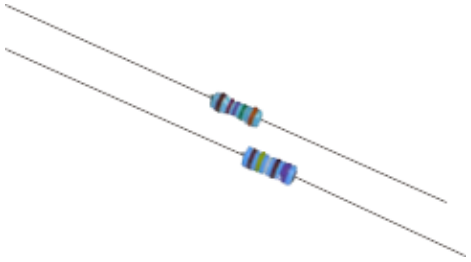


Features:

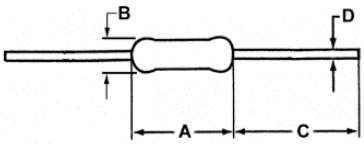
- Precision metal film
- Superior electrical, TCR performances
- Flame-retardant coatings are standard
- Panasert available selected sizes (contact Stackpole)
- RNMF (mini) an ideal choice where size constraints apply
- RNF 5% replaces MP series
- Lower or higher resistance values may be possible (contact Stackpole)
- 100% RoHS compliant and lead free without exemption
- Halogen free
- REACH compliant

Electrical Specifications

Type / Code	Mil Ref	Power Rating (W) @ 70ºC	Maximum Working Voltage (Vrms) (1)	Maximum Overload Voltage (Vrms)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance						
						0.05%	0.1%	0.25%	0.5%	1%	2%	5%
RNF18	RN 50	0.125	200	400	± 25 ± 50 ± 100	100 - 100K	100 - 100K 51.1 - 100K	100 - 100K	30.1 - 499K 10 - 1M	49.9 - 499K 1 - 1M 1 - 10M	- 1 - 22M	
RNMF14	-	0.25	200	400	± 25 ± 50 ± 100	-	100 - 100K		30.1 - 499K 10 - 1M	30.1 - 499K 1 - 1M 1 - 2.15M	- 1 - 2.2M	
RNF14	RN 55	0.25	250	500	± 10 ± 25 ± 50 ± 100	100 - 100K	100 - 100K 1 - 2.2M	-		10 - 1M 1 - 5.11M 1 - 10M	- 5.6 - 10M	- 1.1M - 10M 1 - 10M
RNMF12	RL 07	0.5	350	600	± 25 ± 50 ± 100	-	30.1 - 294K 30.1 - 1M		49.9 - 1M 10 - 1M	1 - 1M 1 - 10M	- 1 - 10M	
RNF12	RN 60	0.5	350	700	± 25 ± 50 ± 100	100 - 100K			49.9 - 499K 10 - 1M	1 - 4.99M 1 - 10M	- 1 - 10M	
RNF1	RN 65	1	350	700	± 25 ± 50 ± 100	-			- 10 - 1M	10 - 470K 1 - 1M	-	- 10 - 470K 1 - 1M
RNF2	-	2	350	800	± 25 ± 50 ± 100	-				- 10 - 1M	-	- 10 - 1M

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

Mechanical Specifications



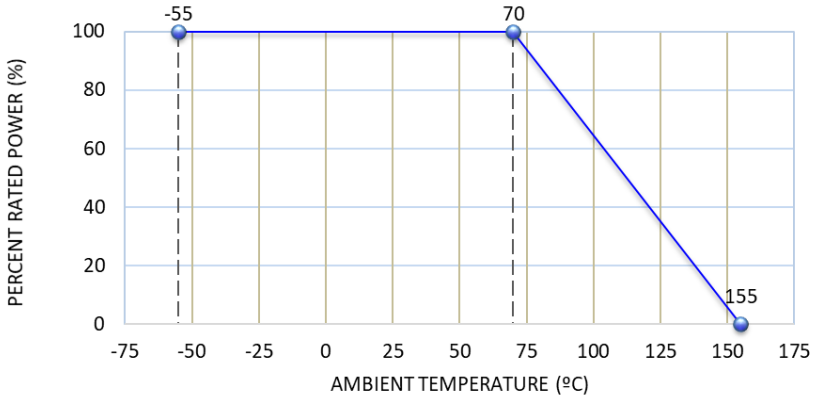
Type / Code	A Body Length	B Body Diameter	C Lead Length (Bulk)	D Lead Diameter	Unit
RNF18	0.130 ± 0.012 3.30 ± 0.30	0.071 ± 0.012 1.80 ± 0.30	1.102 ± 0.118 28.00 ± 3.00	0.018 ± 0.003 0.45 ± 0.07	inches mm
RNMF14	0.130 ± 0.012 3.30 ± 0.30	0.070 ± 0.003 1.78 ± 0.08	1.102 ± 0.118 28.00 ± 3.00	0.017 ± 0.002 0.44 ± 0.05	inches mm
RNF14	0.250 ± 0.026 6.35 ± 0.65	0.093 ± 0.010 2.35 ± 0.25	1.102 ± 0.118 28.00 ± 3.00	0.022 ± 0.003 0.56 ± 0.08	inches mm
RNMF12	0.250 ± 0.026 6.35 ± 0.65	0.093 ± 0.010 2.35 ± 0.25	1.102 ± 0.118 28.00 ± 3.00	0.022 ± 0.003 0.56 ± 0.08	inches mm
RNF12	0.344 ± 0.030 8.75 ± 0.75	0.108 ± 0.039 2.75 ± 1.00	1.102 ± 0.197 28.00 ± 5.00	0.026 ± 0.004 0.65 ± 0.10	inches 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 11.50 ± 1.00	0.177 ± 0.020 4.50 ± 0.50	1.378 ± 0.079 35.00 ± 2.00	0.031 ± 0.001 0.78 ± 0.03	inches mm
RNF1 (≥ 10Ω)	0.433 ± 0.039 11.00 ± 1.00	0.177 ± 0.020 4.50 ± 0.50	1.181 ± 0.118 30.00 ± 3.00	0.030 ± 0.002 0.75 ± 0.05	inches mm
RNF2	0.591 ± 0.039 15.00 ± 1.00	0.197 ± 0.020 5.00 ± 0.50	1.339 ± 0.157 34.00 ± 4.00	0.028 ± 0.004 0.70 ± 0.10	inches mm

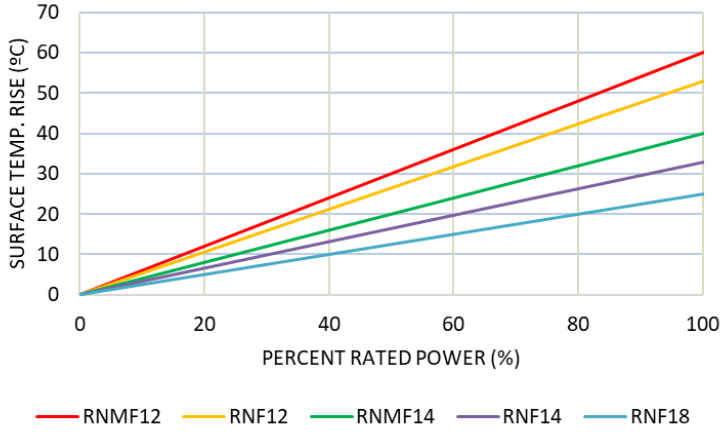
Performance Characteristics			
Test	Test Method	Typical Results	Test Limits
Insulation Resistance	JIS C5201-1, IEC60115-1, 4.6	≥ 1000M Ω	≥ 1000M Ω
Voltage Proof / DWV		RNF16 / RNMF14: 300 RNF14 / RNMF12: 500 RNF12 / RNF1: 700	≤ ± (0.5% + 0.05Ω) No mechanical damage
Short Time Overload	JIS C5201-1, IEC60115-1, 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 -55ºC to +155ºC

Power Derating Curve:



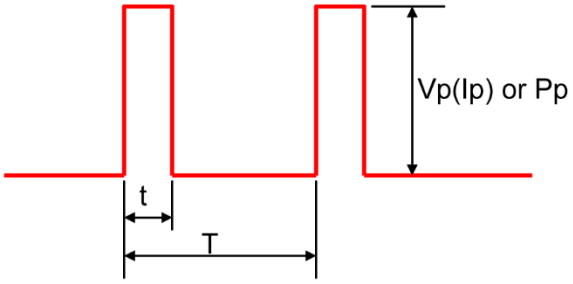
Surface Temperature Rise:



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.

$$Vp = K\sqrt{P \times R \times T/t}$$
$$Ip = K\sqrt{P/R \times T/t}$$
$$Pp = K^2 \times P \times T/t$$

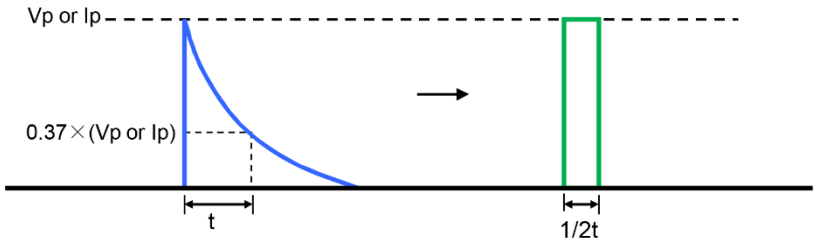


Where: Vp: Pulse limiting voltage (V)
Ip: Pulse limiting current (A)
Pp: Pulse limiting wattage (W)
P: Power rating (W)
R: Nominal resistance (ohm)
T: Repetitive period (sec)
t: Pulse duration (sec)
K: RNF / RNMF Coefficient: 0.7
[Vr: Rated Voltage (V), Ir: Rated Current (A)]

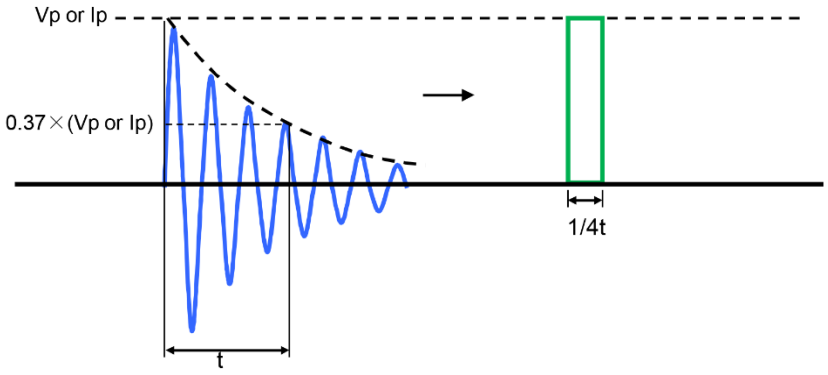
Note 1: If T > 10 → T = 10 (sec), T / t > 1000 → T / t = 1000
Note 2: If T > 10 and T / t > 1000, “Pulse Limiting power (Single pulse) is applied
Note 3: If Vp < Vr (Ip < Ir or Pp < P), Vr (Ir, P) is Vp (Ip, Pp)
Note 4: Pulse limiting voltage (current, wattage) is applied at less than rated ambient temperature. 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

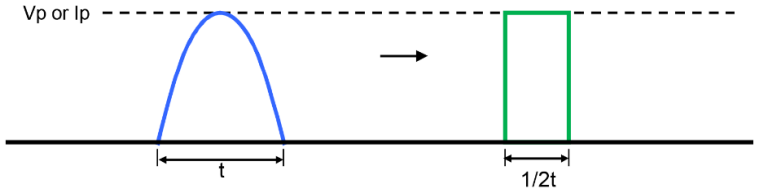
1. Discharge curve wave with time constant “t” → Square wave



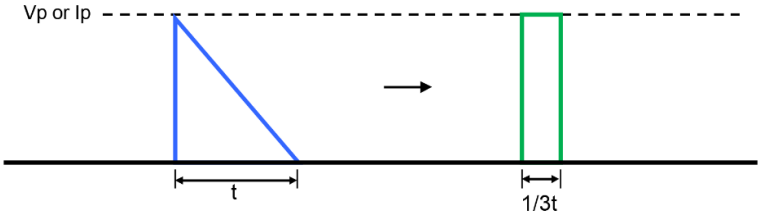
2. Damping oscillation wave with time constant of envelope “t” → Square wave



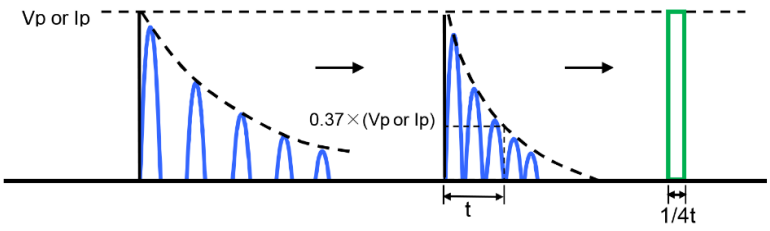
3. Half-wave rectification wave → Square wave



4. Triangular wave → Square wave



5. 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

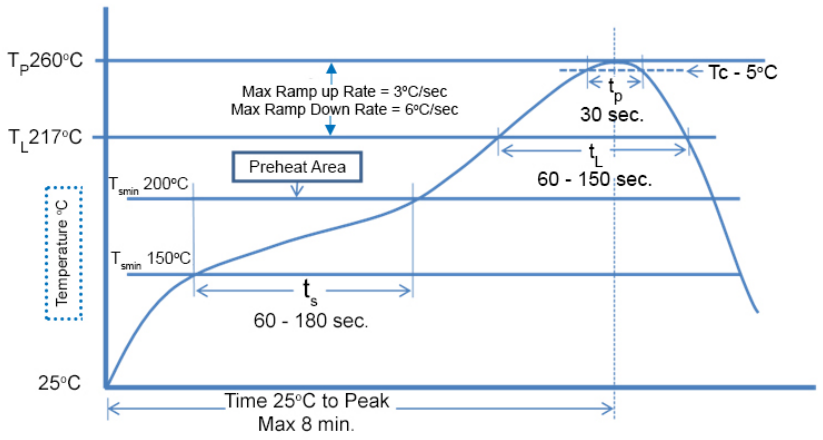
Soldering iron recommended temperatures: 330°C to 350°C with minimum duration.
Maximum number of reflow cycles: 3.

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

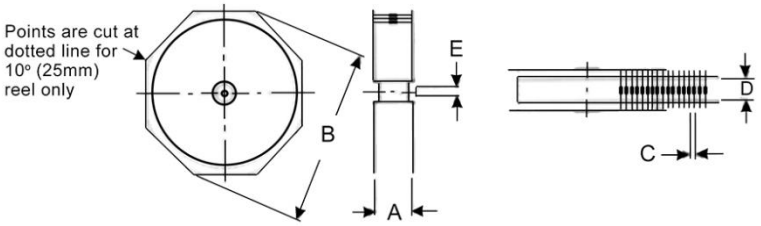
Temperature Diff. = Defference between final preheat stage and soldering stage.

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	*

Recommended Lead Free Resistor Reflow Profile



Reel Packaging Specifications



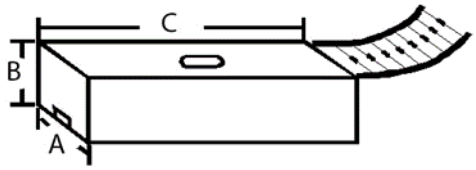
Series	A max (1)	B max	C	D (2)	Tape	Unit
RNF18	2.756 ± 0.118 70.00 ± 3.00	11.811 ± 0.197 300.00 ± 5.00	0.197 ± 0.020 5.00 ± 0.50	2.047 ± 0.020 52.00 ± 0.50	0.250 6.35	inches mm
RNMF14	2.756 ± 0.118 70.00 ± 3.00	11.811 ± 0.197 300.00 ± 5.00	0.197 ± 0.020 5.00 ± 0.50	2.047 ± 0.020 52.00 ± 0.50	0.250 6.35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

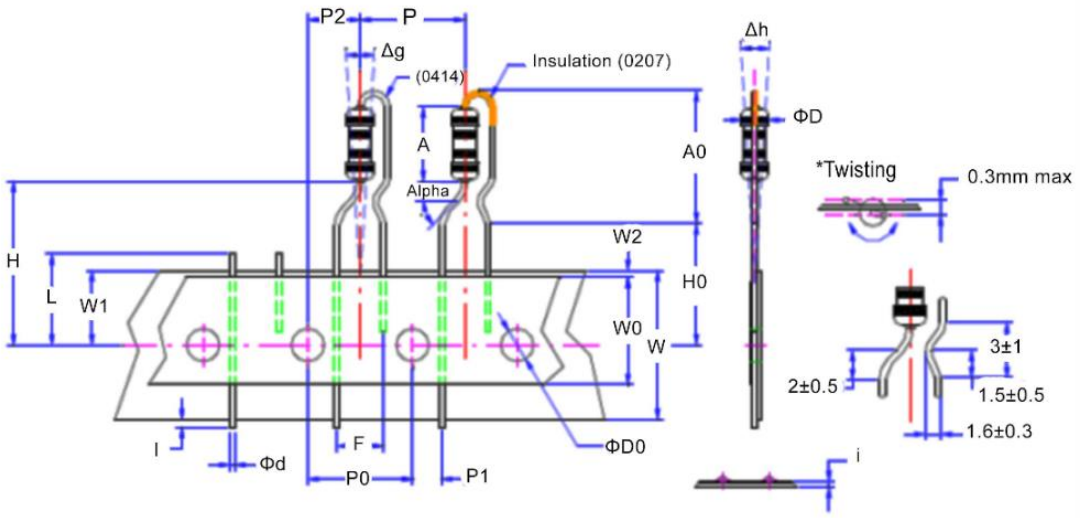
(2) The given dimension "D" expresses the standard width spacing. A 26 mm narrow spacing is available as option "N" packaging code.

Ammo Packaging Specifications



Type/Code	Size	A	B	C	Unit
RNF	16	2.953 ± 0.079 75.00 ± 2.00	2.756 ± 0.118 70.00 ± 3.00	10.039 ± 0.197 255.00 ± 5.00	inches mm
RNF	14		3.937 ± 0.118 100.00 ± 3.00		inches mm
RNF	12		2.756 ± 0.118 70.00 ± 3.00		inches mm
RNF	1		2.953 ± 0.118 75.00 ± 3.00		inches mm
RNMF	14		2.756 ± 0.118 70.00 ± 3.00		inches mm
RNMF	12		3.937 ± 0.118 100.00 ± 3.00		inches mm

Pana-Sert Packaging Specifications



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
l	Lead wire portrait	0.039 max. 1.00 max.
ØD0	Feed hole diamenter	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

R	N	F	1	4	F	T	D	4	K	7	5

Product Series	
Code	Description
RNF	Standard
RNMF	Mini
PRNF	Panasert RoHS

Power Rating	
Code	W
18	0.125
14	0.25
12	0.5
1	1
2	2

Tolerance		
Code	Tol	Value
A	0.05%	E96 E24
B	0.1%	
C	0.25%	
D	0.5%	
F	1%	
G	2%	E24
J	5%	

Packaging			
Code	Description	Size	Quantity
T	Tape and Reel	RNF18, RNF14 RNMF14, RNMF12	5000
		RNF12, RNF1	2500
		RNF2	1000
A	Ammo	RNF18, RNF14 RNMF14, RNMF12	5000 (*)
		RNF12	2000
		RNF1, RNF2	1000
B	Bulk	RNF18, RNF14, RNF12, RNF1, RNF2, RNMF12, RNMF14	1000

TCR	
Code	ppm
T	10
E	25
C	50
D	100

Resistance Value
Four characters with the multiplier used as the decimal holder.
10 ohm = 10R0 10.2 K ohm = 10K2 1 M ohm = 1M00

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