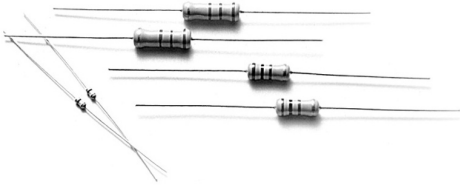


Carbon Film Resistors

General Type

Normal & Miniature Style [CFR Series]



INTRODUCTION

The CFR Series Carbon Film Resistors are manufactured by coating a homogeneous film of pure carbon on high grade ceramic rods. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of tan color lacquer.

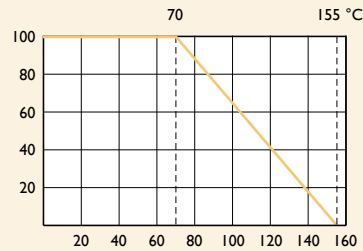
FEATURES

| | |
|----------------------|------------------------------|
| Power Rating | 1/6W, 1/4W, 1/2W, 1W, 2W, 3W |
| Resistance Tolerance | ±2%, ±5% |
| T.C.R. | see Table I |

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

Rated Load (%)



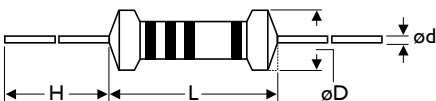
Ambient Temperature (°C)

TABLE I TEMPERATURE COEFFICIENT

| STYLE | MAX. VALUE OF TEMP. COEFFICIENT PPM/°C | | |
|---|--|---------------|--------------|
| | under 100K Ω | 100K Ω - 1M Ω | 1M Ω - 10M Ω |
| CFR100, CFR200, CFR2WS, CFR3WS | ±350 | -500 | -1,500 |
| CFR-12, CFR-25, CFR-50, CFR25S, CFR50S, CFR1WS | +350 / -500 | -700 | -1,500 |

DIMENSIONS

Unit: mm



| STYLE | | DIMENSION | | | |
|--------|-----------|-----------|---------|--------|-----------|
| Normal | Miniature | L | øD | H | ød |
| CFR-12 | CFR25S | 3.4±0.3 | 1.9±0.2 | 28±2.0 | 0.45±0.05 |
| CFR-25 | CFR50S | 6.3±0.5 | 2.4±0.2 | 28±2.0 | 0.55±0.05 |
| CFR-50 | CFR1WS | 9.0±0.5 | 3.3±0.3 | 26±2.0 | 0.55±0.05 |
| CFR100 | CFR2WS | 11.5±1.0 | 4.5±0.5 | 35±2.0 | 0.8±0.05 |
| CFR200 | CFR3WS | 15.5±1.0 | 5.0±0.5 | 33±2.0 | 0.8±0.05 |

Note:

ELECTRICAL CHARACTERISTICS

| STYLE | CFR-12 | CFR25S | CFR-25 | CFR50S | CFR-50 | CFRIWS | CFRI00 | CFR2WS | CFR200 | CFR3WS |
|--------------------------|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Power Rating at 70°C | 1/6W | 1/4W | | 1/2W | | 1W | | 2W | | 3W |
| Maximum Working Voltage | 150V | 200V | 250V | 300V | 350V | 400V | 500V | | | |
| Maximum Overload Voltage | 300V | 400V | 500V | 600V | 700V | 800V | 1,000V | | | |
| Voltage Proof | 300V | 400V | 500V | | | 700V | 1,000V | | | |
| Resistance Range | 1 Ω - 10M Ω & 0 Ω for E24 series value | | | | | | | | | |
| Operating Temp. Range | -55°C to +155°C | | | | | | | | | |
| Temperature Coefficient | see Table I | | | | | | | | | |

Note: Special value is available on request

ENVIRONMENTAL CHARACTERISTICS

| PERFORMANCE TEST | TEST METHOD | | APPRAISE |
|-------------------------------|------------------|--|---|
| Short Time Overload | IEC 60115-1 4.13 | 2.5 times RCWV for 5 Sec. | ±0.75%+0.05 Ω |
| Voltage Proof | IEC 60115-1 4.7 | in V-block for 60 Sec., test voltage by type | By type |
| Temperature Coefficient | IEC 60115-1 4.8 | -55°C to +155°C | By type |
| Insulation Resistance | IEC 60115-1 4.6 | in V-block for 60 Sec. | >1,000M Ω |
| Solderability | IEC 60115-1 4.17 | 235±5°C for 3±0.5 Sec. | 95% Min. coverage |
| Solvent Resistance of Marking | IEC 60115-1 4.30 | IPA for 5±0.5 Min. with ultrasonic | No deterioration of coatings and markings |
| Robustness of Terminations | IEC 60115-1 4.16 | Direct load for 10 Sec. in the direction of the terminal leads | ≥2.5kg (24.5N) |
| Periodic-pulse Overload | IEC 60115-1 4.39 | 4 times RCWV 10,000 cycles (1 Sec. on, 25 Sec. off) | ±1.0%+0.05 Ω |
| Damp Heat Steady State | IEC 60115-1 4.24 | 40±2°C, 90-95% RH for 56 days, loaded with 0.1 times RCWV | ±3.0%+0.05 Ω |
| Endurance at 70°C | IEC 60115-1 4.25 | 70±2°C at RCWV for 1,000 Hr. (1.5 Hr. on, 0.5 Hr. off) | ±3.0%+0.05 Ω |
| Temperature Cycling | IEC 60115-1 4.19 | -55°C ⇌ Room Temp. ⇌ +155°C ⇌ Room Temp. (5 cycles) | ±1.0%+0.05 Ω |
| Resistance to Soldering Heat | IEC 60115-1 4.18 | 260±3°C for 10±1 Sec., immersed to a point 3±0.5mm from the body | ±1.0%+0.05 Ω |

Note: Rated Continuous Working Voltage (RCWV) = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$