

Chip NTC Thermistor

Features

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Applications

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PART NUMBER

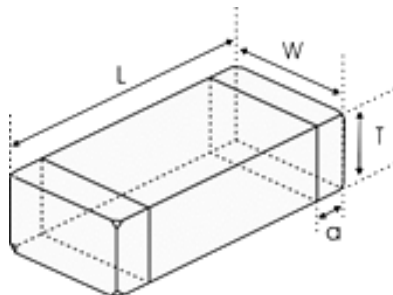
Example: RND 155QN0805X334F3950FB

RND 155QN0805	X	334	F	3950	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		222 = 2.2 kΩ 333 = 33 kΩ 334 = 330 kΩ	F = ± 1% G = ± 2% H = ± 3% J = ± 5 %	3600 = 3600 K 3950 = 3950 K 4050 = 4050 K 4500 = 4500 K	F = ± 1% H = ± 3%	A = 25 °C & 85 °C B = 25 °C & 50 °C

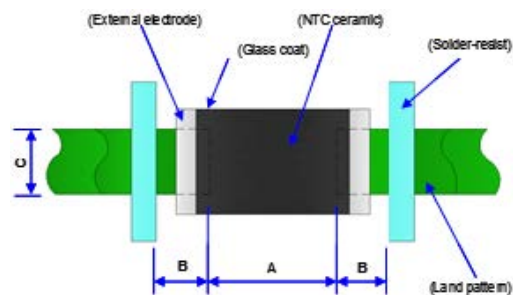
Electrical Characteristics

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 155QN0805X334F3950FB	330 kΩ ±1%	3950 K±1%	3987 K	0.07 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

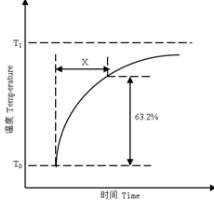
If any doubt on the results, measurements/tests should be made within the following limits

- 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

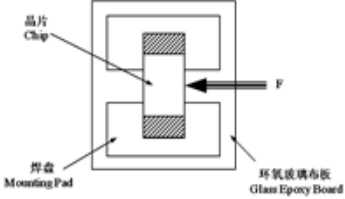
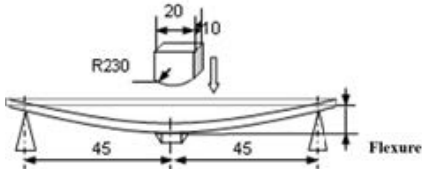
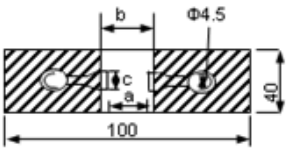
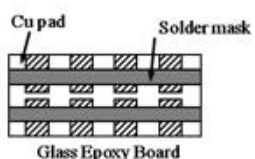
Electrical Test

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. $\Delta R_{25}/R_{25} \leq 5\%$</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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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: $\leq 75\% \text{RH}$
- Keep away from corrosive atmosphere and sunlight
- Period of Storage: 6 Months after delivery

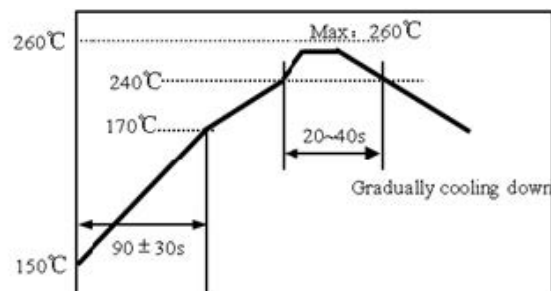
Notes & Warnings

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

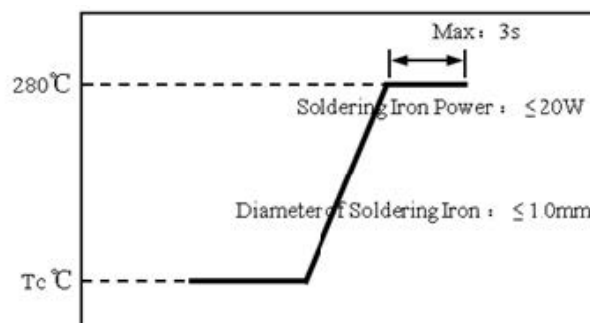
- 1~2°C/sec. Ramp
- Pre-heating: 150~170°C/90±30 sec.
- Time above 240°C: 20~40 sec.
- Peak temperature: 260°C Max./10 sec.
- Solder paste: Sn/3.0Ag/0.5Cu
- Max.2 times for re-flowing



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	10,887.606	11,394.069	11,922.899	4.64%	0.67
-39	10,185.472	10,652.099	11,138.989	4.57%	0.66
-38	9,533.422	9,963.516	10,411.972	4.50%	0.66
-37	8,927.555	9,324.129	9,737.346	4.43%	0.65
-36	8,364.300	8,730.105	9,110.997	4.36%	0.65
-35	7,840.386	8,177.933	8,529.159	4.29%	0.64
-34	7,352.806	7,664.390	7,988.377	4.23%	0.64
-33	6,898.813	7,186.530	7,485.498	4.16%	0.63
-32	6,475.874	6,741.642	7,017.616	4.09%	0.63
-31	6,081.669	6,327.245	6,582.078	4.03%	0.62
-30	5,714.064	5,941.053	6,176.441	3.96%	0.61
-29	5,371.095	5,580.969	5,798.464	3.90%	0.61
-28	5,050.957	5,245.065	5,446.088	3.83%	0.60
-27	4,751.986	4,931.564	5,117.416	3.77%	0.60
-26	4,472.652	4,638.834	4,810.710	3.71%	0.59
-25	4,211.541	4,365.369	4,524.363	3.64%	0.59
-24	3,966.828	4,109.232	4,256.322	3.58%	0.58
-23	3,737.922	3,869.784	4,005.897	3.52%	0.58
-22	3,523.703	3,645.834	3,771.821	3.46%	0.57
-21	3,323.139	3,436.284	3,552.926	3.39%	0.56
-20	3,135.275	3,240.119	3,348.133	3.33%	0.56
-19	2,959.229	3,056.402	3,156.449	3.27%	0.55
-18	2,794.186	2,884.266	2,976.952	3.21%	0.55
-17	2,639.392	2,722.914	2,808.798	3.15%	0.54
-16	2,494.148	2,571.603	2,651.198	3.10%	0.53
-15	2,357.807	2,429.648	2,503.427	3.04%	0.53
-14	2,229.770	2,296.415	2,364.814	2.98%	0.52
-13	2,109.482	2,171.315	2,234.736	2.92%	0.51
-12	1,996.429	2,053.805	2,112.618	2.86%	0.51
-11	1,890.131	1,943.378	1,997.924	2.81%	0.50
-10	1,790.146	1,839.566	1,890.160	2.75%	0.49
-9	1,696.060	1,741.932	1,788.866	2.69%	0.49
-8	1,607.493	1,650.075	1,693.616	2.64%	0.48
-7	1,524.087	1,563.618	1,604.014	2.58%	0.47
-6	1,445.512	1,482.213	1,519.693	2.53%	0.47
-5	1,371.462	1,405.536	1,440.312	2.47%	0.46
-4	1,301.553	1,333.185	1,365.449	2.42%	0.45
-3	1,235.631	1,264.997	1,294.930	2.37%	0.45
-2	1,173.445	1,200.707	1,228.478	2.31%	0.44
-1	1,114.762	1,140.069	1,165.834	2.26%	0.43
0	1,059.366	1,082.858	1,106.759	2.21%	0.43
1	1,007.110	1,028.918	1,051.092	2.16%	0.42

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2	957.738	977.979	998.548	2.10%	0.41
3	911.073	929.859	948.937	2.05%	0.40
4	866.952	884.385	902.078	2.00%	0.40
5	825.222	841.397	857.802	1.95%	0.39
6	785.670	800.672	815.878	1.90%	0.38
7	748.245	762.156	776.248	1.85%	0.37
8	712.824	725.721	738.777	1.80%	0.37
9	679.287	691.241	703.334	1.75%	0.36
10	647.524	658.601	669.799	1.70%	0.35
11	617.451	627.711	638.078	1.65%	0.34
12	588.947	598.448	608.041	1.60%	0.33
13	561.919	570.713	579.586	1.55%	0.33
14	536.285	544.421	552.624	1.51%	0.32
15	511.964	519.488	527.069	1.46%	0.31
16	488.874	495.827	502.828	1.41%	0.30
17	466.956	473.378	479.839	1.37%	0.29
18	446.143	452.070	458.030	1.32%	0.29
19	426.377	431.844	437.337	1.27%	0.28
20	407.597	412.635	417.694	1.23%	0.27
21	389.748	394.388	399.042	1.18%	0.26
22	372.781	377.049	381.327	1.13%	0.25
23	356.648	360.570	364.498	1.09%	0.24
24	341.301	344.901	348.504	1.04%	0.24
25	326.700	330.000	333.300	1.00%	0.23
26	312.528	315.824	319.122	1.04%	0.24
27	299.050	302.336	305.626	1.09%	0.25
28	286.225	289.496	292.774	1.13%	0.26
29	274.020	277.271	280.531	1.18%	0.27
30	262.401	265.628	268.867	1.22%	0.29
31	251.341	254.540	257.753	1.26%	0.30
32	240.808	243.977	247.162	1.31%	0.31
33	230.774	233.909	237.062	1.35%	0.32
34	221.211	224.310	227.429	1.39%	0.33
35	212.096	215.157	218.240	1.43%	0.35
36	203.406	206.427	209.472	1.47%	0.36
37	195.120	198.099	201.104	1.52%	0.37
38	187.214	190.151	193.114	1.56%	0.38
39	179.671	182.564	185.484	1.60%	0.40
40	172.472	175.320	178.197	1.64%	0.41
41	165.599	168.401	171.233	1.68%	0.42
42	159.037	161.793	164.580	1.72%	0.43
43	152.769	155.478	158.219	1.76%	0.45
44	146.780	149.442	152.137	1.80%	0.46
45	141.058	143.673	146.321	1.84%	0.47
46	135.595	138.162	140.764	1.88%	0.49
47	130.372	132.893	135.448	1.92%	0.50

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48	125.378	127.851	130.360	1.96%	0.51
49	120.601	123.027	125.489	2.00%	0.53
50	116.031	118.410	120.826	2.04%	0.54
51	111.658	113.991	116.361	2.08%	0.55
52	107.472	109.760	112.084	2.12%	0.57
53	103.465	105.707	107.986	2.16%	0.58
54	99.628	101.825	104.059	2.19%	0.59
55	95.952	98.105	100.295	2.23%	0.61
56	92.432	94.541	96.687	2.27%	0.62
57	89.059	91.124	93.227	2.31%	0.64
58	85.826	87.848	89.908	2.35%	0.65
59	82.727	84.707	86.725	2.38%	0.66
60	79.755	81.693	83.670	2.42%	0.68
61	76.910	78.807	80.743	2.46%	0.69
62	74.181	76.038	77.934	2.49%	0.71
63	71.564	73.382	75.238	2.53%	0.72
64	69.051	70.830	72.648	2.57%	0.74
65	66.639	68.381	70.160	2.60%	0.75
66	64.319	66.023	67.764	2.64%	0.76
67	62.092	63.759	65.464	2.67%	0.78
68	59.952	61.583	63.251	2.71%	0.79
69	57.896	59.492	61.125	2.75%	0.81
70	55.921	57.482	59.080	2.78%	0.82
71	54.033	55.560	57.124	2.82%	0.84
72	52.218	53.712	55.243	2.85%	0.85
73	50.473	51.935	53.433	2.88%	0.87
74	48.795	50.225	51.691	2.92%	0.88
75	47.182	48.581	50.015	2.95%	0.90
76	45.626	46.994	48.398	2.99%	0.92
77	44.127	45.465	46.839	3.02%	0.93
78	42.686	43.995	45.339	3.06%	0.95
79	41.299	42.579	43.894	3.09%	0.96
80	39.963	41.216	42.503	3.12%	0.98
81	38.683	39.908	41.167	3.16%	0.99
82	37.448	38.646	39.879	3.19%	1.01
83	36.259	37.431	38.637	3.22%	1.03
84	35.114	36.261	37.441	3.26%	1.04
85	34.010	35.132	36.287	3.29%	1.06
86	32.947	34.044	35.174	3.32%	1.07
87	31.922	32.996	34.102	3.35%	1.09
88	30.933	31.983	33.066	3.38%	1.11
89	29.980	31.008	32.068	3.42%	1.12
90	29.061	30.066	31.103	3.45%	1.14
91	28.175	29.159	30.173	3.48%	1.16
92	27.320	28.283	29.276	3.51%	1.17
93	26.495	27.437	28.409	3.54%	1.19

Chip NTC Thermistor



94	25.698	26.619	27.571	3.57%	1.21
95	24.930	25.832	26.763	3.61%	1.22
96	24.190	25.073	25.984	3.64%	1.24
97	23.477	24.341	25.233	3.67%	1.26
98	22.789	23.634	24.508	3.70%	1.27
99	22.123	22.950	23.806	3.73%	1.29
100	21.480	22.290	23.128	3.76%	1.31
101	20.860	21.653	22.473	3.79%	1.33
102	20.259	21.035	21.838	3.82%	1.34
103	19.680	20.439	21.226	3.85%	1.36
104	19.118	19.862	20.632	3.88%	1.38
105	18.577	19.305	20.059	3.91%	1.40
106	18.052	18.765	19.504	3.94%	1.41
107	17.545	18.243	18.967	3.97%	1.43
108	17.056	17.739	18.448	4.00%	1.45
109	16.581	17.250	17.944	4.03%	1.47
110	16.122	16.778	17.458	4.05%	1.49
111	15.677	16.319	16.985	4.08%	1.50
112	15.247	15.876	16.529	4.11%	1.52
113	14.831	15.447	16.087	4.14%	1.54
114	14.429	15.032	15.658	4.17%	1.56
115	14.039	14.630	15.243	4.20%	1.58
116	13.664	14.243	14.844	4.22%	1.60
117	13.299	13.866	14.456	4.25%	1.62
118	12.947	13.503	14.081	4.28%	1.63
119	12.606	13.151	13.717	4.31%	1.65
120	12.275	12.809	13.364	4.34%	1.67
121	11.954	12.477	13.021	4.36%	1.69
122	11.644	12.156	12.690	4.39%	1.71
123	11.342	11.844	12.367	4.42%	1.73
124	11.050	11.543	12.055	4.44%	1.75
125	10.767	11.250	11.753	4.47%	1.77