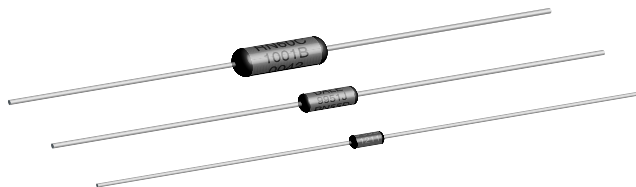


Metal Film Resistors, Military, MIL-R-10509 Qualified, Type RN and MIL-PRF-22684 Qualified, Type RL



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 appropriate catalog or web page

STANDARD ELECTRICAL SPECIFICATIONS

| MIL STYLE | VISHAY DALE MODEL | MAXIMUM WORKING VOLTAGE | VISHAY DALE® MILITARY APPROVED VALUE RANGE (Ω) | | | | DIELECTRIC STRENGTH V_{AC} |
|-----------|-------------------|-------------------------|---|------------------|------------------|---------------|------------------------------|
| | | | MIL-R-10509 | | | MIL-PRF-22684 | |
| | | | CHARACTERISTIC D | CHARACTERISTIC C | CHARACTERISTIC E | | |
| RN50 | CMF50 | 200 | - | 10R - 100K | 10R - 100K | - | 450 |
| RN55 | CMF55 | 200 | 10R - 301K | 49R9 - 100K | 49R9 - 100K | - | 450 |
| RN60 | CMF60 | 300 | 10R - 1M | 49R9 - 499K | 49R9 - 499K | - | 500 |
| RN65 | CMF65 | 350 | 10R - 2M | 49R9 - 1M | 49R9 - 1M | - | 900 |
| RN70 | CMF70 | 500 | 10R - 2.49M | 24R9 - 1M | 24R9 - 1M | - | 900 |
| RL07 | CMF07 | 250 | - | - | - | 51R - 150K | 450 |
| RL20 | CMF20 | 350 | - | - | - | 4R3 - 470K | 700 |

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 | $\geq 10^{10}$ minimum dry; $\geq 10^8$ minimum after moisture test |
| Operating Temperature Range | $^{\circ}C$ | - 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 |



CMF (Military RN and RL)

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

Vishay Dale

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 10R0 = 10 Ω 2152 = 21.5 k Ω 2494 = 2.49 M Ω | | | B = ± 0.1 % C = ± 0.25 % D = ± 0.5 % F = ± 1 % | | B14 = Tin/Lead, Bulk R36 = Tin/Lead, T/R (Full) RE6 = Tin/Lead, T/R (1000 pcs) | | Blank = Standard (Dash Number) (up to 1 digit) | | |

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 | | | |
| RL07 RL20 | S = Solderable | | 2 digit significant figure, followed by a multiplier 4R3 = 4.3 Ω 202 = 2.0 k Ω 474 = 470 k Ω | | | G = ± 2 % J = ± 5 % | | B14 = Tin/Lead, Bulk R36 = Tin/Lead, T/R (Full) RE6 = Tin/Lead, T/R (1000 pcs) | | | |

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

| | | | | |
|-------------|---------------|------------------|----------------|------------|
| RL07 | S | 471 | J | R36 |
| MIL STYLE | LEAD MATERIAL | RESISTANCE VALUE | TOLERANCE CODE | PACKAGING |

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. |

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. |

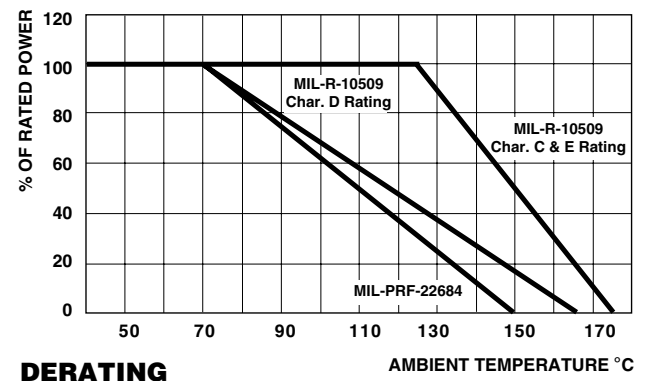
APPLICABLE MIL-SPECS

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.

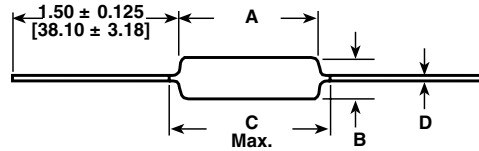
Noise: Vishay Dale metal film resistors have exceptionally low noise level. Average for standard resistance range is 0.10 micro-volt per volt over a decade of frequency, with low and intermediate resistance values typically below 0.05 micro-volt per volt.

CAGE CODE: 91637

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]

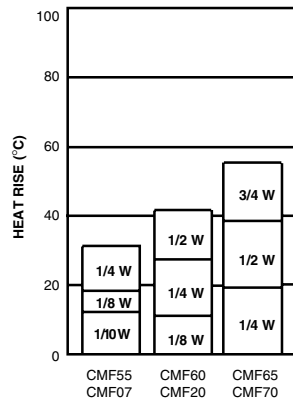


| VISHAY DALE MODEL | A | B | C (Max.) | D |
|-------------------|---------------------------------|--------------------------------|------------------|--------------------------------|
| CMF50 | 0.150 ± 0.020 [3.81 ± 0.51] | 0.065 ± 0.015 [1.65 ± 0.38] | 0.244 [6.20] | 0.016 ± 0.002 [0.41 ± 0.05] |
| CMF55 | 0.240 ± 0.020 [6.10 ± 0.51] | 0.090 ± 0.008 [2.29 ± 0.20] | 0.278 [7.06]* | 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] |

* 0.290" [7.37] for ± 0.25 % and ± 0.1 % resistance tolerances.

| MILITARY POWER RATING | | | |
|-----------------------|--------------------|------------------------|---------------|
| WATTAGE | MILITARY QUALIFIED | | |
| | MIL-R-10509 | | MIL-PRF-22684 |
| | AT + 70 °C (D) | AT + 125 °C (C & E) | AT + 70 °C |
| 0.05 | - | RN50 | - |
| 0.10 | - | RN55 | - |
| 0.125 | RN55 | RN60 | - |
| 0.25 | RN60 | RN65 | RL07 |
| 0.50 | RN65 | RN70 | RL20 |
| 1.0 | RN70 | - | - |

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



HEAT RISE

The increase in resistors surface temperature due to rated load is shown in the chart above. Resistor temperature = heat rise + ambient temperature.



CMF (Military RN and RL)

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

Vishay Dale

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

(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 - 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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