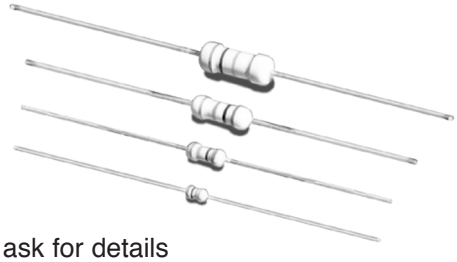
# Carbon Film Fixed Resistors (RoHS Compliant) CF-RC Series

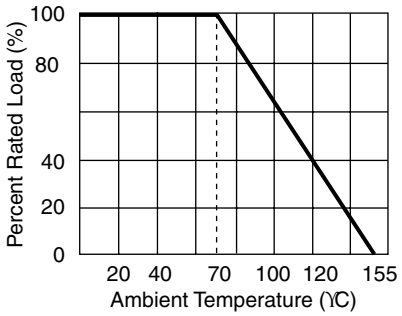
## FEATURES

- 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

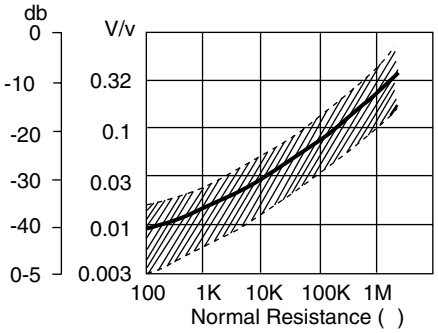
RoHS Compliant



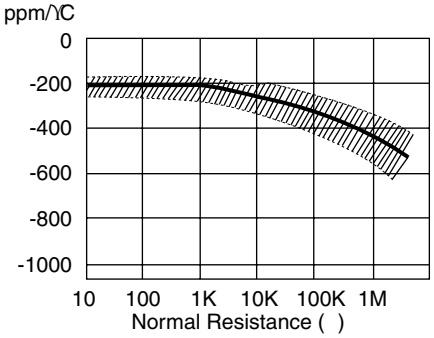
## DERATING CURVE




## CURRENT NOISE



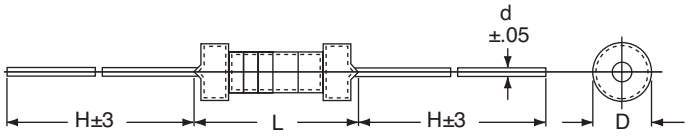

## TEMPERATURE COEFFICIENT




## PART NUMBERING SYSTEM

| 2 | 9 | 1 | – | 1 | 0 | K | / | R | E | E | L | - | R | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | | | | Value | | | | Package | | | | | Suffix (RoHS Compliant) | |

## 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 | 24 K | 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 | |




Specifications are subject to change without notice. No liability or warranty implied by this information. Environmental compliance based on producer documentation.

# Carbon Film Fixed Resistors (RoHS Compliant) CF-RC Series

## 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.<br>$\frac{R_2-R_1}{R_1(t_2-t_1)}$ x106 (PPM/°C)<br>$R_1$: Resistance value at room temperature ($t_1$)<br>$R_2$: Resistance value at room temp.plus 100°C ($t_2$) |
| | < 10 Ω<br>11Ω ~ 99K<br>100K ~ 1M<br>1.1M ~ 10M | 0 ~ ±350<br>0 ~ -450<br>0 ~ -700<br>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**<br>Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads.<br>**Twist test :**<br>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.<br>Test temp. of solder : 245°C ± 3°C<br>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: |

| 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 |

| Load life in humidity | Resistance value | | ΔR/R |
|---|---|---|---|
| | Normal Type | < than 100KΩ<br>>100KΩ | ± 3 %<br>± 5 % |

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

| Load life | Resistance value | | ΔR/R |
|---|---|---|---|
| | Normal Type | < than 56KΩ<br>> 56KΩ | ± 2 %<br>± 3 % |

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



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