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.

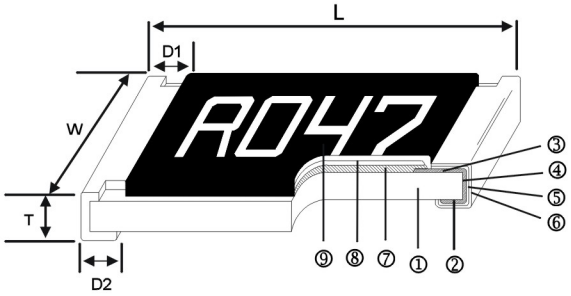
■Features

—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

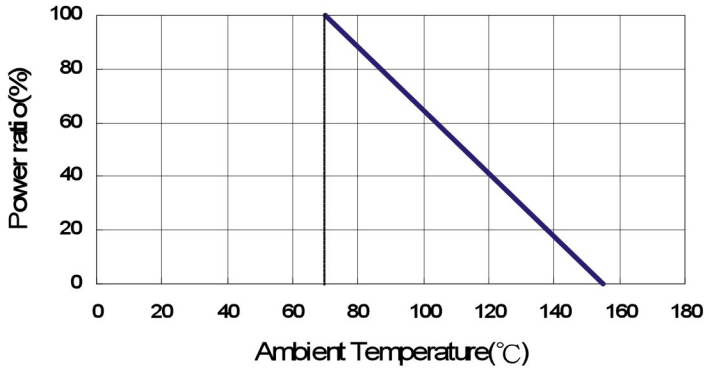
Unit: mm

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

■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



■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ) ±1%	Resistance Range (mΩ) ±5%	TCR (PPM/°C)
RL0402	1/16W	-55～+155°C	50 - 99 100 - 499 500 - 976		±800 ±500 ±200
RL0603	1/10W	-55～+155°C	20 - 47 50 - 99 100 - 499 500 - 976		±1200 ±800 ±500 ±200
RL0805	1/8W	-55～+155°C	10 - 18 20 - 47 50 - 99 100 - 499 500 - 976		±1500 ±1200 ±800 ±500 ±200
RL1206	1/4W				
RL1210	1/3W	-55～+155°C	10 - 18 20 - 47 50 - 99 100 - 499 500 - 976		±1500 ±800 ±800 ±200 ±200
RL2010	3/4W				
RL2512	1W				

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

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

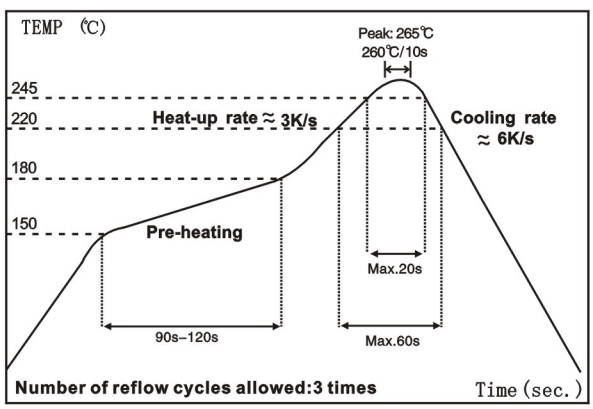
■High Power Rating Electrical Specifications

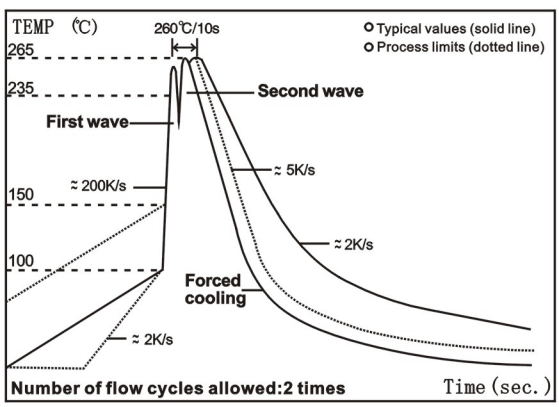
Item / Type	Power Rating at 70 C	e	Resistance Range (mΩ)		TCR (PPM/ C)
			±1%	±5%	
RL0402	1/10W	-55～+155 C	50 - 99 100 - 499 500 - 976		800 500 200
RL0603	1/8W	-55～+155 C	20 - 47 50 - 99 100 - 499 500 - 976		1200 800 500 200
RL0805	1/4W	-55～+155 C	10 - 18 20 - 47 50 - 99 100 - 499 500 - 976		1500 1200 800 500 200
RL1206	1/3W				
RL1210	1/2W	-55～+155 C	10 - 18 20 - 47 50 - 99 100 - 499 500 - 976		1500 800 800 200 200
RL2010	1W				
RL2512	2W				

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

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

■Soldering Condition





IR Reflow Soldering

Wave Soldering (Flow Soldering)

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

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

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

■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˚C~+125 ˚C, 25 ˚C 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˚C 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˚C 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˚C 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˚C 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˚C to +155˚C, 5 cycles

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