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SPECIFICATION FOR APPROVAL

CUSTOMER	立創電子
CERTIFIED MODEL/TYPE	TSM1B474
PART NO.	TSM1B474F4151RZ1 (RoHS+HF)
APPLICATION	
CUSTOMER P/N	
ISSUE DATE	Dec. 29, 2020
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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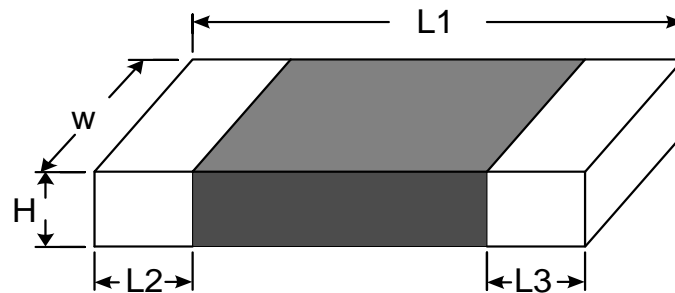
Part Number Code

Example :

TSM **1** **B** **474** **F** **415** **1** **R** **Z1**
 (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	B	B _{25/50}
(4)	Zero Power Resistance at 25°C (R ₂₅)	474	Refer to optional suffix
(5)	Tolerance of R ₂₅	F	Refer to optional suffix
(6)	B Value	415	4150K
(7)	Tolerance of B Value	1	± 1%
(8)	Packaging	R	Reel
(9)	Optional Suffix	Z1	R ₁₁₃ =19.3KΩ±1% 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 113°C	Tolerance of R ₁₁₃	B _{25/50} Value	Tolerance of B Value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Operating Temperature Range
	R ₁₁₃ (KΩ)	(± %)	(K)	(± %)	P _{max} (mW)	δ (mW/°C)	τ (sec.)	T _L ~T _U (°C)
TSM1B474F4151RZ1	19.3	1	4150	1	210	Approx. 2.1	Approx. 3.1	-40 ~ +125

Reliability

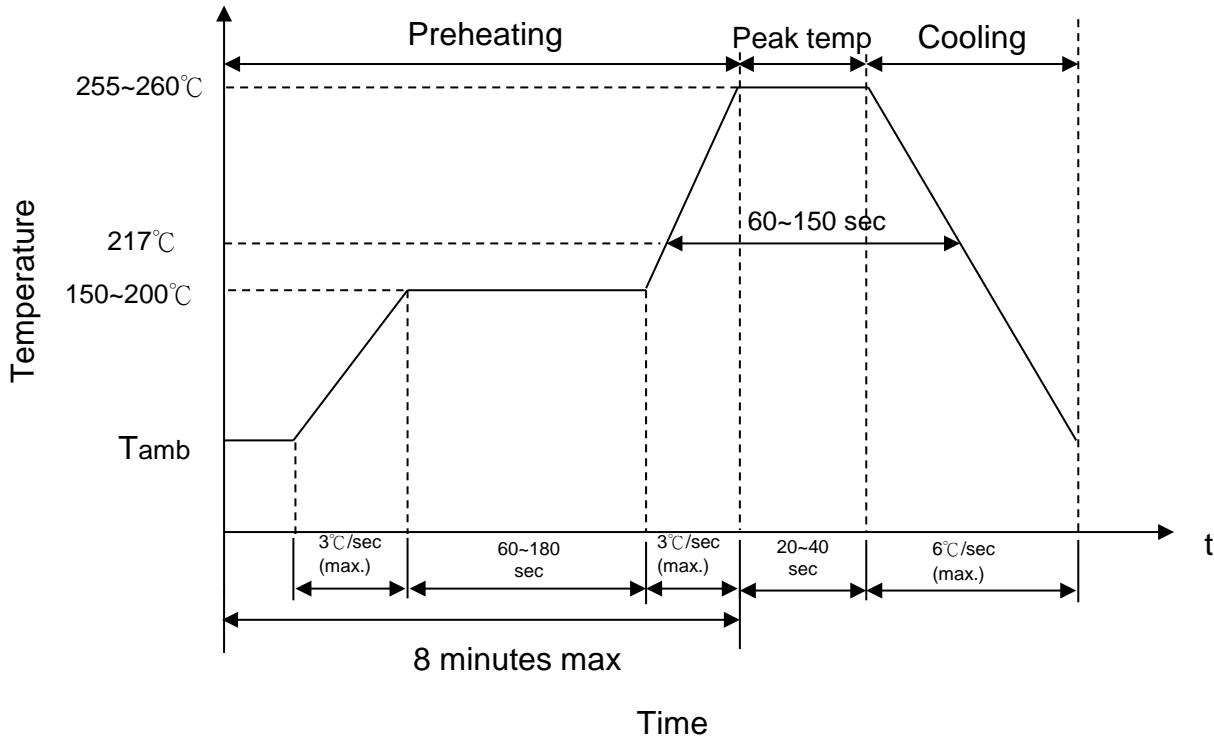
Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp : 2mm ; Speed < 0.5mm/sec. Duration : 10 sec on PCB. 	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$															
Solderability	IEC60068-2-58	245 ± 5°C , 3 ± 0.3 sec	At least 95% of terminal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

Soldering Recommendation

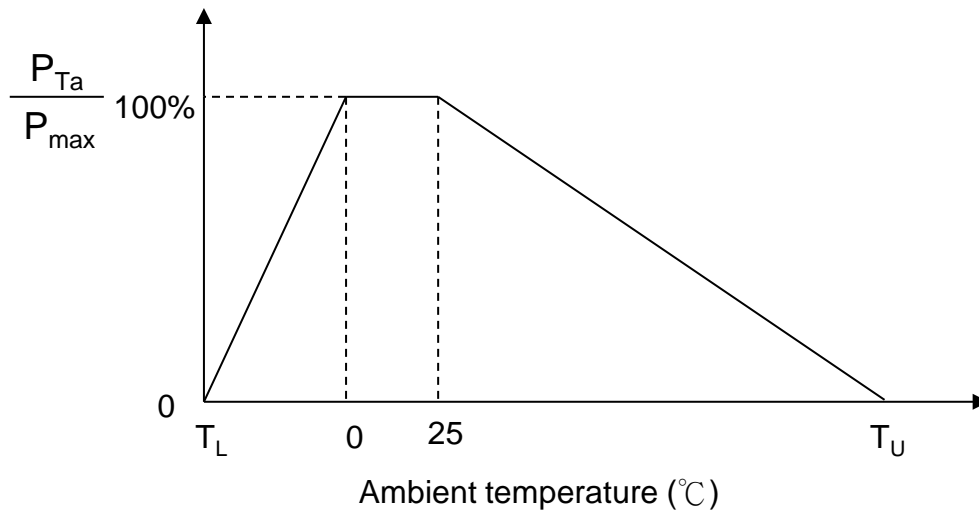
■ IR-Reflow Soldering Profile



■ 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)

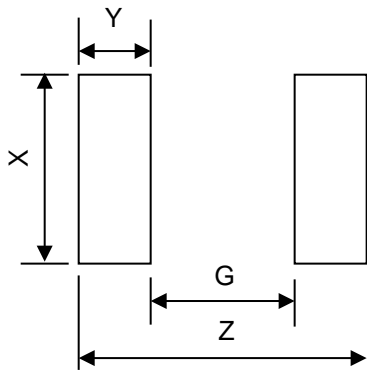
For example :

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	2.8 mm
G	0.8 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 2015/863/EU.

Warehouse Storage Conditions of Products

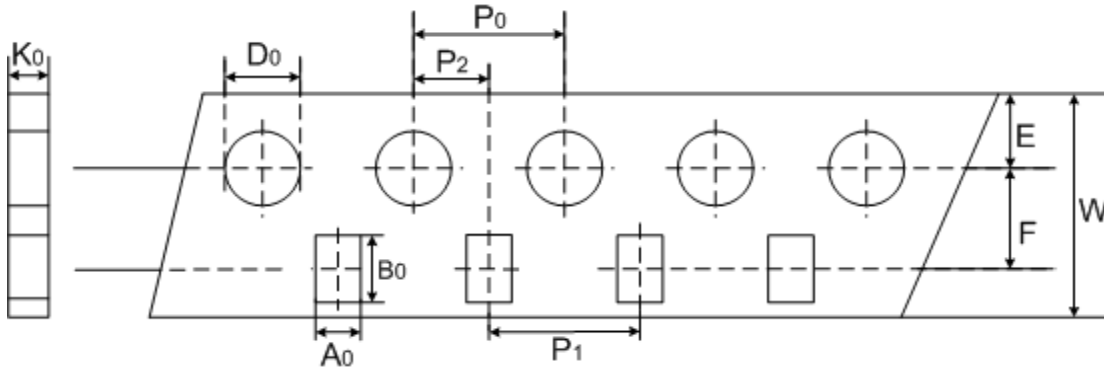
(I) Storage Conditions :

- 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

Packaging

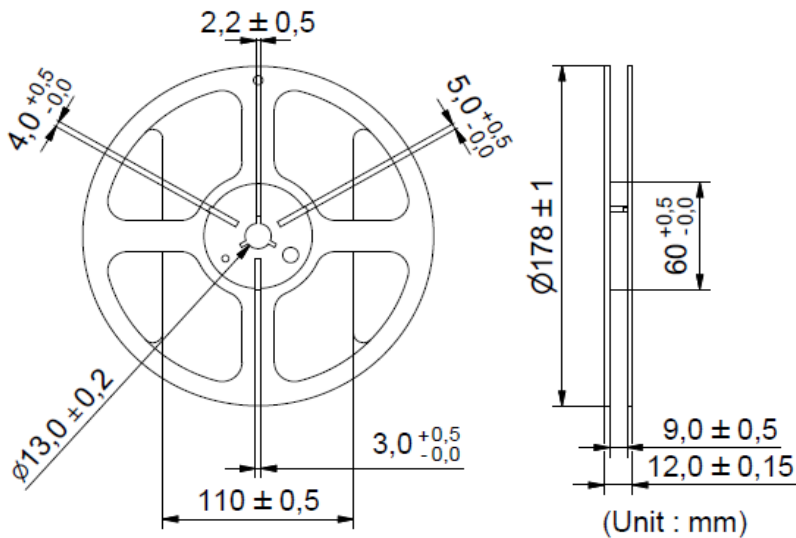
■ Taping Specification (0603 Series)



(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)



(Unit : mm)

Safety Approvals (Certified Model/Type : TSM1B474)



* UL 1434 / cUL recognized (File # E138827)



* TUV recognized (File # R 50167657)



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

Certificates

- (1) IATF 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. : TSM1B474F4151RZ1

R113 =19.3 KOhm ± 1%

B25/50 = 4150 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol.		Resistance Tol.	
				(°C)		(%)	
-40	21,096	19,491	18,006	-1.15	1.16	8.2%	-7.6%
-39	19,664	18,180	16,807	-1.15	1.16	8.2%	-7.6%
-38	18,346	16,973	15,702	-1.15	1.16	8.1%	-7.5%
-37	17,132	15,861	14,683	-1.15	1.16	8.0%	-7.4%
-36	16,012	14,834	13,742	-1.15	1.16	7.9%	-7.4%
-35	14,978	13,885	12,871	-1.15	1.16	7.9%	-7.3%
-34	14,020	13,006	12,064	-1.15	1.16	7.8%	-7.2%
-33	13,133	12,191	11,315	-1.15	1.16	7.7%	-7.2%
-32	12,308	11,433	10,618	-1.15	1.15	7.7%	-7.1%
-31	11,541	10,727	9,969.2	-1.15	1.15	7.6%	-7.1%
-30	10,826	10,069	9,363.8	-1.15	1.15	7.5%	-7.0%
-29	10,160	9,455.3	8,798.5	-1.15	1.15	7.5%	-6.9%
-28	9,537.9	8,881.8	8,270.1	-1.14	1.14	7.4%	-6.9%
-27	8,956.6	8,345.7	7,775.7	-1.14	1.14	7.3%	-6.8%
-26	8,413.2	7,844.2	7,313.0	-1.13	1.13	7.3%	-6.8%
-25	7,904.9	7,374.8	6,879.6	-1.13	1.13	7.2%	-6.7%
-24	7,429.3	6,935.4	6,473.7	-1.12	1.12	7.1%	-6.7%
-23	6,984.2	6,523.9	6,093.3	-1.12	1.12	7.1%	-6.6%
-22	6,567.6	6,138.5	5,736.8	-1.11	1.11	7.0%	-6.5%
-21	6,177.6	5,777.5	5,402.7	-1.11	1.11	6.9%	-6.5%
-20	5,812.5	5,439.3	5,089.5	-1.10	1.10	6.9%	-6.4%
-19	5,470.7	5,122.5	4,796.0	-1.10	1.10	6.8%	-6.4%
-18	5,150.6	4,825.7	4,520.8	-1.09	1.10	6.7%	-6.3%
-17	4,850.9	4,547.6	4,262.8	-1.09	1.09	6.7%	-6.3%
-16	4,570.3	4,287.0	4,020.9	-1.09	1.09	6.6%	-6.2%
-15	4,307.4	4,042.8	3,794.1	-1.08	1.09	6.5%	-6.2%
-14	4,061.2	3,814.0	3,581.4	-1.08	1.08	6.5%	-6.1%
-13	3,830.6	3,599.4	3,381.9	-1.08	1.08	6.4%	-6.0%
-12	3,614.4	3,398.2	3,194.7	-1.07	1.08	6.4%	-6.0%
-11	3,411.7	3,209.5	3,019.0	-1.07	1.08	6.3%	-5.9%
-10	3,221.7	3,032.5	2,854.1	-1.07	1.07	6.2%	-5.9%
-9	3,043.4	2,866.3	2,699.2	-1.07	1.07	6.2%	-5.8%
-8	2,876.2	2,710.3	2,553.8	-1.06	1.07	6.1%	-5.8%
-7	2,719.1	2,563.8	2,417.0	-1.06	1.07	6.1%	-5.7%
-6	2,571.7	2,426.1	2,288.5	-1.06	1.06	6.0%	-5.7%
-5	2,433.1	2,296.6	2,167.5	-1.05	1.06	5.9%	-5.6%
-4	2,302.9	2,174.9	2,053.8	-1.05	1.06	5.9%	-5.6%
-3	2,180.4	2,060.3	1,946.6	-1.05	1.05	5.8%	-5.5%
-2	2,065.2	1,952.5	1,845.7	-1.05	1.05	5.8%	-5.5%
-1	1,956.7	1,850.9	1,750.7	-1.04	1.05	5.7%	-5.4%

R - T Table

Part No. : TSM1B474F4151RZ1

R113 =19.3 KOhm ± 1%

B25/50 = 4150 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
0	1,854.6	1,755.2	1,661.1	-1.04	1.04	5.7%	-5.4%
1	1,758.4	1,665.0	1,576.5	-1.03	1.04	5.6%	-5.3%
2	1,667.7	1,580.0	1,496.8	-1.03	1.04	5.5%	-5.3%
3	1,582.1	1,499.7	1,421.5	-1.03	1.03	5.5%	-5.2%
4	1,501.4	1,424.0	1,350.4	-1.02	1.03	5.4%	-5.2%
5	1,425.3	1,352.5	1,283.2	-1.02	1.02	5.4%	-5.1%
6	1,353.4	1,284.9	1,219.8	-1.01	1.02	5.3%	-5.1%
7	1,285.5	1,221.1	1,159.8	-1.01	1.02	5.3%	-5.0%
8	1,221.4	1,160.7	1,103.0	-1.00	1.01	5.2%	-5.0%
9	1,160.8	1,103.7	1,049.3	-1.00	1.01	5.2%	-4.9%
10	1,103.4	1,049.7	998.51	-1.00	1.00	5.1%	-4.9%
11	1,049.2	998.65	950.41	-0.99	1.00	5.1%	-4.8%
12	997.96	950.32	904.86	-0.99	0.99	5.0%	-4.8%
13	949.44	904.56	861.72	-0.98	0.99	5.0%	-4.7%
14	903.52	861.23	820.84	-0.98	0.98	4.9%	-4.7%
15	860.04	820.18	782.10	-0.97	0.98	4.9%	-4.6%
16	818.86	781.29	745.38	-0.97	0.97	4.8%	-4.6%
17	779.85	744.44	710.56	-0.96	0.97	4.8%	-4.6%
18	742.90	709.50	677.54	-0.96	0.96	4.7%	-4.5%
19	707.88	676.38	646.22	-0.95	0.96	4.7%	-4.5%
20	674.68	644.96	616.50	-0.95	0.96	4.6%	-4.4%
21	643.20	615.16	588.29	-0.94	0.95	4.6%	-4.4%
22	613.35	586.89	561.52	-0.94	0.95	4.5%	-4.3%
23	585.04	560.06	536.10	-0.93	0.94	4.5%	-4.3%
24	558.17	534.59	511.96	-0.93	0.94	4.4%	-4.2%
25	532.68	510.41	489.03	-0.92	0.93	4.4%	-4.2%
26	508.48	487.45	467.24	-0.92	0.93	4.3%	-4.1%
27	485.51	465.64	446.54	-0.91	0.92	4.3%	-4.1%
28	463.69	444.92	426.86	-0.91	0.92	4.2%	-4.1%
29	442.97	425.23	408.15	-0.90	0.91	4.2%	-4.0%
30	423.28	406.51	390.37	-0.90	0.91	4.1%	-4.0%
31	404.57	388.72	373.45	-0.89	0.90	4.1%	-3.9%
32	386.79	371.80	357.35	-0.89	0.90	4.0%	-3.9%
33	369.88	355.70	342.03	-0.88	0.89	4.0%	-3.8%
34	353.80	340.39	327.45	-0.88	0.89	3.9%	-3.8%
35	338.51	325.82	313.57	-0.87	0.88	3.9%	-3.8%
36	323.95	311.94	300.35	-0.87	0.88	3.9%	-3.7%
37	310.10	298.74	287.76	-0.86	0.87	3.8%	-3.7%
38	296.92	286.16	275.76	-0.86	0.87	3.8%	-3.6%
39	284.36	274.17	264.32	-0.85	0.86	3.7%	-3.6%

R - T Table

Part No. : TSM1B474F4151RZ1

R113 =19.3 KOhm \pm 1%B25/50 = 4150 K \pm 1%

Temperature (°C)	Rmax. (K Ω)	Rnor. (K Ω)	Rmin. (K Ω)	Temperature Tol. (°C)		Resistance Tol. (%)	
40	272.40	262.76	253.42	-0.84	0.86	3.7%	-3.6%
41	261.01	251.87	243.03	-0.84	0.85	3.6%	-3.5%
42	250.15	241.50	233.12	-0.83	0.85	3.6%	-3.5%
43	239.80	231.60	223.66	-0.83	0.84	3.5%	-3.4%
44	229.93	222.16	214.63	-0.82	0.84	3.5%	-3.4%
45	220.52	213.16	206.02	-0.82	0.83	3.5%	-3.3%
46	211.54	204.56	197.79	-0.81	0.83	3.4%	-3.3%
47	202.97	196.36	189.93	-0.81	0.82	3.4%	-3.3%
48	194.79	188.52	182.43	-0.80	0.81	3.3%	-3.2%
49	186.98	181.03	175.26	-0.79	0.81	3.3%	-3.2%
50	179.53	173.88	168.40	-0.79	0.80	3.2%	-3.2%
51	172.40	167.05	161.85	-0.78	0.80	3.2%	-3.1%
52	165.59	160.52	155.58	-0.78	0.79	3.2%	-3.1%
53	159.08	154.27	149.58	-0.77	0.78	3.1%	-3.0%
54	152.86	148.29	143.85	-0.76	0.78	3.1%	-3.0%
55	146.91	142.58	138.36	-0.76	0.77	3.0%	-3.0%
56	141.22	137.11	133.10	-0.75	0.77	3.0%	-2.9%
57	135.78	131.88	128.07	-0.75	0.76	3.0%	-2.9%
58	130.57	126.87	123.25	-0.74	0.75	2.9%	-2.8%
59	125.58	122.07	118.64	-0.73	0.75	2.9%	-2.8%
60	120.81	117.47	114.22	-0.73	0.74	2.8%	-2.8%
61	116.24	113.07	109.98	-0.72	0.73	2.8%	-2.7%
62	111.86	108.85	105.91	-0.71	0.73	2.8%	-2.7%
63	107.66	104.81	102.02	-0.71	0.72	2.7%	-2.7%
64	103.64	100.93	98.284	-0.70	0.71	2.7%	-2.6%
65	99.790	97.217	94.701	-0.69	0.71	2.6%	-2.6%
66	96.096	93.654	91.264	-0.69	0.70	2.6%	-2.6%
67	92.555	90.236	87.967	-0.68	0.69	2.6%	-2.5%
68	89.159	86.958	84.802	-0.67	0.69	2.5%	-2.5%
69	85.902	83.812	81.764	-0.66	0.68	2.5%	-2.4%
70	82.778	80.793	78.848	-0.66	0.67	2.5%	-2.4%
71	79.779	77.895	76.048	-0.65	0.66	2.4%	-2.4%
72	76.902	75.113	73.358	-0.64	0.66	2.4%	-2.3%
73	74.141	72.442	70.775	-0.64	0.65	2.3%	-2.3%
74	71.490	69.877	68.294	-0.63	0.64	2.3%	-2.3%
75	68.945	67.413	65.910	-0.62	0.64	2.3%	-2.2%
76	66.500	65.047	63.619	-0.61	0.63	2.2%	-2.2%
77	64.153	62.773	61.417	-0.61	0.62	2.2%	-2.2%
78	61.898	60.588	59.300	-0.60	0.61	2.2%	-2.1%
79	59.731	58.488	57.265	-0.59	0.61	2.1%	-2.1%

R - T Table

Part No. : TSM1B474F4151RZ1

R113 =19.3 KOhm ± 1%

B25/50 = 4150 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
80	57.650	56.470	55.308	-0.58	0.60	2.1%	-2.1%
81	55.650	54.529	53.426	-0.58	0.59	2.1%	-2.0%
82	53.727	52.664	51.616	-0.57	0.58	2.0%	-2.0%
83	51.879	50.870	49.875	-0.56	0.58	2.0%	-2.0%
84	50.102	49.144	48.200	-0.55	0.57	1.9%	-1.9%
85	48.393	47.485	46.589	-0.55	0.56	1.9%	-1.9%
86	46.750	45.888	45.038	-0.54	0.55	1.9%	-1.9%
87	45.170	44.352	43.545	-0.53	0.55	1.8%	-1.8%
88	43.650	42.874	42.108	-0.52	0.54	1.8%	-1.8%
89	42.188	41.452	40.725	-0.52	0.53	1.8%	-1.8%
90	40.781	40.083	39.393	-0.51	0.52	1.7%	-1.7%
91	39.426	38.765	38.110	-0.50	0.52	1.7%	-1.7%
92	38.123	37.496	36.875	-0.49	0.51	1.7%	-1.7%
93	36.869	36.274	35.685	-0.49	0.50	1.6%	-1.6%
94	35.661	35.097	34.539	-0.48	0.49	1.6%	-1.6%
95	34.498	33.964	33.435	-0.47	0.48	1.6%	-1.6%
96	33.378	32.872	32.371	-0.46	0.48	1.5%	-1.5%
97	32.300	31.821	31.345	-0.46	0.47	1.5%	-1.5%
98	31.261	30.807	30.357	-0.45	0.46	1.5%	-1.5%
99	30.260	29.830	29.404	-0.44	0.45	1.4%	-1.4%
100	29.296	28.889	28.485	-0.43	0.45	1.4%	-1.4%
101	28.367	27.982	27.599	-0.42	0.44	1.4%	-1.4%
102	27.471	27.107	26.745	-0.42	0.43	1.3%	-1.3%
103	26.608	26.263	25.921	-0.41	0.42	1.3%	-1.3%
104	25.775	25.450	25.126	-0.40	0.41	1.3%	-1.3%
105	24.973	24.665	24.359	-0.39	0.40	1.2%	-1.2%
106	24.199	23.908	23.618	-0.38	0.40	1.2%	-1.2%
107	23.453	23.178	22.904	-0.38	0.39	1.2%	-1.2%
108	22.733	22.473	22.215	-0.37	0.38	1.2%	-1.2%
109	22.038	21.793	21.549	-0.36	0.37	1.1%	-1.1%
110	21.367	21.137	20.906	-0.35	0.36	1.1%	-1.1%
111	20.720	20.503	20.286	-0.34	0.36	1.1%	-1.1%
112	20.096	19.891	19.686	-0.33	0.35	1.0%	-1.0%
113	19.493	19.300	19.107	-0.33	0.34	1.0%	-1.0%
114	18.922	18.729	18.536	-0.34	0.35	1.0%	-1.0%
115	18.371	18.178	17.985	-0.35	0.36	1.1%	-1.1%
116	17.838	17.645	17.453	-0.36	0.37	1.1%	-1.1%
117	17.322	17.130	16.939	-0.37	0.38	1.1%	-1.1%
118	16.824	16.633	16.442	-0.38	0.40	1.2%	-1.1%
119	16.343	16.152	15.962	-0.40	0.41	1.2%	-1.2%

