

## *Data Sheet*

Customer: \_\_\_\_\_

Product: Thick Film Chip Resistor. Low Ohmic Value (10mΩ~910mΩ) RL Series \_\_\_\_\_

Size : 0402/0603/0805/1206/1210/2512 \_\_\_\_\_

Issued Date: 15-Sep.-2016 \_\_\_\_\_

Edition: Ver. 2 \_\_\_\_\_

### Record of change

Date	Ver.	Description	Page
1-Apr.-2015	1		
15-Sep.-2016	2	Add 0402 size	

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Prepared by	Checked by	Approved by	Accepted by (customer)
1-Apr.-2015	1-Apr.-2015	1-Apr.-2015	
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# THICK FILM CHIP RESISTORS LOW RESISTANCE

# RL SERIES

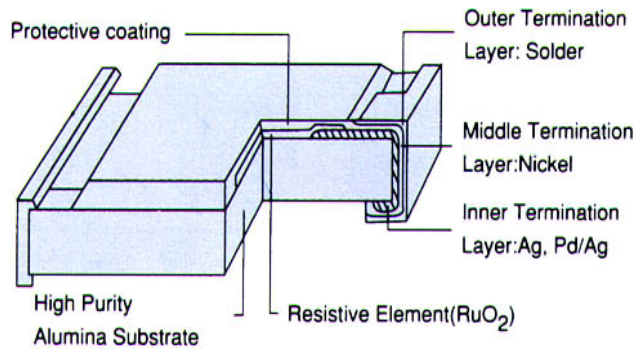
## ■ Features

- Suitable for lead free soldering.
- Compatible with flow and reflow soldering

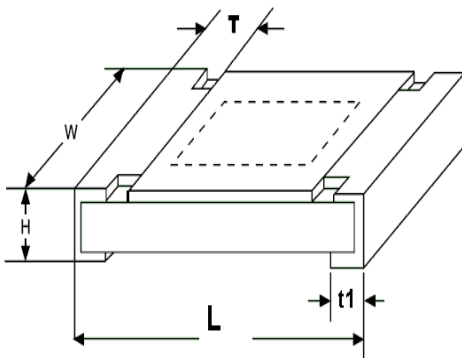
## ■ Applications

- Consumer Electronics
- Automotive industry
- Computer
- Measurement instrument
- Electronic watch and camera

## ■ Configuration



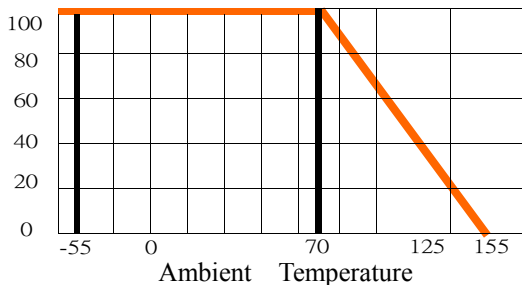
## ■ Dimensions



Size	L	W	T	t1	H
0402	1.00±0.10	0.50±0.05	0.20±0.10	0.25±0.10	0.30±0.05
0603	1.60±0.10	0.80±0.10	0.25±0.15	0.25±0.15	0.45±0.15
0805	2.00±0.10	1.25±0.10	0.40±0.20	0.35±0.20	0.50±0.15
1206	3.10±0.10	1.60±0.10	0.50±0.25	0.40±0.20	0.60±0.15
1210	3.10±0.10	2.60±0.10	0.50±0.20	0.50±0.20	0.55±0.10
2010	5.00±0.20	2.50±0.20	0.60±0.25	0.50±0.20	0.55±0.10
2512	6.40±0.20	3.20±0.20	0.60±0.25	0.50±0.20	0.60±0.10

Unit(mm)

## ■ Power Derating Curve



Maximum dissipation in percentage of rated power as a function of the ambient temperature.

# THICK FILM CHIP RESISTORS LOW RESISTANCE

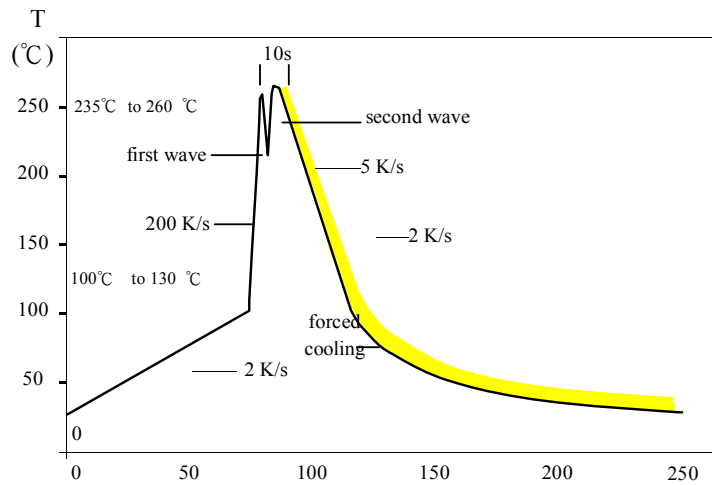
# RL SERIES

## Rating

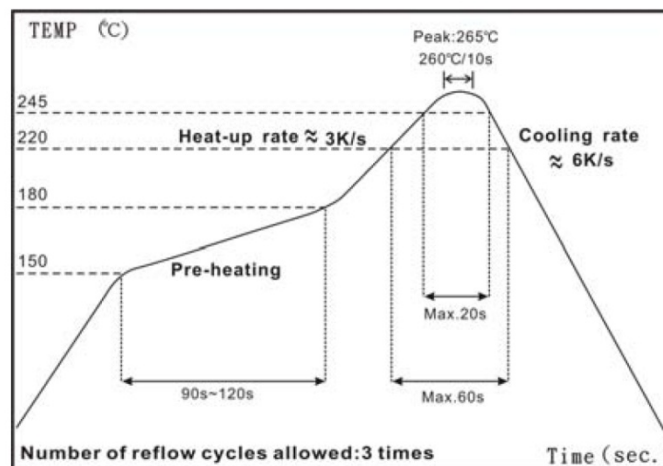
Size	Power Rating at 70°C	Tolerance (%)	T.C.R. ppm/°C	Resistance Range		Standard Resistance Values
				Min.	Max.	
RL0402	1/16W	±1%(F) ±5%(J)	≤ 600	100mΩ	976mΩ	E-24  E-96 (on request)
RL0603	1/8W		±100	100mΩ	976mΩ	
			±200	20mΩ	99mΩ	
			±400	10mΩ	19mΩ	
RL0805	1/4W		±100	47mΩ	976mΩ	
RL1206	1/3W		±200	10mΩ	46mΩ	
			±100	47mΩ	976mΩ	
RL1210	1/2W		±200	10mΩ	47mΩ	
RL2010	1/2W	±100	47mΩ	976mΩ		
RL2512	1W	±200	10mΩ	47mΩ		
		±100	47mΩ	976mΩ		

Note : RCWV(Rated Continuous Working Voltage) =  $\sqrt{P(\text{rated power}) \times R(\text{Resistance value})}$   
 RCWV: Working Voltage(V). P: Rated Power (W), R: Resistance Value(Ω)

## Soldering Temperature Curve



Process limits (dotted line). **WAVE soldering.**

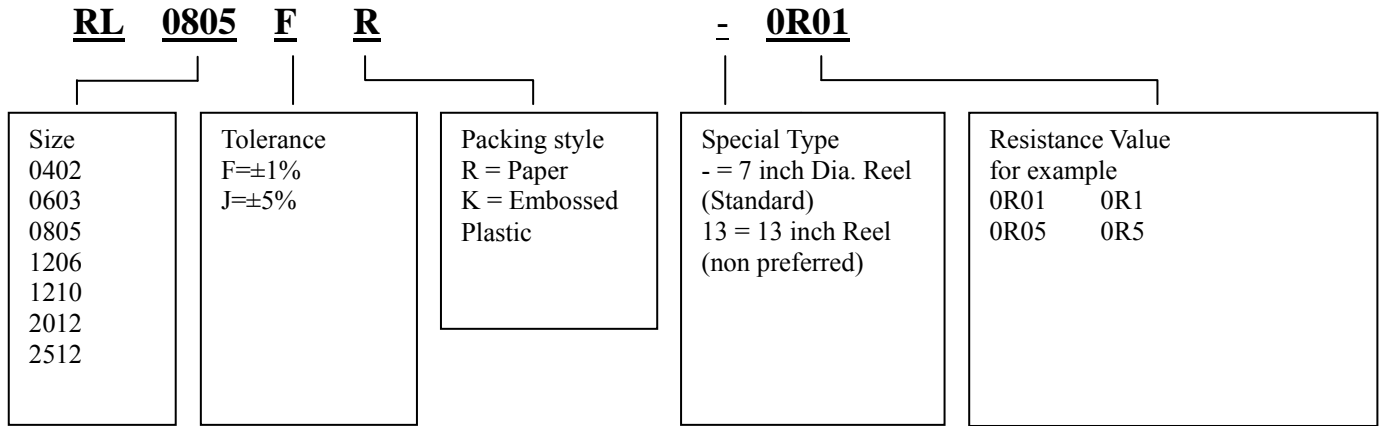


IR Reflow Soldering

# THICK FILM CHIP RESISTORS LOW RESISTANCE

# RL SERIES

## ■ Part Numbering



## GENERAL SPECIFICATION

### ■ Resistance Marking

#### E - 24 SERIES



4 digits marking for ±1%, ±5%  
E24 (10mΩ~976mΩ)

Examples: R100 = 100mΩ

R047 = 47mΩ



3 digits marking for 0603 ±1%, ±5%  
E24 (10mΩ~976mΩ)

Example: R100 = 100mΩ, R047 = 47mΩ

3 digits marking with underline for 0603 ±1%  
E-96 (10mΩ~976mΩ)

Examples: 499 = 499 mΩ

No marking for 0402 size

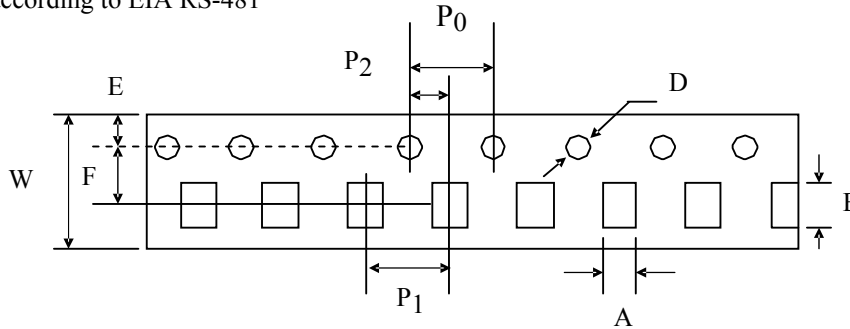
# THICK FILM CHIP RESISTORS LOW RESISTANCE

# RL SERIES

## GENERAL SPECIFICATION

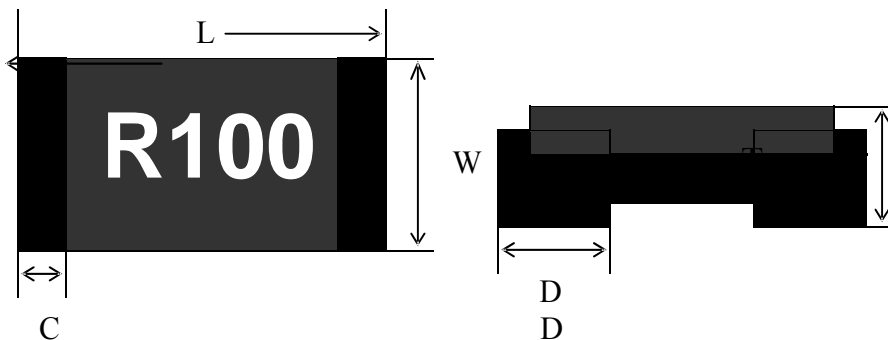
### ■ Tape And Reel Package

• Taping specs are according to EIA RS-481



Accumulated dimensional tolerance 40±0.2mm

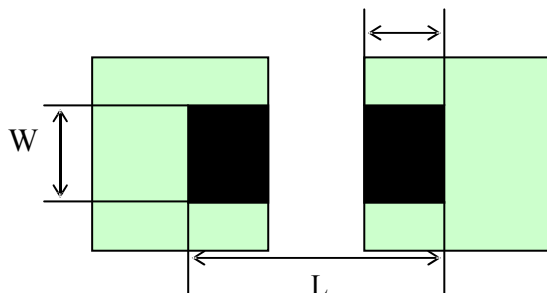
Size	A	B	W	F	E	P1	P2	P0	D
0402	0.65±0.1	1.15±0.1	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
0603	1.10±0.20	1.90±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
0805	1.65±0.20	2.40±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
1206	2.00±0.20	3.60±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
1210	3.00±0.20	3.60±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
2010	2.80±0.20	5.50±0.20	12.00±0.30	5.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
2512	3.50±0.20	6.70±0.20	12.00±0.30	5.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0



(unit: mm)

\* 2W loading with total solder-pad and trace size of 300mm<sup>2</sup>

Type	W	D	L
RL2512	3.7mm	2.45mm	7.6mm

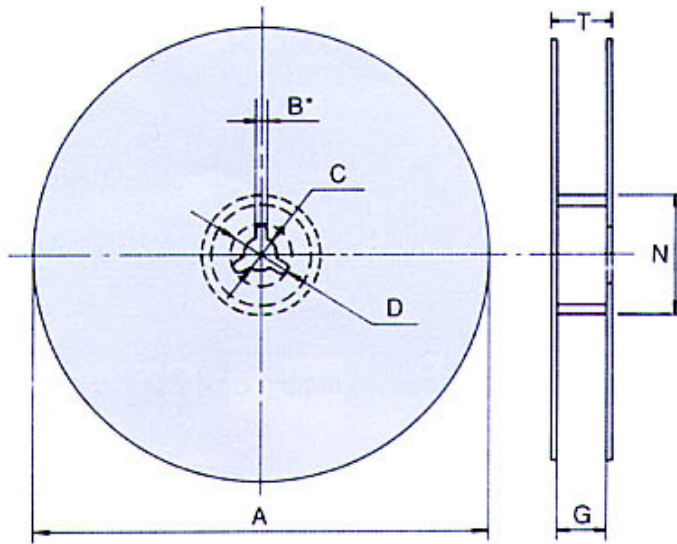


# THICK FILM CHIP RESISTORS LOW RESISTANCE

# RL SERIES

## GENERAL SPECIFICATION

■ **Reel Package**



Size	Packaging Q'ty	A	N	C	D	B	G	T
<b>0402</b>	10Kpcs / Reel	178.0±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	10.0±1.5	14.9 max.
<b>0603</b>	5Kpcs / Reel	178.0±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	10.0±1.5	14.9 max.
<b>0805</b>	20Kpcs / Reel	330.0±2.0	100.0±1.0	13.5±0.5	20min	2.0±0.5	10.0±1.5	14.9 max.
<b>1206</b>								
<b>1210</b>								
<b>2010</b>	4Kpcs / Reel	178.0±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	13.8±1.5	16.7 max.
<b>2512</b>	16Kpcs / Reel	330.0±2.0	100.0±1.0	13.5±0.5	20min	2.0±0.5	13.8±1.5	20.0 max.

(unit: mm)

# THICK FILM CHIP RESISTORS

## LOW RESISTANCE

# RL SERIES

### GENERAL SPECIFICATION

#### ■ RL < 1Ω Specification And Test Methods

ITEM	SPECIFICATION	TEST METHOD
DC Resistance	J: $\pm 5\%$ , F: $\pm 1\%$	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.5</b> Measure the resistance value.
Short time Overload	J: $\Delta R \leq \pm (2\% + 0.5m\Omega)$ F: $\Delta R \leq \pm (1\% + 0.5m\Omega)$	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.13</b> 2.5×Rated voltage or Max. Overload Voltage for 5 sec. measure resistance after 30 minutes
Solderability	Over 95% of termination must be covered with solder	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.17</b> After immersing flux, dip in the $235\pm 2^{\circ}C$ molten solder bath for $2\pm 0.5$ sec.
Resistance to Solder Heat	J: $\Delta R \leq \pm (1\% + 0.5m\Omega)$ F: $\Delta R \leq \pm (0.5\% + 0.5m\Omega)$ No mechanical damage	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.18</b> With $260\pm 5^{\circ}C$ for $10\pm 1$ sec.
Temperature Coefficient of Resistance (TCR)	As Spec.	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.8</b> $-55^{\circ}C \sim +125^{\circ}C$ , $25^{\circ}C$ is the reference temperature
Load Life Humidity	J: $\Delta R \leq \pm (3\% + 0.5m\Omega)$ F: $\Delta R \leq \pm (1\% + 0.5m\Omega)$	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.24</b> Maintain the temperature of the resistor at $40\pm 2^{\circ}C$ and 90 ~ 95% R.H. with the rated voltage applied. Cycle ON for 1.5 hours and OFF for 0.5 hour for $1000+48/-0$ hours. After 1~4 hour, measure
Load Life	J: $\Delta R \leq \pm (3\% + 0.5m\Omega)$ F: $\Delta R \leq \pm (1\% + 0.5m\Omega)$	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.25</b> Permanent resistance change after $1000+48/-0$ hours (1.5 hours ON , 0.5 hour OFF) at RCWV or Max. Keep the resistor at $70\pm 2^{\circ}C$ ambient
Temperature Cycle	J: $\Delta R \leq \pm (1\% + 1m\Omega)$ F: $\Delta R \leq \pm (0.5\% + 1m\Omega)$ No mechanical damage	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.19</b> Repeat 5 cycles as follows $-55^{\circ}C$ (30 min.) + $25^{\circ}C$ (2~3 min.) $+125^{\circ}C$ (30 min.) + $25^{\circ}C$ (2~3 min.) for 0201 $55^{\circ}C$ (30 min.) + $25^{\circ}C$ (2~3 min.) $+155^{\circ}C$ (30 min.) + $25^{\circ}C$ (2~3 min.) for others
Insulation Resistance	Between termination and coating must be over $1000M\Omega$	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.6</b> Test voltage: $100\pm 15V$
Bending Strength	J: $\Delta R \leq \pm (1\% + 1m\Omega)$ F: $\Delta R \leq \pm (0.5\% + 1m\Omega)$ No mechanical damage	<b>IEC 60115-1 / JIS C 5201-1 , Clause 4.33</b> Resistance change after bended on the 90mm PCB Bend: 3mm for 0603 · 0805 2mm for 1206 · 1210 · 2010 · 2512