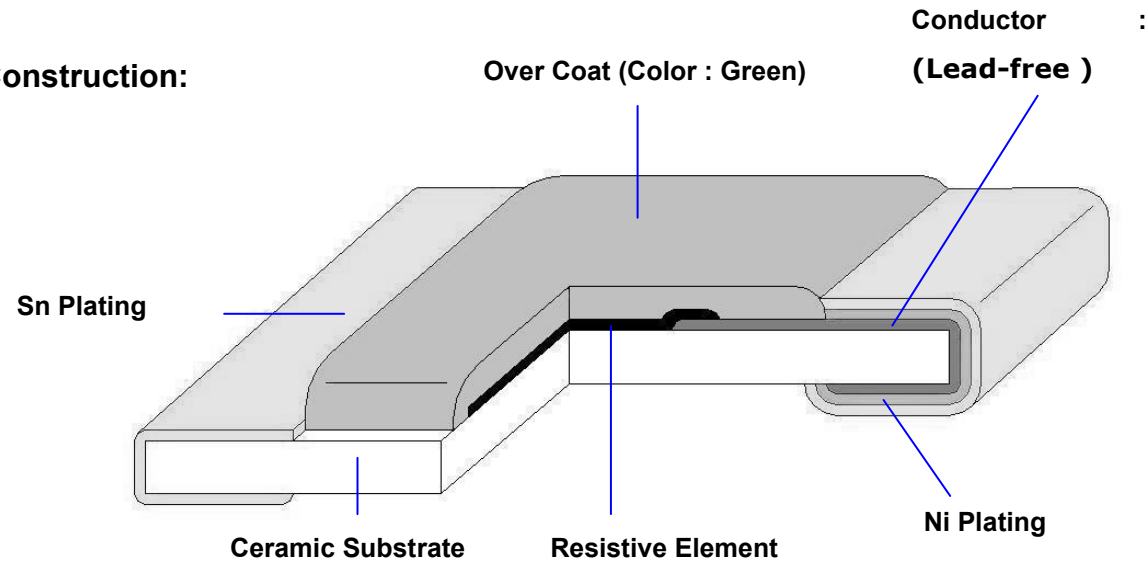
1. Scope :

This specification applies for thick film high voltage Laed-Free chip resistors made by TA-I.

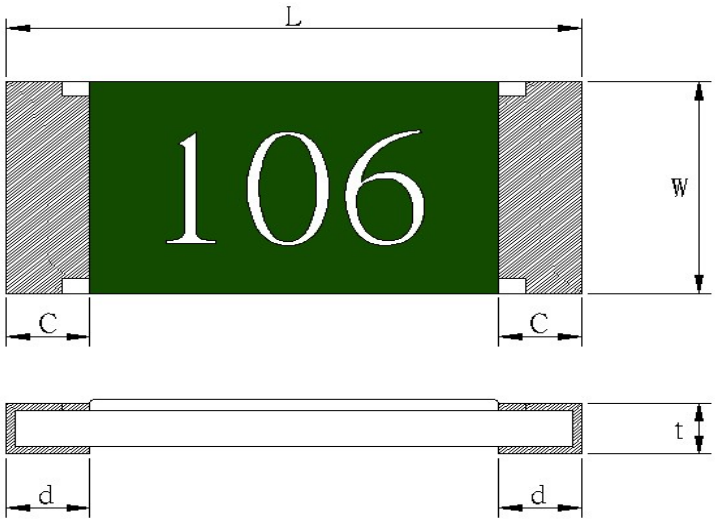
2. Construction:



3. Type Designation:

RH	12	F	TN	4993
Product Code RH : High voltage	Size Power Rating	Tolerance	Packaging	Nominal Resistance
12-1206(3216) 1/4W 20-2010(5025) 1/2W		1206 : J- ±5% G- ±2% F- ±1% 2010 : J- ±5%	1206 : T-Paper Tape 2010 : E-Emboss Tape N-Lead Free	e.g., 4993=499kΩ , 1% 106=10MΩ 2% ,5 %

4. Dimensions:



UNIT: mm

Type	L	W	C	d	t
RH12	3.10 ±0.20	1.55 ±0.10	0.40 ±0.25	0.40 ±0.20	0.55 ±0.10
RH20	5.00 ±0.20	2.50 ±0.20	0.40 ±0.25	0.50 ±0.25	0.55 ±0.10

5. Ratings & Characteristics :

Characteristics	Rating voltage	Feature		Measurement Method
		RH12	RH20	
Power Ratings (W)	Refer 5.2	1/4W	1/2W	JIS Code 3A / JIS Code 3D
Resistance Value (Ω)		47Ω ~ 22MΩ		Refer to JIS C 5201-1-4.5
T.C.R (ppm/°C)		±200		Refer to JIS C 5201-1-4.8
Operation Temperature Range (°C)		-55 ~ +155		
Resistance Tolerance (%)		±1, ±2, ±5	±5	JIS C 5201-1-4.2.5
Maximum Working Voltage (V)		500	1500	
Maximum Overload Voltage (V)		1000	3000	Remark RH20 : DC 3000V , AC 2122V

Note : Except for the above standardized products, we also provide the customized products.

5.1 Derating Curve :

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

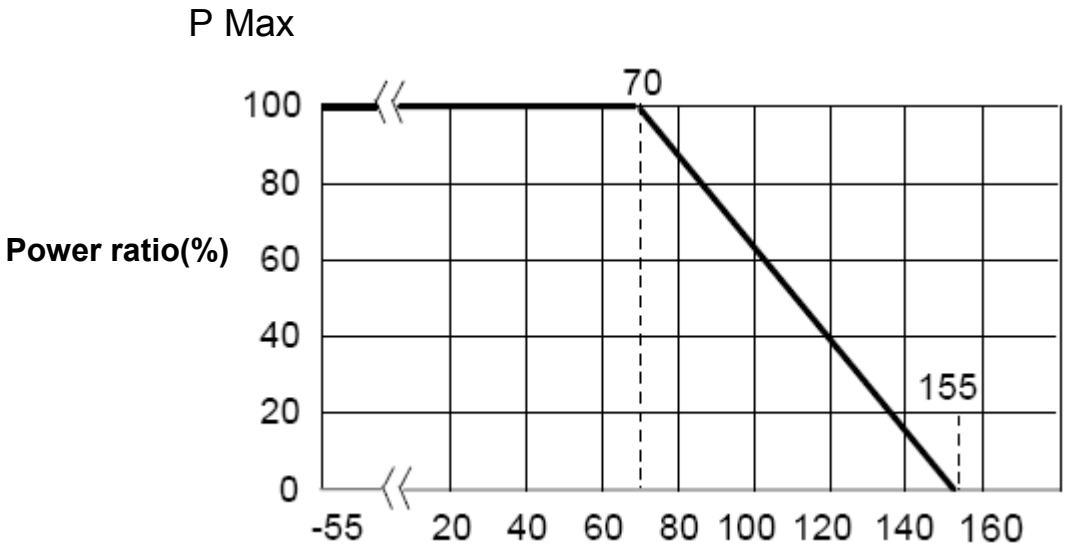


Figure 1

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 RH12FTN 3003 the rated voltage ?

RH12FTN3003 P=1/4W ; R:3003=300KΩ=300,000Ω

$E=\sqrt{1/4(W)*300000\ (\Omega)}$ = 273.86 V

Remark : However , it shall not exceed the maximum rated voltage .

6. Reliability Tests:

Test Items	Reference standard	Condition of Test	Test Limits
Visual examination		Checked by visual examination .	The marking shall be legible , as checked by visual examination
Temperature Coefficient of Resistance	IEC60115-1-4.8 JIS-C5201-1-4.8	-55 ~ +125 ℃	Refer to paragraph 5
Dielectric Withstanding Voltage (Voltage Proof)	IEC60115-1-4.7 JIS-C5201-1-4.7	500Va. c., voltage , 1 min .	No abnormalities such as flashover , burning dielectric breakdown shall appear .
Insulation Resistance	IEC60115-1-4.6 JIS-C5201-1-4.6	100V voltage , 1 min .	≧1GΩ
Solderability	IEC60115-1-4.17 JIS-C5201-1-4.17	245 ±5℃ solder, 2 ±0.5 sec dwell. Solder : Sn96.5/Ag3/Cu0.5	At least 95% of surface area of electrode shall be covered with new solder.
Short Time Overload	IEC60115-1-4.13 JIS-C5201-1-4.13	1206 : 2.5 × rated voltage, 5s 2010 : 2.0 X rated voltage, 2s DC : 3000 V Max , AC (RMS) : 2122V Max Test Substrate : pitch 10.16 mm	±1%+0.05Ω
Resistance to Soldering Heat	IEC60115-1-4.18 JIS-C5201-1-4.18	270 ±5℃ solder , 10 ±1 sec dwell .	±1%+0.05Ω
Rapid Change of Temperature	IEC60115-1-4.19 JIS-C5201-1-4.19	-55℃ (30 min.) / +155 ℃(30 min.) 5 cycles	±1%+0.05Ω
Load Life	IEC60115-1-4.25.1 JIS-C5201-1-4.25.1	1000 hours at rated power , 70℃ , 1.5hours "ON ", 0.5hour "OFF"	±5%+0.1Ω
Load Life with Humidity	IEC60115-1-4.24 JIS-C5201-1-4.24	1000 hours at rated voltage , 40±2℃, 90~95% RH 1.5hours "ON ", 0.5hour "OFF"	±5%+0.1Ω

7. Marking

7.1 ±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.

Ex. 106 =10×10^{6}=10000000Ω=10MΩ

7.2 ±1% (E96)

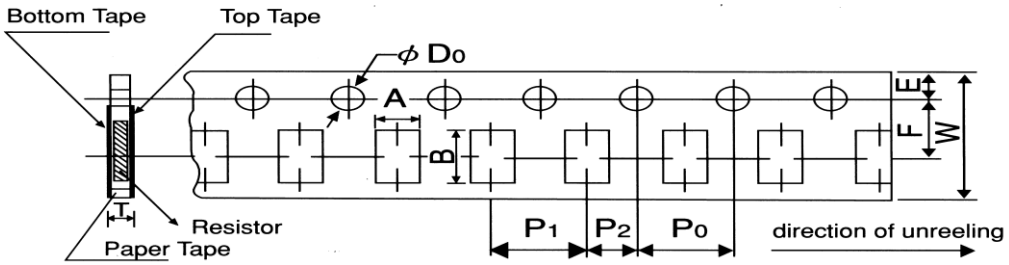
Resistance value is expressed by 4digits, the first three digits represent the significant figures of nominal resistance value in Ω, and the fourth digit represents exponent for base of 10.

Ex. 4993 =499×10^3 =499000Ω=499kΩ

8. Taping & Reel

8.1 Taping Dimensions

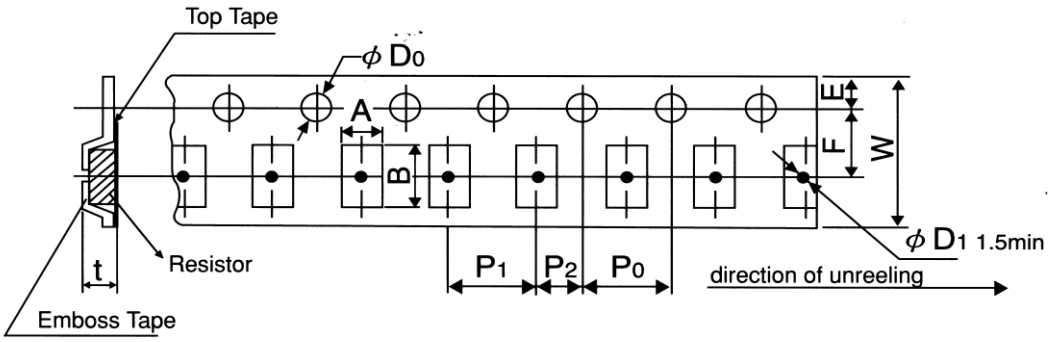
8.1.1 4 mm pitch paper



Packing	Type	A	B	W	F	E	P_1	P_2	P_0	D_0	T
Paper Tape	RH12	2.0±0.15	3.6±0.2	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	φ1.5 +0.1 -0	0.84±0.1

UNIT: mm

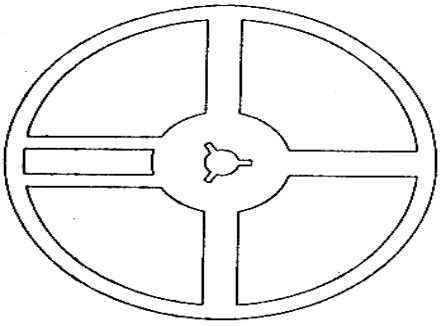
8.1.2 4 mm pitch Emboss



Packing	Type	A	B	W	F	E	P_1	P_2	P_0	D_0	T
Emboss	RH20	2.8 ±0.2	5.3 ±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 series		Paper Tape	Emboss Plastic Tape
		4 mm pitch	
		178mm/R	
RH	12	5000	
RH	20		4000

8.2 Reel Specifications



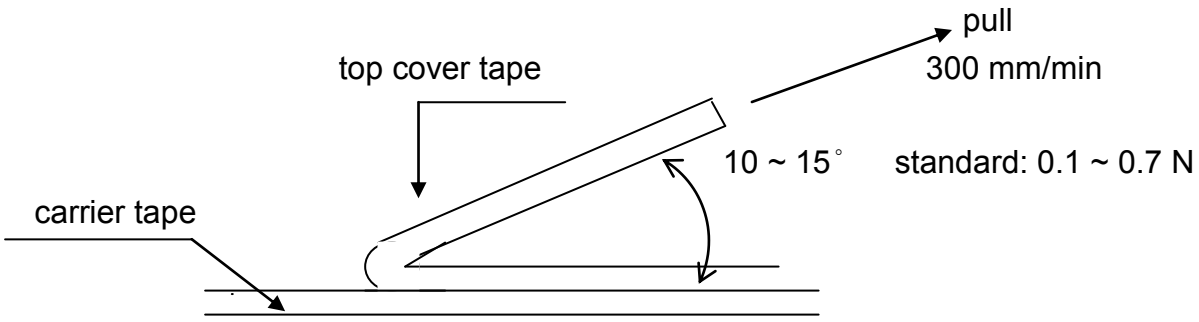
UNIT: mm

Type	ϕ A	ϕ B	ϕ C	W	T
RH12	178 ±2.0	60.0±1.0	13.0 ±1.0	9.0 ±1.0	11.5 ±1.0
RH20				13.0 ±1.0	15.5 ±1.0

8.3 Peel –off force :

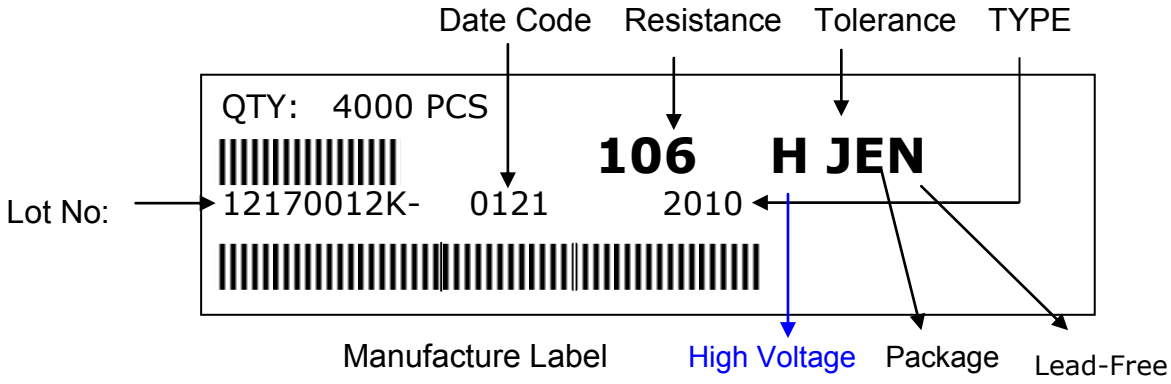
Peel –off force of paper and blister tape is in accordance with "JIS "

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

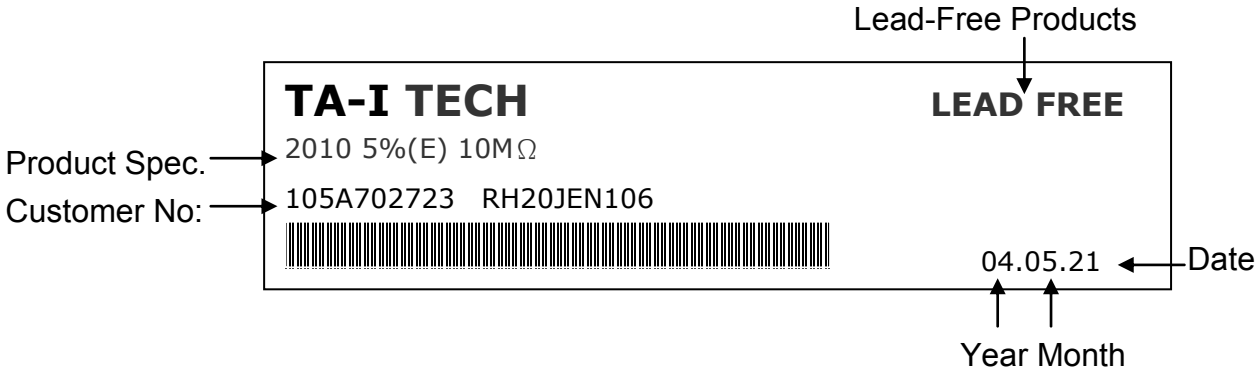


9. Label

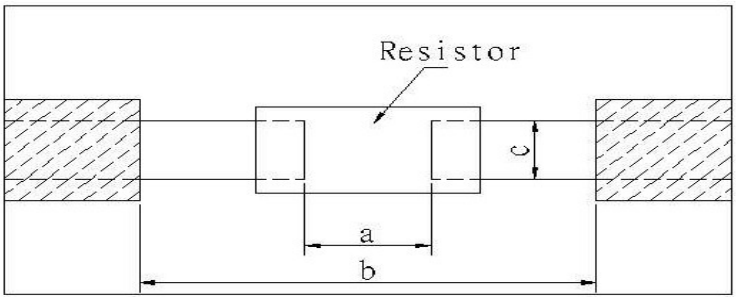
9.1 Manufacture Label



9.2 Customer Label(By customer request):

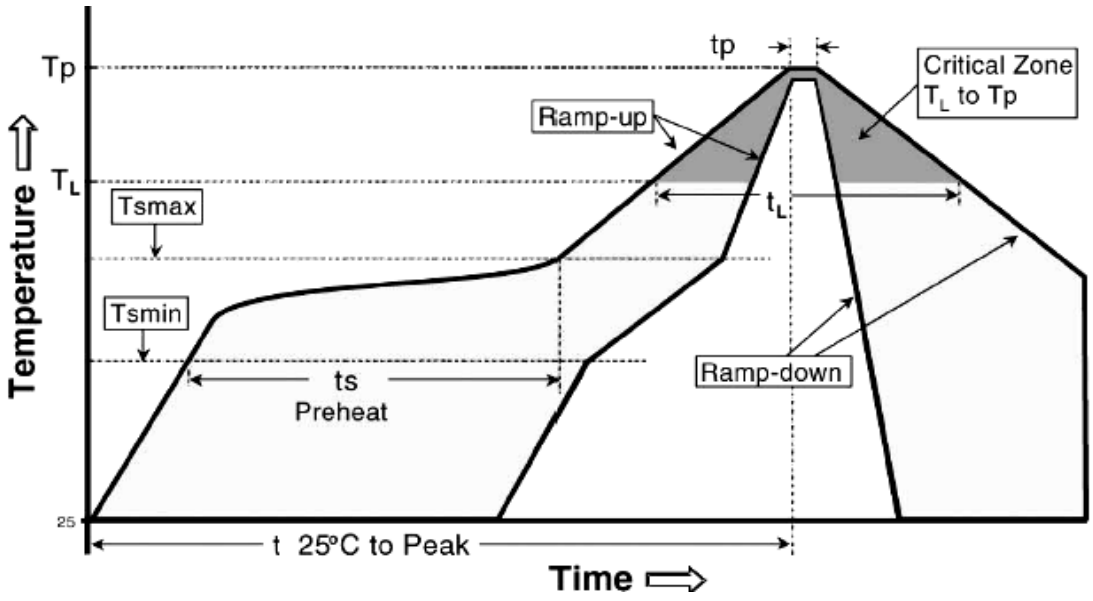


10. Recommended land patterns



Type \ Land pattern Size		Dimension (mm) a	b	c
RH	12 (1206)	2.0~2.4	4.4~5.0	1.2~1.8
RH	20 (2010)	3.3~3.7	5.7~6.5	2.3~3.5

11. 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 -150 seconds
Time maintained above : - Temperature (T_L) - Time (T_L)	 217℃ 60-120 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.

Alloyed Re-flow times : 3 times

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

12. Storage Conditions:

Temperature: 5℃~35℃,Humidity:40%~75%

13. Shelf Life:

2 years from manufacturing date.

14. 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.

15. Manufacturing Country & City :

TA-I TECHNOLOGY CO., LTD. (Taiwan– Tao Yuan)
Tel: 886-3-3246169 Fax : 886-3-3246167

Associated companies :

(1) FORTUNE TASK RESISTOR FACTORY (China – Dongguan)
Tel : 86-769-8339-4790～3 Fax : 86-769-8339-4794

(2) TA-I TECHNOLOGY (DONGGUAN) CO., LTD. (China –Dongguan)
Tel : 86-769-8339-4790～3 Fax : 86-769-8339-4794

(3) TA-I TECHNOLOGY (SU ZHOU) CO., LTD. (China – Su Zhou)
Tel :86- 512-63457879 Fax : 86-512-63457869

(4) TAI OHM ELECTRONICS (M) SDN. BHD. (Malaysia – Pulaupinang)
Tel :604- 3900480 Fax : 604-3901481

(5) P.T.TAI ELECTRONICS Indonesia (Indonesia – Jakarta)
Tel :62-21-89830123 Fax : 62-21-89830703