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**SPECIFICATION FOR APPROVAL**

CUSTOMER	Codico
CERTIFIED MODEL/TYPE	TSM2A684
PART NO.	TSM2A684J4503RE (RoHS+HF)
APPLICATION	
CUSTOMER P/N	
ISSUE DATE	Mar. 11, 2016
REV. NO.	
REV. DATE	

FOR CUSTOMER APPROVAL	CHECKED BY
	<i>Shu Ling Fu</i>
	APPROVED BY
	<i>Chun Chu Tu</i>





REVISED RECORD SHEET

REV. NO	REV. DATE	REVISED CONTENT



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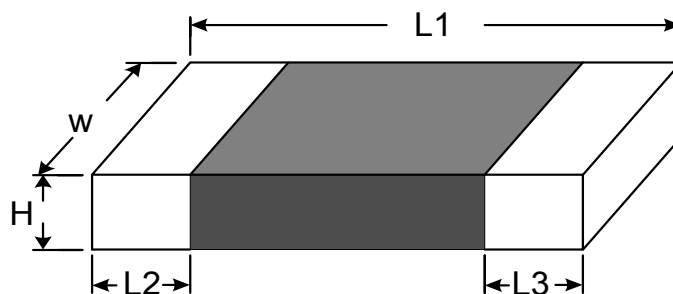
Part Number Code

Example :

TSM **2** **A** **684** **J** **450** **3** **R** **E**
(1) (2) (3) (4) (5) (6) (7) (8) (9)

No.	Item	Digit	Specification
(1)	Product Type	TSM	Thinking NTC thermistor TSM type
(2)	Size (EIA)	2	0805
(3)	Definition of B Value	A	B _{25/85}
(4)	Zero Power Resistance at 25°C (R ₂₅)	684	68 x 10 ⁴ Ω = 680 KΩ
(5)	Tolerance of R ₂₅	J	± 5%
(6)	B Value	450	4500K
(7)	Tolerance of B Value	3	± 3%
(8)	Packaging	R	Reel
(9)	Optional Suffix	E	RoHS+HF compliance

Structure and Dimensions



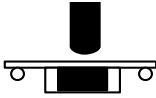
(unit : mm)

L1	W	H max.	L2 and L3
2.00±0.20	1.25±0.20	1.00	0.40±0.20

Electrical Characteristics

Part No.	Zero Power Resistance at 25°C	Tolerance of R ₂₅	B _{25/85} Value	Tolerance of B Value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Operating Temperature Range
	R ₂₅ (KΩ)	(± %)	(K)	(± %)	P _{max} (mW)	δ (mW/°C)	τ (sec.)	T _L ~T _U (°C)
TSM2A684J4503RE	680	5	4500	3	100	Approx. 2.4	Approx. 5.4	-40 ~ +125

Reliability

Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp : 2mm ; Speed < 0.5mm/sec. Duration : 10 sec on PCB. 	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$															
Solderability	IEC60068-2-58	245 ± 5°C , 3 ± 0.3 sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC60068-2-58	260 ± 5°C , 10 ± 1 sec	No visible damage $ \Delta R_{25}/R_{25} \leq 3\%$															
High Temperature Storage	IEC60068-2-2	125 ± 5°C , 1000 ± 24 hrs	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$															
Damp Heat, Steady State	IEC60068-2-78	40 ± 2°C , 90 ~ 95 % RH , 1000 ± 24 hrs	No visible damage $ \Delta R_{25}/R_{25} \leq 3\%$															
Rapid Change of Temperature	IEC60068-2-14	The conditions shown below shall be repeated 5 cycles on PCB <table border="1" data-bbox="523 1220 1168 1534"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <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>125 ± 5</td> <td>30 ± 3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>5 ± 3</td> </tr> </tbody> </table>	Step	Temperature (°C)	Period (minutes)	1	-40 ± 5	30 ± 3	2	Room temperature	5 ± 3	3	125 ± 5	30 ± 3	4	Room temperature	5 ± 3	No visible damage $ \Delta R_{25}/R_{25} \leq 3\%$
Step	Temperature (°C)	Period (minutes)																
1	-40 ± 5	30 ± 3																
2	Room temperature	5 ± 3																
3	125 ± 5	30 ± 3																
4	Room temperature	5 ± 3																
Max. Power Dissipation	IEC60539-1 4.26.3	25 ± 5°C , P _{max.} , 1000 ± 24 hrs	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$															

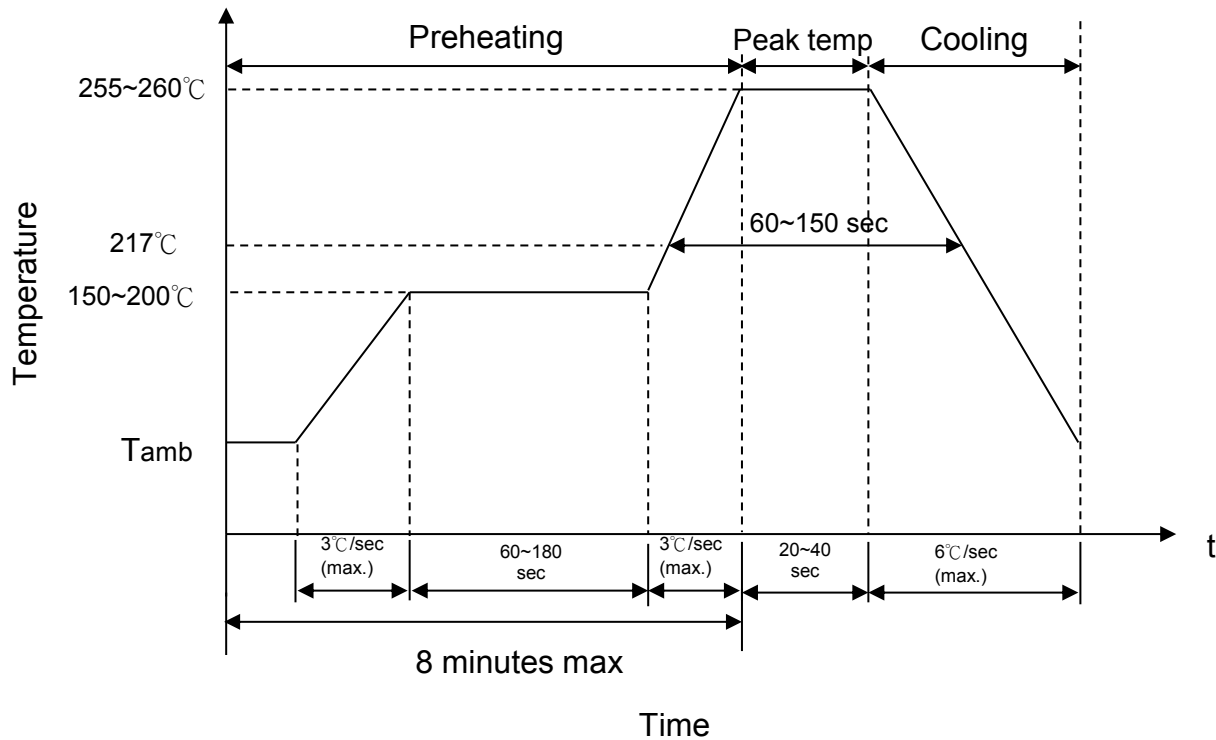
Products have been tested at Thinking Electronic

Industrial Co.,Ltd. Laboratory recognized by UL (Underwriters Laboratories Inc.) under CTRP

(Client Test Data Program).

Soldering Recommendation

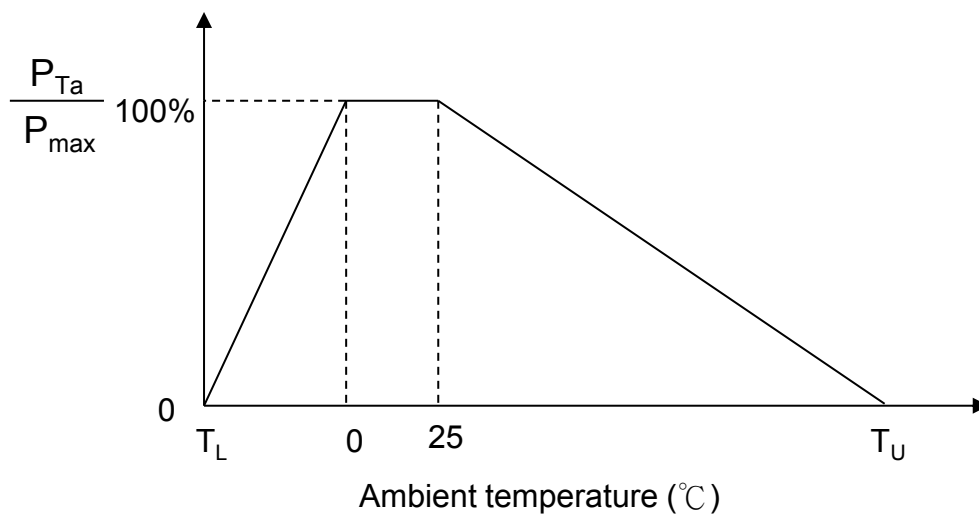
■ IR-Reflow Soldering Profile



■ Recommended Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec (max.)
Diameter of Soldering Iron-tip	φ 3mm (max.)
Caution: Not to touch the component surface with soldering iron directly to prevent component damage.	

Max. Power Dissipation Derating Curve



Note: T_L = Minimum operating temperature ($^{\circ}\text{C}$)

T_U = Maximum operating temperature ($^{\circ}\text{C}$)

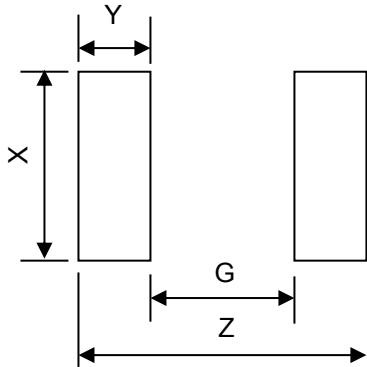
For example :

Ambient temperature(T_a)=55 $^{\circ}\text{C}$

Maximum operating temperature(T_u)= 125 $^{\circ}\text{C}$

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

Recommended Soldering Pad Dimensions



Size (EIA)	0805
Z	3.4 mm
G	1.0 mm
X	1.4 mm
Y	1.2 mm

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

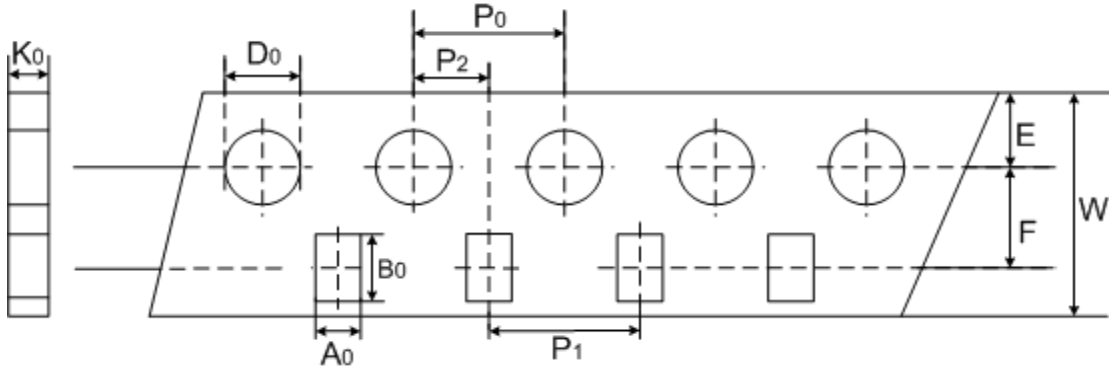
(I) Storage Conditions :

- 1.Storage Temperature : $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
- 2.Relative Humidity : $\leq 75\% \text{RH}$
- 3.Keep away from corrosive atmosphere and sunlight.

(II) Period of Storage : 1 year

Packaging

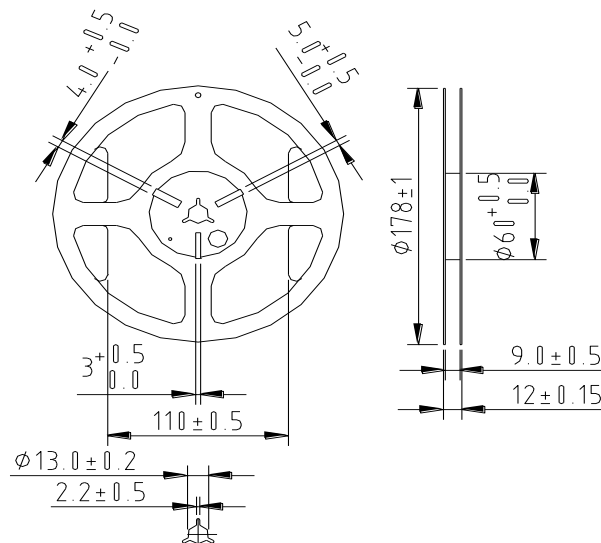
■ Taping Specification (0805 Series)



(Unit : mm)

Index	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	K ₀
Size	±0.2	±0.2	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1

■ Quantity (3500 pcs / reel)



Safety Approvals (Certified Model/Type : TSM2A684)

* UL 1434 / cUL recognized (File # E138827)



* TUV recognized (File # R 50167657)



* CQC GB/T 6663.1-2007 recognized (File # CQC12001080962)

Certificates

- (1) TS 16949 certificate
- (2) ISO 9001 certificate
- (3) QC 080000 certificate

Test Report

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

R - T Table

Part No. : TSM2A684J4503RE

R25 = 680 KOhm ± 5%

B25/85 = 4500 K ± 3%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol.		Resistance Tol.	
				(°C)		(%)	
-40	41,202	34,868	29,434	-2.39	2.21	18.2%	-15.6%
-39	38,210	32,408	27,417	-2.36	2.19	17.9%	-15.4%
-38	35,443	30,127	25,544	-2.33	2.17	17.6%	-15.2%
-37	32,886	28,014	23,805	-2.31	2.15	17.4%	-15.0%
-36	30,525	26,059	22,191	-2.28	2.14	17.1%	-14.8%
-35	28,344	24,250	20,695	-2.26	2.12	16.9%	-14.7%
-34	26,331	22,576	19,308	-2.24	2.11	16.6%	-14.5%
-33	24,471	21,026	18,021	-2.22	2.09	16.4%	-14.3%
-32	22,753	19,591	16,827	-2.20	2.08	16.1%	-14.1%
-31	21,165	18,263	15,719	-2.18	2.07	15.9%	-13.9%
-30	19,697	17,032	14,690	-2.17	2.05	15.7%	-13.7%
-29	18,340	15,891	13,734	-2.15	2.04	15.4%	-13.6%
-28	17,083	14,832	12,846	-2.13	2.02	15.2%	-13.4%
-27	15,920	13,851	12,021	-2.11	2.01	14.9%	-13.2%
-26	14,842	12,940	11,253	-2.09	1.99	14.7%	-13.0%
-25	13,844	12,094	10,539	-2.07	1.98	14.5%	-12.9%
-24	12,918	11,308	9,873.9	-2.05	1.96	14.2%	-12.7%
-23	12,060	10,578	9,254.8	-2.03	1.95	14.0%	-12.5%
-22	11,264	9,899.0	8,678.1	-2.01	1.93	13.8%	-12.3%
-21	10,524	9,267.7	8,140.7	-1.99	1.92	13.6%	-12.2%
-20	9,838.0	8,680.3	7,639.7	-1.97	1.90	13.3%	-12.0%
-19	9,200.3	8,133.6	7,172.5	-1.95	1.89	13.1%	-11.8%
-18	8,607.8	7,624.5	6,736.7	-1.93	1.87	12.9%	-11.6%
-17	8,057.0	7,150.3	6,329.9	-1.91	1.86	12.7%	-11.5%
-16	7,544.6	6,708.5	5,950.1	-1.89	1.84	12.5%	-11.3%
-15	7,068.0	6,296.6	5,595.4	-1.87	1.83	12.3%	-11.1%
-14	6,624.3	5,912.5	5,264.0	-1.85	1.81	12.0%	-11.0%
-13	6,211.1	5,554.2	4,954.3	-1.83	1.79	11.8%	-10.8%
-12	5,826.3	5,219.7	4,664.6	-1.81	1.78	11.6%	-10.6%
-11	5,467.6	4,907.5	4,393.7	-1.79	1.76	11.4%	-10.5%
-10	5,133.2	4,615.8	4,140.2	-1.77	1.75	11.2%	-10.3%
-9	4,821.3	4,343.3	3,902.8	-1.75	1.73	11.0%	-10.1%
-8	4,530.3	4,088.5	3,680.6	-1.73	1.71	10.8%	-10.0%
-7	4,258.6	3,850.2	3,472.3	-1.71	1.70	10.6%	-9.8%
-6	4,004.9	3,627.3	3,277.2	-1.69	1.68	10.4%	-9.7%
-5	3,767.8	3,418.7	3,094.2	-1.67	1.66	10.2%	-9.5%
-4	3,546.2	3,223.3	2,922.5	-1.65	1.64	10.0%	-9.3%
-3	3,339.0	3,040.3	2,761.4	-1.63	1.63	9.8%	-9.2%
-2	3,145.2	2,868.8	2,610.2	-1.61	1.61	9.6%	-9.0%
-1	2,963.7	2,708.0	2,468.1	-1.59	1.59	9.4%	-8.9%

R - T Table

Part No. : TSM2A684J4503RE

R25 =680 KOhm ± 5%

B25/85 = 4500 K ± 3%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
0	2,793.8	2,557.1	2,334.6	-1.57	1.57	9.3%	-8.7%
1	2,634.7	2,415.6	2,209.2	-1.55	1.55	9.1%	-8.5%
2	2,485.6	2,282.7	2,091.2	-1.53	1.53	8.9%	-8.4%
3	2,345.7	2,158.0	1,980.3	-1.50	1.52	8.7%	-8.2%
4	2,214.6	2,040.7	1,875.8	-1.48	1.50	8.5%	-8.1%
5	2,091.5	1,930.5	1,777.5	-1.46	1.48	8.3%	-7.9%
6	1,976.0	1,826.9	1,684.9	-1.44	1.46	8.2%	-7.8%
7	1,867.5	1,729.5	1,597.6	-1.42	1.44	8.0%	-7.6%
8	1,765.6	1,637.8	1,515.4	-1.39	1.42	7.8%	-7.5%
9	1,669.8	1,551.4	1,437.9	-1.37	1.40	7.6%	-7.3%
10	1,579.8	1,470.1	1,364.7	-1.35	1.38	7.5%	-7.2%
11	1,495.1	1,393.6	1,295.7	-1.33	1.36	7.3%	-7.0%
12	1,415.4	1,321.4	1,230.5	-1.30	1.33	7.1%	-6.9%
13	1,340.3	1,253.3	1,169.0	-1.28	1.31	6.9%	-6.7%
14	1,269.7	1,189.1	1,110.9	-1.26	1.29	6.8%	-6.6%
15	1,203.2	1,128.6	1,056.0	-1.23	1.27	6.6%	-6.4%
16	1,140.5	1,071.4	1,004.1	-1.21	1.25	6.4%	-6.3%
17	1,081.4	1,017.5	955.00	-1.18	1.23	6.3%	-6.1%
18	1,025.6	966.54	908.58	-1.16	1.20	6.1%	-6.0%
19	973.06	918.41	864.66	-1.14	1.18	6.0%	-5.9%
20	923.46	872.92	823.09	-1.11	1.16	5.8%	-5.7%
21	876.65	829.93	783.73	-1.09	1.14	5.6%	-5.6%
22	832.45	789.27	746.46	-1.06	1.11	5.5%	-5.4%
23	790.71	750.82	711.16	-1.04	1.09	5.3%	-5.3%
24	751.27	714.43	677.71	-1.01	1.07	5.2%	-5.1%
25	714.00	680.00	646.00	-0.99	1.04	5.0%	-5.0%
26	680.77	647.40	614.13	-1.02	1.08	5.2%	-5.1%
27	649.26	616.53	583.99	-1.06	1.11	5.3%	-5.3%
28	619.37	587.29	555.48	-1.10	1.15	5.5%	-5.4%
29	591.01	559.59	528.51	-1.13	1.18	5.6%	-5.6%
30	564.09	533.33	502.98	-1.17	1.22	5.8%	-5.7%
31	538.53	508.44	478.82	-1.21	1.25	5.9%	-5.8%
32	514.27	484.83	455.94	-1.25	1.29	6.1%	-6.0%
33	491.21	462.44	434.27	-1.29	1.33	6.2%	-6.1%
34	469.31	441.20	413.74	-1.32	1.36	6.4%	-6.2%
35	448.50	421.04	394.28	-1.36	1.40	6.5%	-6.4%
36	428.71	401.91	375.84	-1.40	1.44	6.7%	-6.5%
37	409.90	383.74	358.35	-1.44	1.47	6.8%	-6.6%
38	392.01	366.49	341.76	-1.48	1.51	7.0%	-6.7%
39	374.99	350.09	326.03	-1.52	1.54	7.1%	-6.9%

R - T Table

Part No. : TSM2A684J4503RE

R25 =680 KOhm ± 5%

B25/85 = 4500 K ± 3%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
40	358.80	334.52	311.10	-1.56	1.58	7.3%	-7.0%
41	343.39	319.72	296.93	-1.60	1.62	7.4%	-7.1%
42	328.72	305.64	283.48	-1.64	1.66	7.5%	-7.3%
43	314.75	292.26	270.70	-1.68	1.69	7.7%	-7.4%
44	301.44	279.53	258.57	-1.72	1.73	7.8%	-7.5%
45	288.77	267.42	247.04	-1.76	1.77	8.0%	-7.6%
46	276.69	255.90	236.08	-1.80	1.81	8.1%	-7.7%
47	265.18	244.93	225.66	-1.85	1.84	8.3%	-7.9%
48	254.20	234.49	215.76	-1.89	1.88	8.4%	-8.0%
49	243.74	224.54	206.34	-1.93	1.92	8.5%	-8.1%
50	233.76	215.07	197.38	-1.97	1.96	8.7%	-8.2%
51	224.23	206.04	188.85	-2.02	2.00	8.8%	-8.3%
52	215.15	197.44	180.74	-2.06	2.04	9.0%	-8.5%
53	206.48	189.24	173.01	-2.10	2.08	9.1%	-8.6%
54	198.20	181.42	165.65	-2.15	2.12	9.2%	-8.7%
55	190.29	173.97	158.65	-2.19	2.15	9.4%	-8.8%
56	182.74	166.86	151.97	-2.23	2.19	9.5%	-8.9%
57	175.53	160.07	145.61	-2.28	2.23	9.7%	-9.0%
58	168.63	153.59	139.54	-2.32	2.27	9.8%	-9.1%
59	162.04	147.41	133.76	-2.37	2.31	9.9%	-9.3%
60	155.75	141.51	128.25	-2.41	2.35	10.1%	-9.4%
61	149.72	135.87	122.99	-2.46	2.39	10.2%	-9.5%
62	143.96	130.48	117.97	-2.50	2.43	10.3%	-9.6%
63	138.45	125.34	113.18	-2.55	2.47	10.5%	-9.7%
64	133.18	120.42	108.61	-2.59	2.51	10.6%	-9.8%
65	128.13	115.71	104.24	-2.64	2.55	10.7%	-9.9%
66	123.30	111.22	100.07	-2.69	2.59	10.9%	-10.0%
67	118.67	106.92	96.088	-2.73	2.63	11.0%	-10.1%
68	114.24	102.80	92.282	-2.78	2.67	11.1%	-10.2%
69	109.99	98.867	88.644	-2.83	2.71	11.3%	-10.3%
70	105.92	95.100	85.167	-2.87	2.75	11.4%	-10.4%
71	102.03	91.493	81.842	-2.92	2.79	11.5%	-10.5%
72	98.289	88.040	78.663	-2.97	2.84	11.6%	-10.7%
73	94.705	84.733	75.621	-3.02	2.88	11.8%	-10.8%
74	91.268	81.564	72.710	-3.06	2.92	11.9%	-10.9%
75	87.972	78.529	69.924	-3.11	2.96	12.0%	-11.0%
76	84.809	75.620	67.258	-3.16	3.00	12.2%	-11.1%
77	81.773	72.831	64.705	-3.21	3.04	12.3%	-11.2%
78	78.860	70.157	62.259	-3.25	3.08	12.4%	-11.3%
79	76.063	67.593	59.917	-3.30	3.12	12.5%	-11.4%

R - T Table

Part No. : TSM2A684J4503RE

R25 =680 KOhm ± 5%

B25/85 = 4500 K ± 3%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
80	73.377	65.134	57.673	-3.35	3.16	12.7%	-11.5%
81	70.797	62.775	55.522	-3.40	3.20	12.8%	-11.6%
82	68.319	60.511	53.461	-3.45	3.24	12.9%	-11.7%
83	65.938	58.338	51.485	-3.50	3.29	13.0%	-11.7%
84	63.650	56.252	49.590	-3.55	3.33	13.2%	-11.8%
85	61.451	54.249	47.772	-3.60	3.37	13.3%	-11.9%
86	59.336	52.326	46.028	-3.64	3.41	13.4%	-12.0%
87	57.303	50.478	44.355	-3.69	3.45	13.5%	-12.1%
88	55.347	48.703	42.750	-3.74	3.49	13.6%	-12.2%
89	53.466	46.998	41.209	-3.79	3.53	13.8%	-12.3%
90	51.657	45.359	39.729	-3.84	3.57	13.9%	-12.4%
91	49.915	43.783	38.309	-3.89	3.61	14.0%	-12.5%
92	48.239	42.269	36.944	-3.94	3.66	14.1%	-12.6%
93	46.626	40.812	35.634	-3.99	3.70	14.2%	-12.7%
94	45.073	39.411	34.375	-4.04	3.74	14.4%	-12.8%
95	43.577	38.064	33.165	-4.09	3.78	14.5%	-12.9%
96	42.137	36.767	32.002	-4.14	3.82	14.6%	-13.0%
97	40.750	35.520	30.884	-4.19	3.86	14.7%	-13.1%
98	39.413	34.319	29.809	-4.24	3.90	14.8%	-13.1%
99	38.125	33.164	28.776	-4.29	3.94	15.0%	-13.2%
100	36.884	32.051	27.782	-4.34	3.99	15.1%	-13.3%
101	35.688	30.980	26.827	-4.39	4.03	15.2%	-13.4%
102	34.534	29.949	25.907	-4.45	4.07	15.3%	-13.5%
103	33.423	28.955	25.022	-4.50	4.11	15.4%	-13.6%
104	32.351	27.998	24.171	-4.55	4.15	15.5%	-13.7%
105	31.317	27.077	23.352	-4.60	4.19	15.7%	-13.8%
106	30.320	26.188	22.563	-4.65	4.23	15.8%	-13.8%
107	29.358	25.332	21.804	-4.70	4.28	15.9%	-13.9%
108	28.430	24.507	21.073	-4.75	4.32	16.0%	-14.0%
109	27.535	23.712	20.369	-4.81	4.36	16.1%	-14.1%
110	26.671	22.945	19.691	-4.86	4.40	16.2%	-14.2%
111	25.837	22.206	19.038	-4.91	4.45	16.4%	-14.3%
112	25.032	21.493	18.409	-4.96	4.49	16.5%	-14.4%
113	24.255	20.806	17.802	-5.02	4.53	16.6%	-14.4%
114	23.505	20.143	17.218	-5.07	4.57	16.7%	-14.5%
115	22.781	19.503	16.656	-5.12	4.62	16.8%	-14.6%
116	22.082	18.886	16.113	-5.18	4.66	16.9%	-14.7%
117	21.406	18.291	15.590	-5.23	4.70	17.0%	-14.8%
118	20.754	17.717	15.086	-5.29	4.75	17.1%	-14.8%
119	20.124	17.162	14.600	-5.34	4.79	17.3%	-14.9%

