

THINKING ELECTRONIC INDUSTRIAL CO., LTD.

HEAD OFFICE: 8F-1, No.93, Ta-Shun 1st Rd., Kaohsiung, Taiwan
 TEL: 886-7-5577660 FAX: 886-7-5570560

MANUFACTURING SITE

- KAOHSIUNG FACTORY: No.51, Kaifa Road, Nantze Export Processing Zone,
 Kaohsiung City 81170, Taiwan
 TEL: 886-7-9616668 FAX: 886-7-9616698
- CHANGZHOU FACTORY: No.82,Renmin Mid Rd.,WuJin High&New-Tech Industrial
 Development Zone,ChangZhou,JiangSu,China
 TEL:86-519-86578999 FAX:86-519-86558643
- DONG GUAN FACTORY: Chiao-Tou Tsun, Sha-Tao Hsiang, Chang-An Town,
 Dong-Guan City 523863, Guangdong, China
 TEL:86-769-85542016 FAX:86-769-85546890
- YICHANG FACTORY: No. 283 Xiaoting Avenue, Xiaoting Dist., Yichang
 City 443007, Hubei, China
 TEL:86-717-6510010 FAX:86-717-6511430

**SPECIFICATION FOR APPROVAL**

CUSTOMER	Codico
CERTIFIED MODEL/TYPE	TSM0B474
PART NO.	TSM0B474J4503RZ (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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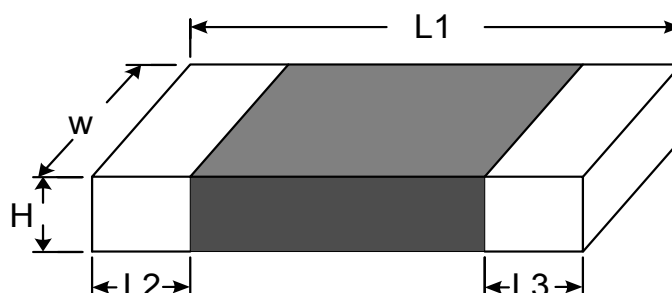
Part Number Code

Example :

TSM **0** **B** **474** **J** **450** **3** **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)	0	0402
(3)	Definition of B Value	B	$B_{25/50}$
(4)	Zero Power Resistance at 25°C (R_{25})	474	$47 \times 10^4 \Omega = 470 \text{ K}\Omega$
(5)	Tolerance of R_{25}	J	$\pm 5\%$
(6)	B Value	450	4500K
(7)	Tolerance of B Value	3	$\pm 3\%$
(8)	Packaging	R	Reel
(9)	Optional Suffix	Z	RoHS+HF compliance

Structure and Dimensions



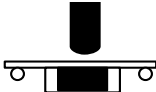
(unit : mm)

L1	W	H max.	L2 and L3
1.00±0.15	0.50±0.10	0.60	0.20±0.10

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)
TSM0B474J4503RZ	470	5	4500	3	170	Approx. 1.7	Approx. 2.0	-40 ~ +125

Reliability

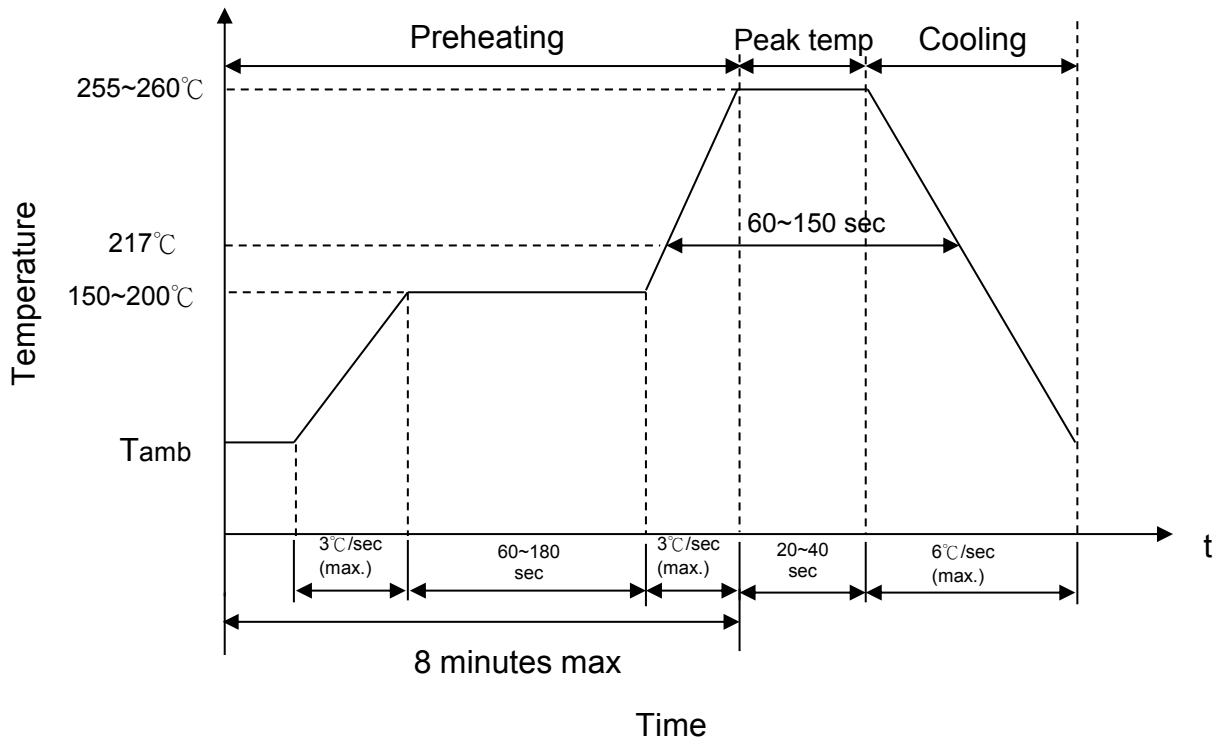
Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp : 2mm ; Speed < 0.5mm/sec. Duration : 10 sec on PCB. 	No visible damage $ \Delta R_{25}/R_{25} \leq 5\%$															
Solderability	IEC60068-2-58	245 ± 5°C , 3 ± 0.3 sec	At least 95% of terminal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

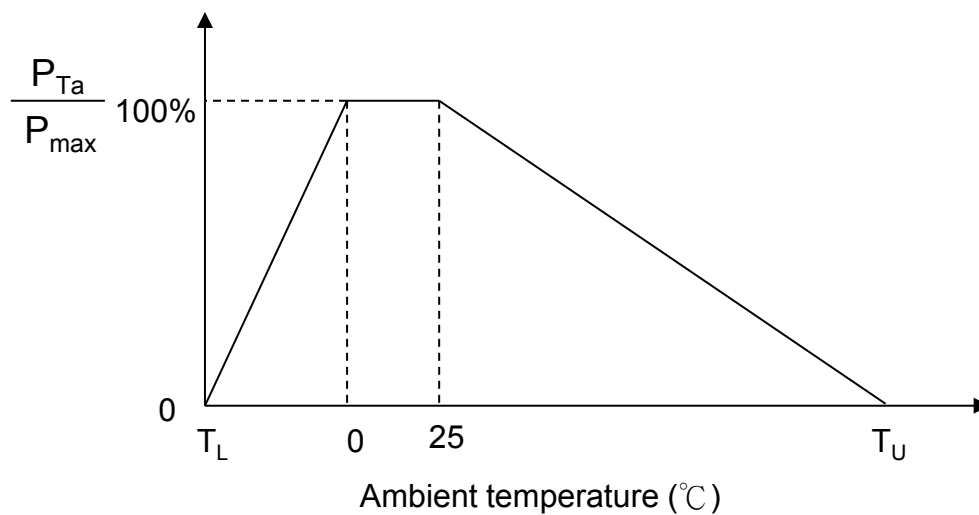
■ IR-Reflow Soldering Profile



■ 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)

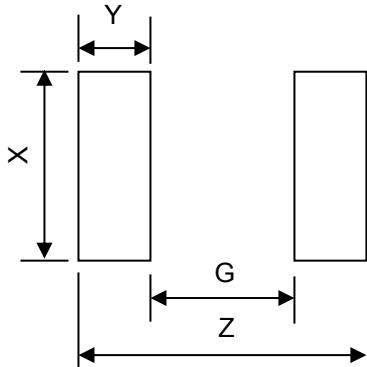
For example :

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)	0402
Z	1.7 mm
G	0.5 mm
X	0.6 mm
Y	0.6 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

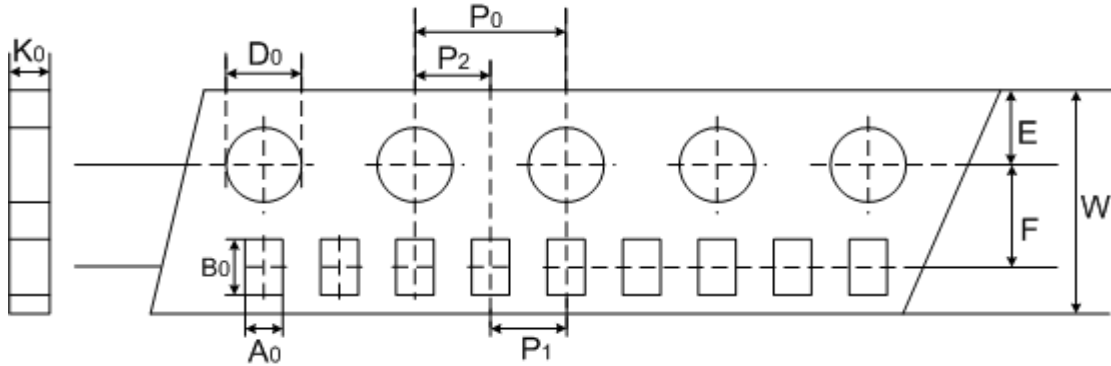
(I) Storage Conditions :

- 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

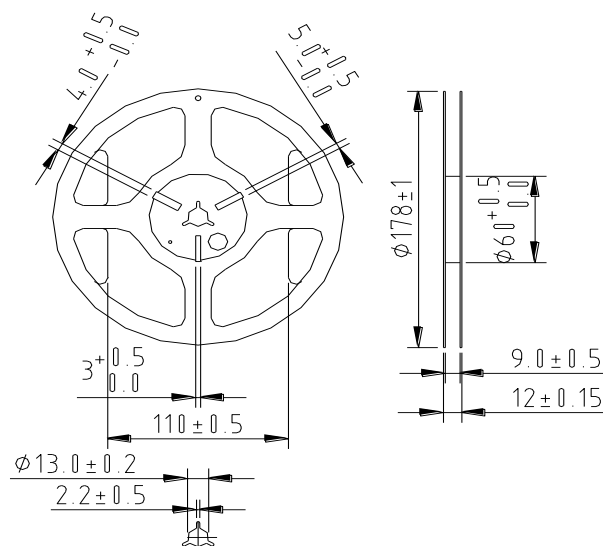
■ Taping Specification (0402 Series)



(Unit : mm)

Index	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	K ₀
Size	±0.05	±0.12	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1
0402	0.62	1.12	8	1.75	3.5	2	2	4	1.55	0.60

■ Quantity (10000 pcs / reel)



Safety Approvals (Certified Model/Type : TSM0B474)

* 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. : TSM0B474J4503RZ

R25 = 470 KΩ ± 5%

B25/50 = 4500 K ± 3%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol.		Resistance Tol.	
				(°C)		(%)	
-40	30,184	25,501	21,490	-2.38	2.20	18.4%	-15.7%
-39	27,962	23,676	19,997	-2.35	2.18	18.1%	-15.5%
-38	25,909	21,987	18,612	-2.32	2.16	17.8%	-15.4%
-37	24,014	20,424	17,327	-2.30	2.14	17.6%	-15.2%
-36	22,266	18,979	16,137	-2.27	2.13	17.3%	-15.0%
-35	20,654	17,643	15,034	-2.25	2.11	17.1%	-14.8%
-34	19,166	16,408	14,012	-2.23	2.10	16.8%	-14.6%
-33	17,794	15,266	13,065	-2.21	2.08	16.6%	-14.4%
-32	16,527	14,210	12,187	-2.19	2.07	16.3%	-14.2%
-31	15,358	13,233	11,374	-2.17	2.06	16.1%	-14.1%
-30	14,278	12,329	10,619	-2.16	2.04	15.8%	-13.9%
-29	13,280	11,491	9,918.4	-2.14	2.03	15.6%	-13.7%
-28	12,358	10,715	9,268.2	-2.12	2.01	15.3%	-13.5%
-27	11,505	9,996.5	8,664.4	-2.10	2.00	15.1%	-13.3%
-26	10,715	9,329.8	8,103.3	-2.08	1.98	14.8%	-13.1%
-25	9,984.3	8,711.4	7,581.8	-2.06	1.97	14.6%	-13.0%
-24	9,307.6	8,137.6	7,096.9	-2.04	1.95	14.4%	-12.8%
-23	8,680.6	7,604.8	6,645.7	-2.02	1.94	14.1%	-12.6%
-22	8,099.4	7,110.0	6,225.9	-2.00	1.92	13.9%	-12.4%
-21	7,560.5	6,650.3	5,835.0	-1.98	1.91	13.7%	-12.3%
-20	7,060.6	6,222.9	5,470.9	-1.96	1.89	13.5%	-12.1%
-19	6,596.6	5,825.5	5,131.7	-1.94	1.88	13.2%	-11.9%
-18	6,165.9	5,455.9	4,815.5	-1.92	1.86	13.0%	-11.7%
-17	5,765.8	5,111.8	4,520.7	-1.90	1.85	12.8%	-11.6%
-16	5,394.1	4,791.6	4,245.7	-1.88	1.83	12.6%	-11.4%
-15	5,048.6	4,493.3	3,989.1	-1.86	1.81	12.4%	-11.2%
-14	4,727.2	4,215.4	3,749.5	-1.84	1.80	12.1%	-11.1%
-13	4,428.3	3,956.3	3,525.8	-1.82	1.78	11.9%	-10.9%
-12	4,150.1	3,714.8	3,316.8	-1.80	1.77	11.7%	-10.7%
-11	3,891.1	3,489.5	3,121.5	-1.78	1.75	11.5%	-10.5%
-10	3,649.8	3,279.2	2,938.9	-1.76	1.73	11.3%	-10.4%
-9	3,425.0	3,082.9	2,768.1	-1.74	1.72	11.1%	-10.2%
-8	3,215.3	2,899.6	2,608.2	-1.72	1.70	10.9%	-10.0%
-7	3,019.8	2,728.2	2,458.6	-1.70	1.68	10.7%	-9.9%
-6	2,837.4	2,568.1	2,318.5	-1.68	1.67	10.5%	-9.7%
-5	2,667.1	2,418.3	2,187.2	-1.66	1.65	10.3%	-9.6%
-4	2,508.1	2,278.2	2,064.2	-1.64	1.63	10.1%	-9.4%
-3	2,359.5	2,147.0	1,948.8	-1.62	1.61	9.9%	-9.2%
-2	2,220.6	2,024.2	1,840.6	-1.60	1.60	9.7%	-9.1%
-1	2,090.7	1,909.2	1,739.0	-1.58	1.58	9.5%	-8.9%

R - T Table

Part No. : TSM0B474J4503RZ

R25 =470 KOhm ± 5%

B25/50 = 4500 K ± 3%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
0	1,969.2	1,801.3	1,643.7	-1.56	1.56	9.3%	-8.8%
1	1,855.5	1,700.3	1,554.1	-1.54	1.54	9.1%	-8.6%
2	1,749.0	1,605.4	1,470.0	-1.51	1.52	8.9%	-8.4%
3	1,649.2	1,516.5	1,390.9	-1.49	1.50	8.8%	-8.3%
4	1,555.7	1,432.9	1,316.5	-1.47	1.48	8.6%	-8.1%
5	1,468.1	1,354.5	1,246.5	-1.45	1.46	8.4%	-8.0%
6	1,385.9	1,280.8	1,180.7	-1.43	1.44	8.2%	-7.8%
7	1,308.7	1,211.5	1,118.7	-1.40	1.42	8.0%	-7.7%
8	1,236.3	1,146.4	1,060.3	-1.38	1.40	7.8%	-7.5%
9	1,168.3	1,085.1	1,005.3	-1.36	1.38	7.7%	-7.4%
10	1,104.4	1,027.4	953.43	-1.34	1.36	7.5%	-7.2%
11	1,044.4	973.16	904.53	-1.31	1.34	7.3%	-7.1%
12	987.92	922.05	858.41	-1.29	1.32	7.1%	-6.9%
13	934.83	873.90	814.90	-1.27	1.30	7.0%	-6.8%
14	884.87	828.52	773.82	-1.24	1.28	6.8%	-6.6%
15	837.85	785.74	735.04	-1.22	1.26	6.6%	-6.5%
16	793.57	745.40	698.40	-1.19	1.23	6.5%	-6.3%
17	751.87	707.34	663.79	-1.17	1.21	6.3%	-6.2%
18	712.58	671.43	631.07	-1.15	1.19	6.1%	-6.0%
19	675.55	637.53	600.14	-1.12	1.17	6.0%	-5.9%
20	640.64	605.51	570.88	-1.10	1.15	5.8%	-5.7%
21	607.71	575.27	543.20	-1.07	1.12	5.6%	-5.6%
22	576.64	546.69	517.01	-1.05	1.10	5.5%	-5.4%
23	547.32	519.69	492.22	-1.02	1.08	5.3%	-5.3%
24	519.64	494.15	468.74	-1.00	1.05	5.2%	-5.1%
25	493.50	470.00	446.50	-0.97	1.03	5.0%	-5.0%
26	470.21	447.15	424.16	-1.01	1.06	5.2%	-5.1%
27	448.14	425.53	403.05	-1.05	1.10	5.3%	-5.3%
28	427.22	405.07	383.10	-1.08	1.13	5.5%	-5.4%
29	407.39	385.69	364.24	-1.12	1.17	5.6%	-5.6%
30	388.57	367.34	346.40	-1.16	1.20	5.8%	-5.7%
31	370.72	349.96	329.53	-1.19	1.24	5.9%	-5.8%
32	353.78	333.48	313.56	-1.23	1.28	6.1%	-6.0%
33	337.70	317.87	298.45	-1.27	1.31	6.2%	-6.1%
34	322.43	303.06	284.14	-1.31	1.35	6.4%	-6.2%
35	307.93	289.02	270.59	-1.35	1.38	6.5%	-6.4%
36	294.16	275.70	257.76	-1.39	1.42	6.7%	-6.5%
37	281.07	263.06	245.60	-1.42	1.46	6.8%	-6.6%
38	268.63	251.07	234.07	-1.46	1.49	7.0%	-6.8%
39	256.80	239.68	223.15	-1.50	1.53	7.1%	-6.9%

R - T Table

Part No. : TSM0B474J4503RZ

R25 =470 KOhm ± 5%

B25/50 = 4500 K ± 3%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
40	245.56	228.87	212.78	-1.54	1.57	7.3%	-7.0%
41	234.86	218.60	202.96	-1.58	1.60	7.4%	-7.2%
42	224.69	208.84	193.63	-1.62	1.64	7.6%	-7.3%
43	215.00	199.57	184.78	-1.66	1.68	7.7%	-7.4%
44	205.79	190.76	176.38	-1.71	1.72	7.9%	-7.5%
45	197.01	182.38	168.41	-1.75	1.75	8.0%	-7.7%
46	188.66	174.41	160.83	-1.79	1.79	8.2%	-7.8%
47	180.70	166.83	153.64	-1.83	1.83	8.3%	-7.9%
48	173.11	159.61	146.80	-1.87	1.87	8.5%	-8.0%
49	165.89	152.75	140.30	-1.91	1.90	8.6%	-8.1%
50	159.00	146.22	134.12	-1.96	1.94	8.7%	-8.3%
51	152.43	139.99	128.25	-2.00	1.98	8.9%	-8.4%
52	146.17	134.07	122.66	-2.04	2.02	9.0%	-8.5%
53	140.19	128.42	117.34	-2.09	2.06	9.2%	-8.6%
54	134.49	123.04	112.28	-2.13	2.10	9.3%	-8.7%
55	129.05	117.91	107.47	-2.17	2.14	9.4%	-8.9%
56	123.86	113.03	102.88	-2.22	2.18	9.6%	-9.0%
57	118.90	108.36	98.512	-2.26	2.22	9.7%	-9.1%
58	114.17	103.92	94.352	-2.31	2.26	9.9%	-9.2%
59	109.64	99.676	90.387	-2.35	2.29	10.0%	-9.3%
60	105.32	95.628	86.609	-2.39	2.33	10.1%	-9.4%
61	101.19	91.764	83.007	-2.44	2.37	10.3%	-9.5%
62	97.243	88.075	79.572	-2.49	2.41	10.4%	-9.7%
63	93.468	84.552	76.295	-2.53	2.45	10.5%	-9.8%
64	89.858	81.187	73.170	-2.58	2.49	10.7%	-9.9%
65	86.404	77.972	70.187	-2.62	2.53	10.8%	-10.0%
66	83.099	74.900	67.340	-2.67	2.57	10.9%	-10.1%
67	79.937	71.963	64.622	-2.72	2.61	11.1%	-10.2%
68	76.910	69.155	62.027	-2.76	2.65	11.2%	-10.3%
69	74.011	66.470	59.548	-2.81	2.70	11.3%	-10.4%
70	71.236	63.901	57.179	-2.86	2.74	11.5%	-10.5%
71	68.577	61.444	54.915	-2.90	2.78	11.6%	-10.6%
72	66.029	59.092	52.752	-2.95	2.82	11.7%	-10.7%
73	63.588	56.841	50.683	-3.00	2.86	11.9%	-10.8%
74	61.248	54.686	48.705	-3.04	2.90	12.0%	-10.9%
75	59.004	52.622	46.813	-3.09	2.94	12.1%	-11.0%
76	56.853	50.645	45.002	-3.14	2.98	12.3%	-11.1%
77	54.790	48.751	43.270	-3.19	3.02	12.4%	-11.2%
78	52.810	46.936	41.612	-3.24	3.06	12.5%	-11.3%
79	50.910	45.197	40.024	-3.28	3.10	12.6%	-11.4%

R - T Table

Part No. : TSM0B474J4503RZ

R25 =470 KOhm ± 5%

B25/50 = 4500 K ± 3%

Temperature (°C)	Rmax. (KΩ)	Rnor. (KΩ)	Rmin. (KΩ)	Temperature Tol. (°C)		Resistance Tol. (%)	
80	49.087	43.529	38.504	-3.33	3.14	12.8%	-11.5%
81	47.337	41.930	37.048	-3.38	3.18	12.9%	-11.6%
82	45.657	40.397	35.653	-3.43	3.22	13.0%	-11.7%
83	44.043	38.926	34.317	-3.48	3.27	13.1%	-11.8%
84	42.494	37.514	33.036	-3.53	3.31	13.3%	-11.9%
85	41.004	36.160	31.808	-3.58	3.35	13.4%	-12.0%
86	39.574	34.860	30.631	-3.63	3.39	13.5%	-12.1%
87	38.199	33.612	29.502	-3.68	3.43	13.6%	-12.2%
88	36.877	32.413	28.419	-3.72	3.47	13.8%	-12.3%
89	35.606	31.262	27.380	-3.77	3.51	13.9%	-12.4%
90	34.384	30.156	26.383	-3.82	3.55	14.0%	-12.5%
91	33.208	29.094	25.426	-3.87	3.59	14.1%	-12.6%
92	32.077	28.074	24.508	-3.92	3.63	14.3%	-12.7%
93	30.990	27.092	23.626	-3.97	3.68	14.4%	-12.8%
94	29.943	26.149	22.780	-4.02	3.72	14.5%	-12.9%
95	28.935	25.243	21.967	-4.07	3.76	14.6%	-13.0%
96	27.965	24.371	21.186	-4.12	3.80	14.7%	-13.1%
97	27.031	23.532	20.435	-4.17	3.84	14.9%	-13.2%
98	26.132	22.726	19.714	-4.22	3.88	15.0%	-13.3%
99	25.266	21.950	19.021	-4.27	3.92	15.1%	-13.3%
100	24.432	21.203	18.355	-4.32	3.96	15.2%	-13.4%
101	23.629	20.485	17.715	-4.38	4.01	15.3%	-13.5%
102	22.854	19.793	17.099	-4.43	4.05	15.5%	-13.6%
103	22.108	19.127	16.507	-4.48	4.09	15.6%	-13.7%
104	21.389	18.486	15.937	-4.53	4.13	15.7%	-13.8%
105	20.696	17.869	15.389	-4.58	4.17	15.8%	-13.9%
106	20.028	17.274	14.862	-4.63	4.21	15.9%	-14.0%
107	19.383	16.702	14.355	-4.68	4.25	16.1%	-14.1%
108	18.762	16.150	13.867	-4.74	4.30	16.2%	-14.1%
109	18.163	15.619	13.397	-4.79	4.34	16.3%	-14.2%
110	17.585	15.107	12.945	-4.84	4.38	16.4%	-14.3%
111	17.027	14.613	12.510	-4.89	4.42	16.5%	-14.4%
112	16.490	14.137	12.090	-4.95	4.46	16.6%	-14.5%
113	15.970	13.679	11.687	-5.00	4.51	16.8%	-14.6%
114	15.470	13.237	11.298	-5.05	4.55	16.9%	-14.6%
115	14.986	12.811	10.923	-5.10	4.59	17.0%	-14.7%
116	14.520	12.400	10.563	-5.16	4.64	17.1%	-14.8%
117	14.069	12.003	10.215	-5.21	4.68	17.2%	-14.9%
118	13.634	11.621	9.8801	-5.27	4.72	17.3%	-15.0%
119	13.215	11.252	9.5574	-5.32	4.77	17.4%	-15.1%

