Metal Film Resistors, Industrial, Precision

FEATURES

- Small size - conformal coated
- Flame retardant epoxy coating
- Controlled temperature coefficient
- Excellent high frequency characteristics
- Exceptionally low noise; typically 0.10 µV/V
- Low voltage coefficient to ± 5 ppm/V
- Lead (Pb)-free version is RoHS compliant
- Special tolerance and or TC matching available on request

Pb-free Available

e3

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≅	RESISTANCE RANGE Ω								
			0.1 % - 1 %	0.1 % - 0.5 %	1 % - 5 %	1 %	2 %, 5 %	1 %	2 %, 5 %	1 %	2 %, 5 %
			25 ppm	50 ppm	50 ppm	100 ppm	100 ppm	150 ppm	150 ppm	200 ppm	200 ppm
CMF50	CMF-50	200	10 - 2M5	10 - 2M5	10 - 2M5	10 - 2M5	10 - 2M5	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 - 10M	1 - 10M	1 - 10M	R5 - 10M	R5 - 10M	R5 - 10M	R1 - 10M
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 - 10M	-	1 - 10M	-	1 - 10M

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)

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

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	TEMPERATURE COEFFICIENT (1)	PACKAGING	SPECIAL
(see Standard Electrical Specifications table)	**R** = Decimal **K** = Thousand **M** = Million **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	**EK** = Lead (Pb)-free, Bulk **EA** = Lead (Pb)-free, T/R (Full) **EB** = Lead (Pb)-free, T/R (1000 pieces) **BF** = Tin/Lead, Bulk **RE** = Tin/Lead, T/R (Full) **R6** = Tin/Lead, T/R (1000 pieces)	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)

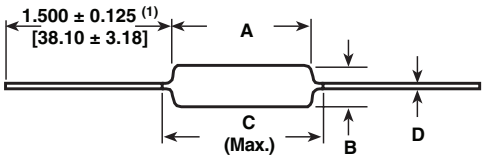
CMF-55	3010	F	T-1	R36
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	TEMP. COEFFICIENT	PACKAGING

Note

(1) Tolerances of ± 0.5 % (D), ± 0.25 % (C) and ± 0.1 % (B) are available only in 50 ppm and 25 ppm temperature coefficients

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

DIMENSIONS in inches [millimeters]



GLOBAL MODEL	A	B	C (Max.)	D
CMF50	0.150 ± 0.020 [3.81 ± 0.51]	0.065 ± 0.015 [1.65 ± 0.68]	0.187 [4.75]	0.016 ± 0.002 [0.41 ± 0.05]
CMF55	0.240 ± 0.020 (4) [6.10 ± 0.51]	0.090 ± 0.008 [2.29 ± 0.20]	0.278 [7.06] (3)	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 (2) [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]

Notes
(1) 1.08 ± 0.125 [27.43 ± 3.18] if tape and reel
(2) Available with 0.032" with [0.813 mm] lead
(3) 0.290" [7.37 mm] for ± 0.25 % and ± 0.1 % resistance tolerances and values > 1 MΩ
(4) 0.260" ± 0.020" [6.60 mm ± 0.508 mm] for values > 5 MΩ

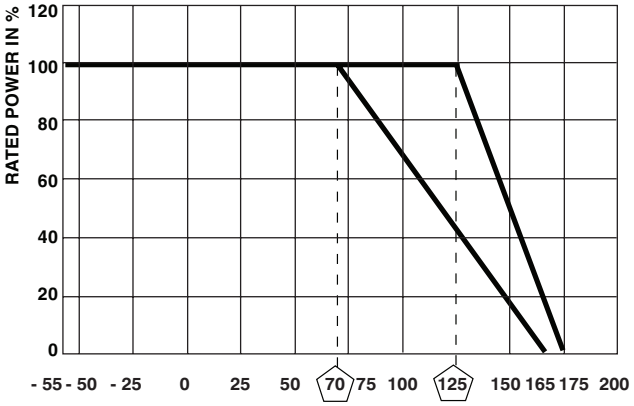
TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CMF50	CMF55	CMF07	CMF60	CMF20	CMF65	CMF70
Maximum Working Voltage	V≅	≤ 200	≤ 250	≤ 250	≤ 500	≤ 500	≤ 500	≤ 500
Insulation Voltage (1 Min)	V_{eff}	> 500						
Voltage Coefficient (Max.)	ppm/V	± 5 (measured between 10 % and full rated voltage)						
Dielectric Strength	V_{AC}	450	450	450	750	750	900	900
Insulation Resistance	Ω	≥ 10^{11}						
Operating Temperature Range	°C	- 55 to + 175						
Terminal Strength (Pull Test)	lb	2	2	5	2	5	2	5
Noise	dB	0.10 µV/V over a decade of frequency, with low and intermediate resistance values typically below 0.5 µV/V						
Weight (Max.)	g	0.12	0.20	0.20	0.50	0.60	1.00	1.10

TEMPERATURE COEFFICIENT CODES

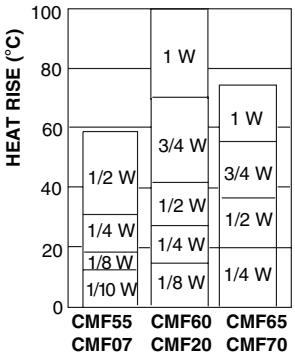
GLOBAL TC CODE	HISTORICAL TC CODE	TEMPERATURE COEFFICIENT
E	T-9	25 ppm/°C
H	T-2	50 ppm/°C
K	T-1	100 ppm/°C
L	T-0	150 ppm/°C
N	T-00	200 ppm/°C

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

- Value
- Decade and Tolerance
- Date code

(Alternately, parts may be MIL marked)

Note

- CMF07 and CMF20 parts are marked with color bands, either per MIL-PRF-22684 (with a wide white band) or using commercial color bands.

PERFORMANCE						
MODEL	POWER RATING					
	AT + 70 °C			AT + 125 °C		
CMF50	1/10 W	1/8 W	1/4 W	1/20 W	1/10 W	1/8 W
CMF55	1/8 W	1/4 W	1/2 W	1/10 W	1/8 W	1/4 W
CMF60	1/4 W	1/2 W	3/4 W and 1 W	1/8 W	1/4 W	1/2 W
CMF65	1/2 W	3/4 W	1 W	1/4 W	1/2 W	3/4 W
CMF70	1/2 W	3/4 W	1 W	1/4 W	1/2 W	3/4 W
CMF07	-	1/4 W	-	-	-	-
CMF20	-	1/2 W	1 W	-	-	-
TEST (Test methods - MIL-STD-202)	**MAXIMUM ΔR (Typical Test Lots)**					
Short Time Overload	-	± 0.05 %	-	-	± 0.05 %	-
Low Temperature Operation	-	± 0.05 %	-	-	± 0.05 %	-
Moisture Resistance	-	± 0.05 %	-	-	± 0.05 %	-
Shock	-	± 0.01 %	-	-	± 0.01 %	-
Vibration	-	± 0.004 %	-	-	± 0.04 %	-
Temperature Cycling	-	± 0.15 %	-	-	± 0.15 %	-
Load Life	± 0.15 %	± 0.5 %	± 1.0 %	± 0.15 %	± 0.5 %	± 1.0 %
Dielectric Withstanding Voltage	-	± 0.01 %	-	-	± 0.01 %	-
Effect of Solder	-	± 0.03 %	-	-	± 0.03 %	-

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