



Carbon Film Fixed Resistors (RoHS Compliant)

CF-RC Series

FEATURES

- Temperature Range -55°C ~ +155°C
- ±5% tolerance
- High quality performance at economical prices
- Compatible with automatic insertion equipment
- Flame retardant type available
- Tin coated annealed copper wire
- Value Range below 1Ω or above 10MΩ are available by special request, please ask for details



RoHS Compliant



DERATING CURVE



CURRENT NOISE



TEMPERATURE COEFFICIENT



PART NUMBERING SYSTEM



SERIES, SIZE, WATTAGE, VOLTAGE, DIMENSIONS, AND AVAILABLE PACKAGING



| Code: | Package: |
|-------|---------------|
| | Bulk |
| /REEL | Tape and Reel |
| /AP | Ammo Pack |

| Series | Size | Watts | Voltage (V) (max.) | | Dimensions (mm) | | | | Standard Quantities Available | | |
|--------|----------|-------|--------------------|-------|-----------------|--------|----|------|-------------------------------|---------------|-----------|
| | | | W.V. | O.V. | L max. | D max. | H | d | Bulk | Tape and Reel | Ammo Pack |
| 291 | Standard | 1/4 | 250 | 500 | 6.8 | 2.5 | 28 | 0.54 | 1,000 | 5,000 | 1,000 |
| 293 | Standard | 1/2 | 350 | 700 | 10 | 3.5 | 28 | 0.54 | 1,000 | 3,000 | 1,000 |
| 294 | Small | 1 | 500 | 1,000 | 12 | 5.0 | 28 | 0.7 | 1,000 | 3,000 | 1,000 |
| 299 | Standard | 1/8 | 200 | 400 | 3.5 | 1.85 | 28 | 0.45 | 1,000 | 5,000 | 2,000 |

STANDARD VALUES (Ω)

| | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|----|----|-----|-----|-----|------|------|------|------|-----|-----|------|------|------|------|------|------|------|
| 0.5 | 2.0 | 4.3 | 9.1 | 20 | 43 | 91 | 200 | 430 | 910 | 2K | 3.9K | 8.2K | 18K | 39K | 82K | 180K | 390K | 820K | 1.8M | 3.9M | 8.2M |
| 1.0 | 2.2 | 4.7 | 10 | 22 | 47 | 100 | 220 | 470 | 1K | 2.2K | 4.3K | 9.1K | 20K | 43K | 91K | 200K | 430K | 910K | 2M | 4.3M | 9.1M |
| 1.1 | 2.4 | 5.1 | 11 | 24 | 51 | 110 | 240 | 510 | 1.1K | 2.4K | 4.7K | 10K | 22K | 47K | 100K | 220K | 470K | 1M | 2.2M | 4.7M | 10M |
| 1.2 | 2.7 | 5.6 | 12 | 27 | 56 | 120 | 270 | 560 | 1.2K | 2.7K | 5.1K | 11K | 24K | 51K | 110K | 240K | 510K | 1.1M | 2.4M | 5.1M | 15M |
| 1.3 | 3.0 | 6.2 | 13 | 30 | 62 | 130 | 300 | 620 | 1.3K | 3K | 5.6K | 12K | 27K | 56K | 120K | 270K | 560K | 1.2M | 2.7M | 5.6M | 22M |
| 1.5 | 3.3 | 6.8 | 15 | 33 | 68 | 150 | 330 | 680 | 1.5K | 3.2K | 6.2K | 13K | 30K | 62K | 130K | 300K | 620K | 1.3M | 3M | 6.2M | |
| 1.6 | 3.6 | 7.5 | 16 | 36 | 75 | 160 | 360 | 750 | 1.6K | 3.3K | 6.8K | 15K | 33K | 68K | 150K | 330K | 680K | 1.5M | 3.3M | 6.8M | |
| 1.8 | 3.9 | 8.2 | 18 | 39 | 82 | 180 | 390 | 820 | 1.8K | 3.6K | 7.5K | 16K | 36K | 75K | 160K | 360K | 750K | 1.6M | 3.6M | 7.5M | |





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■ 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 | Resist. Range | T.C.R. (PPM / °C) | 5.2 Natural resistance change per temp. degree centigrade. R ₂ -R ₁ ————— x106 (PPM/°C) R ₁ (t ₂ -t ₁) R ₁ : Resistance value at room temperature (t ₁) R ₂ : Resistance value at room temp.plus 100°C (t ₂) | | | | | | | | | | | | | | | |
| | < 10 Ω 11Ω ~ 99K 100K ~ 1M 1.1M ~ 10M | 0 ~ ±350 0 ~ -450 0 ~ -700 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 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. | | | | | | | | | | | | | | | |
| Resistance to soldering heat | Resistance change rate is ± (1% + 0.05Ω) 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 °C ± 10°C solder for 3 ± 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°C ± 3°C Dwell time in solder : 2 ~ 3 seconds | | | | | | | | | | | | | | | |
| Temperature cycling | Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage. | | 7.4 Resistance change after continuous 5 cycles for duty shown below: | | | | | | | | | | | | | | | |
| | | | <table border="1"> <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 |
| | | | Step | Temperature | Time | | | | | | | | | | | | | |
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| 3 | +155°C ±2°C | 30 mins | | | | | | | | | | | | | | | | |
| 4 | Room temp. | 10~15 mins | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Load life in humidity | Resistance value | | 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°C ± 2°C and 90 to 95 % relative humidity | | | | | | | | | | | | | | | |
| | Normal Type | < than 100KΩ >100KΩ | | ± 3 % ± 5 % | | | | | | | | | | | | | | |
| Load life | Resistance value | | 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°C ± 2°C ambient | | | | | | | | | | | | | | | |
| | Normal Type | < than 56KΩ > 56KΩ | | ± 2 % ± 3 % | | | | | | | | | | | | | | |

