

## 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 appropriate catalog or web page.

| STANDARD ELECTRICAL SPECIFICATIONS |           |                 |                      |                       |                   |                                       |                    |                 |                 |                                     |               |
|------------------------------------|-----------|-----------------|----------------------|-----------------------|-------------------|---------------------------------------|--------------------|-----------------|-----------------|-------------------------------------|---------------|
| VISHAY DALE MODEL                  | MIL STYLE | MIL SPEC. SHEET | POWER RATING         |                       | TOLERANCE ± %     | MAX. WORKING VOLTAGE <sup>(1)</sup> V | RESISTANCE RANGE Ω |                 |                 | DIELECTRIC STRENGTH V <sub>Ac</sub> |               |
|                                    |           |                 | P <sub>70 °C</sub> W | P <sub>125 °C</sub> W |                   |                                       | MIL-R-10509        |                 |                 |                                     | MIL-PRF-22684 |
|                                    |           |                 |                      |                       |                   |                                       | ± 100 ppm/°C (D)   | ± 50 ppm/°C (C) | ± 25 ppm/°C (E) |                                     |               |
| CMF50                              | RN50      | 08              | -                    | 0.05                  | 0.1, 0.25, 0.5, 1 | 200                                   | -                  | 10 to 100K      | 10 to 100K      | -                                   | 450           |
| CMF55                              | RN55      | 07              | 0.125                | 0.10                  | 0.1, 0.25, 0.5, 1 | 200                                   | 10 to 301K         | 49.9 to 100K    | 49.9 to 100K    | -                                   | 450           |
| CMF60                              | RN60      | 01              | 0.25                 | 0.125                 | 0.1, 0.25, 0.5, 1 | 300                                   | 10 to 1M           | 49.9 to 499K    | 49.9 to 499K    | -                                   | 500           |
| CMF65                              | RN65      | 02              | 0.50                 | 0.25                  | 0.1, 0.25, 0.5, 1 | 350                                   | 10 to 2M           | 49.9 to 1M      | 49.9 to 1M      | -                                   | 900           |
| CMF70                              | RN70      | 03              | 0.75 <sup>(2)</sup>  | 0.50                  | 0.1, 0.25, 0.5, 1 | 500                                   | 10 to 2.49M        | 24.9 to 1M      | 24.9 to 1M      | -                                   | 900           |
| CMF07                              | RL07      | 01              | 0.25                 | -                     | 2, 5              | 250                                   | -                  | -               | -               | 51 to 150K                          | 450           |
| CMF20                              | RL20      | 02              | 0.50                 | -                     | 2, 5              | 350                                   | -                  | -               | -               | 4.3 to 470K                         | 700           |

### Notes

<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.

| TECHNICAL SPECIFICATIONS    |       |   |
|-----------------------------|-------|---|
| PARAMETER                   | UNIT  | CONDITION   |
| Voltage Coefficient         | ppm/V | 5 when measured between 10 % and full rated voltage   |
| Insulation Resistance       | Ω     | ≥ 10 <sup>10</sup> min. dry; ≥ 10 <sup>8</sup> 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 |



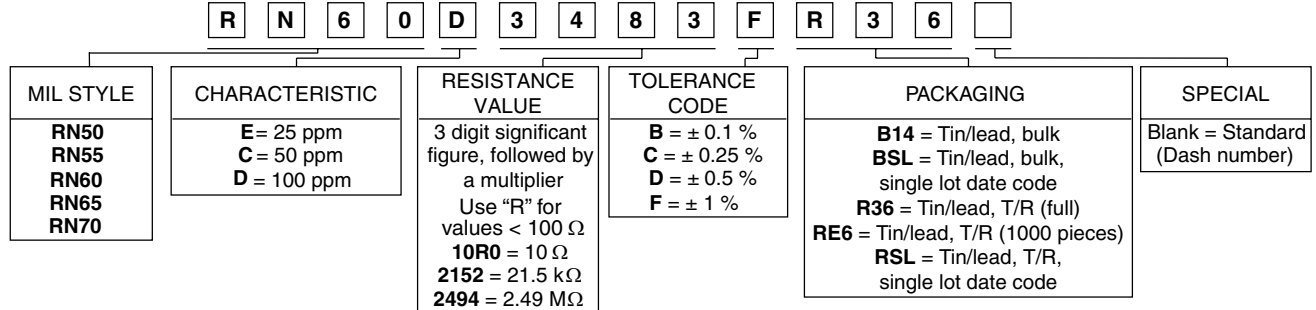
# CMF (Military RN and RL)

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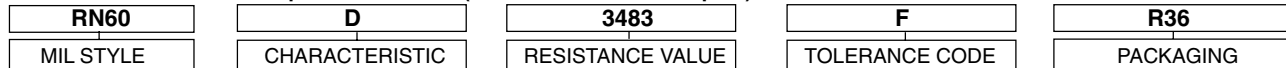
Vishay Dale

## GLOBAL PART NUMBER INFORMATION

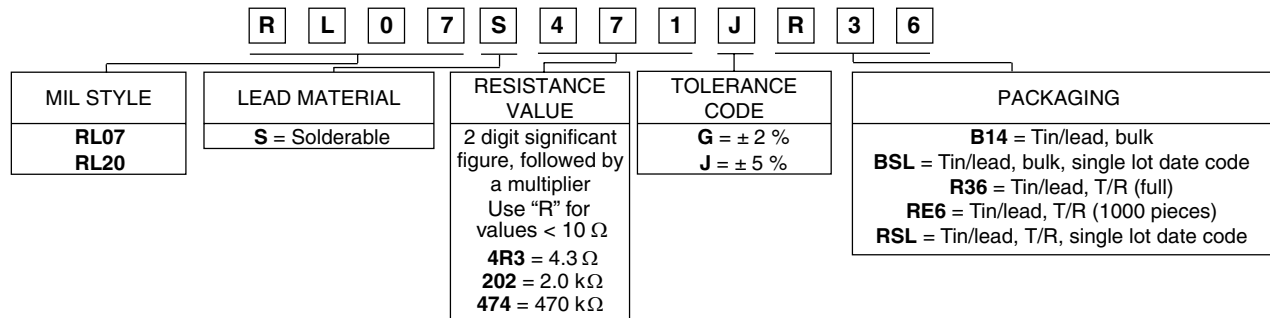
New Global Part Numbering: RN60D3483FR36 (preferred part numbering format)



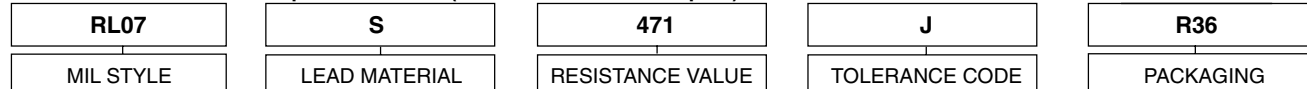
Historical Part Number example: RN60D3483F (will continue to be accepted)



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



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



## 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.

**CAGE CODE: 91637**

## 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.  |

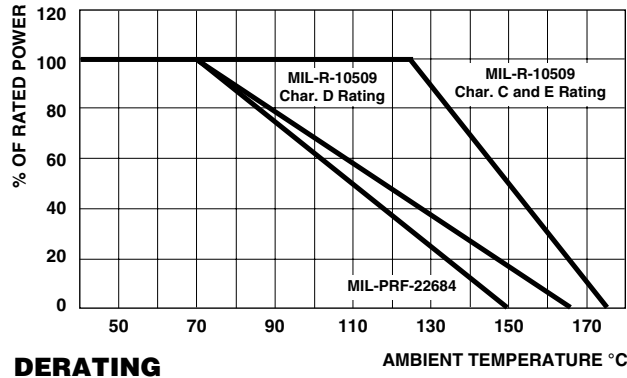
# CMF (Military RN and RL)



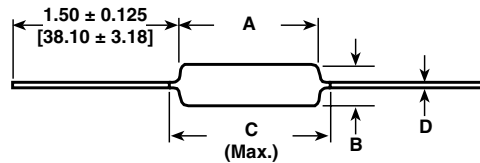
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Vishay Dale CMF resistors have an operating temperature range of - 65 °C to + 175 °C. They must be derated according to the following curves:



## DIMENSIONS in inches (millimeters)



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

### Note

<sup>(1)</sup> 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<br>(D)  | AT + 125 °C<br>(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 <sup>(1)</sup>   | RN70               | -                        | -             |

### Notes

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

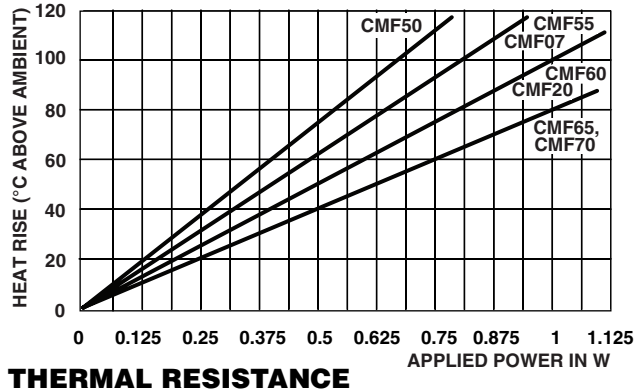
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| MARKING   |                                       |
|---|---------------------------------------|
| Characteristics: D = 100 ppm, C = 50 ppm, E = 25 ppm<br>Tolerance: F = 1 %, D = 0.5 %, C = 0.25 %, B = 0.1 %<br>Value = three significant figures and multiplier<br>J = JAN (joint Army - Navy) brand |                                       |
| RN50: (3 lines)   | RN55, RN60, RN65, RN70 (4 lines)      |
| J50D JAN, type, characteristic  | DALE Company logo                     |
| 1211 Value  | 0137J 4 digit date code and JAN brand |
| F137 Tolerance and 3 digit date code  | 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             |
| <b>TEST</b>                                    | <b>MIL<sub>max</sub></b>  | <b>MIL<sub>max</sub></b> | <b>MIL<sub>max</sub></b> | <b>MIL<sub>max</sub></b> |
| 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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