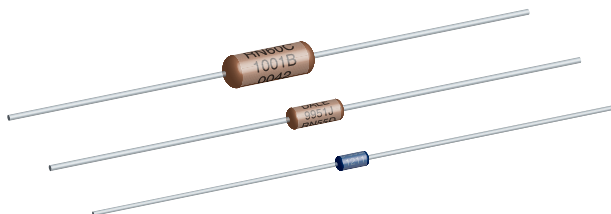




## Metal Film Resistors, Axial, Military, MIL-R-10509 Qualified, Precision, Type RN and MIL-PRF-22684 Qualified, Type RL



### FEATURES

- Very low noise (-40 dB)
- Very low voltage coefficient (5 ppm/V)
- Controlled temperature coefficient
- Flame retardant epoxy coating
- Commercial alternatives to military styles are available with higher power ratings. See CMF Industrial data sheet: [www.vishay.com/doc?31018](http://www.vishay.com/doc?31018)

### STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	MIL STYLE	MIL SPEC. SHEET	POWER RATING $P_{70^{\circ}\text{C}}$ W	POWER RATING $P_{125^{\circ}\text{C}}$ W	MAX. WORKING VOLTAGE <sup>(1)</sup> V	RESISTANCE RANGE $\Omega$ MIL-R-10509 $\pm 100 \text{ ppm}/^{\circ}\text{C}$ (D)	RESISTANCE RANGE $\Omega$ MIL-R-10509 $\pm 50 \text{ ppm}/^{\circ}\text{C}$ (C)	RESISTANCE RANGE $\Omega$ MIL-R-10509 $\pm 25 \text{ ppm}/^{\circ}\text{C}$ (E)	RESISTANCE RANGE $\Omega$ MIL-PRF-22684	TOL. <sup>(3)</sup> $\pm \%$	DIELECTRIC STRENGTH $V_{AC}$
CMF50	RN50	08	-	0.05	200	-	10 to 100K	10 to 100K	-	0.1, 0.25, 0.5, 1	450
CMF55	RN55	07	0.125	0.10	200	10 to 301K	49.9 to 100K	49.9 to 100K	-	0.1, 0.25, 0.5, 1	450
CMF60	RN60	01	0.25	0.125	300	10 to 1M	49.9 to 499K	49.9 to 499K	-	0.1, 0.25, 0.5, 1	500
CMF65	RN65	02	0.50	0.25	350	10 to 2M	49.9 to 1M	49.9 to 1M	-	0.1, 0.25, 0.5, 1	900
CMF70	RN70	03	0.75 <sup>(2)</sup>	0.50	500	10 to 2.49M	24.9 to 1M	24.9 to 1M	-	0.1, 0.25, 0.5, 1	900
CMF07	RL07	01	0.25	-	250	-	-	-	51 to 150K	2, 5	450
CMF20	RL20	02	0.50	-	350	-	-	-	4.3 to 470K	2, 5	700

#### Notes

- (1) Continuous working voltage shall be  $\sqrt{P \times R}$  or maximum working voltage, whichever is less.  
 (2) Formerly rated at 1 W and is the direct replacement for RN70 of MIL-R-10509 rev. D.  
 (3) Tolerances of  $\pm 0.1 \%$ ,  $\pm 0.25 \%$  and  $\pm 0.5 \%$  are not applicable to characteristic D.

### TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CONDITION
Voltage Coefficient	ppm/V	5 when measured between 10 % and full rated voltage
Insulation Resistance	$\Omega$	$\geq 10^{10}$ min. dry; $\geq 10^8$ min. after moisture test
Operating Temperature Range	$^{\circ}\text{C}$	-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



## GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: RN60D3483FR36 (preferred part numbering format)

<b>R</b>	<b>N</b>	<b>6</b>	<b>0</b>	<b>D</b>	<b>3</b>	<b>4</b>	<b>8</b>	<b>3</b>	<b>F</b>	<b>R</b>	<b>3</b>	<b>6</b>			
<b>MIL STYLE</b>	<b>CHARACTERISTIC</b>			<b>RESISTANCE VALUE</b>			<b>TOLERANCE CODE</b>			<b>PACKAGING</b>			<b>SPECIAL</b>		
<b>RN50</b> <b>RN55</b> <b>RN60</b> <b>RN65</b> <b>RN70</b>	<b>E</b> = 25 ppm <b>C</b> = 50 ppm <b>D</b> = 100 ppm			3 digit significant figure, followed by a multiplier Use "R" for values < 100 Ω <b>10R0</b> = 10 Ω <b>2152</b> = 21.5 kΩ <b>2494</b> = 2.49 MΩ			<b>B</b> = ± 0.1 % <b>C</b> = ± 0.25 % <b>D</b> = ± 0.5 % <b>F</b> = ± 1 %			<b>B14</b> = tin/lead, bulk <b>BSL</b> = tin/lead, bulk, single lot date code <b>R36</b> = tin/lead, T/R (full) <b>RE6</b> = tin/lead, T/R (1000 pieces) <b>RSL</b> = tin/lead, T/R, single lot date code			Blank = standard (Dash number) <b>88</b> = hot solder dip <b>143</b> = non-magnetic		

Historical Part Number example: RN60D3483F (will continue to be accepted)

<b>RN60</b>	<b>D</b>	<b>3483</b>	<b>F</b>	<b>R36</b>
MIL STYLE	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

New Global Part Numbering: RL07S471JR36 (preferred part numbering format)

<b>R</b>	<b>L</b>	<b>0</b>	<b>7</b>	<b>S</b>	<b>4</b>	<b>7</b>	<b>1</b>	<b>J</b>	<b>R</b>	<b>3</b>	<b>6</b>				
<b>MIL STYLE</b>		<b>LEAD MATERIAL</b>			<b>RESISTANCE VALUE</b>			<b>TOLERANCE CODE</b>		<b>PACKAGING</b>			<b>SPECIAL</b>		
<b>RL07</b> <b>RL20</b>		<b>S</b> = solderable			2 digit significant figure, followed by a multiplier Use "R" for values < 10 Ω <b>4R3</b> = 4.3 Ω <b>202</b> = 2.0 kΩ <b>474</b> = 470 kΩ			<b>G</b> = ± 2 % <b>J</b> = ± 5 %		<b>B14</b> = tin/lead, bulk <b>BSL</b> = tin/lead, bulk, single lot date code <b>R36</b> = tin/lead, T/R (full) <b>RE6</b> = tin/lead, T/R (1000 pieces) <b>RSL</b> = tin/lead, T/R, single lot date code			Blank = standard (Dash number) <b>88</b> = hot solder dip <b>143</b> = non-magnetic		

Historical Part Number example: RL07S471J (will continue to be accepted)

<b>RL07</b>	<b>S</b>	<b>471</b>	<b>J</b>	<b>R36</b>
MIL STYLE	LEAD MATERIAL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

## Note

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

## 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.

## 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 μV per V over a decade of frequency, with low and intermediate resistance values typically below 0.05 μV per V.

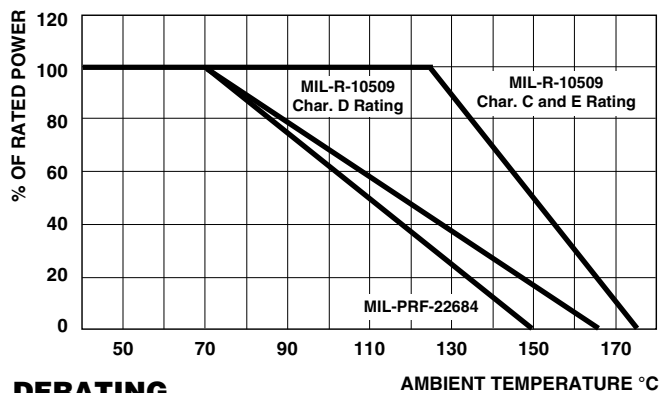
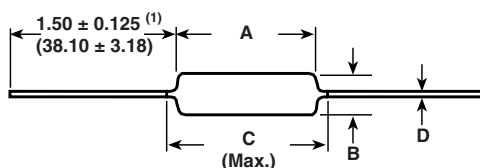
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## ENVIRONMENTAL SPECIFICATIONS

<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.



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****DIMENSIONS** in inches (millimeters)

VISHAY DALE MODEL	A	B	C (MAX.)	D
CMF50	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)
CMF55	0.240 ± 0.020 (6.10 ± 0.51)	0.090 ± 0.008 (2.29 ± 0.20)	0.290 (7.37)	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)	0.290 (7.37)	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)

**Note**

(1) Lead length for product in bulk pack. For product supplied in tape and reel, the actual lead length would be based on the body size, tape spacing and lead trim.

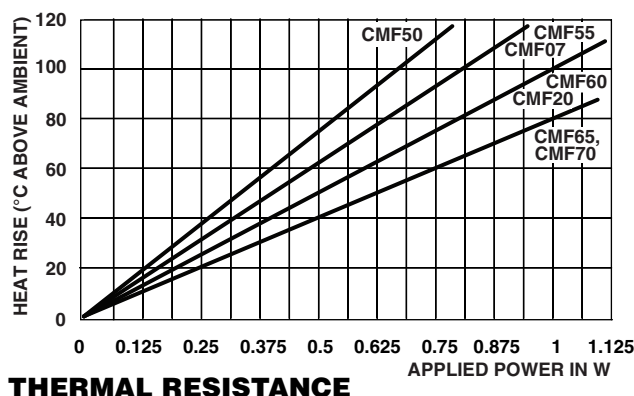
**MILITARY POWER RATING**

WATTAGE	MILITARY QUALIFIED		
	MIL-R-10509		MIL-PRF-22684
	AT +70 °C (D)	AT +125 °C (C and E)	AT +70 °C
0.05	-	RN50	-
0.10	-	RN55	-
0.125	RN55	RN60	-
0.25	RN60	RN65	RL07
0.50	RN65	RN70	RL20
0.75 (1)	RN70	-	-

**Notes**

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

(1) Formerly rated at 1 W and is the direct replacement for RN70 of MIL-R-10509 rev. D.



## MARKING (per MIL-PRF-10509)

Characteristics: D = 100 ppm, C = 50 ppm, E = 25 ppm  
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 and 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

## Note

- RL series are color banded per MIL-PRF-22684.

## PERFORMANCE

REQUIREMENT	MIL-R-10509			MIL-PRF-22684
	CHARACTERISTIC D	CHARACTERISTIC C	CHARACTERISTIC E	
MIL Temperature Coefficient	+200 ppm/°C -500 ppm/°C	± 50 ppm/°C	± 25 ppm/°C	± 200 ppm/°C
Applicable Vishay Dale Temperature Coefficient	± 100 ppm/°C	± 50 ppm/°C	± 25 ppm/°C	± 200 ppm/°C
TEST	MIL <sub>max.</sub>	MIL <sub>max.</sub>	MIL <sub>max.</sub>	MIL <sub>max.</sub>
Thermal Shock	± 0.50 % $\Delta R$	± 0.25 % $\Delta R$	± 0.25 % $\Delta R$	± 1.00 % $\Delta R$
Short Time Overload	± 0.50 % $\Delta R$	± 0.25 % $\Delta R$	± 0.25 % $\Delta R$	± 0.50 % $\Delta R$
Low Temperature Operation	± 0.50 % $\Delta R$	± 0.25 % $\Delta R$	± 0.25 % $\Delta R$	± 0.50 % $\Delta R$
Moisture Resistance	± 1.50 % $\Delta R$	± 0.50 % $\Delta R$	± 0.50 % $\Delta R$	± 1.50 % $\Delta R$
Shock	± 0.50 % $\Delta R$	± 0.25 % $\Delta R$	± 0.25 % $\Delta R$	± 0.50 % $\Delta R$
Vibration	± 0.50 % $\Delta R$	± 0.25 % $\Delta R$	± 0.25 % $\Delta R$	± 0.50 % $\Delta R$
Load Life	± 1.00 % $\Delta R$	± 0.50 % $\Delta R$	± 0.50 % $\Delta R$	± 2.00 % $\Delta R$
Dielectric Withstanding Voltage	± 0.50 % $\Delta R$	± 0.25 % $\Delta R$	± 0.25 % $\Delta R$	± 0.50 % $\Delta R$
Effect of Solder	± 0.50 % $\Delta R$	± 0.10 % $\Delta R$	± 0.10 % $\Delta R$	± 0.50 % $\Delta R$



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