Chip NTC Thermistor

RND components

Features

- I λ∃K ΰŜăΰλy∃ LJ№ŜŎλăλ2y˜
- {ΰŜI·Řè 2LJŜ№I·ΰλy∃ ŦZ№ f2y∃ ΰλYŜ
- wŜŦf2ø ă2fŘŜ№λy∃ LJ2ăăλōfŜ
- {K2№ΰ №ŜăLJ2yãŜ ΰλYŜ

Applications

- ¢ŜYLJŜ№I·ΰdz№Ŝ YŜI·ădz№ŜYŜyΰ
- . I·ΰΰŜ№è ŎKI·№∃Ŝ№ă
- ¢ŜYLJŜ№I·ΰdz№Ŝ ăŜyãλy∃Σ LJ№2ΰŜŎΰλ2y˜ I·yŘ Ŏ2YLJŜyãI·ΰλ2y˜λy˜λyŘdzăΰ№λI·fΣ ΰŜfŜŎ2Y I·yŘ Ŏ2yãdzYŜ№ I·LJLJfλŎI·ΰλ2yã
- Ly№dzăK ŎdzNJ№Ŝyΰ fλY˜λΰλy∃Σ Ŝφ∃φ λy˜ăøλΰŎKπY˜2ŘŜ LJ2øŜ№ ădzLJLJfλŜăΣ ă2ŦΰπăΰI·№ΰ Y˜2ΰ2№ă

PART NUMBER

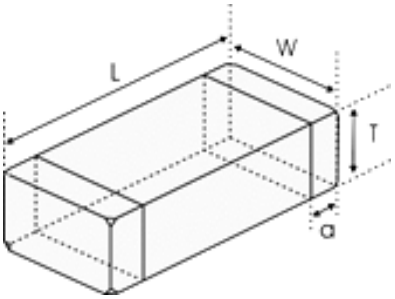
Example: RND 155QN0603X473F3950FB

RND 155QN0603	X	473	F	3950	F	B
Type	Delimeter	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 473 = 47 kΩ 104 = 100 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℃ & 85℃ B = 25℃ & 50℃

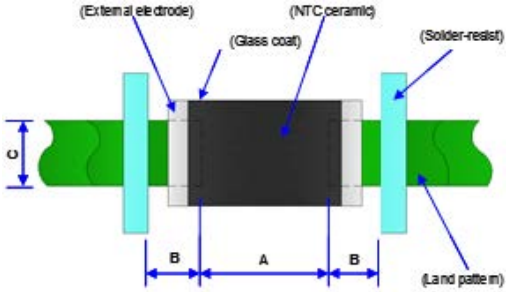
Electrical Characteristics

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 155QN0603X473F3950FB	47 kΩ ±1%	3950 K±1%	3987 K	0.14 mA	1 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	лφпр φφφ лφрр YY
0603	1.6 mm	0.8 mm	0.8 mm	0.3 mm	0.6 ... 0.8 mm	0.6 ... 0.7 mm	лφс φφφ лφу YY
0805	2 mm	1.25 mm	0.85 mm	0.5 mm	1 ... 1.1 mm	0.6 ... 0.7 mm	м ... мφн mm

RND is a trademark of Distrelec

Test and Measurement Procedures

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

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

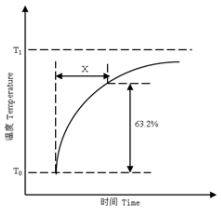
If any doubt on the results, measurements/tests should be made within the following limits

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

Inspection Equipment

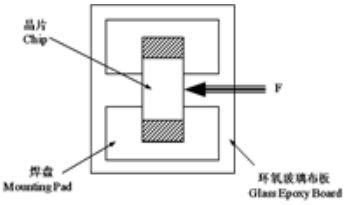
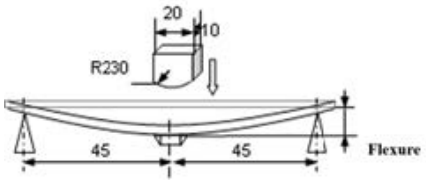
- Visual Examination: 20x magnifier
- Resistance value test: Thermistor resistance tester

Electrical Test

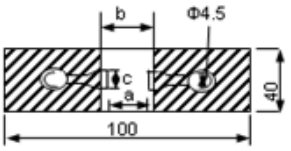
Item	Test Methods and Remarks
Nominal Zero-Power Resistance at 25 ℃(R25)	Ambient temperature: 25 ± 0.05℃ Measuring electric power: ≤0.1 mW
Nominal B Constant	25 ± 0.05℃, 50 ± 0.05℃, 85 ± 0.05℃ Measure the resistance at the ambient temperature of 25 ± 0.05℃, 50 ± 0.05℃ or 85 ± 0.05℃ B(25-50℃) = $\frac{\ln R_{25}-\ln R_{50}}{1/T_{25}-1/T_{50}}$ B(25-85℃) = $\frac{\ln R_{25}-\ln R_{85}}{1/T_{25}-1/T_{85}}$ 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 (℃) to T1 (℃) 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℃ through self-heated, normally expressed in milliwatts per degree Celsius (mW/℃). It can be calculated by the following formula $\delta = WT-T0$
Rated Power	The necessary electric power makes thermistor's temperature rise 100℃ by self-heating at ambient temperature 25℃
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

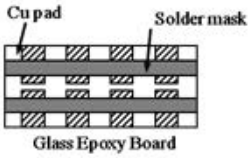
Reliability Test

<table>
<tr><th>Item</th><th>Standard</th><th>Test Methods and Remarks</th><th>Requirements</th></tr>
<tr><td>Terminal Strength</td><td>IEC 60068-2-21</td><td>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.
<table>
<tr><th>Size</th><th>F</th><th>Duration</th></tr>
<tr><td>0402, 0603</td><td>5N</td><td rowspan="2">10 ± 1 s</td></tr>
<tr><td>0805</td><td>10N</td></tr>
</table></td><td>No removal or split of the termination or other defects shall occur

</td></tr>
<tr><td>Resistance to Flexure</td><td>IEC 60068-2-21</td><td>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


<table>
<tr><th>Size</th><th>Flexure</th><th>Pressurizing Speed</th><th>Duration</th></tr>
<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>
</table></td><td>1. No visible damage

2. ΔR25/R25 ≤5%
<table>
<tr><th>Size</th><th>a</th><th>b</th><th>c</th></tr>
<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>
</table>

</td></tr>
<tr><td>Vibration</td><td>IEC 60068-2-80</td><td>1. Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder

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

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)</td><td>No visible damage

</td></tr>
<tr><td>Dropping</td><td>IEC 60068-2-32</td><td>Drop a chip 10 times on a concrete floor from a height of 1 meter</td><td>No visible damage</td></tr>
</table>

Item	Standard	Test Methods and Remarks	Requirements
Solderability	IEC 60068-2-58	• Solder temperature: 245 ± 5℃ • Duration: 10 ± 1s • 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	• Solder temperature: 245 ± 5℃ • Duration: 10±1s • 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. |ΔR25/R25| ≤5% 3. |ΔB/B| ≤2%
Temperature Cycling	IEC 60068-2-14	5 cycles of following sequence without loading Step / Temperature / Time 1 / -40 ± 5℃ / 30 ± 3min 2 / 25 ± 2 ℃ / 5 ± 3min 3 / 125 ± 2 ℃ / 30 ± 3min 4 / 25±2℃ / 5 ± 3min	1. No visible damage 2. |ΔR25/R25| ≤3% 3. |ΔB/B| ≤2%
Resistance to Dry Heat	IEC 60068-2-2	1. 125 ± 5℃ 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. |ΔR25/R25| ≤5% 3. |ΔB/B| ≤2%
Resistance to Cold	IEC 60068-2-1	1. -40 ± 3℃ 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. |ΔR25/R25| ≤5% 3. |ΔB/B| ≤2%
Resistance to Damp Heat	IEC 60068-2-78	1. 40 ± 2℃, 90~95%RH in air, for 1000 ±2 4 hours without loading 2. The chip shall be stabilized at normal condition for 1~2 hours before measuring	1. No visible damage 2. |ΔR25/R25| ≤3% 3. |ΔB/B| ≤2%
Resistance to high temperature load	IEC 60539-1 5.25.4	1. 85 ± 2℃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. |ΔR25/R25| ≤5% 3. |ΔB/B| ≤2%

Storage

Storage Conditions

- Storage Temperature: -10℃～40℃
- Relative Humidity: ≦ 75%RH
- Keep away from corrosive atmosphere and sunlight
- Period of Storage: 6 Months after delivery

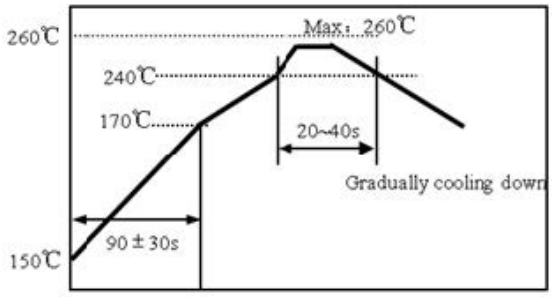
Notes & Warnings

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

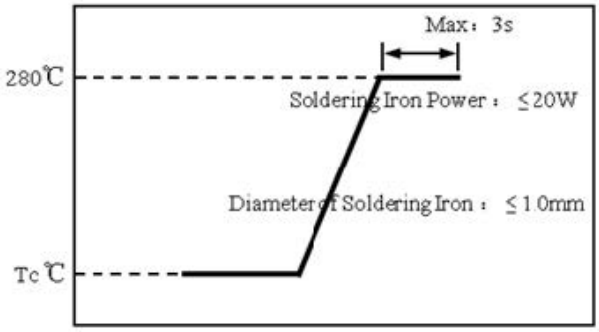
- 1~2℃/sec. Ramp
- Pre-heating: 150~170℃/90±30 sec.
- Time above 240℃: 20~40 sec.
- Peak temperature: 260℃Max./10 sec.
- Solder paste: Sn/3.0Ag/0.5Cu
- Max.2 times for re-flowing



Iron Soldering Profile

- Iron soldering power: Max.20W
- Pre-heating: 150℃/60sec.
- Soldering Tip temperature: 280℃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



Chip NTC Thermistor

RND components

R-T Table

Temp. (℃)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(℃)
-40	1,550.659	1,622.792	1,698.110	4.64%	0.67
-39	1,450.658	1,517.117	1,586.462	4.57%	0.66
-38	1,357.790	1,419.046	1,482.917	4.50%	0.66
-37	1,271.500	1,327.982	1,386.834	4.43%	0.65
-36	1,191.279	1,243.379	1,297.627	4.36%	0.65
-35	1,116.661	1,164.736	1,214.759	4.29%	0.64
-34	1,047.218	1,091.595	1,137.739	4.23%	0.64
-33	982.558	1,023.536	1,066.116	4.16%	0.63
-32	922.321	960.173	999.479	4.09%	0.63
-31	866.177	901.153	937.447	4.03%	0.62
-30	813.821	846.150	879.675	3.96%	0.61
-29	764.974	794.865	825.842	3.90%	0.61
-28	719.379	747.024	775.655	3.83%	0.60
-27	676.798	702.374	728.844	3.77%	0.60
-26	637.014	660.682	685.162	3.71%	0.59
-25	599.826	621.734	644.379	3.64%	0.59
-24	564.972	585.254	606.203	3.58%	0.58
-23	532.371	551.151	570.537	3.52%	0.58
-22	501.861	519.255	537.199	3.46%	0.57
-21	473.296	489.410	506.023	3.39%	0.56
-20	446.539	461.471	476.855	3.33%	0.56
-19	421.466	435.306	449.555	3.27%	0.55
-18	397.960	410.789	423.990	3.21%	0.55
-17	375.913	387.809	400.041	3.15%	0.54
-16	355.227	366.259	377.595	3.10%	0.53
-15	335.809	346.041	356.549	3.04%	0.53
-14	317.573	327.065	336.807	2.98%	0.52
-13	300.441	309.248	318.281	2.92%	0.51
-12	284.340	292.512	300.888	2.86%	0.51
-11	269.200	276.784	284.553	2.81%	0.50
-10	254.960	261.999	269.205	2.75%	0.49
-9	241.560	248.093	254.778	2.69%	0.49
-8	228.946	235.011	241.212	2.64%	0.48
-7	217.067	222.697	228.451	2.58%	0.47
-6	205.876	211.103	216.441	2.53%	0.47
-5	195.329	200.182	205.135	2.47%	0.46
-4	185.373	189.878	194.473	2.42%	0.45
-3	175.984	180.166	184.429	2.37%	0.45
-2	167.127	171.010	174.965	2.31%	0.44
-1	158.769	162.373	166.043	2.26%	0.43
0	150.879	154.225	157.629	2.21%	0.43
1	143.437	146.543	149.701	2.16%	0.42

Chip NTC Thermistor

RND components

2	136.405	139.288	142.217	2.10%	0.41
3	129.759	132.434	135.152	2.05%	0.40
4	123.475	125.958	128.478	2.00%	0.40
5	117.532	119.835	122.172	1.95%	0.39
6	111.898	114.035	116.201	1.90%	0.38
7	106.568	108.549	110.557	1.85%	0.37
8	101.523	103.360	105.220	1.80%	0.37
9	96.747	98.449	100.172	1.75%	0.36
10	92.223	93.801	95.396	1.70%	0.35
11	87.940	89.401	90.878	1.65%	0.34
12	83.880	85.233	86.600	1.60%	0.33
13	80.031	81.283	82.547	1.55%	0.33
14	76.380	77.539	78.707	1.51%	0.32
15	72.916	73.988	75.067	1.46%	0.31
16	69.627	70.618	71.615	1.41%	0.30
17	66.506	67.420	68.341	1.37%	0.29
18	63.542	64.386	65.235	1.32%	0.29
19	60.726	61.505	62.287	1.27%	0.28
20	58.052	58.769	59.490	1.23%	0.27
21	55.510	56.170	56.833	1.18%	0.26
22	53.093	53.701	54.310	1.13%	0.25
23	50.795	51.354	51.913	1.09%	0.24
24	48.610	49.122	49.635	1.04%	0.24
25	46.530	47.000	47.470	1.00%	0.23
26	44.512	44.981	45.451	1.04%	0.24
27	42.592	43.060	43.529	1.09%	0.25
28	40.765	41.231	41.698	1.13%	0.26
29	39.027	39.490	39.954	1.18%	0.27
30	37.372	37.832	38.293	1.22%	0.29
31	35.797	36.253	36.710	1.26%	0.30
32	34.297	34.748	35.202	1.31%	0.31
33	32.868	33.314	33.763	1.35%	0.32
34	31.506	31.947	32.391	1.39%	0.33
35	30.208	30.644	31.083	1.43%	0.35
36	28.970	29.400	29.834	1.47%	0.36
37	27.790	28.214	28.642	1.52%	0.37
38	26.664	27.082	27.504	1.56%	0.38
39	25.590	26.001	26.417	1.60%	0.40
40	24.564	24.970	25.380	1.64%	0.41
41	23.585	23.984	24.388	1.68%	0.42
42	22.651	23.043	23.440	1.72%	0.43
43	21.758	22.144	22.534	1.76%	0.45
44	20.905	21.284	21.668	1.80%	0.46
45	20.090	20.463	20.840	1.84%	0.47
46	19.312	19.678	20.048	1.88%	0.49
47	18.568	18.927	19.291	1.92%	0.50

48	17.857	18.209	18.566	1.96%	0.51
49	17.176	17.522	17.873	2.00%	0.53
50	16.526	16.864	17.209	2.04%	0.54
51	15.903	16.235	16.573	2.08%	0.55
52	15.307	15.632	15.964	2.12%	0.57
53	14.736	15.055	15.380	2.16%	0.58
54	14.189	14.502	14.821	2.19%	0.59
55	13.666	13.972	14.284	2.23%	0.61
56	13.165	13.465	13.771	2.27%	0.62
57	12.684	12.978	13.278	2.31%	0.64
58	12.224	12.512	12.805	2.35%	0.65
59	11.782	12.064	12.352	2.38%	0.66
60	11.359	11.635	11.917	2.42%	0.68
61	10.954	11.224	11.500	2.46%	0.69
62	10.565	10.830	11.100	2.49%	0.71
63	10.192	10.451	10.716	2.53%	0.72
64	9.835	10.088	10.347	2.57%	0.74
65	9.491	9.739	9.992	2.60%	0.75
66	9.161	9.403	9.651	2.64%	0.76
67	8.843	9.081	9.324	2.67%	0.78
68	8.539	8.771	9.009	2.71%	0.79
69	8.246	8.473	8.706	2.75%	0.81
70	7.964	8.187	8.414	2.78%	0.82
71	7.696	7.913	8.136	2.82%	0.84
72	7.437	7.650	7.868	2.85%	0.85
73	7.189	7.397	7.610	2.88%	0.87
74	6.950	7.153	7.362	2.92%	0.88
75	6.720	6.919	7.123	2.95%	0.90
76	6.498	6.693	6.893	2.99%	0.92
77	6.285	6.475	6.671	3.02%	0.93
78	6.080	6.266	6.457	3.06%	0.95
79	5.882	6.064	6.252	3.09%	0.96
80	5.692	5.870	6.053	3.12%	0.98
81	5.509	5.684	5.863	3.16%	0.99
82	5.333	5.504	5.680	3.19%	1.01
83	5.164	5.331	5.503	3.22%	1.03
84	5.001	5.164	5.333	3.26%	1.04
85	4.844	5.004	5.168	3.29%	1.06
86	4.692	4.849	5.010	3.32%	1.07
87	4.546	4.699	4.857	3.35%	1.09
88	4.406	4.555	4.709	3.38%	1.11
89	4.270	4.416	4.567	3.42%	1.12
90	4.139	4.282	4.430	3.45%	1.14
91	4.013	4.153	4.297	3.48%	1.16
92	3.891	4.028	4.170	3.51%	1.17
93	3.774	3.908	4.046	3.54%	1.19

94	3.660	3.791	3.927	3.57%	1.21
95	3.551	3.679	3.812	3.61%	1.22
96	3.445	3.571	3.701	3.64%	1.24
97	3.344	3.467	3.594	3.67%	1.26
98	3.246	3.366	3.491	3.70%	1.27
99	3.151	3.269	3.391	3.73%	1.29
100	3.059	3.175	3.294	3.76%	1.31
101	2.971	3.084	3.201	3.79%	1.33
102	2.885	2.996	3.110	3.82%	1.34
103	2.803	2.911	3.023	3.85%	1.36
104	2.723	2.829	2.938	3.88%	1.38
105	2.646	2.750	2.857	3.91%	1.40
106	2.571	2.673	2.778	3.94%	1.41
107	2.499	2.598	2.701	3.97%	1.43
108	2.429	2.526	2.627	4.00%	1.45
109	2.362	2.457	2.556	4.03%	1.47
110	2.296	2.390	2.486	4.05%	1.49
111	2.233	2.324	2.419	4.08%	1.50
112	2.172	2.261	2.354	4.11%	1.52
113	2.112	2.200	2.291	4.14%	1.54
114	2.055	2.141	2.230	4.17%	1.56
115	1.999	2.084	2.171	4.20%	1.58
116	1.946	2.028	2.114	4.22%	1.60
117	1.894	1.975	2.059	4.25%	1.62
118	1.844	1.923	2.005	4.28%	1.63
119	1.795	1.873	1.954	4.31%	1.65
120	1.748	1.824	1.903	4.34%	1.67
121	1.703	1.777	1.855	4.36%	1.69
122	1.658	1.731	1.807	4.39%	1.71
123	1.615	1.687	1.761	4.42%	1.73
124	1.574	1.644	1.717	4.44%	1.75
125	1.534	1.602	1.674	4.47%	1.77

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