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**SPECIFICATION FOR APPROVAL**

CUSTOMER	Codico
CERTIFIED MODEL/TYPE	TSM1B103
PART NO.	TSM1B103F3381RZ (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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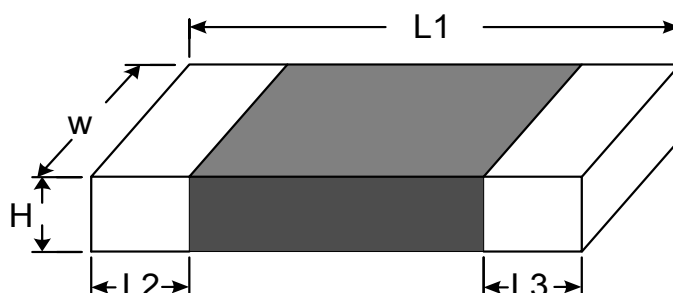
Part Number Code

Example :

TSM **1** **B** **103** **F** **338** **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	B	$B_{25/50}$
(4)	Zero Power Resistance at 25°C (R_{25})	103	$10 \times 10^3 \Omega = 10 \text{ K}\Omega$
(5)	Tolerance of R_{25}	F	$\pm 1\%$
(6)	B Value	338	3380K
(7)	Tolerance of B Value	1	$\pm 1\%$
(8)	Packaging	R	Reel
(9)	Optional Suffix	Z	RoHS+HF compliance

Structure and Dimensions



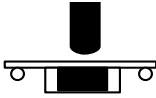
(unit : mm)

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 _{25/50} 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)
TSM1B103F3381RZ	10	1	3380	1	210	Approx. 2.1	Approx. 3.1	-40 ~ +125

Reliability

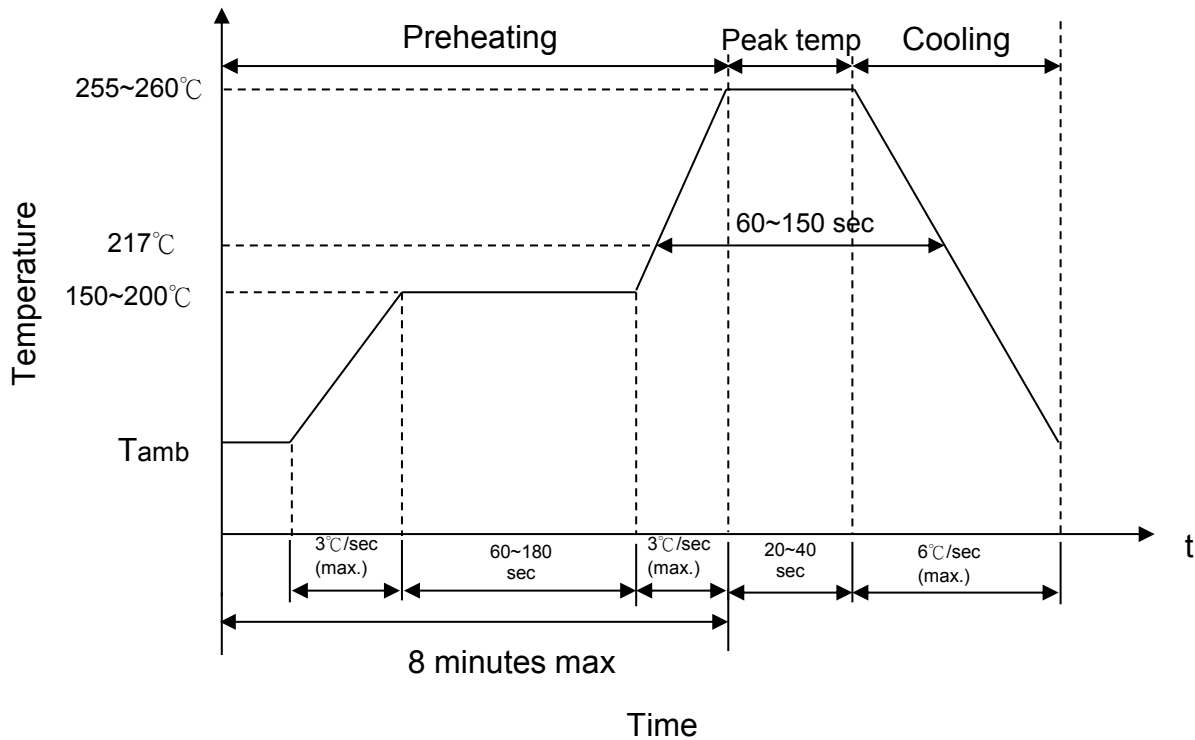
Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp : 2mm ; Speed < 0.5mm/sec. Duration : 10 sec on PCB. 	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$															
Solderability	IEC60068-2-58	245 ± 5°C , 3 ± 0.3 sec	At least 95% of terminal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

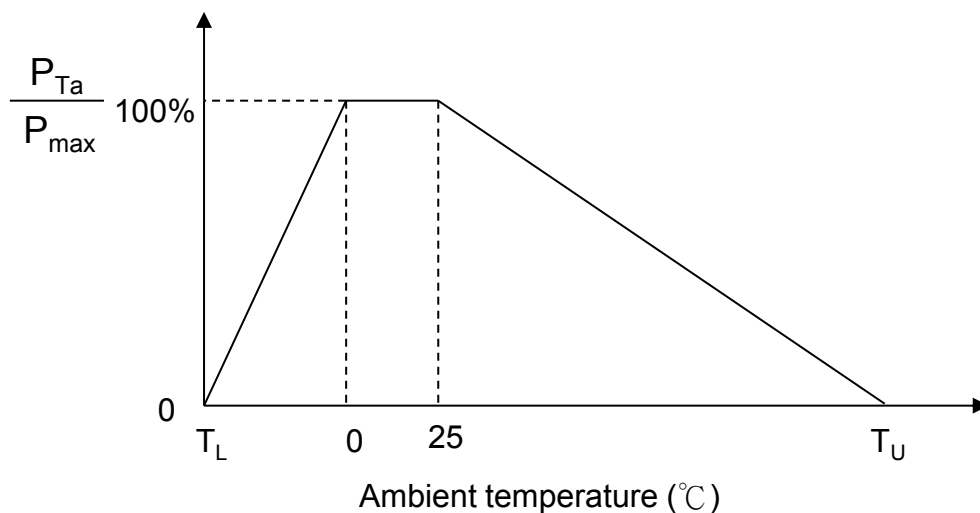
■ IR-Reflow Soldering Profile



■ 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)

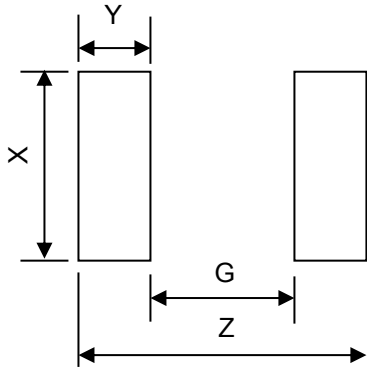
For example :

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

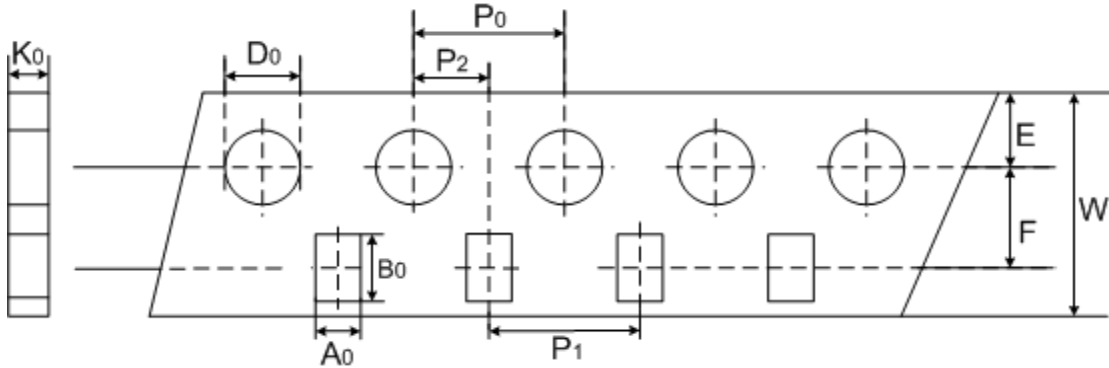
(I) Storage Conditions :

- 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

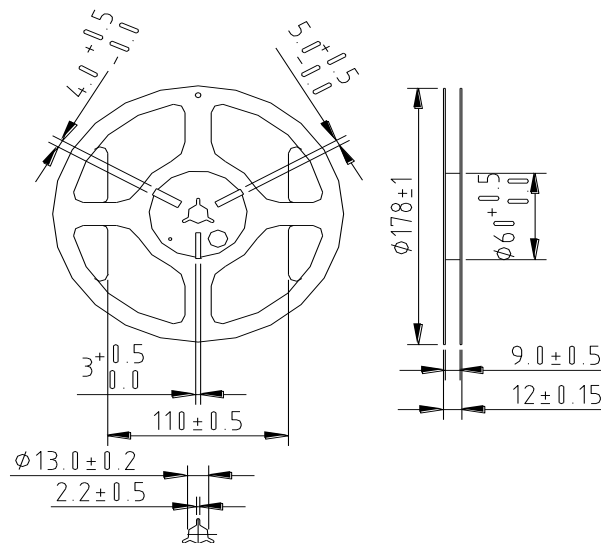
■ Taping specification (0603 Series)



(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 : TSM1B103)

* 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. : TSM1B103F3381RZ

R25 = 10 KOhm ± 1%
B25/50 = 3380 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol.		Resistance Tol.	
				(°C)		(%)	
-40	208.11	199.97	192.13	-0.70	0.72	4.1%	-3.9%
-39	196.68	189.09	181.77	-0.70	0.72	4.0%	-3.9%
-38	185.97	178.89	172.07	-0.69	0.71	4.0%	-3.8%
-37	175.91	169.31	162.95	-0.69	0.71	3.9%	-3.8%
-36	166.47	160.31	154.37	-0.68	0.70	3.8%	-3.7%
-35	157.59	151.84	146.29	-0.68	0.70	3.8%	-3.7%
-34	149.23	143.86	138.68	-0.67	0.69	3.7%	-3.6%
-33	141.35	136.34	131.50	-0.67	0.68	3.7%	-3.6%
-32	133.93	129.25	124.73	-0.66	0.68	3.6%	-3.5%
-31	126.93	122.56	118.34	-0.65	0.67	3.6%	-3.5%
-30	120.33	116.25	112.30	-0.65	0.66	3.5%	-3.4%
-29	114.10	110.29	106.60	-0.64	0.66	3.5%	-3.3%
-28	108.23	104.67	101.22	-0.63	0.65	3.4%	-3.3%
-27	102.68	99.359	96.133	-0.63	0.64	3.3%	-3.2%
-26	97.452	94.345	91.329	-0.62	0.64	3.3%	-3.2%
-25	92.513	89.611	86.790	-0.61	0.63	3.2%	-3.1%
-24	87.852	85.139	82.502	-0.61	0.62	3.2%	-3.1%
-23	83.451	80.915	78.449	-0.60	0.62	3.1%	-3.0%
-22	79.296	76.925	74.618	-0.59	0.61	3.1%	-3.0%
-21	75.372	73.155	70.997	-0.59	0.61	3.0%	-3.0%
-20	71.666	69.593	67.573	-0.58	0.60	3.0%	-2.9%
-19	68.165	66.226	64.336	-0.58	0.59	2.9%	-2.9%
-18	64.856	63.043	61.274	-0.57	0.59	2.9%	-2.8%
-17	61.730	60.033	58.377	-0.56	0.58	2.8%	-2.8%
-16	58.774	57.186	55.635	-0.56	0.58	2.8%	-2.7%
-15	55.979	54.493	53.041	-0.55	0.57	2.7%	-2.7%
-14	53.335	51.944	50.584	-0.55	0.56	2.7%	-2.6%
-13	50.833	49.531	48.257	-0.54	0.56	2.6%	-2.6%
-12	48.465	47.245	46.052	-0.53	0.55	2.6%	-2.5%
-11	46.222	45.081	43.963	-0.53	0.54	2.5%	-2.5%
-10	44.099	43.029	41.982	-0.52	0.54	2.5%	-2.4%
-9	42.086	41.085	40.103	-0.51	0.53	2.4%	-2.4%
-8	40.178	39.241	38.321	-0.51	0.53	2.4%	-2.3%
-7	38.370	37.491	36.629	-0.50	0.52	2.3%	-2.3%
-6	36.654	35.830	35.022	-0.50	0.51	2.3%	-2.3%
-5	35.025	34.254	33.496	-0.49	0.51	2.3%	-2.2%
-4	33.479	32.757	32.047	-0.48	0.50	2.2%	-2.2%
-3	32.011	31.334	30.668	-0.48	0.49	2.2%	-2.1%
-2	30.616	29.982	29.358	-0.47	0.49	2.1%	-2.1%
-1	29.290	28.696	28.111	-0.46	0.48	2.1%	-2.0%

R-T Table

Part No. : TSM1B103F3381RZ

R25 =10 KOhm ± 1%
B25/50 = 3380 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
0	28.029	27.473	26.925	-0.46	0.47	2.0%	-2.0%
1	26.830	26.309	25.795	-0.45	0.46	2.0%	-2.0%
2	25.690	25.201	24.720	-0.44	0.46	1.9%	-1.9%
3	24.604	24.146	23.695	-0.43	0.45	1.9%	-1.9%
4	23.570	23.142	22.719	-0.43	0.44	1.9%	-1.8%
5	22.585	22.184	21.788	-0.42	0.43	1.8%	-1.8%
6	21.647	21.272	20.901	-0.41	0.43	1.8%	-1.7%
7	20.753	20.402	20.054	-0.40	0.42	1.7%	-1.7%
8	19.901	19.572	19.247	-0.40	0.41	1.7%	-1.7%
9	19.088	18.780	18.476	-0.39	0.40	1.6%	-1.6%
10	18.313	18.025	17.740	-0.38	0.40	1.6%	-1.6%
11	17.573	17.304	17.037	-0.37	0.39	1.6%	-1.5%
12	16.867	16.616	16.366	-0.37	0.38	1.5%	-1.5%
13	16.194	15.958	15.725	-0.36	0.37	1.5%	-1.5%
14	15.550	15.331	15.113	-0.35	0.36	1.4%	-1.4%
15	14.936	14.731	14.527	-0.34	0.36	1.4%	-1.4%
16	14.349	14.157	13.967	-0.33	0.35	1.4%	-1.3%
17	13.788	13.609	13.432	-0.33	0.34	1.3%	-1.3%
18	13.251	13.085	12.919	-0.32	0.33	1.3%	-1.3%
19	12.739	12.584	12.429	-0.31	0.32	1.2%	-1.2%
20	12.249	12.105	11.961	-0.30	0.31	1.2%	-1.2%
21	11.780	11.646	11.512	-0.29	0.31	1.2%	-1.2%
22	11.332	11.207	11.082	-0.28	0.30	1.1%	-1.1%
23	10.903	10.787	10.671	-0.28	0.29	1.1%	-1.1%
24	10.493	10.385	10.277	-0.27	0.28	1.0%	-1.0%
25	10.100	10.000	9.9000	-0.26	0.27	1.0%	-1.0%
26	9.7313	9.6313	9.5314	-0.27	0.28	1.0%	-1.0%
27	9.3780	9.2782	9.1785	-0.28	0.29	1.1%	-1.1%
28	9.0394	8.9399	8.8406	-0.29	0.31	1.1%	-1.1%
29	8.7149	8.6158	8.5169	-0.31	0.32	1.2%	-1.1%
30	8.4037	8.3051	8.2068	-0.32	0.33	1.2%	-1.2%
31	8.1054	8.0073	7.9097	-0.33	0.34	1.2%	-1.2%
32	7.8192	7.7218	7.6249	-0.34	0.35	1.3%	-1.3%
33	7.5448	7.4481	7.3519	-0.35	0.37	1.3%	-1.3%
34	7.2814	7.1855	7.0902	-0.37	0.38	1.3%	-1.3%
35	7.0287	6.9337	6.8392	-0.38	0.39	1.4%	-1.4%
36	6.7861	6.6920	6.5985	-0.39	0.40	1.4%	-1.4%
37	6.5533	6.4601	6.3676	-0.40	0.42	1.4%	-1.4%
38	6.3297	6.2376	6.1461	-0.41	0.43	1.5%	-1.5%
39	6.1150	6.0239	5.9335	-0.43	0.44	1.5%	-1.5%

R-T Table

Part No. : TSM1B103F3381RZ

R25 =10 KOhm ± 1%
B25/50 = 3380 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
40	5.9088	5.8187	5.7294	-0.44	0.45	1.5%	-1.5%
41	5.7107	5.6217	5.5335	-0.45	0.47	1.6%	-1.6%
42	5.5203	5.4324	5.3454	-0.46	0.48	1.6%	-1.6%
43	5.3374	5.2506	5.1647	-0.48	0.49	1.7%	-1.6%
44	5.1615	5.0759	4.9911	-0.49	0.50	1.7%	-1.7%
45	4.9924	4.9079	4.8244	-0.50	0.52	1.7%	-1.7%
46	4.8298	4.7465	4.6641	-0.52	0.53	1.8%	-1.7%
47	4.6734	4.5912	4.5101	-0.53	0.54	1.8%	-1.8%
48	4.5229	4.4419	4.3620	-0.54	0.56	1.8%	-1.8%
49	4.3781	4.2983	4.2196	-0.56	0.57	1.9%	-1.8%
50	4.2388	4.1601	4.0826	-0.57	0.58	1.9%	-1.9%
51	4.1046	4.0272	3.9508	-0.58	0.60	1.9%	-1.9%
52	3.9754	3.8992	3.8240	-0.60	0.61	2.0%	-1.9%
53	3.8510	3.7760	3.7020	-0.61	0.62	2.0%	-2.0%
54	3.7312	3.6573	3.5845	-0.62	0.64	2.0%	-2.0%
55	3.6158	3.5430	3.4714	-0.64	0.65	2.1%	-2.0%
56	3.5045	3.4329	3.3624	-0.65	0.66	2.1%	-2.1%
57	3.3973	3.3268	3.2575	-0.66	0.68	2.1%	-2.1%
58	3.2939	3.2246	3.1564	-0.68	0.69	2.1%	-2.1%
59	3.1942	3.1260	3.0590	-0.69	0.71	2.2%	-2.1%
60	3.0981	3.0310	2.9651	-0.71	0.72	2.2%	-2.2%
61	3.0053	2.9394	2.8746	-0.72	0.73	2.2%	-2.2%
62	2.9159	2.8510	2.7873	-0.73	0.75	2.3%	-2.2%
63	2.8295	2.7657	2.7031	-0.75	0.76	2.3%	-2.3%
64	2.7461	2.6834	2.6219	-0.76	0.77	2.3%	-2.3%
65	2.6657	2.6040	2.5435	-0.78	0.79	2.4%	-2.3%
66	2.5879	2.5273	2.4679	-0.79	0.80	2.4%	-2.4%
67	2.5129	2.4533	2.3949	-0.80	0.82	2.4%	-2.4%
68	2.4404	2.3818	2.3244	-0.82	0.83	2.5%	-2.4%
69	2.3703	2.3127	2.2563	-0.83	0.85	2.5%	-2.4%
70	2.3026	2.2460	2.1906	-0.85	0.86	2.5%	-2.5%
71	2.2371	2.1815	2.1271	-0.86	0.87	2.5%	-2.5%
72	2.1739	2.1192	2.0657	-0.88	0.89	2.6%	-2.5%
73	2.1127	2.0590	2.0064	-0.89	0.90	2.6%	-2.6%
74	2.0535	2.0007	1.9491	-0.91	0.92	2.6%	-2.6%
75	1.9963	1.9444	1.8937	-0.92	0.93	2.7%	-2.6%
76	1.9409	1.8899	1.8401	-0.94	0.95	2.7%	-2.6%
77	1.8873	1.8372	1.7883	-0.95	0.96	2.7%	-2.7%
78	1.8354	1.7862	1.7382	-0.96	0.97	2.8%	-2.7%
79	1.7852	1.7369	1.6897	-0.98	0.99	2.8%	-2.7%

R-T Table

Part No. : TSM1B103F3381RZ

R25 =10 KOhm ± 1%
B25/50 = 3380 K ± 1%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
80	1.7366	1.6891	1.6427	-0.99	1.00	2.8%	-2.7%
81	1.6896	1.6429	1.5973	-1.01	1.02	2.8%	-2.8%
82	1.6440	1.5981	1.5534	-1.02	1.03	2.9%	-2.8%
83	1.5998	1.5548	1.5109	-1.04	1.05	2.9%	-2.8%
84	1.5571	1.5128	1.4697	-1.05	1.06	2.9%	-2.9%
85	1.5156	1.4722	1.4298	-1.07	1.08	3.0%	-2.9%
86	1.4755	1.4328	1.3911	-1.08	1.09	3.0%	-2.9%
87	1.4366	1.3946	1.3537	-1.10	1.11	3.0%	-2.9%
88	1.3989	1.3576	1.3175	-1.12	1.12	3.0%	-3.0%
89	1.3623	1.3218	1.2824	-1.13	1.14	3.1%	-3.0%
90	1.3269	1.2871	1.2484	-1.15	1.15	3.1%	-3.0%
91	1.2925	1.2534	1.2154	-1.16	1.17	3.1%	-3.0%
92	1.2592	1.2208	1.1834	-1.18	1.18	3.1%	-3.1%
93	1.2269	1.1892	1.1525	-1.19	1.20	3.2%	-3.1%
94	1.1956	1.1585	1.1224	-1.21	1.21	3.2%	-3.1%
95	1.1652	1.1287	1.0933	-1.22	1.23	3.2%	-3.1%
96	1.1357	1.0999	1.0651	-1.24	1.24	3.3%	-3.2%
97	1.1071	1.0719	1.0377	-1.26	1.26	3.3%	-3.2%
98	1.0793	1.0448	1.0112	-1.27	1.27	3.3%	-3.2%
99	1.0524	1.0184	0.98547	-1.29	1.29	3.3%	-3.2%
100	1.0262	0.99289	0.96051	-1.31	1.31	3.4%	-3.3%
101	1.0009	0.96810	0.93630	-1.32	1.32	3.4%	-3.3%
102	0.97627	0.94406	0.91282	-1.34	1.34	3.4%	-3.3%
103	0.95239	0.92073	0.89004	-1.36	1.36	3.4%	-3.3%
104	0.92920	0.89809	0.86794	-1.37	1.37	3.5%	-3.4%
105	0.90669	0.87612	0.84650	-1.39	1.39	3.5%	-3.4%
106	0.88485	0.85480	0.82569	-1.41	1.41	3.5%	-3.4%
107	0.86364	0.83411	0.80551	-1.43	1.42	3.5%	-3.4%
108	0.84305	0.81403	0.78593	-1.45	1.44	3.6%	-3.5%
109	0.82307	0.79454	0.76692	-1.46	1.46	3.6%	-3.5%
110	0.80366	0.77562	0.74848	-1.48	1.48	3.6%	-3.5%
111	0.78482	0.75726	0.73059	-1.50	1.50	3.6%	-3.5%
112	0.76653	0.73943	0.71322	-1.52	1.52	3.7%	-3.5%
113	0.74878	0.72213	0.69637	-1.54	1.53	3.7%	-3.6%
114	0.73154	0.70534	0.68001	-1.56	1.55	3.7%	-3.6%
115	0.71480	0.68904	0.66414	-1.58	1.57	3.7%	-3.6%
116	0.69854	0.67321	0.64874	-1.60	1.59	3.8%	-3.6%
117	0.68276	0.65785	0.63379	-1.62	1.61	3.8%	-3.7%
118	0.66744	0.64294	0.61928	-1.64	1.63	3.8%	-3.7%
119	0.65256	0.62847	0.60521	-1.66	1.66	3.8%	-3.7%

