ROYALOHM

C O N F I D E N T I A L D O C U M E N T

SPECIFICATION FOR APPROVAL

MANTECH ELECTRONICS

Description : Carbon Film Fixed Resistors

Royalohm Part no.: CFR0W4JxxxxA50 (CR 1/4W +/- 5% PT-52mm.)

Approved by

Parts corresponding to RoHS Compliant: 2005-Apr.-1

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Approved	Checked	Prepared
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Issue Date: 2010/07/31

CHANGE NOTIFICATION HISTORY

Version	Date of Version	History	Remark
1	2005/07/07	1. Resistance range: 1Ω----10MΩ	
		2. Finished size: 2.5mm x 6.8mm	
		3. Lead wire diameter: 0.54 ± 0.05 (Unit: mm)	
		4. Pitch of Tape(PT): 52mm	

Customer: MANTECH ELECTRONICS	**Part No.: CFR0W4JxxxxA50**

1. Scope:

This specification for approval relates to Carbon Film Fixed Resistors manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form :

(Ex.)	CR	1/4W	J	1.2KΩ
	Type	Power Rating	Resistance Tolerance	Nominal Resistance

3. Ratings:

Ratings shall be shown in the table 1.

Table 1

Type	CR
Rated Power	0.25 W at 70℃
Max. Working Voltage	250 V
Max. Overload Voltage	500 V
Dielectric Withstanding Voltage	500 V
Rated Ambient Temp.	70 ℃
Operating Temp.Range.	-55℃ --- +155℃
Resistance Tolerance	± 5 %
Resistance Range	1Ω----10MΩ

3.1 Power rating:

Resistors shall have a power rating based on continuous full load operation at an ambient temperature of 70 ℃. For temperature in excess of 70 ℃ , the load shall be derated as shown in the figure 1.

3.2 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform curresponding to the power rating , as determined from the following formula :

$$RCWV = \sqrt{P \times R}$$

Were : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

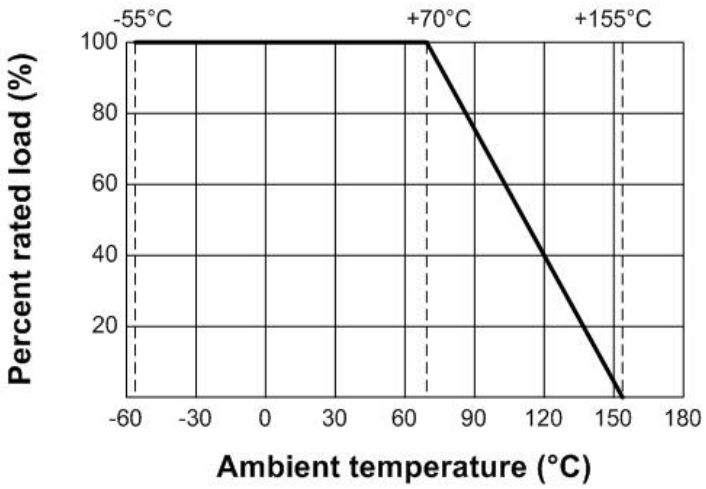
P = Power Rating (watt)

R = Nominal Resistance (ohm)

Carbon Film Fixed Resistors

In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

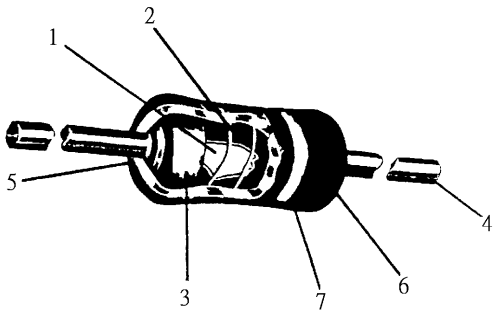
Figure 1.



3.3 Nominal resistance :

Effective figures of nominal resistance shall be in accordance with E-24 series, and resistance tolerance shall be shown by table 1.

4. Construction :



No.	Name	Material
1	Basic Body	Rod Type Ceramics
2	Resistance Film	Carbon Film
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire coated with tin
5	Joint	By welding
6	Coating	Insulated epoxy resin (Color : Beige)
7	Color Code	Epoxy Resin

Carbon Film Fixed Resistors

5. Characteristics :

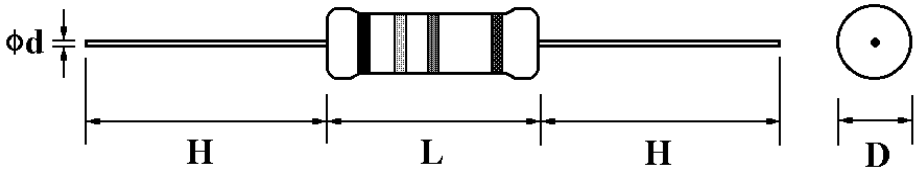
Characteristics	Limits		Test Methods (JIS C 5201-1)
DC. resistance	Must be within the specified tolerance.		The limit of error of measuring apparatus shall not exceed allowable range or 5% of resistance tolerance (Sub-clause 4.5)
Insulation resistance	Insulation resistance is 10,000 MΩ Min		Resistors shall be clamped in the trough of a 90° metallic V-block or foil method use a metal foil shall be wrapped closely around the body of the resistor. After that shall be tested at DC potential respectively specified in the above list for 60 +10/-0 secs. (Sub-clause 4.6)
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down		Resistors shall be clamped in the trough of a 90° metallic V-block or foil method use a metal foil shall be wrapped closely around the body of the resistor. After that shall be tested at AC potential respectively specified in the table 1. for 60 +10/-0 secs. (Sub-clause 4.7)
Temperature coefficient	Resis.Range	T.C.R. (PPM/℃)	Natural resistance change per temp. degree centigrade. $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance value at room temperature (t_1) R_2: Resistance value at room temp.plus 100℃ (t_2) (Sub-clause 4.8)
	≦ 10 Ω	0 ～ ±350	
	11Ω ～ 99K	0 ～ -450	
	100K ～ 1M	0 ～ -700	
	1.1M ～ 10M	0 ～ -1500	
Short time overload	Resistance change rate is ± (1 % + 0.05Ω) Max. with no evidence of mechanical damage		Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds. (Sub-clause 4.13)
Terminal strength	No evidence of mechanical damage.		**Direct load** : Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads. **Twist test :** Terminal leads shall be bent through 90 ° at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations. (Sub-clause 4.16)

Carbon Film Fixed Resistors

Characteristics	Limits	Test Methods (JIS C 5201-1)
Solderability	95 % coverage Min.	The area covered with a new , smooth clean , shiny and continuous surface free from concentrated pinholes. Test temp. of solder : 245℃ ± 3℃ Dwell time in solder : 2 ~ 3 seconds (Sub-clause 4.17)
Soldering temp. reference	Electrical characteristics shall be satisfied. Without distinct deformation in appearance. (95 % coverage Min.)	The leads immersed into solder bath to 3.2 to 4.8 mm. from the body. Permanent resistance change shall be checked. Wave soldering condition: (2 cycles Max.) Pre-heat : 100 ~ 120 ℃, 30 ± 5 sec. Suggestion solder temp.: 235 ~ 255 ℃, 10 sec. (Max.) Peak temp.: 260 ℃ Hand soldering condition: Hand Soldering bit temp. : 380 ± 10 ℃ Dwell time in solder : 3 +1/-0 sec.
Resistance to soldering heat	Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage.	Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in 350℃ ± 10 ℃ solder for 3 ± 0.5 seconds (Sub-clause 4.18)
Temperature cycling	Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage.	Resistance change after continuous 5 cycles for duty shown below: **Step** / **Temperature** / **Time** 1 / -55℃ ±3℃ / 30 mins 2 / Room temp. / 10～15 mins 3 / +155℃ ±2℃ / 30 mins 4 / Room temp. / 10～15 mins (Sub-clause 4.19)
Vibration	Resistance change rate is ± (1% + 0.05Ω) Max.	55Hz, 3 planes 2hrs each Total amplitude = 1.5mm (Sub-clause 4.22)
Load life in humidity	**Resistance value** / △R/R Normal Type: < 100KΩ / ± 3 % Normal Type: ≧100KΩ / ± 5 %	Resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") in a humidity test chamber controlled at 40 ℃ ± 2 ℃ and 90 to 95 % relative humidity (Sub-clause 4.24.2.1)
Load life	**Resistance value** / △R/R Normal Type: < 56KΩ / ± 2 % Normal Type: ≧56KΩ / ± 3 %	Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70℃ ± 2℃ ambient (Sub-clause 4.25.1)
Resistance to solvent	No deterioration of protective coatings and markings	Specimens shall be immersed in a bath of trichroethane completely for 3 minutes with ultrasonic (Sub-clause 4.30)

Carbon Film Fixed Resistors

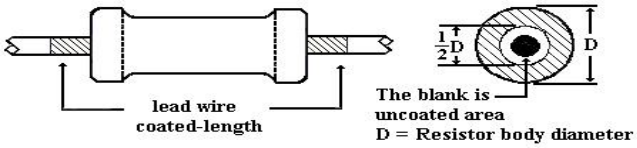
6. Dimension : Unit : mm



Type	Power Rating	D (Max.)	L (Max.)	d ± 0.05	H ± 3
CR	1/4W	2.5 mm	6.8 mm	0.54 mm	28 mm

Painting method:

Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within 1/2 of the are angle.

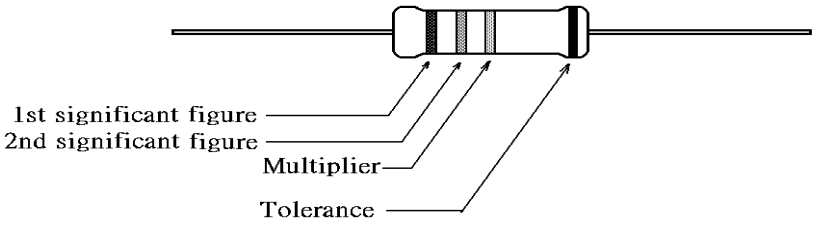


7. Marking :

7.1 Resistor :

Resistors shall be marked with color coding

colors shall be in accordance with JIS C 0802



7.2 Label :

Label shall be marked with following items:

(1) Order code
(2) Type and Nominal resistance
(3) Wattage and Resistance tolerance
(4) Lot number and PPM
(5) Quantity

Example :

Carbon Film Fixed Resistors

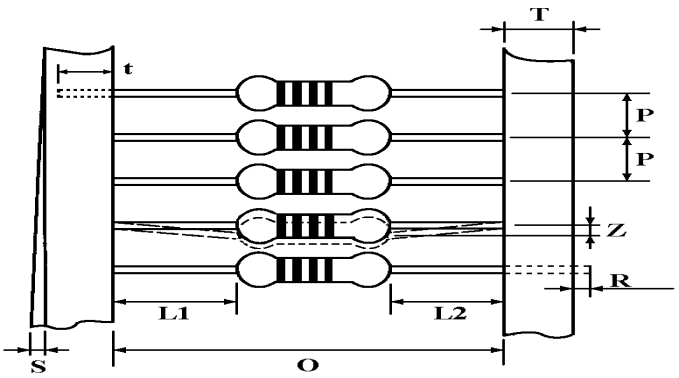
Watt	:	1/4W	Val	:	1K2
Q'TY	:	5,000	Tol	:	5%
Lot	:	813478	PPM	:	

ROYALOHM Pb Free

Carbon Film Fixed Resistors

8. Packing specification :

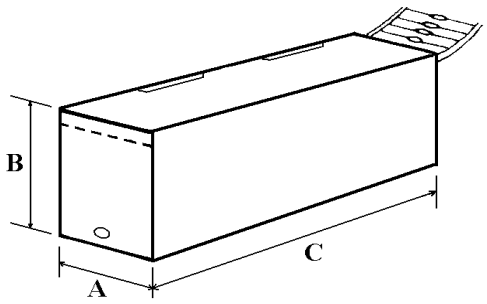
8.1 Taping dimension :



Dimensions (mm)

Type	Style	O	P	L1-L2	T	Z	R	t	S
CR-25	PT-52	52±1	5±0.3	1 Max.	6±1	1 Max.	0	4 ±1	0.5 Max.

8.2 Tape in box packing :



Bandoliers may also be contained in a cardboard box ("Ammopack")

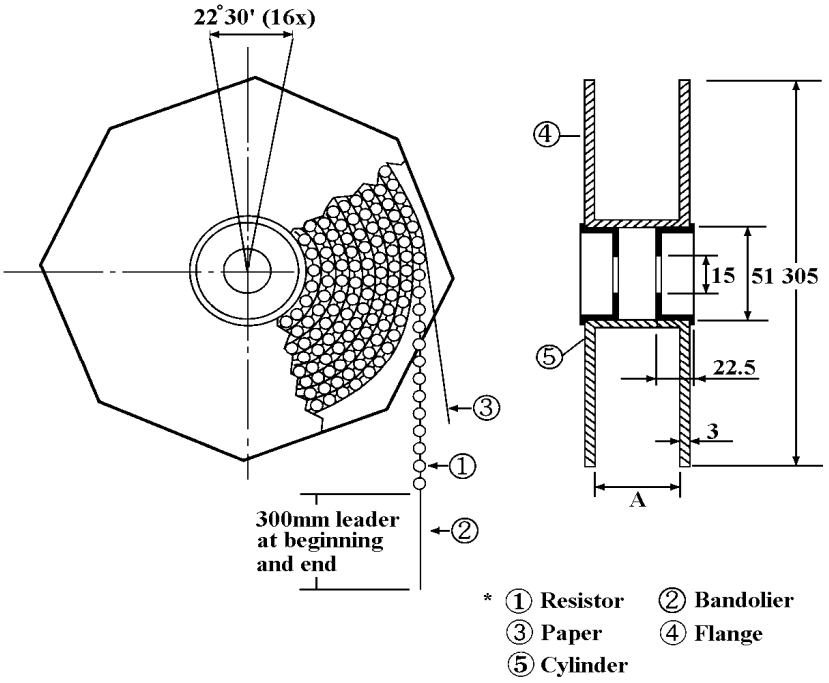
Dimension (mm)

Type	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
CR-25	PT-52	250	75	96	5,000

"Ammopack" is an abbreviation of "ammunition pack"

Carbon Film Fixed Resistors

8.3 Tape on reel packing :



Dimension (mm) :

Type	Style	Across Flange (A)	Quantity Per Reel
CR-25	PT-52	73 ± 2	5,000 pcs.

Part Number System

Explanation of Part Number System
(Carbon Film Fixed Resistors)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
C	F	R	0	W	4	J	0	1	2	2	A	5	0

Product Type:
CFR = Carbon Film

Special Feature:
0 = Standard Product
F = Non-Flame Product
I = Non-Inductive Product

Wattage:

Normal size:	Small size:
W8 = 1/8W	S4 = 1/4W-S
W6 = 1/6W	S3 = 1/3W-S
W4 = 1/4W	S2 = 1/2W-S
W2 = 1/2W	1S = 1W-S
1W = 1W	2S = 2W-S
2W = 2W	3S = 3W-S

Extra Small size:
U2 = 1/2W-SS
1U = 1W-SS

Tolerance:
F ~ ± 1%
G ~ ± 2%
J ~ ± 5%
K ~ ± 10%

Resistance Value:
E-24 series: the 1st digit is"0", the 2nd & 3rd digits are for the significant figures of the resistance and the 4th indicate the number of zeros following:
"J" ~ 0.1, "K" ~ 0.01
Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
E--96 Series: the 1st to 3rd digits are significant figures of resistance and the fourth one denotes number of zeros following:
Ex.: 1.33KΩ = 1331

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box
P = Tape/Box of PT-26

Packing Quantity:
1 = 1,000pcs
2 = 2,000pcs
4 = 4,000pcs
5 = 5,000pcs
A = 500pcs
B = 2,500pcs
0 = Bulk/Box

Addition Information:
P = Panasert type
1 = Avisert type 1
2 = Avisert type 2
3 = Avisert type 3
0 = PT-52mm, PT-26mm
8 = PT-58mm
9 = PT-64mm
7 = Lead wire(H) 38mm

Sample: CR 1/4W +/- 5% 1.2KΩ T/B 5,000 → CFR0W4J0122A50

Carbon Film Fixed Resistors

Environment Related Substance

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and Halogen free.

Ozone layer depleting substances.

Ozone depleting substances are not used in our manufacturing process of this product.
This product is not manufactured using Chloro fluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.

Storage Condition

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of 25°C ± 5°C and a relative humidity of 60%RH ± 10%RH

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_2
2. In direct sunlight