

Carbon Film Fixed Resistor



RoHS
Compliant



Specifications

Rated Power at 70°C	: 1/2 W (0.5W)
Max. Working Voltage	: 33.16V
Max. Overload Voltage	: 82.91 V
Dielectric Withstanding Voltage	: 700 V
Rated Ambient Temp.	: 70°C
Operating Temp. Range	: -55°C to +155°C
Resistance Tolerance	: ±5%
Resistance Value	: 2.2kΩ

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

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:

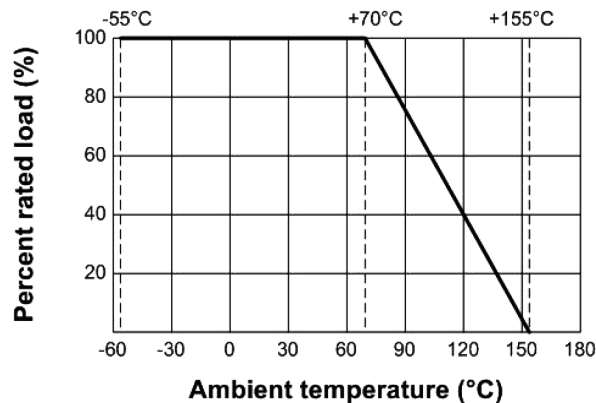
$$RCWV = \sqrt{P \times R}$$

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)

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



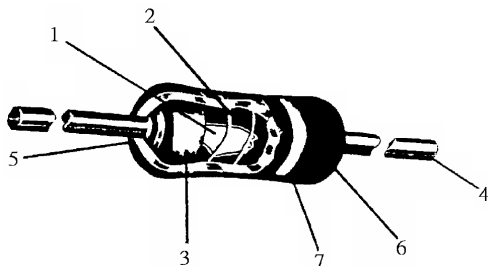
Nominal Resistance

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

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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 resin (Colour : Beige)
7	Colour Code	Epoxy Resin

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
Insulation resistance	Insulation resistance is 10,000MΩ 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.
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 specification for 60 +10/-0 secs.
Temperature coefficient	Resis.Value	Natural resistance change per temp. degree centigrade. $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/°C) R1: Resistance value at room temperature (t ₁) R2: Resistance value at room temp. plus 100°C (t ₂)
	2.2kΩ	
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.
Terminal strength	No evidence of mechanical damage.	Direct load: Resistance to a 2.5kgs 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.

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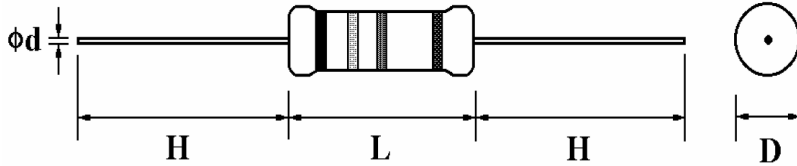


Characteristics	Limits	Test Methods (JIS C 5201-1)															
Solderability	95 % coverage Min.	The area covered with a new , smooth clean , shiny and continuous surface free from concentrated pinholes. Test temp. of solder : 245°C ±3°C Dwell time in solder : 2 ~ 3 seconds															
Soldering 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°C, 30 ±5 sec. Suggestion solder temp.: 235 ~ 255°C, 10 sec. (Max.) Peak temp.: 260°C Hand soldering condition: Hand Soldering bit temp. : 380 ±10°C 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 3.2mm to 4.8 mm from the body in 255°C ± 5°C solder for 5+1/-0 sec seconds (Preheat 120°C 60s)															
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: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C ±3°C</td> <td>30 mins</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>10 ~ 15 mins</td> </tr> <tr> <td>3</td> <td>+155°C ±2°C</td> <td>30 mins</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>10 ~ 15 mins</td> </tr> </tbody> </table>	Step	Temperature	Time	1	-55°C ±3°C	30 mins	2	Room temp.	10 ~ 15 mins	3	+155°C ±2°C	30 mins	4	Room temp.	10 ~ 15 mins
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Vibration	Resistance change rate is ±(1% + 0.05Ω) Max.	55Hz, 3 planes 2hrs each Total amplitude = 1.5mm															
Load life in humidity	Resistance value	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°C ±2°C and 90 to 95 % relative humidity															
	Normal Type 2.2kΩ		ΔR/R ± 3 %														
Load life	Resistance value	Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70°C ±2°C ambient															
	Normal Type 2.2kΩ		ΔR/R ± 2 %														
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															

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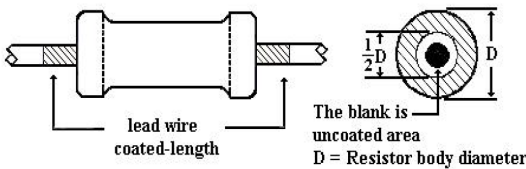
Dimension



D (Max.)	L (Max.)	d ± 0.05	H ± 3
3mm	9mm	0.54mm	28mm

Painting Method

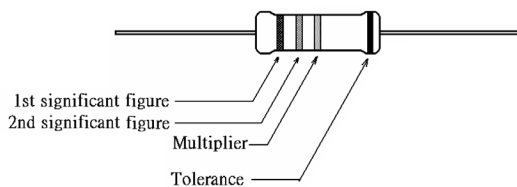
Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within 1/2 of the arc angle.



Marking

Resistor

Resistors shall be marked with colour coding. Colours shall be in accordance with JIS C 0802.



Part Number Table

Description	Part Number
Resistor, Carbon Film, 2.2k Ω , 0.5W, $\pm 5\%$	MCF 0.5W 2K2

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