

Chip NTC Thermistor

Features

- = 0.1% tolerance
- 0 = 0.5% tolerance
- k = 1% tolerance
- O = 3% tolerance

Applications

- U = Automotive
- " = Industrial
- U = Consumer
- @ = Medical

PART NUMBER

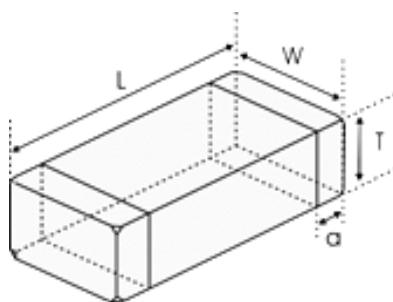
Example: RND 155QN0402X103F3450FB

RND 155QN0402	X	103	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 103 = 10 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

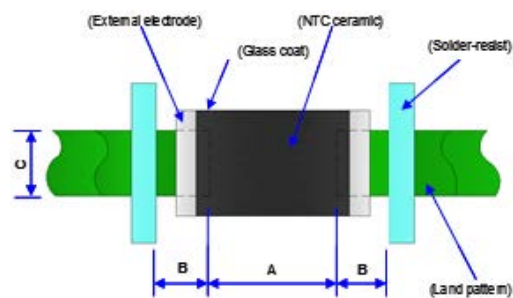
Electrical Characteristics

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 155QN0402X103F3450FB	10 kΩ ±1%	3450 K ±1%	3500 K	0.31 mA	1 mW / °C	<3 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

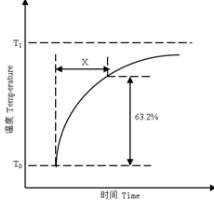
If any doubt on the results, measurements/tests should be made within the following limits

- 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

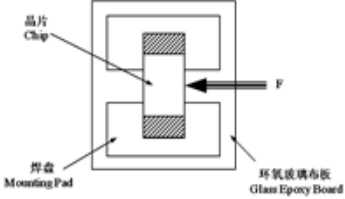
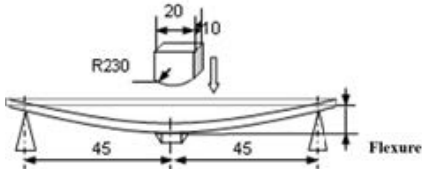
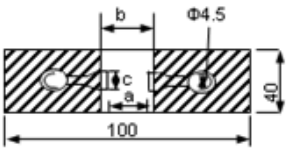
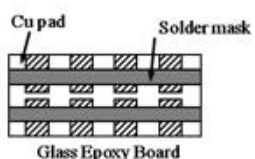
Electrical Test

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 T0 (°C) to T1 (°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

Chip NTC Thermistor

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																											
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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																										

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	$-40 \pm 5^{\circ}\text{C}$	$30 \pm 3\text{min}$																
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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

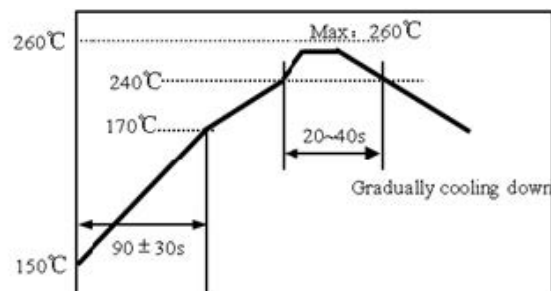
Notes & Warnings

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

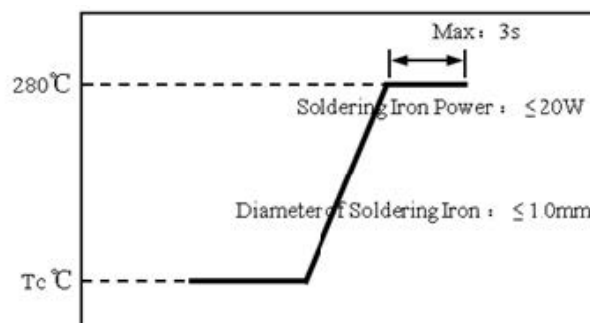
- 1~2°C/sec. Ramp
- Pre-heating: 150~170°C/90±30 sec.
- Time above 240°C: 20~40 sec.
- Peak temperature: 260°C Max./10 sec.
- Solder paste: Sn/3.0Ag/0.5Cu
- Max.2 times for re-flowing



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



Chip NTC Thermistor



R-T table

Temp. (°C)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(°C)
-40	195.784	203.814	212.153	4.09%	0.69
-39	185.358	192.854	200.633	4.03%	0.69
-38	175.541	182.539	189.798	3.98%	0.68
-37	166.293	172.828	179.603	3.92%	0.68
-36	157.580	163.684	170.007	3.86%	0.67
-35	149.368	155.070	160.973	3.81%	0.67
-34	141.626	146.953	152.466	3.75%	0.66
-33	134.325	139.303	144.452	3.70%	0.66
-32	127.439	132.091	136.900	3.64%	0.65
-31	120.941	125.290	129.783	3.59%	0.65
-30	114.808	118.874	123.072	3.53%	0.64
-29	109.018	112.820	116.743	3.48%	0.63
-28	103.550	107.106	110.773	3.42%	0.63
-27	98.385	101.711	105.139	3.37%	0.62
-26	93.505	96.616	99.821	3.32%	0.62
-25	88.892	91.803	94.800	3.26%	0.61
-24	84.531	87.255	90.057	3.21%	0.61
-23	80.407	82.956	85.577	3.16%	0.60
-22	76.506	78.892	81.343	3.11%	0.60
-21	72.815	75.048	77.341	3.06%	0.59
-20	69.321	71.411	73.557	3.01%	0.58
-19	66.013	67.970	69.979	2.95%	0.58
-18	62.881	64.713	66.593	2.90%	0.57
-17	59.914	61.630	63.388	2.85%	0.57
-16	57.103	58.709	60.355	2.80%	0.56
-15	54.438	55.943	57.484	2.75%	0.55
-14	51.912	53.321	54.764	2.70%	0.55
-13	49.517	50.837	52.187	2.66%	0.54
-12	47.244	48.481	49.745	2.61%	0.54
-11	45.088	46.247	47.430	2.56%	0.53
-10	43.042	44.127	45.235	2.51%	0.52
-9	41.100	42.117	43.154	2.46%	0.52
-8	39.256	40.208	41.179	2.42%	0.51
-7	37.504	38.396	39.305	2.37%	0.50
-6	35.840	36.675	37.527	2.32%	0.50
-5	34.258	35.041	35.838	2.27%	0.49
-4	32.755	33.488	34.234	2.23%	0.48
-3	31.326	32.012	32.711	2.18%	0.48
-2	29.966	30.609	31.263	2.14%	0.47
-1	28.673	29.276	29.888	2.09%	0.46
0	27.443	28.007	28.580	2.05%	0.45
1	26.272	26.800	27.336	2.00%	0.45

Chip NTC Thermistor

Temp. (°C)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(°C)
2	25.157	25.651	26.153	1.96%	0.44
3	24.095	24.558	25.027	1.91%	0.43
4	23.084	23.517	23.956	1.87%	0.43
5	22.120	22.526	22.937	1.82%	0.42
6	21.202	21.582	21.966	1.78%	0.41
7	20.327	20.682	21.041	1.74%	0.40
8	19.493	19.825	20.161	1.69%	0.40
9	18.697	19.008	19.322	1.65%	0.39
10	17.938	18.229	18.522	1.61%	0.38
11	17.214	17.485	17.759	1.57%	0.37
12	16.523	16.777	17.032	1.52%	0.37
13	15.863	16.100	16.339	1.48%	0.36
14	15.234	15.455	15.677	1.44%	0.35
15	14.632	14.838	15.046	1.40%	0.34
16	14.057	14.250	14.443	1.36%	0.33
17	13.508	13.688	13.868	1.32%	0.33
18	12.984	13.151	13.319	1.28%	0.32
19	12.482	12.638	12.794	1.24%	0.31
20	12.003	12.148	12.293	1.20%	0.30
21	11.544	11.679	11.814	1.16%	0.29
22	11.106	11.231	11.356	1.12%	0.29
23	10.686	10.802	10.919	1.08%	0.28
24	10.284	10.392	10.500	1.04%	0.27
25	9.900	10.000	10.100	1.00%	0.26
26	9.525	9.625	9.725	1.04%	0.27
27	9.166	9.265	9.365	1.08%	0.28
28	8.822	8.921	9.021	1.12%	0.30
29	8.493	8.592	8.691	1.15%	0.31
30	8.178	8.276	8.375	1.19%	0.32
31	7.876	7.974	8.072	1.23%	0.33
32	7.587	7.684	7.781	1.27%	0.34
33	7.310	7.406	7.503	1.30%	0.36
34	7.045	7.140	7.236	1.34%	0.37
35	6.790	6.885	6.979	1.38%	0.38
36	6.547	6.640	6.734	1.41%	0.39
37	6.313	6.405	6.498	1.45%	0.41
38	6.088	6.180	6.271	1.49%	0.42
39	5.873	5.963	6.054	1.52%	0.43
40	5.667	5.756	5.846	1.56%	0.44
41	5.469	5.556	5.645	1.60%	0.46
42	5.278	5.365	5.453	1.63%	0.47
43	5.096	5.181	5.268	1.67%	0.48
44	4.921	5.005	5.090	1.70%	0.50
45	4.752	4.835	4.919	1.74%	0.51
46	4.590	4.672	4.755	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	4.435	4.515	4.597	1.81%	0.54
48	4.285	4.365	4.445	1.84%	0.55
49	4.142	4.220	4.299	1.88%	0.56
50	4.004	4.081	4.159	1.91%	0.58
51	3.871	3.947	4.023	1.94%	0.59
52	3.743	3.818	3.893	1.98%	0.60
53	3.621	3.694	3.768	2.01%	0.62
54	3.502	3.574	3.647	2.04%	0.63
55	3.389	3.459	3.531	2.08%	0.65
56	3.279	3.349	3.419	2.11%	0.66
57	3.174	3.242	3.312	2.14%	0.67
58	3.072	3.140	3.208	2.18%	0.69
59	2.975	3.041	3.108	2.21%	0.70
60	2.881	2.945	3.011	2.24%	0.72
61	2.790	2.854	2.918	2.27%	0.73
62	2.702	2.765	2.829	2.31%	0.75
63	2.618	2.680	2.742	2.34%	0.76
64	2.537	2.598	2.659	2.37%	0.78
65	2.459	2.518	2.579	2.40%	0.79
66	2.384	2.442	2.501	2.43%	0.81
67	2.311	2.368	2.426	2.47%	0.82
68	2.241	2.297	2.354	2.50%	0.84
69	2.173	2.228	2.284	2.53%	0.85
70	2.108	2.162	2.217	2.56%	0.87
71	2.045	2.098	2.152	2.59%	0.88
72	1.984	2.036	2.089	2.62%	0.90
73	1.925	1.976	2.029	2.65%	0.91
74	1.868	1.919	1.970	2.68%	0.93
75	1.814	1.863	1.914	2.71%	0.94
76	1.761	1.809	1.859	2.74%	0.96
77	1.710	1.757	1.806	2.77%	0.97
78	1.660	1.707	1.755	2.80%	0.99
79	1.613	1.658	1.705	2.83%	1.00
80	1.567	1.612	1.658	2.86%	1.02
81	1.522	1.566	1.611	2.89%	1.04
82	1.479	1.522	1.567	2.92%	1.05
83	1.437	1.480	1.523	2.95%	1.07
84	1.397	1.439	1.482	2.98%	1.09
85	1.358	1.399	1.441	3.01%	1.10
86	1.320	1.361	1.402	3.03%	1.12
87	1.284	1.324	1.364	3.06%	1.13
88	1.249	1.288	1.327	3.09%	1.15
89	1.215	1.253	1.292	3.12%	1.17
90	1.182	1.219	1.257	3.15%	1.18
91	1.150	1.186	1.224	3.18%	1.20

Chip NTC Thermistor

Temp. (°C)	R_Min (Kohm)	R_Cent (Kohm)	R_Max (Kohm)	Res TOL.	Temp. TOL.(°C)
92	1.119	1.155	1.192	3.20%	1.22
93	1.089	1.124	1.160	3.23%	1.23
94	1.060	1.094	1.130	3.26%	1.25
95	1.032	1.066	1.101	3.29%	1.27
96	1.004	1.038	1.072	3.31%	1.29
97	0.978	1.011	1.045	3.34%	1.30
98	0.952	0.985	1.018	3.37%	1.32
99	0.928	0.959	0.992	3.40%	1.34
100	0.904	0.935	0.967	3.42%	1.36
101	0.880	0.911	0.942	3.45%	1.37
102	0.858	0.888	0.918	3.48%	1.39
103	0.836	0.865	0.895	3.50%	1.41
104	0.815	0.843	0.873	3.53%	1.43
105	0.794	0.822	0.852	3.56%	1.44
106	0.774	0.802	0.831	3.58%	1.46
107	0.755	0.782	0.810	3.61%	1.48
108	0.736	0.763	0.790	3.63%	1.50
109	0.718	0.744	0.771	3.66%	1.52
110	0.700	0.726	0.752	3.68%	1.53
111	0.683	0.708	0.734	3.71%	1.55
112	0.666	0.691	0.717	3.74%	1.57
113	0.650	0.674	0.700	3.76%	1.59
114	0.634	0.658	0.683	3.79%	1.61
115	0.619	0.642	0.667	3.81%	1.63
116	0.604	0.627	0.651	3.84%	1.65
117	0.589	0.612	0.636	3.86%	1.66
118	0.575	0.598	0.621	3.89%	1.68
119	0.562	0.584	0.607	3.91%	1.70
120	0.549	0.570	0.593	3.93%	1.72
121	0.536	0.557	0.579	3.96%	1.74
122	0.523	0.544	0.566	3.98%	1.76
123	0.511	0.532	0.553	4.01%	1.78
124	0.499	0.519	0.540	4.03%	1.80
125	0.488	0.508	0.528	4.06%	1.82