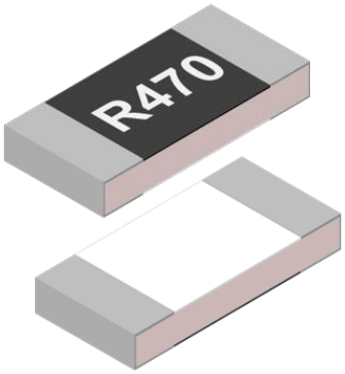
Features:

- Low resistance
- Low TCR
- Inductance of ≤ 5nH
- Excellent long-term stability
- High precision current sensing
- High rated power capability and excellent anti-surge
- RoHS compliant, REACH compliant, lead free, and halogen free
- AEC-Q200 compliant



Applications:

- Consumer electronics
- Computer and relative products
- Communication devices
- Measuring instruments
- Industrial / Power supplies
- Battery management systems

Electrical Specifications

Type/Code	Power Rating (W) @ 70ºC	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance
			0.5%, 1%, 2%, 5%
RNCL1206	1	± 100	0.05 - 0.976
		± 50	0.1 - 33
RNCL1210	1	± 100	0.05 - 0.976
		± 50	0.1 - 33
RNCL2010	1.5	± 50	0.05 - 50
RNCL2512	2	± 50	

Max. Working Voltage = $(P*R)^{1/2}$

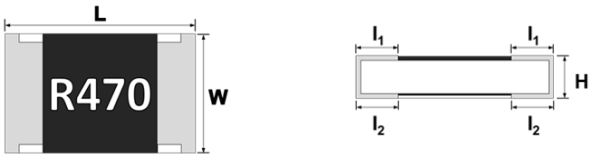
P = Rated Power (W)

R = Resistance Value (Ω)

Non-standard parts may be available. Please contact Stackpole Electronics.

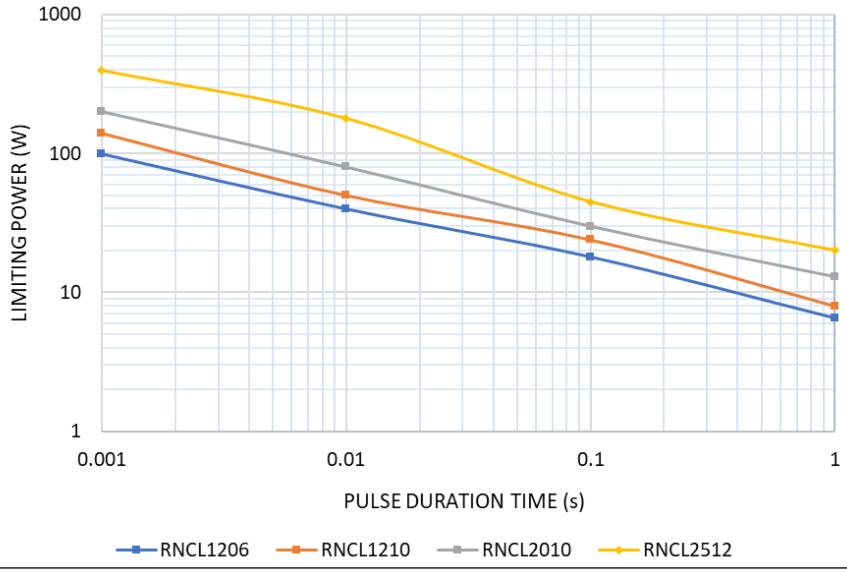
Operating temperature range is -55°C ~ +170°C

Mechanical Specifications

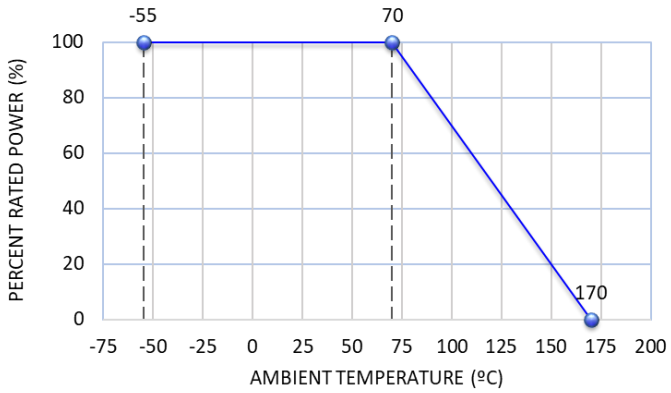


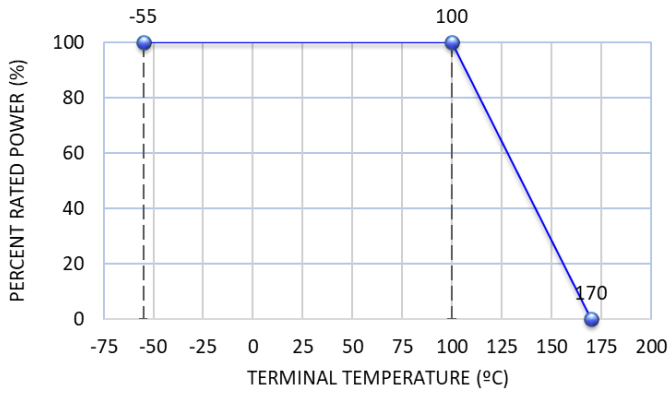
Type/Code	L Body Length	W Body Width	H Body Height	l_1 Top Termination	l_2 Bottom Termination	Unit
RNCL1206	0.122 ± 0.004	0.063 ± 0.004	0.022 ± 0.004	0.016 ± 0.008	0.018 ± 0.008	inches
	3.10 ± 0.10	1.60 ± 0.10	0.55 ± 0.10	0.40 ± 0.20	0.45 ± 0.20	mm
RNCL1210	0.122 ± 0.004	0.098 ± 0.006	0.022 ± 0.004	0.020 ± 0.008	0.020 ± 0.008	inches
	3.10 ± 0.10	2.50 ± 0.15	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20	mm
RNCL2010	0.197 ± 0.008	0.098 ± 0.006	0.022 ± 0.004	0.024 ± 0.010	0.024 ± 0.010	inches
	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.60 ± 0.25	mm
RNCL2512	0.248 ± 0.008	0.126 ± 0.008	0.022 ± 0.004	0.026 ± 0.010	0.026 ± 0.010	inches
	6.30 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.65 ± 0.25	0.65 ± 0.25	mm

Anti-surge Curve



Power Derating Curve





The Operating Temperature Range is -55°C ~ +170°C.
Power rating or current rating is based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature above 70°C, the load should be derated in accordance with the Power Derating Curve. (Terminal temperature derating from 100°C.

Rated Current
Resistance Range: < 1Ω
Rated Current: The resistor shall have a DC continuous working current or an AC (rms) continuous working current at commercial-line frequency and wave form corresponding to the power rating, as per formula below:

$$I = \sqrt{P/R}$$

I = Rated current (A)
P = Rated power (W)
R = Nominal resistance (Ω)

Rated Voltage

Resistance Range: ≥ 1 Ω

Rated Voltage: The resistor shall have a DC continuous working voltage or an RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as per formula below:

$$V = \sqrt{P*R}$$

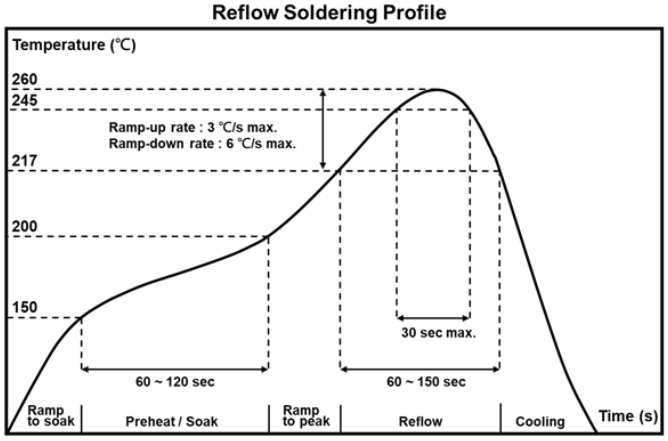
V = Rated voltage (V)
P = Rated power (W)
R = Nominal resistance (Ω)

Performance Characteristics			
Test Item	Test Method	Test Condition	Test Limits
Temperature Coefficient of Resistance (TCR)	JIS C-5201-1 4.8 IEC-60115-1 4.8	At 25°C / +125°C, 25°C is the reference temperature.	Refer to Electrical Specifications table
Short Time Overload	JIS C-5201-1 4.13 IEC-60115-1 4.13	5 times rated power whichever is less for 5 seconds	± (1% + 0.001Ω)
Insulation Resistance	JIS C-5201-1 4.6 IEC-60115-1 4.6	Applied 100 VDC for 1 minute	≥ 10GΩ
Dielectric Withstanding Voltage	JIS C-5201-1 4.7	Applied 500 VAC for 1 minute	No short or burned on the appearance
Core Body Strength	JIS C-5201-1 4.15	Central part pressurizing force: 10N for 10 seconds	No breakage.
Solderability	JIS C-5201-1 4.17 IEC-60115-1 4.17	245ºC ± 5°C for 3 seconds	>95% coverage no visual damage
Resistance to Soldering Heat	JIS C-5201-1 4.18 IEC-60115-1 4.18	260ºC ± 5°C for 10 seconds	± (1% + 0.001Ω) No visual damage
Leaching	JIS C5201-1 4.18 IEC-60068-2-58 8.2.1	260ºC ± 5°C for 30 seconds	>95% coverage no visual damage
Rapid Change of Temperature	JIS C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles	± (1% + 0.001Ω) No visual damage
Damp Heat with Load	JIS C-5201-1 4.24 IEC-60115-1 4.24	40ºC ± 2°C, 90 ~ 95% R.H., RCWV or max. working current whichever is less for 1000 hours with 1.5 hours "ON" and 0.5 hour "OFF"	± (1% + 0.001Ω)
Biased Humidity	MIL-STD-202 Method 103	1000 hours; 85°C/85% RH, 10% of operating power. Measurement at 24 ± 4 hours after test conclusion.	± (1% + 0.05Ω)
Load Life (Endurance)	JIS C-5201-1 4.25 IEC-60115-1 4.25.1	70ºC ± 2°C, rated power or max. working current whichever is less for 1000 hours with 1.5 hours "ON" and 0.5 hours "OFF"	± (1% + 0.001Ω)
High Temperature Exposure	JIS C-5201-1 4.23.2 IEC 60068-2-2	At +170 ± 5°C for 1000 hours	± (1% + 0.001Ω)
Resistance to Solvent	JIS C-5201-1 4.29	The tested resistor will be immersed into isopropyl alcohol of 20°C ~ 25°C for 60 seconds. Then the resistor is left in room for 48 hours	± (1% + 0.001Ω) No visual damage
Terminal Strength	JIS C-5201-1 4.32 AEC Q200-006	Pressurizing force for 60 seconds. 1206 and above 17.7N	No breakage
Bending Strength	JIS C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds. D: 1206-1210 = 3mm; 2010-2512 = 2mm	± (1% + 0.001Ω) No visual damage

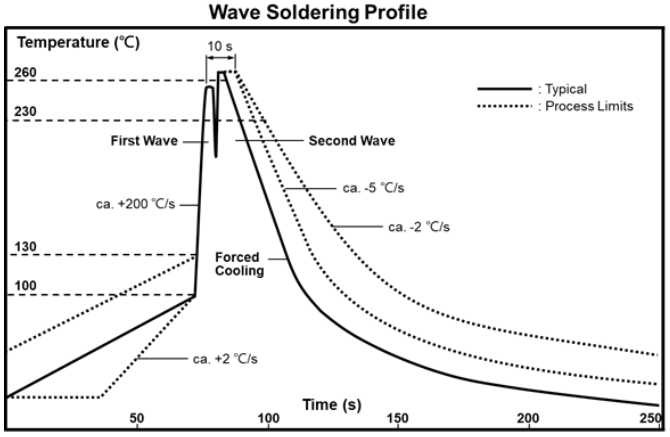
Temperature coefficient of resistance test to -55°C and AEC-Q200 test reports available upon request. Contact Stackpole Electronics.
Storage time at environment temperature is 25 ± 5°C and R.H. of 60 ± 20%.

Soldering Profiles

Reflow Soldering Profile

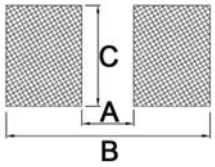


Wave Soldering Profile



Rework temperature (hot air equipment): 350°C, 3 ~ 5 seconds
Recommended reflow methods:
IR, vapor phase oven, hot air oven
If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

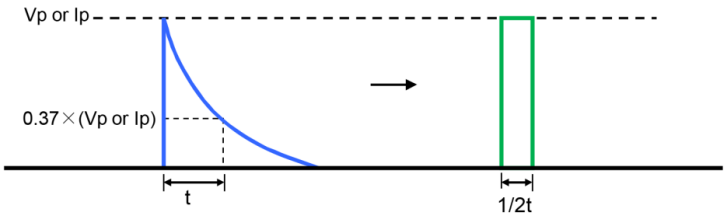
Recommended Pad Layout



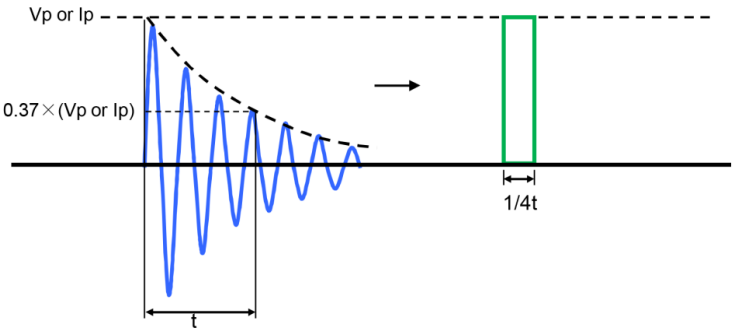
Type/Code	A	B	C	Unit
RNCL1206	0.087 2.20	0.165 4.20	0.071 1.80	inches mm
RNCL1210	0.079 2.00	0.173 4.40	0.106 2.70	inches mm
RNCL2010	0.150 3.80	0.260 6.60	0.106 2.70	inches mm
RNCL2512	0.193 4.90	0.319 8.10	0.134 3.40	inches mm

Waveform Transformation to Square Wave

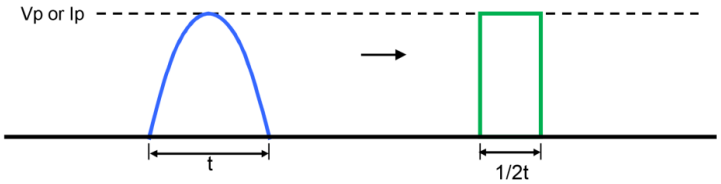
1. Discharge curve wave with time constant “t” → Square wave



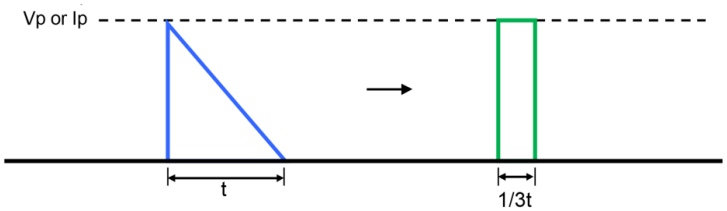
2. Damping oscillation wave with time constant of envelope “t” → Square wave



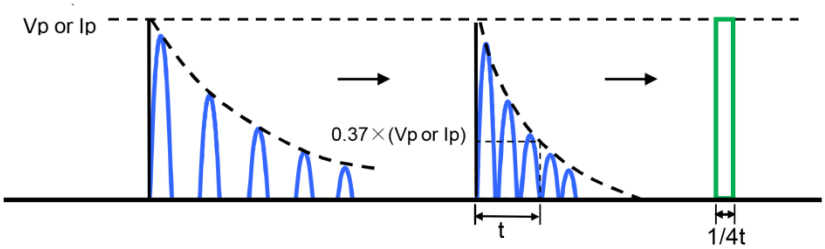
3. Half-wave rectification wave → Square wave



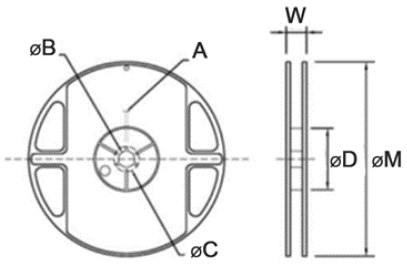
4. Triangular wave → Square wave



5. Special wave → Square wave

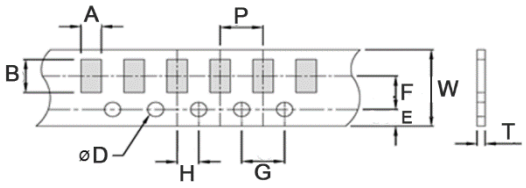


Reel Specifications



Type/Code	A	B	C	D	W	M	Unit
RNCL1206	0.079 ± 0.020	0.531 ± 0.039	0.827 ± 0.039	2.362 ± 0.039	0.453 ± 0.079	7.008 ± 0.079	inches
	2.00 ± 0.50	13.50 ± 1.00	21.00 ± 1.00	60.00 ± 1.00	11.50 ± 2.00	178.00 ± 2.00	mm
RNCL1210	0.079 ± 0.020	0.531 ± 0.039	0.827 ± 0.039	2.362 ± 0.039	0.453 ± 0.079	7.008 ± 0.079	inches
	2.00 ± 0.50	13.50 ± 1.00	21.00 ± 1.00	60.00 ± 1.00	11.50 ± 2.00	178.00 ± 2.00	mm
RNCL2010	0.079 ± 0.020	0.531 ± 0.039	0.827 ± 0.039	2.362 ± 0.039	0.630 ± 0.079	7.008 ± 0.079	inches
	2.00 ± 0.50	13.50 ± 1.00	21.00 ± 1.00	60.00 ± 1.00	16.00 ± 2.00	178.00 ± 2.00	mm
RNCL2512	0.079 ± 0.020	0.531 ± 0.039	0.827 ± 0.039	2.362 ± 0.039	0.630 ± 0.079	7.008 ± 0.079	inches
	2.00 ± 0.50	13.50 ± 1.00	21.00 ± 1.00	60.00 ± 1.00	16.00 ± 2.00	178.00 ± 2.00	mm

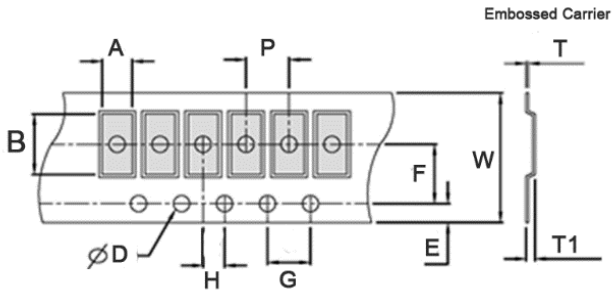
Packaging Specifications - Paper Tape



Type/Code	A	B	W	E	F	Unit
RNCL1206	0.075 ± 0.008	0.120 ± 0.008	0.315 ± 0.008	0.069 ± 0.004	0.138 ± 0.002	inches
	1.90 ± 0.20	3.05 ± 0.20	8.00 ± 0.20	1.75 ± 0.10	3.50 ± 0.05	mm
RNCL1210	0.112 ± 0.008	0.120 ± 0.008	0.315 ± 0.008	0.069 ± 0.004	0.138 ± 0.002	inches
	2.85 ± 0.20	3.05 ± 0.20	8.00 ± 0.20	1.75 ± 0.10	3.50 ± 0.05	mm

Type/Code	G	H	T	P	D	Unit
RNCL1206	0.157 ± 0.004	0.079 ± 0.002	0.030 ± 0.004	0.157 ± 0.004	0.059 +0.004/-0	inches
	4.00 ± 0.10	2.00 ± 0.05	0.75 ± 0.10	4.00 ± 0.10	1.50 +0.10/-0	mm
RNCL1210	0.157 ± 0.004	0.079 ± 0.002	0.030 ± 0.004	0.157 ± 0.004	0.059 +0.004/-0	inches
	4.00 ± 0.10	2.00 ± 0.05	0.75 ± 0.10	4.00 ± 0.10	1.50 +0.10/-0	mm

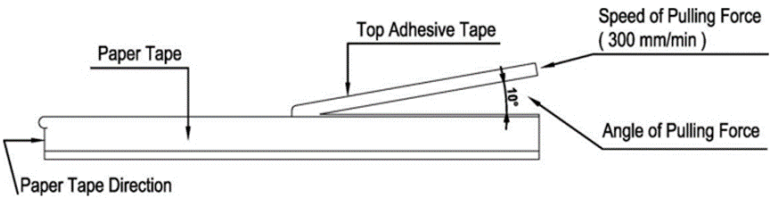
Packaging Specifications - Embossed Tape



Type/Code	A	B	W	E	F	G	Unit
RNCL2010	0.110 ± 0.008 2.80 ± 0.20	0.220 ± 0.008 5.60 ± 0.20	0.472 ± 0.004 12.00 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.002 5.50 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	inches mm
RNCL2512	0.134 ± 0.008 3.40 ± 0.20	0.264 ± 0.008 6.70 ± 0.20	0.472 ± 0.004 12.00 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.002 5.50 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	inches mm

Type/Code	H	T	T1	P	D	D1	Unit
RNCL2010	0.079 ± 0.002 2.00 ± 0.05	0.009 ± 0.004 0.23 ± 0.10	0.033 ± 0.006 0.85 ± 0.15	0.157 ± 0.004 4.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	0.059 ± 0.004 1.50 ± 0.10	inches mm
RNCL2512	0.079 ± 0.002 2.00 ± 0.05	0.009 ± 0.004 0.23 ± 0.10	0.033 ± 0.006 0.85 ± 0.15	0.157 ± 0.004 4.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	0.059 ± 0.004 1.50 ± 0.10	inches mm

Top Adhesive Peel Off



Top adhesive peel off strength is 10 ~ 70g.

Part Marking Instructions

1% Marking
The nominal resistance is marked on the surface of the overcoating with the use of 4 digit markings.
0201 and 0402 are not marked.

5% Marking
The nominal resistance is marked on the surface of the overcoating with the use of 3 digit markings.
0201 and 0402 are not marked.

For shared E24/E96 values, 1% tolerance product may be marked with three-digit marking instead of the standard four-digit marking for all other E96 values. All E24 values available in 1% tolerance are also marked with three-digit marking.

Marking Instructions for 0603 1% Chip Resistors (per EIA-J)

A two-digit number is assigned to each standard R-Value (E96) as shown in the chart below. This is followed by one alpha character which is used as a multiplier. Each letter represents a specific multiplier as follows:

Z = 0.01	A = 10	D = 10,000
Y = 0.1	B = 100	E = 100,000
X = 1	C = 1,000	F = 1,000,000

EXAMPLE:

Chip Marking	Explanation	Value
01B	01 means 10.0 and B = 100	10.0 x 100 = 1 Kohm
25C	25 means 17.8 and C = 1,000	17.8 x 1,000 = 17.8 Kohm
93D	93 means 90.9 and D = 10,000	90.9 x 10,000 = 909 Kohm

E96											
#	R-Value	#	R-Value	#	R-Value	#	R-Value	#	R-Value	#	R-Value
01	10.0	**17**	14.7	**33**	21.5	**49**	31.6	**65**	46.4	**81**	68.1
02	10.2	**18**	15.0	**34**	22.1	**50**	32.4	**66**	47.5	**82**	69.8
03	10.5	**19**	15.4	**35**	22.6	**51**	33.2	**67**	48.7	**83**	71.5
04	10.7	**20**	15.8	**36**	23.2	**52**	34.0	**68**	49.9	**84**	73.2
05	11.0	**21**	16.2	**37**	23.7	**53**	34.8	**69**	51.1	**85**	75.0
06	11.3	**22**	16.5	**38**	24.3	**54**	35.7	**70**	52.3	**86**	76.8
07	11.5	**23**	16.9	**39**	24.9	**55**	36.5	**71**	53.6	**87**	78.7
08	11.8	**24**	17.4	**40**	25.5	**56**	37.4	**72**	54.9	**88**	80.6
09	12.1	**25**	17.8	**41**	26.1	**57**	38.3	**73**	56.2	**89**	82.5
10	12.4	**26**	18.2	**42**	26.7	**58**	39.2	**74**	57.6	**90**	84.5
11	12.7	**27**	18.7	**43**	27.4	**59**	40.2	**75**	59.0	**91**	86.6
12	13.0	**28**	19.1	**44**	28.0	**60**	41.2	**76**	60.4	**92**	88.7
13	13.3	**29**	19.6	**45**	28.7	**61**	42.2	**77**	61.9	**93**	90.9
14	13.7	**30**	20.0	**46**	29.4	**62**	43.2	**78**	63.4	**94**	93.1
15	14.0	**31**	20.5	**47**	30.1	**63**	44.2	**79**	64.9	**95**	95.3
16	14.3	**32**	21.0	**48**	30.9	**64**	45.3	**80**	66.5	**96**	97.6

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 3). 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 as amended by Directive (EU) 2015/863/EU as regards the list of restricted substances.

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)
RNCL	Thin Film High Power Anti-surge	SMD	YES	100% Matte Sn over Ni	Always	Always

"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. 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	C	L	1	2	0	6	F	T	5	0	L	0

Product Series

RNCL	Thin film High Power Anti-surge

Size

Code	W
1206	1
1210	1
2010	1.5
2512	2

Tolerance

Code	Tol
D	0.5%
F	1%
G	2%
J	5%

Packaging

Code	Description	Size	Quantity
T	Paper Tape	1206, 1210	5000
	Embossed	2010, 2512	4000

Resistance Value

Four characters with the multiplier used as the decimal holder.
"L" used as multiplier of 10^{-3} for any value under 0.1 ohm.

0.05 ohm = 50L0
0.1 ohm = R100
33 ohm = 33R0

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

SEI Stackpole:

RNCL1206FT10R0 RNCL1206FT15R0 RNCL1206FT1R00 RNCL1206FT1R10 RNCL1206FT1R20
RNCL1206FT1R30 RNCL1206FT1R50 RNCL1206FT1R80 RNCL1206FT20R0 RNCL1206FT22R0
RNCL1206FT2R00 RNCL1206FT2R20 RNCL1206FT2R40 RNCL1206FT2R50 RNCL1206FT2R70
RNCL1206FT33R0 RNCL1206FT3R00 RNCL1206FT3R30 RNCL1206FT3R60 RNCL1206FT3R90
RNCL1206FT4R30 RNCL1206FT4R70 RNCL1206FT50L0 RNCL1206FT51L0 RNCL1206FT56L0
RNCL1206FT5R00 RNCL1206FT5R10 RNCL1206FT5R60 RNCL1206FT62L0 RNCL1206FT68L0
RNCL1206FT6R20 RNCL1206FT6R80 RNCL1206FT75L0 RNCL1206FT7R50 RNCL1206FT82L0
RNCL1206FT8R20 RNCL1206FT91L0 RNCL1206FT9R10 RNCL1206FTR100 RNCL1206FTR110
RNCL1206FTR120 RNCL1206FTR130 RNCL1206FTR150 RNCL1206FTR180 RNCL1206FTR200
RNCL1206FTR220 RNCL1206FTR240 RNCL1206FTR250 RNCL1206FTR270 RNCL1206FTR300
RNCL1206FTR330 RNCL1206FTR360 RNCL1206FTR390 RNCL1206FTR430 RNCL1206FTR470
RNCL1206FTR500 RNCL1206FTR510 RNCL1206FTR560 RNCL1206FTR620 RNCL1206FTR680
RNCL1206FTR750 RNCL1206FTR820 RNCL1206FTR910 RNCL1210FT10R0 RNCL1210FT15R0
RNCL1210FT1R00 RNCL1210FT1R10 RNCL1210FT1R20 RNCL1210FT1R30 RNCL1210FT1R50
RNCL1210FT1R80 RNCL1210FT20R0 RNCL1210FT22R0 RNCL1210FT2R00 RNCL1210FT2R20
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RNCL1210FT50L0 RNCL1210FT51L0 RNCL1210FT56L0 RNCL1210FT5R00 RNCL1210FT5R10
RNCL1210FT5R60 RNCL1210FT62L0 RNCL1210FT68L0 RNCL1210FT6R20 RNCL1210FT6R80
RNCL1210FT75L0 RNCL1210FT7R50 RNCL1210FT82L0 RNCL1210FT8R20 RNCL1210FT91L0