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# Approval Specification

Customer:

Product: SMD Thick Film Resistor

CR-12  $\pm 1\%$   $\pm 5\%$

Sizes : 2512

Approval Date: \_\_\_\_\_

Customer Approval:

(please sign & return)



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## 1. Features

- Small and light weight
- Excellent heat resistance and moisture resistance
- Lead free products for RoHS compliance
- ISO 9001, ISO 14001, ISO/TS 16949 Certified

## 2. Applications

- For all electronic products
- Miniaturization products

## 3. Description

The resistors are constructed on the alumina substrate. Top electrodes are added to each end and connected with resistive paste that is applied to top surface of the alumina substrate. The resistive layer is made by resistive paste that is prepared to approach the nominal value. Laser trimming process makes the resistance value to meet the nominal value and within the tolerance.

The resistive layer is protected by primary overcoat and secondary overcoat. Marking on secondary overcoat let user to know the resistance value directly. The barrier layer is added to edge electrodes for plating with external electrode that is the main role makes the resistor mounted on PCB.

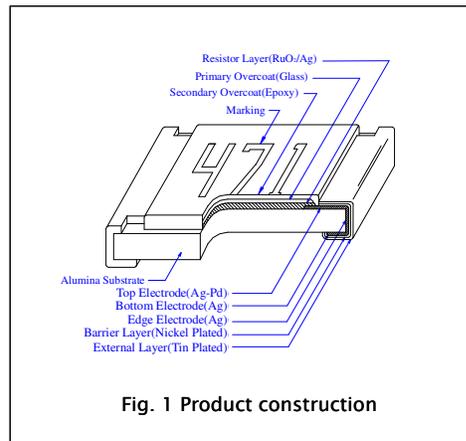


Fig. 1 Product construction

## 4. Quick Reference Data

Type name	CR-12
Size code	2512
Resistance tolerance	±1%, E24/E96 series ±5%, E24 series
Resistance range	1Ω~10MΩ, Jumper (<50mΩ)
Temperature Coefficient of Resistance (ppm/°C)	±1%    ±5%
1Ω ≤ R ≤ 9.76Ω	±200
10Ω ≤ R ≤ 1MΩ	±100
1.02M Ω ≤ R ≤ 10MΩ	±200
Power rating (at 70°C)	1W
Max. operation voltage (DC or RMS)	250V
Max. overload voltage	500V
Jumper Rated current	4A
Climatic category (IEC 60068)	55/155/42



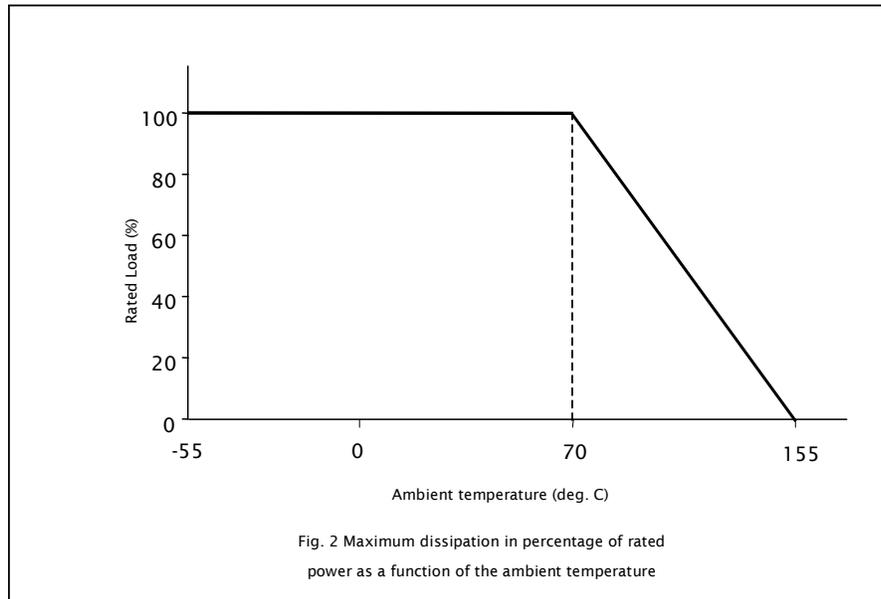
## 5. Order Information

Digits	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Order Code	C	R	-	1	2	J	L	4	-	-	1	0	K	2
	<b>Type Name</b> CR-12: 2512					<b>Tolerance</b> J : ±5%	<b>Function code</b> : Lead Free	<b>Packaging</b> 4 : 7" reel, Embossed tape, 4000 pcs/reel 9 : 10" reel, Embossed tape, 8000 pcs/reel - : Not Applicable	<b>Resistance Value</b> ---- 0R : Jumper ---- 1R : 1Ω ---1R2 : 1.2Ω -3K32 : 3.32KΩ -10K2 : 10.2KΩ -100K : 100KΩ ---- 1M : 1MΩ					

## 6. Functional description

### Derating curve

For resistors operate in the ambient temperature over 70°C, loading power ratio will derate in accordance with following curve.



**Soldering condition**

Fig.3 IR Reflow Soldering

Fig.4 Wave Soldering (Flow Soldering)

- (1) Time of IR reflow soldering at maximum temperature point 260°C : 10s
- (2) Time of wave soldering at maximum temperature point 260°C : 10s
- (3) Time of soldering iron at maximum temperature point 410°C : 5s

**7. Mechanical Data**

**Dimension**

Type	CR-12
L (mm)	6.35±0.20
W (mm)	3.20±0.15
H (mm)	0.55±0.10
A (mm)	0.60±0.25
B (mm)	0.50±0.20

**Mass per 1000 pcs**

TYPE NAME	MASS (g)
CR-12	39.448

**Outline**

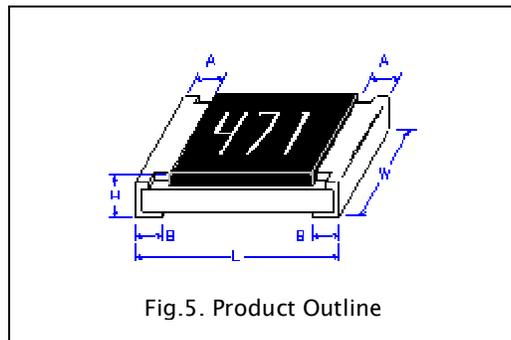


Fig.5. Product Outline

**Termination**

- (1) Thickness of Tin plating product termination :  $\geq 3\mu\text{m}$
- (2) Thickness of Nickel plating product termination :  $\geq 3\mu\text{m}$

**Marking**

Type A: 5% product with 3 digits marking, the first two digits are significant figures; third digit is number of zeros to follow. Letter "R" is as decimal point. Letter "0" is for jumper.

The marking example is as table 1.

**Table 1 Making code example**

Type	Product	Value	Example
A	CR-12, ±5%	68KΩ	
		Jumper	

## 8. Test and Requirements

In table 2 the tests and requirements are listed with reference relevant clause of IEC 60115-1. A short description of the test procedure is given. Essentially all tests are carried out refer to the schedule of IEC 60115-8-1. The testing also covers the requirements specified by EIA.

**Table 2 Test procedure and requirements**

Test Item	Test Method	Test Condition	Requirement		
			±1%	±5%	Jumper
Temperature Coefficient of Resistance (T.C.R.)	JIS C 5201 4.8 IEC 60115-1 4.8	-55°C~+155°C, 20°C is the reference temperature	Within the specification		
Short Time Overload	JIS C 5201 4.13 IEC 60115-1 4.13	2.5 times RCWV or Max. overload voltage for 5 seconds	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ
Insulation Resistance	JIS C 5201 4.6 IEC 60115-1 4.6	Max. overload voltage for 1 minute	≥10G		
Voltage Proof	JIS C 5201 4.7 IEC 60115-1 4.7	1.42 times RCWV (RMS) for 1 minute	no breakdown or flashover		
Substrate Bending Test	JIS C 5201 4.33 IEC 60115-1 4.33	Bending once with 5 seconds for 3 mm	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ
Resistance to soldering heat	JIS C 5201 4.18 IEC 60115 4.18	260±5°C for 10 seconds	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ
Leaching	JIS C 5201 4.18 IEC 60068-2-58 8.2.1	260±5°C for 30 seconds	Individual leaching area ≤5% Total leaching area ≤ 10%		
Solderability	JIS C 5201 4.17 IEC 60115-1 4.17	245±5°C for 3 seconds	>95% coverage		
Endurance at upper category temperature	JIS C 5201 4.23 IEC 60115-1 2.23.2	at +155 °C, for 1000 hrs	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ
Rapid change of temperature	JIS C 5201 4.19 IEC 60115-1 4.19	-55°C to +155 °C 5 cycles	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ
Damp heat with load	JIS 5201 4.24	40±2°C, 90~95% R.H. or Max. working voltage for 1000 hrs with 1.5hrs "ON" and 0.5 hr "OFF"	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ
Endurance	JIS C 5201 4.25 IEC 60115-1 4.25.1	70±2°C, or Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	±(2.0+0.10Ω)	±(3.0+0.10Ω)	<100mΩ

**Note:**

RCWV : Rated continuous working voltage

RCWV=Radical of Rated power x Resistance value

## 9. Packaging

### Packaging Methods

Type	Paper Tape			Embossed Tape	
	(unit: piece)	7" (178mm)	10" (254mm)	13" (330mm)	7"(178mm)
CR-12	-	-	-	4000	8000

### Embossed Plastic Tape

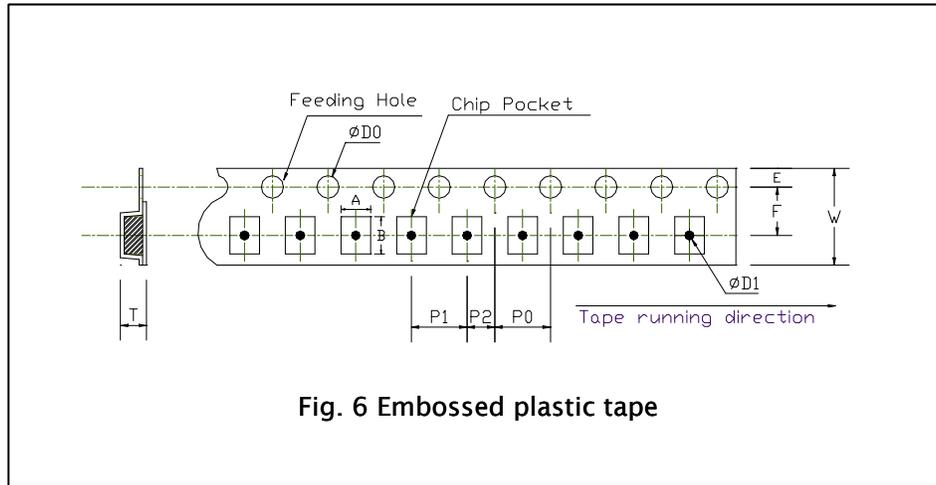
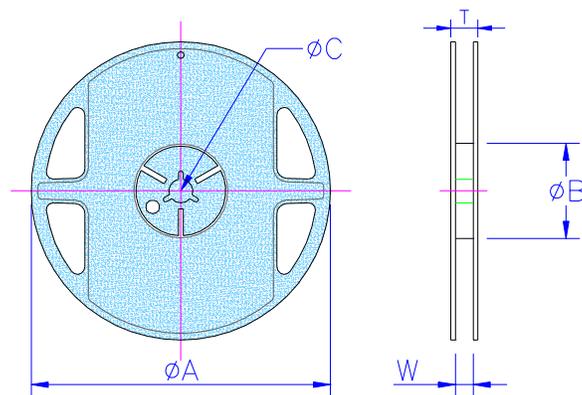


Fig. 6 Embossed plastic tape

Type	A	B	W	E	F	P0	P1	P2	$\phi D0$	$\phi D1$	T
CR-12	$3.5 \pm 0.2$	$6.7 \pm 0.2$	$12 \pm 0.3$	$1.75 \pm 0.1$	$5.5 \pm 0.05$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$2.0 \pm 0.05$	$1.5^{+0.1/0}$	$1.5^{+0.25/0}$	Max. 1.2

Unit: mm

### Reel Specification



Style	Packing	Tape width	Reel Diameter	$\phi A$	$\phi B$	$\phi C$	W	T
CR-12	Embossed	12mm	7 inch	$178.5 \pm 1.5$	$60^{+1/0}$	$13.0 \pm 0.5$	$13.0 \pm 0.5$	$15.5 \pm 0.5$
			10 inch	$250 \pm 1$	$62 \pm 0.5$	$13.0 \pm 0.5$	$12.5 \pm 0.5$	$16.5 \pm 0.5$

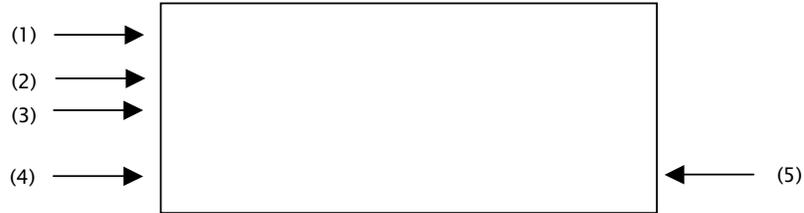
Unit: mm



**Label**

The label put on each reel denoted with each products types, tolerance, resistance value, Q'ty, each lot tracing no and barcode etc.

**Example**



- (1) Type / Tolerance / Resistance value
- (2) Reel packing quantity
- (3) Lot Number
- (4) Part Number
- (5) Labeling control sequence

**10. Storage Condition**

- (1) Suggest temperature : 5~40°C
- (2) Suggest humidity : 40%~80% R.H.

**11. Revising History**

Revision	Date	Change notification	Description
Rev.1	2005/2/23	N/A	New issue
Rev.2	2005/8/8	N/A	Revise soldering condition and reel drawing
Rev.3	2005/9/21	N/A	Revise power rating and voltage
Rev.4	2006/4/6	N/A	Add storage condition of chip resistor
Rev.5	2007/2/1	N/A	Revise soldering temp. and test method
Rev.6	2008/2/20	N/A	Test and Requirements-Leaching
Rev.7	2008/8/4	N/A	Revise Features & Applications; Cancel Bulk Cassette; Add Embossed 10" taping reel & Packing Methods; Revise Reel Specification