

Vishay Dale

# 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)

STANE	STANDARD ELECTRICAL SPECIFICATIONS										
GLOBAL MODEL	MIL STYLE	MIL SPEC. SHEET	_	POWER RATING P <sub>125°C</sub> W	MAX. WORKING VOLTAGE <sup>(1)</sup> V	RESISTANCE RANGE Ω MIL-R-10509 ± 100 ppm/°C (D)	$\begin{array}{c} \text{RESISTANCE} \\ \text{RANGE} \\ \Omega \\ \text{MIL-R-10509} \\ \pm 50 \text{ ppm/°C} \\ \text{(C)} \end{array}$	RESISTANCE RANGE Ω MIL-R-10509 ± 25 ppm/°C (E)	RESISTANCE RANGE Ω MIL-PRF-22684	TOL. <sup>(3)</sup> ± %	DIELECTRIC STRENGTH V <sub>AC</sub>
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	-	ı	-	51 to 150K	2, 5	450
CMF20	RL20	02	0.50	-	350	-	-	-	4.3 to 470K	2, 5	700

#### Notes

 $<sup>^{(3)}</sup>$  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	Ω	$\geq 10^{10}$ min. dry; $\geq 10^8$ min. after moisture test				
Operating Temperature Range	°C	- 65/+ 175 (see derating curves for military range)				
Terminal Strength	Ib	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				

<sup>(1)</sup> Continuous working voltage shall be  $\sqrt{P \times R}$  or maximum working voltage, whichever is less.

<sup>(2)</sup> Formerly rated at 1 W and is the direct replacement for RN70 of MIL-R-10509 rev. D.



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New Global Part Numbering: RN60D3483FR36 (preferred part numbering format)   R	GLOBAL PART NUMBER INFORMATION								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	New Global Part Numbering: RN60D3483FR36 (preferred part numbering format)								
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	MIL STYLE	CHAF	RACTERISTIC	ALUE	-	-	PACKAGING	SPECIAL	
RN60 RN65 RN70							1	- 1011111	
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			10R	$0 = 10 \Omega$				(300)	
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  O  T  S  4  T  J  R  3  6  PACKAGING  SPECIAL  Blank = Standard (Dash number)  RL20  FRL20  Historical Part Number example: RL07S471J (will continue to be accepted)  RL07  S  471  J  R  RESISTANCE  CODE  G  S  B14 = 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			_	-					
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			2494	= 2.49 MΩ	]				
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figure, followed by a multiplier Use "R" for values < $10 \Omega$ $4R3 = 4.3 \Omega$ $202 = 2.0 k\Omega$ $474 = 470 k\Omega$ Historical Part Number example: RL07S471J (will continue to be accepted)  RL20  Figure, followed by a multiplier Use "R" for values < $10 \Omega$ $4R3 = 4.3 \Omega$ $4R3 = $	MIL STYLE	LEAD N	MAILBIAI II				PACKAGING	SPECIAL	
a multiplier Use "R" for values < $10 \Omega$ 4R3 = $4.3 \Omega$ 202 = $2.0 k\Omega$ 474 = $470 k\Omega$ Historical Part Number example: RL07S471J (will continue to be accepted)		<b>S</b> = S			<b>G</b> = ± 2 %				
Use "R" for values < 10 $\Omega$ 4R3 = 4.3 $\Omega$ 202 = 2.0 k $\Omega$ 474 = 470 k $\Omega$ Historical Part Number example: RL07S471J (will continue to be accepted)  RE6 = Tin/lead, T/R (1000 pieces) RSL = Tin/lead, T/R, single lot date code  143 = Non-magnetic  RA71 J RA6	RL20				$J = \pm 5 \%$	BSL =			
$values < 10 \ \Omega \\ 4R3 = 4.3 \ \Omega \\ 202 = 2.0 \ k\Omega \\ 474 = 470 \ k\Omega$ Historical Part Number example: RL07S471J (will continue to be accepted)  RSL = Tin/lead, T/R, single lot date code									
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						RSL =	: Tin/lead, T/R, single lot date o	code	
RL07 S 471 J R36									
RL07 S 471 J R36									
RL07 S 471 J R36	Historical Part Number example: RL07S471J (will continue to be accepted)								
MIL STYLE LEAD MATERIAL RESISTANCE VALUE TOLERANCE CODE PACKAGING	RL07		S		471		J	R36	
	MIL STYLE	:	LEAD MATERIAL	RES	ISTANCE VAL	UE	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.				

## **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  $\mu$ V per V over a decade of frequency, with low and intermediate resistance values typically below 0.05  $\mu$ V per V.

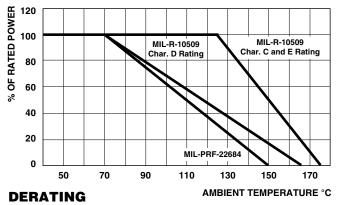
<b>CAGE CODE: 91637</b>
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ENVIRONMENTAL SPECIFICATIONS						
General	Environmental performance is shown in the Environmental Performance table. Test methods are those specified in MIL-R-10509 and MIL-PRF-22684.					
Shelf Life	Resistance shifts due to storage at room temperature are negligible.					

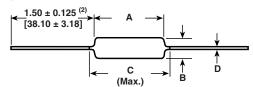
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Vishay Dale CMF resistors have an operating temperature range of - 65 °C to + 175 °C. They must be derated according to the following curves:



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



VISHAY DALE MODEL	A	В	C (MAX.)	D
CMF50	0.150 ± 0.020	0.065 ± 0.015	0.244	0.016 ± 0.002
	(3.81 ± 0.51)	(1.65 ± 0.38)	(6.20)	(0.41 ± 0.05)
CMF55	0.240 ± 0.020	$0.090 \pm 0.008$	0.278	0.025 ± 0.002
	(6.10 ± 0.51)	(2.29 ± 0.20)	(7.06) <sup>(1)</sup>	(0.64 ± 0.05)
CMF60	0.344 ± 0.031	$0.145 \pm 0.015$	0.425	0.025 ± 0.002
	(8.74 ± 0.79)	(3.68 ± 0.38)	(10.80)	(0.64 ± 0.05)
CMF65	0.562 ± 0.031	0.180 ± 0.015	0.687	0.025 ± 0.002
	(14.27 ± 0.79)	(4.57 ± 0.38)	(17.45)	(0.64 ± 0.05)
CMF70	0.562 ± 0.031	0.180 ± 0.015	0.687	0.032 ± 0.002
	(14.27 ± 0.79)	(4.57 ± 0.38)	(17.45)	(0.81 ± 0.05)
CMF07	0.240 ± 0.020	$0.090 \pm 0.008$	0.278	0.025 ± 0.002
	(6.10 ± 0.51)	(2.29 ± 0.20)	(7.06)	(0.64 ± 0.05)
CMF20	0.375± 0.040	0.145 ± 0.015	0.425	0.032 ± 0.002
	(9.53 ± 1.02)	(3.68 ± 0.38)	(10.80)	(0.81 ± 0.05)

#### Notes

<sup>(2)</sup> 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						
	MILITARY QUALIFIED					
WATTAGE	MIL-	R-10509	MIL-PRF-22684			
WALLAGE	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	-	-			

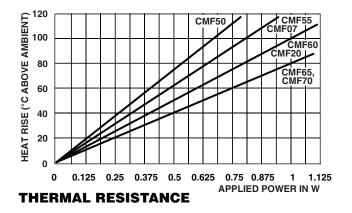
### Notes

 $<sup>^{(1)}</sup>$  0.290" (7.37) for  $\pm$  0.25 % and  $\pm$  0.1 % resistance tolerances.

<sup>•</sup> Commercial equivalents of military styles are available with higher power ratings. Consult factory.

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

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## 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

RN55; (3 lines) RN55, RN60, RN65, RN70 (4 lines)

J50D JAN, type, characteristic DALE Company logo

John Jan, type, characteristic

1211 Value

O137J 4 digit date code and JAN brand
RN55D Type and characteristic

F137 Tolerance and 3 digit date code 1211F Value and Tolerance

#### Note

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

PERFROMANCE						
REQUIREMENT		MIL-PRF-22684				
REQUIREMENT	CHARACTERISTIC D CHARACTERIS		CHARACTERISTIC E	WIIL-PHF-22004		
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 % ΔR	± 0.25 % ΔR	± 0.25 % ΔR	± 1.00 % ∆R		
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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Revision: 02-Oct-12 Document Number: 91000

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## Vishay:

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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
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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
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