

### 1. Scope :

This specification applies for the RL series of alloy film chip resistors made by TA-I.

### 2. Construction :



### 3. Type Designation :

**RL**

Product Code  
RL : Chip Resistor

**10**

Size  
Power Rating

**F**

Tolerance

**TN**

Packaging

**R100**

Nominal  
Resistance

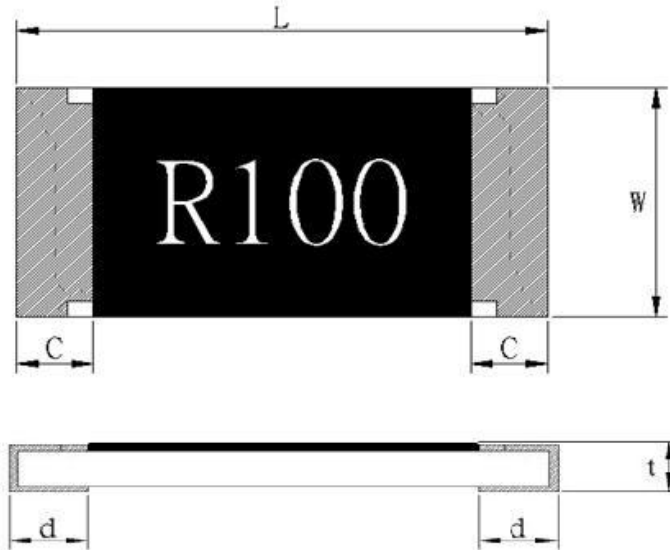
04-0402(1005) 1/16W  
06-0603(1608) 1/8W  
10-0805(2012) 1/4W  
12-1206(3216) 1/2W  
13-1210(3226) 1/2W  
20-2010(5025) 3/4W  
25-2512(6432) 1W

J-  $\pm 5\%$   
G-  $\pm 2\%$   
F-  $\pm 1\%$

T-Paper Tape  
E-Embossed Tape  
N-Lead Free

3 Digits e.g.,5%  
(E24) R10=0.1  $\Omega$   
4 Digits e.g.,1%  
(E96) R100=0.1  $\Omega$

### 4. Dimensions :



UNIT: mm

| Type | L  | W          | C          | d          | t          |
|------|--|------------|------------|------------|------------|
| RL04 | 1.00 <sup>+0.10</sup> / <sub>-0.05</sub> | 0.50 ±0.05 | 0.20 ±0.10 | 0.25 ±0.10 | 0.35 ±0.05 |
| RL06 | 1.60 ±0.10                               | 0.80 ±0.10 | 0.30 ±0.20 | 0.35 ±0.20 | 0.45 ±0.10 |
| RL10 | 2.00 ±0.10                               | 1.25 ±0.10 | 0.40 ±0.20 | 0.35 ±0.20 | 0.50 ±0.10 |
| RL12 | 3.10 ±0.20                               | 1.55 ±0.10 | 0.50 ±0.30 | 0.40 ±0.20 | 0.55 ±0.10 |
| RL13 | 3.10 ±0.20                               | 2.55 ±0.20 | 0.50 ±0.30 | 0.50 ±0.20 | 0.55 ±0.15 |
| RL20 | 5.00 ±0.20                               | 2.50 ±0.20 | 0.60 ±0.30 | 0.50 ±0.25 | 0.55 ±0.10 |
| RL25 | 6.30 ±0.20                               | 3.20 ±0.20 | 0.60 ±0.30 | 0.50 ±0.25 | 0.55 ±0.10 |

### 5. Electrical characteristics :

| Characteristics                 | Feature                            |      |      |      |      |      |      | Measurement Method        |
|---------------------------------|------------------------------------|------|------|------|------|------|------|---------------------------|
|                                 | RL04                               | RL06 | RL10 | RL12 | RL13 | RL20 | RL25 |                           |
| Power Ratings (W)               | 1/16W                              | 1/8W | 1/4W | 1/2W | 1/2W | 3/4W | 1W   | JIS Code 3A / JIS Code 3D |
| Resistance Value (mΩ)           | 100 ~ 910                          |      |      |      |      |      |      | Refer to JIS C 5201-1-4.5 |
| T.C.R ( ppm / °C )              | 100~500mΩ: ±300<br>501~910mΩ: ±200 |      | ±200 |      |      |      |      | Refer to JIS C 5201-1-4.8 |
| Operation Temperature Range(°C) | -55 ~ +155                         |      |      |      |      |      |      |                           |
| Resistance Tolerance (%)        | ± 1%, ± 2%, ± 5%                   |      |      |      |      |      |      | JIS C 5201-1-4.2.5        |
| Insulation Resistance (MΩ)      | Over 100                           |      |      |      |      |      |      | Refer to JIS C 5201-1-4.6 |
| Maximum Working Voltage (V)     | ( P * R ) <sup>1/2</sup>           |      |      |      |      |      |      |                           |

Note : Except for the above standardized products, we also provide the customized products.

### 5.1 Derating Curve :

For resistors operated at ambient temperature over 70°C , power rating shall be derated in accordance with figure 1.



Figure 1

### 6. Reliability Test :

| NTest Item                                   | Reference standard                      | Condition of Test   | Test Limits   |
|--|---|---|---|
| Temperature Coefficient of Resistance        | IEC60115-1-4.8<br>JIS-C5201-1-4.8       | -55 ~ +125°C  | Refer to paragraph 5  |
| Short Time Overload                          | IEC60115-1-4.13<br>JIS-C5201-1-4.13     | 2.5 X rated voltage, 5s   | 1%:± (1%+0.005 Ω )<br>2%,5%:± (3%+0.005 Ω )<br>Remark: 0402±(2%+0.005 Ω )   |
| Load Life                                    | IEC60115-1-4.25.1<br>JIS-C5201-1-4.25.1 | 1000 hours at rated power ,<br>70°C , 1.5hours "ON " , 0.5hour "OFF"                  | 1%:± (1%+0.001 Ω )<br>2%,5%:± (3%+0.001 Ω )<br>Remark: 0402±(3%+0.005 Ω )   |
| Load Life with Humidity                      | IEC60115-1-4.24<br>JIS-C5201-1-4.24     | 1000 hours at rated power ,<br>40 ± 2°C , 90~95% RH<br>1.5hours "ON " , 0.5hour "OFF" | 1%:± (1%+0.001 Ω )<br>2%,5%:± (3%+0.001 Ω )<br>Remark: 0402±(3%+0.005 Ω )   |
| Rapid Change of Temperature                  | IEC60115-1-4.19<br>JIS-C5201-1-4.19     | -55°C (30 min. ) / +155 °C(30 min.)<br>5 cycles                                       | ± 1%+0.005 Ω  |
| Resistance to Soldering Heat                 | IEC60115-1-4.18<br>JIS-C5201-1-4.18     | 270 ± 5°C solder , 10 ± 1 sec dwell .   | ± 1%+0.005 Ω  |
| Solderability                                | IEC60115-1-4.17<br>JIS-C5201-1-4.17     | 245±5°C solder, 2±0.5 sec dwell.<br>Solder : Sn96.5 / Ag3.0 / Cu0.5                   | At least 95% of surface area of electrode shall be covered with new solder. |
| Robustness of Termination (Bending Strength) | IEC60115-1-4.33<br>JIS-C5201-1-4.33     | 3mm deflection<br>2mm deflection (RL20,25)  | ± 1%+0.005Ω   |
| Resistance to Dry Heat                       | IEC60115-1-4.23.2<br>JIS-C5201-1-4.23.2 | 155 ± 5°C for 96 ± 4hrs   | 1%: ± (1%+0.005 Ω )<br>2%,5%:± (2%+0.005 Ω )                                |

MSL Level: 1

Note\* :RCWV : Rated continuous working voltage .

### 7. Marking :

#### 7.1 Type : 0805, 1206, 1210, 2010, 2512

##### 7.1.1 E96: 1%

Resistance value is expressed by 4 digits, the first "R" means decimal point and the other digits represent for the normal resistance in  $\Omega$ .

e.g., R100 = 100 m $\Omega$

##### 7.1.2 E24: 2%,5%

Resistance value is expressed by 3 digits, the first "R" means decimal point and the other digits represent for the normal resistance in  $\Omega$ .

e.g., R10 = 100 m $\Omega$

#### 7.2 Type : 0603

##### 7.2.1 E96: 1%

When the marking space is too small in such small-sized resistors as RL06, the marking can not made by 4 digits and may be made by two digits combined with one English capital.

Significant figures of nominal resistance

| Symbol | E96 | Symbol | E96 | Symbol | E96 | Symbol | E96 |
|--------|-----|--------|-----|--------|-----|--------|-----|
| 01     | 100 | 25     | 178 | 49     | 316 | 73     | 562 |
| 02     | 102 | 26     | 182 | 50     | 324 | 74     | 576 |
| 03     | 105 | 27     | 187 | 51     | 332 | 75     | 590 |
| 04     | 107 | 28     | 191 | 52     | 340 | 76     | 604 |
| 05     | 110 | 29     | 196 | 53     | 348 | 77     | 619 |
| 06     | 113 | 30     | 200 | 54     | 357 | 78     | 634 |
| 07     | 115 | 31     | 205 | 55     | 365 | 79     | 649 |
| 08     | 118 | 32     | 210 | 56     | 374 | 80     | 665 |
| 09     | 121 | 33     | 215 | 57     | 383 | 81     | 681 |
| 10     | 124 | 34     | 221 | 58     | 392 | 82     | 698 |
| 11     | 127 | 35     | 226 | 59     | 402 | 83     | 715 |
| 12     | 130 | 36     | 232 | 60     | 412 | 84     | 732 |
| 13     | 133 | 37     | 237 | 61     | 422 | 85     | 750 |
| 14     | 137 | 38     | 243 | 62     | 432 | 86     | 768 |
| 15     | 140 | 39     | 249 | 63     | 442 | 87     | 787 |
| 16     | 143 | 40     | 255 | 64     | 453 | 88     | 806 |
| 17     | 147 | 41     | 261 | 65     | 464 | 89     | 825 |
| 18     | 150 | 42     | 267 | 66     | 475 | 90     | 845 |
| 19     | 154 | 43     | 274 | 67     | 487 | 91     | 866 |
| 20     | 158 | 44     | 280 | 68     | 499 | 92     | 887 |
| 21     | 162 | 45     | 287 | 69     | 511 | 93     | 909 |
| 22     | 165 | 46     | 294 | 70     | 523 | 94     | 931 |
| 23     | 169 | 47     | 301 | 71     | 536 | 95     | 953 |
| 24     | 174 | 48     | 309 | 72     | 549 | 96     | 976 |

#### Symbol for multipliers

| Symbol      | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| multipliers | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

e.g., 01Z = 100 × 10<sup>-3</sup> = 100 m $\Omega$

#### Notes :

When the resistance value is not in the list of E96 , 3 digitals with underline in E-24 series is used as mark .

e.g., 0603 : 120m $\Omega$ , 1% Marking is 012

### 7.2.2 E24: 2%,5%

Resistance value is expressed by 3 digits, the first "0" means decimal point and the other digits represent for the normal resistance in  $\Omega$ .  
e.g., 010 = 100 m $\Omega$

### 7.2 Type: 0402

RL04 : No Marking

## 8. Taping & Reel :

### 8.1 Taping Dimensions :

#### 8.1.1 4 mm pitch paper



UNIT: mm

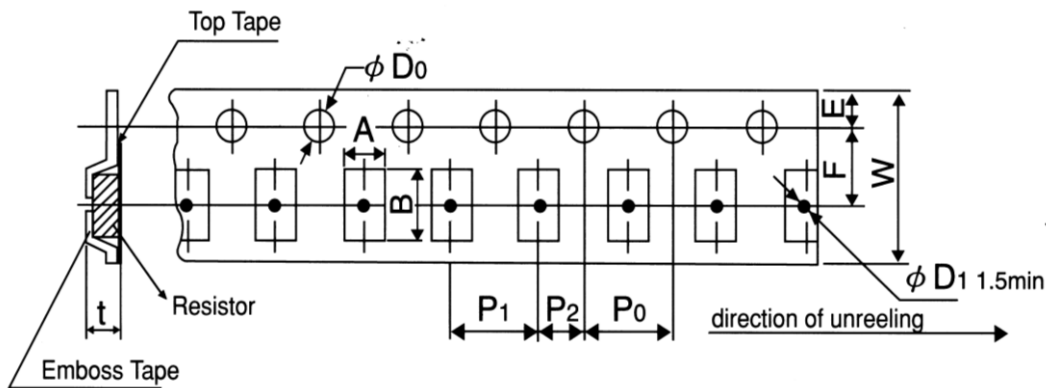
| Packing    | Type | A         | B        | W       | F        | E        | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | D <sub>0</sub> | T         |
|------------|------|-----------|----------|---------|----------|----------|----------------|----------------|----------------|----------------|-----------|
| Paper Tape | RL06 | 1.1 ±0.1  | 1.9 ±0.1 | 8.0±0.2 | 3.5±0.05 | 1.75±0.1 | 4.0±0.1        | 2.0±0.05       | 4.0±0.1        | φ 1.5          | 0.64 ±0.1 |
|            | RL10 | 1.6 ±0.15 | 2.4 ±0.2 |         |          |          |                |                |                |                | +0.1      |
|            | RL12 | 2.0 ±0.15 | 3.6 ±0.2 |         |          |          |                |                |                |                | -0        |
|            | RL13 | 2.8 ±0.20 | 3.6 ±0.2 |         |          |          |                |                |                |                | 0.84 ±0.1 |

### 8.1.2 2 mm pitch paper :



| Packing    | Type | A        | B        | W        | F        | E        | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | D <sub>0</sub>      | T         |
|------------|------|----------|----------|----------|----------|----------|----------------|----------------|----------------|---------------------|-----------|
| Paper Tape | RL04 | 0.7±0.05 | 1.2±0.05 | 8.0 ±0.2 | 3.5±0.05 | 1.75±0.1 | 2.0 ±0.1       | 2.0 ±0.1       | 4.0 ±0.1       | φ 1.5<br>+0.1<br>-0 | 0.45 ±0.1 |
|            | RL06 | 1.1 ±0.1 | 1.9 ±0.1 | 8.0 ±0.2 | 3.5±0.05 | 1.75±0.1 | 4.0 ±0.1       | 2.0 ±0.1       | 4.0 ±0.1       | φ 1.5<br>+0.1<br>-0 | 0.64 ±0.1 |

### 8.1.3 4 mm pitch Emboss :



| Packing | Type | A        | B        | W        | F        | E        | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | D <sub>0</sub>      | T          |
|---------|------|----------|----------|----------|----------|----------|----------------|----------------|----------------|---------------------|------------|
| Emboss  | RL20 | 2.8 ±0.2 | 5.3 ±0.2 | 12.0±0.2 | 5.5±0.05 | 1.75±0.1 | 4.0±0.1        | 2.0±0.05       | 4.0±0.05       | φ 1.5<br>+0.1<br>-0 | 0.85 ±0.15 |
|         | RL25 | 3.6 ±0.2 | 6.9 ±0.2 |          |          |          |                |                |                |                     |            |

| Type Size |    | Paper Tape |            | Emboss Plastic Tape<br>4 mm pitch |
|-----------|----|------------|------------|-----------------------------------|
|           |    | 4 mm pitch | 2 mm pitch |                                   |
|           |    | 178mm/R    | 178mm/R    |                                   |
| RL        | 04 |            | 10000      |                                   |
| RL        | 06 | 5000       | 10000      |                                   |
| RL        | 10 | 5000       |            |                                   |
| RL        | 12 | 5000       |            |                                   |
| RL        | 13 | 5000       |            |                                   |
| RL        | 20 |            |            | 4000                              |
| RL        | 25 |            |            | 4000                              |

### 8.2 Reel Specifications :

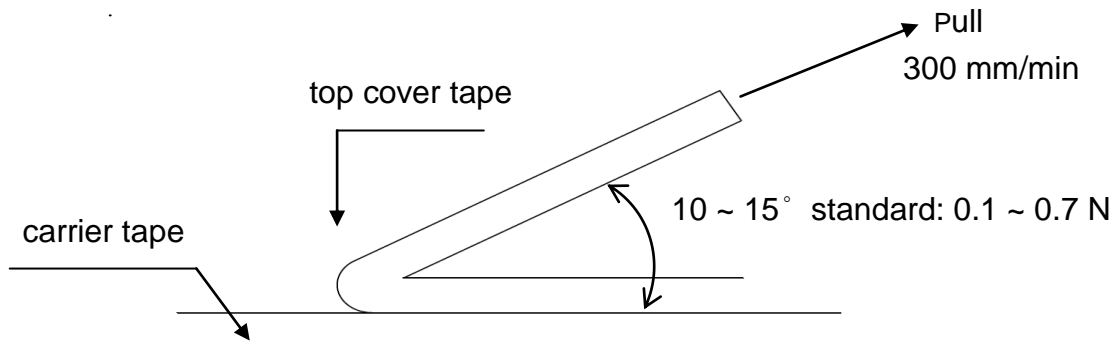


UNIT: mm

| Series                | $\phi A$      | $\phi B$       | $\phi C$       | W              | T              |
|-----------------------|---------------|----------------|----------------|----------------|----------------|
| RL 04/ 06/ 10/ 12/ 13 | $178 \pm 2.0$ | $60.0 \pm 1.0$ | $13.0 \pm 1.0$ | $9.0 \pm 1.0$  | $11.5 \pm 1.0$ |
| RL 20 / 25            |               |                |                | $13.0 \pm 1.0$ | $15.5 \pm 1.0$ |

### 8.3 Peel – off force :

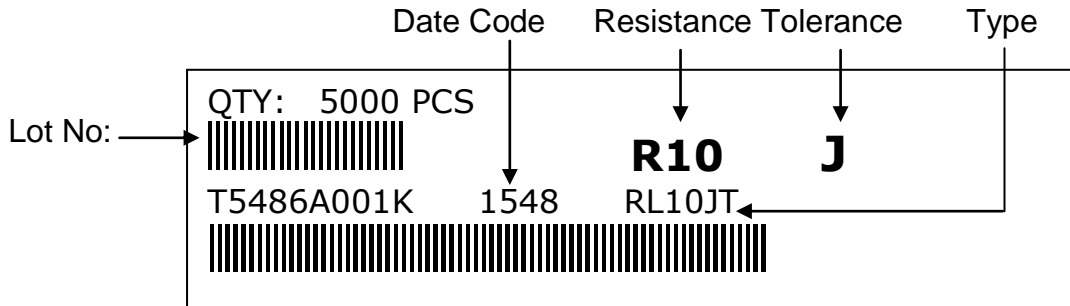
Peel – off force of paper and blister tape is in accordance with “JIS-C5202 ” that is , 0.1 to 0.7 N at a peel-off speed of 300 mm / minute.



|             |   |             |              |
|-------------|---|-------------|--------------|
| <b>TA-I</b> | <b>Alloy Film Chip Resistors<br/>Low Resistance (Standard)<br/>Halogen-Free</b> | Document No | TRL-XX0S002C |
|             |   | Issued date | 2022/02/23   |
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**9. Label :**

**9.1 Manufacture Label :**



**9.2 Customer Label: ( By customer request ) :**



**10. Recommended land patterns :**



| Type | Land pattern<br>Size | Dimension ( mm ) |         |         |
|------|----------------------|------------------|---------|---------|
|      |                      | a                | b       | c       |
| RL   | 04(1005 )            | 0.5~0.6          | 1.4~1.6 | 0.4~0.6 |
| RL   | 06 (0603 )           | 0.7~0.9          | 2.0~2.2 | 0.8~1.0 |
| RL   | 10 (0805 )           | 1.0~1.4          | 3.2~3.8 | 0.9~1.4 |
| RL   | 12 (1206 )           | 2.0~2.4          | 4.4~5.0 | 1.2~1.8 |
| RL   | 13 (1210 )           | 2.0~2.4          | 4.4~5.0 | 2.3~3.5 |
| RL   | 20 (2010 )           | 3.3~3.7          | 5.7~6.5 | 2.3~3.5 |
| RL   | 25 (2512 )           | 3.6~4.0          | 7.6~8.6 | 2.3~3.5 |



### 11. Recommend IR – Reflow profile : ( Lead-Free solder : Sn96.5 / Ag3 / Cu0.5 )



| Profile Feature  | Lead (Pb )-Free Assembly          |
|--|-----------------------------------|
| Average ramp-up rate (Tsmax to Tp)   | 3°C / second max.                 |
| Preheat<br>- Temperature Min (T <sub>sm</sub> )<br>- Temperature Max (T <sub>sm</sub> )<br>- Time (T <sub>sm</sub> to T <sub>sm</sub> ) (ts) | 150°C<br>200°C<br>60 -120 seconds |
| Time maintained above :<br>- Temperature (T <sub>l</sub> )<br>- Time (T <sub>l</sub> )   | 217°C<br>60-150 seconds           |
| Peak Temperature (Tp)  | 260°C                             |
| Time within $\begin{matrix} +0 \\ -5 \end{matrix}$ °C of actual Peak Temperature (tp) <sup>2</sup>   | 10 seconds                        |
| Ramp-down Rate   | 6°C/second max.                   |
| Time 25°C to Peak Temperature  | 8minutes max.                     |

Allowed Re-flow times : 3 times

Remark : To avoid discoloration phenomena of chip on terminal electrodes, please use N2 Re-flow furnace .

### 12. Storage Conditions :

Temperature: 5°C~35°C, Humidity:40%~75%

### 13. Shelf Life :

2 years from manufacturing date

|             |   |             |              |
|-------------|---|-------------|--------------|
| <b>TA-I</b> | <b>Alloy Film Chip Resistors<br/>Low Resistance (Standard)<br/>Halogen-Free</b> | Document No | TRL-XX0S002C |
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**14. ECN :**

Engineering Change Notice: The customer will be informed with ECN if there is significant modification on the characteristics and materials described in Approval Sheet.

**15. Manufacturing Country & City :**

TA-I TECHNOLOGY CO., LTD. ( Taiwan– Tao Yuan )  
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**Associated companies :**

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(2) TA-I TECHNOLOGY (DONGGUAN ) CO., LTD. ( China –Dongguan )  
Tel : 86-769-8339-4790~3 Fax : 86-769-8339-4794

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(4) TAI OHM ELECTRONICS ( M ) SDN. BHD. ( Malaysia – Penang )  
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(5) P.T.TAI ELECTRONICS Indonesia ( Indonesia – Jakarta )  
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