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SPECIFICATION FOR APPROVAL

CUSTOMER _____

CERTIFIED
MODEL/TYPE

TTC03-474

PART NO.

TTC3C474F4571W01 (RoHS+HF)

APPLICATION _____

CUSTOMER P/N _____

ISSUE DATE

Mar.05,2018

REV. NO. _____

REV. DATE _____

FOR CUSTOMER APPROVAL	CHECKED BY
	<i>Haili Gong</i>
	APPROVED BY
	<i>Huaifang Zhang</i>





REVISED RECORD SHEET

REV. NO	REV. DATE	REVISED CONTENT



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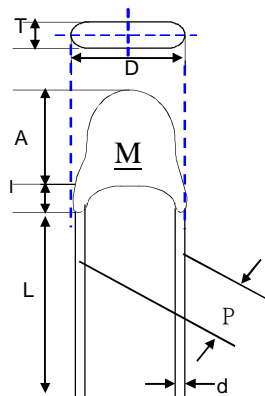
Part Number Code

Example :

TTC **3** **C** **474** **F** **457** **1** **W01**
 (1) (2) (3) (4) (5) (6) (7) (8)

No.	Item	Digit	Specification
(1)	Product Type	TTC	Thinking NTC thermistor TTC type
(2)	Body Size	3	Φ4 mm x H 5.0 mm (max.)
(3)	Definition of B Value	C	Automobile; B _{25/85}
(4)	Zero Power Resistance at 25°C	474	47 x 10 ⁴ Ω = 470 KΩ
(5)	Tolerance of R _{25°C}	F	± 1%
(6)	B Value	457	4570K
(7)	Tolerance of B Value	1	± 1%
(8)	Optional Suffix	W01	RoHS+HF compliance 0.5mm Cu Wires

Structure and Dimensions



(unit:mm)

Item	D	d	P	A	I	L	T
Max	4	0.52	3.04	5	3	40	3
Min	2.5	0.48	2.04	2.5	---	30	1.5

Electrical Characteristics

Part No.	Zero Power Resistance at 25°C	Tolerance of R _{25°C}	B _{25/85} Value	Tolerance of B Value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Operating Temperature Range
	R _{25°C} (KΩ)	(± %)	(K)	(± %)	P _{max} (mW)	δ(mW/°C)	τ (sec.)	T _L ~T _U (°C)
TTC3C474F4571W01	470	1	4570	1	150	≥2.5	≤18	-55 ~+150

Reliability

Tests of TTC03 NTC thermistors are based on AEC-Q200 Rev-D.

Table of Test Methods

Item	Standard	Test conditions / Methods	Specifications
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	Test temp.: 150 +3/-0°C Duration: 1000 h Unpowered Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±2 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$
Biased Humidity	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. 1mW power. Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$
Operational Life	MIL-STD-202 Method 108	Test temp.: 150 +3/-0°C Duration: 1000 h. 1mW power. Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$
External Visual	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required.	Within the specified values.



Reliability

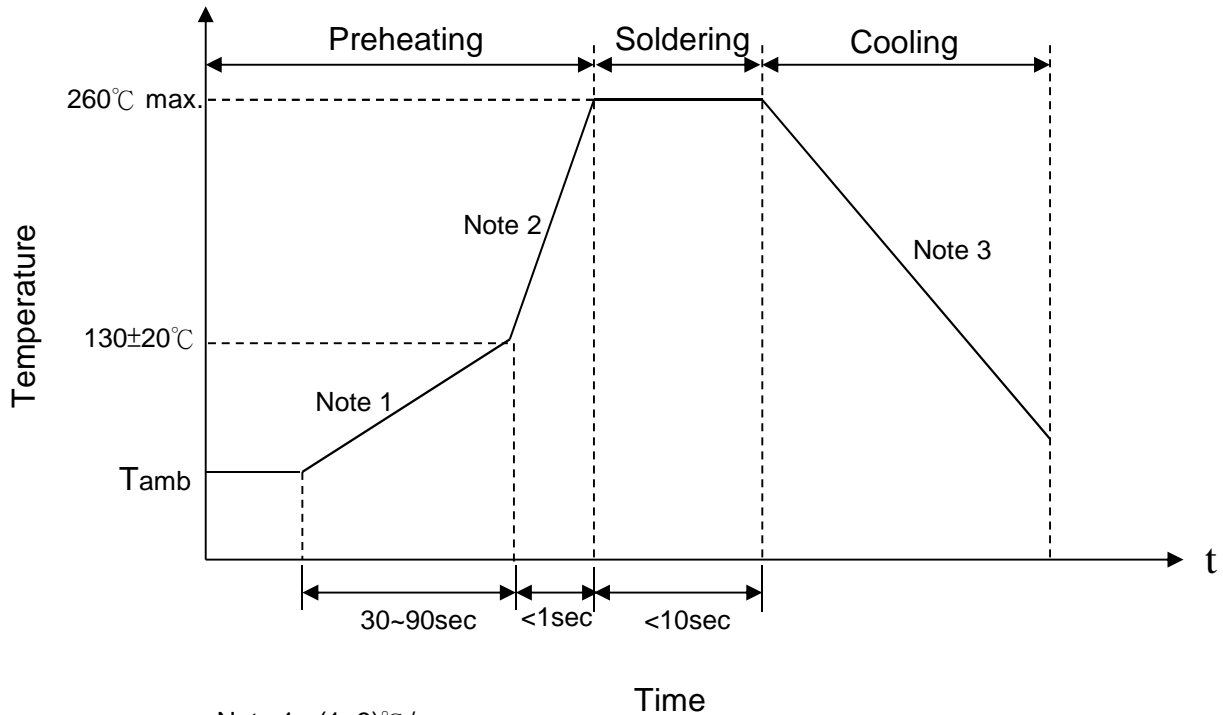
Tests of TTC03 NTC thermistors are based on AEC-Q200 Rev-D.

Table of Test Methods

Item	Standard	Test conditions / Methods	Specifications
Physical Dimension	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification.	Within the specified values.
Resistance to Solvents	MIL-STD-202 Method 215	Also aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.	No visible damage.
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213 LEADED:Condition C	No visible damage. $ \Delta R_{25}/R_{25} \leq 5\%$
Vibration	MIL-STD-202 Method 204	5 g's for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick with 7 secure points on one 8" side and 2 secure points on corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.	No visible damage. $ \Delta R_{25}/R_{25} \leq 5\%$
Resistance to Soldering Heat	MIL-STD-202 Method 210	260+/-5°C 10+/-1s,25mm/s+/-6mm/s, 1cycle.	No visible damage. $ \Delta R_{25}/R_{25} \leq 5\%$
Flammability	UL-94	V-0 or V-1 are acceptable. Electrical test not required.	V-0 or V-1 are acceptable.
ESD	AEC-Q200 -002	Discharge capacitance : 150 pF Charging voltage: 6 kV ,Contact discharge 1 pulse in each polarity	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$
Solderability	J-STD-002	Dipping Method Temperature : 235±5°C Time : 2±0.5sec	95% of termination wetted
Electrical Characterization	user spec	R(-40°C) / R(25°C) / R(150°C) B25/85 or B25/50	Within the specified values.
Terminal Strength	MIL-STD-202 Method 211	The terminal shall gradually be bent by 90° in one direction, then 90° in the opposite direction, and again back to the original position for three times.	No visible damage.

Soldering Recommendation

Wave Soldering Profile

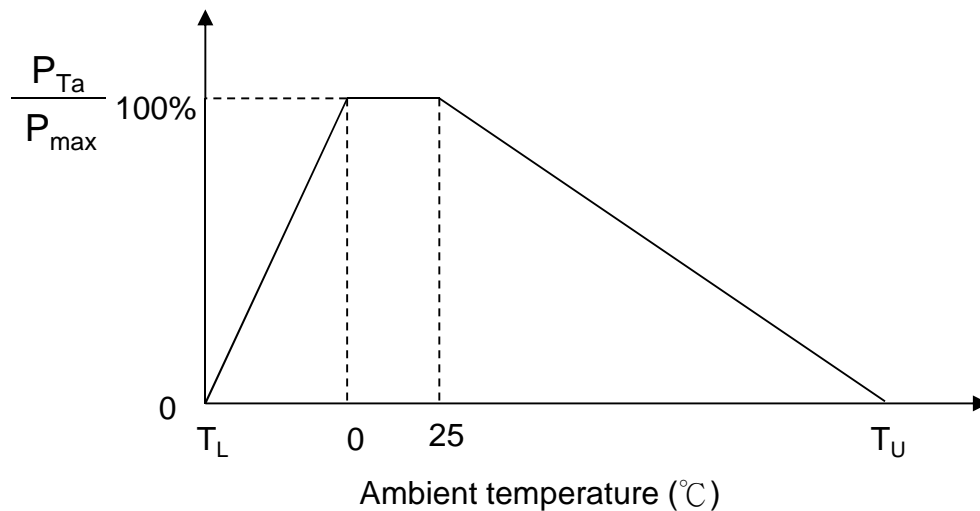


- Note 1 : $(1\sim 3)^{\circ}\text{C/sec}$
 Note 2 : Approx. 200°C/sec
 Note 3 : $5^{\circ}\text{C/sec Max}$

Recommended Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	$360^{\circ}\text{C (max.)}$
Soldering Time	3 sec (max.)
Distance from Thermistor	2 mm (min.)

Max. Power Dissipation Derating Curve



Note: T_L = Minimum operating temperature (°C)

T_U = Maximum operating temperature (°C)

For example :

Ambient temperature(T_a)=55°C

Maximum operating temperature(T_u)=125°C

$P_{Ta} = (T_u - T_a) / (T_u - 25) \times P_{max} = 70\% P_{max}$

RoHS Compliant Declaration

We hereby declare that the components delivered to your company are compliant with RoHS directive 2011/65/EU.

Warehouse Storage Conditions of Products

(I) Storage Conditions :

- 1.Storage Temperature : -10°C ~+40°C
- 2.Relative Humidity : $\leq 75\%RH$
- 3.Keep away from corrosive atmosphere and sunlight

(II) Period of Storage : 1 year

Certificates

- (1) IATF 16949 certificate
- (2) ISO 9001 certificate

Test Report

- (1) RoHS test report
- (2) Halogen-free test report



R - T Table

Part No. : TTC3C474F4571W01

R25=470KOhm ±1%

B25/85 = 4570 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
-40	24964.3	23766.2	22623.3	-0.66	0.68	5.0%	-4.8%
-39	23191.3	22094.4	21047.2	-0.66	0.68	5.0%	-4.7%
-38	21559.5	20554.6	19594.6	-0.65	0.68	4.9%	-4.7%
-37	20055.0	19133.9	18253.4	-0.65	0.67	4.8%	-4.6%
-36	18665.7	17821.1	17013.0	-0.64	0.67	4.7%	-4.5%
-35	17381.2	16606.4	15864.6	-0.64	0.66	4.7%	-4.5%
-34	16192.4	15481.5	14800.3	-0.63	0.65	4.6%	-4.4%
-33	15091.4	14438.9	13813.2	-0.63	0.65	4.5%	-4.3%
-32	14071.0	13471.9	12897.1	-0.62	0.64	4.4%	-4.3%
-31	13124.7	12574.6	12046.4	-0.61	0.63	4.4%	-4.2%
-30	12246.8	11741.6	11256.0	-0.61	0.63	4.3%	-4.1%
-29	11432.0	10967.8	10521.4	-0.60	0.62	4.2%	-4.1%
-28	10675.4	10248.9	9838.45	-0.59	0.61	4.2%	-4.0%
-27	9972.67	9580.70	9203.21	-0.59	0.61	4.1%	-3.9%
-26	9319.72	8959.41	8612.18	-0.58	0.60	4.0%	-3.9%
-25	8712.83	8381.57	8062.10	-0.57	0.59	4.0%	-3.8%
-24	8148.56	7843.96	7549.98	-0.57	0.59	3.9%	-3.7%
-23	7623.76	7343.61	7073.05	-0.56	0.58	3.8%	-3.7%
-22	7135.49	6877.79	6628.74	-0.55	0.57	3.7%	-3.6%
-21	6681.07	6443.98	6214.68	-0.55	0.57	3.7%	-3.6%
-20	6258.00	6039.84	5828.69	-0.54	0.56	3.6%	-3.5%
-19	5863.99	5663.20	5468.75	-0.53	0.55	3.5%	-3.4%
-18	5496.91	5312.09	5132.97	-0.53	0.55	3.5%	-3.4%
-17	5154.79	4984.64	4819.63	-0.52	0.54	3.4%	-3.3%
-16	4835.82	4679.16	4527.13	-0.51	0.53	3.3%	-3.2%
-15	4538.33	4394.07	4253.97	-0.51	0.53	3.3%	-3.2%
-14	4260.76	4127.90	3998.79	-0.50	0.52	3.2%	-3.1%
-13	4001.69	3879.32	3760.31	-0.49	0.51	3.2%	-3.1%
-12	3759.79	3647.07	3537.37	-0.49	0.51	3.1%	-3.0%
-11	3533.84	3429.99	3328.87	-0.48	0.50	3.0%	-2.9%
-10	3322.70	3227.02	3133.79	-0.47	0.49	3.0%	-2.9%
-9	3125.33	3037.18	2951.22	-0.46	0.48	2.9%	-2.8%
-8	2940.76	2859.54	2780.28	-0.46	0.48	2.8%	-2.8%
-7	2768.09	2693.25	2620.18	-0.45	0.47	2.8%	-2.7%
-6	2606.50	2537.54	2470.16	-0.44	0.46	2.7%	-2.7%
-5	2455.22	2391.68	2329.55	-0.44	0.45	2.7%	-2.6%
-4	2313.54	2254.99	2197.70	-0.43	0.45	2.6%	-2.5%
-3	2180.79	2126.85	2074.03	-0.42	0.44	2.5%	-2.5%
-2	2056.38	2006.68	1957.98	-0.41	0.43	2.5%	-2.4%
-1	1939.72	1893.94	1849.05	-0.41	0.42	2.4%	-2.4%



R - T Table

Part No. : TTC3C474F4571W01

R25=470KOhm ±1%

B25/85 = 4570 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
0	1830.31	1788.14	1746.76	-0.40	0.42	2.4%	-2.3%
1	1727.65	1688.81	1650.67	-0.39	0.41	2.3%	-2.3%
2	1631.30	1595.52	1560.38	-0.38	0.40	2.2%	-2.2%
3	1540.82	1507.89	1475.51	-0.38	0.39	2.2%	-2.1%
4	1455.84	1425.52	1395.70	-0.37	0.39	2.1%	-2.1%
5	1376.00	1348.09	1320.62	-0.36	0.38	2.1%	-2.0%
6	1300.95	1275.27	1249.98	-0.35	0.37	2.0%	-2.0%
7	1230.38	1206.77	1183.49	-0.34	0.36	2.0%	-1.9%
8	1164.01	1142.30	1120.88	-0.34	0.35	1.9%	-1.9%
9	1101.57	1081.61	1061.91	-0.33	0.34	1.8%	-1.8%
10	1042.80	1024.46	1006.34	-0.32	0.34	1.8%	-1.8%
11	987.462	970.621	953.971	-0.31	0.33	1.7%	-1.7%
12	935.349	919.890	904.596	-0.30	0.32	1.7%	-1.7%
13	886.254	872.072	858.031	-0.30	0.31	1.6%	-1.6%
14	839.988	826.985	814.102	-0.29	0.30	1.6%	-1.6%
15	796.373	784.459	772.646	-0.28	0.29	1.5%	-1.5%
16	755.245	744.337	733.514	-0.27	0.29	1.5%	-1.5%
17	716.450	706.471	696.562	-0.26	0.28	1.4%	-1.4%
18	679.845	670.724	661.660	-0.26	0.27	1.4%	-1.4%
19	645.296	636.967	628.684	-0.25	0.26	1.3%	-1.3%
20	612.677	605.080	597.518	-0.24	0.25	1.3%	-1.2%
21	581.871	574.950	568.055	-0.23	0.24	1.2%	-1.2%
22	552.770	546.473	540.193	-0.22	0.23	1.2%	-1.1%
23	525.270	519.549	513.838	-0.21	0.22	1.1%	-1.1%
24	499.277	494.087	488.901	-0.20	0.22	1.1%	-1.0%
25	474.700	470.000	465.300	-0.20	0.21	1.0%	-1.0%
26	451.905	447.208	442.516	-0.21	0.22	1.1%	-1.0%
27	430.318	425.636	420.962	-0.22	0.23	1.1%	-1.1%
28	409.871	405.211	400.565	-0.23	0.24	1.1%	-1.1%
29	390.497	385.869	381.258	-0.24	0.25	1.2%	-1.2%
30	372.135	367.546	362.977	-0.25	0.26	1.2%	-1.2%
31	354.729	350.184	345.664	-0.26	0.27	1.3%	-1.3%
32	338.222	333.729	329.262	-0.27	0.29	1.3%	-1.3%
33	322.566	318.128	313.720	-0.28	0.30	1.4%	-1.4%
34	307.712	303.334	298.988	-0.30	0.31	1.4%	-1.4%
35	293.615	289.301	285.021	-0.31	0.32	1.5%	-1.5%
36	280.234	275.986	271.775	-0.32	0.33	1.5%	-1.5%
37	267.528	263.349	259.210	-0.33	0.35	1.6%	-1.6%
38	255.461	251.354	247.288	-0.34	0.36	1.6%	-1.6%
39	243.998	239.963	235.972	-0.35	0.37	1.7%	-1.7%



R - T Table

Part No. : TTC3C474F4571W01

R25=470KOhm ±1%

B25/85 = 4570 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
40	233.105	229.145	225.230	-0.37	0.38	1.7%	-1.7%
41	222.752	218.868	215.029	-0.38	0.39	1.8%	-1.8%
42	212.910	209.101	205.340	-0.39	0.41	1.8%	-1.8%
43	203.550	199.818	196.135	-0.40	0.42	1.9%	-1.8%
44	194.648	190.993	187.388	-0.41	0.43	1.9%	-1.9%
45	186.178	182.600	179.073	-0.43	0.44	2.0%	-1.9%
46	178.118	174.617	171.168	-0.44	0.45	2.0%	-2.0%
47	170.446	167.022	163.650	-0.45	0.47	2.1%	-2.0%
48	163.142	159.793	156.498	-0.46	0.48	2.1%	-2.1%
49	156.186	152.913	149.694	-0.48	0.49	2.1%	-2.1%
50	149.561	146.362	143.218	-0.49	0.50	2.2%	-2.1%
51	143.248	140.124	137.054	-0.50	0.52	2.2%	-2.2%
52	137.232	134.181	131.184	-0.51	0.53	2.3%	-2.2%
53	131.498	128.519	125.595	-0.53	0.54	2.3%	-2.3%
54	126.031	123.123	120.270	-0.54	0.55	2.4%	-2.3%
55	120.818	117.979	115.196	-0.55	0.57	2.4%	-2.4%
56	115.845	113.075	110.361	-0.56	0.58	2.4%	-2.4%
57	111.101	108.399	105.752	-0.58	0.59	2.5%	-2.4%
58	106.573	103.938	101.357	-0.59	0.61	2.5%	-2.5%
59	102.252	99.6815	97.1661	-0.60	0.62	2.6%	-2.5%
60	98.1261	95.6198	93.1682	-0.62	0.63	2.6%	-2.6%
61	94.1866	91.7429	89.3537	-0.63	0.65	2.7%	-2.6%
62	90.4239	88.0415	85.7134	-0.64	0.66	2.7%	-2.6%
63	86.8293	84.5070	82.2386	-0.66	0.67	2.7%	-2.7%
64	83.3945	81.1311	78.9211	-0.67	0.69	2.8%	-2.7%
65	80.1119	77.9059	75.7531	-0.68	0.70	2.8%	-2.8%
66	76.9739	74.8241	72.7270	-0.70	0.71	2.9%	-2.8%
67	73.9735	71.8786	69.8361	-0.71	0.73	2.9%	-2.8%
68	71.1041	69.0629	67.0736	-0.72	0.74	3.0%	-2.9%
69	68.3595	66.3707	64.4333	-0.74	0.75	3.0%	-2.9%
70	65.7336	63.7960	61.9092	-0.75	0.77	3.0%	-3.0%
71	63.2209	61.3331	59.4958	-0.77	0.78	3.1%	-3.0%
72	60.8158	58.9768	57.1876	-0.78	0.79	3.1%	-3.0%
73	58.5135	56.7219	54.9797	-0.79	0.81	3.2%	-3.1%
74	56.3089	54.5637	52.8673	-0.81	0.82	3.2%	-3.1%
75	54.1976	52.4976	50.8458	-0.82	0.83	3.2%	-3.1%
76	52.1752	50.5192	48.9108	-0.84	0.85	3.3%	-3.2%
77	50.2376	48.6245	47.0584	-0.85	0.86	3.3%	-3.2%
78	48.3808	46.8095	45.2847	-0.87	0.88	3.4%	-3.3%
79	46.6012	45.0706	43.5859	-0.88	0.89	3.4%	-3.3%



R - T Table

Part No. : TTC3C474F4571W01

R25=470KOhm ±1%

B25/85 = 4570 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol.		Resistance Tol.	
				(°C)		(%)	
80	44.8951	43.4042	41.9587	-0.89	0.91	3.4%	-3.3%
81	43.2593	41.8071	40.3996	-0.91	0.92	3.5%	-3.4%
82	41.6906	40.2760	38.9055	-0.92	0.93	3.5%	-3.4%
83	40.1859	38.8079	37.4735	-0.94	0.95	3.6%	-3.4%
84	38.7423	37.4000	36.1006	-0.95	0.96	3.6%	-3.5%
85	37.3571	36.0495	34.7843	-0.97	0.98	3.6%	-3.5%
86	36.0277	34.7539	33.5219	-0.98	0.99	3.7%	-3.5%
87	34.7516	33.5107	32.3110	-1.00	1.01	3.7%	-3.6%
88	33.5264	32.3176	31.1492	-1.01	1.02	3.7%	-3.6%
89	32.3499	31.1723	30.0345	-1.03	1.03	3.8%	-3.6%
90	31.2200	30.0727	28.9646	-1.04	1.05	3.8%	-3.7%
91	30.1345	29.0167	27.9376	-1.06	1.06	3.9%	-3.7%
92	29.0917	28.0026	26.9516	-1.07	1.08	3.9%	-3.8%
93	28.0896	27.0284	26.0048	-1.09	1.09	3.9%	-3.8%
94	27.1264	26.0925	25.0954	-1.10	1.11	4.0%	-3.8%
95	26.2005	25.1930	24.2219	-1.12	1.12	4.0%	-3.9%
96	25.3103	24.3286	23.3826	-1.14	1.14	4.0%	-3.9%
97	24.4543	23.4976	22.5761	-1.15	1.15	4.1%	-3.9%
98	23.6310	22.6987	21.8009	-1.17	1.17	4.1%	-4.0%
99	22.8391	21.9304	21.0558	-1.18	1.18	4.1%	-4.0%
100	22.0771	21.1915	20.3394	-1.20	1.20	4.2%	-4.0%
101	21.3439	20.4807	19.6504	-1.21	1.21	4.2%	-4.1%
102	20.6382	19.7968	18.9879	-1.23	1.23	4.3%	-4.1%
103	19.9590	19.1388	18.3505	-1.25	1.24	4.3%	-4.1%
104	19.3050	18.5055	17.7373	-1.26	1.26	4.3%	-4.2%
105	18.6753	17.8959	17.1472	-1.28	1.28	4.4%	-4.2%
106	18.0688	17.3089	16.5793	-1.29	1.29	4.4%	-4.2%
107	17.4847	16.7438	16.0327	-1.31	1.31	4.4%	-4.2%
108	16.9219	16.1996	15.5064	-1.33	1.32	4.5%	-4.3%
109	16.3797	15.6753	14.9997	-1.34	1.34	4.5%	-4.3%
110	15.8572	15.1703	14.5117	-1.36	1.35	4.5%	-4.3%
111	15.3536	14.6837	14.0417	-1.38	1.37	4.6%	-4.4%
112	14.8681	14.2148	13.5888	-1.39	1.39	4.6%	-4.4%
113	14.4000	13.7629	13.1525	-1.41	1.40	4.6%	-4.4%
114	13.9487	13.3272	12.7321	-1.43	1.42	4.7%	-4.5%
115	13.5134	12.9072	12.3269	-1.44	1.43	4.7%	-4.5%
116	13.0936	12.5022	11.9363	-1.46	1.45	4.7%	-4.5%
117	12.6885	12.1116	11.5597	-1.48	1.46	4.8%	-4.6%
118	12.2977	11.7348	11.1966	-1.49	1.48	4.8%	-4.6%
119	11.9206	11.3714	10.8464	-1.51	1.50	4.8%	-4.6%

