

**I. PRODUCTS LIST**

Type	Series Number	Power Rating @70° C	Maximum Working Voltage	Resistance Range	Resistance Tolerance	Temperature Coefficient (ppm/°C)
Carbon Film	CCF16	0.16W	200V	10 ~ 1MΩ	±2, ±5%	+350—450 ~ 0—1300
Carbon Film	CCF25	0.25W	300V	1.0 ~ 10MΩ	±2, ±5%	+350—450 ~ 0—1300
Carbon Film	CCF50	0.50W	350V	1.0 ~ 10MΩ	±2, ±5%	+350—450 ~ 0—1300
Carbon Film	CCF1W	1W	500V	1.0 ~ 5.1MΩ	±2, ±5%	+350—450 ~ 0—1300
Metal Oxide Film	CMO1W	1W	350V	1.0 ~ 100KΩ	±2, ±5%	±350
Metal Oxide Film	CMO2W	2W	350V	1.0 ~ 100KΩ	±2, ±5%	±350
Metal Oxide Film	CMO3W	3W	500V	1.0 ~ 100KΩ	±2, ±5%	±350
Metal Oxide Film	CMO5W	5W	750V	5.1 ~ 240KΩ	±2, ±5%	±350
Metal Oxide Film	CMO7W	7W	750V	5.1 ~ 240KΩ	±2, ±5%	±350
Metal Film	CMR25	0.25W	250V	10 ~ 1MΩ	±0.5, ±1, ±2%	±25, ±50, ±100
Metal Film	CMR50	0.5W	350V	10 ~ 1MΩ	±0.5, ±1, ±2%	±25, ±50, ±100
Metal Film	CMR1W	1W	500V	20 ~ 1MΩ	±0.5, ±1, ±2%	±25, ±50, ±100

Note: Higher and lower resistance values are available upon request.

**II. GENERAL SPECIFICATIONS**
**A. ELECTRICAL CHARACTERISTICS**
**1. POWER**

The power rating is the maximum power which can be applied to the resistor continuously at the specified ambient temperature.

**2. RATED WORKING VOLTAGE**

The rated working voltage is the maximum DC voltage or RMS value of AC voltage which can be applied to the resistor at the specified ambient temperature, and will be calculated by the following formula:

$$\text{RATED WORKING VOLTAGE} = \sqrt{\text{POWER RATING (W)} \times \text{NOM. RESISTANCE (}\Omega\text{)}}$$

However, the resistor can not be used over the specified MAXIMUM WORKING VOLTAGE.

**3. MAXIMUM WORKING VOLTAGE**

The maximum working voltage is the maximum limit of DC voltage or RMS value of AC voltage which can be applied to the resistor at the specified ambient temperature.

**4. OVERLOAD VOLTAGE**

The overload voltage is 2.5 times of rated working voltage which can be applied on the resistor in a period of 5 seconds at the specified ambient temperature. However, the resistor can not be used over the specified MAXIMUM OVERLOAD VOLTAGE even for a short period.

**5. PULSE LOAD VOLTAGE**

The pulse load voltage is the maximum pulse voltage specified in JIS C5202, 5.11 which can be applied on the resistor at the specified ambient temperature, and will be calculated by the following formula:

$$E_p = \text{POWER RATING (W)} \times \text{RESISTANCE (}\Omega\text{)} \frac{1}{t \times f} \quad (t: \text{time of pulse, } f: \text{test frequency})$$

However, the resistor can not be used over the specified MAXIMUM PULSE VOLTAGE.

**B. MECHANICAL CHARACTERISTICS**
**1. LEAD PULL TEST**

The lead wire shall withstand steady pull of the following weight applied axially to the lead wire for the minimum period of 10 seconds without any breakage or damage:

Nom. Lead Diameter	0.4φmm	0.5φmm	0.6φmm	0.7φmm	0.8φmm & over
Steady Weight	1.0Kgs.	1.0Kgs.	1.5Kgs.	2.0Kgs.	2.5Kgs.

**2. LEAD BEND TEST**

The lead wire shall withstand minimum 4 bends of 90° rotation without any breakage or damage, when the resistor is placed in a vertical position and is applied with a weight of 0.5Kgs for 0.4—0.5φmm or 1.1Kgs for 0.6φmm and over lead wire.

**3. SOLDERABILITY**

The lead wire is immersed into 10% methanol or isopropyl alcohol of rosin by weight for a period of 2±0.5 seconds. Then, it shall be dipped into molten solder (60% Sn & 40% Pb) melted at 230±5°C for a period of 5±1 seconds approximately 1.5mm from the body of the resistor. A new adhering coating of solder shall cover minimum 95% of the surface being dipped into solder.

**4. RESISTANCE TO CLEANING SOLVENTS**

Color coating or marking shall remain legible after cleaning by solvents such as isopropyl alcohol, trichloroethylene, freon TF/TAC, xylene etc., in form of liquid or gas.



**INSULATED MINIATURE TYPE**
**METAL FILM FIXED RESISTORS**

- \* MIL-R-10509F & MIL-R-2268B EQUIVALENT
- \* EPOXY RESIN COATING INSULATION

- \* SOLVENT RESISTANT EIA COLOR CODING
- \* HIGH PERFORMANCE & REDUCED COST ENABLE EXPANDING APPLICATIONS

**STANDARD TYPE, RATING & AVAILABILITY:**

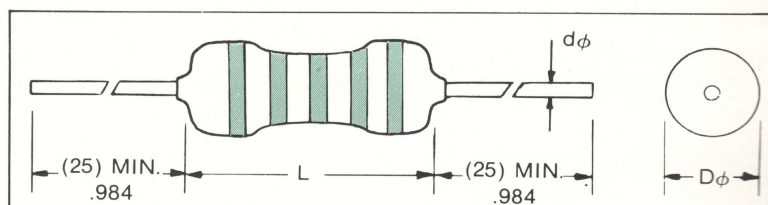
Type	CMR-25			CMR-50	CMR-1W
Power Rating at 70°C	0.25W			0.5W	1W
Max. Working Voltage at 70°C	250V			350V	500V
Max. Overload Voltage at 70°C	500V			700V	1000V
Resistance Tolerance	±0.5%	±1%	±2%	±1%	±1%
Temperature Coefficient	±50ppm/°C	20Ω ~ 200KΩ	20Ω ~ 300KΩ	—	20Ω ~ 604KΩ
Coefficient	±100ppm/°C	—	10Ω ~ 1MΩ	10Ω ~ 1MΩ	10Ω ~ 1MΩ
Resistance Value Availability	E96			E96	E96
Axial Taping Availability	YES			YES	NO

**CHARACTERISTICS:**

REQUIREMENTS	PERFORMANCE	TEST METHOD MIL-R-10509F
Operating Temperature Range	—55 ~ +155°C (Derated as below over 70°C)	
Temperature Coefficient	±50, ±100ppm/°C	4.6.12
Temperature Cycling	$R \leq \pm (0.5\% + 0.05\Omega)$	4.6.4
Low Temperature Operation	$R \leq \pm (0.5\% + 0.05\Omega)$	4.6.5
Short Time Overload	$R \leq \pm (0.5\% + 0.05\Omega)$	4.6.6
Terminal Strength	$R \leq \pm (0.5\% + 0.05\Omega)$	4.6.7
Dielectric Withstanding Voltage	$R \leq \pm (0.5\% + 0.05\Omega)$	4.6.8
Insulation Resistance	10,000M Min.	5.6.9
Soldering Effect	$R \leq \pm (0.5\% + 0.05\Omega)$	4.6.10
Moisture Resistance	$R \leq \pm (1\% + 0.05\Omega)$	(MIL-R-2268B, 4.6.10)
Load Life	$R \leq \pm (1\% + 0.05\Omega)$	4.6.13
Vibration	$R \leq \pm (0.5\% + 0.05\Omega)$	(MIL-R-2268B, 4.6.14)
Current Noise	0.2μV/V (—14dB)	(JIS C5202, 5.9 Method II)
Solvent Resist	MIL-STD-202, Method 215, Trichlorethylene, Trichloroethane Trichlorotrifluoroethane (Freon TMC)	

**DIMENSIONS: INCHES AND (MM)**

Type	Dimensions (m/m) Inches			
	Dφ	L	dφ	
CMR-25	.10 (2.3 ± 0.3)	.256 ( 6.5 ± 0.5)	.02 (0.6)	.024
CMR-50	.140 (3.5 ± 0.4)	.374 ( 9.5 ± 0.5)	.02 (0.8)	.032
CMR-1W	.200 (4.8 ± 0.5)	.555 (14.1 ± 1.0)	.04 (1.0)	.04


**TYPICAL PERFORMANCES:**
