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TY-OHM ELECTRONIC WORKS CO.,LTD.

THICK FILM CHIP RESISTORS

RESISTOR SPECIFICATION

Version : 2012.A

APPROVED BY

APPROVED

REVIEWED

PREPARED

Jack kw
Aug 8, 2012

Jack kw
Aug 8, 2012

Rob Lo
Aug 8, 2012

THICK FILM CHIP RESISTORS

1. Applicable Scope:

This standard specification is for use in consumer electronics, computers, telecommunications, control instruments...etc.

2. Part Number:

It is composed by Type, Code Number, Nominal Resistance, Tolerance, Terminal Surface Material. e.g.

<u>RMC</u>	<u>0603</u>	<u>1K</u>	<u>5%</u>	<u>N</u>
Type	Code Number	Nominal Resistance	Tolerance	Terminal Surface Material

2.1 Type :

Thick Film Chip Resistors are called "RMC".

2.2 Code Number:

There are 0402, 0603, 0805, 1206, 2010, 2512.

2.3 Nominal Resistance:

Ω , $K\Omega$, $M\Omega$ are its unit, which be in accordance with JIS-C6409 article 6 (EIA RS-196A) series.

2.4 Tolerance:

It is measured by Bridge-method at room temperature. Normally it is $\pm 1\%$, $\pm 5\%$.

2.5 Terminal Surface Material:

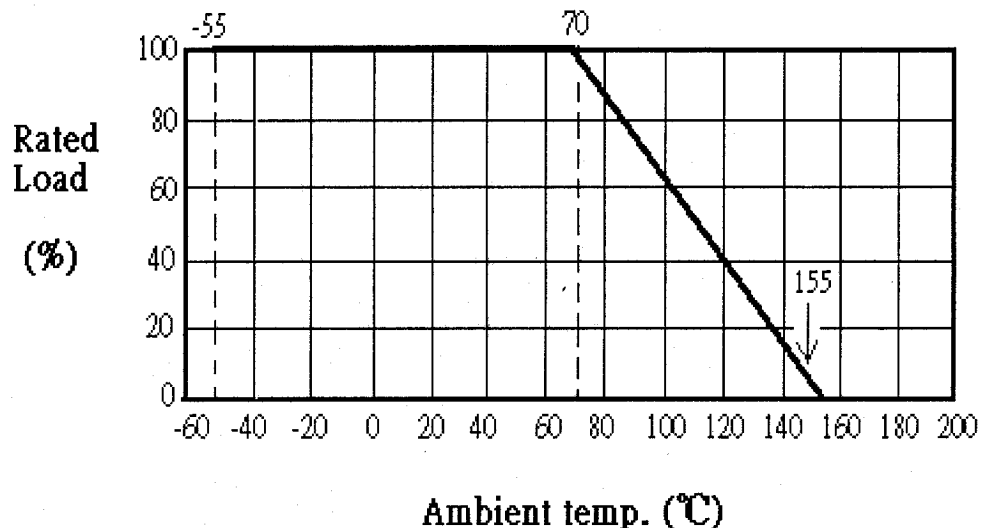
N: Sn (RoHS Compliant)

Nil: Sn/Pb

3. Rated Power:

Rated power is the value of Max load voltage specified at the ambient temperature of 70°C , and shall meet the functions of electrical and mechanical performance. When the ambient temperature surpasses above mentioned temperature, the value declines as per following DERATING CURVE.

DERATING CURVE



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3.1 Rated Voltage:

It is calculated through the following formula:

$$E = \sqrt{P * R}$$

where E: rated voltage (V)

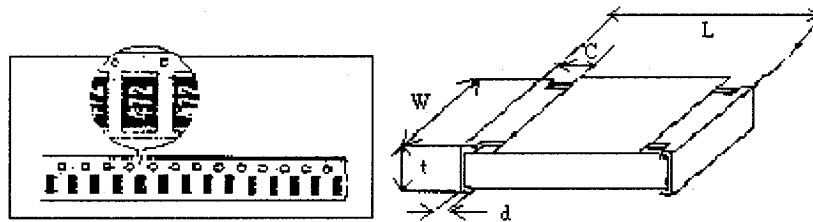
P: rated power (W)

R: nominal resistance value (Ω)

However, in case the voltage calculated exceeds the maximum load voltage, such the maximum load voltage shall be regarded as its rated voltage, means whichever less.

4. Dimension and structure:

4.1 Dimension:



Code	Rated Power	Dimension (mm)					Max Working Voltage	Resistance Range(Ω)
		L $\pm$ 0.2	W $\pm$ 0.2	C $\pm$ 0.2	d $\pm$ 0.2	t $\pm$ 0.1		
0402	1/16W	1.0 $\pm$ 0.1	0.5 $\pm$ 0.05	0.2 $\pm$ 0.1	0.25 $\pm$ 0.1	0.35 $\pm$ 0.05	50V	1 ~ 10 M
0603	1/10W	1.6	0.8	0.3	0.3	0.45	50V	1 ~ 10 M
0805	1/8W	2.0	1.25	0.4	0.4	0.5	150V	1 ~ 10 M
1206	1/4W	3.2	1.6	0.5	0.5	0.6	200V	1 ~ 10 M
2010	1/2W	5.0	2.5	0.6	0.5	0.6	200V	1 ~ 10 M
2512	1W	6.3	3.2	0.6	0.5	0.6	200V	1 ~ 10 M

Note:

1. Max Overload Voltage is 2 times of Max Working Voltage.
2. Zero ohm is also supplied. (50m Ω Max)
3. Too low or too high ohmic values (0.01 Ω ~1 Ω , 11M Ω ~100 M Ω) can be supplied only case by case.

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4.2 STRUCTURE:

4.2.1 Material:

It is composed with metal glaze element on high purity alumina substrates coated by special glass.

4.2.2 Marking:

1. $\pm 5\%$ (0603, 0805, 1206, 2010, 2512) :

It is made by three numbers indicating the resistance value, such as 472 for 4.7K Ω .

2. $\pm 1\%$ (0805, 1206, 2010, 2512) :

It is made by four numbers indicating the resistance value, such as 2211 for 2.21K Ω .

3. $\pm 1\%$ (0603) :

It is made by two numbers combined with one English capital indicating the resistance value, such as 34B for 2.21K Ω .

4. No Marking for 0402.

Code for E96 Series Nominal Value															
Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value	Code	R Value
01	100	13	133	25	178	37	237	49	316	61	422	73	562	85	750
02	102	14	137	26	182	38	243	50	324	62	432	74	576	86	768
03	105	15	140	27	187	39	249	51	332	63	442	75	590	87	787
04	107	16	143	28	191	40	255	52	340	64	453	76	604	88	806
05	110	17	147	29	196	41	261	53	348	65	464	77	619	89	825
06	113	18	150	30	200	42	267	54	357	66	475	78	634	90	845
07	115	19	154	31	205	43	274	55	365	67	487	79	649	91	866
08	118	20	158	32	210	44	280	56	374	68	499	80	665	92	887
09	121	21	162	33	215	45	287	57	383	69	511	81	681	93	909
10	124	22	165	34	221	46	294	58	392	70	523	82	698	94	931
11	127	23	169	35	226	47	301	59	402	71	536	83	715	95	953
12	130	24	174	36	232	48	309	60	412	72	549	84	732	96	976

Code for Multipliers											
Code	A	B	C	D	E	F	G	H	X	Y	Z
Multipliers	10 ⁰	10 ¹	10 ²	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁷	10 ⁻¹	10 ⁻²	10 ⁻³

5. Operating Temperature Range: -55°C ~ 155°C

6. Mechanical Performance:

6.1 Terminal tensile:

To fix the resistor body, a static load of 0.5kg. is to be gradually applied into the terminal for 10 seconds without causing any looseness and fall.

7. Electrical Performance:

7.1 Resistance Temperature Coefficient:

It shall be within :

Resistance Range	T.C.(ppm/°C)
<10 Ω	± 400
10 Ω ~1M Ω	± 100
>1M Ω	± 200

$$T.C (ppm/^{\circ}C) = [(R2 - R1) \div R1] \times [1 \div (T2 - T1)] \times 10^6$$

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where

R1: resistance value at reference temperature

R2: resistance value at test temp.

T1: reference temp. (usu. 25°C)

T2: test temp. (about 75°C)

7.2 Temperature Cycle:

Following temp. cycles are to be made 5 times and then put at room temp. for one hour, the resistance value change rate between pre-and-post test shall be within $\pm 0.5\%$.

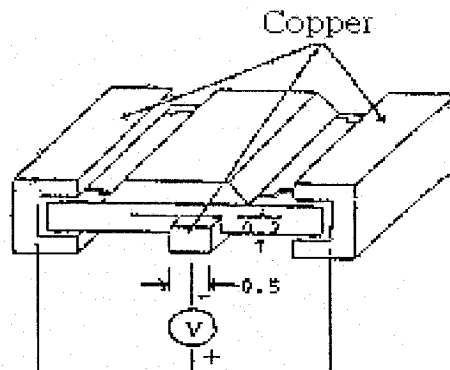
Steps	Temperature(°C)	Time (minutes)
1 st step	-55 $\pm$ 3	30
2 nd step	Room temp.	3
3 rd step	155 $\pm$ 3	30
4 th step	Room temp.	3

7.3 Short Time Over Load:

When the resistors are applied 2.5 times as much as rated voltage for 5 seconds continuously, it shows no evidence of arc, flame...etc. Removing the voltage and place the resistors to the normal condition for 30 minutes, the resistance value change rate between pre-and-post test shall be within $\pm 1\%$.

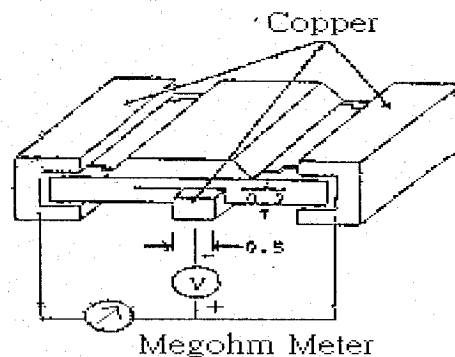
7.4 Voltage Withstanding:

Resistors are located in a jig and applying AC500V for 1 minute and should find no physical damage to the resistors, such as arc, char...etc.



7.5 Insulation Character :

Resistors are located in a jig and applying DC 500V, measuring the Insulation Resistance which shall be over 1000M Ω .



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7.6 Moisture-proof Load Life:

The resistors arrayed are placed into a constant temp./humidity oven at the temp. of $40 \pm 2^{\circ}\text{C}$ and the humidity of 90~95%, then rated power is applied for 1.5 hours and cut off for 0.5 hour. The similar cycle will be repeated for 500_{-0}^{+24} hours in total (including cut-off time). Then remove the voltage, taking the resistors out of the oven and leaving them at room temp. for one hour. The resistance value change rate between pre-and-post test shall be within $\pm 1\%$. There also shall be no evidence of remarkable change on appearance, and the marking shall not be illegible.

7.7 Load Life:

The resistors arrayed are sent into the 70°C oven, applying rated voltage at the cycle of 1.5 hours ON, 0.5 hour OFF for 1000_{-0}^{+48} hours in total. Then, after removing the voltage, take the resistors out of the oven and left under normal temp. for about one hour for cooling. The resistance value change rate between pre-and-post test shall be within $\pm 1\%$.

7.8 Solderability :

7.8.1 For Sn/Pb Terminal Surface Material:

Immerse the resistors in the solder pot at $235 \pm 5^{\circ}\text{C}$ for 2 seconds. At least 95% solder coverage on the termination.

7.8.2 For Sn Terminal Surface Material:

Immerse the resistors in the solder pot at $245 \pm 5^{\circ}\text{C}$ for 3 seconds. At least 95% solder coverage on the termination.

7.9 Resistance to Soldering Heat:

Immerse the resistors in the solder pot at $270 \pm 5^{\circ}\text{C}$ for 10 ± 1 seconds. Then remove the resistors out of the solder pot and leaving them at room temp. for one hour for cooling. The resistance value change rate between pre-and-post test shall be within $\pm 1\%$.

7.10 Storage Conditions:

The resistors with appropriate package would have a preservative duration of 2 years, under the following conditions.

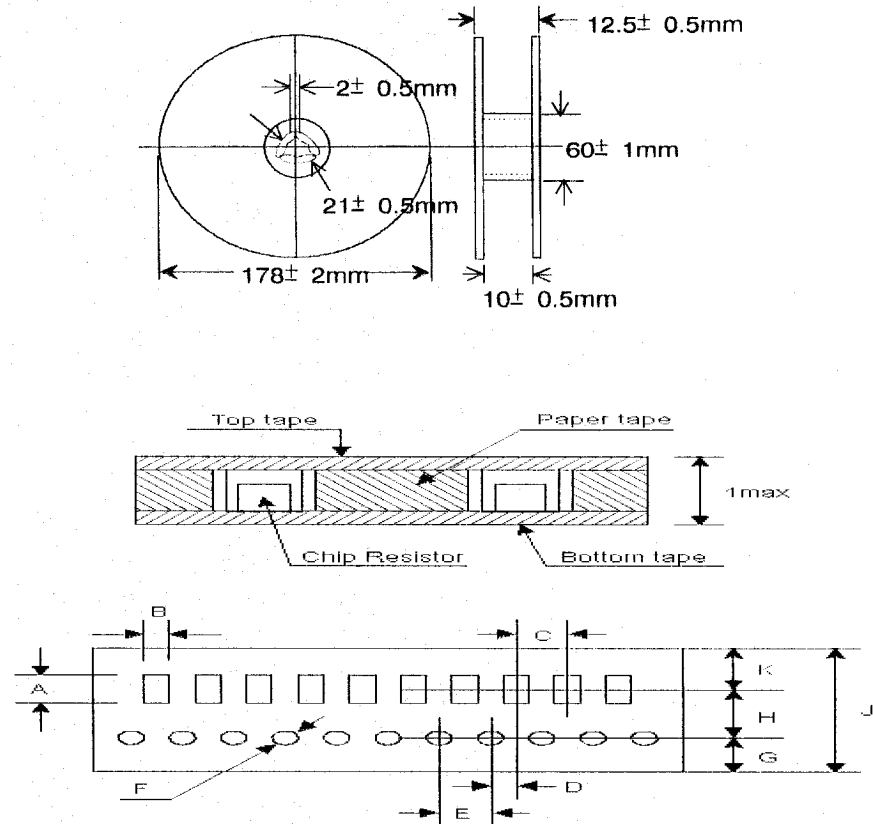
$$T=5^{\circ}\text{C} \sim 35^{\circ}\text{C}$$

$$H=40\% \sim 75\%$$

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8.Others:

8.1 Tape & Reel:



Code	Rated Power	A ± 0.2	B ± 0.2	C ± 0.1	D ± 0.05	E ± 0.1	F ± 0.1	G ± 0.1	H ± 0.1	J ± 0.3	K ± 0.1
0402	1/16W	1.15	0.65	2	2	4	1.5	1.75	3.5	8	2.75
0603	1/10W	1.9	1.1	4	2	4	1.5	1.75	3.5	8	2.75
0805	1/8W	2.4	1.65	4	2	4	1.5	1.75	3.5	8	2.75
1206	1/4W	3.5	2	4	2	4	1.5	1.75	3.5	8	2.75
2010	1/2W	5.4	2.8	4	2	4	1.5	1.75	5.5	12	4.75
2512	1W	6.7	3.5	4	2	4	1.5	1.75	5.5	12	4.75