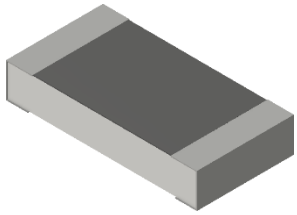
RNHT Series

Automotive Grade High Temperature Thin Film Chip Resistor

Stackpole Electronics, Inc.
Resistive Product Solutions

Features:

- High precision resistance tolerance: ± 0.02%
- Low TCR down to ± 5 ppm/ºC
- Advanced sulfur resistance verified according to ASTM B 809
- RoHS compliant, REACH compliant, lead free, and halogen free
- AEC-Q200 qualified

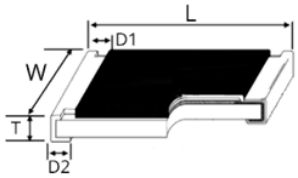


Electrical Specifications

Type/Code	Power Rating @ 85°C (W)	Maximum Working Voltage (V)	Maximum Overload Voltage (V)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance			
					±0.02%	±0.05%	±0.1%	±0.5%
RNHT0402	0.063	75	100	± 5	100 - 3K			
				± 10	100 - 3K	47 - 100K		
				± 25		47 - 100K		47 - 150K
RNHT0603	0.1	100	200	± 5	100 - 5.1K			
				± 10	100 - 5.1K	47 - 270K		
				± 25		47 - 270K	47 - 332K	47 - 1M
				± 50	-	-	-	10 - 47
RNHT0805	0.125	150	300	± 5	100 - 10.2K			
				± 10	100 - 10.2K	47 - 475K		
				± 25		47 - 475K	47 - 2.7M	
				± 50	-	-	-	10 - 47
RNHT1206	0.25	200	400	± 5	100 - 33.2K			
				± 10	100 - 33.2K	47 - 1M		
				± 25		47 - 1M	47 - 5.1M	
				± 50	-	-	-	10 - 47

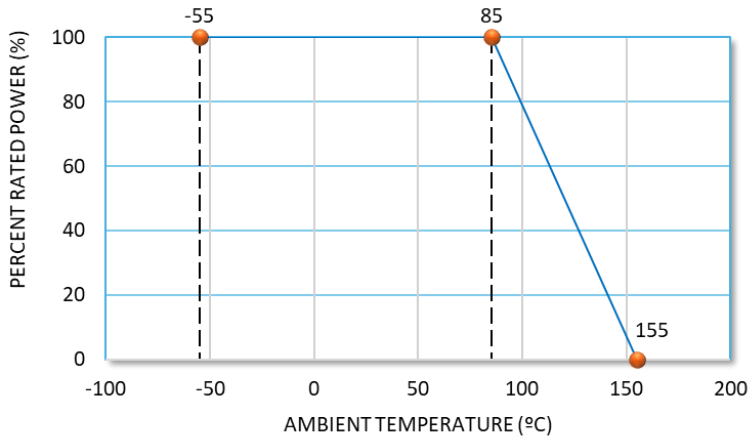
Max Working Voltage: √P*R or max working voltage listed above, whichever is lower.
Overload Voltage: 2.5* √P*R or max overload voltage listed above, whichever is lower.
Operating Temperature Range is -55 to +155°C

Mechanical Specifications

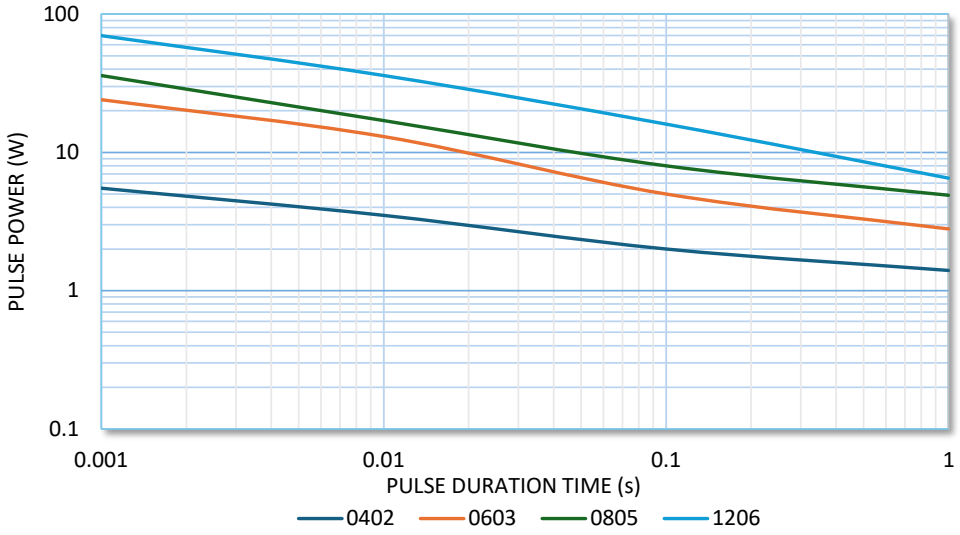


Type/Code	Typical Unit Weight (mg)	L Body Length	W Body Width	T Body Height	D1 Top Termination	D2 Bottom Termination	Unit
RNHT0402	0.54	0.039 ± 0.002 1.00 ± 0.05	0.020 ± 0.002 0.50 ± 0.05	0.012 ± 0.002 0.30 ± 0.05	0.008 ± 0.004 0.20 ± 0.10	0.008 ± 0.004 0.20 ± 0.10	inches mm
RNHT0603	1.8	0.061 ± 0.004 1.55 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.018 ± 0.004 0.45 ± 0.10	0.012 ± 0.008 0.30 ± 0.20	0.012 ± 0.008 0.30 ± 0.20	inches mm
RNHT0805	4.7	0.079 ± 0.006 2.00 ± 0.15	0.049 ± 0.006 1.25 ± 0.15	0.022 ± 0.004 0.55 ± 0.10	0.012 ± 0.008 0.30 ± 0.20	0.016 ± 0.008 0.40 ± 0.20	inches mm
RNHT1206	9.0	0.120 ± 0.006 3.05 ± 0.15	0.061 ± 0.006 1.55 ± 0.15	0.022 ± 0.004 0.55 ± 0.10	0.017 ± 0.008 0.42 ± 0.20	0.014 ± 0.010 0.35 ± 0.25	inches mm

Power Derating Curve:



Single Pulse Characteristics



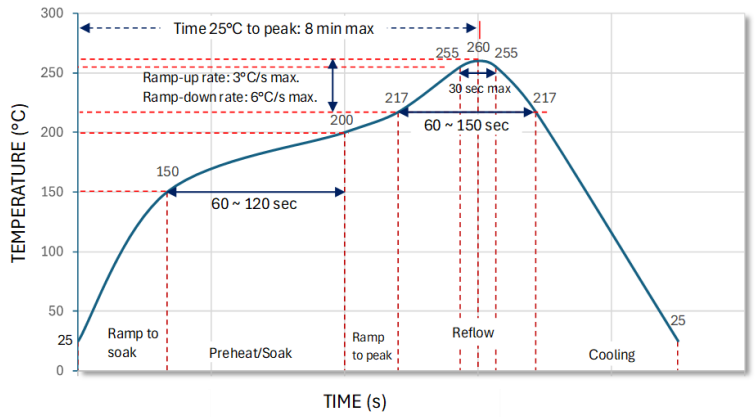
Performance Characteristics

Test	Test Method	Test Specifications	Test Condition
Temperature Coefficient of Resistance (TCR)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	Refer to Electrical Specification table	-55 to +125°C, 25°C is the reference temperature
Short Time Overload	JIS-C-5201-1 4.13	≤ 47Ω ΔR ± 0.1% > 47 Ω Δ R ± 0.05%	RCWV*2.5 or max. overload voltage whichever is lower for 5 seconds
Endurance	MIL-STD-202 Method 108	ΔR ± 0.25%	RCWV for 1000 hours with 1.5 hours "ON" and 0.5 hours "OFF"
Biased Humidity	MIL-STD-202 Method 103	ΔR ± 0.25%	1000 hours; 85°C / 85% RH, 10% of operating power.
High Temperature Exposure	MIL-STD-202 Method 108	≤ 47Ω ΔR ± 0.25% > 47Ω ΔR ± 0.1% for 0603/0805/1206 sizes > 47ΩΔ R ± 0.2% for 0402 size	at +155°C for 1000 hours
Temperature Cycling	JESD22 Method JA-104	≤ 47Ω ΔR ± 0.25% > 47Ω ΔR ± 0.1%	-55 to +125°C, 1000 cycles
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	ΔR ± 0.1%	260 ± 5°C for 10 seconds
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	> 1000 MΩ	Apply 100V_{DC} for 1 minute

Performance Characteristics (cont.)			
Test	Test Method	Test Specifications	Test Condition
Bending Strength (Board Flex)	JIS-C-5201-1 4.33	ΔR ± 0.1%	Bending once for 60 seconds Bending displacement: 1206 sizes: 3 mm
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	95% min. coverage	245 ± 5°C for 3 seconds
Terminal Strength	AEC Q200-006	No breakage	Force of 1.8kg for 60 seconds
Mechanical Shock	MIL-STD-202 Method 213	ΔR ± 0.1%	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	MIL-STD-202 Method 204	ΔR ± 0.1%	5 g's for 20 minutes, 12 cycles each of 3 orientations. 10 - 2000 H
ESD	AEC-Q200-002	ΔR ± 0.5%	Human body model 0402, 0603: 0.2KV 0805, 1206: 1KV
Resistance to Solvent	MIL-STD-202 Method 215	Marking unsmeared	Add aqueous wash chemical - OKEM clean or equivalent
Sulfur Test	ASTM B-809-95 Modified	ΔR ± 1%	105 ± 2°C, no power rating for 1000 hours
Flammability	UL-94	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V1 are acceptable. Electrical test not required.

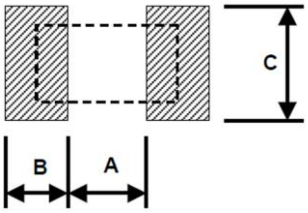
RCWV (Rated Continuous working Voltage) = √P*R or Max. Operating Voltage whichever is lower.
Recommended storage temperature is 15 to 28°C; Humidity < 80% R.H.
Shelf Life: 2 years from production date.

Recommended Resistor Reflow Profile



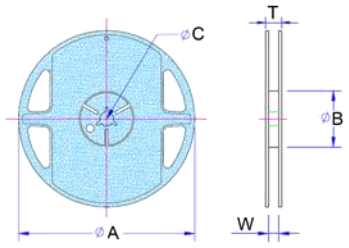
Number or reflow cycles allowed is 3 times.

Recommended Solder Pad



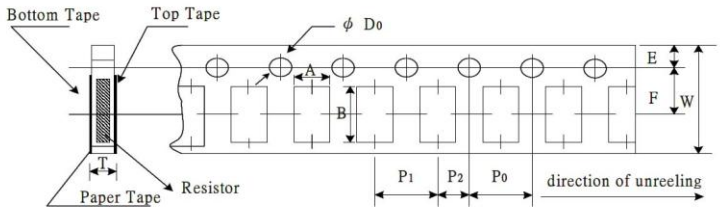
Type/Code	A	B	C	Unit
RNHT0402	0.020 0.50	0.020 0.50	0.024 ± 0.008 0.60 ± 0.20	inches mm
RNHT0603	0.039 1.00	0.039 1.00	0.047 ± 0.008 1.20 ± 0.20	inches mm
RNHT0805	0.047 1.20	0.055 1.40	0.065 ± 0.008 1.65 ± 0.20	inches mm
RNHT1206	0.087 2.20	0.055 1.40	0.079 ± 0.008 2.00 ± 0.20	inches mm

Reel Specifications



Type/Code	ØA	ØB	ØC	W	T	Unit
All sizes	7.008 ± 0.039 178.00 ± 1.00	2.362 ± 0.039 60.00 ± 1.00	0.531 ± 0.028 13.50 ± 0.70	0.374 ± 0.039 9.50 ± 1.00	0.453 ± 0.039 11.50 ± 1.00	inches mm

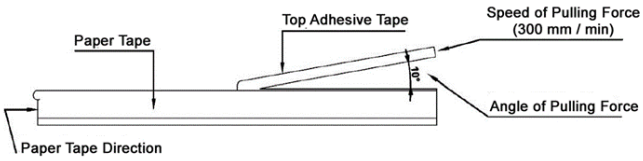
Taping Specification - Paper Tape



Type/Code	A	B	W	E	F	Unit
RNHT0402	0.028 ± 0.002 0.70 ± 0.05	0.046 ± 0.002 1.16 ± 0.05	0.315 ± 0.004 8.00 ± 0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
RNHT0603	0.043 ± 0.002 1.10 ± 0.05	0.075 ± 0.002 1.90 ± 0.05	0.315 ± 0.004 8.00 ± 0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
RNHT0805	0.063 ± 0.002 1.60 ± 0.05	0.093 ± 0.002 2.37 ± 0.05	0.315 ± 0.004 8.00 ± 0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
RNHT1206	0.079 ± 0.002 2.00 ± 0.05	0.140 ± 0.002 3.55 ± 0.05	0.315 ± 0.004 8.00 ± 0.10	0.069 ± 0.002 1.75 ± 0.05	0.138 ± 0.002 3.50 ± 0.05	inches mm
Type/Code	P0	P_1	P_2	ØD0	T	Unit
RNHT0402	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.016 ± 0.001 0.40 ± 0.03	inches mm
RNHT0603	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.024 ± 0.001 0.60 ± 0.03	inches mm
RNHT0805	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.030 ± 0.002 0.75 ± 0.05	inches mm
RNHT1206	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.030 ± 0.002 0.75 ± 0.05	inches mm

Peel Force of Top Cover Tape - Paper Tape

The peel speed shall be about 300mm/min ± 5%.
The peel force of top cover tape shall be between 8 gf to 60 gf.



Part Marking Specifications

E96 and E24 Values for 0805 and 1206

The nominal resistance is marked on the surface of the overcoating with the use of four character markings. Values below 100Ω will use "R" as the decimal holder.

E96 Values for 0603 size

A two character 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 from "Y" - "F" represents a specific multiplier.

Alpha Character = Multiplier	
Y = 0.1	C = 1000
X = 1	D = 10000
A = 10	E = 100000
B = 100	F = 1000000

Chip Marking	Value
01B	10.0 x 100 = 1 KΩ
25C	17.8 x 1000 = 17.8 KΩ
93D	90.9 x 10000 = 909 KΩ

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

Note: 0402 size is unmarked.

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
RNHT	Automotive Grade High Temperature Thin Film Chip Resistor	SMD	YES	100% Matte Sn over Ni

"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	H	T	1	2	0	6	B	T	E	1	0	0	R

Product Series

RNHT

Size

Size
0402
0603
0805
1206

Tolerance

Code	Tol.
Y	0.02%
A	0.05%
B	0.1%
D	0.5%

Packaging

Code	Description	Size	Quantity
T	7" Reel Paper Tape	0402	10000
		0603, 0805, 1206	5000

TCR

Code	ppm
Y	5
T	10
E	25
C	50

Resistance Value

Four characters with the multiplier used as the decimal holder.
47 ohm = 47R0 100 Kohm = 100K 5.1 Mohm = 5M10