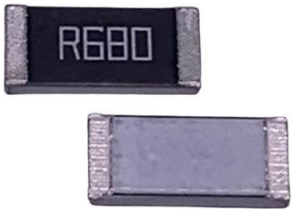
Features:



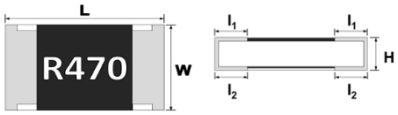
- Low resistance
- Low TCR
- Typical Inductance of ≤ 5 nH
- Excellent long-term stability
- High precision current sensing
- High rated power capability and excellent anti-surge
- RoHS compliant, REACH compliant, lead free, and halogen free
- AEC-Q200 compliant

Electrical Specifications

Type/Code	Power Rating (W) @ 70ºC	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance
			0.5%, 1%, 5%
RNCL1206	1	± 100	0.05 - 0.091
		± 50	0.1 - 33
RNCL1210	1	± 100	0.05 - 0.091
		± 50	0.1 - 33
RNCL2010	1.5	± 50	0.05 - 50
RNCL2512	2	± 50	

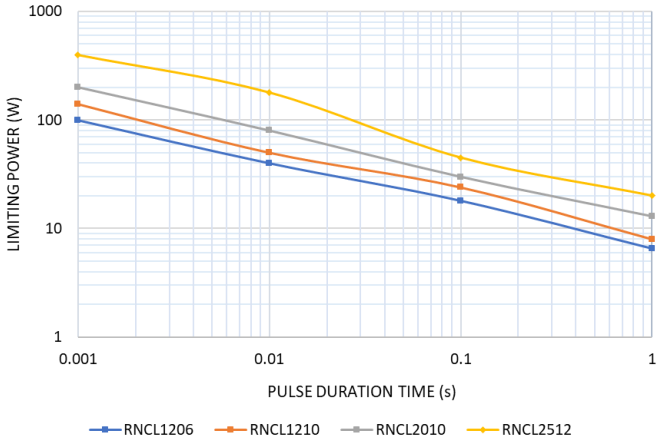
Max. Working Voltage = $(P*R)^{1/2}$; P = Rated Power (W); R = Resistance Value (Ω)
Non-standard values may be available. Please contact Stackpole Electronics.
Operating temperature range is -55 to +170°C

Mechanical Specifications

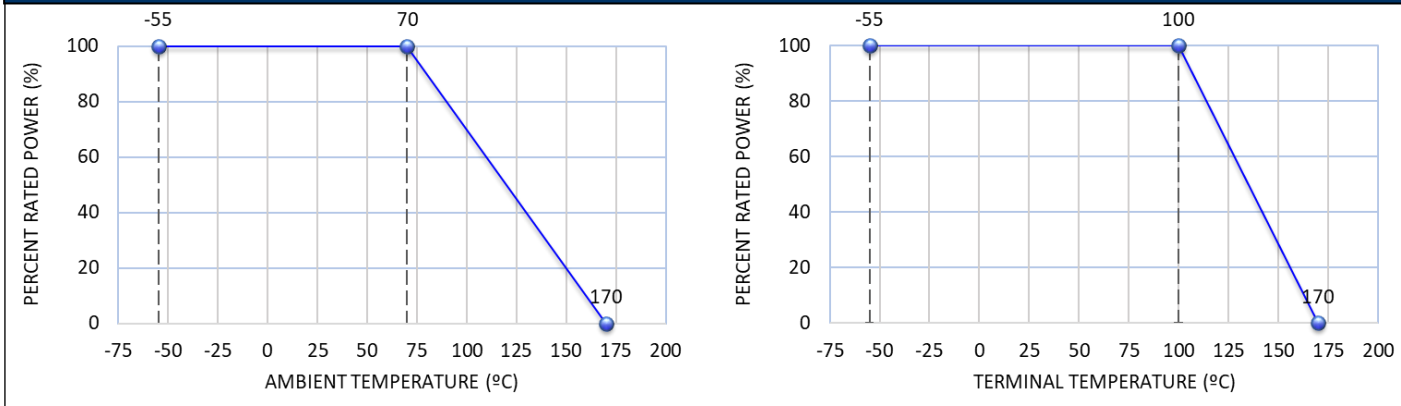


Type/Code	L Body Length	W Body Width	H Body Height	l_1 Top Termination	l_2 Bottom Termination	Unit
RNCL1206	0.122 ± 0.004	0.063 ± 0.004	0.022 ± 0.004	0.016 ± 0.008	0.018 ± 0.008	inches
	3.10 ± 0.10	1.60 ± 0.10	0.55 ± 0.10	0.40 ± 0.20	0.45 ± 0.20	mm
RNCL1210	0.122 ± 0.004	0.098 ± 0.006	0.022 ± 0.004	0.020 ± 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 to +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: 10 N for 10 seconds	No breakage.
Solderability	JIS C-5201-1 4.17 IEC-60115-1 4.17	245 ± 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	260 ± 5°C for 10 seconds	± (1% + 0.001Ω) No visual damage

Performance Characteristics (cont.)			
Test Item	Test Method	Test Condition	Test Limits
Leaching	JIS C5201-1 4.18 IEC-60068-2-58 8.2.1	260 ± 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 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	40 ± 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	70 ± 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 ~ 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 = 3 mm; 2010-2512 = 2 mm	± (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.
Recommended storage temperature is 15 to 28°C and humidity < 80% R.H.

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

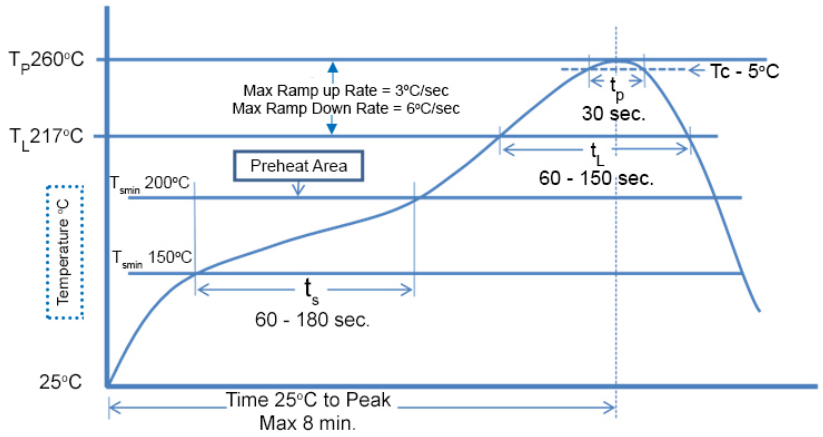
Soldering iron recommended temperatures: 330 to 350°C with minimum duration.
Maximum number of reflow cycles: 3.

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

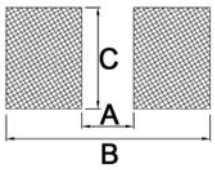
Temperature Diff. = Difference between final preheat stage and soldering stage.

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	*

Recommended Resistor Reflow Profile



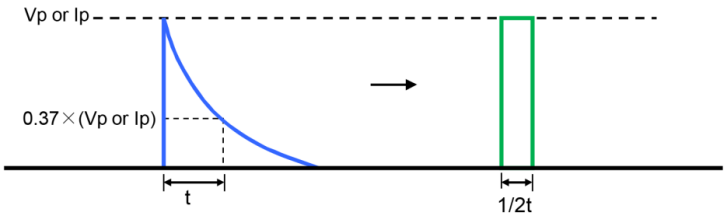
Recommended Pad Layout



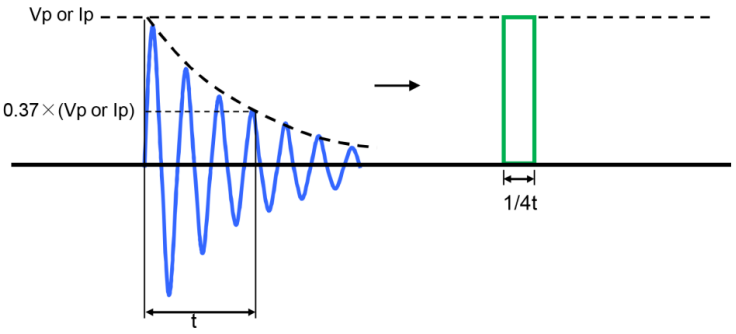
Type/Code	A	B	C	Unit
RNCL1206	0.087 2.20	0.165 4.20	0.071 1.80	inches mm
RNCL1210	0.079 2.00	0.173 4.40	0.106 2.70	inches mm
RNCL2010	0.150 3.80	0.260 6.60	0.106 2.70	inches mm
RNCL2512	0.193 4.90	0.319 8.10	0.134 3.40	inches mm

Waveform Transformation to Square Wave

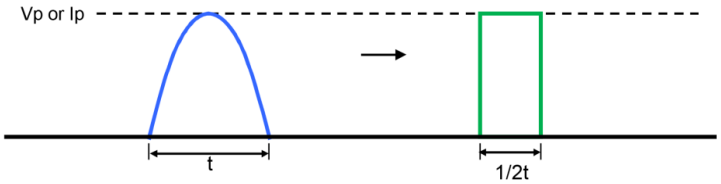
1. Discharge curve wave with time constant “t” → Square wave



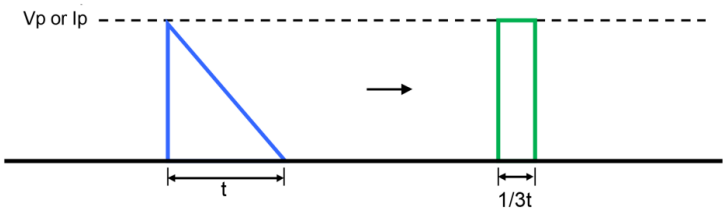
2. Damping oscillation wave with time constant of envelope “t” → Square wave



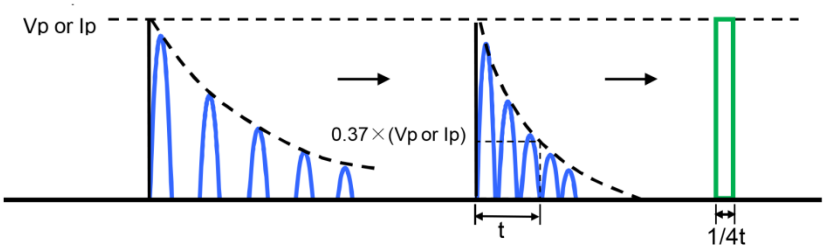
3. Half-wave rectification wave → Square wave



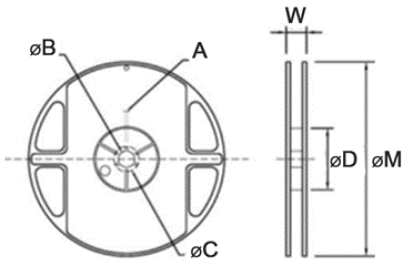
4. Triangular wave → Square wave



5. Special wave → Square wave

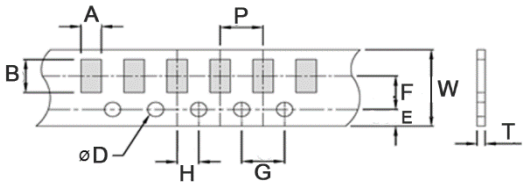


Reel Specifications



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

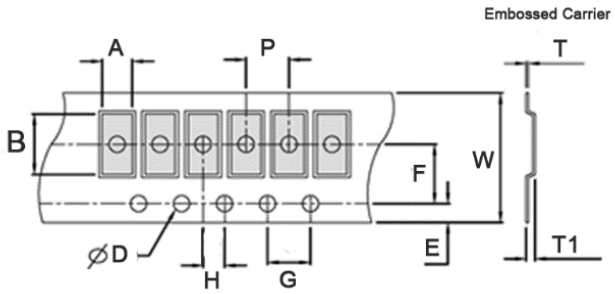
Packaging Specifications – Paper Tape



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

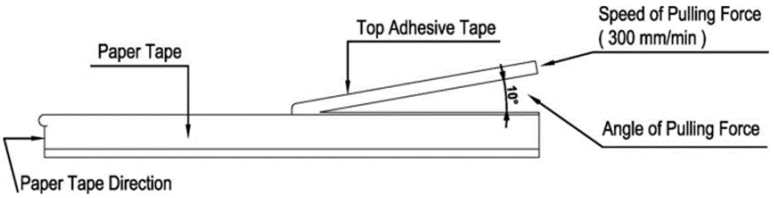
Packaging Specifications – Plastic Tape



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

The nominal resistance is marked on the surface of the part with the use of four-character marking, with the letter “R” used as the decimal place holder.

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 Chip Resistor	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

1206
1210
2010
2512

Tolerance

Code	Tol
D	0.5%
F	1%
J	5%

Packaging

Code	Description	Size	Quantity
T	7" Reel Paper Tape	1206, 1210	5000
	7" Reel Plastic Tape	2010, 2512	4000

Resistance Value

Four characters with the multiplier used as the "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