

Bulk Metal® Foil Technology RNC90Y and RNC90Z (Z-Foil) to MIL-PRF-55182/9



INTRODUCTION

Military Established Reliability resistors from Vishay Foil Resistors are available in resistance values from 4.99 Ω through 121 k Ω and for tolerances from $\pm 0.005\%$ to $\pm 1.0\%$. The same resistors are also available as a non-qualified product for customers desiring higher or lower resistance values and the same or better performance capabilities. (See table 2) Both the qualified and the non-qualified version are manufactured on the same production line facilities and are subjected to the same process, lot control, conditioning, and GRP A (100 %) screening. Qualified versions receive additional MIL Group B and C testing.

FEATURES

- QPL product with established reliability (ER): meets requirements of MIL-PRF-55182/9
- Load life stability: $\pm 0.005\%$ for 2000 h, 0.3 W at + 125 °C
- Temperature coefficient of resistance (TCR): ± 2 ppm/°C max. (- 55 °C to + 175 °C)
- Resistance tolerance: to $\pm 0.005\%$
- Thermal EMF: < 0.1 μ V/°C
- Qualified resistance range: 4.99 Ω to 121 k Ω (RNC90Y)
30.1 Ω to 121 k Ω (RNC90Z)
- Specially conditioned non-QPL resistors available
See data sheet "Improved Performance Tested"
- Fast thermal stabilization
- Rise time: 1 ns without ringing
- Special coatings that provide a cushioning layer which isolates the resistive element from external stresses and moisture
- Electrostatic discharge (ESD) above 25 000 V
- Non inductive, non capacitive design
- Current noise < - 42 dB
- Prototype sample available from 72 h

TABLE 1 - SPECIFICATIONS COMPARISON

| SPECIFICATION | RNC90Y (QUALIFIED) MIL-PRF-55182/9 CHARACTERISTIC Y LIMITS | RNC90Z (QUALIFIED) MIL-PRF-55182/9 CHARACTERISTIC Z LIMITS | S555 (NON-QUALIFIED) VFR PERFORMANCE LIMITS | Z555 (NON-QUALIFIED) VFR PERFORMANCE LIMITS |
|--|--|---|---|---|
| Temperature Coefficient of Resistance | ± 5 ppm/°C (- 55 °C to + 125 °C) ± 10 ppm/°C (+ 125 °C to + 175 °C) | ± 2 ppm/°C (- 55 °C to + 175 °C) | ± 5 ppm/°C (- 55 °C to + 125 °C) | ± 3 ppm/°C ± 2.5 ppm/°C ± 2 ppm/°C (- 55 °C to + 125 °C) |
| Resistance Range | 4.99 Ω to 121 k Ω | 30.1 Ω to 121 k Ω | 1 Ω to 150 k Ω | 4.99 Ω to 25 Ω > 25 Ω to 80 Ω > 80 Ω |
| Failure Rate | Level R | Level R | Not specified | Not specified |
| Load-Life Stability 0.3 W at + 125 °C at 2000 h at 10 000 h | $\pm 0.05\%$ maximum ΔR $\pm 0.5\%$ maximum ΔR | $\pm 0.05\%$ maximum ΔR $\pm 0.5\%$ maximum ΔR | $\pm 0.015\%$ maximum ΔR^2 $\pm 0.05\%$ maximum ΔR^2 | $\pm 0.015\%$ maximum ΔR^2 $\pm 0.05\%$ maximum ΔR^2 |
| Current Noise | Not specified | Not specified | - 40 dB minimum | - 40 dB minimum |
| High-Frequency Operation Rise Time Inductance ³⁾ (L) Capacitance (C) | Not specified Not specified Not specified | Not specified Not specified Not specified | 1.0 ns at 1 k Ω 0.1 μ H maximum 0.08 μ H typical 1.0 pF maximum 0.5 pF typical | 1.0 ns at 1 k Ω 0.1 μ H maximum 0.08 μ H typical 1.0 pF maximum 0.5 pF typical |
| Voltage Coefficient | 0.0005 %/V | 0.0005 %/V | 0.0001 %/V | 0.0001 %/V |
| Working Voltage ⁴⁾ | 300 V maximum | 300 V maximum | 300 V maximum | 300 V maximum |
| Thermal EMF ⁵⁾ | Not specified | Not specified | 0.1 μ V/°C maximum 1 μ V/W maximum | 0.1 μ V/°C maximum 1 μ V/W maximum |

Notes

1. Qualification and failure rate verification test data is maintained by Vishay Foil and is available upon request. Lot traceability and identification data is maintained by Vishay Foil for 7 years.
2. Load life ΔR Maximum can be reduced by 80 % through Enhanced Reliability Testing (ERT). Consult our Applications Engineering for details.
3. Inductance (L) due mainly to the leads.
4. Not to exceed power rating of resistor.
5. μ V/°C relates to EMF due to lead temperature differences and μ V/W due to power applied to the resistor.
6. 0.200" (5.08 mm) lead spacing available - specify RNC90T for RNC90Y, and RNC90S for RNC90Z.

FIGURE 1 - COMPARISON OF RNC90Y TO RNC90Z TEMPERATURE COEFFICIENT OF RESISTANCE

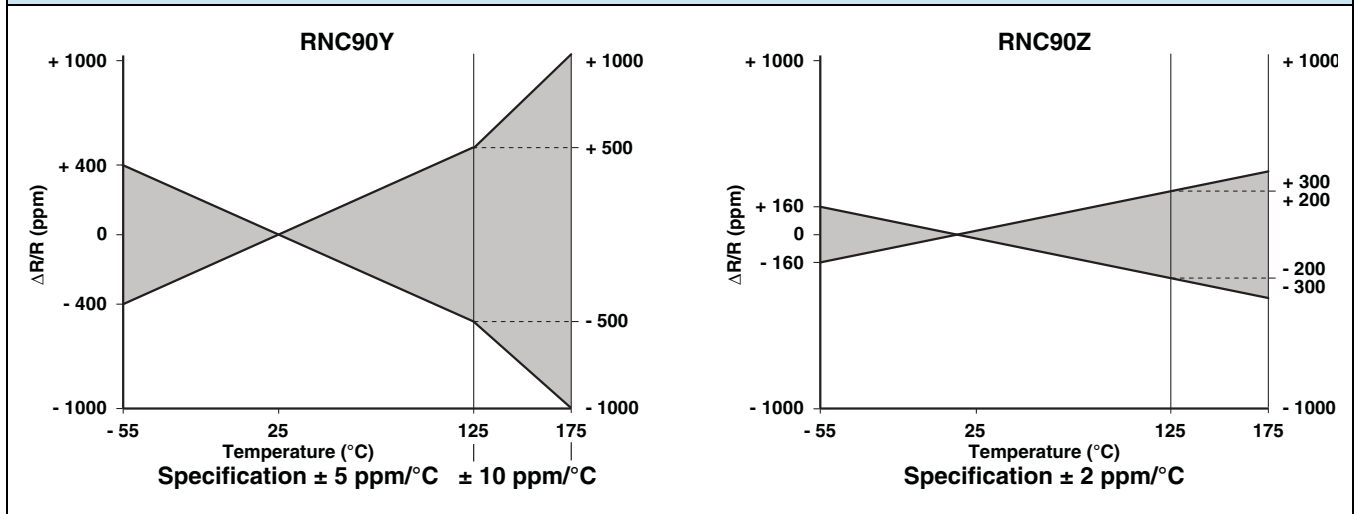


FIGURE 2 - TRIMMING TO VALUES
 (Conceptual Illustration)

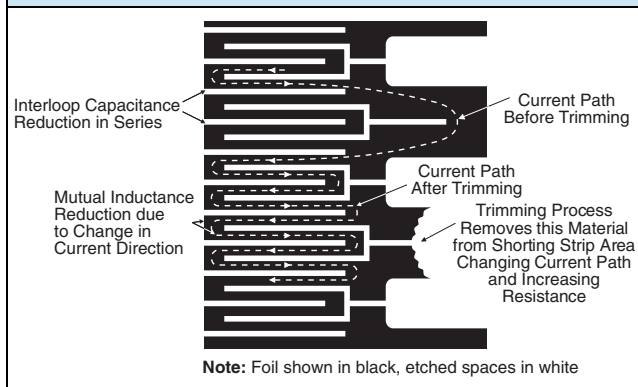


FIGURE 3 - POWER DERATING CURVE

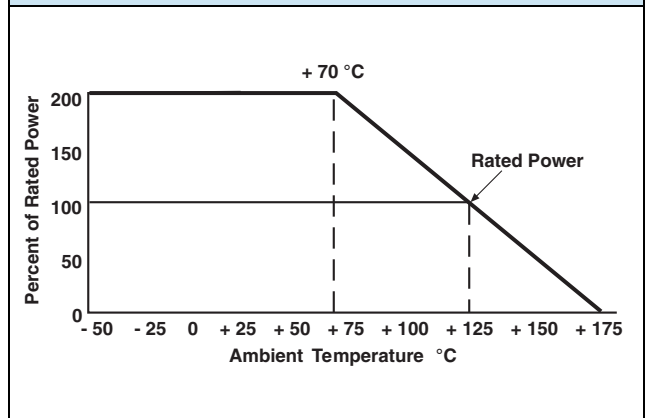


FIGURE 4 - IMPRINTING AND DIMENSIONS

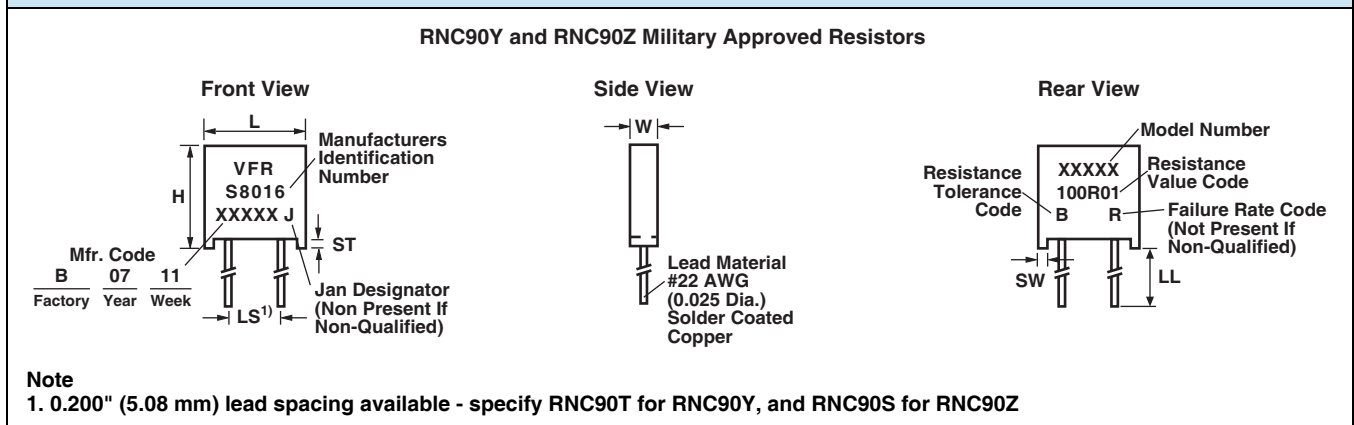


TABLE 2 - MODEL SELECTION

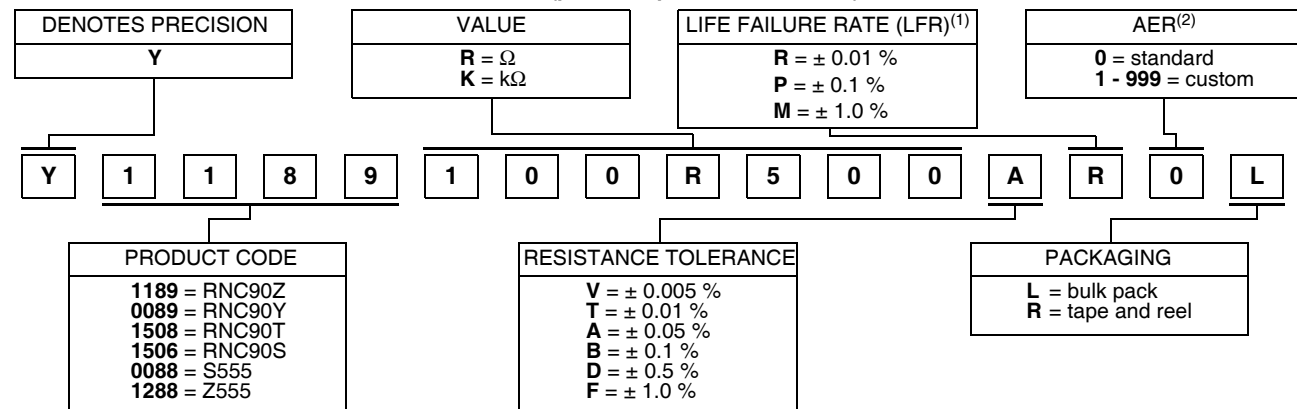
| MODEL NUMBER | RESISTANCE RANGE (Ω) | STANDARD RESISTANCE TOLERANCE | | FAILURE RATE | AMBIENT POWER RATING | | AVERAGE WEIGHT (g) | DIMENSIONS | |
|-------------------|---|-------------------------------|-------------------------|--------------------------|----------------------|-------------|--------------------|--|---|
| | | TIGHTEST % | LOOSEST % | | at + 70 °C | at + 125 °C | | INCHES | mm |
| RNC90Y | 30.1 to 121K 16.2 to 30.0 4.99 to 16.0 | ± 0.005 ± 0.05 ± 0.1 | ± 1.0 ± 1.0 ± 1.0 | M, P, R (See Table 3) | 0.6 W | 0.3 W | 0.6 | W: 0.105 ± 0.010 L: 0.300 ± 0.010 H: 0.326 ± 0.010 ST: 0.015 ± 0.005 SW: 0.040 ± 0.005 LL: 1.000 ± 0.125 LS: 0.150 ± 0.005 | 2.67 ± 0.25 7.62 ± 0.25 8.28 ± 0.25 0.38 ± 0.13 1.02 ± 0.13 25.4 ± 3.18 3.81 ± 0.13 |
| RNC90Z | 30.1 to 121K | ± 0.005 | ± 1.0 | | 0.6 W | 0.3 W | | | |
| S555 (NON QPL) | 30.1 to 121K | ± 0.005 | ± 1.0 | - | 0.6 W | 0.3 W | 0.6 | | |
| | 20 to < 30.1 | ± 0.01 | ± 1.0 | | | | | | |
| | 5 to < 20 | ± 0.05 | ± 1.0 | | | | | | |
| | 2 to < 5 | ± 0.1 | ± 1.0 | | | | | | |
| 1 to < 2 | ± 0.5 | ± 1.0 | | | | | | | |
| Z555 (NON QPL) | 30.1 to 121K 20 to < 30.1 4.99 to < 20R | ± 0.005 ± 0.01 ± 0.05 | ± 1.0 ± 1.0 ± 1.0 | - | 0.6 W | 0.3 W | 0.6 | | |

Note

- S555 and Z555 units are manufactured on the same production line facilities and are subjected to all the same process and lot control requirements imposed on RNC90Y (Z) version, as well as all of the special screening, environmental conditioning and documentation stipulations outlined in MIL-PRF 55182/9

TABLE 3 - GLOBAL PART NUMBER INFORMATION

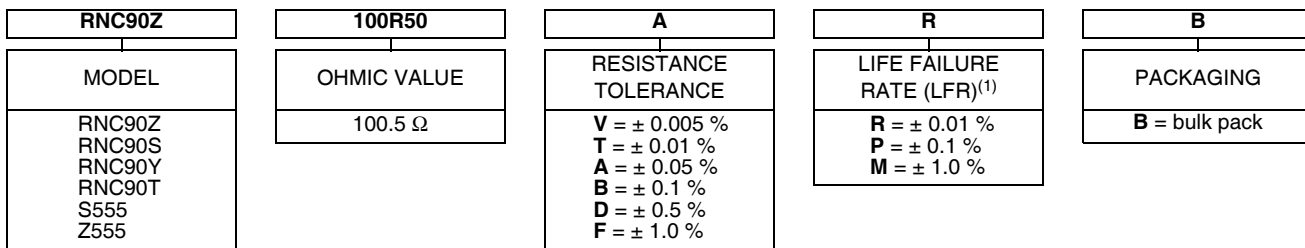
NEW GLOBAL PART NUMBER: Y1189100R50AR0L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1189 100R50 A R 0 L:

TYPE: RNC90Z
VALUE: 100.5 Ω
ABSOLUTE TOLERANCE: ± 0.05 %
LIFE FAILURE RATE (LFR): ± 0.01 %
AER: standard
PACKAGING: bulk pack

HISTORICAL PART NUMBER: RNC90Z 100R50 A R B (will continue to be used)



Note

- ⁽¹⁾ Applicable only for QPL part. For S555 and Z555 please assign "0" instead.
- ⁽²⁾ For non-standard requests, please contact application engineering.

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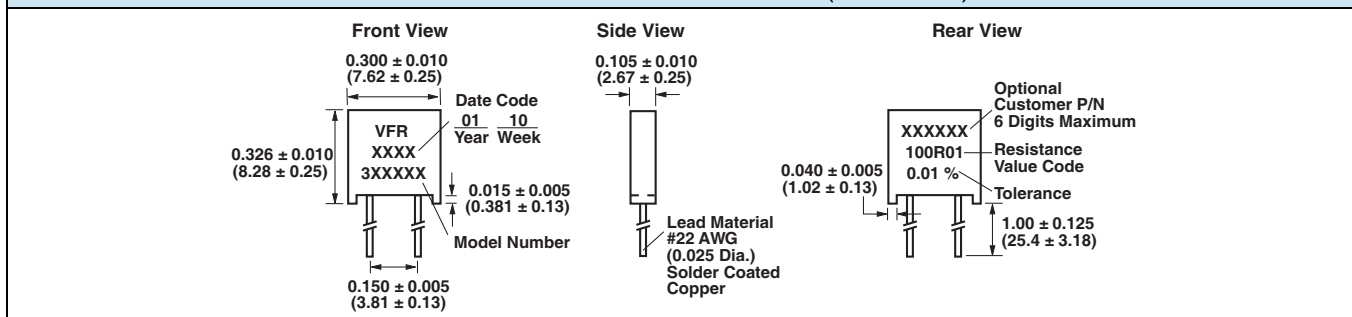
“Commercial and Government Entity”
Formerly “FSCM”

The response of military and non military grade resistors to environmental stresses can be made better by “Improved Performance Testing” (IPT). The IPT part will see burn-in and cycling that removes the “knee” from the normal drift of non IPT parts. (See Table 4 for the improvement to expect in military parts when calling for VFR recommended screening). Users should be aware that IPT testing renders the part non QPL and so a 3XXXXX part number will be assigned by VFR. Consult Applications Engineering for details and ordering advice.

TABLE 4 - IMPROVED PERFORMANCE TESTING (NON-QPL APPROVED) VS. QPL

| TEST GROUP | TEST | RNC90Y MIL-PRF-55182/9 | | VISHAY FOIL RESISTORS IMPROVED PERFORMANCE TESTING (IPT) LIMITS |
|------------|--|---------------------------|-------------------------|---|
| | | METHOD PARAGRAPH | LIMITS | |
| I | Power Conditioning | not done | - | ± 0.0025 % |
| | Thermal Shock and | 4.8.2 | - | ± 0.0025 % |
| | Overload Combined | 4.8.3 | ± 0.05 % | ± 0.0025 % |
| II | Resistance Temperature Characteristic | 4.8.9 | ± 5 ppm/°C | < ± 2 ppm/°C (- 55 °C to + 125 °C) (Can be sorted for tighter tracking) |
| | Low Temperature Storage | 4.8.23 | ± 0.05 % | ± 0.0025 % |
| | Low Temperature Operation | 4.8.10 | ± 0.05 % | ± 0.0025 % |
| | Terminal Strength | 4.8.11 | ± 0.02 % | ± 0.001 % |
| III | DWV | 4.8.12 | ± 0.02 % | ± 0.001 % |
| | Insulation Resistance | 4.8.13 | 10 ⁴ MΩ | > 10 ⁴ MΩ |
| | Resistance to Soldering Heat | 4.8.14 | ± 0.02 % | ± 0.001 % |
| | Moisture Resistance | 4.8.15 | ± 0.05 % | ± 0.015 % |
| IV | Shock | 4.8.16 | ± 0.01 % | ± 0.0025 % |
| | Vibration | 4.8.17 | ± 0.02 % | ± 0.0025 % |
| V | Load Life at + 125 °C; 2000 h | 4.8.18 | ± 0.05 % | ± 0.005 % (50 ppm) |
| | Load Life at + 125 °C; 10 000 h | 4.8.18 | ± 0.5 % | ± 0.015 % (150 ppm) |
| V (a) | + 85 °C Power Rating | - | - | ± 0.005 % (50 ppm) |
| | + 70 °C Power Rating | 4.8.18 | ± 0.05 % | ± 0.005 % (50 ppm) |
| V (b) | + 25 °C Power Rating | - | - | ± 0.005 % (50 ppm) |
| VI | Storage Life | - | - | ± 0.0025 % |
| VII | High Temperature Exposure | 4.8.19 | ± 0.5 % | ± 0.005 % |
| VIII | Max. Allowance Reactance | - | - | < 1 % |
| | Current Noise | - | - | < - 42 dB |
| | Voltage Coefficient | 4.8.20 | 0.0005 %/V (5 ppm/V) | < 0.00001 %/V (< 0.1 ppm/V) |
| | Thermal EMF | - | - | 0.1 μV/°C |

FIGURE 5 - IPT IMPRINTING AND DIMENSIONS in inches (millimeters)



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