

# Datasheet

1. Scope:

This specification for approval relates to Carbon Film Fixed Resistors

2. Type designation:

The type designation shall be in the following form :

**All part numbers in the coding below start with "TC-" and end with "203"**

(Ex.)	<u>CR</u>	<u>1/4W</u>	<u>J</u>	<u>100KΩ</u>
	Type	Power Rating	Resistance Tolerance	Nominal Resistance

3. Ratings:

Ratings shall be shown in the table 1.

Table 1

Type	CR
Rated Power	0.25W at 70°C
Max. Working Voltage	250 V
Max. Overload Voltage	500 V
Dielectric Withstanding Voltage	500 V
Rated Ambient Temp.	70 °C
Operating Temp.Range.	-55°C ~ +155°C
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 °C. For temperature in excess of 70 °C , 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)

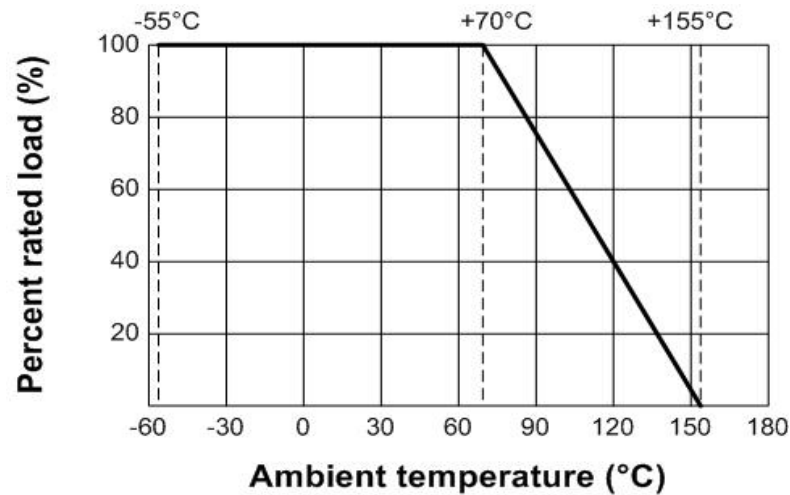
P = Power Rating (watt)

R = Nominal Resistance (ohm)

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

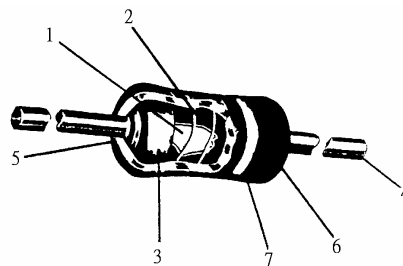
Figure 1.



### 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

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### 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 M $\Omega$ 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)

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### 5. Characteristics :

Characteristics	Limits		Test Methods ( JIS C 5201-1 )
Temperature coefficient			Natural resistance change per temp. degree centigrade.
	Resist. Value	T.C.R. (PPM/°C)	$\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (PPM/°C)
	$\cong 10 \Omega$	0 ~ ±350	
	11Ω ~ 99K	0 ~ -450	
	100K ~ 1M	0 ~ -700	R1: Resistance value at room temperature (t <sub>1</sub> )
	1.1M ~ 10M	0 ~ -1500	R2: Resistance value at room temp.plus 100°C (t <sub>2</sub> ) (Sub-clause 4.8)
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.		<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. (Sub-clause 4.16)

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Characteristics	Limits	Test Methods ( JIS C 5201-1 )
Solderability	95 % coverage Min.	<p>The area covered with a new , smooth clean , shiny and continuous surface free from concentrated pinholes.</p> <p>Test temp. of solder : 245°C ± 3°C Dwell time in solder : 2 ~ 3 seconds (Sub-clause 4.17)</p>
Soldering temp. reference	Electrical characteristics shall be satisfied. Without distinct deformation in appearance. (95 % coverage Min.)	<p>The leads immersed into solder bath to 3.2 to 4.8 mm. from the body. Permanent resistance change shall be checked.</p> <p><u>Wave soldering condition: (2 cycles Max.)</u></p> <p>Pre-heat : 100 ~ 120 °C, 30 ± 5 sec. Suggestion solder temp.: 235 ~ 255 °C, 10 sec. (Max.) Peak temp.: 260 °C</p> <p><u>Hand soldering condition:</u></p> <p>Hand Soldering bit temp. : 380 ± 10 °C Dwell time in solder : 3 +1/-0 sec.</p>
Resistance to soldering heat	Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage.	<p>Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in 350°C ± 10 °C solder for 3 ± 0.5 seconds (Sub-clause 4.18)</p>

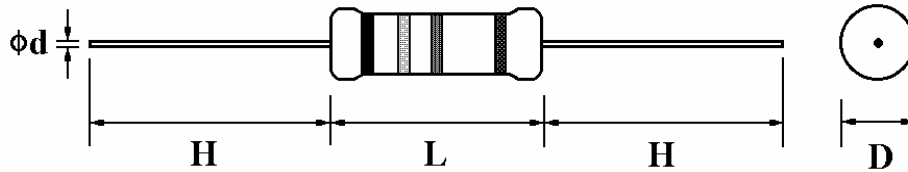
### Carbon Film Fixed Resistors

Characteristics	Limits	Test Methods ( JIS C 5201-1 )		
Temperature cycling	Resistance change rate is $\pm (1\% + 0.05 \Omega)$ Max. with no evidence of mechanical damage.	Resistance change after continuous 5 cycles for duty shown below:		
		<b>Step</b>	<b>Temperature</b>	<b>Time</b>
		1	$-55^{\circ}\text{C} \pm 3^{\circ}\text{C}$	30 mins
		2	Room temp.	10~15 mins
		3	$+155^{\circ}\text{C} \pm 2^{\circ}\text{C}$	30 mins
		4	Room temp.	10~15 mins
		(Sub-clause 4.19)		
Vibration	Resistance change rate is $\pm (1\% + 0.05 \Omega)$ Max.	55Hz, 3 planes 2hrs each Total amplitude = 1.5mm (Sub-clause 4.22)		
Load life in humidity	<b>Resistance value</b>		$\Delta R/R$	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 $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 90 to 95 % relative humidity (Sub-clause 4.24.2.1)
	Normal	$<100\text{K}\Omega$	$\pm 3\%$	
	Type	$\geq 100\text{K}\Omega$	$\pm 5\%$	
Load life	<b>Resistance value</b>		$\Delta R/R$	Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of ( 1.5 hours "on", 0.5 hour "off" ) at $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ambient (Sub-clause 4.25.1)
	Normal	$<56\text{K}\Omega$	$\pm 2\%$	
	Type	$\geq 56\text{K}\Omega$	$\pm 3\%$	
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 :

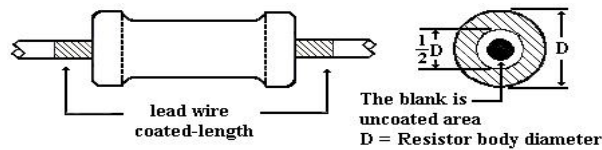
Unit : mm



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:

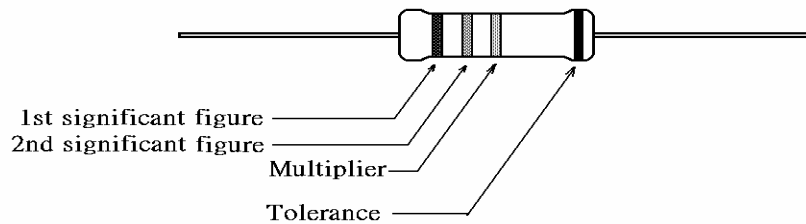
Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within 1/2 of the arc angle.



7. Marking :

7.1 Resistor :

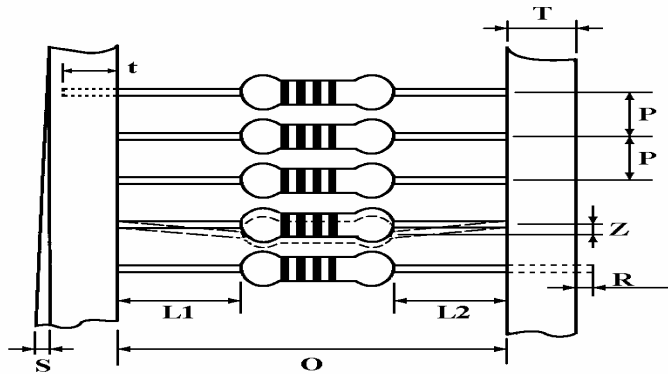
Resistors shall be marked with color coding colors shall be in accordance with JIS C 0802



## Carbon Film Fixed Resistors

8. Packing specification :

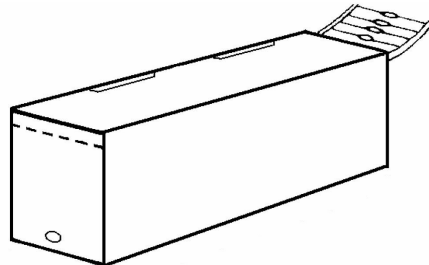
8.1 Taping dimension :



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")



## Part Number System

### Explanation of Part Number System

#### (Carbon Film Fixed Resistors)

All part numbers in the coding below start with "TC-" and end with "203"

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

**Product Type:**  
CFR = Carbon Film

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

**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  
4 = 4,000pcs  
5 = 5,000pcs  
A = 500pcs  
B = 2,500pcs  
0 = Bulk/Box

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

<b>Wattage:</b>	
<b>Normal size:</b>	<b>Small size:</b>
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

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

**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% 100KΩ T/B-2,000 → CFR0W4J0104A20

## 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  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and a relative humidity of  $60\%\text{RH} \pm 10\%\text{RH}$

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  $\text{Cl}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$ ,  $\text{SO}_2$ , or  $\text{NO}_2$
2. In direct sunlight

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