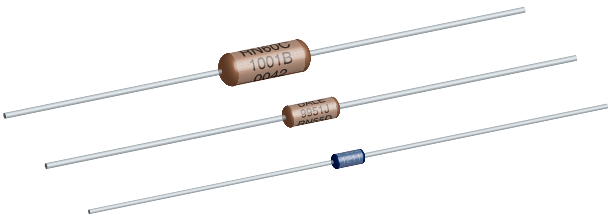
Metal Film Resistors, Military, MIL-R-10509 Qualified, Precision, Type RN and MIL-PRF-22684 Qualified, Type RL



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)

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	MIL STYLE	MIL SPEC. SHEET	POWER RATING $P_{70\,°C}$ W	POWER RATING $P_{125\,°C}$ W	MAX. WORKING VOLTAGE (1) V	RESISTANCE RANGE Ω MIL-R-10509 ± 100 ppm/°C (D)	RESISTANCE RANGE Ω MIL-R-10509 ± 50 ppm/°C (C)	RESISTANCE RANGE Ω MIL-R-10509 ± 25 ppm/°C (E)	RESISTANCE RANGE Ω MIL-PRF-22684	TOL. (3) ± %	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 (2)	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 ± 0.1 %, ± 0.25 % and ± 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	Ω	≥ 10^{10} min. dry; ≥ 10^{8} min. 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

GLOBAL PART NUMBER INFORMATION

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

R	N	6	0	D	3	4	8	3	F	R	3	6			

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

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

RN60	D	3483	F	R36
MIL STYLE	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

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

R	L	0	7	S	4	7	1	J	R	3	6			

MIL STYLE	LEAD MATERIAL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING	SPECIAL
RL07 **RL20**	**S** = Solderable	2 digit significant figure, followed by a multiplier Use "R" for values < 10 Ω **4R3** = 4.3 Ω **202** = 2.0 kΩ **474** = 470 kΩ	**G** = ± 2 % **J** = ± 5 %	**B14** = Tin/lead, bulk **BSL** = Tin/lead, bulk, single lot date code **R36** = Tin/lead, T/R (full) **RE6** = Tin/lead, T/R (1000 pieces) **RSL** = Tin/lead, T/R, single lot date code	Blank = Standard (Dash number) **88** = Hot solder dip **143** = Non-magnetic

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

RL07	S	471	J	R36
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).

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.

CAGE CODE: 91637

ENVIRONMENTAL SPECIFICATIONS

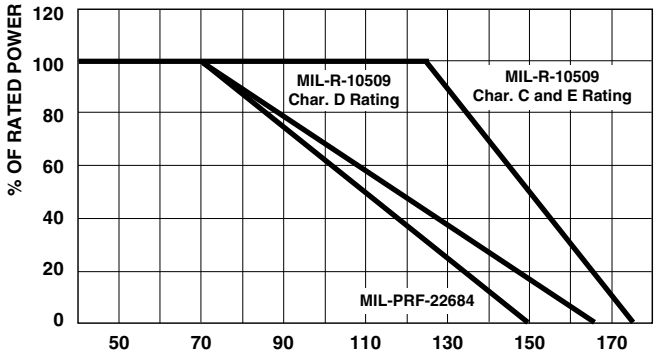
General	Environmental performance is shown in the Environmental Performance table. Test methods are those specified in MIL-R-10509 and MIL-PRF-22684.
Shelf Life	Resistance shifts due to storage at room temperature are negligible.

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.

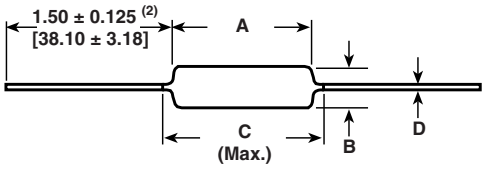
Noise: Vishay Dale metal film resistors have exceptionally low noise level. Average for standard resistance range is 0.10 µV per V over a decade of frequency, with low and intermediate resistance values typically below 0.05 µV per V.

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)	0.278 (7.06) (1)	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)

Notes

(1) 0.290" (7.37) for ± 0.25 % and ± 0.1 % resistance tolerances.

(2) 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.

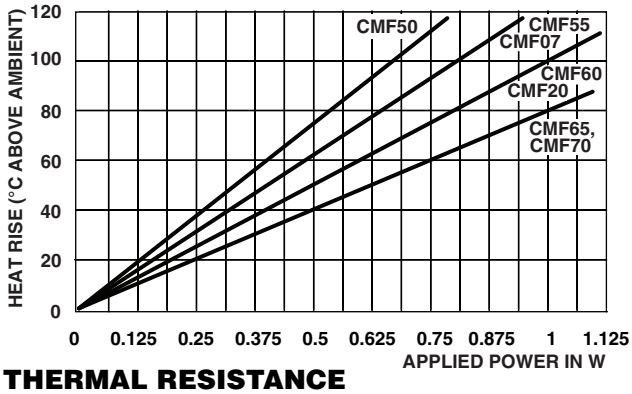
MILITARY POWER RATING

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 (3)	RN70	-	-

Notes

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

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



THERMAL RESISTANCE

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.

PERFROMANCE

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	**$MIL_{max.}$**	**$MIL_{max.}$**	**$MIL_{max.}$**	**$MIL_{max.}$**
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

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RN50C4641BB14 RN55D7502FB14 RN65C4641CB14 RN55C1744FB14 RN60D1272FB14 RN55C2004BB14 RN55C1042BB14 RN55C2001BB14 RL20S820GB14 RN60E6191FB14 RN65C3093FRE6 RN55D1151FB14 RN60D3303FB14 RN60C2001BB14 RN55D9532FB14 RL20S124GB14 RN70D3321FRE5 RN60D3323FB14 RN55D8872FB14 RN55C6001BB14 RN60C4871FRE8 RN70C2001BB14 RN50C1213FB14 RN55D1270FB14 RN55D69R8FB14 RN60C1052FB14 RN55C6121BRE6 RN65C2004BB14 RN60D1270FB14 RN55E1872BB14 RN55D1603FB14 RN50C1800BRE6 RL20S821GB14 RN55C5001BB14 RL20S270GB14 RN55C69R8FB14 RN55D1272FB14 RN55C1623FB14 RL20S-G-22 RL20S470GB14 RL07S121GRE5 RN55C6572BB14 RN55D5231FB14 RN65D1151FB14 RL07S820GB14 RN60C3323FB14 RN60C2550BB14 RN60D33R2FB14 RN55E2032BB14 RN60D9101FB14 RN60D6190FB14 RN60D3012FB14 RN55D3242FRE6 RN60C1801FB14 RN60E1001FB14 RN55D1242FRE6 RN60D5603FB14 RN65E1001FB14 RN55D5760FB14 RN55E39R2BB14 RN60C6980FB14 RN55C9200BB14 RN60D6980FB14 RL07S331GRE5 RN60D6803FB14 RN60C1801BB14 RN50C2552FB14 RN55C2552FB14 RN55C2552BB14 RN55D1022FB14 RN55C1242FRE6 RN55C3242FRE6 RN55E4222BRE6 RN55E1001FB14 RN55E1003FB14 RN55C1801BB14 RN55E1001BB14 RN50E1001BB14 RN50E1001FB14 RN50C2432FB14 RN55C2403BRE6 RN60C5623FB14 RN70E1003FB14 RN65D41R2FB14 RN55C1403BRE6 RN55C2432FB14 RN60D2942FRE6 RN60D5760FB14 RN55C2550FB14 RN50C4700DRE6 RN50C4323FRE6 RN55D2002FB14 RN55C2002FB14 RN55C2102FB14 RN55D2005FB14 RN60D1653FRE6 RN55D2610FRE6 RN60C5001BB14 RN55D3482FRE6 RN55E2002FB14