Chip NTC Thermistor

RND components

Features

- High testing precision
- Steady operating for long time
- Reflow soldering possible
- Short response time

Applications

- Temperature measurement
- Battery chargers
- Temperature sensing, protection and compensation in industrial, telecom and consumer applications
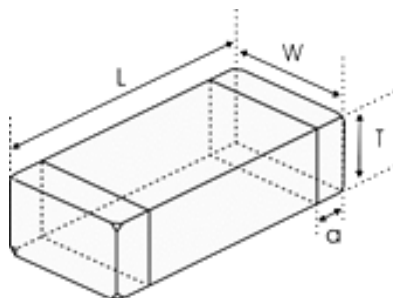- Inrush current limiting, e.g. in switch-mode power supplies, soft-start motors

PART NUMBER

Example: RND 155QN0603X272F3600FB

RND 155QN0603	X	272	F	3600	F	B

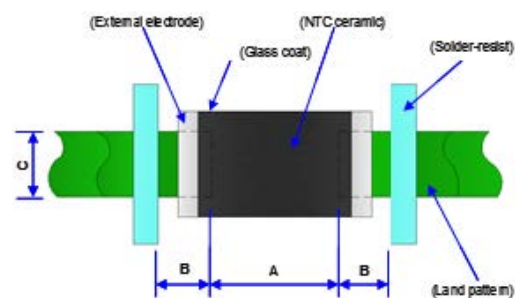| Type	Delimeter	Nominal Resistance	Tolerance	B Constant	Tolerance of B Constant	B Constant Calculation Method
RND 155QN0402: 0402 RND 155QN0603: 0603 RND 155QN0805: 0805		272 = 2.7 kΩ 223 = 22 kΩ 104 = 100 kΩ	F = ± 1% G = ± 2% H = ± 3% J = ±5 %	3600 = 3600 K 3950 = 3950 K 4050 = 4050 K 4500 = 4500 K	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 155QN0603X272F3600FB	2.7 kΩ ±1%	3600 K±1%	3650 K	0.61 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	
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

Chip NTC Thermistor

Test and Measurement Procedures

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

• Ambient Temperature: 20±15℃

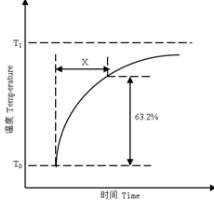• Relative Humidity: 65±20%

• 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

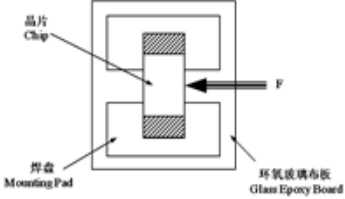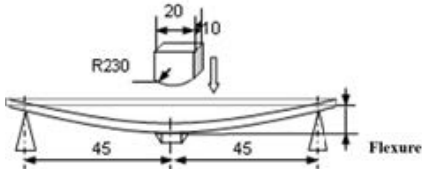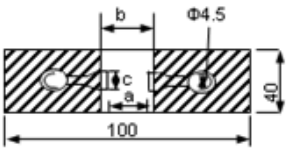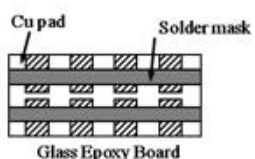• Resistance value test: Thermistor resistance tester

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℃ $B(25\text{-}50℃) = \dfrac{\ln R_{25} - \ln R_{50}}{1/T_{25} - 1/T_{50}}$ $\qquad B(25\text{-}85℃) = \dfrac{\ln R_{25} - \ln R_{85}}{1/T_{25} - 1/T_{85}}$ 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

Chip NTC Thermistor

RND components

Reliability Test

Item	Standard	Test Methods and Remarks	Requirements
Terminal Strength	IEC 60068-2-21	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. **Size / F / Duration** 0402, 0603 — 5N — 10 ± 1 s 0805 — 10N — 10 ± 1 s	No removal or split of the termination or other defects shall occur
Resistance to Flexure	IEC 60068-2-21	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 **Size / Flexure / Pressurizing Speed / Duration** 0402, 0603 — 1 mm — <0.5 mm/s — 10 ± 1 s 0805 — 2 mm — <0.5 mm/s — 10 ± 1 s	1. No visible damage 2. ∣ΔR25/R25∣ ≤5% **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
Vibration	IEC 60068-2-80	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)	No visible damage
Dropping	IEC 60068-2-32	Drop a chip 10 times on a concrete floor from a height of 1 meter	No visible damage

Chip NTC Thermistor

RND components

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

Chip NTC Thermistor

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	60.514	63.082	65.752	4.23%	0.68
-39	57.030	59.414	61.892	4.17%	0.68
-38	53.770	55.985	58.286	4.11%	0.67
-37	50.764	52.824	54.963	4.05%	0.67
-36	47.904	49.819	51.806	3.99%	0.66
-35	45.224	47.005	48.851	3.93%	0.66
-34	42.748	44.406	46.124	3.87%	0.65
-33	40.391	41.933	43.530	3.81%	0.65
-32	38.209	39.646	41.133	3.75%	0.64
-31	36.131	37.468	38.852	3.69%	0.64
-30	34.205	35.452	36.741	3.63%	0.63
-29	32.371	33.532	34.731	3.58%	0.63
-28	30.668	31.751	32.869	3.52%	0.62
-27	29.046	30.055	31.096	3.46%	0.62
-26	27.538	28.480	29.450	3.41%	0.61
-25	26.101	26.979	27.883	3.35%	0.61
-24	24.764	25.583	26.427	3.30%	0.60
-23	23.489	24.253	25.039	3.24%	0.59
-22	22.301	23.014	23.748	3.19%	0.59
-21	21.180	21.846	22.531	3.13%	0.58
-20	20.111	20.732	21.371	3.08%	0.58
-19	19.113	19.694	20.290	3.03%	0.57
-18	18.161	18.702	19.259	2.97%	0.57
-17	17.271	17.777	18.297	2.92%	0.56
-16	16.430	16.903	17.388	2.87%	0.55
-15	15.627	16.069	16.521	2.82%	0.55
-14	14.875	15.288	15.711	2.77%	0.54
-13	14.157	14.543	14.938	2.72%	0.53
-12	13.485	13.845	14.214	2.66%	0.53
-11	12.848	13.185	13.530	2.61%	0.52
-10	12.239	12.554	12.876	2.56%	0.52
-9	11.668	11.963	12.264	2.51%	0.51
-8	11.127	11.402	11.683	2.47%	0.50
-7	10.609	10.867	11.129	2.42%	0.50
-6	10.123	10.364	10.609	2.37%	0.49
-5	9.658	9.883	10.112	2.32%	0.48
-4	9.221	9.431	9.645	2.27%	0.48
-3	8.805	9.002	9.202	2.22%	0.47
-2	8.408	8.592	8.779	2.18%	0.46
-1	8.034	8.206	8.380	2.13%	0.45
0	7.678	7.839	8.002	2.08%	0.45
1	7.338	7.488	7.640	2.04%	0.44

Chip NTC Thermistor

Temp. (℃)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(℃)
2	7.017	7.157	7.299	1.99%	0.43
3	6.709	6.840	6.973	1.94%	0.43
4	6.419	6.541	6.666	1.90%	0.42
5	6.143	6.257	6.373	1.85%	0.41
6	5.878	5.985	6.093	1.81%	0.40
7	5.628	5.728	5.829	1.76%	0.40
8	5.389	5.482	5.576	1.72%	0.39
9	5.162	5.249	5.337	1.67%	0.38
10	4.945	5.026	5.108	1.63%	0.37
11	4.739	4.815	4.891	1.59%	0.37
12	4.542	4.612	4.684	1.54%	0.36
13	4.355	4.420	4.487	1.50%	0.35
14	4.176	4.237	4.299	1.46%	0.34
15	4.006	4.063	4.120	1.41%	0.33
16	3.843	3.896	3.949	1.37%	0.33
17	3.688	3.737	3.787	1.33%	0.32
18	3.539	3.585	3.632	1.29%	0.31
19	3.398	3.441	3.484	1.25%	0.30
20	3.263	3.303	3.342	1.20%	0.29
21	3.134	3.171	3.208	1.16%	0.29
22	3.011	3.045	3.079	1.12%	0.28
23	2.893	2.925	2.956	1.08%	0.27
24	2.781	2.810	2.839	1.04%	0.26
25	2.673	2.700	2.727	1.00%	0.25
26	2.568	2.595	2.622	1.04%	0.26
27	2.468	2.495	2.522	1.08%	0.27
28	2.372	2.399	2.426	1.12%	0.29
29	2.280	2.307	2.334	1.16%	0.30
30	2.193	2.219	2.246	1.20%	0.31
31	2.109	2.135	2.161	1.24%	0.32
32	2.028	2.055	2.081	1.28%	0.33
33	1.952	1.978	2.004	1.32%	0.35
34	1.878	1.904	1.930	1.35%	0.36
35	1.808	1.833	1.859	1.39%	0.37
36	1.740	1.765	1.791	1.43%	0.38
37	1.676	1.701	1.726	1.47%	0.40
38	1.614	1.639	1.663	1.51%	0.41
39	1.555	1.579	1.603	1.54%	0.42
40	1.498	1.522	1.546	1.58%	0.43
41	1.444	1.467	1.491	1.62%	0.45
42	1.391	1.415	1.438	1.66%	0.46
43	1.341	1.364	1.387	1.69%	0.47
44	1.293	1.316	1.339	1.73%	0.49
45	1.247	1.270	1.292	1.77%	0.50

Chip NTC Thermistor

Temp. (℃)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(℃)
46	1.203	1.225	1.247	1.80%	0.51
47	1.161	1.182	1.204	1.84%	0.53
48	1.120	1.141	1.163	1.87%	0.54
49	1.081	1.102	1.123	1.91%	0.55
50	1.044	1.064	1.085	1.94%	0.57
51	1.008	1.028	1.048	1.98%	0.58
52	0.973	0.993	1.013	2.02%	0.59
53	0.940	0.959	0.979	2.05%	0.61
54	0.908	0.927	0.946	2.09%	0.62
55	0.877	0.896	0.915	2.12%	0.63
56	0.847	0.866	0.884	2.16%	0.65
57	0.819	0.837	0.855	2.19%	0.66
58	0.792	0.809	0.827	2.22%	0.68
59	0.765	0.783	0.800	2.26%	0.69
60	0.740	0.757	0.774	2.29%	0.71
61	0.716	0.732	0.749	2.33%	0.72
62	0.692	0.709	0.726	2.36%	0.73
63	0.670	0.686	0.702	2.39%	0.75
64	0.648	0.664	0.680	2.43%	0.76
65	0.627	0.643	0.658	2.46%	0.78
66	0.607	0.622	0.638	2.49%	0.79
67	0.588	0.603	0.618	2.53%	0.81
68	0.569	0.584	0.599	2.56%	0.82
69	0.551	0.565	0.580	2.59%	0.84
70	0.534	0.548	0.562	2.62%	0.85
71	0.517	0.531	0.545	2.66%	0.87
72	0.501	0.514	0.528	2.69%	0.88
73	0.486	0.499	0.512	2.72%	0.90
74	0.471	0.484	0.497	2.75%	0.91
75	0.456	0.469	0.482	2.78%	0.93
76	0.442	0.455	0.468	2.82%	0.94
77	0.429	0.441	0.454	2.85%	0.96
78	0.416	0.428	0.440	2.88%	0.98
79	0.403	0.415	0.427	2.91%	0.99
80	0.391	0.403	0.414	2.94%	1.01
81	0.380	0.391	0.402	2.97%	1.02
82	0.368	0.379	0.391	3.00%	1.04
83	0.357	0.368	0.379	3.03%	1.05
84	0.347	0.358	0.368	3.06%	1.07
85	0.337	0.347	0.358	3.09%	1.09
86	0.327	0.337	0.348	3.12%	1.10
87	0.318	0.328	0.338	3.15%	1.12
88	0.308	0.318	0.328	3.18%	1.14
89	0.300	0.309	0.319	3.21%	1.15

Chip NTC Thermistor

Temp. (℃)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(℃)
90	0.291	0.301	0.310	3.24%	1.17
91	0.283	0.292	0.302	3.27%	1.19
92	0.275	0.284	0.293	3.30%	1.20
93	0.267	0.276	0.285	3.33%	1.22
94	0.260	0.268	0.277	3.36%	1.24
95	0.252	0.261	0.270	3.39%	1.25
96	0.245	0.254	0.263	3.42%	1.27
97	0.239	0.247	0.255	3.44%	1.29
98	0.232	0.240	0.248	3.47%	1.30
99	0.226	0.234	0.242	3.50%	1.32
100	0.220	0.227	0.235	3.53%	1.34
101	0.214	0.221	0.229	3.56%	1.36
102	0.208	0.216	0.223	3.59%	1.37
103	0.202	0.210	0.217	3.61%	1.39
104	0.197	0.204	0.212	3.64%	1.41
105	0.192	0.199	0.206	3.67%	1.43
106	0.187	0.194	0.201	3.70%	1.45
107	0.182	0.189	0.196	3.72%	1.46
108	0.177	0.184	0.191	3.75%	1.48
109	0.173	0.179	0.186	3.78%	1.50
110	0.168	0.175	0.181	3.80%	1.52
111	0.164	0.170	0.177	3.83%	1.54
112	0.159	0.166	0.172	3.86%	1.55
113	0.155	0.161	0.168	3.89%	1.57
114	0.151	0.157	0.164	3.91%	1.59
115	0.148	0.153	0.160	3.94%	1.61
116	0.144	0.150	0.156	3.96%	1.63
117	0.140	0.146	0.152	3.99%	1.65
118	0.137	0.142	0.148	4.02%	1.67
119	0.134	0.139	0.145	4.04%	1.68
120	0.130	0.136	0.141	4.07%	1.70
121	0.127	0.132	0.138	4.09%	1.72
122	0.124	0.129	0.134	4.12%	1.74
123	0.121	0.126	0.131	4.14%	1.76
124	0.118	0.123	0.128	4.17%	1.78
125	0.115	0.120	0.125	4.19%	1.80