Specifications Approval Sheet

CUSTOMER: _____

CUSTOMER P/N: _____

PART NAME: DT-G Series - NTC Thermistor Chip

SPECIFICATION: DT103F3950A-G-B-M

DATE: _____

For Customer Approval:

For Manufacturer Approval:

Formulation	Audit	Approval

EXSENSE Electronics Technology Co., Ltd.
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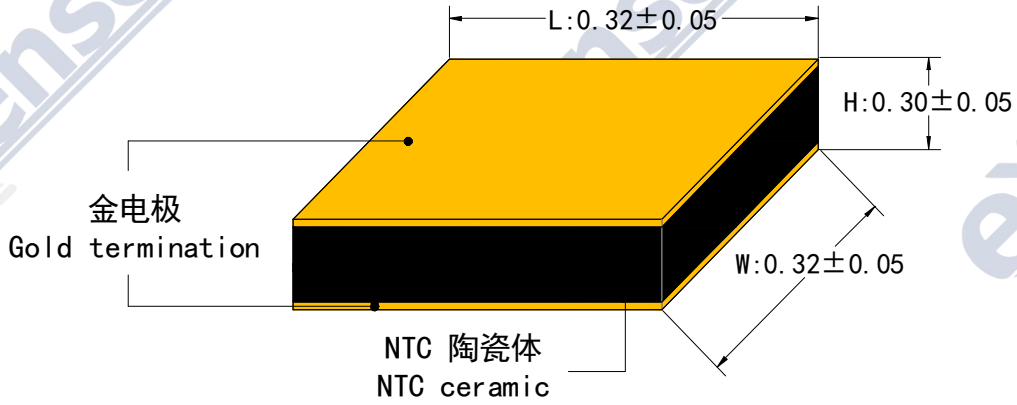
1. Range of Application

The specification approval sheet is applicable to DT-G series NTC thermistor produced by EXSENSE Electronics Technology Co., Ltd.

This product is complied with the EU RoHS Directive.

2. Product Structure and Size

Unit: mm



3. Part Number

DT	103	F	3930	A	G	B	M
①	②	③	④	⑤	⑥	⑦	⑧
Product Series Code	Resistance @25℃	Tolerance @25℃	Beta	Test temp. of B	Electrode Material	Welding Method	Packing
DT-G Series NTC Thermistor	$10\times10^{3}\Omega$	±1%	3930K	25/50℃	Gold Electrode	Bonding	Blue Taping

4. Electrical Performance

No.	Item	Symbol	Test Condition	Scope	Unit
1	Resistance @25℃	R_{25}	T=25±0.01℃	10±1%	KΩ
2	Beta	$B_{25/50}$	$B=\frac{\ln(R_{T1})-\ln(R_{T2})}{(1/T_1-1/T_2)}$	3930±1%	K
3	Thermal time constant	τ	50℃→25℃, in oil	≤1.0	sec
4	Dissipation Factor	δ	Ta=25±0.5℃	~0.2	mW/℃
5	Max. Rated Power	Pr	Ta=25±0.5℃	≤20	mW
6	Operating Temp. Range	/	/	-40~+125	℃

4.1 Resistance Value ($R_{25℃}$)

Requirement: R_{25}＝10KΩ±1%

Test method: Measuring in high-precision thermostatic oil tank of 25℃±0.05℃, high precision resistance measuring instrument is used, and the measuring power of the measuring instrument should be zero power. (That is, the self-heat generated by the current flowing through the product can be negligible.)

4.2 Beta

Requirement: $B_{25/50}$=3930K±1%

Test method: The resistance values of 25±0.05℃ and 50±0.05℃ are measured in high-precision thermostatic oil tank, then calculate according to the following formula:

$B_{T1/T2}=\ln(R_{T1}/R_{T2})/(1/(T1+273.15)-1/(T2+273.15))$

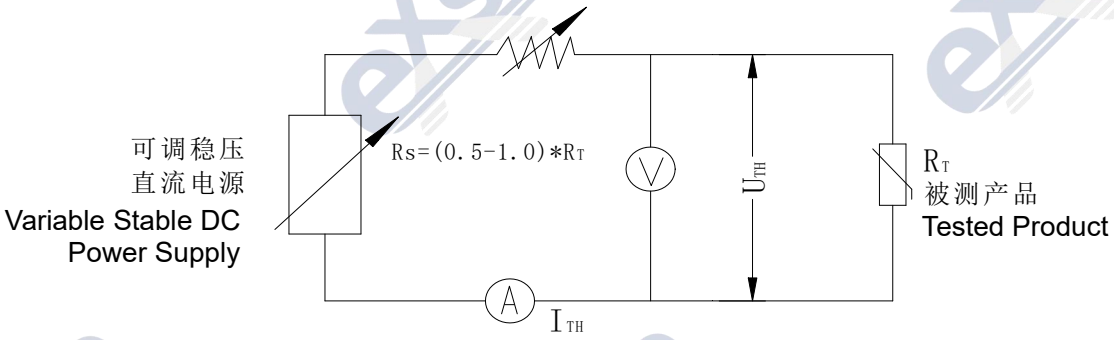
4.3 Thermal Time Constant (τ)

Thermal time constant: T1=50-(50-25)*63.2%=34.2℃, max 10 seconds (in oil)

Test method: the time required for the product to quickly convert from the 50℃ oil tank to the 25℃ oil tank to reach the resistance value corresponding to 34.2℃.

4.4 Dissipation Factor (δ)

Test method: the product under test is connected to the following circuit in the still air of 25±0.5℃.



Adjust I_{TH} for $\frac{U_{TH}}{I_{TH}}$ = R_{85}, then calculate by the following formula:

$$\delta=\frac{U_{TH}\cdot I_{TH}}{85-25℃}\ (mw/℃)$$

4.5 Max. Rated Power (Pr)

Requirement: Ta=25±0.5℃, max 20mW.

4.6 Operating temp. Range

-40℃~+125℃. (All materials used to assemble must meet the highest operating temperature)

5. Reliability

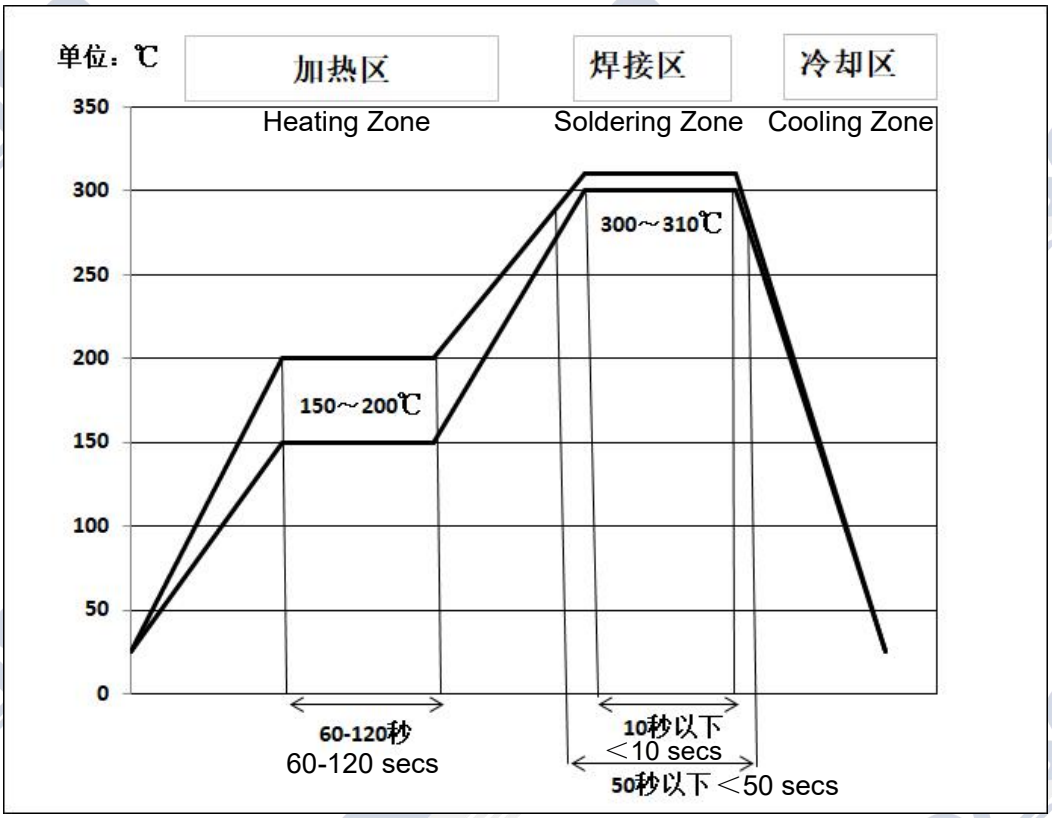
Item	Standard	Test Method
Vibration Test	△ Change rate of resistance value≤±1% △ Change rate of Beta≤±1% △ Appearance without damage	Vibration frequency range:10~55Hz Total amplitude: 1.52mm Time: X, Y, Z direction each 2hrs.
Temperature Cycling Test		After the chip wire bonding, -40℃×30min→room temperature×5min→100℃×30 min→room temperature×5min, 1000 cycle times.
High Temperature Storage Test		After the chip wire bonding, placed at 125±5℃ air for 1000h±24hrs
Low Temperature Storage Test		After the chip wire bonding, placed at -40±5℃ air for 1000h±24hrs
High Temperature High Humidity Test		After the chip wire bonding, placed at 85±2℃, 85±5%RH air for 1000h±24hrs
Salt spray Test	△ Change rate of resistance value≤±1% △ Change rate of Beta≤±1% △ Appearance without damage, oxidation, corrosion	Concentration of sodium chloride: 5%, relative humidity: 98%; Temperature of pressure barrel: 47℃, Temperature of brine barrel and test room: 5℃, test lasted for 48 hrs

6. Recommended Welding Process Condition

6.1 Gold electrode NTC Thermistor chip is only applicable to bonding with gold wire and aluminum wire.

6.2 Welding process

Au/Sn=80/20 (m.p.280℃) solder is recommended. If other solder (Sn/Ag/Cu, Sn/Cu/Ni, etc.) is used, it is easy to lead to electrode leaching, bonding strength reduction, resulting in performance changes.



①The time shown in the figure above is measured after surface temperature of the chip has been reached.

②The welding time should be less than 50 seconds when the temperature exceeds 280℃.

③Do not force cooling after welding, let the product gradually cool to room temperature.

6.3 Recommended instructions for conductive paste (silver paste)

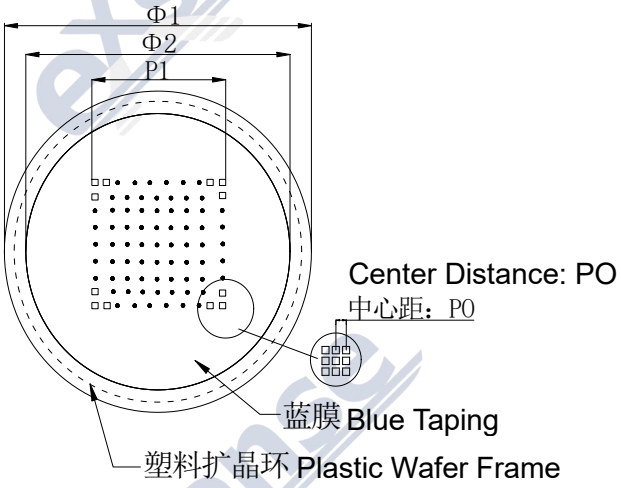
Conductive paste will shrink greatly during curing, which will cause the electrode to flake off easily. Please check the product carefully after welding. Meanwhile, please set the curing temperature below 180℃ and curing time below 2 hours.

6.4 Welding conditions for bonding (applicable to bonding with gold wire, aluminum wire)

Item	Wire Diameter	Condition	Requirement
Gold Wire	0.8~2.0mil	**1.** Clean and dust-free, no vibration interference around, no oxidation of chip **2.** Room temperature: 20~28℃, humidity: 40~60%	**1.** Diameter of welding ball: 2.6~2.7 times wire diameter **2.** Bonding tension force of 1mil ≥3.5g **3.** Bonding tension force of 1.2mil ≥5g
Aluminum Wire	0.8~2.0mil		**1.** Length of solder joint: ≥1.5 times wire diameter, ≤5 times wire diameter **2.** Width of solder joint: ≥1.2 times wire diameter, ≤3 times wire diameter **3.** Wire end: ≥0.3 times wire diameter, ≤1.5 times wire diameter **4.** Bonding tension force of 1mil ≥3.5g Bonding tension force of 1.2mil ≥5g
Note: Bonding pressure should not be too large to avoid damage to the chip			

7. Packing

Blue taping, QTY of each ring: about 2.5K pcs, space between chips ≈ 1.2mm.



Unit	Φ1	Φ2	PO	P1
mm	≈152	≈140	≈1.2	≈60

8. Transportation and Storage

8.1 The height of each stack shall not exceed 4 boxes during storage and transportation, products must be vacuumed and stored in anti-oxidation packaging.

8.2 Select packing cases according to the quantity of shipment, any method of transportation is allowed; But need to avoid the directly or indirectly drenched hit of dirt, rain, snow and mechanical damage in transport process

8.3 The storage environment of product must be free from acidic and alkaline substances, corrosive gases or radiation sources, avoid storing in environment with light.

8.4 Storage temperature: -10℃~+40℃.

8.5 Relative humidity: ≤75%RH.

9. Storage Life

9.1 Under the guarantee of the integrity of the sealed package and the above storage conditions, the tray vacuum-sealed package can be stored for 1 year, the bulk vacuum-sealed package can be stored for 1 year, and the blue taping vacuum-sealed package can be stored for 6 months. (Recommended to store in inert gas.)

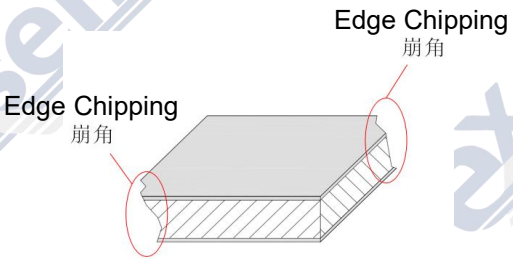
9.2 The shelf life of the packaging material (blue tape) is 6 months. Long-term storage will easily increase the viscosity of the blue tape, resulting in difficulty in product taking and adhesive phenomenon of product.

9.3 After opening the blue tape of product, please use it within 24 hours under indoor conditions of normal temperature and humidity. If not, please immediately vacuum again and keep according to storage method to avoid the oxidation of product leads.

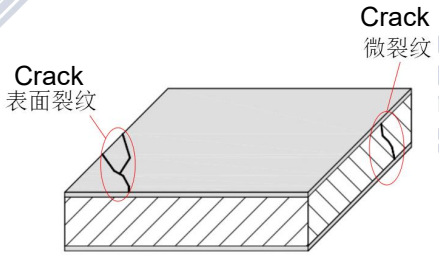
10. Attention

Thermistor chip may be damaged or misused. Please strictly observe as following:

10.1 Thermistor is designed for the specified purpose. Do not use them for other purposes.
10.2 Do not use the thermistor exceed the maximum rated power of it.
10.3 Please use the thermistor within the applicable temperature range. All materials used to assemble must meet the highest operating temperature.
10.4 Measuring power of the measuring instrument should be zero power. (That is, the self-heat generated by the current flowing through the product can be negligible.)
10.5 Please avoid excessive welding pressure; Avoid the external mechanical force to the thermistor chip caused by crack, edge chipping and other damage. (The causes of thermistor chip damage are: ①using tweezers to pick up the chip; ②welding pressure is too large; ③strong impact) See Picture 1 and Picture 2 below:

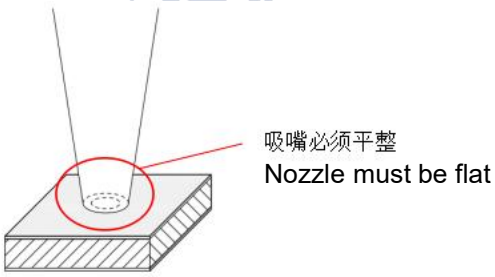


Picture 1



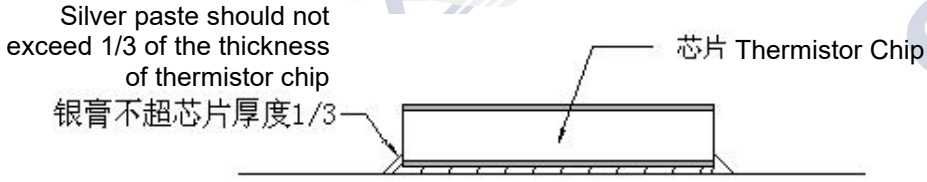
Picture 2

10.6 If a vacuum pen (suction nozzle) is used during welding, the nozzle must be flat and the material with low hardness (such as plastic) should be used to avoid damage to thermistor chip. See Picture 3 below:

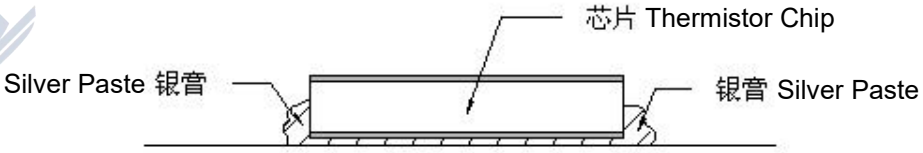


Picture 3

10.7 Paste of thermistor chip should not be too much, if the silver paste is covering both sides of the chip too high, which is easy to cause low resistance value or short circuit; It is recommended that silver paste should not exceed 1/3 of the thickness of thermistor chip (for reference only). See Picture 4 and Picture 5 below:

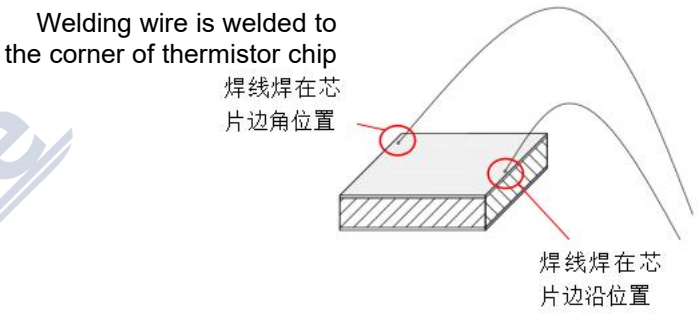


Picture 4



Picture 5

10.8 Solder joint of the bonding wire should fall in the middle of thermistor chip as far as possible to avoid edge crack during welding. See Picture 6 below:



Picture 6

10.9 The selection of silver paste must match the process, if the temperature during production or product use is higher than the highest use temperature of silver paste, the silver paste will release destructive substances and damage thermistor chip, which is easy to cause poor resistance value and poor appearance. easily leading to poor resistance and appearance.

10.10 Thermistor chip exposed to the air directly will lead to oxidation, yellowing; Do not touch thermistor chip with hands directly.

10.11 Do not use in the following environment:

A. Corrosive air ($C1_2$, NH_3, SO_X, $N_{OX,}$, etc.)

B. Acid, alkali, organic solvent

C. Medium with high electrical conductivity (electrolyte, water, salt water)

D. Places with lots of dust

11. Period of Validity

After being used on the machine, under the conditions specified in the specification approval sheet, the used period can be guaranteed for 10 years.

12. R-T Table

Part No.:DT103F3930A-G-B-M R_{25}=10KΩ±1% $B_{25/50}$=3930K±1%

$T_{emperature}$ (℃)	R_{min} (KΩ)	R_{nor} (KΩ)	R_{max} (KΩ)	$T_{emperature}$ (℃)	R_{min} (KΩ)	R_{nor} (KΩ)	R_{max} (KΩ)
-40	321.9	336.8	352.3	3	27.60	28.17	28.74
-39	301.6	315.4	329.7	4	26.26	26.78	27.32
-38	282.8	295.4	308.7	5	24.99	25.48	25.97
-37	265.2	276.9	289.1	6	23.79	24.24	24.70
-36	248.8	259.6	270.9	7	22.65	23.08	23.50
-35	233.6	243.6	254.0	8	21.58	21.97	22.37
-34	219.3	228.6	238.2	9	20.57	20.93	21.29
-33	206.1	214.6	223.5	10	19.60	19.94	20.28
-32	193.7	201.6	209.8	11	18.69	19.00	19.32
-31	182.1	189.4	197.0	12	17.83	18.12	18.41
-30	171.3	178.1	185.1	13	17.01	17.28	17.54
-29	161.2	167.5	174.0	14	16.23	16.48	16.73
-28	151.8	157.6	163.6	15	15.50	15.73	15.96
-27	142.9	148.3	153.9	16	14.80	15.01	15.22
-26	134.7	139.7	144.8	17	14.14	14.33	14.53
-25	126.9	131.6	136.3	18	13.51	13.69	13.87
-24	119.7	124.0	128.4	19	12.91	13.08	13.24
-23	112.9	116.9	121.0	20	12.34	12.50	12.65
-22	106.5	110.2	114.0	21	11.80	11.94	12.09
-21	100.6	104.0	107.5	22	11.29	11.42	11.55
-20	94.95	98.13	101.4	23	10.80	10.92	11.04
-19	89.63	92.57	95.60	24	10.34	10.45	10.56
-18	84.63	87.36	90.17	25	9.900	10.00	10.10
-17	79.95	82.48	85.08	26	9.472	9.572	9.672
-16	75.55	77.90	80.31	27	9.065	9.165	9.264
-15	71.42	73.60	75.83	28	8.678	8.777	8.876
-14	67.55	69.57	71.64	29	8.309	8.408	8.507
-13	63.91	65.78	67.70	30	7.959	8.056	8.155
-12	60.48	62.22	64.00	31	7.625	7.722	7.819
-11	57.27	58.88	60.53	32	7.306	7.402	7.499
-10	54.24	55.73	57.27	33	7.003	7.098	7.194
-9	51.39	52.78	54.20	34	6.715	6.809	6.903
-8	48.71	50.00	51.32	35	6.439	6.532	6.626
-7	46.18	47.38	48.60	36	6.177	6.268	6.361
-6	43.80	44.91	46.05	37	5.926	6.017	6.108
-5	41.56	42.59	43.64	38	5.688	5.777	5.866
-4	39.44	40.40	41.38	39	5.460	5.547	5.636
-3	37.45	38.34	39.25	40	5.242	5.328	5.416
-2	35.57	36.39	37.24	41	5.034	5.119	5.205
-1	33.79	34.56	35.34	42	4.836	4.920	5.004
0	32.11	32.83	33.55	43	4.647	4.729	4.812
1	30.52	31.18	31.85	44	4.465	4.546	4.628
2	29.02	29.63	30.25	45	4.292	4.372	4.452

Part No.:DT103F3930A-G-B-M R_{25}=10KΩ±1% $B_{25/50}$=3930K±1%

Temperature (℃)	Rmin (KΩ)	Rnor (KΩ)	Rmax (KΩ)	Temperature (℃)	Rmin (KΩ)	Rnor (KΩ)	Rmax (KΩ)
46	4.127	4.205	4.284	86	1.025	1.059	1.094
47	3.969	4.045	4.123	87	0.9941	1.027	1.061
48	3.818	3.893	3.969	88	0.9643	0.9967	1.030
49	3.673	3.747	3.822	89	0.9355	0.9673	1.000
50	3.535	3.607	3.680	90	0.9077	0.9388	0.9709
51	3.403	3.474	3.546	91	0.8809	0.9113	0.9428
52	3.277	3.346	3.417	92	0.8550	0.8848	0.9156
53	3.156	3.224	3.293	93	0.8300	0.8592	0.8894
54	3.040	3.107	3.175	94	0.8059	0.8345	0.8641
55	2.929	2.995	3.061	95	0.7826	0.8106	0.8396
56	2.823	2.887	2.953	96	0.7601	0.7876	0.8159
57	2.722	2.784	2.848	97	0.7384	0.7653	0.7931
58	2.624	2.686	2.748	98	0.7174	0.7437	0.7709
59	2.531	2.591	2.652	99	0.6971	0.7229	0.7496
60	2.441	2.500	2.560	100	0.6775	0.7028	0.7289
61	2.355	2.413	2.472	101	0.6586	0.6833	0.7089
62	2.273	2.329	2.387	102	0.6403	0.6645	0.6896
63	2.193	2.249	2.306	103	0.6225	0.6463	0.6709
64	2.118	2.172	2.227	104	0.6054	0.6287	0.6528
65	2.045	2.098	2.152	105	0.5888	0.6116	0.6353
66	1.975	2.027	2.080	106	0.5728	0.5951	0.6183
67	1.907	1.958	2.010	107	0.5573	0.5792	0.6019
68	1.843	1.893	1.944	108	0.5423	0.5637	0.5860
69	1.781	1.830	1.879	109	0.5277	0.5488	0.5706
70	1.721	1.769	1.818	110	0.5137	0.5343	0.5557
71	1.664	1.711	1.758	111	0.5000	0.5202	0.5412
72	1.609	1.654	1.701	112	0.4869	0.5067	0.5272
73	1.556	1.600	1.646	113	0.4741	0.4935	0.5137
74	1.505	1.549	1.593	114	0.4617	0.4807	0.5005
75	1.456	1.499	1.543	115	0.4497	0.4684	0.4878
76	1.409	1.450	1.494	116	0.4381	0.4564	0.4754
77	1.363	1.404	1.446	117	0.4268	0.4448	0.4634
78	1.319	1.360	1.401	118	0.4159	0.4335	0.4518
79	1.277	1.317	1.357	119	0.4053	0.4226	0.4405
80	1.237	1.275	1.315	120	0.3951	0.4120	0.4296
81	1.198	1.236	1.275	121	0.3851	0.4017	0.4190
82	1.161	1.198	1.236	122	0.3755	0.3918	0.4087
83	1.125	1.161	1.198	123	0.3661	0.3821	0.3987
84	1.091	1.126	1.162	124	0.3571	0.3727	0.3890
85	1.057	1.092	1.127	125	0.3483	0.3636	0.3796