

# CFR Series

## Carbon Film Resistors (CFR)

New Sincere resistors are RoHS compliant in accordance to RoHS directive 2002/95/EC

General Specifications						
Normal Type	CFR-0204	CFR-0207	CFR-0309	CFR-0410	CFR-0414	CFR-0617
Rated Power	1/8W, 1/6W	1/4W, 1/3W	1/2W	1/2, 0.7, 3/4W	0.7W, 1W	2W
Mini Type	CFR-0204M	CFR-0207M	CFR-0309M	CFR-0410M	CFR-0414M	CFR-0617M
Rated Power	1/5W, 1/4W	1/2W	0.7W	1W	2W	3W
Super Mini Type <sup>^</sup>	TBD	CFR-0207SS	TBD	CFR-0410SS	TBD	TBD
Rated Power		0.7W, 1W		2W		
Standard Dimensions (mm)						
Body Length (L)	3.2 ± 0.2	6.5 ± 0.5	8.5 ± 0.5	9 ± 0.5	11 ± 1	15 ± 1
Body Diameter (D)	1.7 ± 0.2	2.3 ± 0.2	2.7 ± 0.5	3.5 ± 0.5	4.5 ± 0.5	5 ± 0.5
Lead Length (H)(±3)	28	28	28	28	30	30
Lead Diameter (d)	0.42 ± 0.05	0.52 ± 0.05	0.56 ± 0.05	0.6 ± 0.05	0.7 ± 0.1	0.7 ± 0.1
Electrical Specification						
Din Size	0204	0207	0309	0410	0414	0617
Maximum Working Voltage (V)*	250	350, <sup>^</sup> 500	350	350, <sup>^</sup> 600	500	500
Maximum Overload Voltage (V)	500	600, <sup>^</sup> 1000	700	700, <sup>^</sup> 1000	1000	1000
Resistance Range (±2%(G))	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ
(±5%(J))	1Ω-10MΩ	1Ω-10MΩ	1Ω-10MΩ	1Ω-10MΩ	1Ω-10MΩ	1Ω-10MΩ

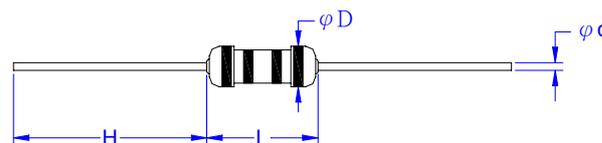
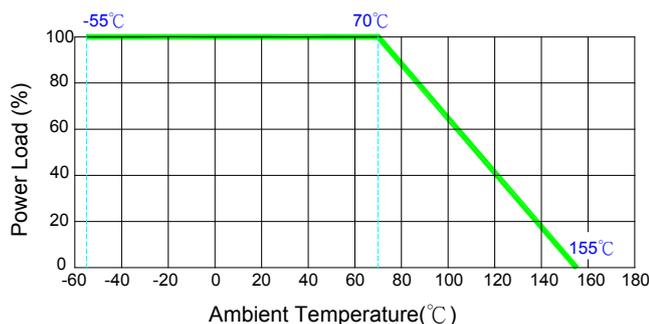
\*Lesser of  $\sqrt{PR}$  or maximum working voltage.

Δ M=Miniature Type. For Example: 0207M the body size of 1/4W but with rated power of 1/2W.

Δ SS=Super Mini Type. For Example: 0207SS the body size of 1/4W but with rated power of 1W.

- ☞ The taping dimension other than the standard is also available as per our taping specifications.
- ☞ The resistance range of lower than 1Ω and higher than 10M are also available on special request.
- ☞ Packaging: Taped / Reel, Taped / Box and Bulk.
- ☞ Forming: Panasert / Cut and Formed.
- ☞ Standard: MIL-R-10509F

Power Derating:



### NON Flammable

The carbon film resistors are also available in NON-Flammable Coating.

Type: CFR-xxxx-NF

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

## Carbon Film Resistors (CFR)

### 1. Performance Specification

Characteristics	Limits	Test Methods										
<b>Resistance Temperature Coefficient (PPM/°C)</b>	See Table Below	<p>Natural resistance change per temperature degree centigrade.</p> $\frac{R2 - R1}{R1(T2 - T1)} \times 10^6 \text{ (PPM/°C)}$ <p>R1: Resistance value at reference temp. (T1)            R2: Resistance value at reference temp. (T2)            T1: Room temperature            T2 : (T1+100°C)</p>										
<b>Dielectric Withstanding Voltage</b>	No evidence of flashover, mechanical damage or arcing or, insulation break down.	Resistors shall be subjected to an approximately sinusoidal test potential (as below) 60Hz applied between both terminals connected together and a 90° V-Block extending beyond the end of the resistor.										
		<table border="1"> <thead> <tr> <th>Resistor Wattage</th> <th>DC or RMS Volts</th> </tr> </thead> <tbody> <tr> <td>1/8W 1/6W (1/4W Mini)</td> <td>150~350</td> </tr> <tr> <td>1/4W (1/2W Mini)</td> <td>350</td> </tr> <tr> <td>(1W Mini) Above</td> <td>600</td> </tr> <tr> <td>1/2W 1W 2W Above</td> <td>600</td> </tr> <tr> <td>0.7WSS, 1WSS, 2WSS</td> <td>1000</td> </tr> </tbody> </table>	Resistor Wattage	DC or RMS Volts	1/8W 1/6W (1/4W Mini)	150~350	1/4W (1/2W Mini)	350	(1W Mini) Above	600	1/2W 1W 2W Above	600
Resistor Wattage	DC or RMS Volts											
1/8W 1/6W (1/4W Mini)	150~350											
1/4W (1/2W Mini)	350											
(1W Mini) Above	600											
1/2W 1W 2W Above	600											
0.7WSS, 1WSS, 2WSS	1000											
<b>Solderability</b>	90% Covered min.	The terminal lead shall be dipped into molten solder of 250±10°C for 3±0.5 seconds up to 3.2 to 4.8mm from the body of resistor.										
<b>Resistance to Soldering</b>	No evidence of mechanical damage ΔR/R ±1%	The terminal of the resistor is dipped into the molten solder of 350±10°C for 3±0.5 seconds. Then put the resistor in the room temp for 3 hours.										
<b>Humidity Load Life</b>	>100K ±2% <100K~1.0M ±3% <1.0M ±5%	Resistance change after 1000 hours ( 1.5 hours on 0.5 hours off)at rated continuous working voltage in a humidity chamber controlled at 40±2°C and 90~95% relative humidity.										
<b>Load Life</b>	>100K ±2% <100K ±3%	Permanent resistance change after 1000 hours operating at rated continuous working voltage with a duty cycle of 1.5 hours on 0.5 hours off at 70 ± 5°C.										
<b>Voltage Coefficient (Applicable 10Ω and Higher)</b>	25 PPM / V Max.	<p>Instantaneous change in resistance per volt based on,</p> $\frac{R1 - R2}{R2} \times \frac{100}{0.9 \times RCWV} \text{ (PPM / V)}$ <p>R1:Resistance value at rated working voltage.            R2:Resistance value at one-tenth rated working voltage.</p>										
<b>Intermittent Overload (Applicable 10Ω and Over)</b>	Resistance change shall be within ± (0.75%+0.05Ω) with no evidence of mechanical damage.	Resistance changes after 10000 cycles (1 second “on”, 25 seconds “off”) at 4 times (3 times: 1/4W products) rated working voltage. Maximum Intermittent Overload Voltage is 1000V.										

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

## Carbon Film Resistors (CFR)

Characteristics	Limits	Test Methods															
<b>Resistance to Vibration (Low Frequency)</b>	Resistance change shall be with $\pm (0.5\%+0.05\Omega)$ with no evidence of mechanical damage.	Resistors shall be subjected to a single vibration having amplitude of 0.8 mm, or 0.0315 inch (1.6mm, or 0.063 inch double amplitude) for 2 hours in each of three mutually perpendicular directions for a total of 6 hours. The vibration frequency shall be varied uniformly 10 to 55Hz and return to 10Hz shall be traversed in 1 min.															
<b>Resistance to Cold</b>	Resistance change shall be within shown below with no evidence of mechanical damage.	Resistance change after 1000 hours exposure in a chamber controlled at $-55 \pm 3^\circ\text{C}$ .															
	<table border="1"> <thead> <tr> <th>Nominal Resistance</th> <th>Resistance Change Rate</th> </tr> </thead> <tbody> <tr> <td><math>&lt;100\text{K}\Omega</math></td> <td><math>\pm(2\%+0.05\Omega)</math></td> </tr> <tr> <td><math>\geq 100\text{K}\Omega</math></td> <td><math>\pm 3\%</math></td> </tr> </tbody> </table>		Nominal Resistance	Resistance Change Rate	$<100\text{K}\Omega$	$\pm(2\%+0.05\Omega)$	$\geq 100\text{K}\Omega$	$\pm 3\%$									
Nominal Resistance	Resistance Change Rate																
$<100\text{K}\Omega$	$\pm(2\%+0.05\Omega)$																
$\geq 100\text{K}\Omega$	$\pm 3\%$																
<b>Resistance to Dry Heat</b>	Resistance change shall be within shown below with no evidence of mechanical damage.	Resistance change after 1000 hours exposure in a test chamber controlled at $125 \pm 2^\circ\text{C}$ .															
	<table border="1"> <thead> <tr> <th>Nominal Resistance</th> <th>Resistance Change Rate</th> </tr> </thead> <tbody> <tr> <td><math>&lt;100\text{K}\Omega</math></td> <td><math>\pm(2\%+0.05\Omega)</math></td> </tr> <tr> <td><math>\geq 100\text{K}\Omega</math></td> <td><math>\pm 3\%</math></td> </tr> </tbody> </table>		Nominal Resistance	Resistance Change Rate	$<100\text{K}\Omega$	$\pm(2\%+0.05\Omega)$	$\geq 100\text{K}\Omega$	$\pm 3\%$									
Nominal Resistance	Resistance Change Rate																
$<100\text{K}\Omega$	$\pm(2\%+0.05\Omega)$																
$\geq 100\text{K}\Omega$	$\pm 3\%$																
<b>Resistance to Solvent</b>	No deterioration of protective coatings and markings.	Specimens shall be immersed in a bath of solvent under the condition specified below table, and then the surface is rubbed with absorbent cotton.															
		<table border="1"> <thead> <tr> <th>Kind of Solvent</th> <th>Temp of Solvent <math>^\circ\text{C}</math></th> <th>Immersion Time</th> </tr> </thead> <tbody> <tr> <td>Isopropyl Alcohol</td> <td>20 - 25</td> <td>60 <math>\pm</math> 10s</td> </tr> <tr> <td>Water</td> <td>55 <math>\pm</math> 5</td> <td>5 <math>\pm</math> 0.5 min</td> </tr> </tbody> </table>	Kind of Solvent	Temp of Solvent $^\circ\text{C}$	Immersion Time	Isopropyl Alcohol	20 - 25	60 $\pm$ 10s	Water	55 $\pm$ 5	5 $\pm$ 0.5 min						
		Kind of Solvent	Temp of Solvent $^\circ\text{C}$	Immersion Time													
Isopropyl Alcohol	20 - 25	60 $\pm$ 10s															
Water	55 $\pm$ 5	5 $\pm$ 0.5 min															
<b>Temperature Cycling</b>	$\pm 2\%$ Max no evidence of Mechanical damage	Resistance change after continuous five cycles for duty cycle as specified below.															
		<table border="1"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>-30^\circ\text{C}</math></td> <td>30 Minutes</td> </tr> <tr> <td>2</td> <td><math>+25^\circ\text{C}</math></td> <td>10~15 Minutes</td> </tr> <tr> <td>3</td> <td><math>+85^\circ\text{C}</math></td> <td>30 Minutes</td> </tr> <tr> <td>4</td> <td><math>+25^\circ\text{C}</math></td> <td>10~15 Minutes</td> </tr> </tbody> </table>	Step	Temperature	Time	1	$-30^\circ\text{C}$	30 Minutes	2	$+25^\circ\text{C}$	10~15 Minutes	3	$+85^\circ\text{C}$	30 Minutes	4	$+25^\circ\text{C}$	10~15 Minutes
		Step	Temperature	Time													
		1	$-30^\circ\text{C}$	30 Minutes													
		2	$+25^\circ\text{C}$	10~15 Minutes													
3	$+85^\circ\text{C}$	30 Minutes															
4	$+25^\circ\text{C}$	10~15 Minutes															
<b>Short Time Overload</b>	$\pm 2\%$ Max no evidence of arcing burning, or charring	Permanent resistance change after the application of a potential of 2.5 times rated continuous working voltage for 5 seconds at room temperature.															
<b>Terminal Strength</b>	No evidence of mechanical damage or loosening terminals	Direct load resistance to 2.5 kg direct load 30 $\pm$ 5 seconds twist test, for axial leads unit only. Terminal lead shall be bent through of a right angle at a point of 6.35mm from the body of resistor and shall be rotated through of a right angle about the original axis of the bent terminal in alternating direction for a total of 3 rotations.															
<b>Boiling Test</b>	The change in resistance shall not exceed $\pm 5\%$ .	Resistors shall be exposed for 1 hrs. To 98 ~ 100% relative humidity and an ambient.															

## Carbon Film Resistors (CFR)

### 2. Temperature Coefficient (TCR.)

Style CFR	Max. Value of Temp. Coefficient PPM/°C						
	1R to 9R1Ω	10R to 100KΩ	110K to 910KΩ	1MΩ	1M1 to 2M2Ω	2M4 to 5M1Ω	5M6 to 10MΩ
0204, 0204M	0 to ±350	0 to -350	0 to -700	0 to -1000	0 to -1000	0 to -1500	0 to -1700
0207, 0207M	0 to ±350	0 to -350	0 to -700	0 to -1000	0 to -1000	0 to -1500	0 to -1700
0309, 0309M	0 to ±350	0 to -350	0 to -700	0 to -1000	0 to -1000	0 to -1500	0 to -1700
0410, 0410M	0 to ±350	0 to -250	0 to -700	0 to -1000	0 to -700	0 to -1500	0 to -1500
0414, 0414M	0 to ±350	0 to -250	0 to -700	0 to -1000	0 to -700	0 to -1000	0 to -1500
0617, 0617M	0 to ±350	0 to -250	0 to -700	0 to -1000	0 to -700	0 to -1000	0 to -1500

**Note:** Lower PPM also available. Please consult factory for availability.

### 3. Part Number

CFR - 0207 - TB - 103 - J - NF - TBD - EM - PPM  
 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9

1. Type	CFR = Carbon Film Resistors
---------	-----------------------------

2. Size / Power	TYPE	0204	0204M	0207	0309	0410	....	0617M
	POWER	1/8W	1/4W	1/4W	1/2W	1/2W	....	3W

3. Packing	CODE	TB	TR	B
	TYPE	AMMO BOX	REEL	BULK

4. Ohmage	OHM	0.15	1.5	15	15K	910K	1.5M	15M
	E24	R15	1R5	150	153	914	155	156

5. Tolerance	CODE	G	J
	%	2%	5%

6. Flammability	CODE	BLANK	NF
	TYPE	BLANK	FLAME PROOF

7. Special Request	CODE	0204	0410	TBD
	DESCRIPTION	1/6W	0.7W	TBD

8. Forming	CODE	BLANK	EM	MG	R
	TYPE	AXIAL	EM	MG	PANA

9. PPM	CODE	BLANK	SPECIAL REQUEST - E.G. 400PPM
	PPM	SPEC	400PPM