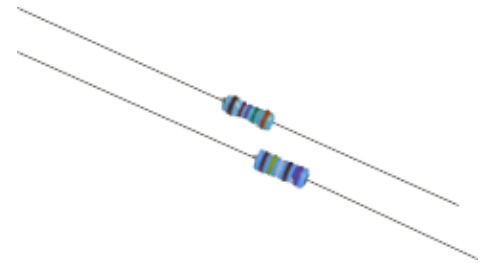


Features:

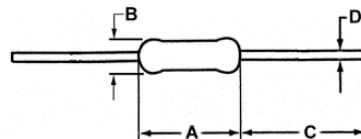
- Precision metal film
- Superior electrical, TCR performances
- Flame-retardant coatings are standard
- Panasert available selected sizes (contact Stackpole)
- RNMF (mini) an ideal choice where size constraints apply
- RNF 5% replaces MP series
- Lower or higher resistance values may be possible (contact Stackpole)
- RoHS compliant, lead free and halogen free



| Electrical Specifications | | | | | | | | | | | |
|---------------------------|---------|-------------------------|---|---------------------------------|-------------------------------|-------------------------------|-------------|------------|-------------|-------------|----|
| Type / Code | Mil Ref | Power Rating (W) @ 70°C | Maximum Working Voltage (Vrms) ⁽¹⁾ | Maximum Overload Voltage (Vrms) | TCR (ppm/°C) | Ohmic Range (Ω) and Tolerance | | | | | |
| | | | | | | 0.05% | 0.1% | 0.25% | 0.5% | 1% | 2% |
| RNF18 | RN 50 | 0.125 | 200 | 400 | ± 25 ± 50 ± 100 | 100 - 100K | 100 - 100K | 100 - 100K | 30.1 - 499K | 49.9 - 499K | - |
| | | | | | | | 51.1 - 100K | | 10 - 1M | 1 - 1M | |
| RNMF14 | - | 0.25 | 200 | 400 | ± 25 ± 50 ± 100 | - | 100 - 100K | - | 30.1 - 499K | 30.1 - 499K | - |
| | | | | | | | | | 10 - 1M | 1 - 1M | |
| RNF14 | RN 55 | 0.25 | 250 | 500 | ± 10 ± 25 ± 50 ± 100 | 100 - 100K | 100 - 100K | - | | - | - |
| | | | | | | | 1 - 2.2M | | 10 - 1M | | |
| RNMF12 | RL 07 | 0.5 | 350 | 600 | ± 25 ± 50 ± 100 | - | 30.1 - 294K | 49.9 - 1M | | - | - |
| | | | | | | | 30.1 - 1M | 10 - 1M | 1 - 1M | | |
| RNF12 | RN 60 | 0.5 | 350 | 700 | ± 25 ± 50 ± 100 | 100 - 100K | 49.9 - 499K | | - | - | - |
| | | | | | | | 10 - 1M | 1 - 4.99M | | | |
| RNF1 | RN 65 | 1 | 350 | 700 | ± 25 ± 50 ± 100 | - | - | | - | - | - |
| | | | | | | | 10 - 1M | 10 - 470K | | | |
| RNF2 | - | 2 | 350 | 800 | ± 25 ± 50 ± 100 | - | - | | - | - | - |
| | | | | | | | - | | | | |

(1) Lesser of $\sqrt{P \cdot R}$ or maximum working voltage

Mechanical Specifications



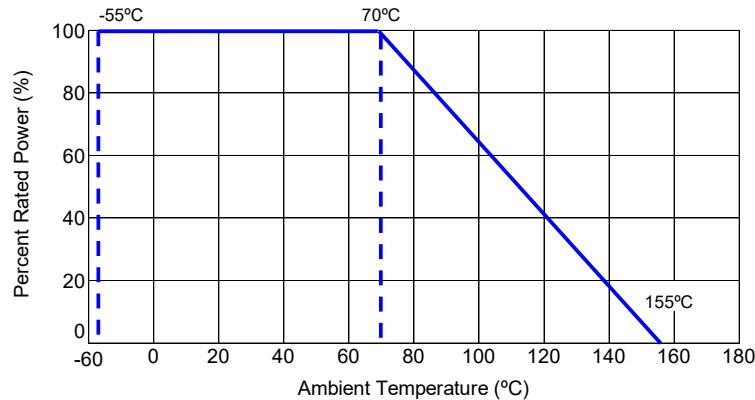
| Type / Code | A Body Length | B Body Diameter | C Lead Length (Bulk) | D Lead Diameter | Unit |
|-------------|------------------|--------------------|-------------------------|--------------------|--------|
| RNF18 | 0.130 ± 0.012 | 0.071 ± 0.012 | 1.102 ± 0.118 | 0.018 ± 0.003 | inches |
| | 3.30 ± 0.30 | 1.80 ± 0.30 | 28.00 ± 3.00 | 0.45 ± 0.07 | mm |
| RNMF14 | 0.130 ± 0.012 | 0.070 ± 0.003 | 1.102 ± 0.118 | 0.017 ± 0.002 | inches |
| | 3.30 ± 0.30 | 1.78 ± 0.08 | 28.00 ± 3.00 | 0.44 ± 0.05 | mm |
| RNF14 | 0.250 ± 0.026 | 0.093 ± 0.010 | 1.102 ± 0.118 | 0.022 ± 0.003 | inches |
| | 6.35 ± 0.65 | 2.35 ± 0.25 | 28.00 ± 3.00 | 0.56 ± 0.08 | mm |
| RNMF12 | 0.250 ± 0.026 | 0.093 ± 0.010 | 1.102 ± 0.118 | 0.022 ± 0.003 | inches |
| | 6.35 ± 0.65 | 2.35 ± 0.25 | 28.00 ± 3.00 | 0.56 ± 0.08 | mm |
| RNF12 | 0.344 ± 0.030 | 0.108 ± 0.039 | 1.102 ± 0.197 | 0.026 ± 0.004 | inches |
| | 8.75 ± 0.75 | 2.75 ± 1.00 | 28.00 ± 5.00 | 0.65 ± 0.10 | mm |

| Mechanical Specifications (cont.) | | | | | |
|-----------------------------------|------------------|--------------------|-------------------------|--------------------|--------|
| Type / Code | A Body Length | B Body Diameter | C Lead Length (Bulk) | D Lead Diameter | Unit |
| RNF1 (< 10Ω) | 0.453 ± 0.039 | 0.177 ± 0.020 | 1.378 ± 0.079 | 0.031 ± 0.001 | inches |
| | 11.50 ± 1.00 | 4.50 ± 0.50 | 35.00 ± 2.00 | 0.78 ± 0.03 | mm |
| RNF1 (≥ 10Ω) | 0.433 ± 0.039 | 0.177 ± 0.020 | 1.181 ± 0.118 | 0.030 ± 0.002 | inches |
| | 11.00 ± 1.00 | 4.50 ± 0.50 | 30.00 ± 3.00 | 0.75 ± 0.05 | mm |
| RNF2 | 0.591 ± 0.039 | 0.197 ± 0.020 | 1.339 ± 0.157 | 0.028 ± 0.004 | inches |
| | 15.00 ± 1.00 | 5.00 ± 0.50 | 34.00 ± 4.00 | 0.70 ± 0.10 | mm |

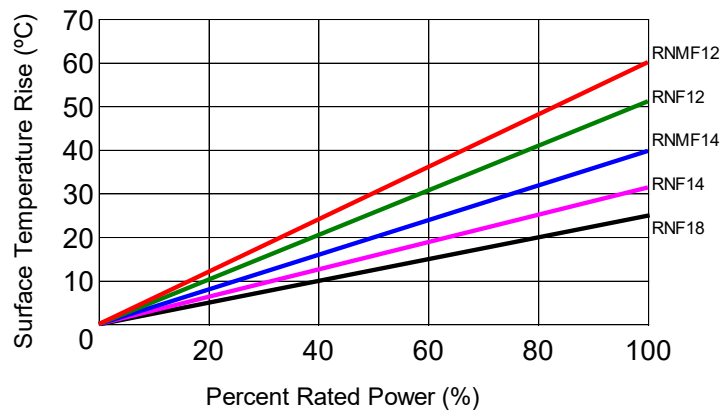
| Performance Characteristics | | | |
|-----------------------------|---------------------------------|---|--|
| Test | Test Method | Typical Results | Test Limits |
| Insulation Resistance | JIS C5201-1, IEC60115-1, 4.6 | ≥ 1000M Ω | ≥ 1000M Ω |
| Voltage Proof / DWV | | RNF16 / RNMF14: 300 RNF14 / RNMF12: 500 RNF12 / RNF1: 700 | ≤ ± (0.5% + 0.05Ω) No mechanical damage |
| Short Time Overload | JIS C5201-1, IEC60115-1, 4.13 | < ± 0.1% | ≤ ± (0.25% + 0.05Ω) |
| Resistance to Solder Heat | JIS C5201-1, IEC60115-1, 4.18 | < ± 0.1% | ≤ ± (0.3% + 0.05Ω) |
| Rapid Change of Temperature | JIS C5201-1, IEC60115-1, 4.19 | < ± 0.05% | ≤ ± (0.35% + 0.05Ω) |
| Endurance at 70°C | JIS C5201-1, IEC60115-1, 4.25.1 | < ± 0.15% | ≤ ± (1.0% + 0.05Ω) |
| Robustness of Terminations | JIS C5201-1, IEC60115-1, 4.16 | < ± 0.10% | ≤ ± (0.2% + 0.05Ω) |
| Damp Heat (Steady state) | JIS C5201-1, IEC60115-1, 4.24 | < ± 0.10% | ≤ ± (1.5% + 0.05Ω) |

Operating temperature range is -55°C to +155°C

Power Derating Curve:



Surface Temperature Rise:



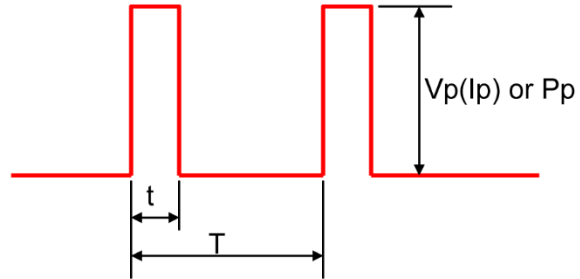
Repetitive Pulse Information:

If repetitive pulses are applied to resistors, pulse wave form must be less than “pulse limiting voltage”, “pulse limiting current” or “pulse limiting wattage” calculated by the formula below.

$$V_p = K\sqrt{P \times R \times T/t}$$

$$I_p = K\sqrt{P/R \times T/t}$$

$$P_p = K^2 \times P \times T/t$$

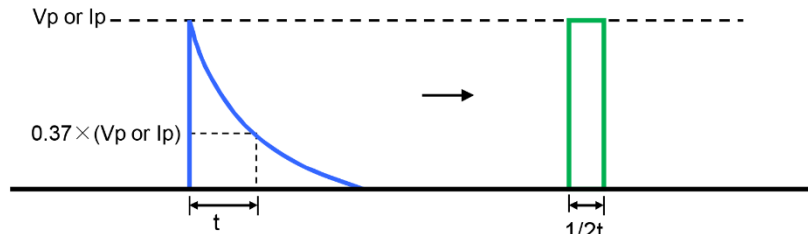


- Where: Vp: Pulse limiting voltage (V)
 Ip: Pulse limiting current (A)
 Pp: Pulse limiting wattage (W)
 P: Power rating (W)
 R: Nominal resistance (ohm)
 T: Repetitive period (sec)
 t: Pulse duration (sec)
 K: RNF / RNMF Coefficient: 0.7
 [Vr: Rated Voltage (V), Ir: Rated Current (A)]

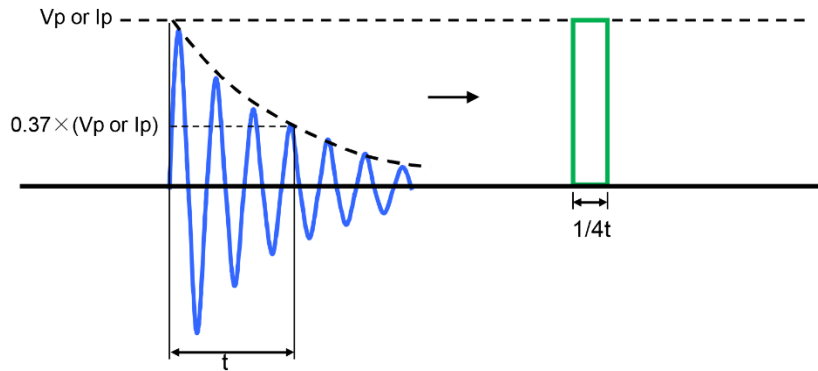
- Note 1: If $T > 10 \rightarrow T = 10$ (sec), $T / t > 1000 \rightarrow T / t = 1000$
 Note 2: If $T > 10$ and $T / t > 1000$, “Pulse Limiting power (Single pulse) is applied
 Note 3: If $V_p < V_r$ ($I_p < I_r$ or $P_p < P$), V_r (I_r , P) is V_p (I_p , P_p)
 Note 4: Pulse limiting voltage (current, wattage) is applied at less than rated ambient temperature.
 If ambient temperature is more than the rated temperature (70 °C), decrease power rating according to “Power Derating Curve”
 Note 5: Assure sufficient margin for use period and conditions for “pulse limiting voltage”
 Note 6: If the pulse waveform is not square wave, judge after transform the waveform into square wave according to the “Waveform Transformation to Square Wave”.

Waveform Transformation to Square Wave

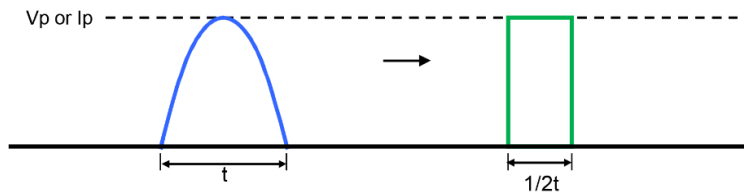
1. Discharge curve wave with time constant "t" → Square wave



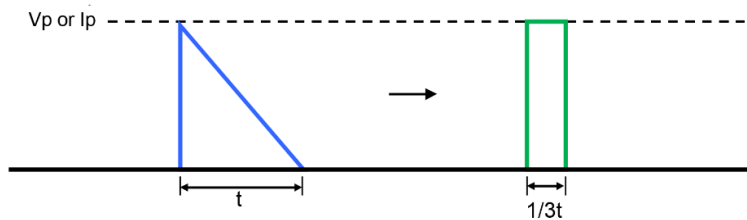
2. Damping oscillation wave with time constant of envelope "t" → Square wave



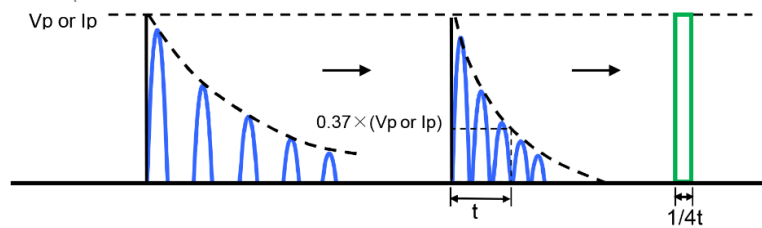
3.
 4.
 5. Half-wave rectification wave → Square wave



6. Triangular wave → Square wave



7. Special wave → Square wave



Recommended Solder Profile

This information is intended as a reference for solder profiles for Stackpole resistive components. These profiles should be compatible with most soldering processes. These are only recommendations. Actual numbers will depend on board density, geometry, packages used, etc., especially those cells labeled with “*”.

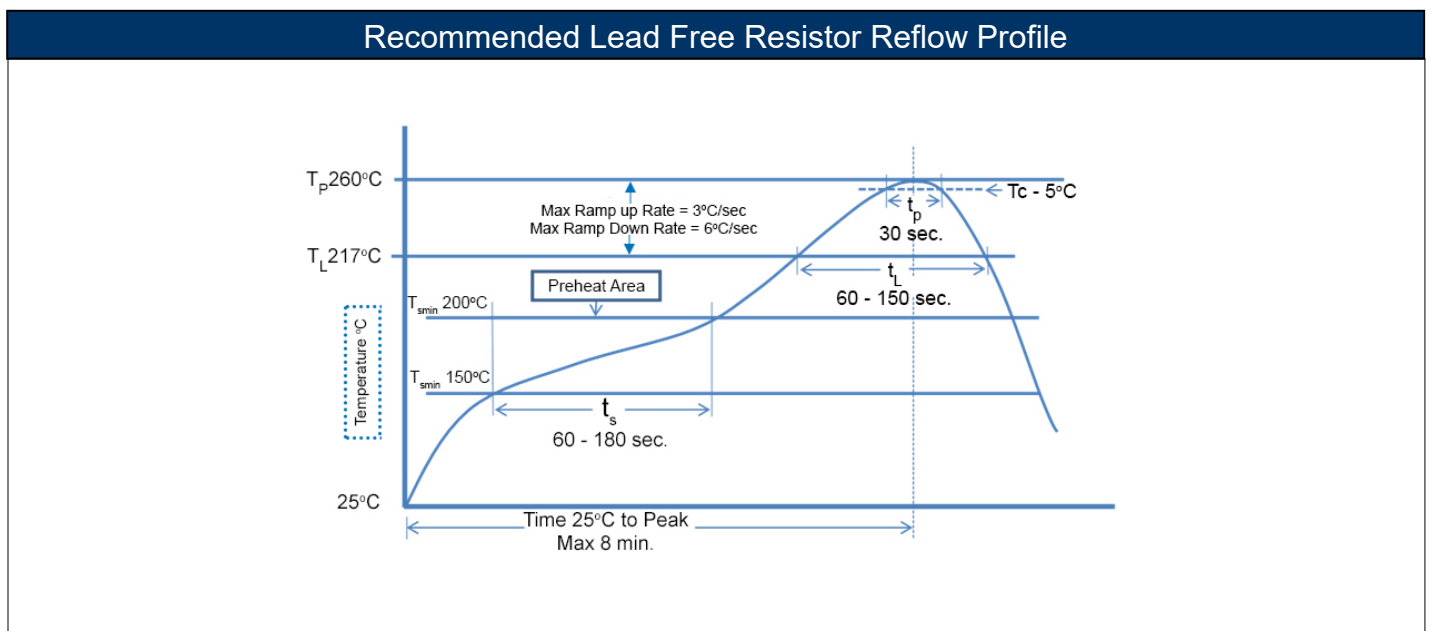
100% Matte Tin / RoHS Compliant Terminations

Soldering iron recommended temperatures: 330°C to 350°C with minimum duration.
 Maximum number of reflow cycles: 3.

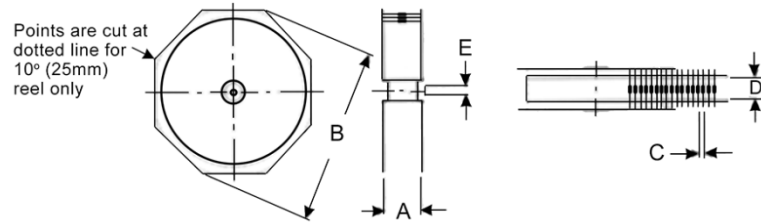
| Wave Soldering | | | |
|--------------------|------------|-------------|------------|
| Description | Maximum | Recommended | Minimum |
| Preheat Time | 80 seconds | 70 seconds | 60 seconds |
| Temperature Diff. | 140°C | 120°C | 100°C |
| Solder Temp. | 260°C | 250°C | 240°C |
| Dwell Time at Max. | 10 seconds | 5 seconds | * |
| Ramp DN (°C/sec) | N/A | N/A | N/A |

Temperature Diff. = Difference between final preheat stage and soldering stage.

| Convection IR Reflow | | | |
|----------------------|-------------|-------------|------------|
| Description | Maximum | Recommended | Minimum |
| Ramp Up (°C/sec) | 3°C/sec | 2°C/sec | * |
| Dwell Time > 217°C | 150 seconds | 90 seconds | 60 seconds |
| Solder Temp. | 260°C | 245°C | * |
| Dwell Time at Max. | 30 seconds | 15 seconds | 10 seconds |
| Ramp DN (°C/sec) | 6°C/sec | 3°C/sec | * |



Packaging Specifications



| Series | A max ⁽¹⁾ | B max | C | D ⁽²⁾ | Tape | Unit |
|--------|----------------------|----------------|---------------|------------------|-------|--------|
| RNF18 | 2.756 ± 0.118 | 11.811 ± 0.197 | 0.197 ± 0.020 | 2.047 ± 0.020 | 0.250 | inches |
| | 70.00 ± 3.00 | 300.00 ± 5.00 | 5.00 ± 0.50 | 52.00 ± 0.50 | 6.35 | mm |
| RNMF14 | 2.756 ± 0.118 | 11.811 ± 0.197 | 0.197 ± 0.020 | 2.047 ± 0.020 | 0.250 | inches |
| | 70.00 ± 3.00 | 300.00 ± 5.00 | 5.00 ± 0.50 | 52.00 ± 0.50 | 6.35 | mm |
| RNF14 | 2.756 ± 0.118 | 11.811 ± 0.197 | 0.197 ± 0.020 | 2.047 ± 0.020 | 0.250 | inches |
| | 70.00 ± 3.00 | 300.00 ± 5.00 | 5.00 ± 0.50 | 52.00 ± 0.50 | 6.35 | mm |
| RNMF12 | 2.756 ± 0.118 | 11.811 ± 0.197 | 0.197 ± 0.020 | 2.047 ± 0.020 | 0.250 | inches |
| | 70.00 ± 3.00 | 300.00 ± 5.00 | 5.00 ± 0.50 | 52.00 ± 0.50 | 6.35 | mm |
| RNF12 | 2.756 ± 0.118 | 11.811 ± 0.197 | 0.197 ± 0.020 | 2.047 ± 0.020 | 0.250 | inches |
| | 70.00 ± 3.00 | 300.00 ± 5.00 | 5.00 ± 0.50 | 52.00 ± 0.50 | 6.35 | mm |
| RNF1 | 2.756 ± 0.118 | 11.811 ± 0.197 | 0.197 ± 0.020 | 2.047 ± 0.020 | 0.250 | inches |
| | 70.00 ± 3.00 | 300.00 ± 5.00 | 5.00 ± 0.50 | 52.00 ± 0.50 | 6.35 | mm |
| RNF2 | 2.756 ± 0.118 | 11.811 ± 0.197 | 0.197 ± 0.020 | 2.047 ± 0.020 | 0.250 | inches |
| | 70.00 ± 3.00 | 300.00 ± 5.00 | 5.00 ± 0.50 | 52.00 ± 0.50 | 6.35 | mm |

Dimension "E": This is a non-critical dimension that does not have a tolerance in the standard.

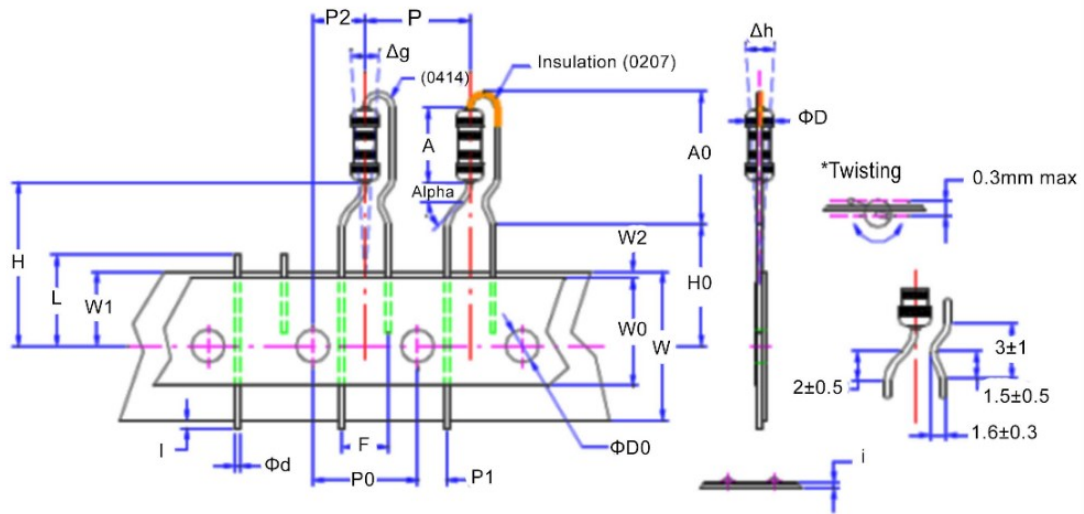
Range of diameters is from 0.547 inches (13.90 mm) to 1.500 inches (38.10 mm).

(1) Reference value only. The "A" dimension shall be governed by the overall length of the taped component.

The distance between flanges shall be 0.059 inches (1.50 mm) to 0.315 (8.00 mm) greater than the overall component.

(2) The given dimension "D" expresses the standard width spacing. A 26 mm narrow spacing is available as option "N" packaging code.

Packaging Specifications – Pana-Sert



| Symbol | Description | PRNF14 |
|--------|--------------------------|--|
| ØD | Body diameter | 0.102 max. 2.60 max. |
| A | Body length | 0.276 max. 7.00 max. |
| A0 | Mounting height | 0.492 max. 12.50 max. |
| Ød | Lead diameter | 0.020 ± 0.002 0.52 ± 0.05 |
| P | Component pitch | 0.500 ± 0.039 12.70 ± 1.00 |
| P0 | Feed hole pitch | 0.500 ± 0.012 12.70 ± 0.30 |
| P1 | Feed hole center to lead | 0.152 ± 0.020 3.85 ± 0.50 |
| P2 | Feed hole center to body | 0.250 ± 0.016 6.35 ± 0.40 |
| F | Lead-lead distance | 0.200 +0.024 / -0.008 5.08 +0.60 / -0.20 |
| Alpha | Performing angle | 45° max. |
| Δh | Component alignment | 0.000 ± 0.079 0.00 ± 2.00 |
| Δg | Component alignment | 0.000 ± 0.118 0.00 ± 3.00 |
| W | Tape width | 0.709 +0.039 / -0.031 18.00 +1.00 / -0.80 |
| W0 | Hold down tape width | 0.492 min. 12.50 min. |
| W1 | Hole position | 0.354 ± 0.020 9.00 ± 0.50 |
| W2 | Hold down tape position | 0.079 +0 / -0.059 2.00 +0 / -1.5 |
| H | Distance to tape center | 0.748 ± 0.039 19.00 ± 1.00 |
| H0 | Lead wire clinch height | 0.630 ± 0.020 16.00 ± 0.50 |

| Packaging Specifications – Pana-Sert (cont.) | | |
|--|------------------------|------------------------------|
| Symbol | Description | PRNF14 |
| I | Lead wire portrait | 0.039 max. 1.00 max. |
| ØD0 | Feed hole diameter | 0.157 ± 0.008 4.00 ± 0.20 |
| i | Total tape thickness | 0.028 max. 0.70 max. |
| L | Length of shipped lead | 0.433 max. 11.00 max. |

RoHS Compliance

Stackpole Electronics has joined the worldwide effort to reduce the amount of lead in electronic components and to meet the various regulatory requirements now prevalent, such as the European Union’s directive regarding “Restrictions on Hazardous Substances” (RoHS 2). As part of this ongoing program, we periodically update this document with the status regarding the availability of our compliant components. All our standard part numbers are compliant to EU Directive 2011/65/EU of the European Parliament.

| RoHS Compliance Status | | | | | | |
|-------------------------|---|----------------------------|--------------------------------|-----------------------------------|--|---------------------------------------|
| Standard Product Series | Description | Package / Termination Type | Standard Series RoHS Compliant | Lead-Free Termination Composition | Lead-Free Mfg. Effective Date (Std Product Series) | Lead-Free Effective Date Code (YY/WW) |
| RNF | General Purpose Metal Film Leaded Resistor | Axial | YES | 99.3/0.7 Sn/Cu 100% Matte Sn | Apr-05 (Japan) Jan-04 (Taiwan, China) | 05/14 04/01 |
| RNMF | General Purpose Mini Metal Film Leaded Resistor | Axial | YES | 99.3/0.7 Sn/Cu 100% Matte Sn | Apr-05 (Japan) Jan-04 (Taiwan, China) | 05/14 04/01 |

“Conflict Metals” Commitment

We at Stackpole Electronics, Inc. are joined with our industry in opposing the use of metals mined in the “conflict region” of the Eastern Democratic Republic of the Congo (DRC) in our products. Recognizing that the supply chain for metals used in the electronics industry is very complex, we work closely with our own suppliers to verify to the extent possible that the materials and products we supply do not contain metals sourced from this conflict region. As such, we are in compliance with the requirements of Dodd-Frank Act regarding Conflict Minerals.

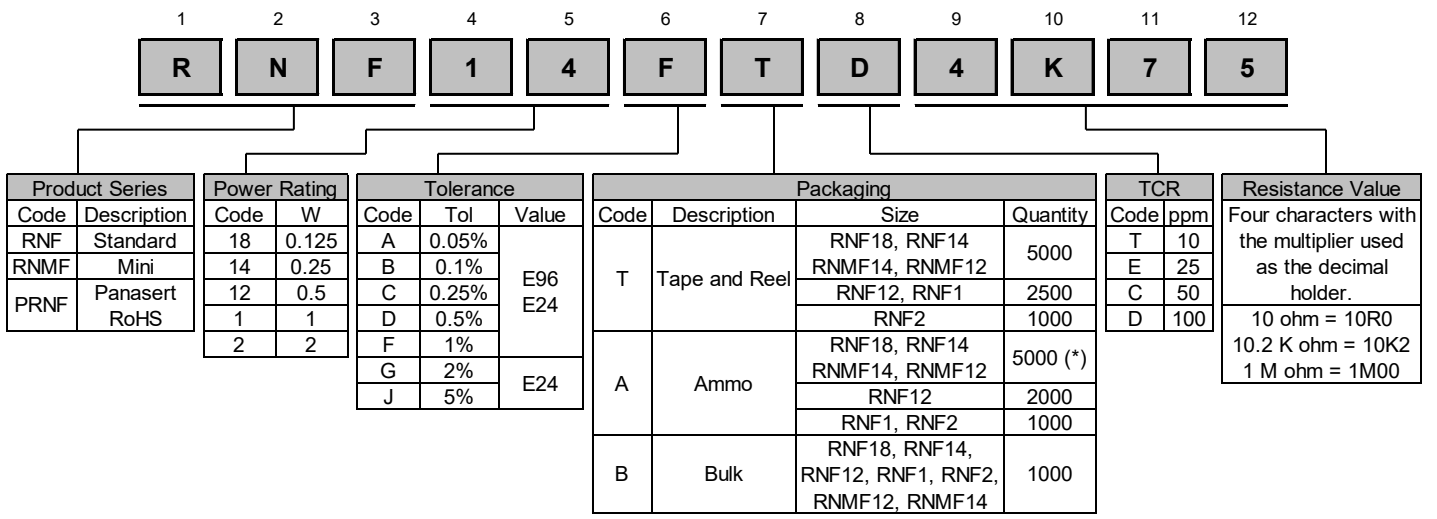
Compliance to “REACH”

We certify that all passive components supplied by Stackpole Electronics, Inc. are SVHC (Substances of Very High Concern) free and compliant with the requirements of EU Directive 1907/2006/EC, “The Registration, Evaluation, Authorization and Restriction of Chemicals”, otherwise referred to as REACH. Contact us for complete list of REACH Substance Candidate List.

Environmental Policy

It is the policy of Stackpole Electronics, Inc. (SEI) to protect the environment in all localities in which we operate. We continually strive to improve our effect on the environment. We observe all applicable laws and regulations regarding the protection of our environment and all requests related to the environment to which we have agreed. We are committed to the prevention of all forms of pollution.

How to Order



(*) Precision metal film resistors with tolerances <1% may be available in smaller quantities. Contact Stackpole for more details.