

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

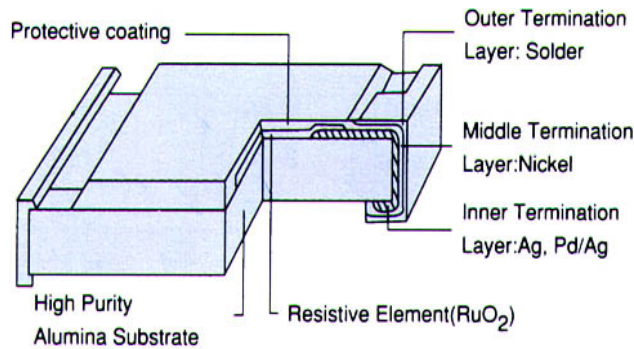
■ Features

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

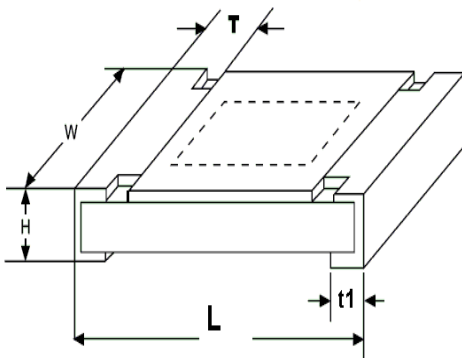
■ Applications

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

■ Configuration



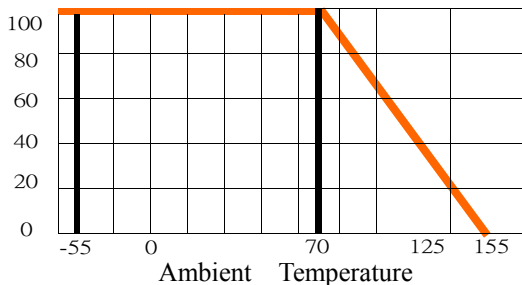
■ Dimensions



| 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.

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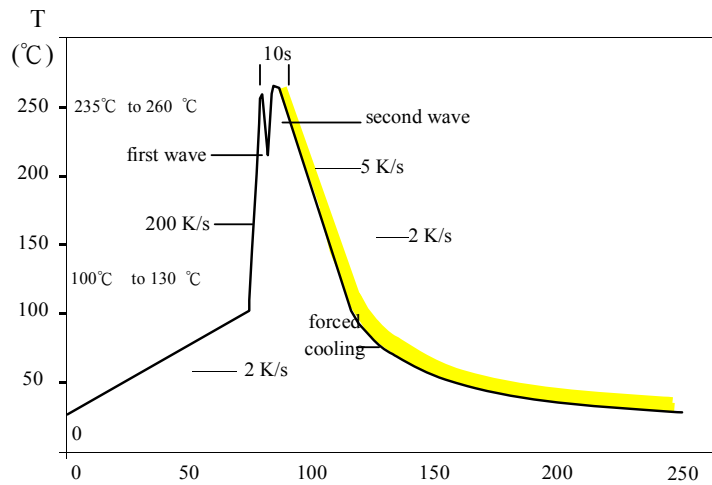
RL SERIES

Rating

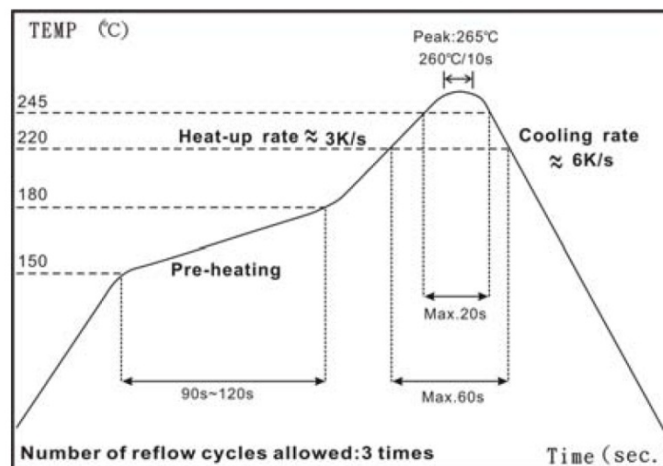
| Size | Power Rating at 70°C | Tolerance (%) | T.C.R. ppm/°C | Resistance Range | | Standard Resistance Values |
|--------|----------------------|------------------|---------------|------------------|-------|----------------------------------|
| | | | | Min. | Max. | |
| RL0402 | 1/16W | ±1%(F) ±5%(J) | ≤ 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.**

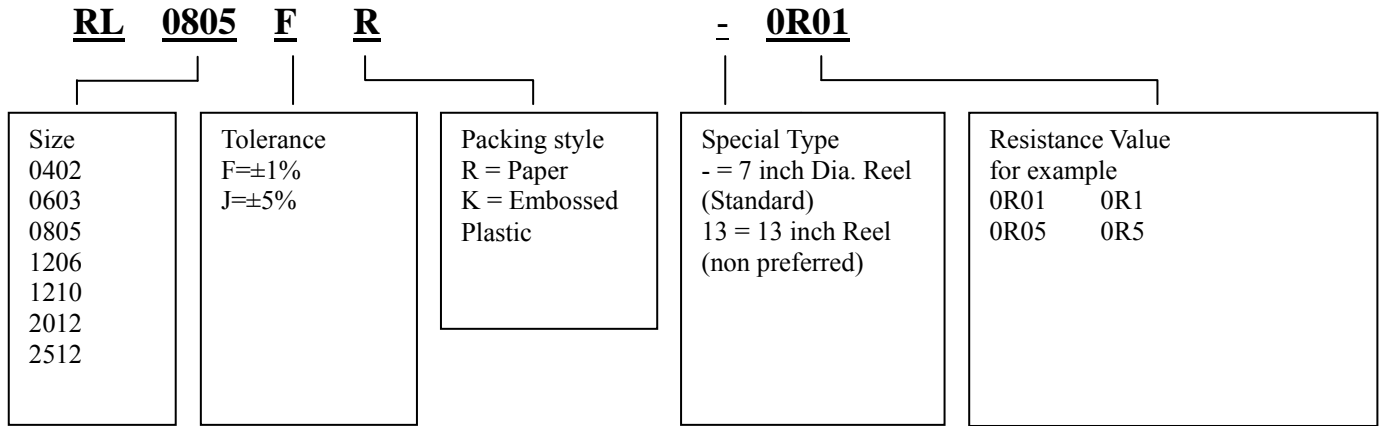


IR Reflow Soldering

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

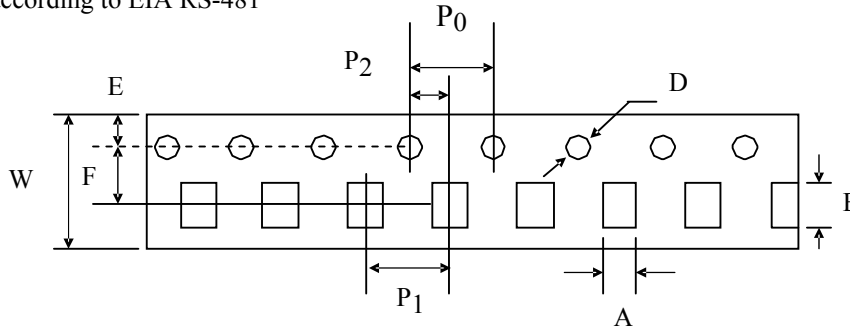
THICK FILM CHIP RESISTORS LOW RESISTANCE

RL SERIES

GENERAL SPECIFICATION

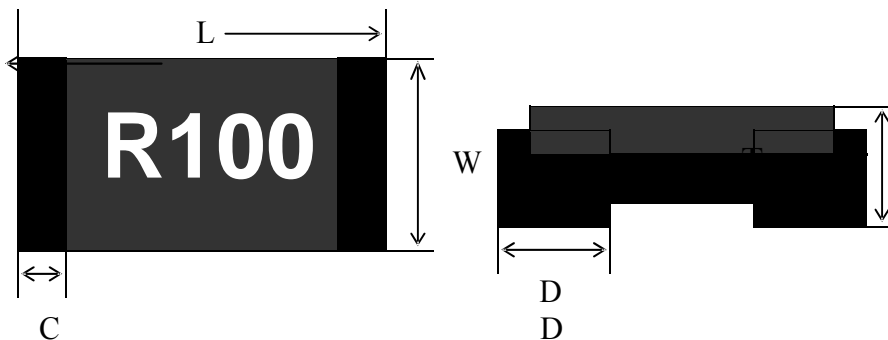
■ Tape And Reel Package

• Taping specs are according to EIA RS-481



Accumulated dimensional tolerance $40 \pm 0.2 \text{mm}$

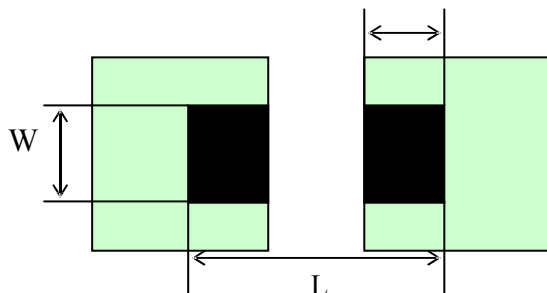
| Size | A | B | W | F | E | P1 | P2 | P0 | D |
|------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------|
| 0402 | 0.65 ± 0.1 | 1.15 ± 0.1 | 8.00 ± 0.30 | 3.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 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^2

| Type | W | D | L |
|--------|-------|--------|-------|
| RL2512 | 3.7mm | 2.45mm | 7.6mm |

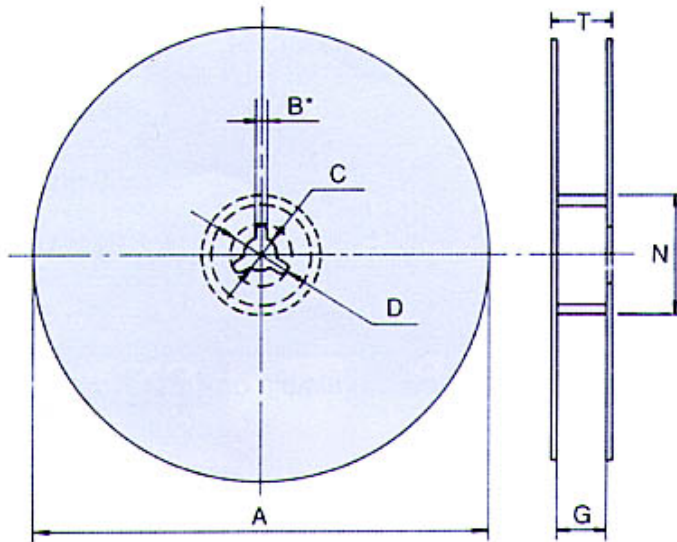


THICK FILM CHIP RESISTORS LOW RESISTANCE

RL SERIES

GENERAL SPECIFICATION

■ **Reel Package**



| Size | Packaging Q'ty | A | N | C | D | B | G | T |
|-------------|----------------|-----------|-----------|----------|-------|---------|----------|-----------|
| 0402 | 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. |
| 0603 | 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. |
| 0805 | 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. |
| 1206 | | | | | | | | |
| 1210 | | | | | | | | |
| 2010 | 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. |
| 2512 | 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: $\pm 1\%$ | IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance value. |
| Short time Overload | J: $\Delta R \leq \pm (2\% + 0.5m\Omega)$ F: $\Delta R \leq \pm (1\% + 0.5m\Omega)$ | IEC 60115-1 / JIS C 5201-1 , Clause 4.13 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 | IEC 60115-1 / JIS C 5201-1 , Clause 4.17 After immersing flux, dip in the $235\pm 2^{\circ}\text{C}$ molten solder bath for 2 ± 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 | IEC 60115-1 / JIS C 5201-1 , Clause 4.18 With $260\pm 5^{\circ}\text{C}$ for 10 ± 1 sec. |
| Temperature Coefficient of Resistance (TCR) | As Spec. | IEC 60115-1 / JIS C 5201-1 , Clause 4.8 $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$, 25°C is the reference temperature |
| Load Life Humidity | J: $\Delta R \leq \pm (3\% + 0.5m\Omega)$ F: $\Delta R \leq \pm (1\% + 0.5m\Omega)$ | IEC 60115-1 / JIS C 5201-1 , Clause 4.24 Maintain the temperature of the resistor at $40\pm 2^{\circ}\text{C}$ 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: $\Delta R \leq \pm (1\% + 0.5m\Omega)$ | IEC 60115-1 / JIS C 5201-1 , Clause 4.25 Permanent resistance change after $1000+48/-0$ hours (1.5 hours ON , 0.5 hour OFF) at RCWV or Max. Keep the resistor at $70\pm 2^{\circ}\text{C}$ ambient |
| Temperature Cycle | J: $\Delta R \leq \pm (1\% + 1m\Omega)$ F: $\Delta R \leq \pm (0.5\% + 1m\Omega)$ No mechanical damage | IEC 60115-1 / JIS C 5201-1 , Clause 4.19 Repeat 5 cycles as follows -55°C (30 min.) + 25°C (2~3 min.) $+125^{\circ}\text{C}$ (30 min.) + 25°C (2~3 min.) for 0201 55°C (30 min.) + 25°C (2~3 min.) $+155^{\circ}\text{C}$ (30 min.) + 25°C (2~3 min.) for others |
| Insulation Resistance | Between termination and coating must be over $1000M\Omega$ | IEC 60115-1 / JIS C 5201-1 , Clause 4.6 Test voltage: $100\pm 15\text{V}$ |
| Bending Strength | J: $\Delta R \leq \pm (1\% + 1m\Omega)$ F: $\Delta R \leq \pm (0.5\% + 1m\Omega)$ No mechanical damage | IEC 60115-1 / JIS C 5201-1 , Clause 4.33 Resistance change after bended on the 90mm PCB Bend: 3mm for 0603 · 0805 2mm for 1206 · 1210 · 2010 · 2512 |