

Chip NTC Thermistor

Features

- = 5000 VDC
- O = 1000 VDC
- k = 500 VDC
- o = 100 VDC

Applications

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

PART NUMBER

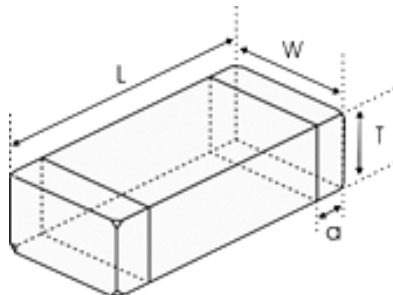
Example: RND 155QN0805X104F4050FB

RND 155QN0805	X	104	F	4050	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 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

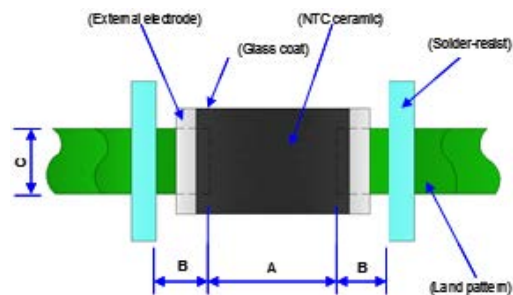
Electrical Characteristics

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 155QN0805X104F4050FB	100 kΩ ±1%	4050 K±1%	4100 K	0.14 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

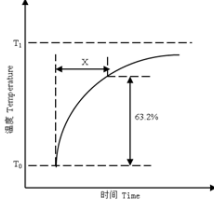
If any doubt on the results, measurements/tests should be made within the following limits

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

Inspection Equipment

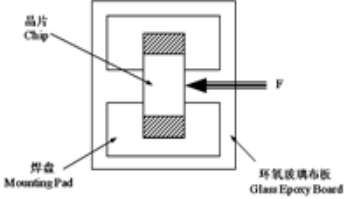
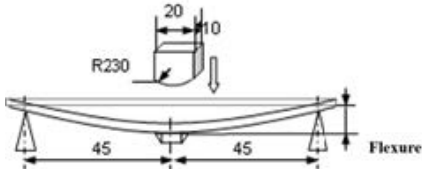
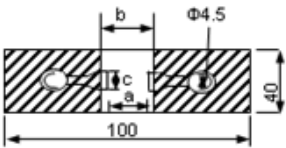
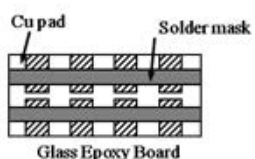
- Visual Examination: 20x magnifier
- Resistance value test: Thermistor resistance tester

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

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. <table border="1" data-bbox="619 497 954 609"> <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	No removal or split of the termination or other defects shall occur 																		
Size	F	Duration																											
0402, 0603	5N	10 ± 1 s																											
0805	10N																												
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  <table border="1" data-bbox="545 1025 1040 1160"> <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	1. No visible damage 2. $ \Delta R_{25}/R_{25} \leq 5\%$ <table border="1" data-bbox="1104 846 1449 981"> <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	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

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

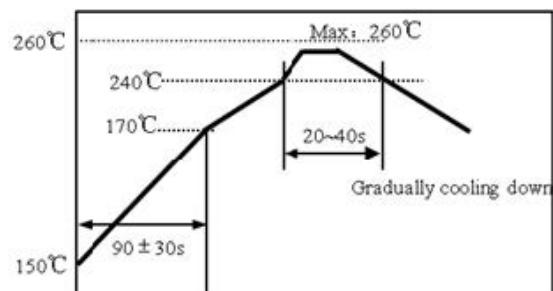
Notes & Warnings

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

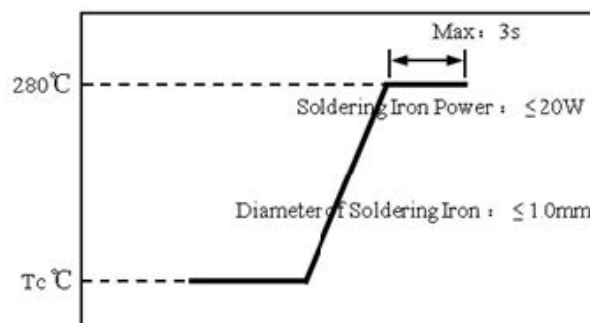
- 1~2°C/sec. Ramp
- Pre-heating: 150~170°C/90±30 sec.
- Time above 240°C: 20~40 sec.
- Peak temperature: 260°C Max./10 sec.
- Solder paste: Sn/3.0Ag/0.5Cu
- Max.2 times for re-flowing



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	3,551.032	3,718.978	3,894.478	4.72%	0.66
-39	3,317.146	3,471.641	3,632.967	4.65%	0.66
-38	3,100.269	3,242.447	3,390.807	4.58%	0.65
-37	2,899.052	3,029.948	3,166.437	4.50%	0.65
-36	2,712.262	2,832.818	2,958.436	4.43%	0.64
-35	2,538.771	2,649.846	2,765.503	4.36%	0.64
-34	2,377.547	2,479.924	2,586.450	4.30%	0.63
-33	2,227.643	2,322.036	2,420.188	4.23%	0.63
-32	2,088.191	2,175.255	2,265.722	4.16%	0.62
-31	1,958.397	2,038.727	2,122.140	4.09%	0.62
-30	1,837.529	1,911.671	1,988.605	4.02%	0.61
-29	1,724.918	1,793.370	1,864.352	3.96%	0.61
-28	1,619.947	1,683.166	1,748.677	3.89%	0.60
-27	1,522.051	1,580.453	1,640.933	3.83%	0.60
-26	1,430.707	1,484.677	1,540.528	3.76%	0.59
-25	1,345.437	1,395.324	1,446.915	3.70%	0.58
-24	1,265.800	1,311.924	1,359.594	3.63%	0.58
-23	1,191.387	1,234.045	1,278.103	3.57%	0.57
-22	1,121.825	1,161.287	1,202.016	3.51%	0.57
-21	1,056.768	1,093.281	1,130.942	3.44%	0.56
-20	995.896	1,029.689	1,064.521	3.38%	0.55
-19	938.915	970.196	1,002.420	3.32%	0.55
-18	885.552	914.515	944.330	3.26%	0.54
-17	835.556	862.377	889.971	3.20%	0.54
-16	788.694	813.537	839.078	3.14%	0.53
-15	744.752	767.766	791.411	3.08%	0.52
-14	703.529	724.852	746.746	3.02%	0.52
-13	664.842	684.601	704.877	2.96%	0.51
-12	628.519	646.831	665.611	2.90%	0.50
-11	594.402	611.376	628.771	2.85%	0.50
-10	562.345	578.079	594.194	2.79%	0.49
-9	532.210	546.797	561.727	2.73%	0.48
-8	503.872	517.396	531.230	2.67%	0.48
-7	477.212	489.752	502.571	2.62%	0.47
-6	452.123	463.750	475.629	2.56%	0.46
-5	428.501	439.283	450.291	2.51%	0.46
-4	406.225	416.222	426.422	2.45%	0.45
-3	385.240	394.509	403.961	2.40%	0.44
-2	365.465	374.059	382.816	2.34%	0.44
-1	346.822	354.789	362.904	2.29%	0.43
0	329.239	336.626	344.145	2.23%	0.42
1	312.652	319.500	326.465	2.18%	0.41

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2	296.998	303.346	309.798	2.13%	0.41
3	282.219	288.102	294.079	2.07%	0.40
4	268.261	273.713	279.248	2.02%	0.39
5	255.075	260.126	265.251	1.97%	0.38
6	242.613	247.292	252.037	1.92%	0.38
7	230.831	235.165	239.556	1.87%	0.37
8	219.689	223.702	227.765	1.82%	0.36
9	209.148	212.863	216.622	1.77%	0.35
10	199.173	202.610	206.086	1.72%	0.35
11	189.729	192.909	196.123	1.67%	0.34
12	180.787	183.727	186.697	1.62%	0.33
13	172.317	175.034	177.777	1.57%	0.32
14	164.290	166.801	169.333	1.52%	0.31
15	156.682	159.000	161.337	1.47%	0.31
16	149.469	151.608	153.763	1.42%	0.30
17	142.627	144.600	146.586	1.37%	0.29
18	136.136	137.954	139.783	1.33%	0.28
19	129.976	131.651	133.334	1.28%	0.27
20	124.129	125.670	127.217	1.23%	0.26
21	118.575	119.992	121.413	1.18%	0.26
22	113.301	114.602	115.906	1.14%	0.25
23	108.290	109.483	110.678	1.09%	0.24
24	103.527	104.620	105.714	1.05%	0.23
25	99.000	100.000	101.000	1.00%	0.22
26	94.610	95.609	96.608	1.05%	0.23
27	90.438	91.433	92.430	1.09%	0.25
28	86.472	87.463	88.456	1.14%	0.26
29	82.701	83.686	84.673	1.18%	0.27
30	79.115	80.092	81.072	1.22%	0.28
31	75.702	76.670	77.643	1.27%	0.29
32	72.455	73.413	74.377	1.31%	0.30
33	69.363	70.311	71.265	1.36%	0.32
34	66.419	67.356	68.299	1.40%	0.33
35	63.616	64.540	65.472	1.44%	0.34
36	60.946	61.858	62.778	1.49%	0.35
37	58.403	59.301	60.208	1.53%	0.37
38	55.978	56.864	57.758	1.57%	0.38
39	53.667	54.539	55.419	1.61%	0.39
40	51.463	52.321	53.187	1.66%	0.40
41	49.361	50.204	51.057	1.70%	0.42
42	47.355	48.184	49.023	1.74%	0.43
43	45.441	46.256	47.080	1.78%	0.44
44	43.614	44.414	45.224	1.82%	0.45
45	41.870	42.655	43.450	1.86%	0.47
46	40.204	40.974	41.755	1.91%	0.48
47	38.613	39.369	40.135	1.95%	0.49

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48	37.093	37.834	38.585	1.99%	0.51
49	35.640	36.366	37.103	2.03%	0.52
50	34.251	34.963	35.685	2.07%	0.53
51	32.923	33.620	34.329	2.11%	0.55
52	31.654	32.336	33.031	2.15%	0.56
53	30.439	31.107	31.788	2.19%	0.57
54	29.277	29.931	30.597	2.23%	0.59
55	28.165	28.805	29.458	2.26%	0.60
56	27.100	27.727	28.366	2.30%	0.61
57	26.081	26.695	27.320	2.34%	0.63
58	25.105	25.705	26.317	2.38%	0.64
59	24.170	24.758	25.357	2.42%	0.66
60	23.275	23.849	24.435	2.46%	0.67
61	22.418	22.980	23.554	2.50%	0.68
62	21.598	22.147	22.708	2.53%	0.70
63	20.811	21.348	21.897	2.57%	0.71
64	20.056	20.582	21.119	2.61%	0.73
65	19.333	19.847	20.372	2.65%	0.74
66	18.639	19.141	19.655	2.68%	0.76
67	17.973	18.464	18.967	2.72%	0.77
68	17.334	17.814	18.305	2.76%	0.79
69	16.721	17.190	17.671	2.79%	0.80
70	16.133	16.591	17.061	2.83%	0.82
71	15.567	16.014	16.474	2.87%	0.83
72	15.023	15.460	15.909	2.90%	0.85
73	14.500	14.928	15.366	2.94%	0.86
74	13.998	14.416	14.845	2.98%	0.88
75	13.516	13.924	14.343	3.01%	0.89
76	13.054	13.453	13.862	3.05%	0.91
77	12.609	12.999	13.400	3.08%	0.92
78	12.182	12.563	12.955	3.12%	0.94
79	11.771	12.144	12.526	3.15%	0.95
80	11.376	11.740	12.114	3.19%	0.97
81	10.997	11.353	11.719	3.22%	0.98
82	10.633	10.980	11.338	3.26%	1.00
83	10.282	10.621	10.971	3.29%	1.02
84	9.945	10.276	10.618	3.32%	1.03
85	9.620	9.944	10.278	3.36%	1.05
86	9.306	9.623	9.949	3.39%	1.06
87	9.004	9.313	9.632	3.43%	1.08
88	8.712	9.015	9.327	3.46%	1.10
89	8.432	8.727	9.032	3.49%	1.11
90	8.162	8.450	8.748	3.53%	1.13
91	7.902	8.184	8.475	3.56%	1.15
92	7.650	7.926	8.211	3.59%	1.16
93	7.409	7.678	7.956	3.63%	1.18

Chip NTC Thermistor



94	7.176	7.439	7.711	3.66%	1.20
95	6.951	7.208	7.474	3.69%	1.21
96	6.735	6.986	7.247	3.72%	1.23
97	6.527	6.772	7.027	3.76%	1.25
98	6.326	6.566	6.815	3.79%	1.26
99	6.132	6.367	6.610	3.82%	1.28
100	5.945	6.174	6.412	3.85%	1.30
101	5.764	5.989	6.221	3.88%	1.32
102	5.590	5.809	6.037	3.92%	1.33
103	5.421	5.636	5.858	3.95%	1.35
104	5.259	5.469	5.686	3.98%	1.37
105	5.102	5.307	5.520	4.01%	1.39
106	4.950	5.150	5.358	4.04%	1.40
107	4.802	4.999	5.202	4.07%	1.42
108	4.660	4.852	5.051	4.10%	1.44
109	4.523	4.710	4.905	4.13%	1.46
110	4.390	4.574	4.764	4.16%	1.47
111	4.263	4.442	4.628	4.19%	1.49
112	4.139	4.314	4.497	4.23%	1.51
113	4.020	4.191	4.370	4.26%	1.53
114	3.904	4.072	4.247	4.29%	1.55
115	3.793	3.957	4.128	4.32%	1.57
116	3.685	3.846	4.013	4.34%	1.58
117	3.582	3.739	3.902	4.37%	1.60
118	3.481	3.635	3.795	4.40%	1.62
119	3.384	3.534	3.691	4.43%	1.64
120	3.290	3.437	3.590	4.46%	1.66
121	3.198	3.342	3.492	4.49%	1.68
122	3.109	3.250	3.397	4.52%	1.70
123	3.023	3.161	3.305	4.55%	1.72
124	2.940	3.075	3.216	4.58%	1.73
125	2.859	2.991	3.129	4.61%	1.75