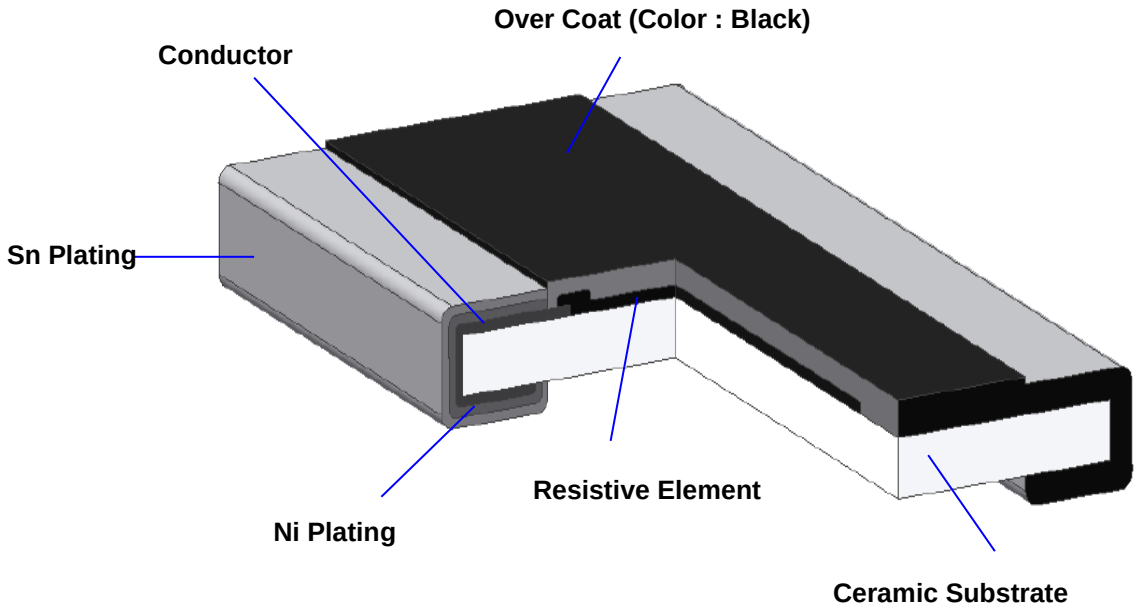
1. Scope：

This specification applies for the RMLA12 series of Anti-Sulfurated thick film chip resistors made by TA-I.

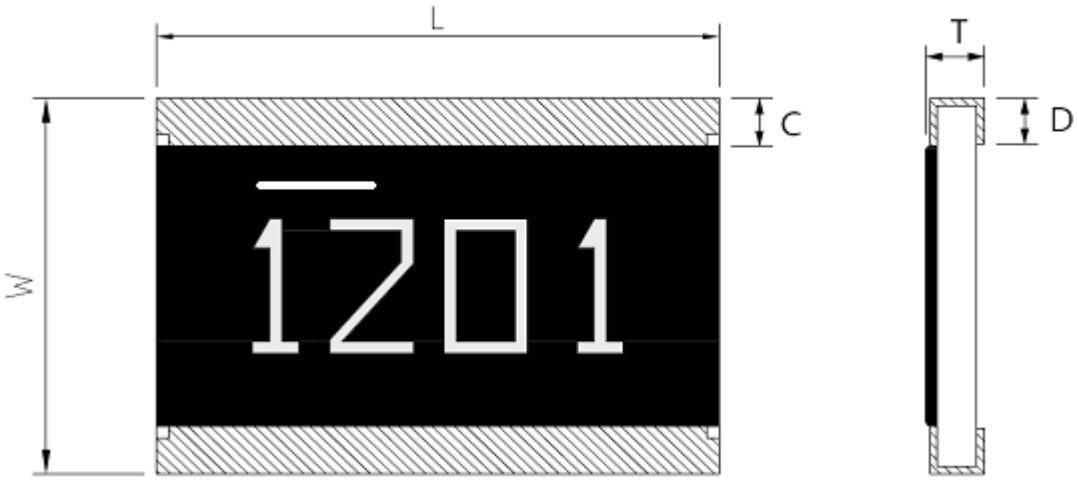
2. Construction：



3. Type Designation：

RMLA	12	J	E	103
Product Code **RMLA : Anti-Sulfurated Chip Resistor**	**Size** **Power Rating**	**Tolerance**	**Packaging**	**Nominal Resistance**
12-1225(3264) 2W	J-±5% G-±2% F-±1%	E- Embossed Tape		3 digits, e.g.,: (E-24) 103 = 10kΩ 4 digits, e.g., : (E-96) 1540 = 154Ω 43R2 = 43.2Ω

4. Dimensions：



UNIT: mm

Type	L	W	C	d	t
RMLA12	6.30±0.20	3.20±0.20	0.40±0.20	0.80±0.20	0.70±0.10

5. Ratings & Characteristics：

Type	Power Rating at 70℃	Rating Voltage	Max. Working Voltage	Max. Over-Load Voltage	T.C.R (PPM/℃)	Resistance Range(Ω)		
						F(±1%) E-96&E-24	G(±2%) E-24	J(±5%) E-24
RMLA12	2W	Refer 5.2	200V	400V	±100	1Ω-10KΩ		
					±200		1Ω-10KΩ	1Ω-10KΩ
Operating Temp (℃)： -55℃ ～ +155℃								

Note： Specified power rating requires dedicated mounting conditions to achieve the required thermal resistance

5.1. Derating Curve：

For resistors operated at ambient temperature over 70℃ , power rating shall be derated in accordance with figure 1.

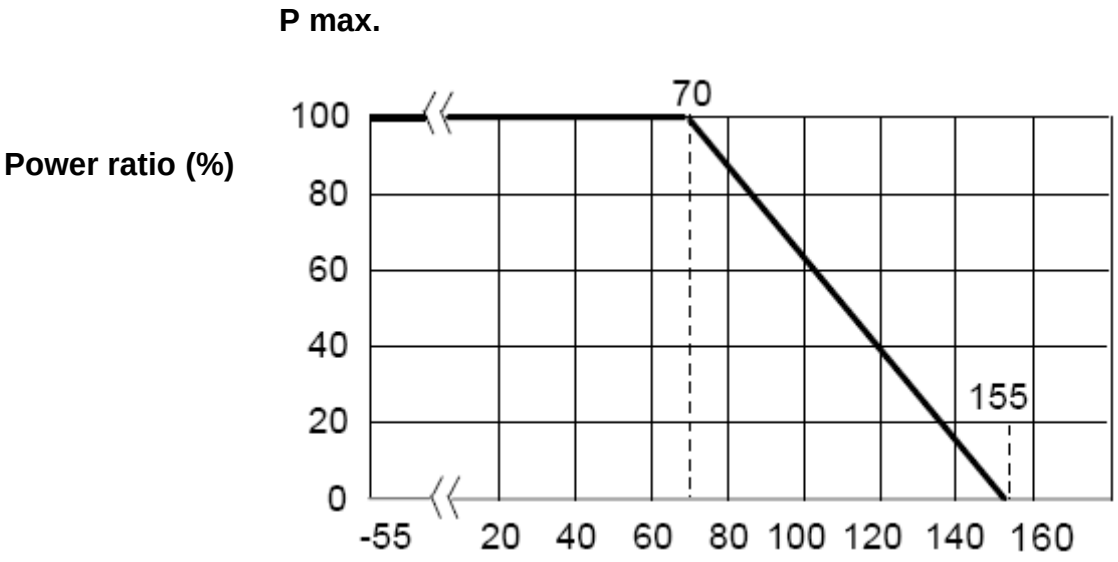


Figure 1

5.2. Rated Voltage：

The rated voltage is calculated by the following formula:

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

E=Rated Voltage(V)
P=Rated Power(W)
R=Resistance Value(Ω)

E.G.：What is RMLA12JE102 the rated voltage ?

RMLA12JE102 P:2W ; R:102 = 1KΩ = 1000Ω

$$E = \sqrt{2(W) * 1000(\Omega)} = 44.72\ (V)$$

6. Reliability Tests :

Test Items	Reference standard	Condition of Test	Test Limits △R
Temperature Coefficient of Resistance	IEC 60115-1 4.8	-At +25/–55 °C and +25/+125 °C	Refer 5.0
Short Time Overload	IEC60115-1 4.13	2.5 X rated voltage for 5 sec	±(1% + 0.05Ω)
High Temperature Exposure (Storage)	AEC-Q200-REV D-Test 3 MIL-STD-202 Method 108	1000 hrs. @ T=125°C. Unpowered. Measurement at 24±2 hours after test conclusion.	1%:±(1.0%+0.05Ω) 2%,5%:±(2.0%+0.1Ω)
Temperature Cycling	AEC-Q200-REV D-Test 4 JESD22 Method JA-104	1000 Cycles (-55°Cto+125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.	±(1% + 0.05Ω)
Moisture Resistance	AEC-Q200-REV D-Test 6 MIL-STD-202 Method 106	T=24 hours / Cycle ,10Cycles . Notes : Steps 7a& 7b not required. Unpowered .	1%：±(1.0% + 0.05Ω) 2%,5%：±(2.0% + 0.1Ω)
Biased Humidity	AEC-Q200-REV D-Test 7 MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Note: Specified conditions: 10% of operating power(not exceeding max working voltage). Measurement at 24±2 hours after test conclusion.	±(3% + 0.1Ω)
Operational Life	AEC-Q200-REV D-Test 8 MIL-STD-202 Method 108	1000 hours TA=125°C at 35% rated power. Measurement at 24±4 hours after test conclusion.	1%：±(1.0% + 0.05Ω) 2%,5%：± (3.0% + 0.1Ω)
External Visual	AEC-Q200-REV D-Test 9 MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	
Physical Dimension	AEC-Q200-REV D-Test 10 JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required.	
Resistance to Solvents	AEC-Q200-REV D-Test 12 MIL-STD-202 Method 215	a:Isopropyl Alcohol：Mineral Spirits= 1：3 b:Terpene Defluxer c:Deionized water ：Propylene Glycol Monomethyl Ether：monoethanolamine = 42：1：1	Marking and protective layer can not be detached
Mechanical Shock	AEC-Q200-REV D-Test 13 MIL-STD-202 Method 213	Wave Form : Tolerance for half sine shock pluse. Peak value is 100g's. Normal duration(D) is 6(ms)	±(1% + 0.05Ω)
Vibration	AEC-Q200-REV D-Test 14 MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz.	±(1% + 0.05Ω)

Resistance to Soldering Heat	AEC-Q200-REV D-Test 15 MIL-STD-202 Method 210	Condition B : Immerse the specimens in and eutectic solder at 260±5℃ for 10±1S .	1%：±(0.5% + 0.05Ω) 2%.5%：±(1% + 0.05Ω)
Thermal Shock	AEC-Q200-REV D-Test 16 MIL-STD-202 Method 107	-55°C/+155°C. Note: Number of cycles required-300, Maximum transfer time-20 seconds, Dwell time-15 minutes. Air-Air.	±(1% + 0.05Ω)
ESD	AEC-Q200-REV D-Test 17	verify the voltage setting at 500V	±(1% + 0.05Ω)
Solderability	AEC-Q200-REV D-Test 18 J-STD-002	Method B, aging 4 hours at 155 °C dry heat Lead-free solder bath at 235±3 °C Dipping time: 3±0.5 seconds	> 95% area covered with tin
Flammability	AEC-Q200-REV D-Test 20 UL-94	V-0 or V-1 are acceptable. Electrical test not required.	V-0 or V-1
Board Flex (Bending)	AEC-Q200-REV D-Test 21	The duration of the applied forces shall be 60 (+ 5) Sec 2mm deflection	1%：±(0.5% + 0.05Ω) 2%.5%：±(1% + 0.05Ω)
Terminal Strength (SMD)	AEC-Q200-REV D-Test 22	Force of 1.8kg for 60 seconds	±(0.5% + 0.05Ω)
Sulfuration Test	ASTM-B-809-95	Sulfur (Saturated Vapor) 1,000 hours,105±2°C, unpowered	1%：±(1% + 0.05Ω) 2%, 5%：±(2% + 0.1Ω)

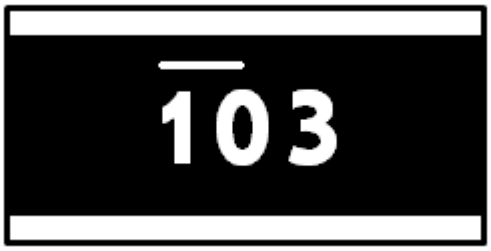
Note* : RCWV : Rated continuous working voltage

7. Marking :

7.1 ±2% & ±5%(E24) :

Resistance value is expressed by 3 digits, the first two digits represent the significant figures of nominal resistance value in Ω, and the third digit represents exponent for base of 10.

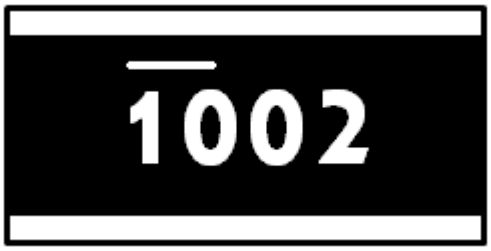
E.G. :, $\bar{1}03 = 10\times10^{3} = 10000\,\Omega = 10K\Omega$



7.2 ±1% (E96) :

Resistance value is expressed by 4 digits , the first three digits represent the significant figures of nominal resistance value in Ω, and the fourth digit represents exponent for base of 10.

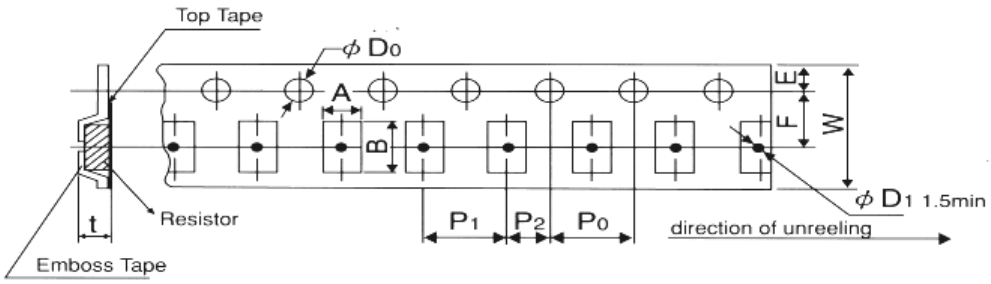
E.G. : $\bar{1}002 = 100\times10^{2} = 1000\,\Omega = 10K\Omega$



8. Taping & Reel :

8.1 Taping Dimensions

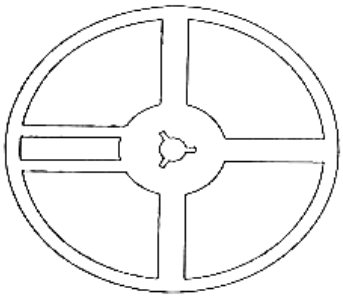
8.1.1 4 mm pitch Emboss :

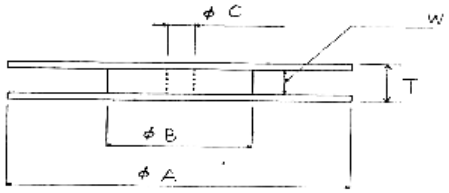


Packing	Type	A	B	W	F	E	P_1	P_2	P_0	D_0	T
Emboss	RMLA12	3.6±0.2	6.9±0.2	12.0±0.2	5.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.05	ϕ1.5 +0.1 -0	0.85±0.15

Type \ Package	Size	Emboss Plastic Tape 4 mm pitch
RMLA	12	4000

8.2 Reel Specifications:





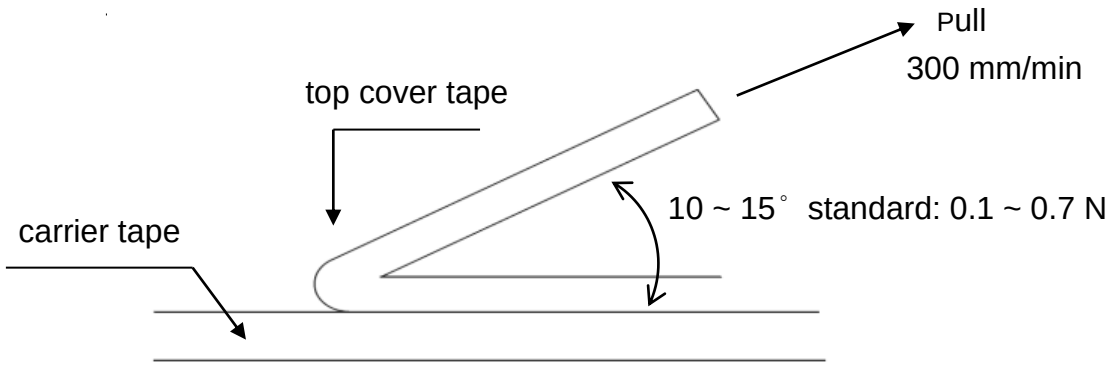
UNIT: mm

Type	ϕ A	ϕ B	ϕ C	W	T
RMLA12	178.0 ± 2.0	60.0 ± 1.0	13.0 ± 1.0	13.0 ± 1.0	15.5 ± 1.0

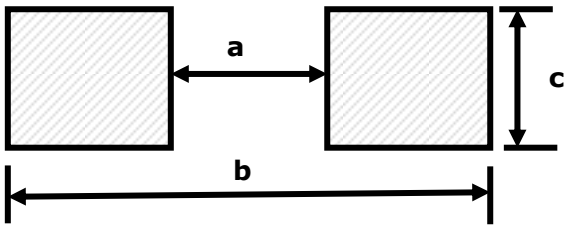
8.3. Peel –off force :

Peel –off force of paper and blister tape is in accordance with “JIS-C5202 ”

that is , 0.1 to 0.7 N at a peel-off speed of 300 mm / minute.

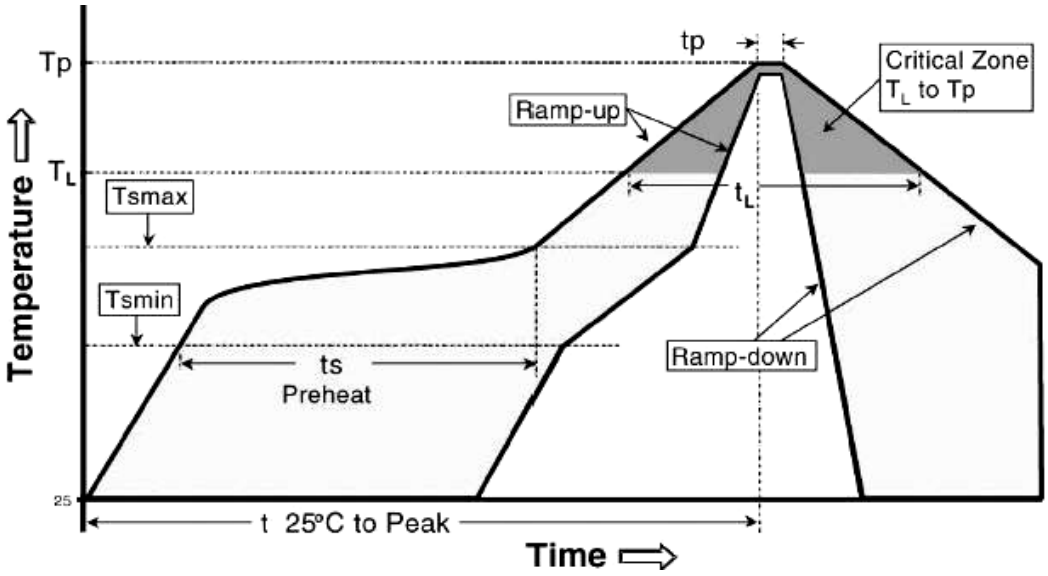


9. Recommended land patterns :



Land pattern / Type	Size	Dimension (mm) a	b	c
RMLA	12(1225)	1.0~1.2	4.4~5.0	6.4~7.0

10. Recommend IR – Reflow profile : (solder : Sn96.5 / Ag3 / Cu0.5)



Profile Feature	Lead (Pb)-Free Assembly
Average ramp-up rate (Tsmax to Tp)	3℃ / second max.
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (Ts_{min} to Ts_{max}) (ts)	 150℃ 200℃ 60 -120 seconds
Time maintained above : - Temperature (T_L) - Time (T_L)	 217℃ 60-150 seconds
Peak Temperature (Tp)	260℃

Time within $^{+0}_{-5}$℃ of actual Peak Temperature (tp)[2]	10 seconds
Ramp-down Rate	6℃/second max.
Time 25℃ to Peak Temperature	8mimutes max.

Allowed Re-flow times : 3 times

Remark : To avoid discoloration phenomena of chip on terminal electrodes, please use N2 Re-flow furnace.

11. Storage Conditions :

Temperature: 5℃~35℃,Humidity:40%~75%

12. Shelf Life :

2 years from manufacturing date.

13. ECN :

Engineering Change Notice: The customer will be informed with ECN if there is significant modification on the characteristics and materials described in Approval Sheet.

14. Manufacturing Country & City

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