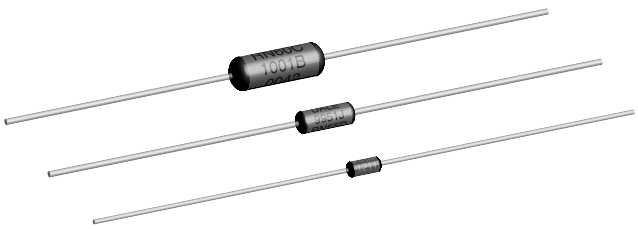
Metal Film Resistors
Military, MIL-R-10509 Qualified, Type RN
Military, MIL-PRF-22684 Qualified, Type RL



FEATURES

- Very low noise
- Very low voltage coefficient
- Controlled temperature coefficient
- Excellent high frequency characteristics
- Flame retardant epoxy coating
- Commercial alternatives to military styles are available with higher power ratings. See appropriate catalog or web page

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	MAXIMUM WORKING VOLTAGE	VISHAY DALE® MILITARY APPROVED VALUE RANGE (Ω)				DIELECTRIC STRENGTH VAC
		MIL-R-10509				
		CHARACTERISTIC D	CHARACTERISTIC C	CHARACTERISTIC E	MIL-PRF-22684	
CMF-50	200	—	10R - 100k	10R - 100k	—	450
CMF-55	200	10R - 301k	49R9 - 100k	49R9 - 100k	—	450
CMF-07	250	—	—	—	51R - 150k	450
CMF-60	300	10R - 1M	49R9 - 499k	49R9 - 499k	—	500
CMF-20	350	—	—	—	4R3 - 470k	700
CMF-65	350	10R - 2M	49R9 - 1M	49R9 - 1M	—	900
CMF-70	500	10R - 2.49M	24R9 - 1M	24R9 - 1M	—	900

Vishay Dale commercial value range: Extended resistance ranges are available in commercial equivalent types. Please contact us by using the email at the bottom of this page.

TECHNICAL SPECIFICATIONS

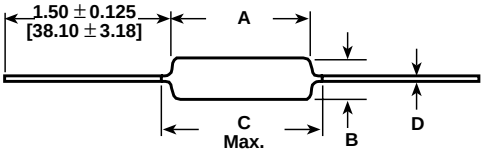
PARAMETER	UNIT	CONDITION
Voltage Coefficient	ppm/V	5 when measured between 10% and full rated voltage
Insulation Resistance	Ω	≥ 10^{10} minimum dry; ≥ 10^{8} minimum after moisture test
Operating Temperature Range	°C	- 65 / + 175 (See derating curves for military range)
Terminal Strength	lb	5 pound pull test for RL07/RL20; 2 pound pull test for all others
Solderability		Continuous satisfactory coverage when tested in accordance with MIL-R-10509 and MIL-PRF-22684

ORDERING INFORMATION - MILITARY PART NUMBER

RN MIL. TYPE Per MIL-R-10509	**60** SIZE 50 65 55 70 60	**D** CHARACTERISTIC E = ± 25ppm/°C C = ± 50ppm/°C *D = + 200ppm/°C - 500ppm/°C	**3483** VALUE First three digits are significant figures. Last digit specifies the number of zeros to follow. (348 kilohm illustrated.)	**F** TOLERANCE B = ± 0.1% C = ± 0.25% D = ± 0.5% F = ± 1%
RL MIL. TYPE Per MIL-PRF-22684	**07** SIZE 07 20	**S** LEAD S = Solderable	**471** VALUE First two digits are significant figures. Last digit specifies the number of zeros to follow. (470 ohm illustrated.)	**J** TOLERANCE G = ± 2% J = ± 5%

*Vishay Dale supplies ± 100ppm parts for characteristic D.

DIMENSIONS in inches [millimeters]



MODEL	A	B	C (Max.)	D
CMF-50	0.150 ± 0.020 [3.81 ± 0.51]	0.065 ± 0.015 [1.65 ± 0.38]	0.244 [6.20]	0.016 ± 0.002 [0.41 ± 0.05]
CMF-55	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]
CMF-60	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]
CMF-65	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]
CMF-70	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]
CMF-07	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]
CMF-20	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]

* .290" [7.37mm] for ± 0.25% and ± 0.1% resistance tolerances.

MATERIAL SPECIFICATIONS	
Element:	Nickel-chrome alloy
Coating:	Flame retardant epoxy, formulated for superior moisture protection
Core:	Fire-cleaned high purity ceramic
Termination:	Standard lead material is solder-coated copper. Solderable and weldable.

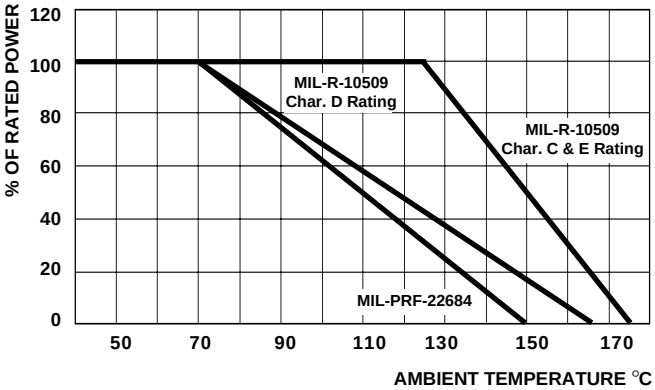
ENVIRONMENTAL SPECIFICATIONS	
General:	Environmental performance is shown in the Environmental Performance table. Test methods are those specified in MIL-R-10509 and MIL-PRF-22684.
Shelf Life:	Resistance shifts due to storage at room temperature are negligible.

APPLICABLE MIL-SPECS

MIL-R-10509 and MIL-PRF-22684: The CMF models meet or exceed the electrical, environmental and dimensional requirements of MIL-R-10509 and MIL-PRF-22684.

Noise: Vishay Dale metal film resistors have exceptionally low noise level. Average for standard resistance range is 0.10 micro-volt per volt over a decade of frequency, with low and intermediate resistance values typically below 0.05 micro-volt per volt.

Vishay Dale CMF resistors have an operating temperature range of - 65°C to +175°C. They must be derated according to the following curves:

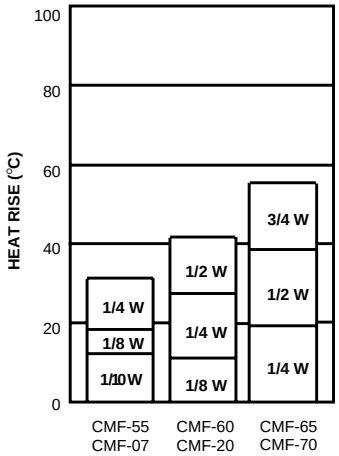


DERATING

MILITARY POWER RATING

WATTAGE	MILITARY QUALIFIED		
	MIL-R-10509		MIL-PRF-22684
	@ + 70°C (D)	@ + 125°C (C & E)	@ + 70°C
0.05	—	CMF-50 (RN50)	—
0.10	—	CMF-55 (RN55)	—
0.125	CMF-55 (RN55)	CMF-60 (RN60)	—
0.25	CMF-60 (RN60)	CMF-65 (RN65)	CMF-07 (RL07)
0.50	CMF-65 (RN65)	CMF-70 (RN70)	CMF-20 (RL20)
1.0	CMF-70 (RN70)	—	—

Note: Commercial equivalents of military styles are available with higher power ratings. Consult factory.



HEAT RISE

The increase in resistor surface temperature due to rated load is shown in the chart above. Resistor temperature = heat rise + ambient temperature.

TEMPERATURE COEFFICIENT CODE

VISHAY DALE TEMPERATURE COEFFICIENT CODE	TEMPERATURE COEFFICIENT	TEMPERATURE RANGE
T-1	0 ± 100ppm/°C	- 55°C to + 175°C
T-2	0 ± 50ppm/°C	- 55°C to + 175°C
T-9	0 ± 25ppm/°C	- 55°C to + 175°C
T-00	0 ± 200ppm/°C	- 55°C to + 150°C

MARKING

Characteristics: D = T-1, C = T-2, E = T-9
Tolerance: F = 1%, D = 0.5%, C = 0.25%, B = 0.1%
Value = three significant figures and multiplier
J = JAN (joint Army - Navy) brand

RN50: (3 lines)

J50D	JAN, type, characteristic
1211	Value
F137	Tolerance & 3 digit date code

RN55, RN60, RN65, RN70 (4 lines)

DALE	Company Logo
0137J	4 digit date code and JAN brand
RN55D	Type and characteristic
1211F	Value and Tolerance

(RL series are color banded per MIL-PRF-22684)

PERFORMANCE

	MIL-R-10509			
REQUIREMENT	**CHARACTERISTIC D**	**CHARACTERISTIC C**	**CHARACTERISTIC E**	**MIL-PRF-22684**
RN50	CMF-50	CMF-50	CMF-50	—
RN55	CMF-55	CMF-55	CMF-55	—
RN60	CMF-60	CMF-60	CMF-60	—
RN65	CMF-65	CMF-65	CMF-65	—
RN70	CMF-70	CMF-70	CMF-70	—
RL07	—	—	—	CMF-07
RL20	—	—	—	CMF-20
MIL. Temperature Coefficient	+ 200 - 500ppm/°C	± 50ppm/°C	± 25ppm/°C	± 200ppm/°C
Applicable Vishay Dale® TC Code	T-1 (100ppm/°C)	T-2 (50ppm/°C)	T-9 (25ppm/°C)	T-00 (± 200ppm/°C)
POWER RATING	**@ + 70°C**	**@ + 125°C**	**@ + 125°C**	**@ + 70°C**
RN50	—	0.05Watt	0.05 Watt	—
RN55	0.125 Watt	0.10 Watt	0.10 Watt	—
RN60	0.25 Watt	0.125 Watt	0.125 Watt	—
RN65	0.5 Watt	0.25 Watt	0.25 Watt	—
RN70	0.75 Watt	0.50 Watt	0.50 Watt	—
RL07	—	—	—	0.25 Watt
RL20	—	—	—	0.5 Watt
TEST	**MIL. (Max.)**	**MIL. (Max.)**	**MIL. (Max.)**	**MIL. (Max.)**
Thermal Shock	± 0.50% ΔR	± 0.25% ΔR	± 0.25% ΔR	± 1.00% ΔR
Short Time Overload	± 0.50% ΔR	± 0.25% ΔR	± 0.25% ΔR	± 0.50% ΔR
Low Temperature Operation	± 0.50% ΔR	± 0.25% ΔR	± 0.25% ΔR	± 0.50% ΔR
Moisture Resistance	± 1.50% ΔR	± 0.50% ΔR	± 0.50% ΔR	± 1.50% ΔR
Shock	± 0.50% ΔR	± 0.25% ΔR	± 0.25% ΔR	± 0.50% ΔR
Vibration	± 0.50% ΔR	± 0.25% ΔR	± 0.25% ΔR	± 0.50% ΔR
Load Life	± 1.00% ΔR	± 0.50% ΔR	± 0.50% ΔR	± 2.00% ΔR
Dielectric Withstanding Voltage	± 0.50% ΔR	± 0.25% ΔR	± 0.25% ΔR	± 0.50% ΔR
Effect of Solder	± 0.50% ΔR	± 0.10% ΔR	± 0.10% ΔR	± 0.50% ΔR