

## 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			MIL-PRF-22684	
		CHARACTERISTIC D	CHARACTERISTIC C	CHARACTERISTIC E		
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**

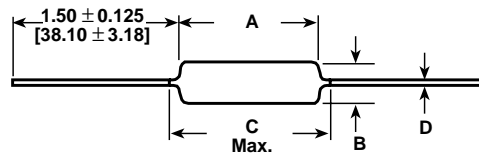
PARAMETER	UNIT	CONDITION
Voltage Coefficient	ppm/V	5 when measured between 10% and full rated voltage
Insulation Resistance	Ω	≥ 10 <sup>10</sup> minimum dry; ≥ 10 <sup>8</sup> minimum after moisture test
Operating Temperature Range	°C	- 65 / + 175 (See derating curves for military range)
Terminal Strength	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**

<b>RN</b> MIL. TYPE Per MIL-R-10509	<b>60</b> SIZE 50 65 55 70 60	<b>D</b> CHARACTERISTIC E = ± 25ppm/°C C = ± 50ppm/°C *D = + 200ppm/°C - 500ppm/°C	<b>3483</b> VALUE First three digits are significant figures. Last digit specifies the number of zeros to follow. (348 kilohm illustrated.)	<b>F</b> TOLERANCE B = ± 0.1% C = ± 0.25% D = ± 0.5% F = ± 1%
<b>RL</b> MIL. TYPE Per MIL-PRF-22684	<b>07</b> SIZE 07 20	<b>S</b> LEAD S = Solderable	<b>471</b> VALUE First two digits are significant figures. Last digit specifies the number of zeros to follow. (470 ohm illustrated.)	<b>J</b> 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	
<b>Element:</b>	Nickel-chrome alloy
<b>Coating:</b>	Flame retardant epoxy, formulated for superior moisture protection
<b>Core:</b>	Fire-cleaned high purity ceramic
<b>Termination:</b>	Standard lead material is solder-coated copper. Solderable and weldable.

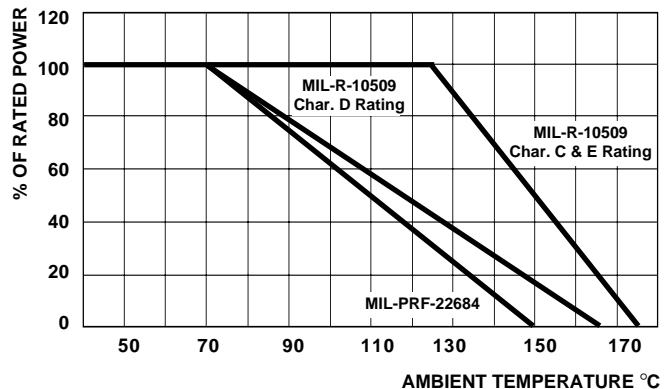
ENVIRONMENTAL SPECIFICATIONS	
<b>General:</b>	Environmental performance is shown in the Environmental Performance table. Test methods are those specified in MIL-R-10509 and MIL-PRF-22684.
<b>Shelf Life:</b>	Resistance shifts due to storage at room temperature are negligible.

**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.

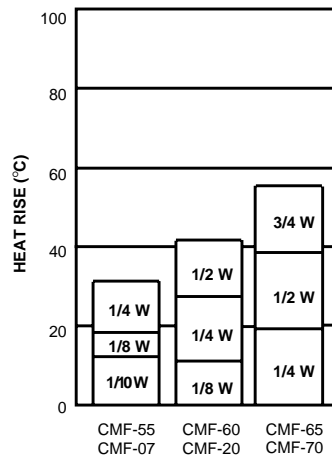
Vishay Dale CMF resistors have an operating temperature range of - 65°C to +175°C. They must be derated according to the following curves:



**DERATING**

<b>MILITARY POWER RATING</b>			
<b>WATTAGE</b>	<b>MILITARY QUALIFIED</b>		
	<b>MIL-R-10509</b>		<b>MIL-PRF-22684</b>
	<b>@ + 70°C (D)</b>	<b>@ + 125°C (C &amp; E)</b>	
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.

<b>TEMPERATURE COEFFICIENT CODE</b>		
<b>VISHAY DALE TEMPERATURE COEFFICIENT CODE</b>	<b>TEMPERATURE COEFFICIENT</b>	<b>TEMPERATURE RANGE</b>
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



<b>MARKING</b>	
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)	RN55, RN60, RN65, RN70 (4 lines)
J50D JAN, type, characteristic	DALE Company Logo
1211 Value	0137J 4 digit date code and JAN brand
F137 Tolerance & 3 digit date code	RN55D Type and characteristic
	1211F Value and Tolerance

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

<b>PERFORMANCE</b>				
REQUIREMENT	MIL-R-10509			MIL-PRF-22684
	CHARACTERISTIC D	CHARACTERISTIC C	CHARACTERISTIC E	
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)
<b>POWER RATING</b>	<b>@ + 70°C</b>	<b>@ + 125°C</b>	<b>@ + 125°C</b>	<b>@ + 70°C</b>
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
<b>TEST</b>	<b>MIL. (Max.)</b>	<b>MIL. (Max.)</b>	<b>MIL. (Max.)</b>	<b>MIL. (Max.)</b>
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