Current Sensing Thick Film Chip Resistor
(RL Series)

■Scope

—This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

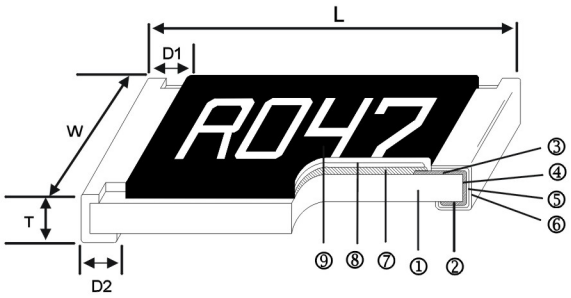
■Features

—Low inductance
—Highly reliable multilayer electrode construction
—Higher component and equipment reliability
—Reduced size of final equipment reliability

■Applications

—Power Management Applications
—Switching Power Supply
—Over Current Protection in Audio Application
—Voltage Regulation Module (VRM)
—DC-DC Converter, Battery Pack, Charger, Adaptor
—Automotive Engine Control
—Disk Driver
—Portable Devices (PDA, Cell Phone)

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/Ag)
②	Bottom Electrode (Ag)	⑤	Barrier Layer (Ni)	⑧	Primary Overcoat (Glass)
③	Top Electrode (Ag-Pd)	⑥	External Electrode (Sn)	⑨	Secondary Overcoat (Epoxy)

■Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
RL0402	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
RL0603	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
RL0805	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
RL1206	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
RL1210	1210	3.20±0.20	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
RL2010	2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
RL2512	2512	6.35±0.20	3.20±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

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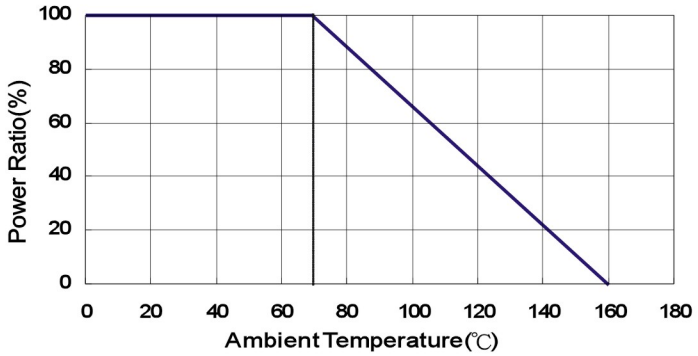
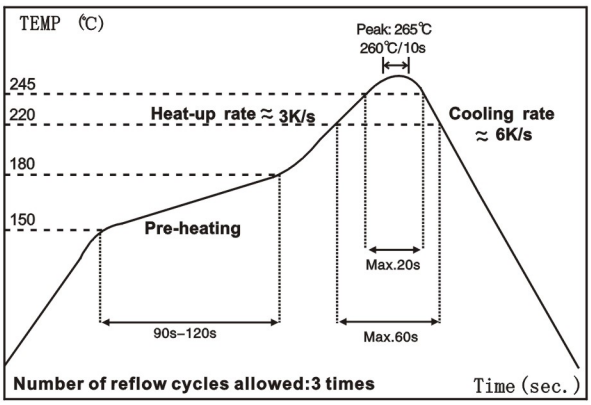
■Part Numbering

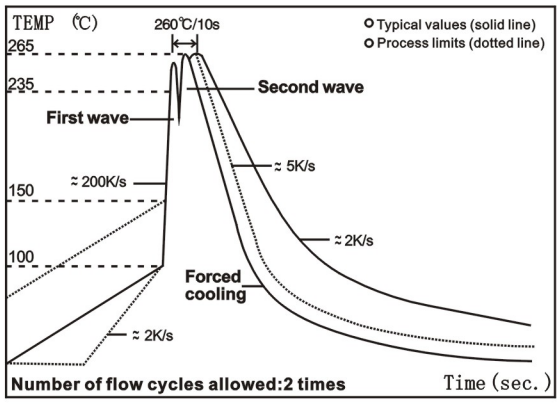
RL	0603	F	R	-	07	0R01	L
Product Type	Size	Resistance Tolerance	Packaging Type	Temperature Coefficient of resistance	Taping Reel	Resistance	Marking Code
	0201 0402 0603 0805 1206 1210 2010 2512	F: ±1% J: ±5%	R:Paper/PE taping reel K:Embossed taping reel	-: Base on spec	07: 7 inch dia. reel 10: 10 inch dia. reel 13: 13 inch dia. Reel 7W: 7 inch Dia. Reel and 2 x standard power type.	0R1 : 0.1Ω 0R47: 0.47Ω	Latter L is system default code for order only.

■Derating Curve



■Soldering Condition





IR Reflow Soldering

Wave Soldering (Flow Soldering)

(1) Time of IR reflow soldering at maximum temperature point 260℃：10s

(2) Time of wave soldering at maximum temperature point 260℃：10s

(3) Time of soldering iron at maximum temperature point 410℃：5s

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max.Operating Current	Resostamce Range (mΩ)		TCR (PPM/°C)
				±1%	±5%	
RL0402	1/16W	-55～+155°C	1.11A	50 - 91 100 - 976		±800 ±500
RL0603	1/10W	-55～+155°C	2.23A	20 - 47 50 - 91 100 - 976		±1200 ±800 ±500
RL0805	1/8W	-55～+155°C	3.53A	10 - 18 20 - 47 50 - 91 100 - 976		±1500 ±1200 ±800 ±500
RL1206	1/4W	-55～+155°C	5.00A			
RL1210	1/3W	-55～+155°C	5.77A	10 - 18 20 - 91 100 - 976		±1500 ±800 ±500
RL2010	3/4W	-55～+155°C	8.66A			
RL2512	1W	-55～+155°C	10.0A			

Operating Voltage=$\sqrt{(P*R)}$: Overload Voltage=2.5*$\sqrt{(P*R)}$

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max.Operating Current	Resostamce Range (mΩ)		TCR (PPM/°C)
				±1%	±5%	
RL0402	1/10W	-55～+155°C	1.40A	50 - 91 100 - 976		±800 ±500
RL0603	1/8W	-55～+155°C	2.50A	20 - 47 50 - 91 100 - 976		±1200 ±800 ±500
RL0805	1/4W	-55～+155°C	5.00A	10 - 18 20 - 47 50 - 91 100 - 976		±1500 ±1200 ±800 ±500
RL1206	1/3W	-55～+155°C	5.77A			
RL1210	1/2W	-55～+155°C	7.07A	10 - 18 20 - 91 100 - 976		±1500 ±800 ±500
RL2010	1W	-55～+155°C	10.0A			
RL2512	2W	-55～+155°C	14.1A			

Operating Voltage=$\sqrt{(P*R)}$

Overload Voltage=2.5*$\sqrt{(P*R)}$

Operating Current=$\sqrt{(P/R)}$

■ Thunder is capable of manufacturing the optional spec based on customer's requirement.

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■Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		**JIS-C-5201-1 4.8** **IEC-60115-1 4.8** -55℃~+125 ℃, 25 ℃ is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	**JIS-C-5201-1 4.13** **IEC-60115-1 4.13** 2.5 times RCWV or Max. overload voltage for 5 seconds, 2 seconds for high power series
Insulation Resistance	≧10G		**JIS-C-5201-1 4.6** **IEC-60115-1 4.6** Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	**JIS-C-5201-1 4.25** **IEC-60115-1 4.25.1** 70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	**JIS-C-5201-1 4.24** 40±2°C, 90~95% R.H., Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	**JIS-C-5201-1 4.23.2** **IEC-60115-1 2.23.2** at +155℃ for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	**JIS-C-5201-1 4.33** **IEC-60115-1 4.33** Bending once for 5 seconds with 3mm 2010, 2512 sizes: 2 mm
Solderability	>95% coverage		**JIS-C-5201-1 4.17** **IEC-60115-1 4.17** 245±5℃ for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	**JIS-C-5201-1 4.18** **IEC-60115-1 4.18** 260±5℃ for 10 seconds
Voltage Proof	No breakdown or flashover		**JIS-C-5201-1 4.7** **IEC-60115-1 4.7** 1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦10%		**JIS-C-5201-1 4.18** **IEC-60068-2-58 8.2.1** 260±5℃ for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	**JIS-C-5201-1 4.19** **IEC-60115-1 4.19** -55℃ to +155℃, 5 cycles

■ **Storage Temperature: 25±3°C; Humidity < 80%RH**