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**SPECIFICATION FOR APPROVAL**

CUSTOMER	CODICO
CERTIFIED MODEL/TYPE	TSM2A104
PART NO.	TSM2A104J39HARZA (RoHS+HF)
APPLICATION	
CUSTOMER P/N	
ISSUE DATE	Jan. 23, 2017
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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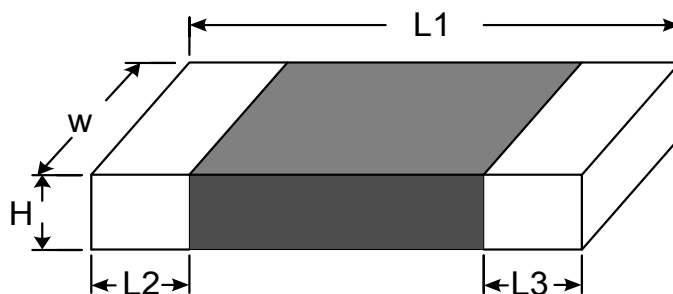
Part Number Code

Example :

**TSM** **2** **A** **104** **J** **39H** **A** **R** **ZA**  
(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 ( $R_{25}$ )	104	$10 \times 10^4 \Omega = 100 \text{ K}\Omega$
(5)	Tolerance of $R_{25}$	J	$\pm 5\%$
(6)	B Value	39H	3975K
(7)	Tolerance of B Value	A	$\pm 1.5\%$
(8)	Packaging	R	Reel
(9)	Optional Suffix	ZA	RoHS+HF compliance

### Structure and Dimensions



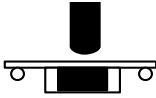
( unit : mm )

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 <sub>25</sub>	B <sub>25/85</sub> Value	Tolerance of B Value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Operating Temperature Range
	R <sub>25</sub> (KΩ)	(± %)	(K)	(± %)	P <sub>max</sub> (mW)	δ (mW/°C)	τ (sec.)	T <sub>L</sub> ~T <sub>U</sub> (°C)
TSM2A104J39HARZA	100	5	3975	1.5	240	Approx. 2.4	Approx. 5.4	-40 ~ +125

Reliability

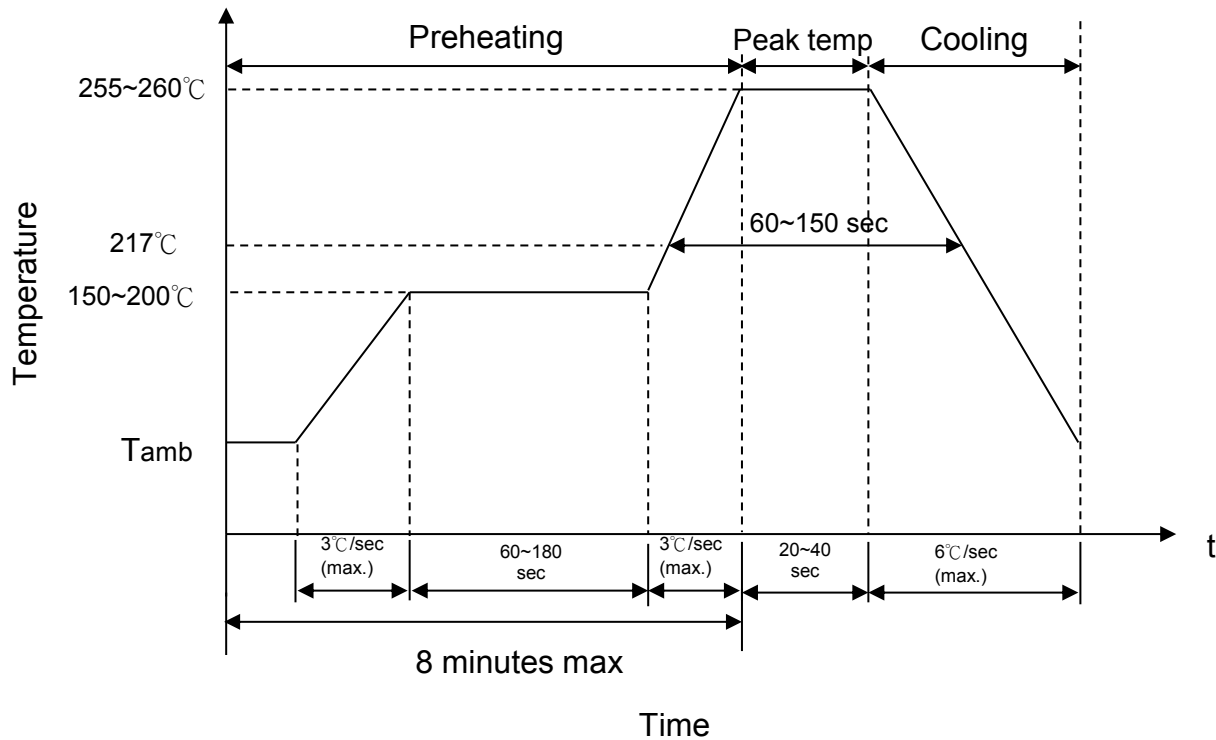
Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp : 2mm ; Speed < 0.5mm/sec. Duration : 10 sec on PCB. 	No visible damage $ \Delta R_{25}/R_{25}  \leq 5\%$															
Solderability	IEC60068-2-58	245 ± 5°C , 3 ± 0.3 sec	At least 95% of terminal 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 <sub>max.</sub> , 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 CTDP (Client Test Data Program).

## Soldering Recommendation

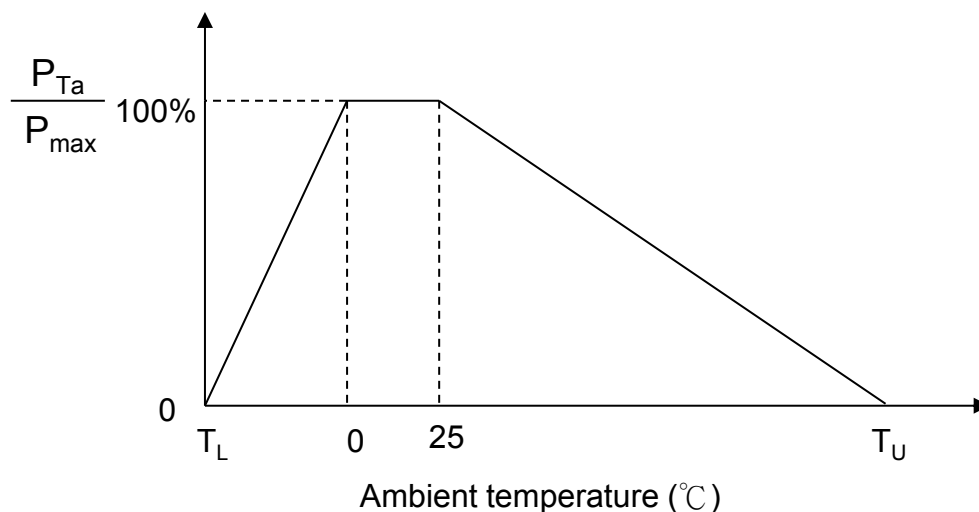
### ■ IR-Reflow Soldering Profile



### ■ 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 (°C)

$T_U$  = Maximum operating temperature (°C)

For example :

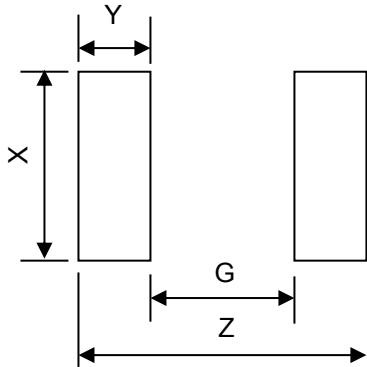
Ambient temperature( $T_a$ )=55°C

Maximum operating temperature( $T_u$ )= 125°C

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



### 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

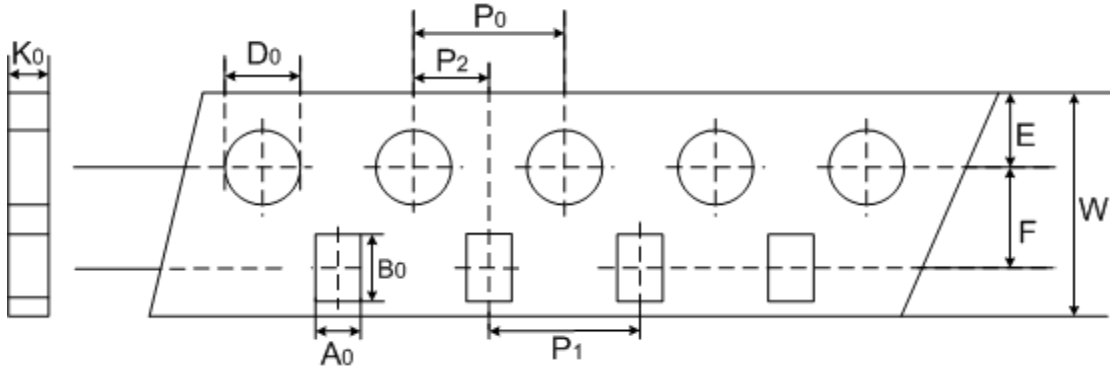
(I) Storage Conditions :

- 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

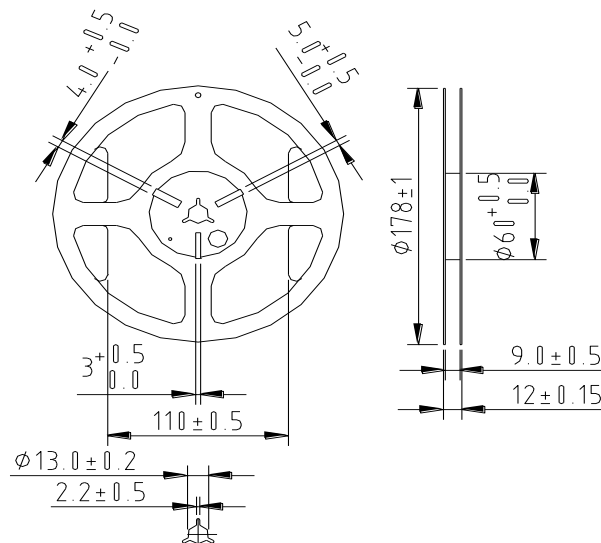
■ Taping Specification ( 0805 Series)



(Unit : mm)

Index	$A_0$	$B_0$	$W$	$E$	$F$	$P_1$	$P_2$	$P_0$	$D_0$	$K_0$
Size	$\pm 0.2$	$\pm 0.2$	$\pm 0.2$	$\pm 0.1$	$\pm 0.05$	$\pm 0.1$	$\pm 0.05$	$\pm 0.1$	$\pm 0.1$	$\pm 0.1$
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1

■ Quantity ( 3500 pcs / reel )



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**Safety Approvals** (Certified Model/Type : TSM2A104)

\* 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. : TSM2A104J39HARZA

R25 = 100 KOhm ± 5%

B25/85 = 3975 K ± 1.5%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol.		Resistance Tol.	
				(°C)		(% )	
-40	3,611.1	3,263.9	2,942.8	-1.53	1.52	10.6%	-9.8%
-39	3,373.9	3,052.7	2,755.1	-1.52	1.52	10.5%	-9.7%
-38	3,153.9	2,856.5	2,580.6	-1.52	1.52	10.4%	-9.7%
-37	2,950.0	2,674.4	2,418.5	-1.51	1.52	10.3%	-9.6%
-36	2,761.0	2,505.5	2,267.9	-1.51	1.52	10.2%	-9.5%
-35	2,585.8	2,348.8	2,128.2	-1.51	1.52	10.1%	-9.4%
-34	2,423.4	2,203.4	1,998.4	-1.51	1.52	10.0%	-9.3%
-33	2,272.8	2,068.4	1,877.7	-1.51	1.52	9.9%	-9.2%
-32	2,132.9	1,942.9	1,765.4	-1.51	1.52	9.8%	-9.1%
-31	2,002.9	1,826.2	1,660.9	-1.51	1.52	9.7%	-9.1%
-30	1,881.9	1,717.4	1,563.4	-1.51	1.52	9.6%	-9.0%
-29	1,769.2	1,616.1	1,472.5	-1.51	1.52	9.5%	-8.9%
-28	1,664.1	1,521.4	1,387.5	-1.51	1.51	9.4%	-8.8%
-27	1,565.9	1,433.0	1,308.0	-1.50	1.51	9.3%	-8.7%
-26	1,474.2	1,350.2	1,233.6	-1.50	1.51	9.2%	-8.6%
-25	1,388.3	1,272.7	1,163.8	-1.49	1.50	9.1%	-8.6%
-24	1,308.0	1,200.1	1,098.4	-1.49	1.49	9.0%	-8.5%
-23	1,232.7	1,132.0	1,037.0	-1.48	1.49	8.9%	-8.4%
-22	1,162.1	1,068.1	979.31	-1.47	1.48	8.8%	-8.3%
-21	1,095.9	1,008.1	925.11	-1.46	1.47	8.7%	-8.2%
-20	1,033.8	951.81	874.17	-1.45	1.47	8.6%	-8.2%
-19	975.43	898.88	826.26	-1.45	1.46	8.5%	-8.1%
-18	920.67	849.14	781.21	-1.44	1.45	8.4%	-8.0%
-17	869.25	802.39	738.83	-1.43	1.45	8.3%	-7.9%
-16	820.95	758.45	698.96	-1.42	1.44	8.2%	-7.8%
-15	775.58	717.14	661.45	-1.41	1.43	8.1%	-7.8%
-14	732.96	678.30	626.14	-1.41	1.43	8.1%	-7.7%
-13	692.92	641.77	592.92	-1.40	1.42	8.0%	-7.6%
-12	655.29	607.42	561.65	-1.39	1.42	7.9%	-7.5%
-11	619.92	575.11	532.21	-1.39	1.41	7.8%	-7.5%
-10	586.68	544.72	504.49	-1.38	1.41	7.7%	-7.4%
-9	555.43	516.12	478.39	-1.37	1.40	7.6%	-7.3%
-8	526.04	489.20	453.80	-1.37	1.40	7.5%	-7.2%
-7	498.39	463.86	430.64	-1.36	1.39	7.4%	-7.2%
-6	472.38	440.00	408.81	-1.36	1.39	7.4%	-7.1%
-5	447.90	417.52	388.23	-1.35	1.38	7.3%	-7.0%
-4	424.84	396.34	368.82	-1.35	1.38	7.2%	-6.9%
-3	403.13	376.37	350.52	-1.34	1.37	7.1%	-6.9%
-2	382.67	357.54	333.24	-1.33	1.37	7.0%	-6.8%
-1	363.37	339.78	316.92	-1.33	1.36	6.9%	-6.7%

R - T Table

Part No. : TSM2A104J39HARZA

R25 =100 KOhm ± 5%

B25/85 = 3975 K ± 1.5%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
0	345.18	323.01	301.51	-1.32	1.36	6.9%	-6.7%
1	328.01	307.18	286.95	-1.32	1.35	6.8%	-6.6%
2	311.81	292.22	273.18	-1.31	1.35	6.7%	-6.5%
3	296.50	278.08	260.15	-1.30	1.34	6.6%	-6.4%
4	282.03	264.71	247.83	-1.30	1.33	6.5%	-6.4%
5	268.36	252.06	236.16	-1.29	1.33	6.5%	-6.3%
6	255.43	240.09	225.11	-1.28	1.32	6.4%	-6.2%
7	243.19	228.75	214.63	-1.27	1.31	6.3%	-6.2%
8	231.61	218.01	204.71	-1.27	1.31	6.2%	-6.1%
9	220.64	207.84	195.29	-1.26	1.30	6.2%	-6.0%
10	210.24	198.19	186.36	-1.25	1.29	6.1%	-6.0%
11	200.39	189.04	177.88	-1.24	1.29	6.0%	-5.9%
12	191.05	180.35	169.83	-1.23	1.28	5.9%	-5.8%
13	182.19	172.11	162.18	-1.22	1.27	5.9%	-5.8%
14	173.79	164.29	154.91	-1.21	1.26	5.8%	-5.7%
15	165.81	156.85	148.01	-1.21	1.25	5.7%	-5.6%
16	158.24	149.79	141.44	-1.20	1.24	5.6%	-5.6%
17	151.05	143.09	135.20	-1.19	1.24	5.6%	-5.5%
18	144.22	136.71	129.27	-1.18	1.23	5.5%	-5.4%
19	137.73	130.65	123.62	-1.17	1.22	5.4%	-5.4%
20	131.56	124.88	118.24	-1.16	1.21	5.4%	-5.3%
21	125.70	119.40	113.13	-1.15	1.20	5.3%	-5.3%
22	120.13	114.18	108.26	-1.14	1.19	5.2%	-5.2%
23	114.83	109.22	103.62	-1.13	1.19	5.1%	-5.1%
24	109.79	104.50	99.206	-1.12	1.18	5.1%	-5.1%
25	105.00	100.00	95.000	-1.11	1.17	5.0%	-5.0%
26	100.57	95.720	90.874	-1.13	1.19	5.1%	-5.1%
27	96.352	91.644	86.948	-1.16	1.21	5.1%	-5.1%
28	92.332	87.763	83.212	-1.18	1.23	5.2%	-5.2%
29	88.499	84.066	79.655	-1.20	1.25	5.3%	-5.2%
30	84.846	80.544	76.269	-1.22	1.27	5.3%	-5.3%
31	81.363	77.188	73.044	-1.24	1.30	5.4%	-5.4%
32	78.041	73.990	69.974	-1.27	1.32	5.5%	-5.4%
33	74.873	70.942	67.048	-1.29	1.34	5.5%	-5.5%
34	71.851	68.035	64.261	-1.31	1.36	5.6%	-5.5%
35	68.968	65.264	61.606	-1.34	1.38	5.7%	-5.6%
36	66.216	62.622	59.074	-1.36	1.41	5.7%	-5.7%
37	63.589	60.101	56.661	-1.38	1.43	5.8%	-5.7%
38	61.082	57.695	54.360	-1.41	1.45	5.9%	-5.8%
39	58.687	55.400	52.166	-1.43	1.48	5.9%	-5.8%

R - T Table

Part No. : TSM2A104J39HARZA

R25 =100 KOhm ± 5%

B25/85 = 3975 K ± 1.5%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
40	56.400	53.209	50.072	-1.46	1.50	6.0%	-5.9%
41	54.216	51.117	48.075	-1.48	1.52	6.1%	-6.0%
42	52.128	49.119	46.168	-1.51	1.55	6.1%	-6.0%
43	50.133	47.211	44.348	-1.53	1.57	6.2%	-6.1%
44	48.225	45.388	42.610	-1.56	1.59	6.3%	-6.1%
45	46.401	43.645	40.951	-1.58	1.62	6.3%	-6.2%
46	44.656	41.980	39.365	-1.61	1.64	6.4%	-6.2%
47	42.987	40.387	37.850	-1.63	1.67	6.4%	-6.3%
48	41.390	38.864	36.401	-1.66	1.69	6.5%	-6.3%
49	39.861	37.407	35.016	-1.68	1.71	6.6%	-6.4%
50	38.397	36.012	33.692	-1.71	1.74	6.6%	-6.4%
51	36.995	34.678	32.425	-1.74	1.76	6.7%	-6.5%
52	35.651	33.400	31.212	-1.76	1.79	6.7%	-6.5%
53	34.364	32.176	30.051	-1.79	1.81	6.8%	-6.6%
54	33.130	31.003	28.940	-1.81	1.84	6.9%	-6.7%
55	31.947	29.880	27.876	-1.84	1.86	6.9%	-6.7%
56	30.813	28.803	26.856	-1.87	1.88	7.0%	-6.8%
57	29.724	27.770	25.879	-1.89	1.91	7.0%	-6.8%
58	28.680	26.780	24.943	-1.92	1.93	7.1%	-6.9%
59	27.677	25.830	24.045	-1.95	1.96	7.2%	-6.9%
60	26.715	24.918	23.184	-1.97	1.98	7.2%	-7.0%
61	25.791	24.043	22.358	-2.00	2.01	7.3%	-7.0%
62	24.903	23.203	21.565	-2.02	2.03	7.3%	-7.1%
63	24.051	22.397	20.805	-2.05	2.06	7.4%	-7.1%
64	23.231	21.622	20.075	-2.08	2.08	7.4%	-7.2%
65	22.443	20.878	19.374	-2.10	2.10	7.5%	-7.2%
66	21.686	20.163	18.700	-2.13	2.13	7.6%	-7.3%
67	20.958	19.476	18.053	-2.16	2.15	7.6%	-7.3%
68	20.257	18.815	17.432	-2.18	2.18	7.7%	-7.4%
69	19.583	18.180	16.835	-2.21	2.20	7.7%	-7.4%
70	18.934	17.568	16.260	-2.24	2.23	7.8%	-7.4%
71	18.310	16.981	15.708	-2.26	2.25	7.8%	-7.5%
72	17.709	16.415	15.177	-2.29	2.27	7.9%	-7.5%
73	17.131	15.871	14.667	-2.32	2.30	7.9%	-7.6%
74	16.574	15.347	14.175	-2.34	2.32	8.0%	-7.6%
75	16.037	14.843	13.703	-2.37	2.35	8.0%	-7.7%
76	15.520	14.357	13.248	-2.40	2.37	8.1%	-7.7%
77	15.023	13.890	12.810	-2.42	2.40	8.2%	-7.8%
78	14.543	13.439	12.389	-2.45	2.42	8.2%	-7.8%
79	14.080	13.006	11.983	-2.48	2.45	8.3%	-7.9%

R - T Table

Part No. : TSM2A104J39HARZA

R25 =100 KOhm ± 5%

B25/85 = 3975 K ± 1.5%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
80	13.635	12.588	11.592	-2.50	2.47	8.3%	-7.9%
81	13.205	12.185	11.216	-2.53	2.50	8.4%	-8.0%
82	12.791	11.797	10.854	-2.56	2.52	8.4%	-8.0%
83	12.391	11.423	10.505	-2.59	2.55	8.5%	-8.0%
84	12.006	11.063	10.168	-2.62	2.57	8.5%	-8.1%
85	11.634	10.715	9.8440	-2.64	2.60	8.6%	-8.1%
86	11.276	10.380	9.5316	-2.67	2.63	8.6%	-8.2%
87	10.930	10.057	9.2305	-2.70	2.65	8.7%	-8.2%
88	10.596	9.7453	8.9402	-2.73	2.68	8.7%	-8.3%
89	10.274	9.4447	8.6604	-2.76	2.70	8.8%	-8.3%
90	9.9634	9.1547	8.3906	-2.79	2.73	8.8%	-8.3%
91	9.6634	8.8749	8.1304	-2.82	2.76	8.9%	-8.4%
92	9.3738	8.6050	7.8794	-2.85	2.79	8.9%	-8.4%
93	9.0943	8.3445	7.6374	-2.88	2.81	9.0%	-8.5%
94	8.8243	8.0931	7.4039	-2.91	2.84	9.0%	-8.5%
95	8.5636	7.8504	7.1786	-2.94	2.87	9.1%	-8.6%
96	8.3118	7.6161	6.9612	-2.97	2.90	9.1%	-8.6%
97	8.0686	7.3899	6.7514	-3.00	2.92	9.2%	-8.6%
98	7.8337	7.1715	6.5489	-3.03	2.95	9.2%	-8.7%
99	7.6067	6.9606	6.3535	-3.06	2.98	9.3%	-8.7%
100	7.3874	6.7569	6.1648	-3.09	3.01	9.3%	-8.8%
101	7.1754	6.5601	5.9826	-3.13	3.04	9.4%	-8.8%
102	6.9705	6.3700	5.8066	-3.16	3.07	9.4%	-8.8%
103	6.7725	6.1863	5.6367	-3.19	3.10	9.5%	-8.9%
104	6.5810	6.0088	5.4726	-3.22	3.13	9.5%	-8.9%
105	6.3959	5.8372	5.3140	-3.26	3.15	9.6%	-9.0%
106	6.2168	5.6713	5.1608	-3.29	3.18	9.6%	-9.0%
107	6.0436	5.5110	5.0127	-3.32	3.21	9.7%	-9.0%
108	5.8761	5.3559	4.8696	-3.36	3.24	9.7%	-9.1%
109	5.7141	5.2060	4.7312	-3.39	3.27	9.8%	-9.1%
110	5.5572	5.0610	4.5975	-3.42	3.30	9.8%	-9.2%
111	5.4055	4.9207	4.4682	-3.46	3.33	9.9%	-9.2%
112	5.2586	4.7849	4.3431	-3.49	3.36	9.9%	-9.2%
113	5.1163	4.6536	4.2221	-3.52	3.39	9.9%	-9.3%
114	4.9786	4.5265	4.1051	-3.56	3.42	10.0%	-9.3%
115	4.8453	4.4034	3.9918	-3.59	3.45	10.0%	-9.3%
116	4.7161	4.2843	3.8822	-3.63	3.49	10.1%	-9.4%
117	4.5910	4.1689	3.7761	-3.66	3.52	10.1%	-9.4%
118	4.4698	4.0572	3.6734	-3.69	3.55	10.2%	-9.5%
119	4.3524	3.9490	3.5740	-3.73	3.58	10.2%	-9.5%

