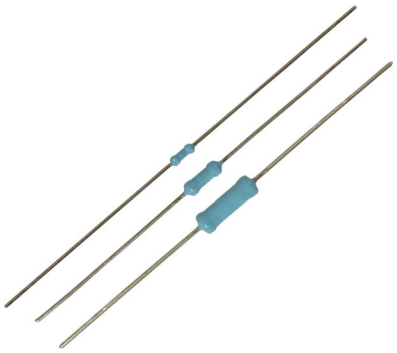
Metal Film Resistors, Axial, Industrial, Precision



FEATURES

- Small size - conformal coated
- Flammability tested according to IEC/EN 60695-11-5
- Controlled temperature coefficient
- Excellent high frequency characteristics
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

HALOGEN FREE

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	HISTORICAL MODEL	MAXIMUM WORKING VOLTAGE (1) V	POWER RATING $P_{70\,°C}$ W	RESISTANCE RANGE Ω	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C
CMF50	CMF-50	200	0.4	43 to 332K	0.1	25
				22 to 332K	0.25	
				10 to 475K	0.5, 1	
				43 to 332K	0.1	50
				22 to 332K	0.25	
				10 to 475K	0.5	
				1 to 10M	1, 2	
				0.22 to 10M	5	
				1 to 10M	1, 2	100, 150, 200
				0.22 to 10M	5	
CMF55	CMF-55	350	0.6	10 to 1M	0.1, 0.25, 0.5, 1	25
				10 to 1M	0.1, 0.25, 0.5	50
				1 to 10M	1	
				0.22 to 10M	2	
				0.22 to 22M	5	
				1 to 10M	1	100, 150, 200
				0.22 to 10M	2	
				0.22 to 22M	5	
				0.22 to 10M	2	300
				0.22 to 22M	5	
CMF60	CMF-60	500	1	43 to 1M	0.1	25
				22 to 1.5M	0.25	
				10 to 2.43M	0.5, 1	
				43 to 1M	0.1	50
				22 to 1.5M	0.25	
				10 to 2.43M	0.5	
				1 to 22M	1, 2	
				0.22 to 22M	5	
				1 to 22M	1, 2	100, 150, 200
				0.22 to 22M	5	
				1 to 22M	2	300
				0.22 to 22M	5	

Note

(1) Continuous working voltage shall be $\sqrt{P \times R}$ or maximum working voltage, whichever is less

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GLOBAL PART NUMBER INFORMATION

Global Part Numbering: CMF55301R00FKEA

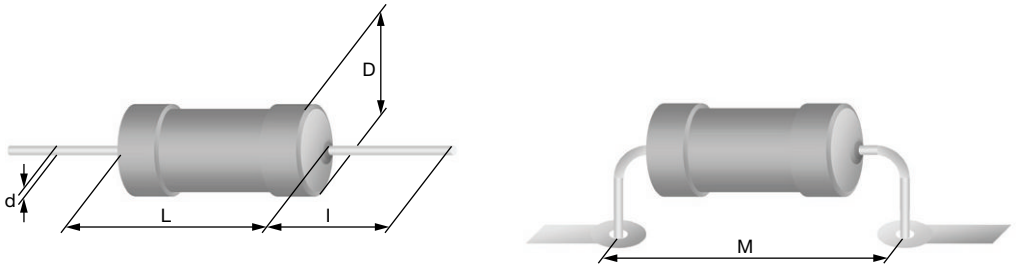
C	M	F	5	5	3	0	1	R	0	0	F	K	E	A

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	TEMPERATURE COEFFICIENT	PACKAGING
(See Standard Electrical Specifications table)	**R** = Ω **K** = kΩ **M** = MΩ **R10000** = 0.1 Ω **680K00** = 680 kΩ **1M0000** = 1.0 MΩ	**B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1 % **G** = ± 2 % **J** = ± 5 %	**E** = 25 ppm **H** = 50 ppm **K** = 100 ppm **L** = 150 ppm **N** = 200 ppm **M** = 300 ppm	**EA** = lead (Pb)-free, T/R (full) **EB** = lead (Pb)-free, ammo pack (1000 pieces)

Note

- For additional information on packaging, refer to the “Through-Hole Resistor Packaging” document (www.vishay.com/doc?31544)

DIMENSIONS in millimeters



GLOBAL MODEL	$D_{max.}$	$L_{max.}$	$d_{nom.}$	$l_{min.}$	$M_{min.}$	MASS (mg)
CMF50	1.6	3.6	0.5	29	5	125
CMF55	2.5	6.5	0.6	28	10	220
CMF60	4.2	11.9	0.8	31	15	700

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CMF50	CMF55	CMF60
Maximum Working Voltage	V≅	≤ 200	≤ 350	≤ 500
Insulation Voltage (1 Min)	V_{eff}	300	500	800
Dielectric Strength	V_{AC}	300	450	750
Insulation Resistance	Ω	≥ 1G		
Operating Temperature Range	°C	-55 to +155		
Terminal Strength (Pull Test)	lb	2	2	2

TEMPERATURE COEFFICIENT CODES

GLOBAL TC CODE	TEMPERATURE COEFFICIENT
E	25 ppm/°C
H	50 ppm/°C
K	100 ppm/°C
L	150 ppm/°C
N	200 ppm/°C
M	300 ppm/°C

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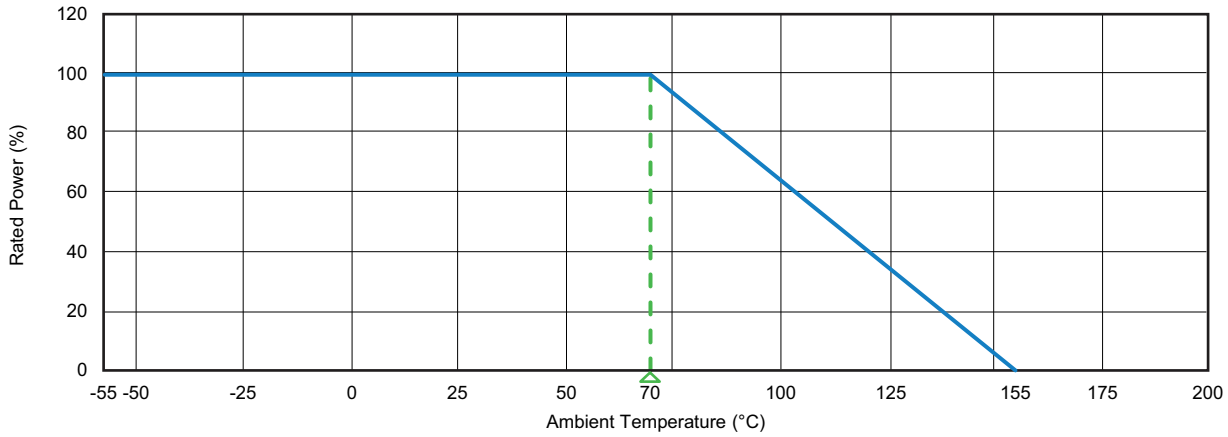
LOAD LIFE SHIFT DUE TO POWER AND DERATING AT +70 °C

The power rating for the CMF parts is tied to the derating temperature, the heat rise of the parts, and the ΔR for the load life performance. When the tables/graphs below are used together they show that when the parts are run at their higher power ratings, the parts will run hotter, which has the potential of causing the resistance of the parts to shift more over the life of the part.

LOAD LIFE SHIFT VS. POWER RATING		
LOAD LIFE	**MAXIMUM $\Delta R/R$ FOR 8000 h**	
	± 0.5 %	± 1.0 %
APPLIED MAXIMUM FILM TEMPERATURE	125 °C	155 °C
MODEL	**POWER RATING AT +70 °C**	
CMF50	0.25 W	0.4 W
CMF55	0.4 W	0.6 W
CMF60	0.65 W	1 W

CMF resistors have an operating temperature range of -55 °C to +155 °C. They must be derated at high ambient temperatures according to the derating curve.



DERATING

MATERIAL SPECIFICATIONS

Element	Material and application process dependent on type, R-value, TCR, and tolerance	**Coating**	Polyurethane based lacquer, formulated for superior moisture protection. Flammability tested according to IEC/EN 60695-11-5
Core	Fire-cleaned high purity ceramic		
Terminals	Matte tin-plated copper termination with whisker resistant diffusion barrier	**Solderability**	Continuous satisfactory coverage when tested in accordance with JSTD-002

MARKING

	CMF50	CMF55	CMF60
Line 1	*ohmic value*	CMF55	CMF60
Line 2	*tolerance*	*ohmic value*	
Line 3	-	*tolerance*TCR*	

Stamp text never contains spaces!
Max. 7 characters per line.

OHMIC VALUE	
0.1	0R1
0.12	0R12
1	1R0
1.2	1R2
1.23	1R23
12	12R
12.3	12R3
123	123R
1000	1K0
1200	1K2
10 000	10K
1 000 000	1M0
1 200 000	1M2
123 456 000	123M456

Leading zero if < 1; at least two numeric digits
(trailing zero if only one digit before the R, K, M)

TOLERANCE	
0.1	.1%
0.25	.25%
0.5	.5%
1	1%
2	2%
5	5%

Without leading zeroes!

TCR	
25	T9
50	T2
100	T1
150	T0
200	T00
300	M

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PERFORMANCE				
TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R_{max.}$)		
	Stability for product line:	STABILITY CLASS 0.5	STABILITY CLASS 1	STABILITY CLASS 2
	CMF50	1 Ω to 332 Ω	0.22 Ω to < 1 Ω	> 332 Ω
	CMF55	1 Ω to 1 MΩ	0.22 Ω to < 1 Ω	> 1 MΩ
	CMF60	1 Ω to 2.43 MΩ	0.22 Ω to < 1 Ω	> 2.43 MΩ
Short time overload	Room temperature $U = 2.5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{max.}$; 5 s	± (0.1 % R + 0.01 Ω) no visible damage	± (0.25 % R + 0.05 Ω) no visible damage	± 0.5 % R no visible damage
Shock	Shock duration: 6 ms Peak value: 100 gn Waveform: half-sine Number of shocks: 3 in both directions of the 3 axes (Σ 18)	± (0.1 % R + 0.01 Ω) no visible damage	± (0.25 % R + 0.05 Ω) no visible damage	± 0.5 % R no visible damage
Vibration	10 sweep cycles per direction; 10 Hz to 2000 Hz; 1.5 mm or 200 m/s²	± (0.1 % R + 0.01 Ω) no visible damage	± (0.25 % R + 0.05 Ω) no visible damage	± 0.5 % R no visible damage
Temperature cycling	30 min at -55 °C 30 min at 155 °C 5 cycles	± (0.1 % R + 0.01 Ω)	± (0.25 % R + 0.05 Ω)	± 0.5 % R
	CMF50: 500 cycles CMF55: 200 cycles CMF60: 100 cycles	± (0.5 % R + 0.05 Ω)		
Load life	Varies based on power rating used; see “Load Life Shift Due To Power And Derating” table			
Dielectric withstanding voltage	$U_{RMS} = U_{ins}$; 60 s	No flashover or breakdown		
Effect of solder	Unmounted components; (260 ± 5) °C, (10 ± 1) s	± (0.1 % R + 0.01 Ω) no visible damage	± (0.25 % R + 0.05 Ω) no visible damage	± 0.5 % R no visible damage

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