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**SPECIFICATION FOR APPROVAL**

CUSTOMER	Codico
CERTIFIED MODEL/TYPE	TSM1A154
PART NO.	TSM1A154F4061RZ (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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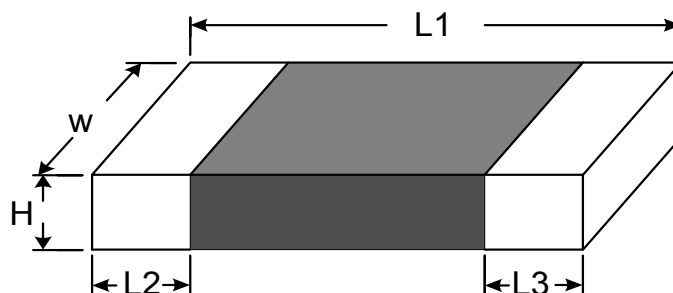
Part Number Code

Example :

TSM **1** **A** **154** **F** **406** **1** **R** **Z**
(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)	1	0603
(3)	Definition of B Value	A	B _{25/85}
(4)	Zero Power Resistance at 25°C (R ₂₅)	154	15 x 10 ⁴ Ω = 150 KΩ
(5)	Tolerance of R ₂₅	F	± 1%
(6)	B Value	406	4060K
(7)	Tolerance of B Value	1	± 1%
(8)	Packaging	R	Reel
(9)	Optional Suffix	Z	RoHS+HF compliance

Structure and Dimensions



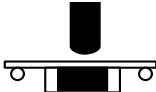
(unit : mm)

L1	W	H max.	L2 and L3
1.60±0.15	0.80±0.15	0.95	0.40±0.15

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)
TSM1A154F4061RZ	150	1	4060	1	210	Approx. 2.1	Approx. 3.1	-40 ~ +125

Reliability

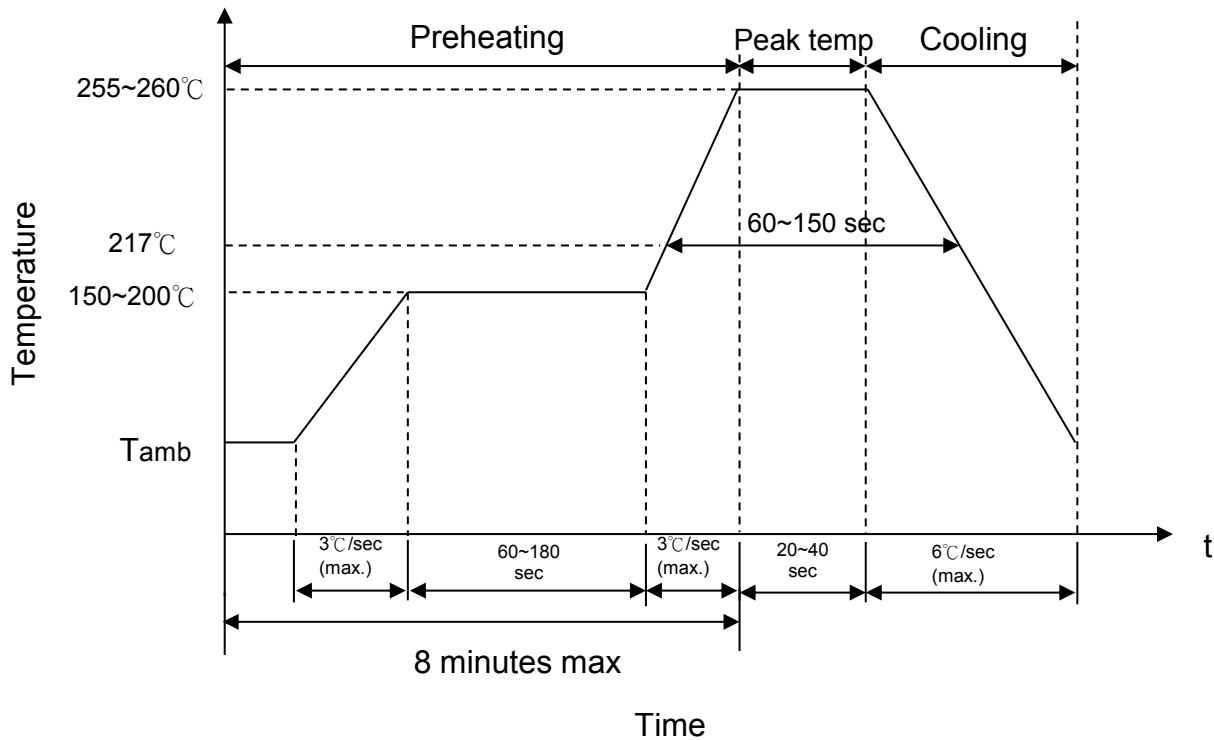
Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp : 2mm ; Speed < 0.5mm/sec. Duration : 10 sec on PCB. 	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$															
Solderability	IEC60068-2-58	245 ± 5°C , 3 ± 0.3 sec	At least 95% of terminal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

Soldering Recommendation

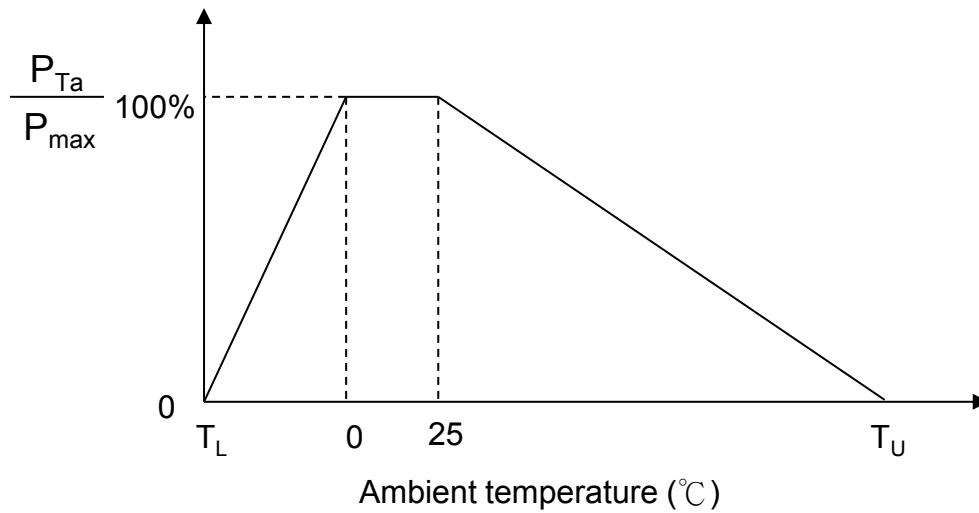
■ IR-Reflow Soldering Profile



■ 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)

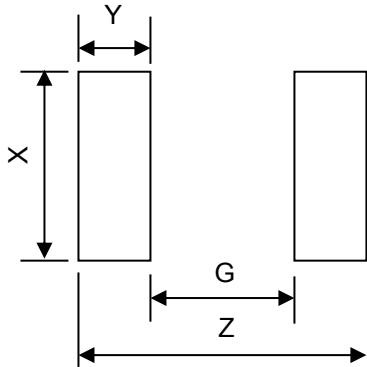
For example :

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)	0603
Z	3.0 mm
G	1.0 mm
X	1.0 mm
Y	1.0 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

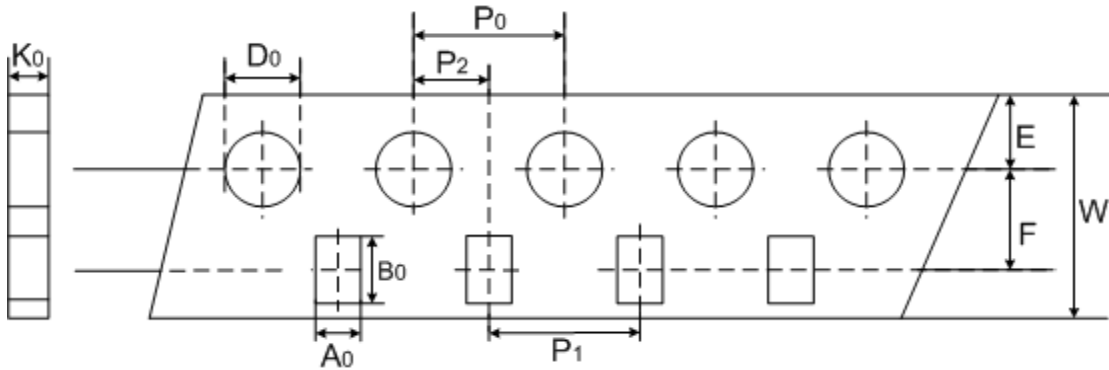
(I) Storage Conditions :

- 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

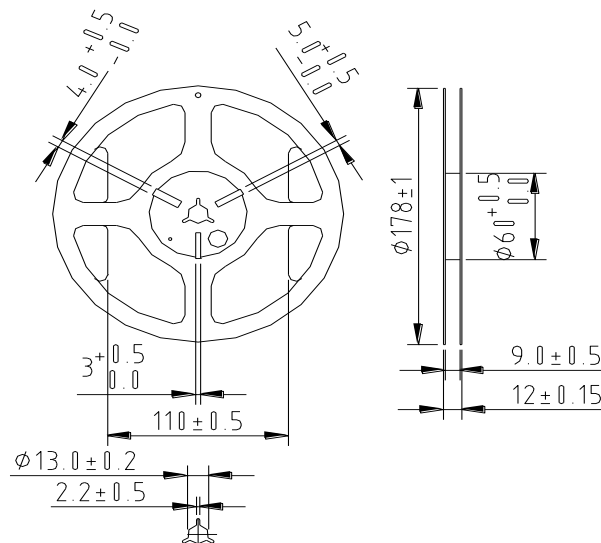
■ Taping Specification (0603 Series)



(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
0603	1.1	1.9	8	1.75	3.5	4	2	4	1.55	0.95

■ Quantity (4000 pcs / reel)



Safety Approvals (Certified Model/Type : TSM1A154)



* 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. : TSM1A154F4061RZ

R25 = 150 KOhm ± 1%

B25/85 = 4060 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol.		Resistance Tol.	
				(°C)		(%)	
-40	5,114.0	4,890.0	4,675.3	-0.69	0.71	4.6%	-4.4%
-39	4,792.8	4,585.8	4,387.3	-0.68	0.70	4.5%	-4.3%
-38	4,493.0	4,301.7	4,118.1	-0.67	0.69	4.4%	-4.3%
-37	4,213.1	4,036.3	3,866.5	-0.67	0.69	4.4%	-4.2%
-36	3,952.0	3,788.5	3,631.5	-0.66	0.68	4.3%	-4.1%
-35	3,708.2	3,557.1	3,411.8	-0.65	0.67	4.2%	-4.1%
-34	3,480.6	3,340.9	3,206.4	-0.65	0.67	4.2%	-4.0%
-33	3,268.1	3,138.9	3,014.4	-0.64	0.66	4.1%	-4.0%
-32	3,069.7	2,950.1	2,834.9	-0.63	0.65	4.1%	-3.9%
-31	2,884.3	2,773.6	2,666.9	-0.63	0.65	4.0%	-3.8%
-30	2,711.0	2,608.6	2,509.8	-0.62	0.64	3.9%	-3.8%
-29	2,549.1	2,454.3	2,362.7	-0.61	0.63	3.9%	-3.7%
-28	2,397.6	2,309.9	2,225.1	-0.61	0.63	3.8%	-3.7%
-27	2,256.0	2,174.7	2,096.2	-0.60	0.62	3.7%	-3.6%
-26	2,123.5	2,048.2	1,975.4	-0.60	0.61	3.7%	-3.6%
-25	1,999.5	1,929.8	1,862.3	-0.59	0.61	3.6%	-3.5%
-24	1,883.4	1,818.8	1,756.2	-0.58	0.60	3.6%	-3.4%
-23	1,774.7	1,714.9	1,656.8	-0.58	0.60	3.5%	-3.4%
-22	1,672.9	1,617.4	1,563.6	-0.57	0.59	3.4%	-3.3%
-21	1,577.5	1,526.1	1,476.2	-0.56	0.58	3.4%	-3.3%
-20	1,488.1	1,440.5	1,394.2	-0.56	0.58	3.3%	-3.2%
-19	1,404.3	1,360.1	1,317.1	-0.55	0.57	3.3%	-3.2%
-18	1,325.7	1,284.7	1,244.9	-0.54	0.56	3.2%	-3.1%
-17	1,252.0	1,214.0	1,177.0	-0.54	0.56	3.1%	-3.0%
-16	1,182.8	1,147.5	1,113.2	-0.53	0.55	3.1%	-3.0%
-15	1,117.9	1,085.1	1,053.2	-0.52	0.54	3.0%	-2.9%
-14	1,056.9	1,026.5	996.84	-0.52	0.54	3.0%	-2.9%
-13	999.56	971.35	943.84	-0.51	0.53	2.9%	-2.8%
-12	945.71	919.52	893.97	-0.51	0.52	2.8%	-2.8%
-11	895.08	870.77	847.03	-0.50	0.52	2.8%	-2.7%
-10	847.47	824.90	802.84	-0.49	0.51	2.7%	-2.7%
-9	802.67	781.71	761.23	-0.49	0.50	2.7%	-2.6%
-8	760.51	741.05	722.01	-0.48	0.50	2.6%	-2.6%
-7	720.82	702.74	685.05	-0.47	0.49	2.6%	-2.5%
-6	683.43	666.64	650.20	-0.46	0.48	2.5%	-2.5%
-5	648.19	632.61	617.33	-0.46	0.48	2.5%	-2.4%
-4	614.98	600.51	586.31	-0.45	0.47	2.4%	-2.4%
-3	583.67	570.22	557.03	-0.44	0.46	2.4%	-2.3%
-2	554.12	541.64	529.38	-0.44	0.45	2.3%	-2.3%
-1	526.24	514.65	503.26	-0.43	0.45	2.3%	-2.2%

R - T Table

Part No. : TSM1A154F4061RZ

R25 =150 KOhm ± 1%

B25/85 = 4060 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
0	499.92	489.15	478.57	-0.42	0.44	2.2%	-2.2%
1	475.06	465.06	455.23	-0.41	0.43	2.1%	-2.1%
2	451.57	442.29	433.16	-0.41	0.42	2.1%	-2.1%
3	429.37	420.76	412.28	-0.40	0.42	2.0%	-2.0%
4	408.38	400.39	392.51	-0.39	0.41	2.0%	-2.0%
5	388.54	381.12	373.80	-0.38	0.40	1.9%	-1.9%
6	369.76	362.87	356.09	-0.38	0.39	1.9%	-1.9%
7	351.98	345.60	339.30	-0.37	0.39	1.8%	-1.8%
8	335.15	329.24	323.39	-0.36	0.38	1.8%	-1.8%
9	319.22	313.73	308.31	-0.35	0.37	1.7%	-1.7%
10	304.12	299.04	294.01	-0.35	0.36	1.7%	-1.7%
11	289.81	285.10	280.45	-0.34	0.35	1.7%	-1.6%
12	276.25	271.89	267.58	-0.33	0.34	1.6%	-1.6%
13	263.39	259.36	255.36	-0.32	0.34	1.6%	-1.5%
14	251.19	247.46	243.76	-0.31	0.33	1.5%	-1.5%
15	239.62	236.17	232.75	-0.31	0.32	1.5%	-1.4%
16	228.63	225.45	222.29	-0.30	0.31	1.4%	-1.4%
17	218.20	215.27	212.34	-0.29	0.30	1.4%	-1.4%
18	208.30	205.59	202.90	-0.28	0.29	1.3%	-1.3%
19	198.90	196.40	193.91	-0.27	0.28	1.3%	-1.3%
20	189.97	187.66	185.37	-0.26	0.28	1.2%	-1.2%
21	181.48	179.36	177.25	-0.25	0.27	1.2%	-1.2%
22	173.41	171.46	169.52	-0.25	0.26	1.1%	-1.1%
23	165.74	163.95	162.17	-0.24	0.25	1.1%	-1.1%
24	158.44	156.80	155.16	-0.23	0.24	1.0%	-1.0%
25	151.50	150.00	148.50	-0.22	0.23	1.0%	-1.0%
26	145.03	143.53	142.03	-0.23	0.24	1.0%	-1.0%
27	138.86	137.36	135.87	-0.24	0.25	1.1%	-1.1%
28	132.98	131.49	130.01	-0.25	0.27	1.1%	-1.1%
29	127.39	125.90	124.43	-0.27	0.28	1.2%	-1.2%
30	122.05	120.58	119.11	-0.28	0.29	1.2%	-1.2%
31	116.96	115.50	114.05	-0.29	0.30	1.3%	-1.3%
32	112.11	110.67	109.23	-0.30	0.31	1.3%	-1.3%
33	107.49	106.06	104.63	-0.31	0.32	1.4%	-1.3%
34	103.08	101.66	100.25	-0.32	0.34	1.4%	-1.4%
35	98.867	97.467	96.077	-0.33	0.35	1.4%	-1.4%
36	94.850	93.467	92.096	-0.35	0.36	1.5%	-1.5%
37	91.015	89.652	88.300	-0.36	0.37	1.5%	-1.5%
38	87.355	86.010	84.678	-0.37	0.38	1.6%	-1.5%
39	83.860	82.535	81.223	-0.38	0.40	1.6%	-1.6%

R - T Table

Part No. : TSM1A154F4061RZ

R25 =150 KOhm ± 1%

B25/85 = 4060 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
40	80.521	79.217	77.926	-0.39	0.41	1.6%	-1.6%
41	77.333	76.049	74.778	-0.41	0.42	1.7%	-1.7%
42	74.286	73.023	71.774	-0.42	0.43	1.7%	-1.7%
43	71.374	70.132	68.905	-0.43	0.44	1.8%	-1.7%
44	68.591	67.370	66.165	-0.44	0.46	1.8%	-1.8%
45	65.930	64.731	63.547	-0.45	0.47	1.9%	-1.8%
46	63.385	62.208	61.046	-0.47	0.48	1.9%	-1.9%
47	60.951	59.795	58.656	-0.48	0.49	1.9%	-1.9%
48	58.623	57.489	56.371	-0.49	0.51	2.0%	-1.9%
49	56.396	55.283	54.186	-0.50	0.52	2.0%	-2.0%
50	54.264	53.172	52.097	-0.52	0.53	2.1%	-2.0%
51	52.223	51.153	50.099	-0.53	0.55	2.1%	-2.1%
52	50.269	49.220	48.188	-0.54	0.56	2.1%	-2.1%
53	48.398	47.370	46.358	-0.56	0.57	2.2%	-2.1%
54	46.606	45.598	44.608	-0.57	0.58	2.2%	-2.2%
55	44.889	43.902	42.932	-0.58	0.60	2.2%	-2.2%
56	43.244	42.277	41.327	-0.60	0.61	2.3%	-2.2%
57	41.667	40.720	39.791	-0.61	0.62	2.3%	-2.3%
58	40.155	39.228	38.319	-0.62	0.64	2.4%	-2.3%
59	38.706	37.798	36.908	-0.63	0.65	2.4%	-2.4%
60	37.316	36.428	35.557	-0.65	0.66	2.4%	-2.4%
61	35.983	35.113	34.261	-0.66	0.68	2.5%	-2.4%
62	34.704	33.853	33.019	-0.68	0.69	2.5%	-2.5%
63	33.477	32.644	31.828	-0.69	0.70	2.6%	-2.5%
64	32.299	31.484	30.686	-0.70	0.72	2.6%	-2.5%
65	31.168	30.370	29.590	-0.72	0.73	2.6%	-2.6%
66	30.082	29.302	28.539	-0.73	0.74	2.7%	-2.6%
67	29.039	28.276	27.530	-0.74	0.76	2.7%	-2.6%
68	28.038	27.291	26.562	-0.76	0.77	2.7%	-2.7%
69	27.075	26.345	25.632	-0.77	0.78	2.8%	-2.7%
70	26.150	25.436	24.739	-0.79	0.80	2.8%	-2.7%
71	25.261	24.563	23.881	-0.80	0.81	2.8%	-2.8%
72	24.407	23.724	23.057	-0.81	0.83	2.9%	-2.8%
73	23.585	22.917	22.266	-0.83	0.84	2.9%	-2.8%
74	22.795	22.141	21.505	-0.84	0.85	3.0%	-2.9%
75	22.035	21.396	20.773	-0.86	0.87	3.0%	-2.9%
76	21.303	20.679	20.070	-0.87	0.88	3.0%	-2.9%
77	20.600	19.989	19.394	-0.89	0.90	3.1%	-3.0%
78	19.922	19.325	18.744	-0.90	0.91	3.1%	-3.0%
79	19.270	18.686	18.118	-0.91	0.92	3.1%	-3.0%

R - T Table

Part No. : TSM1A154F4061RZ

R25 =150 KOhm ± 1%

B25/85 = 4060 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol.		Resistance Tol.	
				(°C)		(%)	
80	18.642	18.071	17.516	-0.93	0.94	3.2%	-3.1%
81	18.038	17.480	16.937	-0.94	0.95	3.2%	-3.1%
82	17.456	16.910	16.379	-0.96	0.97	3.2%	-3.1%
83	16.895	16.361	15.842	-0.97	0.98	3.3%	-3.2%
84	16.354	15.832	15.325	-0.99	1.00	3.3%	-3.2%
85	15.833	15.323	14.828	-1.00	1.01	3.3%	-3.2%
86	15.331	14.832	14.348	-1.02	1.02	3.4%	-3.3%
87	14.847	14.360	13.886	-1.03	1.04	3.4%	-3.3%
88	14.381	13.904	13.441	-1.05	1.05	3.4%	-3.3%
89	13.931	13.464	13.012	-1.06	1.07	3.5%	-3.4%
90	13.497	13.041	12.599	-1.08	1.08	3.5%	-3.4%
91	13.078	12.632	12.200	-1.09	1.10	3.5%	-3.4%
92	12.674	12.238	11.816	-1.11	1.11	3.6%	-3.5%
93	12.285	11.858	11.446	-1.12	1.13	3.6%	-3.5%
94	11.909	11.492	11.088	-1.14	1.14	3.6%	-3.5%
95	11.545	11.138	10.743	-1.15	1.15	3.7%	-3.5%
96	11.195	10.796	10.411	-1.17	1.17	3.7%	-3.6%
97	10.857	10.467	10.090	-1.18	1.18	3.7%	-3.6%
98	10.530	10.148	9.7800	-1.20	1.20	3.8%	-3.6%
99	10.214	9.8413	9.4810	-1.21	1.21	3.8%	-3.7%
100	9.9093	9.5446	9.1924	-1.23	1.23	3.8%	-3.7%
101	9.6148	9.2581	8.9138	-1.24	1.24	3.9%	-3.7%
102	9.3302	8.9814	8.6447	-1.26	1.26	3.9%	-3.7%
103	9.0552	8.7140	8.3849	-1.28	1.27	3.9%	-3.8%
104	8.7895	8.4558	8.1339	-1.29	1.29	3.9%	-3.8%
105	8.5326	8.2062	7.8915	-1.31	1.30	4.0%	-3.8%
106	8.2843	7.9650	7.6572	-1.32	1.32	4.0%	-3.9%
107	8.0442	7.7319	7.4309	-1.34	1.34	4.0%	-3.9%
108	7.8121	7.5066	7.2122	-1.36	1.35	4.1%	-3.9%
109	7.5877	7.2887	7.0009	-1.37	1.37	4.1%	-3.9%
110	7.3706	7.0781	6.7966	-1.39	1.38	4.1%	-4.0%
111	7.1606	6.8745	6.5991	-1.41	1.40	4.2%	-4.0%
112	6.9575	6.6775	6.4082	-1.42	1.41	4.2%	-4.0%
113	6.7610	6.4871	6.2236	-1.44	1.43	4.2%	-4.1%
114	6.5709	6.3028	6.0451	-1.45	1.45	4.3%	-4.1%
115	6.3869	6.1246	5.8725	-1.47	1.46	4.3%	-4.1%
116	6.2089	5.9522	5.7056	-1.49	1.48	4.3%	-4.1%
117	6.0366	5.7854	5.5441	-1.51	1.49	4.3%	-4.2%
118	5.8698	5.6239	5.3878	-1.52	1.51	4.4%	-4.2%
119	5.7083	5.4677	5.2367	-1.54	1.53	4.4%	-4.2%

