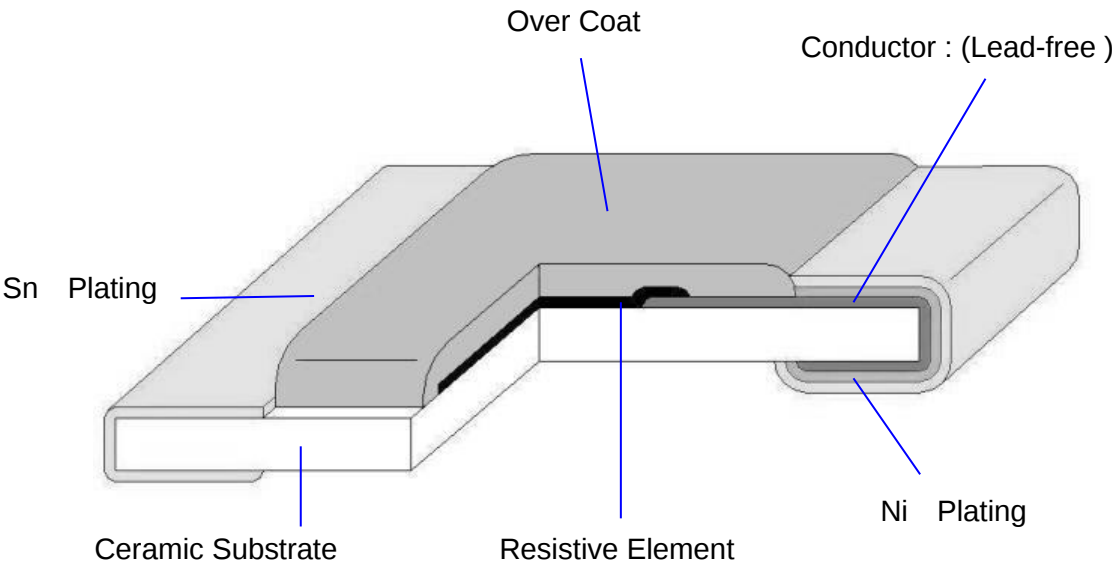


|      |                                                                        |             |              |
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1. Scope :

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

2. Construction :

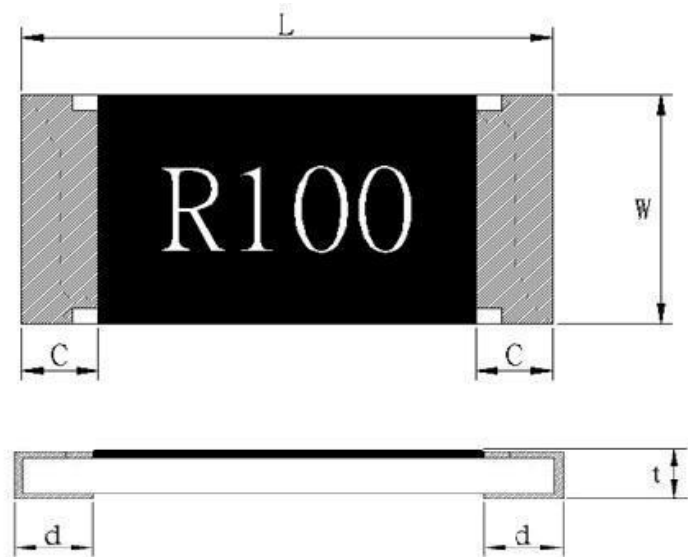


3. Type Designation :

| <u>RL</u>                                                                                                                                             | <u>10</u>                  | <u>F</u>                                       | <u>TN</u>                                                                   | <u>R100</u>           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------------------|-----------------------------------------------------------------------------|-----------------------|
| Product Code<br>RL : Chip Resistor                                                                                                                    | Size<br>Power Rating       | Tolerance                                      | Packaging                                                                   | Nominal<br>Resistance |
| 04-0402(1005) 1/16W<br>06-0603(1608) 1/8W<br>10-0805(2012) 1/4W<br>12-1206(3216) 1/2W<br>13-1210(3226) 1/2W<br>20-2010(5025) 3/4W<br>25-2512(6432) 1W | J- ±5%<br>G- ±2%<br>F- ±1% | T-Paper Tape<br>E-Embossed Tape<br>N-Lead Free | 3 Digits e.g.,5%<br>(E24) R10=0.1 Ω<br>4 Digits e.g.,1%<br>(E96) R100=0.1 Ω |                       |

|      |                                                                        |             |              |
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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.

|      |                                                                        |             |              |
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### 5.1 Derating Curve :

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

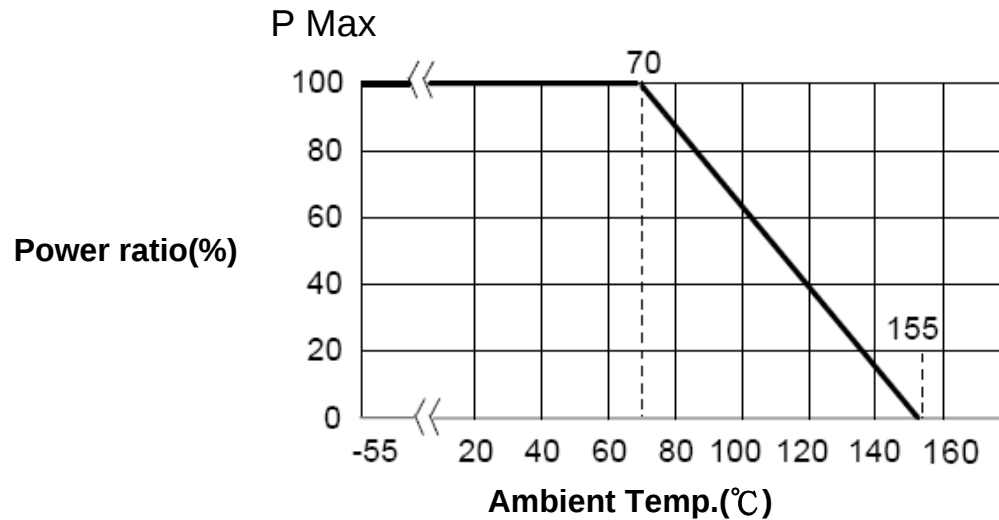


Figure 1

### 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℃                                                                          | 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%+0.5mΩ )<br>2%,5% : ± (3%+0.5mΩ )<br>Remark :<br>0402 : ±(2%+0.5mΩ ) |
| Load Life                                    | IEC60115-1-4.25.1<br>JIS-C5201-1-4.25.1 | 1000 hours at rated power ,<br>70℃ , 1.5hours "ON " , 0.5hour "OFF"                  | 1% : ± (1%+0.5mΩ )<br>2%,5% : ± (3%+0.5mΩ )<br>Remark :<br>0402 : ±(3%+0.5mΩ ) |
| Load Life with Humidity                      | IEC60115-1-4.24<br>JIS-C5201-1-4.24     | 1000 hours at rated power ,<br>40 ± 2℃ , 90~95% RH<br>1.5hours "ON " , 0.5hour "OFF" | 1% : ± (1%+0.5mΩ )<br>2%,5% : ± (3%+0.5mΩ )<br>Remark :<br>0402 : ±(3%+0.5mΩ ) |
| Rapid Change of Temperature                  | IEC60115-1-4.19<br>JIS-C5201-1-4.19     | -55℃ (30 min. ) / +155 ℃ (30 min.)<br>5 cycles                                       | ± (1%+0.5mΩ )                                                                  |
| Resistance to Soldering Heat                 | IEC60115-1-4.18<br>JIS-C5201-1-4.18     | 270 ± 5℃ solder , 10 ± 1 sec dwell .                                                 | ± (1%+0.5mΩ )                                                                  |
| Solderability                                | IEC60115-1-4.17<br>JIS-C5201-1-4.17     | 245±5℃ 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%+0.5mΩ )                                                                  |
| Resistance to Dry Heat                       | IEC60115-1-4.23.2<br>JIS-C5201-1-4.23.2 | 155 ± 5℃ for 96 ± 4hrs                                                               | 1% : ± (1%+0.5mΩ )<br>2%,5% : ± (2%+0.5mΩ )                                    |

MSL Level: 1

Note\* :RCWV : Rated continuous working voltage .

|             |                                                                                 |             |              |
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## 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 inΩ .

e.g., 010 =100 mΩ

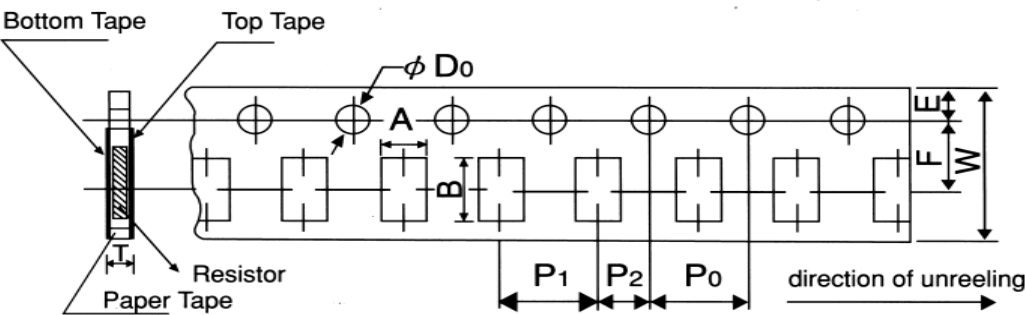
7.2 Type: 0402

RL04 : No Marking

8. Taping & Reel :

8.1 Taping Dimensions :

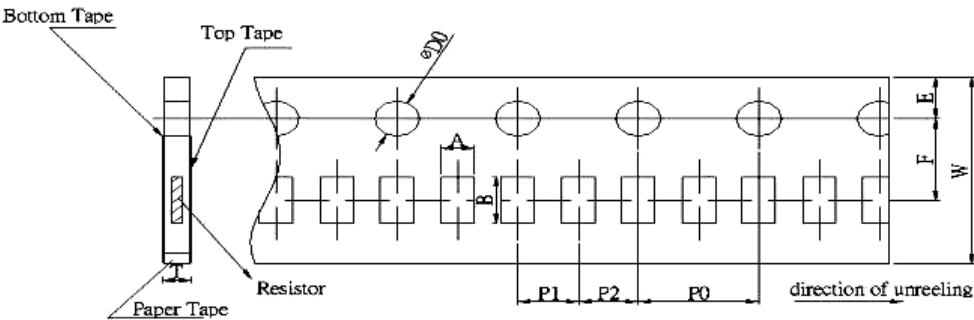
8.1.1 4 mm pitch paper



UNIT: mm

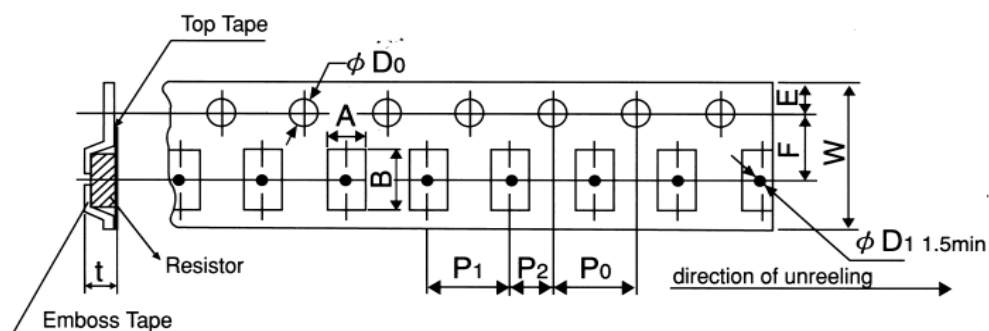
| Packing    | Type | A        | B       | W       | F        | E        | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | D <sub>0</sub>                      | T        |
|------------|------|----------|---------|---------|----------|----------|----------------|----------------|----------------|-------------------------------------|----------|
| 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 <sup>+0.1</sup> <sub>-0</sub> | 0.64±0.1 |
|            | RL10 | 1.6±0.15 | 2.4±0.2 |         |          |          |                |                |                |                                     | 0.84±0.1 |
|            | RL12 | 2.0±0.15 | 3.6±0.2 |         |          |          |                |                |                |                                     |          |
|            | RL13 | 2.8±0.20 | 3.6±0.2 |         |          |          |                |                |                |                                     |          |

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 <sup>+0.1</sup> <sub>-0</sub> | 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 <sup>+0.1</sup> <sub>-0</sub> | 0.64±0.1 |

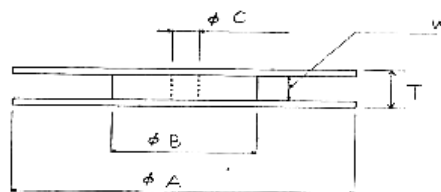
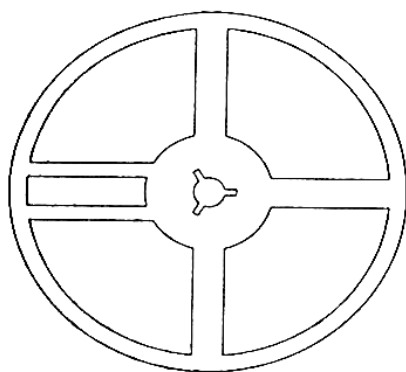
### 8.1.3 4 mm pitch Emboss :



| 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 :



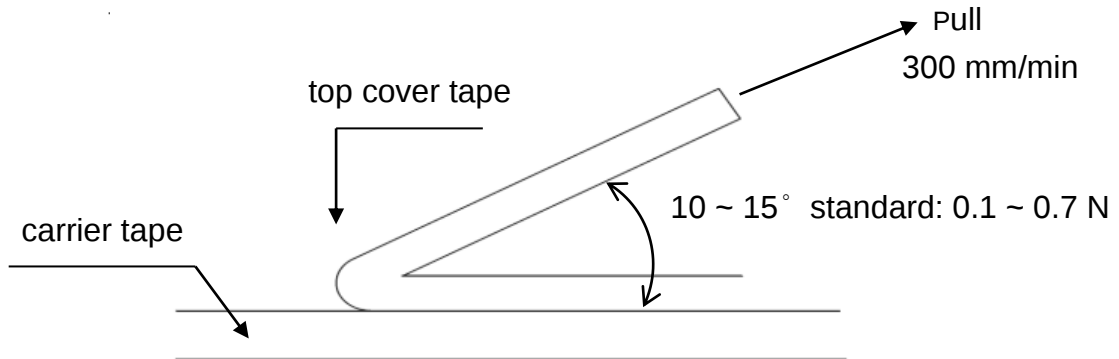
UNIT: mm

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

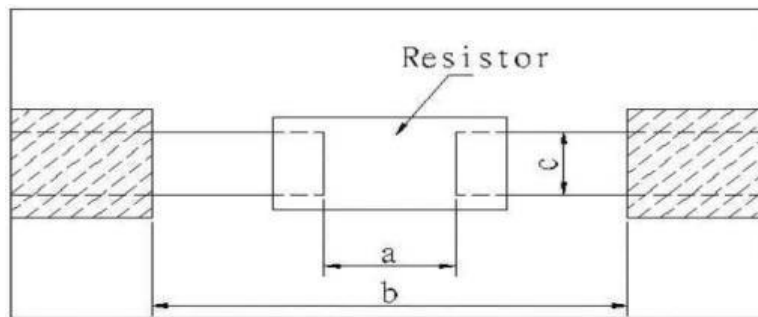
|      |                                                                        |             |              |
|------|------------------------------------------------------------------------|-------------|--------------|
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### 8.3 Peel – off force :

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.

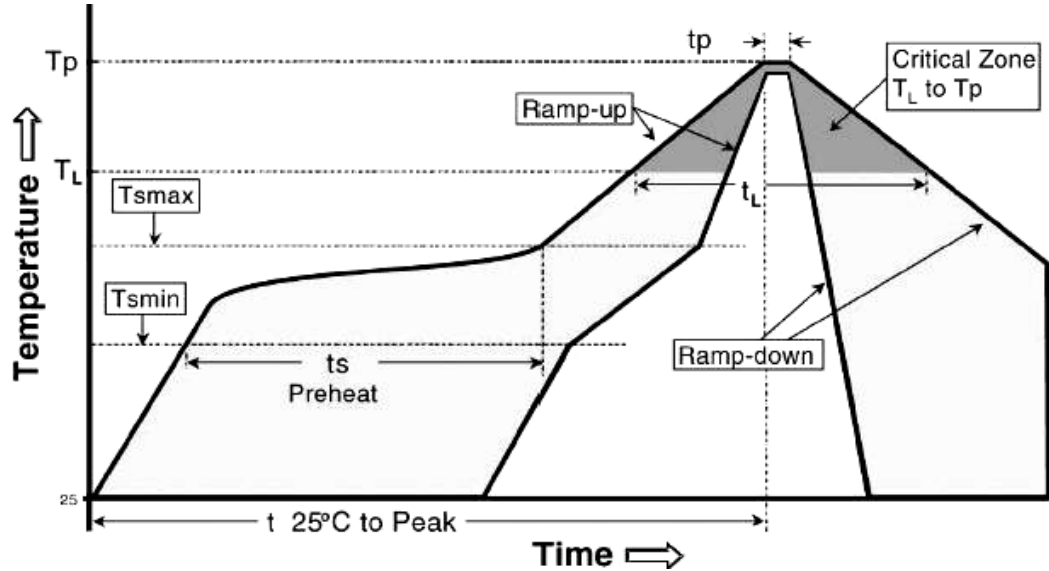


### 9. Recommended land patterns :



| 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 |

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



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

Allowed Re-flow times : 3 times

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

**11. Storage Conditions :**

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

|             |                                                                                 |             |              |
|-------------|---------------------------------------------------------------------------------|-------------|--------------|
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**12. Shelf Life :**

2 years from manufacturing date

**13. 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.

**14. Manufacturing Country & City :**

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(2) TA-I TECHNOLOGY ELECTRONIC (DONGGUAN ) CO., LTD. ( China –Dongguan )

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(3) FORTUNE TASK ENTERPRISES LIMITED.( China – Dongguan )

Tel : (+86) 769-8339-4790~3 Fax : (+86) 769-8339-4794

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