	27.593	28.367	2.80%	0.56
-15	25.586	26.293	27.017	2.75%	0.55
-14	24.399	25.061	25.739	2.70%	0.55
-13	23.273	23.893	24.528	2.66%	0.54
-12	22.205	22.786	23.380	2.61%	0.54
-11	21.192	21.736	22.292	2.56%	0.53
-10	20.230	20.740	21.261	2.51%	0.52
-9	19.317	19.795	20.282	2.46%	0.52
-8	18.450	18.898	19.354	2.42%	0.51
-7	17.627	18.046	18.473	2.37%	0.50
-6	16.845	17.237	17.638	2.32%	0.50
-5	16.101	16.469	16.844	2.27%	0.49
-4	15.395	15.739	16.090	2.23%	0.48
-3	14.723	15.046	15.374	2.18%	0.48
-2	14.084	14.386	14.694	2.14%	0.47
-1	13.476	13.760	14.047	2.09%	0.46
0	12.898	13.163	13.432	2.05%	0.45
1	12.348	12.596	12.848	2.00%	0.45

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Temp. (°C)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(°C)
2	11.824	12.056	12.292	1.96%	0.44
3	11.325	11.542	11.763	1.91%	0.43
4	10.849	11.053	11.259	1.87%	0.43
5	10.397	10.587	10.780	1.82%	0.42
6	9.965	10.143	10.324	1.78%	0.41
7	9.554	9.721	9.889	1.74%	0.40
8	9.162	9.318	9.476	1.69%	0.40
9	8.788	8.934	9.081	1.65%	0.39
10	8.431	8.567	8.705	1.61%	0.38
11	8.091	8.218	8.347	1.57%	0.37
12	7.766	7.885	8.005	1.52%	0.37
13	7.456	7.567	7.679	1.48%	0.36
14	7.160	7.264	7.368	1.44%	0.35
15	6.877	6.974	7.072	1.40%	0.34
16	6.607	6.697	6.788	1.36%	0.33
17	6.349	6.433	6.518	1.32%	0.33
18	6.102	6.181	6.260	1.28%	0.32
19	5.867	5.940	6.013	1.24%	0.31
20	5.641	5.709	5.778	1.20%	0.30
21	5.426	5.489	5.553	1.16%	0.29
22	5.220	5.279	5.337	1.12%	0.29
23	5.022	5.077	5.132	1.08%	0.28
24	4.834	4.884	4.935	1.04%	0.27
25	4.653	4.700	4.747	1.00%	0.26
26	4.477	4.524	4.571	1.04%	0.27
27	4.308	4.355	4.402	1.08%	0.28
28	4.146	4.193	4.240	1.12%	0.30
29	3.992	4.038	4.085	1.15%	0.31
30	3.844	3.890	3.936	1.19%	0.32
31	3.702	3.748	3.794	1.23%	0.33
32	3.566	3.611	3.657	1.27%	0.34
33	3.436	3.481	3.526	1.30%	0.36
34	3.311	3.356	3.401	1.34%	0.37
35	3.191	3.236	3.280	1.38%	0.38
36	3.077	3.121	3.165	1.41%	0.39
37	2.967	3.010	3.054	1.45%	0.41
38	2.862	2.904	2.948	1.49%	0.42
39	2.760	2.803	2.845	1.52%	0.43
40	2.663	2.705	2.747	1.56%	0.44
41	2.570	2.612	2.653	1.60%	0.46
42	2.481	2.522	2.563	1.63%	0.47
43	2.395	2.435	2.476	1.67%	0.48
44	2.313	2.352	2.392	1.70%	0.50
45	2.233	2.273	2.312	1.74%	0.51
46	2.157	2.196	2.235	1.77%	0.52

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Temp. (°C)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(°C)
47	2.084	2.122	2.161	1.81%	0.54
48	2.014	2.051	2.089	1.84%	0.55
49	1.947	1.983	2.021	1.88%	0.56
50	1.882	1.918	1.955	1.91%	0.58
51	1.819	1.855	1.891	1.94%	0.59
52	1.759	1.794	1.830	1.98%	0.60
53	1.702	1.736	1.771	2.01%	0.62
54	1.646	1.680	1.714	2.04%	0.63
55	1.593	1.626	1.660	2.08%	0.65
56	1.541	1.574	1.607	2.11%	0.66
57	1.492	1.524	1.556	2.14%	0.67
58	1.444	1.476	1.508	2.18%	0.69
59	1.398	1.429	1.461	2.21%	0.70
60	1.354	1.384	1.415	2.24%	0.72
61	1.311	1.341	1.372	2.27%	0.73
62	1.270	1.300	1.330	2.31%	0.75
63	1.231	1.260	1.289	2.34%	0.76
64	1.192	1.221	1.250	2.37%	0.78
65	1.156	1.184	1.212	2.40%	0.79
66	1.120	1.148	1.176	2.43%	0.81
67	1.086	1.113	1.140	2.47%	0.82
68	1.053	1.079	1.106	2.50%	0.84
69	1.021	1.047	1.074	2.53%	0.85
70	0.991	1.016	1.042	2.56%	0.87
71	0.961	0.986	1.011	2.59%	0.88
72	0.932	0.957	0.982	2.62%	0.90
73	0.905	0.929	0.953	2.65%	0.91
74	0.878	0.902	0.926	2.68%	0.93
75	0.852	0.876	0.899	2.71%	0.94
76	0.828	0.850	0.874	2.74%	0.96
77	0.804	0.826	0.849	2.77%	0.97
78	0.780	0.802	0.825	2.80%	0.99
79	0.758	0.779	0.802	2.83%	1.00
80	0.736	0.757	0.779	2.86%	1.02
81	0.715	0.736	0.757	2.89%	1.04
82	0.695	0.715	0.736	2.92%	1.05
83	0.676	0.696	0.716	2.95%	1.07
84	0.657	0.676	0.696	2.98%	1.09
85	0.638	0.658	0.677	3.01%	1.10
86	0.621	0.640	0.659	3.03%	1.12
87	0.603	0.622	0.641	3.06%	1.13
88	0.587	0.605	0.624	3.09%	1.15
89	0.571	0.589	0.607	3.12%	1.17
90	0.555	0.573	0.591	3.15%	1.18
91	0.540	0.558	0.575	3.18%	1.20

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Temp. (°C)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(°C)
92	0.526	0.543	0.560	3.20%	1.22
93	0.512	0.528	0.545	3.23%	1.23
94	0.498	0.514	0.531	3.26%	1.25
95	0.485	0.501	0.517	3.29%	1.27
96	0.472	0.488	0.504	3.31%	1.29
97	0.460	0.475	0.491	3.34%	1.30
98	0.448	0.463	0.478	3.37%	1.32
99	0.436	0.451	0.466	3.40%	1.34
100	0.425	0.439	0.454	3.42%	1.36
101	0.414	0.428	0.443	3.45%	1.37
102	0.403	0.417	0.432	3.48%	1.39
103	0.393	0.407	0.421	3.50%	1.41
104	0.383	0.396	0.410	3.53%	1.43
105	0.373	0.386	0.400	3.56%	1.44
106	0.364	0.377	0.390	3.58%	1.46
107	0.355	0.368	0.381	3.61%	1.48
108	0.346	0.358	0.371	3.63%	1.50
109	0.337	0.350	0.362	3.66%	1.52
110	0.329	0.341	0.354	3.68%	1.53
111	0.321	0.333	0.345	3.71%	1.55
112	0.313	0.325	0.337	3.74%	1.57
113	0.305	0.317	0.329	3.76%	1.59
114	0.298	0.309	0.321	3.79%	1.61
115	0.291	0.302	0.313	3.81%	1.63
116	0.284	0.295	0.306	3.84%	1.65
117	0.277	0.288	0.299	3.86%	1.66
118	0.270	0.281	0.292	3.89%	1.68
119	0.264	0.274	0.285	3.91%	1.70
120	0.258	0.268	0.279	3.93%	1.72
121	0.252	0.262	0.272	3.96%	1.74
122	0.246	0.256	0.266	3.98%	1.76
123	0.240	0.250	0.260	4.01%	1.78
124	0.235	0.244	0.254	4.03%	1.80
125	0.229	0.239	0.248	4.06%	1.82