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SPECIFICATION FOR APPROVAL

CUSTOMER	ELECTRONICA ELEMEN SOCIEDAD ANONIMA
MODEL NO.	TCD5B221
PART NO.	TCD5B221J3505BA (RoHS)
APPLICATION	
CUSTOMER P/N	
ISSUE DATE	AUG. 24, 2006
REV. NO	KR1
REV. DATE	SEP. 06, 2006

FOR CUSTOMER APPROVAL	CHECKED BY
	<i>Shu Ling Fu</i>
	APPROVED BY
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REVISED RECORD SHEET

REV. NO	REV. DATE	REVISED CONTENT
KR1	SEP. 06, 2006	Dimensions: D = $5 \pm 0.3 \rightarrow 4.8 \pm 0.3 \text{mm}$



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Part number codeExample : TCD5A561J3921B

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
T	C	D	5	A	5	6	1	J	3	9	2	1	B		

1 ~ 3 th digits : Product Type	
Code	Type
TCD	Thinking NTC Thermistor TCD Type

4 th digit : Body Size	
Code	Body Size
5	φ 5 mm

5 th digit : Define of B Value	
Code	Define
A	B _{25/85}
B	B _{25/50}

6 ~ 8 th digits : Zero Power Resistance at 25°C	
Code	R ₂₅
R ₂₅ < 10Ω	
4R5	4.5 Ω
9R0	9 Ω
R ₂₅ ≥ 10Ω	
470	47 Ω
561	560 Ω
103	10 KΩ

9 th digit : Tolerance of R ₂₅	
Code	Tolerance of R ₂₅
H	±3%
J	±5%
K	±10%

10 ~ 11 th digits : B Value First Two Digits	
Code	B Value First Two Digits
30	30
31	31
:	:
40	40
41	41
:	:

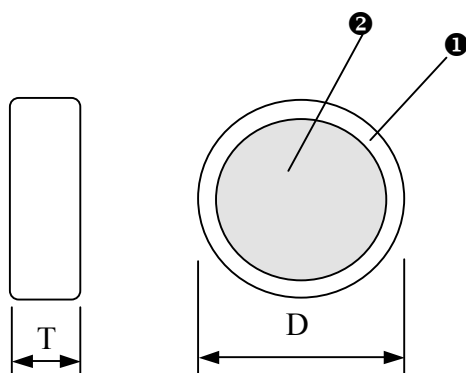
12 th digit : B Value Last Two Digits	
Code	B Value Last Two Digits
0	00
A	05
1	10
B	15
:	:
H	75
8	80
J	85
:	:

13 th digit : Tolerance of B Value	
Code	Tolerance of B Value
1	±1%
2	±2%
3	±3%

14 th digit : Packaging	
Code	Packaging
B	Bulk

15 ~ 16 th digits : Internal Control Code	
01 ~ZZ	

Structure and Dimensions



(unit : mm)

Disc size	D	T
φ 05	4.8 ± 0.3	1 ± 0.3

1、Ceramic Disc : NTC Thermistor

2、Electrode : Ag

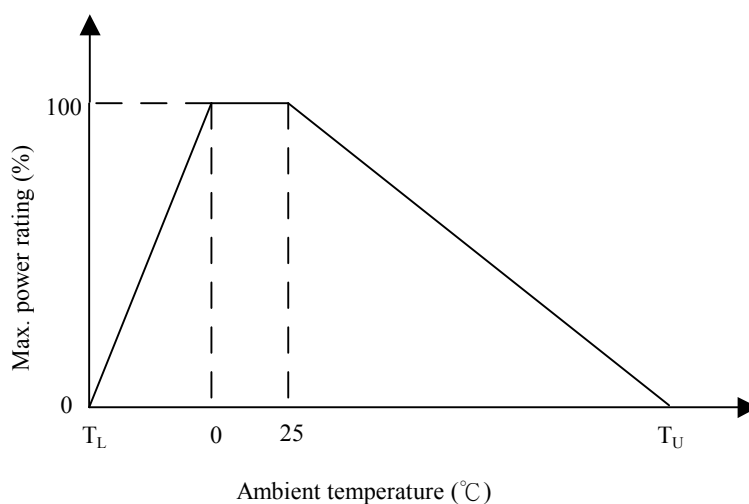
Electrical Characteristics

Part No.	Zero power resistance at 25°C (Ω)	Tolerance of resistance (± %)	B25/50 value (K)	Tolerance of B value (± %)	Max. power rating at 25°C (mW)	Thermal dissipation constant (mW/°C)	Thermal time Constant (sec.)	Operating temperature range (°C)
TCD5B221J3505BA	220	5	3500	5	180	3	30	-40 ~+155

Reliability

Item	Standard	Test conditions / Methods	Specifications															
High Temperature Storage	IEC68-2-2 UL1434	Tmax. $\pm 5^{\circ}\text{C}$, 1000 $\pm$ 24 hrs	No visible damage $\Delta R_{25}/R_{25}$ $\leq 3\%$															
Damp Heat	IEC68-2-3 UL1434	40 $\pm 2^{\circ}\text{C}$, 90 ~ 95 % RH , 500 $\pm$ 24 hrs	No visible damage $\Delta R_{25}/R_{25}$ $\leq 3\%$															
Thermal Shock	IEC68-2-14 UL1434	The thermal shock conditions shown below shall be repeated 100 cycles <table><tr><th>Step</th><th>Temperature ($^{\circ}\text{C}$)</th><th>Period (minutes)</th></tr><tr><td>1</td><td>-40 ± 5</td><td>30 ± 3</td></tr><tr><td>2</td><td>Room temperature</td><td>5 ± 3</td></tr><tr><td>3</td><td>155 ± 5</td><td>30 ± 3</td></tr><tr><td>4</td><td>Room temperature</td><td>5 ± 3</td></tr></table>	Step	Temperature ($^{\circ}\text{C}$)	Period (minutes)	1	-40 ± 5	30 ± 3	2	Room temperature	5 ± 3	3	155 ± 5	30 ± 3	4	Room temperature	5 ± 3	No visible damage $\Delta R_{25}/R_{25}$ $\leq 3\%$
Step	Temperature ($^{\circ}\text{C}$)	Period (minutes)																
1	-40 ± 5	30 ± 3																
2	Room temperature	5 ± 3																
3	155 ± 5	30 ± 3																
4	Room temperature	5 ± 3																
Life Test	CNS5550	25 $\pm 5^{\circ}\text{C}$, Pmax. , 1000 $\pm$ 24 hrs	No visible damage $\Delta R_{25}/R_{25}$ $\leq 3\%$															

Maximum power rating (P_{max})



Note: T_L = Minimum Temp. of Operating Temp. Range ($^{\circ}\text{C}$)

T_U = Maximum Temp. of Operating Temp. Range ($^{\circ}\text{C}$)

Restrictively used substances

We hereby guarantee the components that are delivered to your company has followed EC RoHS Directive (2002/95/EC) to ban all environment-related substances.

Storage condition of products

(I) Storage Conditions :

- 1.Storage Temperature : $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
- 2.Relative humidity : $\leq 75\% \text{RH}$
- 3.Thermistors must be kept away from sunlight and stored in a non-corrosive atmosphere.

(II) Period of Storage : 1 year



Certificates

- (1) QS9000 certificate
- (2) ISO9001 certificate

R - T TABLE

Part No. : TCD5B221J3505BA

R25 = 220 Ohm $\pm$ 5%

B25/50 = 3500 K $\pm$ 5%

Temperature (°C)	Rmax. (Ω)	Rnor. (Ω)	Rmin. (Ω)	Temperature Tol. (°C)		Resistance Tol. (%)	
-40	5,916.4	4,828.3	3,930.5	-3.85	3.36	22.5%	-18.6%
-39	5,572.9	4,561.0	3,723.5	-3.78	3.32	22.2%	-18.4%
-38	5,249.4	4,308.5	3,527.4	-3.73	3.28	21.8%	-18.1%
-37	4,945.2	4,070.4	3,341.9	-3.67	3.25	21.5%	-17.9%
-36	4,659.5	3,846.1	3,166.8	-3.63	3.22	21.1%	-17.7%
-35	4,391.4	3,635.1	3,001.5	-3.58	3.19	20.8%	-17.4%
-34	4,140.0	3,436.5	2,845.5	-3.54	3.17	20.5%	-17.2%
-33	3,904.1	3,249.8	2,698.4	-3.50	3.14	20.1%	-17.0%
-32	3,683.0	3,074.3	2,559.8	-3.47	3.12	19.8%	-16.7%
-31	3,475.6	2,909.2	2,429.0	-3.43	3.09	19.5%	-16.5%
-30	3,281.0	2,753.9	2,305.7	-3.39	3.07	19.1%	-16.3%
-29	3,098.6	2,607.8	2,189.3	-3.36	3.04	18.8%	-16.0%
-28	2,927.3	2,470.4	2,079.5	-3.32	3.02	18.5%	-15.8%
-27	2,766.5	2,341.0	1,975.9	-3.29	3.00	18.2%	-15.6%
-26	2,615.6	2,219.2	1,878.1	-3.25	2.97	17.9%	-15.4%
-25	2,473.8	2,104.4	1,785.7	-3.22	2.95	17.6%	-15.1%
-24	2,340.5	1,996.3	1,698.5	-3.18	2.92	17.2%	-14.9%
-23	2,215.2	1,894.4	1,616.0	-3.15	2.90	16.9%	-14.7%
-22	2,097.4	1,798.3	1,538.0	-3.11	2.87	16.6%	-14.5%
-21	1,986.5	1,707.7	1,464.3	-3.08	2.85	16.3%	-14.3%
-20	1,882.2	1,622.1	1,394.5	-3.04	2.82	16.0%	-14.0%
-19	1,784.0	1,541.4	1,328.5	-3.00	2.79	15.7%	-13.8%
-18	1,691.5	1,465.2	1,266.0	-2.97	2.77	15.4%	-13.6%
-17	1,604.3	1,393.2	1,206.9	-2.93	2.74	15.2%	-13.4%
-16	1,522.2	1,325.2	1,150.8	-2.90	2.71	14.9%	-13.2%
-15	1,444.8	1,260.9	1,097.7	-2.86	2.69	14.6%	-12.9%
-14	1,371.7	1,200.2	1,047.4	-2.82	2.66	14.3%	-12.7%
-13	1,302.9	1,142.7	999.73	-2.79	2.63	14.0%	-12.5%
-12	1,237.9	1,088.3	954.49	-2.75	2.60	13.7%	-12.3%
-11	1,176.5	1,036.9	911.59	-2.71	2.57	13.5%	-12.1%
-10	1,118.6	988.22	870.87	-2.68	2.55	13.2%	-11.9%
-9	1,063.8	942.12	832.23	-2.64	2.52	12.9%	-11.7%
-8	1,012.1	898.45	795.55	-2.60	2.49	12.7%	-11.5%
-7	963.26	857.09	760.71	-2.57	2.46	12.4%	-11.2%
-6	917.05	817.88	727.61	-2.53	2.43	12.1%	-11.0%
-5	873.34	780.71	696.16	-2.49	2.40	11.9%	-10.8%
-4	831.99	745.47	666.27	-2.45	2.37	11.6%	-10.6%
-3	792.85	712.03	637.85	-2.42	2.34	11.4%	-10.4%
-2	755.80	680.30	610.82	-2.38	2.31	11.1%	-10.2%
-1	720.70	650.18	585.10	-2.34	2.28	10.8%	-10.0%

R - T TABLE

Part No. : TCD5B221J3505BA

R25 = 220 Ohm $\pm$ 5%B25/50 = 3500 K $\pm$ 5%

Temperature (°C)	Rmax. (Ω)	Rnor. (Ω)	Rmin. (Ω)	Temperature Tol. (°C)		Resistance Tol. (%)	
0	687.46	621.59	560.62	-2.30	2.24	10.6%	-9.8%
1	655.94	594.42	537.32	-2.26	2.21	10.4%	-9.6%
2	626.07	568.61	515.13	-2.23	2.18	10.1%	-9.4%
3	597.74	544.08	493.99	-2.19	2.15	9.9%	-9.2%
4	570.86	520.75	473.85	-2.15	2.11	9.6%	-9.0%
5	545.35	498.56	454.65	-2.11	2.08	9.4%	-8.8%
6	521.13	477.45	436.34	-2.07	2.05	9.1%	-8.6%
7	498.13	457.36	418.88	-2.03	2.01	8.9%	-8.4%
8	476.28	438.24	402.22	-1.99	1.98	8.7%	-8.2%
9	455.51	420.02	386.32	-1.95	1.94	8.5%	-8.0%
10	435.77	402.67	371.14	-1.91	1.91	8.2%	-7.8%
11	417.00	386.13	356.65	-1.87	1.87	8.0%	-7.6%
12	399.14	370.36	342.80	-1.83	1.83	7.8%	-7.4%
13	382.14	355.33	329.56	-1.78	1.80	7.5%	-7.3%
14	365.96	340.98	316.91	-1.74	1.76	7.3%	-7.1%
15	350.56	327.30	304.82	-1.70	1.72	7.1%	-6.9%
16	335.89	314.24	293.25	-1.66	1.68	6.9%	-6.7%
17	321.90	301.77	282.19	-1.61	1.64	6.7%	-6.5%
18	308.58	289.86	271.60	-1.57	1.61	6.5%	-6.3%
19	295.87	278.48	261.46	-1.53	1.57	6.2%	-6.1%
20	283.76	267.61	251.75	-1.49	1.53	6.0%	-5.9%
21	272.20	257.22	242.46	-1.44	1.49	5.8%	-5.7%
22	261.17	247.29	233.55	-1.40	1.45	5.6%	-5.6%
23	250.65	237.78	225.02	-1.35	1.40	5.4%	-5.4%
24	240.60	228.70	216.84	-1.31	1.36	5.2%	-5.2%
25	231.00	220.00	209.00	-1.26	1.32	5.0%	-5.0%
26	222.69	211.68	200.71	-1.32	1.38	5.2%	-5.2%
27	214.72	203.71	192.78	-1.38	1.43	5.4%	-5.4%
28	207.07	196.08	185.21	-1.44	1.49	5.6%	-5.5%
29	199.74	188.77	177.97	-1.50	1.54	5.8%	-5.7%
30	192.69	181.78	171.05	-1.56	1.60	6.0%	-5.9%
31	185.93	175.07	164.43	-1.62	1.66	6.2%	-6.1%
32	179.44	168.64	158.09	-1.68	1.71	6.4%	-6.3%
33	173.21	162.48	152.04	-1.74	1.77	6.6%	-6.4%
34	167.22	156.57	146.24	-1.80	1.82	6.8%	-6.6%
35	161.47	150.91	140.69	-1.86	1.88	7.0%	-6.8%
36	155.94	145.48	135.38	-1.93	1.94	7.2%	-6.9%
37	150.63	140.27	130.29	-1.99	2.00	7.4%	-7.1%
38	145.53	135.27	125.42	-2.05	2.05	7.6%	-7.3%
39	140.62	130.47	120.75	-2.12	2.11	7.8%	-7.4%

R - T TABLE

Part No. : TCD5B221J3505BA

R25 = 220 Ohm $\pm$ 5%B25/50 = 3500 K $\pm$ 5%

Temperature (°C)	Rmax. (Ω)	Rnor. (Ω)	Rmin. (Ω)	Temperature Tol. (°C)		Resistance Tol. (%)	
40	135.90	125.86	116.28	-2.18	2.17	8.0%	-7.6%
41	131.36	121.44	111.99	-2.24	2.23	8.2%	-7.8%
42	126.99	117.19	107.88	-2.31	2.28	8.4%	-7.9%
43	122.79	113.12	103.95	-2.37	2.34	8.6%	-8.1%
44	118.75	109.20	100.17	-2.44	2.40	8.7%	-8.3%
45	114.86	105.44	96.549	-2.50	2.46	8.9%	-8.4%
46	111.11	101.82	93.077	-2.57	2.52	9.1%	-8.6%
47	107.51	98.350	89.746	-2.64	2.58	9.3%	-8.7%
48	104.04	95.011	86.550	-2.70	2.64	9.5%	-8.9%
49	100.70	91.802	83.483	-2.77	2.70	9.7%	-9.1%
50	97.481	88.717	80.540	-2.84	2.76	9.9%	-9.2%
51	94.381	85.751	77.714	-2.91	2.82	10.1%	-9.4%
52	91.396	82.898	75.002	-2.98	2.88	10.3%	-9.5%
53	88.519	80.153	72.397	-3.05	2.94	10.4%	-9.7%
54	85.747	77.514	69.895	-3.12	3.00	10.6%	-9.8%
55	83.076	74.974	67.493	-3.19	3.06	10.8%	-10.0%
56	80.501	72.530	65.184	-3.26	3.12	11.0%	-10.1%
57	78.018	70.177	62.966	-3.33	3.18	11.2%	-10.3%
58	75.625	67.913	60.835	-3.41	3.25	11.4%	-10.4%
59	73.317	65.733	58.786	-3.48	3.31	11.5%	-10.6%
60	71.092	63.634	56.817	-3.55	3.37	11.7%	-10.7%
61	68.945	61.613	54.924	-3.63	3.44	11.9%	-10.9%
62	66.874	59.667	53.103	-3.70	3.50	12.1%	-11.0%
63	64.876	57.792	51.352	-3.78	3.56	12.3%	-11.1%
64	62.947	55.985	49.668	-3.85	3.63	12.4%	-11.3%
65	61.087	54.244	48.048	-3.93	3.69	12.6%	-11.4%
66	59.290	52.567	46.489	-4.01	3.76	12.8%	-11.6%
67	57.556	50.950	44.988	-4.09	3.82	13.0%	-11.7%
68	55.882	49.391	43.544	-4.16	3.89	13.1%	-11.8%
69	54.266	47.888	42.154	-4.24	3.96	13.3%	-12.0%
70	52.704	46.439	40.816	-4.32	4.02	13.5%	-12.1%
71	51.196	45.041	39.527	-4.40	4.09	13.7%	-12.2%
72	49.739	43.693	38.285	-4.48	4.16	13.8%	-12.4%
73	48.331	42.392	37.089	-4.57	4.23	14.0%	-12.5%
74	46.971	41.137	35.937	-4.65	4.29	14.2%	-12.6%
75	45.656	39.926	34.827	-4.73	4.36	14.4%	-12.8%
76	44.385	38.757	33.757	-4.81	4.43	14.5%	-12.9%
77	43.157	37.628	32.726	-4.90	4.50	14.7%	-13.0%
78	41.969	36.539	31.732	-4.98	4.57	14.9%	-13.2%
79	40.820	35.487	30.773	-5.07	4.64	15.0%	-13.3%



R - T TABLE

Part No. : TCD5B221J3505BA

R25 =220 Ohm $\pm$ 5%B25/50 = 3500 K $\pm$ 5%

Temperature (°C)	Rmax. (Ω)	Rnor. (Ω)	Rmin. (Ω)	Temperature Tol. (°C)		Resistance Tol. (%)	
80	39.709	34.471	29.849	-5.16	4.71	15.2%	-13.4%
81	38.634	33.489	28.957	-5.24	4.78	15.4%	-13.5%
82	37.594	32.541	28.096	-5.33	4.85	15.5%	-13.7%
83	36.587	31.624	27.266	-5.42	4.92	15.7%	-13.8%
84	35.614	30.739	26.465	-5.50	4.99	15.9%	-13.9%
85	34.671	29.883	25.692	-5.59	5.07	16.0%	-14.0%
86	33.758	29.056	24.946	-5.68	5.14	16.2%	-14.1%
87	32.875	28.256	24.225	-5.77	5.21	16.3%	-14.3%
88	32.019	27.482	23.529	-5.86	5.28	16.5%	-14.4%
89	31.190	26.734	22.857	-5.96	5.36	16.7%	-14.5%
90	30.387	26.010	22.208	-6.05	5.43	16.8%	-14.6%
91	29.610	25.310	21.580	-6.14	5.50	17.0%	-14.7%
92	28.856	24.632	20.974	-6.23	5.58	17.1%	-14.9%
93	28.126	23.976	20.388	-6.33	5.65	17.3%	-15.0%
94	27.418	23.342	19.822	-6.42	5.73	17.5%	-15.1%
95	26.732	22.727	19.274	-6.52	5.80	17.6%	-15.2%
96	26.066	22.132	18.744	-6.61	5.88	17.8%	-15.3%
97	25.421	21.556	18.232	-6.71	5.95	17.9%	-15.4%
98	24.795	20.997	17.737	-6.80	6.03	18.1%	-15.5%
99	24.188	20.457	17.258	-6.90	6.11	18.2%	-15.6%
100	23.599	19.933	16.794	-7.00	6.18	18.4%	-15.7%
101	23.028	19.425	16.345	-7.10	6.26	18.5%	-15.9%
102	22.473	18.933	15.910	-7.19	6.34	18.7%	-16.0%
103	21.935	18.456	15.490	-7.29	6.41	18.9%	-16.1%
104	21.413	17.993	15.083	-7.39	6.49	19.0%	-16.2%
105	20.905	17.545	14.688	-7.49	6.57	19.2%	-16.3%
106	20.413	17.110	14.306	-7.59	6.65	19.3%	-16.4%
107	19.934	16.688	13.936	-7.70	6.73	19.5%	-16.5%
108	19.470	16.279	13.577	-7.80	6.80	19.6%	-16.6%
109	19.018	15.882	13.230	-7.90	6.88	19.7%	-16.7%
110	18.580	15.497	12.893	-8.00	6.96	19.9%	-16.8%
111	18.154	15.123	12.567	-8.10	7.04	20.0%	-16.9%
112	17.739	14.760	12.250	-8.21	7.12	20.2%	-17.0%
113	17.337	14.407	11.943	-8.31	7.20	20.3%	-17.1%
114	16.945	14.065	11.646	-8.42	7.28	20.5%	-17.2%
115	16.565	13.733	11.357	-8.52	7.36	20.6%	-17.3%
116	16.195	13.410	11.077	-8.63	7.44	20.8%	-17.4%
117	15.835	13.097	10.805	-8.73	7.52	20.9%	-17.5%
118	15.485	12.792	10.541	-8.84	7.60	21.0%	-17.6%
119	15.144	12.496	10.285	-8.95	7.69	21.2%	-17.7%



R - T TABLE

Part No. : TCD5B221J3505BA

R25 =220 Ohm $\pm$ 5%B25/50 = 3500 K $\pm$ 5%

Temperature (°C)	Rmax. (Ω)	Rnor. (Ω)	Rmin. (Ω)	Temperature Tol. (°C)		Resistance Tol. (%)	
120	14.813	12.209	10.037	-9.05	7.77	21.3%	-17.8%
121	14.490	11.929	9.7957	-9.16	7.85	21.5%	-17.9%
122	14.177	11.657	9.5615	-9.27	7.93	21.6%	-18.0%
123	13.871	11.393	9.3341	-9.38	8.01	21.8%	-18.1%
124	13.574	11.136	9.1132	-9.49	8.10	21.9%	-18.2%
125	13.284	10.886	8.8986	-9.60	8.18	22.0%	-18.3%
126	13.003	10.643	8.6902	-9.71	8.26	22.2%	-18.4%
127	12.728	10.407	8.4877	-9.82	8.35	22.3%	-18.4%
128	12.461	10.177	8.2909	-9.93	8.43	22.4%	-18.5%
129	12.200	9.9532	8.0996	-10.04	8.51	22.6%	-18.6%
130	11.947	9.7355	7.9137	-10.16	8.60	22.7%	-18.7%
131	11.700	9.5236	7.7329	-10.27	8.68	22.8%	-18.8%
132	11.459	9.3173	7.5572	-10.38	8.77	23.0%	-18.9%
133	11.224	9.1166	7.3863	-10.50	8.85	23.1%	-19.0%
134	10.995	8.9211	7.2201	-10.61	8.94	23.3%	-19.1%
135	10.772	8.7308	7.0585	-10.73	9.02	23.4%	-19.2%
136	10.555	8.5455	6.9012	-10.84	9.11	23.5%	-19.2%
137	10.343	8.3650	6.7483	-10.96	9.20	23.6%	-19.3%
138	10.137	8.1892	6.5994	-11.08	9.28	23.8%	-19.4%
139	9.9351	8.0180	6.4546	-11.20	9.37	23.9%	-19.5%
140	9.7386	7.8511	6.3137	-11.31	9.46	24.0%	-19.6%
141	9.5470	7.6886	6.1765	-11.43	9.55	24.2%	-19.7%
142	9.3600	7.5302	6.0430	-11.55	9.64	24.3%	-19.8%
143	9.1777	7.3759	5.9130	-11.67	9.72	24.4%	-19.8%
144	8.9997	7.2254	5.7864	-11.79	9.81	24.6%	-19.9%
145	8.8262	7.0788	5.6632	-11.92	9.90	24.7%	-20.0%
146	8.6568	6.9359	5.5432	-12.04	9.99	24.8%	-20.1%
147	8.4914	6.7965	5.4263	-12.16	10.09	24.9%	-20.2%
148	8.3301	6.6606	5.3124	-12.29	10.18	25.1%	-20.2%
149	8.1726	6.5282	5.2016	-12.41	10.27	25.2%	-20.3%
150	8.0189	6.3990	5.0935	-12.54	10.36	25.3%	-20.4%
151	7.8688	6.2730	4.9883	-12.67	10.45	25.4%	-20.5%
152	7.7223	6.1501	4.8857	-12.79	10.55	25.6%	-20.6%
153	7.5793	6.0302	4.7858	-12.92	10.64	25.7%	-20.6%
154	7.4396	5.9133	4.6884	-13.05	10.74	25.8%	-20.7%
155	7.3032	5.7992	4.5935	-13.18	10.83	25.9%	-20.8%