

# Metal Film Resistors, Industrial



## FEATURES

- Small size - conformal coated
- Flame retardant epoxy coating
- Controlled temperature coefficient
- Excellent high frequency characteristics
- Exceptionally low noise; typically 0.10  $\mu\text{V/V}$
- Low voltage coefficient to  $\pm 5\text{ppm/Volt}$
- Lead (Pb)-Free version is RoHS Compliant
- Special tolerance and or TC matching available on request



RoHS\*  
COMPLIANT

Vishay Dale Model CMF is also available as Military Qualified Styles RN and RL. See appropriate catalog or web page for the MIL-SPEC ratings/attributes. (Except for marking, the Industrial and Military versions are exactly the same. Depending upon stock, military marked parts may be supplied as industrial rated parts.)

## STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	HISTORICAL MODEL	LIMITING ELEMENT VOLTAGE MAX V <sub>≧</sub>	RESISTANCE RANGE Ω								
			0.1% - 1%	0.1% - 0.5%	1% - 5%	1%	2%, 5%	1%	2%, 5%	1%	2%, 5%
			25ppm	50ppm	50ppm	100ppm	100ppm	150ppm	150ppm	200ppm	200ppm
CMF50	CMF-50	200	10 - 500K	10 - 500K	10 - 500K	10 - 1M	10 - 1M	10 - 22M	10 - 22M	10 - 22M	10 - 22M
CMF55	CMF-55	250	10 - 2M5	10 - 2M5	10 - 5M	1 - 22M1	1 - 22M1	R5 - 50M	R5 - 50M	R5 - 50M	R1 - 50M
CMF60	CMF-60	500	10 - 2M5	10 - 2M5	10 - 8M	1 - 8M	1 - 8M	R5 - 8M	R5 - 8M	R5 - 8M	R1 - 8M
CMF65	CMF-65	500	10 - 2M5	10 - 2M5	10 - 10M	1 - 15M	1 - 15M	R5 - 22M	R5 - 22M	R5 - 22M	R1 - 22M
CMF70	CMF-70	500	10 - 2M5	10 - 2M5	10 - 10M	1 - 15M	1 - 15M	1 - 22M	1 - 22M	1 - 22M	1 - 22M
CMF07	CMF-07	250	—	—	—	—	5 - 5M	—	1 - 5M	—	1 - 5M
CMF20	CMF-20	500	—	—	—	—	5 - 8M	—	1 - 8M	—	1 - 8M

## COMMERCIAL POWER RATING (See Performance Table)

WATTAGE	AT + 70°C	AT + 125°C
0.05	CMF50	CMF50
0.10	CMF50, CMF55	CMF50, CMF55
0.125	CMF50, CMF55, CMF60	CMF50, CMF55, CMF60, CMF20
0.25	CMF50, CMF55, CMF60, CMF65, CMF70, CMF07	CMF55, CMF60, CMF65, CMF70, CMF20
0.50	CMF55, CMF60, CMF65, CMF70, CMF20	CMF60, CMF65, CMF70, CMF20
0.75	CMF60, CMF65, CMF70, CMF20	CMF65, CMF70
1.0	CMF60, CMF65, CMF70, CMF20	—

**Note:** The above table summarizes the more common combinations of power rating, case size and ambient operating temperature that prevail in various Industrial and Military resistor specifications. The "performance" table in ensuing pages qualifies the load life stability under these combinations.

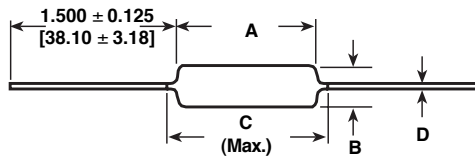
## GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: CMF55301R00FKRE (preferred part numbering format)

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	TEMPERATURE COEFFICIENT**	PACKAGING	SPECIAL
(see Standard Electrical Specifications table)	R = Decimal K = Thousand M = Million R10000 = 0.1 $\Omega$ 680K00 = 680K $\Omega$ 1M0000 = 1.0M $\Omega$	B = $\pm 0.1\%$ C = $\pm 0.25\%$ D = $\pm 0.5\%$ F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$	E = 25ppm H = 50ppm K = 100ppm L = 150ppm N = 200ppm	EK = Lead Free, Bulk EA = Lead Free, T/R (Full) EB = Lead Free, T/R (1000 pcs) BF = Tin/Lead, Bulk RE = Tin/Lead, T/R (Full) R6 = Tin/Lead, T/R (1000 pcs)	Blank = Standard (Dash Number) (up to 3 digits) From 1-999 as applicable
Historical Part Number example: CMF-553010FT-1 (will continue to be accepted)					
CMF-55	3010	F	T-1	R36	
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	TEMP. COEFFICIENT	PACKAGING	

\* Pb containing terminations are not RoHS compliant, exemptions may apply.

\*\* Tolerances of  $\pm 0.5\%$  (D),  $\pm 0.25\%$  (C) and  $\pm 0.1\%$  (B) are available only in 50ppm and 25ppm temperature coefficients.

**DIMENSIONS** in inches [millimeters]


\* 1.08 ± 0.125 [27.43 ± 3.18] IF TAPE AND REEL

GLOBAL MODEL	A	B	C (Max.)	D
CMF50	0.150 ± 0.020 [3.81 ± 0.51]	0.065 ± 0.015 [1.65 ± 0.38]	0.187 [4.75]	0.016 ± 0.002 [0.41 ± 0.05]
CMF55	0.240 ± 0.020*** [6.10 ± 0.51]	0.090 ± 0.008 [2.29 ± 0.20]	0.278 [7.06]**	0.025 ± 0.002 [0.64 ± 0.05]
CMF60	0.344 ± 0.031 [8.74 ± 0.79]	0.145 ± 0.015 [3.68 ± 0.38]	0.425 [10.80]	0.025 ± 0.002* [0.64 ± 0.05]
CMF65	0.562 ± 0.031 [14.27 ± 0.79]	0.180 ± 0.015 [4.57 ± 0.38]	0.687 [17.45]	0.025 ± 0.002 [0.64 ± 0.05]
CMF70	0.562 ± 0.031 [14.27 ± 0.79]	0.180 ± 0.015 [4.57 ± 0.38]	0.687 [17.45]	0.032 ± 0.002 [0.81 ± 0.05]
CMF07	0.240 ± 0.020 [6.10 ± 0.51]	0.090 ± 0.008 [2.29 ± 0.20]	0.278 [7.06]	0.025 ± 0.002 [0.64 ± 0.05]
CMF20	0.375 ± 0.040 [9.53 ± 1.02]	0.145 ± 0.015 [3.68 ± 0.38]	0.425 [10.80]	0.032 ± 0.002 [0.81 ± 0.05]

\* Available with 0.032" [0.813mm] lead.

\*\* 0.290" [7.37mm] for ± 0.25% and ± 0.1% resistance tolerances and values > 1MΩ

\*\*\* 0.260" ± 0.020" [6.60mm ± 0.508mm] for values > 5 MΩ.

**TECHNICAL SPECIFICATIONS**

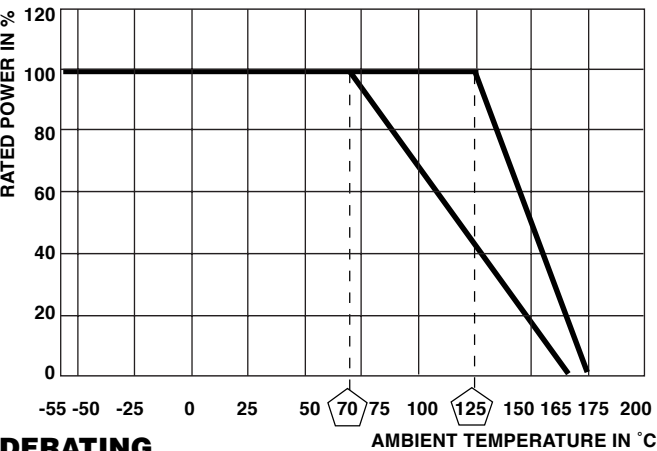
PARAMETER	UNIT	CMF50	CMF55	CMF07	CMF60	CMF20	CMF65	CMF70
Maximum Working Voltage	V <sub>W</sub>	≤ 200	≤ 250	≤ 250	≤ 500	≤ 500	≤ 500	≤ 500
Insulation Voltage (1min)	V <sub>eff</sub>	>500						
Voltage Coefficient	Max	± 5ppm/Volt (measured between 10% and full rated voltage)						
Dielectric Strength	VAC	450	450	450	750	750	900	900
Insulation Resistance	Ω	≥10 <sup>11</sup>						
Operating Temperature Range	°C	- 55 / + 175						
Terminal Strength (pull test)	lb	2	2	5	2	5	2	5
Noise	dB	0.10 microvolts/Volt over a decade of frequency, with low and intermediate resistance values typically below 0.5 microvolts/V						
Weight (max)	g	0.12	0.20	0.20	0.50	0.60	1.00	1.10

**TEMPERATURE COEFFICIENT CODES**

GLOBAL TC CODE	HISTORICAL TC CODE	TEMPERATURE COEFFICIENT
E	T-9	25 ppm/°C
H	T-2	50 ppm/°C
K	T-1	100 ppm/°C
L	T-0	150 ppm/°C
N	T-00	200 ppm/°C

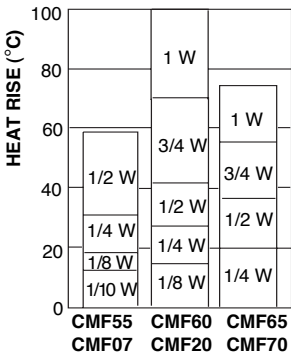


CMF resistors have an operating temperature range of - 55°C to + 175°C. They must be derated at high ambient temperatures according to the derating curve.



DERATING

The increase in resistor surface temperature due to the rated load is shown below.  
Resistor surface temperature = heat rise plus ambient temperature.



HEAT RISE

MATERIAL SPECIFICATIONS			
Element:	Vacuum-deposited nickel-chrome alloy	Coating:	Flame retardant epoxy, formulated for superior moisture protection
Core:	Fire-cleaned high purity ceramic	Solderability:	Continuous satisfactory coverage when tested in accordance with MIL-R-10509

SPECIAL MODIFICATIONS

- 1. Terminals may be supplied in any commercial material with several type finishes.
- 2. Special pre-conditioning (power aging, temperature cycling, etc.) to customer specifications.
- 3. Non-helixed resistors can be supplied for critical high frequency applications.
- 4. Fusible, flameproof versions available.

MARKING
<p>— Value</p> <p>— Decade and Tolerance</p> <p>— Date code</p> <p>(Alternate parts may be MIL marked)</p>



PERFORMANCE						
MODEL	POWER RATING					
	@ + 70°C			@ + 125°C		
CMF50	1/10 Watt	1/8 Watt	1/4 Watt	1/20 Watt	1/10 Watt	1/8 Watt
CMF55	1/8 Watt	1/4 Watt	1/2 Watt	1/10 Watt	1/8 Watt	1/4 Watt
CMF60	1/4 Watt	1/2 Watt	3/4 Watt & 1 Watt	1/8 Watt	1/4 Watt	1/2 Watt
CMF65	1/2 Watt	3/4 Watt	1 Watt	1/4 Watt	1/2 Watt	3/4 Watt
CMF70	1/2 Watt	3/4 Watt	1 Watt	1/4 Watt	1/2 Watt	3/4 Watt
CMF07	–	1/4 Watt	–	–	–	–
CMF20	–	1/2 Watt	1 Watt	–	–	–
TEST [Test methods - MIL-STD-202]	MAXIMUM $\Delta R$ (Typical Test Lots)					
Short Time Overload	–	$\pm 0.05\%$	–	–	$\pm 0.05\%$	–
Low Temperature Operation	–	$\pm 0.05\%$	–	–	$\pm 0.05\%$	–
Moisture Resistance	–	$\pm 0.05\%$	–	–	$\pm 0.05\%$	–
Shock	–	$\pm 0.01\%$	–	–	$\pm 0.01\%$	–
Vibration	–	$\pm 0.004\%$	–	–	$\pm 0.04\%$	–
Temperature Cycling	–	$\pm 0.15\%$	–	–	$\pm 0.15\%$	–
Load Life	$\pm 0.15\%$	$\pm 0.5\%$	$\pm 1.0\%$	$\pm 0.15\%$	$\pm 0.5\%$	$\pm 1.0\%$
Dielectric Withstanding Voltage	–	$\pm 0.01\%$	–	–	$\pm 0.01\%$	–
Effect of Solder	–	$\pm 0.03\%$	–	–	$\pm 0.03\%$	–



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