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

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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.

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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

AMBIENT TEMPERATURE °C

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.

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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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ООО «ЛайфЭлектроникс» “LifeElectronics” LLC

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