

# DATA SHEET

**Product Name** Ultra Low Chip Resistors

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**Part Name** LR Series

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Kunshan Foss Electronic material Co., Ltd.

Brands *RoyalOhm* *UniOhm*



## 1. Scope

- 1.1 This specification for approve relates to the Ultra Low Chip Resistors manufactured by UNI-ROYAL.  
 1.2 High power rating up to 3 watts  
 1.3 Low T.C.R until  $\pm 50\text{PPM}$   
 1.4 Low resistance values, from  $0.5\text{ m}\Omega$  to  $15\text{m}\Omega$   
 1.5 Wide range package size 1206/2010/2512  
 1.6 Tolerance:  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$

## 2. Part No. System

Part No. includes 14 codes shown as below:

2.1 1st~4th codes: Part name. E.g.: LR06, LR10, LR12

2.2 5th~6th codes: Power rating.

E.g.: W=Normal Size		“1~G” = “1~16”								
Wattage	1/32	3/4	1/2	1/3	1/4	1/8	1/10	1/16	1/20	1
Normal Size	WH	07	W2	W3	W4	W8	WA	WG	WM	1W

If power rating is lower or equal than 1 watt, 5<sup>th</sup> code would be “W” and 6<sup>th</sup> code would be a number or letter.

E.g.: WA=1/10W

W4=1/4W

2.3 7<sup>th</sup> code: Tolerance. E.g.: D= $\pm 0.5\%$

F= $\pm 1\%$

G= $\pm 2\%$

J= $\pm 5\%$

K= $\pm 10\%$

2.4 8<sup>th</sup>~11<sup>th</sup> codes: Resistance Value.

2.4.1 If value belongs to standard value of  $\geq 5\%$  series, 8<sup>th</sup> code would be zero, 9<sup>th</sup>~10<sup>th</sup> codes are significant figures of the resistance and 11<sup>th</sup> code is the power of ten.

2.4.2 If value belongs to standard value of  $\leq 2\%$  series, 8<sup>th</sup>~10<sup>th</sup> codes are significant figures of the resistance, and 11<sup>th</sup> code is the power of ten.

2.4.3 11<sup>th</sup> codes listed as following:

0= $10^0$  1= $10^1$  2= $10^2$  3= $10^3$  4= $10^4$  5= $10^5$  6= $10^6$  J= $10^{-1}$  K= $10^{-2}$  L= $10^{-3}$  M= $10^{-4}$  N= $10^{-5}$  P= $10^{-6}$

2.5 12<sup>th</sup>~14<sup>th</sup> codes.

2.5.1 12<sup>th</sup> code: Packaging Type. E.g.: C=Bulk

T=Tape/Reel

2.5.2 13<sup>th</sup> code: Standard Packing Quantity.

4=4000pcs

5=5000pcs

C=10000pcs

D=20000pcs

E=15000pcs

Chip Product: BD=B/B-20000pcs

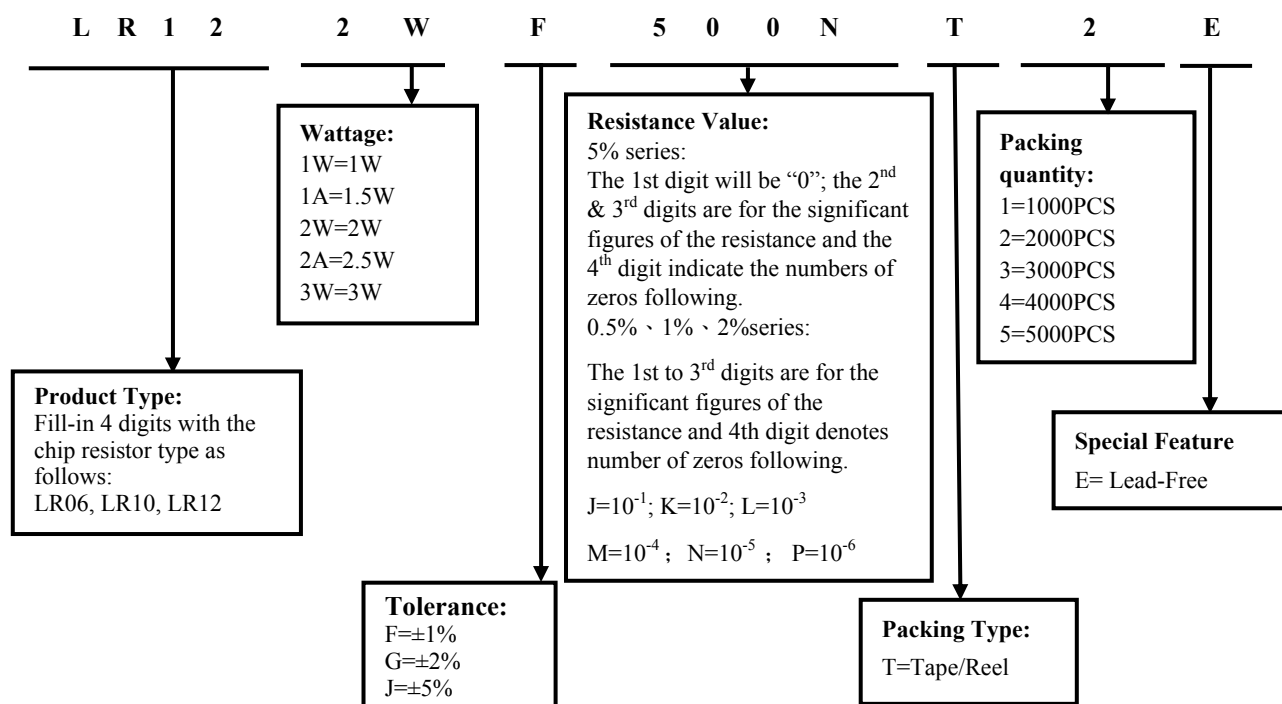
TC=T/R-10000pcs

2.5.3 14<sup>th</sup> code: Special features.

E = Environmental Protection, Lead Free, or Standard type.

## 3. Ordering Procedure

(Example: LR12 2W  $\pm 1\%$  5m $\Omega$  T/R-2000)



**4. Marking**

## 4.1 Resistors

A. Resistance (Marking):

Example :

Resistance	0.5mΩ	1mΩ	1.5mΩ	2mΩ	7mΩ	10mΩ
Codes	M500	R001	1M50	R002	R007	R010

## 4.2 Labels

Label shall be marked with the following item

A. Nominal Resistance

B. Resistance Tolerance


C. Power Rating

D. Size

E. Quantity

F. Lot Number

Example :

UNIOHM Chip Resistors		
Resistance :	1mΩ	± 1%
Wattage :	2W	Size : LR12
Quantity :	2000 Pcs.	50 PPM
Part No.:		
Lot No. :	825723	LR1250F100NT2C
		

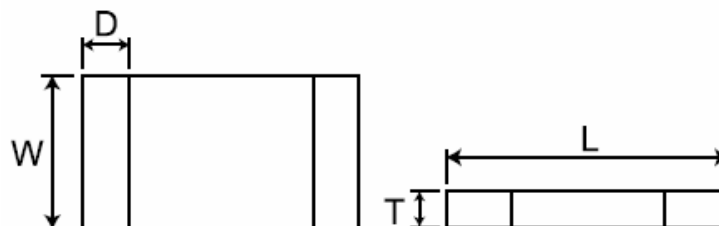
Label is 0R001, value is 0.001 Ω, marking is R001

**5. Power rating and dimensions**

## 5.1 Power Rating :

Type	Power Rating at 70 °C	TCR (PPM/°C)	Resistance value (mΩ)	Standard Series	Color	Sodering
Standard						
LR06 (1206)	1W	± 200	0.5	E-96,E-24	Black	IR reflow
		± 50	0.75 ~ 10			
LR12 (2512)	1W	± 150	2, 5, 3		Black	Wave or IR reflow
		± 100	4, 5, 10			
		± 75	6, 6.5, 7			
		± 50	0.5, 0.75, 1, 1.5, 2		Green	IR reflow
		± 50	11,12,13,14,15			
High Power Rating						
LR10 (2010)	1.5W	± 200	0.5	E-96,E-24	Black	IR reflow
		± 50	0.75 ~ 10			
LR12 (2512)	2W	± 150	2,3,5		Black	Wave or IR reflow
		± 100	4, 5, 10			
		± 75	6, 6.5, 7			
		± 50	0.5, 0.75, 1, 1.5, 2		Green	
		± 50	6.5,7,8,9,10			
	2.5W	± 50	4,4.5,5,6		Green	IR reflow
	3W	± 100	0.5,0.75			
		± 50	1, 1.5, 2,3			

## 5.2 Dimension :

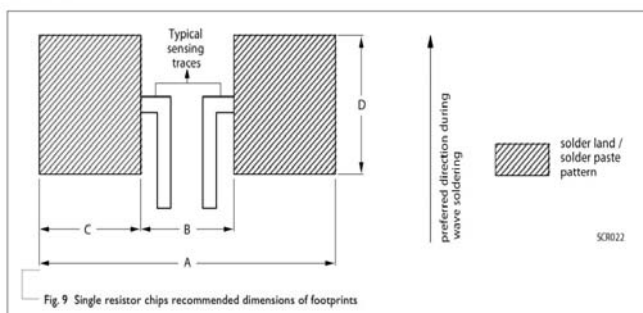


Type	Power Rating at 70 °C	Dimension (mm)			
		L	W	T	D
Standard					
LR06 (1206)	1W	3.20 ± 0.254	1.60 ± 0.104	0.60 ± 0.20	0.980 ± 0.380
LR12 (2512)	1W	6.35 ± 0.254	3.18 ± 0.254	Depends on value	Depends on value
High Power Rating					
LR10 (2010)	1.5W	5.08 ± 0.254	2.54 ± 0.15	0.60 ± 0.20	1.665 ± 0.625
LR12 (2512)	2W	6.35 ± 0.254	3.18 ± 0.254	Depends on value	Depends on value
	2.5W				
	3W				

## 6. Recommend the size of welding plate

Recommended Pad Layout

FOOTPRINT



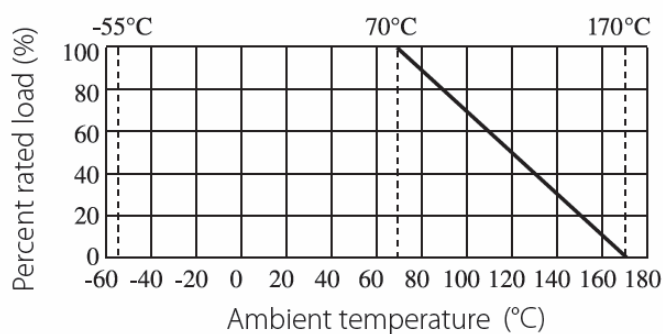
Footprint Dimensions

Size	Resistance Range	A	B	C	D
LR06	$1\text{m}\Omega \leq R \leq 50\text{m}\Omega$	3.9	0.76	1.57	1.78
LR12	$0.5\text{m}\Omega \leq R \leq 4\text{m}\Omega$	7.37	1.27	3.05	3.68
	$5\text{m}\Omega \leq R \leq 6\text{m}\Omega$	7.4	3.18	2.11	3.68
	$7\text{m}\Omega \leq R \leq 100\text{m}\Omega$	7.36	4.06	1.65	3.68

## 7. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature of 70 °C. For temperature in excess of 70 °C, The load shall be derate as shown in figure 1.

Figure 1



### 7.1 Voltage Rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate Sine - wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating , as determined from the following formula :

$$RCWV = \sqrt{P \times R}$$

Where : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

P = Power Rating (watt)

R = Nominal Resistance (ohm)

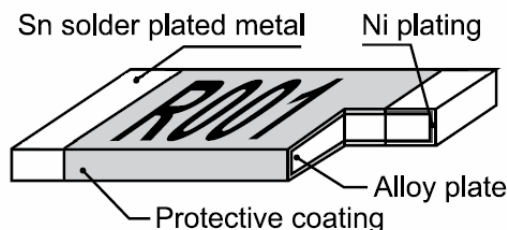
In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

### 6.2 Nominal Resistance

Effective figures of nominal resistance shall be in accordance with E-24, E-96

E-96 for 1 %, E-24 series for 2%, 5%.

## 8. Structure



Black coating - Wave or IR reflow soldering

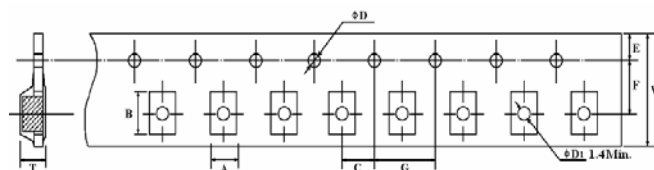
## 9. Performance Specification

Characteristic	Limits	Test Method (GB/T5729&JIS-C-5201&IEC60115)
Temperature Coefficient	Refer to item 5.	<p>4.8 Natural resistance changes per temp. Degree centigrade</p> $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM/}^\circ\text{C)}$ $\frac{R_3 - R_1}{R_1(t_3 - t_1)} \times 10^6 \text{ (PPM/}^\circ\text{C)}$ <p> <math>R_1</math>: Resistance Value at room temperature (<math>t_1</math>) ;  <math>R_2</math>: Resistance Value at upper limit temperature <math>\pm 2^\circ\text{C}</math> (<math>t_2</math>)  <math>R_3</math>: Resistance Value at lower limit temperature <math>\pm 3^\circ\text{C}</math> (<math>t_3</math>)            Test pattern : Room temperature : (<math>t_1</math>)            Upper limit temperature : (<math>t_2</math>)            Lower limit temperature : (<math>t_3</math>)         </p>
Short-time overload	Black coating: $\pm 0.5\%$ Max Green coating: $\pm 1\%$ Max	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5 seconds..
Soldering Heat	Black coating: $\pm 0.5\%$ Max Green coating: $\pm 1\%$ Max	Dip the resistor into a solder bath having a temperature of $260^\circ\text{C} \pm 5^\circ\text{C}$ and hold it for $10 \pm 1$ seconds
Solderability	95% coverage Min.	Wave solder: Test temperature of solder: $245^\circ\text{C} \pm 3^\circ\text{C}$ dipping time in solder: 2-3 seconds.
	Go up tin rate bigger than half of end pole	<p>Reflow:</p> <p>The graph shows a temperature profile for reflow soldering. The temperature starts at 50°C, rises to 150°C (labeled 90 ± 30s), then to 180°C (labeled 20 ± 10s), and finally to a peak value between 245°C and 250°C. The peak is held for 230°C. The temperature then falls back to 150°C. The total time from 150°C to the peak is labeled 'SOLDER TIME'. The time from the start to 150°C is labeled 'HOT UP TIME'.</p>

Rapid change of temperature	$\pm(1\%+0.1\Omega)\text{Max.}$	4.19 30 min at lower limit temperature and 30 min at upper limit temperature , 5 cycles.
Load life	$\pm(1\%+0.1\Omega)\text{Max.}$	4.25.1 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle 1.5 hours "ON", 0.5 hour "OFF" at 70°C $\pm 2^\circ\text{C}$ ambient.
Low Temperature Storage	$\pm(1\%+0.1\Omega)\text{Max.}$	4.23.4 Lower limit temperature , for 2H.
High Temperature Exposure	$\pm(1\%+0.1\Omega)\text{Max.}$	4.23.2 Upper limit temperature , for 16H.
Leaching	No visible damage	J-STD-002 Test D Samples completely immersed for 30 sec in solder bath at 260°C

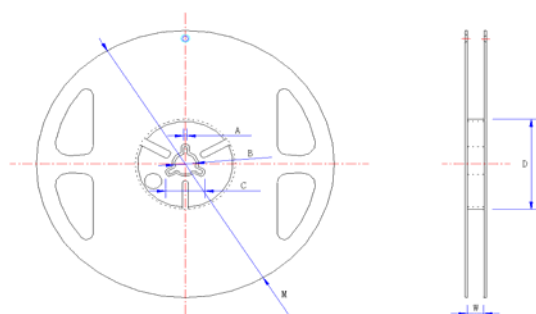
## 10. Packing of Surface Mount Resistors

### 10.1 Dimension of Paper Taping : (Unit: mm)



Type	A $\pm 0.1$	B $\pm 0.1$	C $\pm 0.05$	$\psi D$ $\pm 0.05$	E $\pm 0.1$	F $\pm 0.05$	G $\pm 0.1$	W $\pm 0.1$	T $\pm 0.1$
LR06	1.90	3.6	2.0	1.55	1.75	3.5	4.0	8.0	0.87
LR10	2.85	5.55	2.0	1.55	1.75	5.5	4.0	12.0	0.85
LR12	3.40	6.73	2.0	1.55	1.75	5.5	4.0	12.0	0.81

### 10.2 Dimension of Reel : (Unit: mm)



Type	Packaging	Quantity Per Reel
LR06	Embossed	2,000 pcs.
LR10	Embossed	2,000 pcs.
LR12	Embossed	2,000 pcs.



## 11. Note

11.1 UNI-ROYAL recommend the storage condition temperature: 15°C~35°C, humidity :25%~75%.

(Put condition for individual product).

Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old. (Put condition for each product) may be degraded.

11.2 Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.

Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

11.3 Product performance and soldered connections may deteriorate if the products are stored in the following places:

- Storage in high Electrostatic.
- Storage in direct sunshine、rain and snow or condensation.
- Where the products are exposed to sea winds or corrosive gases, including Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>.

## 12. Record

Version	Description of amendment	Page	Date	Amended by	Checked by
1	First issue of this specification	1~7	Mar.20, 2018	Chen Haiyan	Chen Nana

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