

# ROYAL OHM

## SPECIFICATION FOR APPROVAL

### MARITEX

Description : Carbon Film Fixed Resistors

Royal Ohm Part no.: CFR0W4JxxxxA50 (CR 1/4W +/- 5%)

Approved by

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

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Approved	Checked	Prepared
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Issue Date: 2006/04/07



## 1. Scope:

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

## 2. Type designation:

The type designation shall be in the following form :

(Ex.)	CR	1/4 W	J	10KΩ
	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----11MΩ

## 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 corresponding 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)

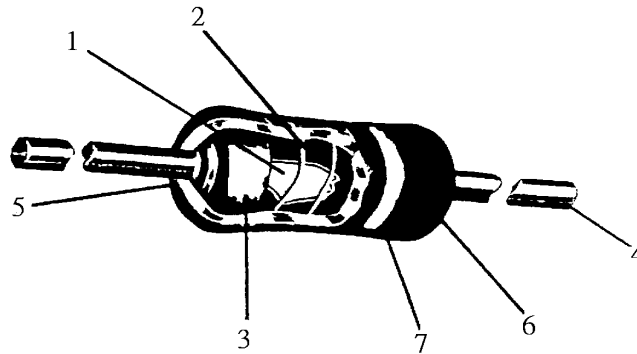
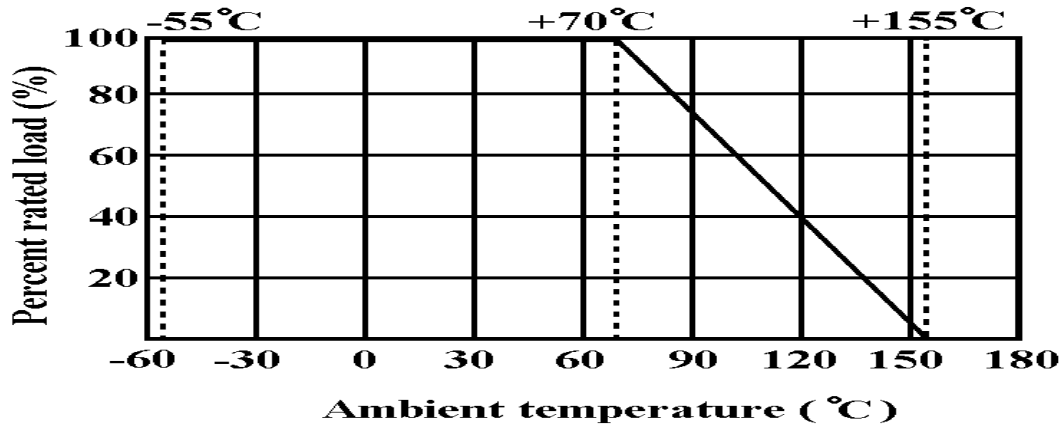
P = Power Rating (watt)

R = Nominal Resistance (ohm)

## Carbon Film Fixed Resistors

In no case shall the rated DC or RMS AC continuous working voltage be greater

Figure 1.



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 (Electrosolder plated surface) <b>Pb Free</b>
5	Joint	By welding
6	Coating	Insulated 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.	5.1 The limit of error of measuring apparatus shall not exceed allowable range or 5% of resistance tolerance										
Temperature coefficient	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Resist. Range</th> <th style="text-align: center;">T.C.R. (PPM/□)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">≤ 10 Ω</td> <td style="text-align: center;">0 □ ±350</td> </tr> <tr> <td style="text-align: center;">11Ω □ 99K</td> <td style="text-align: center;">0 □ -450</td> </tr> <tr> <td style="text-align: center;">100K □ 1M</td> <td style="text-align: center;">0 □ -700</td> </tr> <tr> <td style="text-align: center;">1.1M □ 10M</td> <td style="text-align: center;">0 □ -1500</td> </tr> </tbody> </table>	Resist. Range	T.C.R. (PPM/□)	≤ 10 Ω	0 □ ±350	11Ω □ 99K	0 □ -450	100K □ 1M	0 □ -700	1.1M □ 10M	0 □ -1500	5.2 Natural resistance change per temp. degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \quad (\text{PPM}/\square)$ R1: Resistance value at room temperature (t1) R2: Resistance value at room temp.plus 100□ (t2)
Resist. Range	T.C.R. (PPM/□)											
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1.1M □ 10M	0 □ -1500											
Short time overload	Resistance change rate is ± (1 % + 0.05Ω) Max. with no evidence of mechanical damage	5.5 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds.										
Insulation Resistance	Insulation resistance is 10,000 MΩ Min	5.6 Resistors shall be clamped in the trough of a 90° metallic V-block and shall be tested at DC potential respectively specified in the above list for 60 +10/ -0 seconds.										
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down.	5.7 Resistors shall be clamped in the trough of a 90° metallic V-block and shall be tested at AC potential respectively specified in the table 1. for 60 + 10/-0 seconds.										
Terminal strength	No evidence of mechanical damage.	6.1 <b>Direct load :</b> Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads. <b>Twist test :</b> 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.										

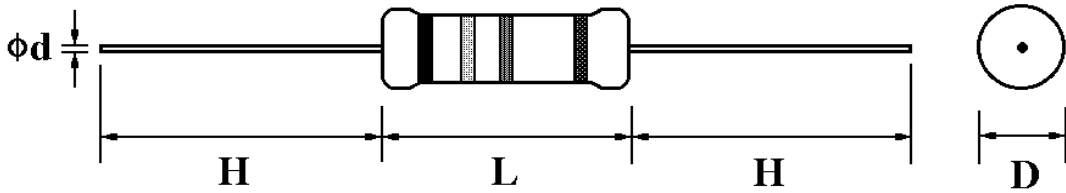
## Carbon Film Fixed Resistors

Characteristics	Limits	Test Methods ( JIS C 5201-1 )															
Resistance to soldering heat	Resistance change rate is $\pm (1\% + 0.05\Omega)$ Max. with no evidence of mechanical damage.	6.4 Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in $350\text{ }^{\circ}\text{C} \pm 10\text{ }^{\circ}\text{C}$ solder for $3 \pm 0.5$ seconds															
Solderability	95 % coverage Min.	6.5 The area covered with a new , smooth clean , shiny and continuous surface free from concentrated pinholes. Test temp. of solder : $245\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ Dwell time in solder : 2 ~ 3 seconds															
Temperature cycling	Resistance change rate is $\pm (1\% + 0.05\Omega)$ Max. with no evidence of mechanical damage.	7.4 Resistance change after continuous 5 cycles for duty shown below:															
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Step</th> <th style="width: 60%;">Temperature</th> <th style="width: 30%;">Time</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;"><math>-55\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}</math></td> <td style="text-align: center;">30 mins</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">Room temp.</td> <td style="text-align: center;">10 <math>\square</math> 15 mins</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;"><math>+155\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}</math></td> <td style="text-align: center;">30 mins</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">Room temp.</td> <td style="text-align: center;">10 <math>\square</math> 15 mins</td> </tr> </tbody> </table>	Step	Temperature	Time	1	$-55\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$	30 mins	2	Room temp.	10 $\square$ 15 mins	3	$+155\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$	30 mins	4	Room temp.	10 $\square$ 15 mins
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4	Room temp.	10 $\square$ 15 mins															
Load life in humidity	<b>Resistance value</b>	7.9 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 $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and 90 to 95 % relative humidity															
	Normal Type		Less than 100K $\Omega$	$\pm 3\%$													
			100K $\Omega$ or more	$\pm 5\%$													
Load life	<b>Resistance value</b>	7.10 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of ( 1.5 hours "on", 0.5 hour "off" ) at $70\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ambient															
	Normal Type		Less than 56K $\Omega$	$\pm 2\%$													
			56K $\Omega$ or more	$\pm 3\%$													

## Carbon Film Fixed Resistors

6. Dimension :

Unit : mm

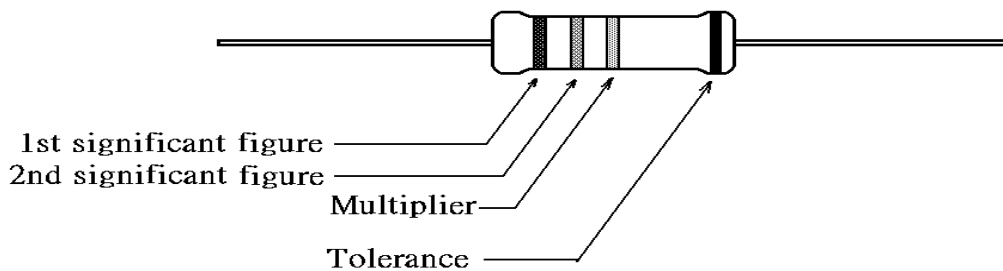


Type	Power Rating	D (Max.)	L (Max.)	$d \pm 0.05$	$H \pm 3$
CR	1/4W	2.5 mm	6.8 mm	0.50 mm	28 mm

7. Marking :

7.1 Resistor :

Resistors shall be marked with color coding  
colors shall be in accordance with JIS C 0802



7.2 Label :

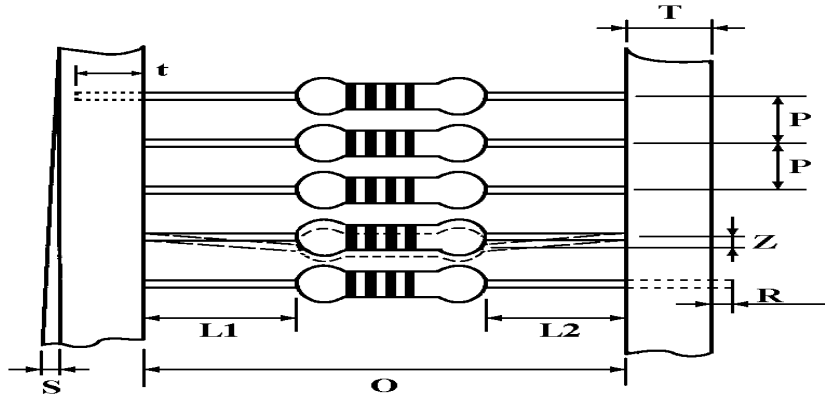
Label shall be marked with following items:

- (1) Type and style
- (2) Nominal resistance
- (3) Resistance tolerance
- (4) Quantity
- (5) Lot number
- (6) PPM

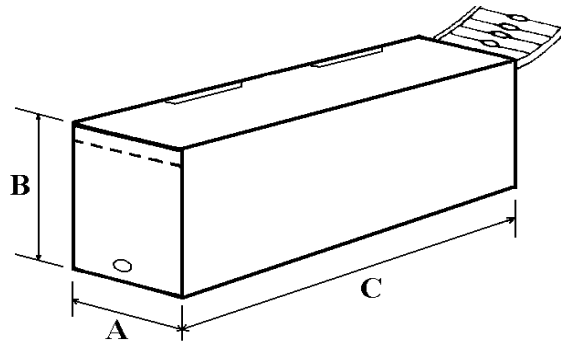
Example :

Carbon Film Resistors	
Watt : 1/4W	Val : 10K
Q'TY : 5 000	Tol : 5%
Lot : 813478	PPM :
ROYAL OHM	

## Carbon Film Fixed Resistors



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.



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

Dimension (mm)

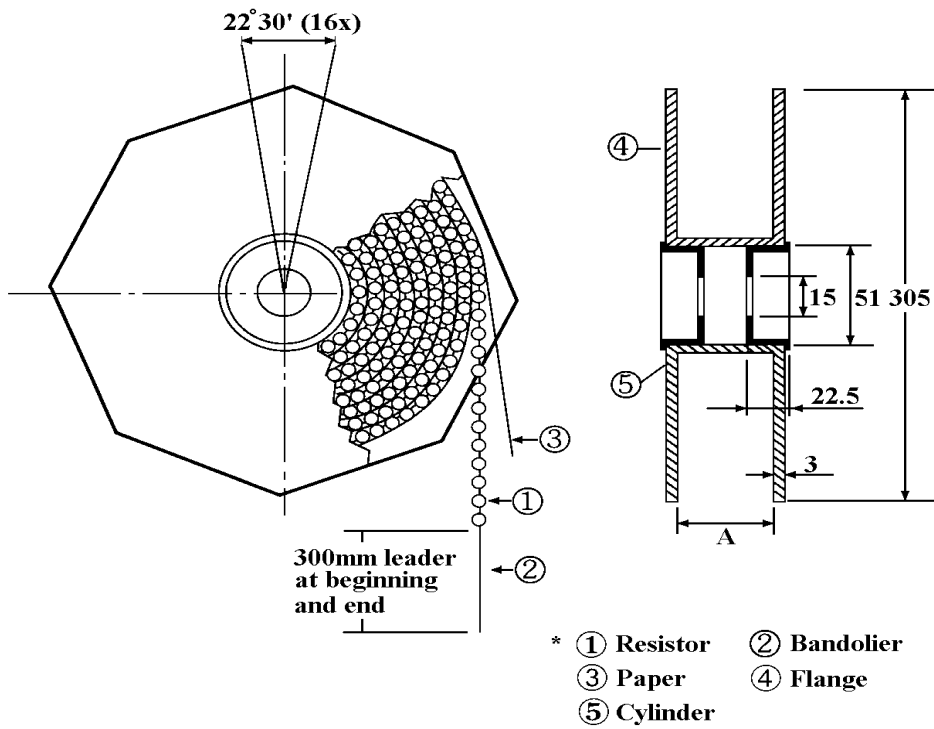
Type	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
CR-25	PT-52	250	75	96	5 000

"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	$73 \pm 2$	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 0 3      A 5 0

**Product Type:**  
CFR = Carbon Film Fixed Resistor

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

**Wattage:**

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

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

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

**Packing Quantity:**  
1 = 1,000pcs  
2 = 2,000pcs  
3 = 3,000pcs  
4 = 4,000pcs  
5 = 5,000pcs  
A = 500pcs  
B = 2,500pcs  
C = 10,000pcs  
D = 20,000pcs  
0 = for Bulk/Box packing

**Packing Type:**  
A = Tape/Box  
T = Tape/Reel  
B = Bulk/Box

**Addition Information:**  
0 = PT-52mm, NIL for PT-26mm  
8 = PT-58mm  
9 = PT-64mm  
P = Panasert type  
1 = Avisert type 1  
2 = Avisert type 2  
3 = Avisert type 3  
A = Cutting type CO 1/4W-A type  
B = Cutting type CO 1/4W-B type  
7 = Lead wire(H) 38mm

Sample: CR 1/4W +/- 5% 10KΩ T/B 5,000 → CFR0W4J0103A50