

DONGGUAN UCHI ELECTRONICS CO., LTD.

APPROVAL SHEET

CUSTOMER _____

PART NAME Temperature measuring NTC thermistor chip

PART NUMBER MF58 Chip 104H3950

DATE 2020-03-12

CONFIRM

CLIENT

Quality
Dep.:
Production
Dep.:
Engineering
Dep.:

MANUFACTOR

Design: Judy Zhu
Check:
Approval:

Temperature measuring NTC thermistor chip

Part No.: MF58 Chip-104H3950

DONGGUAN UCHI ELECTRONICS CO., LTD.

This detailed specification provide MF58 NTC Thermistor chip's structure size、 product performance、 test conditions、 the description of the use requirement, made by DONGGUAN UCHI ELECTRONICS CO., LTD ,please confirm.

If you have any doubt with this specification, please contact us(james@uchidg.com).If you have no doubt ,please confirm back. If you don't confirm back ,our company think that you accept it.Your company change the usage and usage method,please contact us.

Customer:

customer confirm

confirm

Date:

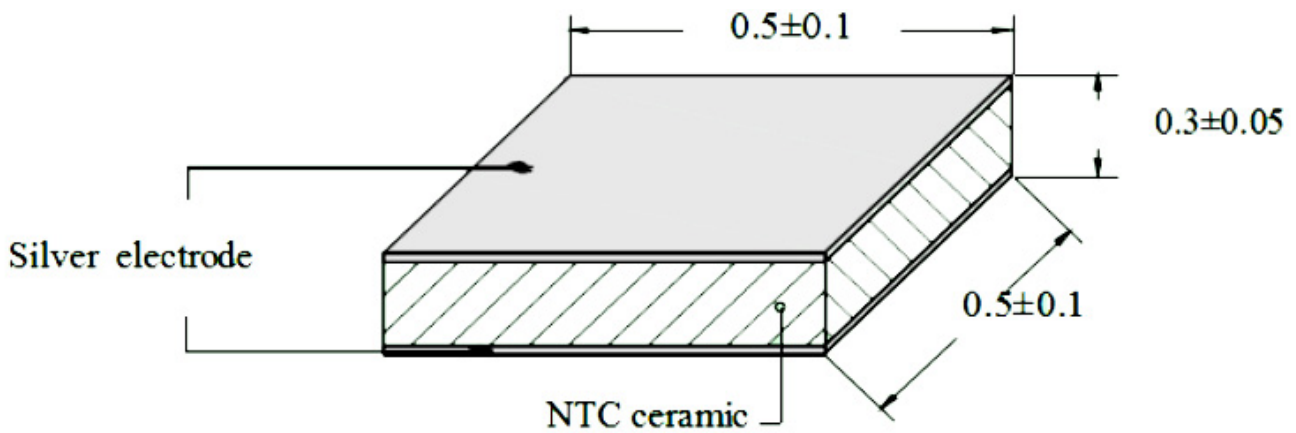
approve

Date:

1. Application

The specification of this approval applies to the MF58 series NTC thermistor chips .These products comply with the requirements of EU RoHS.

2. Dimensions(mm)



3.Specifications:

MF 58 chip	1 0 4	H	3 9 5 0	A	A	B	M
①	②	③	④	⑤	⑥	⑦	⑧
Type	R ₂₅	Tolerance (%)	B value	Measuring Temp.	Electrode material	Welding method	Package
MF58 NTC thermistor chip	10× 10 ⁴ Ω	±3%	3950K	25/50℃	Silver electrode	Binding	Blue film

4.Electricity:

No	Items	符号	Test condition	Range	Unit
1	Resistance at 25 ℃	R ₂₅	T=25±0.01℃	100±3%	KΩ
2	B value	B _{25/50}	$B = \frac{\ln(R_1) - \ln(R_2)}{[1/T_1 - 1/T_2]}$	3950±1%	K
3	Thermal time constant	τ	50℃→25℃, in oil	≤1.0	Sec

4	Dissipation coefficient	δ	$T_a=25\pm 0.5^\circ\text{C}$	~ 0.2	mW/ $^\circ\text{C}$
5	Max rated power	P_{max}	$T_a=25\pm 0.5^\circ\text{C}$	≤ 10	mW
6	Operating temp	/	/	-40 \sim +125	$^\circ\text{C}$

4.1 Resistance (R_{25})

Requirements: $R_{25} = 100\text{K}\Omega \pm 3\%$

Test method: It is measured in a high precision oil tank with constant temperature of $25^\circ\text{C} \pm 0.01^\circ\text{C}$ and applies a high-precision resistance measuring instrument. The instrument's measuring power should be zero power. (In other words, the chip self-heating generated by the current flowing through the product is negligible)

4.2 B value

Requirements: $B_{25/50} = 3950\text{K} \pm 1\%$

Test method: Measure resistance in a high precision oil tank with constant temperature of $25^\circ\text{C} \pm 0.01^\circ\text{C}$ and $50 \pm 0.01^\circ\text{C}$. Then calculate B value according to the following formula: $B_{T1/T2} = \ln(R_{T1}/R_{T2}) / (1/(T1+273.15) - 1/(T2+273.15))$.

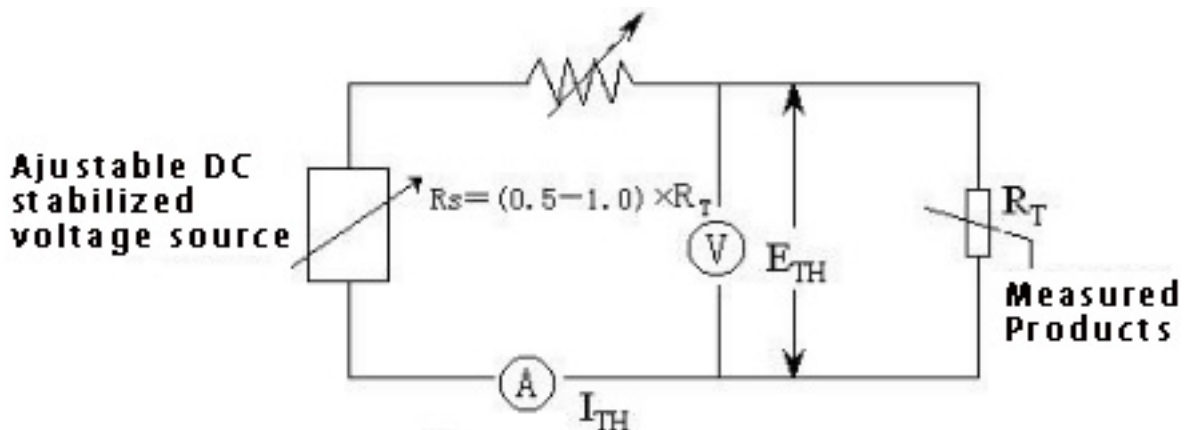
4.3 Thermal time constant (τ)

Requirements: $T1 = 50 - (50 - 25) * 63.2\% = 34.2^\circ\text{C}$, $\tau_{\text{max}} = 1.0\text{ S}$ (in oil).

Test method: Calculate the time required for the product's resistance at 50°C rapidly converted to corresponding resistance at 34.2°C in the oil tank.

4.4 Dissipation coefficient (δ)

Test method: (The product under test is connected to the following circuit in still air at $25 \pm 0.5^\circ\text{C}$)



Ajust I_{TH} Make $\frac{E_{\text{TH}}}{I_{\text{TH}}} = R_{85^\circ\text{C}}$, Then calculate it according to the following formula

$$\delta = \frac{E_{\text{TH}} \cdot I_{\text{TH}}}{85^\circ\text{C} - 25^\circ\text{C}} \text{ (mW/}^\circ\text{C)}$$

4.5 Max rated power(Pmax) Rated power: Ta=25±0.5°C, Pmax= 10mW.

4.6 Operating Temp: -40°C — +125°C.(All materials used to assemble the chip must meet the maximum operating temperature)

5. Recommended welding procedure

5.1 Silver electrode chip is only suitable for welding with gold and silver wire.

5.2 Welding conditions for binding(suitable for gold and silver wire)

Items	Diameter	Condition	Requirements
Gold wire	0.8mil~2.0mil	1. Clean and dustless, no impurities, no around interference and vibration, no chip oxidation. 2. Indoor temperature: 20 ~ 28°C, humidity: 40% ~ 60%	1. Solder ball diameter: ≥ 2.6-2.7 times the line diameter. 2. 1mil wire diameter's binding tension ≥ 3.0g. 3. 1.2mil wire diameter's binding tension ≥ 5g.
Silver wire	0.8mil~2.0mil	1. Clean and dustless, no impurities, no around interference and vibration, no chip oxidation. 2. Indoor temperature: 20 ~ 28°C, humidity: 40% ~ 60%	1. Welding spot length: ≥ 1.5 times the line diameter, ≅ 5 times line diameter. 2. Solder joint width: ≥ 1.2 times the line diameter, ≅ 3 times line diameter. 3, the end of the line: ≥ 0.3 times the line diameter, ≤ 1.5 times the line diameter 4. 1mil wire diameter's binding tension ≥ 3.0g 5. 1.2mil wire diameter's binding tension ≥ 5g.

Notice: Avoiding damage to the chip, binding tension should not be too large.

6. Reliability

Items	Standard	Test method
Vibration test	△ Rate of resistance change ≤ ±1% △ Rate of B value change ≤ ±1% Without appearance damage	Vibration frequency range: 10 ~55Hz Total amplitude: 1.52mm Time: 2hours for X\Y\Z
Cyclic temperature experiments	△ Rate of resistance change ≤ ±1% △ Rate of B value change ≤ ±1% Without appearance damage	The chip will be packaged with vinyl after binding with the wire, and have 1000 times circulation in the air according to following temp-curve -40°C × 30min → 100°C × 30min, 1000 cycles period back and forth
Aging test at high temperature	△ Rate of resistance change ≤ ±1% △ Rate of B value change ≤ ±1% Without appearance damage	The chip will be packaged with vinyl after binding with the wire, placed in the air at 125±5°C for 1000h±24hrs

Storage experiment at low temperature	Δ Rate of resistance change $\leq \pm 1\%$ Δ Rate of B value change $\leq \pm 1\%$ Without appearance damage	The chip will be packaged with vinyl after binding with the wire, placed in the air at $125 \pm 5^\circ\text{C}$ for $1000\text{h} \pm 24\text{hrs}$
Load test at high temperature	Δ Rate of resistance change $\leq \pm 1\%$ Δ Rate of B value change $\leq \pm 1\%$ Without appearance damage	The chip will be packaged with vinyl after binding with the wire, and fled into 0.2mA operating current at $100 \pm 5^\circ\text{C}$ for $1000\text{h} \pm 24\text{hrs}$
Moisture resistance test	Δ Rate of resistance change $\leq \pm 1\%$ Δ Rate of B value change $\leq \pm 1\%$ Without appearance damage	The chip will be packaged with vinyl after binding with the wire, and placed for $1000 \pm 24\text{hrs}$ in the environment of $85 \pm 2^\circ\text{C}$ and 80-90%RH

7、Certificates

7.1 Quality Management System: ISO9001:2015 IATF16949:2016

7.2 Environment Management System: ISO14001:2015

7.3 Intellectual Property Management System: GB/T29490-2013

7.4 Integrated Information Technology and Industrialization Management System:

AITTRE-00920111MS0088301

7.5 CQC: CQC09001033986 

7.6 Safety Approval: UL, C-UL: E240991 

7.7 10,000 durability test of UL

7.8 AEC-Q200:20172052558G

7.9 Environmental test report: RoHS

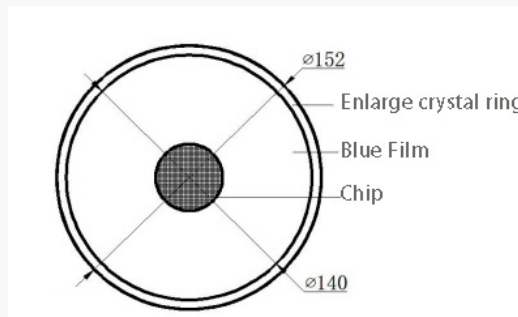
8. Packaging

8.1 Blue film packaging

The blue film was put into the wafer expanding machine and smoothly inlaid on the wafer expanding ring, and then the NTC chips was tidily arranged on the blue film by the sticking membrane.

Quantity of each layer: about 2.5Kpcs/Disk, center distance $\approx 0.6\text{mm}$.

8.2 Packed in paper box, each box has 10 layers, 3 boxes for small carton and 6 boxes for large carton.



9. Mode of transport and storage

9.1 In the process of storage and transportation, the height of each stack shall not exceed 4 boxes, and the chip must be stored in vacuum and anti-oxidation packaging.

9.2 Select the packing box according to the shipment quantity, any method of transportation is allowed; However, it is necessary to avoid contamination, the direct or indirect pouring of rain or snow and mechanical damages during transportation.

9.3 Products shall be stored in an environment free from acidic or alkaline substances, corrosive gases or radiation sources, and shall be avoided in an environment with light.

9.4 Storage temperature: $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$.

9.5 Relative humidity: $\leq 55\% \text{RH}$.

9.6 Stored in an inert gas.

10. Storage life

10.1 Under the guarantee of complete sealing package and the above storage conditions, the chips in bulk can be kept for 1 year in vacuum sealing package, and the chips with blue film can be kept for 6 months in the vacuum sealing package, otherwise the chip electrode will oxidize. (Storage in an inert gas is recommended)

10.2 After opening the film, please use the product within 24 hours under normal temperature and normal humidity indoor. If not, please keep the product according to the storage method.

10.3 The shelf life of the packaging material (blue film) is 3 months, the viscosity of the blue film is easy to increase for a long-time storage, leading to difficulties in wafer taking and adhesion.

11. Precautions

Thermistor chip may be damaged or misused, please strictly observe the following matters:

11.1 Thermistor chips are designed for a specified usage. Do not use them except for the specified usage.

11.2 Please do not exceed the maximum rated power of thermistor chip.

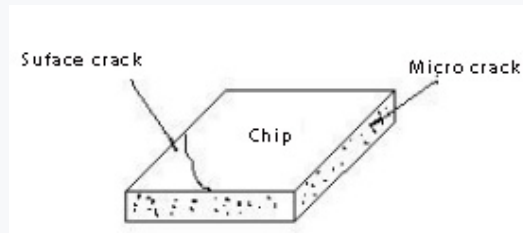
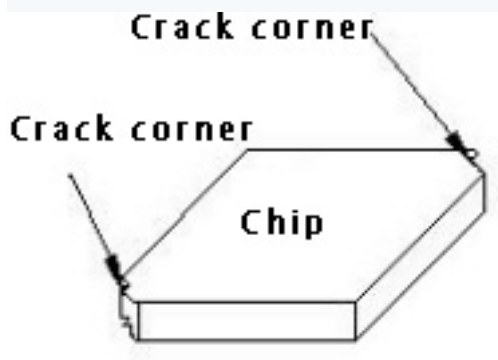
11.3 Please use them within the allowable operating temperature range of the thermistor chip. All the materials of the assembled chip must meet the requirement of maximum operating temperature.

11.4 During the resistance value test, the measured power of the testing instrument shall be zero. (That is, the self-heating of the chip caused by the current flowing through it can be ignored)

11.5 Please avoid excessive pressure of bonding welding; Avoid damages such as corner collapse and cracking caused by mechanical external force on thermistor chip. (Causes of chip damage: ① Clip the chip with tweezers ② Welding pressure is too high ③ Ultrasonic frequency is too high ④ Suffered from a strong impact. See figure 1 and figure 2 below:

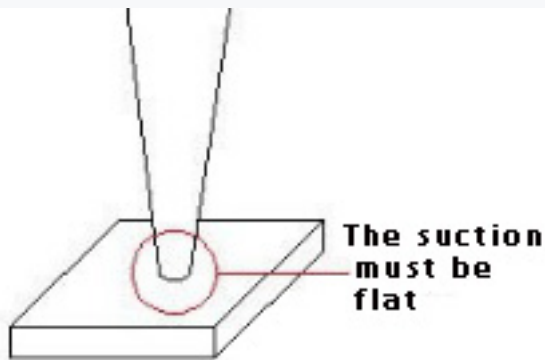
FIG. 1: Schematic diagram of crack angle

FIG. 2: Schematic diagram of micro crack



11.6 When vacuum suction pen(suction nozzle) is used in bonding welding, the nozzle tip must be flat and of low hardness(such as plastic), so as not to damage the chip. See figure 3 below:

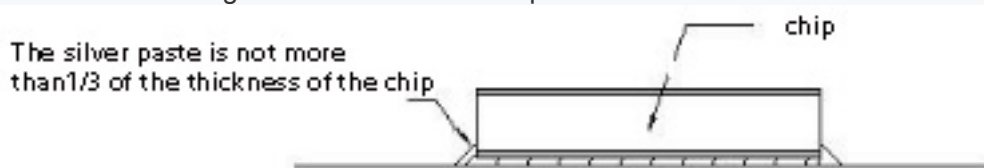
Figure 3: Schematic diagram of suction nozzle



11.7 When pasting the chip, the silver paste should not be too much, if the silver paste covering both sides of the chip is too high, it is likely to lead to low chip resistance or short circuit; It is suggested that silver paste does not exceed 1/3 of chip thickness (for reference only). See figure 4 and figure 5 below:

Figure 4: Schematic diagram of normal silver paste

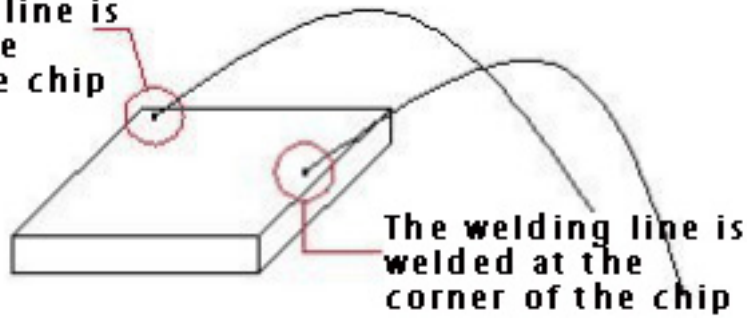
Figure 5: Schematic diagram of excessive silver paste



11.8 The welding spot of the bonding welding line shall fall in the middle of the chip as far as possible to avoid chip edge or angle collapse during welding. See figure 6 below:

Figure 6: Schematic diagram of the bad location of solder joints

The welding line is welded at the corner of the chip



11.9 The selection of silver paste shall be matched with the process. If the temperature during production or using is higher than the maximum operating temperature of silver paste, silver paste will release destructive material and damage the chip, which tend to cause bad resistance value and bad appearance.

11.10 The thermistor chip being directly exposed to air will lead to oxidation and yellowing of the chip electrode; Do not touch the chip directly by hand.

11.11 Please do not use in the following environment:

- A. Corrosive atmosphere (C1₂, NH₃, SO_x, NO_x, etc.)
- B. Acids, alkali, organic solvents
- C. Places with more dust

12. Service life

The service life of this thermistor chip is 10 years, subject to the conditions of this approval sheet.

13. RT Chart

R25=100KΩ TOLERANCE:±3% B25/50=3950K TOLERANCE:±1%(P182-6B2)

TEMP (°C)	RESISTANCE (K Ω)		
	MIN	CENTER	MAX
-40	2785.770	2971.000	3165.690
-39	2621.310	2793.890	2975.150
-38	2466.420	2627.180	2795.900
-37	2320.660	2470.400	2627.440
-36	2183.620	2323.090	2469.240
-35	2054.870	2184.770	2320.800
-34	1933.980	2054.980	2181.590
-33	1820.520	1933.240	2051.100
-32	1714.080	1819.110	1928.830
-31	1614.260	1712.140	1814.310
-30	1520.670	1611.900	1707.060
-29	1432.930	1517.980	1606.630
-28	1350.680	1430.000	1512.610
-27	1273.580	1347.570	1424.570
-26	1201.310	1270.350	1342.140
-25	1133.550	1198.000	1264.960
-24	1070.020	1130.190	1192.670
-23	1010.440	1066.650	1124.960
-22	954.563	1007.070	1061.520
-21	902.128	951.217	1002.070
-20	852.919	898.820	946.339
-19	806.721	849.657	894.074

-18	763.335	803.514	845.047
-17	722.577	760.189	799.039
-16	684.272	719.495	755.849
-15	648.260	681.256	715.288
-14	614.388	645.311	677.180
-13	582.517	611.507	641.361
-12	552.516	579.703	607.680
-11	524.263	549.768	575.995
-10	497.644	521.579	546.174
-9	472.554	495.024	518.095
-8	448.895	469.995	491.645
-7	426.574	446.396	466.718
-6	405.508	424.134	443.215
-5	385.616	403.123	421.046
-4	366.825	383.286	400.125
-3	349.067	364.548	380.373
-2	332.277	346.840	361.716
-1	316.395	330.099	344.087
0	302.709	315.680	328.909
1	287.140	299.283	311.659
3	260.900	271.671	282.632
4	248.800	258.947	269.266
5	237.328	246.889	256.604
6	226.445	235.457	244.606
7	216.119	224.614	233.232
8	206.317	214.326	222.445
9	197.009	204.561	212.211
10	188.167	195.290	202.499
11	179.765	186.484	193.279
12	171.779	178.117	184.523
13	164.185	170.165	176.205
14	156.962	162.605	168.300
15	150.090	155.416	160.786
16	143.550	148.577	153.641
17	137.323	142.068	146.845
18	131.394	135.874	140.380
19	125.746	129.976	134.226
20	120.365	124.358	128.369
21	115.237	119.008	122.791
22	110.348	113.909	117.479
23	105.686	109.049	112.418
24	101.241	104.417	107.596
25	97.000	100.000	103.000
26	92.873	95.786	98.703
27	88.938	91.767	94.602
28	85.185	87.932	90.687
29	81.604	84.272	86.949
30	78.188	80.779	83.380
31	74.928	77.443	79.970

32	71.816	74.258	76.713
33	68.845	71.215	73.601
34	66.007	68.309	70.627
35	63.298	65.532	67.783
36	60.709	62.878	65.065
37	58.236	60.341	62.466
38	55.872	57.916	59.980
39	53.614	55.597	57.602
40	51.454	53.380	55.327
41	49.390	51.259	53.151
42	47.416	49.230	51.068
43	45.528	47.289	49.074
44	43.722	45.432	47.165
45	41.995	43.654	45.338
46	40.342	41.952	43.588
47	38.760	40.323	41.912
48	37.246	38.764	40.307
49	35.797	37.270	38.769
50	34.409	35.840	37.295
51	33.081	34.469	35.883
52	31.809	33.156	34.530
53	30.590	31.898	33.233
54	29.423	30.693	31.989
55	28.304	29.538	30.797
56	27.232	28.430	29.654
57	26.205	27.368	28.557
58	25.221	26.350	27.505
59	24.277	25.374	26.496
60	23.373	24.437	25.528
61	22.505	23.539	24.599
62	21.673	22.678	23.707
63	20.875	21.851	22.851
64	20.110	21.057	22.030
65	19.376	20.296	21.241
66	18.671	19.565	20.483
67	17.995	18.863	19.756
68	17.346	18.189	19.057
69	16.723	17.542	18.386
70	16.124	16.921	17.741
71	15.550	16.324	17.122
72	14.999	15.751	16.526
73	14.469	15.200	15.954
74	13.960	14.671	15.404
75	13.471	14.162	14.875
76	13.001	13.673	14.366
77	12.550	13.203	13.877
78	12.116	12.751	13.407
79	11.699	12.316	12.954
80	11.298	11.898	12.519

81	10.913	11.496	12.100
82	10.542	11.109	11.697
83	10.185	10.737	11.309
84	9.842	10.379	10.935
85	9.512	10.035	10.576
86	9.195	9.703	10.230
87	8.889	9.383	9.896
88	8.595	9.076	9.575
89	8.312	8.780	9.266
90	8.039	8.495	8.968
91	7.777	8.220	8.681
92	7.524	7.956	8.404
93	7.281	7.701	8.138
94	7.046	7.455	7.881
95	6.820	7.219	7.633
96	6.603	6.990	7.394
97	6.393	6.770	7.164
98	6.191	6.558	6.942
99	5.996	6.354	6.727
100	5.823	6.173	6.537
101	5.627	5.966	6.321
102	5.452	5.783	6.129
103	5.283	5.606	5.943
104	5.121	5.435	5.763
105	4.964	5.270	5.590
106	4.812	5.111	5.423
107	4.666	4.957	5.262
108	4.525	4.809	5.106
109	4.389	4.666	4.955
110	4.258	4.527	4.810
111	4.131	4.394	4.669
112	4.008	4.264	4.533
113	3.890	4.140	4.402
114	3.775	4.019	4.275
115	3.665	3.903	4.152
116	3.558	3.790	4.034
117	3.455	3.681	3.919
118	3.355	3.576	3.808
119	3.258	3.474	3.701
120	3.165	3.376	3.597
121	3.075	3.280	3.496
122	2.988	3.188	3.399
123	2.903	3.099	3.305
124	2.822	3.013	3.214
125	2.743	2.929	3.126