



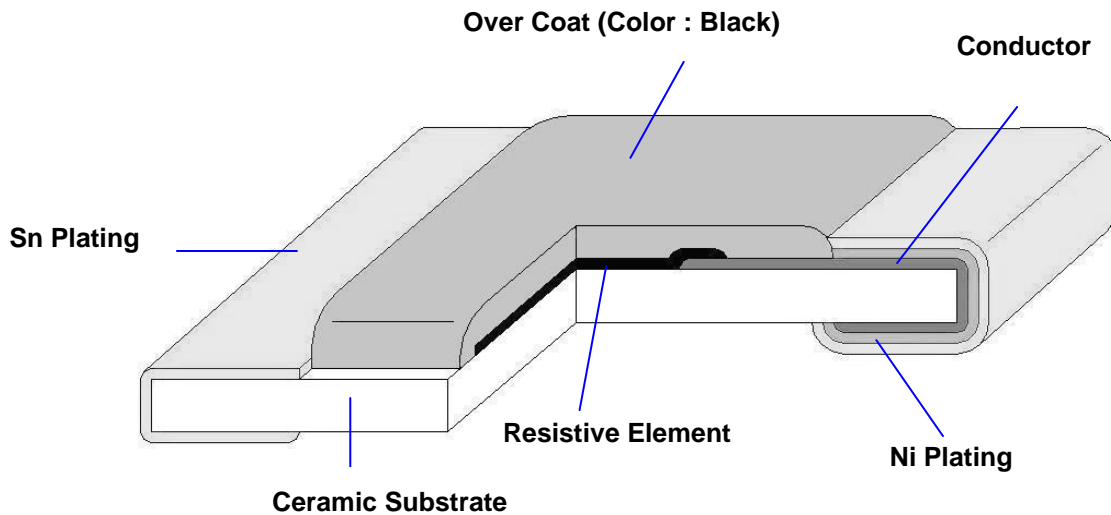
**Anti-Surge Chip Resistors**  
**( Lead-Free for RAS series standard )**  
**Halogen-Free**  
**AEC-Q200 qualified**

|              |               |
|--------------|---------------|
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**1. Scope :**

This specification applies for the RAS series of Anti-Surge chip resistors made by TA-I.

**2. Construction :**



**3. Type Designation :**

|                                   |                  |                 |                  |                   |
|-----------------------------------|------------------|-----------------|------------------|-------------------|
| <b><u>RAS</u></b>                 | <b><u>10</u></b> | <b><u>J</u></b> | <b><u>TN</u></b> | <b><u>100</u></b> |
| Product Code                      | Size             | Tolerance       | Packaging        | Nominal           |
| RAS : Anti-Surge<br>Chip Resistor | Power Rating     | Resistance      |                  |                   |

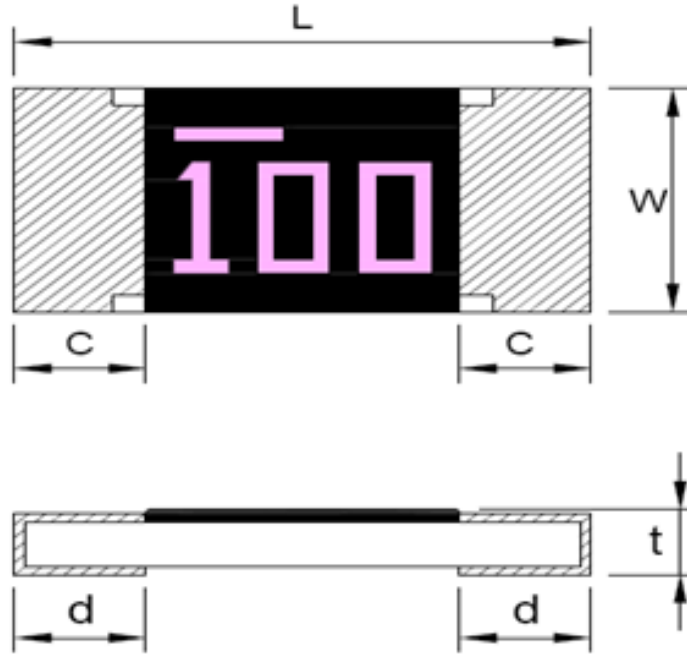
|   |                                |   |  |
|---|--------------------------------|---|--|
| 06 - 0603 (1608) 1/5W<br>10 - 0805 (2012) 2/5W<br>12 - 1206 (3216) 1/2W<br>20 - 2010 (5025) 1W<br>25 - 2512 (6432) 1W | F - ±1%<br>J - ±5%<br>K - ±10% | T- Paper Tape<br>E- Embossed Tape<br><br>+N : Lead-Free | 3 digits, e.g., :<br>(E-24) 100 = 10Ω<br><br>4 digits, e.g., :<br>(E-96) 1000 = 100Ω |
|---|--------------------------------|---|--|



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**4. Dimensions :**



UNIT: mm

| Type  | L         | W         | C         | d         | t         |
|-------|-----------|-----------|-----------|-----------|-----------|
| RAS06 | 1.60±0.10 | 0.80±0.10 | 0.30±0.20 | 0.30±0.20 | 0.45±0.10 |
| RAS10 | 2.00±0.10 | 1.25±0.10 | 0.40±0.20 | 0.40±0.20 | 0.50±0.10 |
| RAS12 | 3.10±0.10 | 1.55±0.10 | 0.50±0.30 | 0.40±0.20 | 0.55±0.10 |
| RAS20 | 5.00±0.15 | 2.50±0.15 | 0.60±0.30 | 0.50±0.25 | 0.60±0.10 |
| RAS25 | 6.30±0.20 | 3.20±0.20 | 0.60±0.30 | 0.50±0.25 | 0.60±0.10 |



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**5. Ratings & Characteristics :**

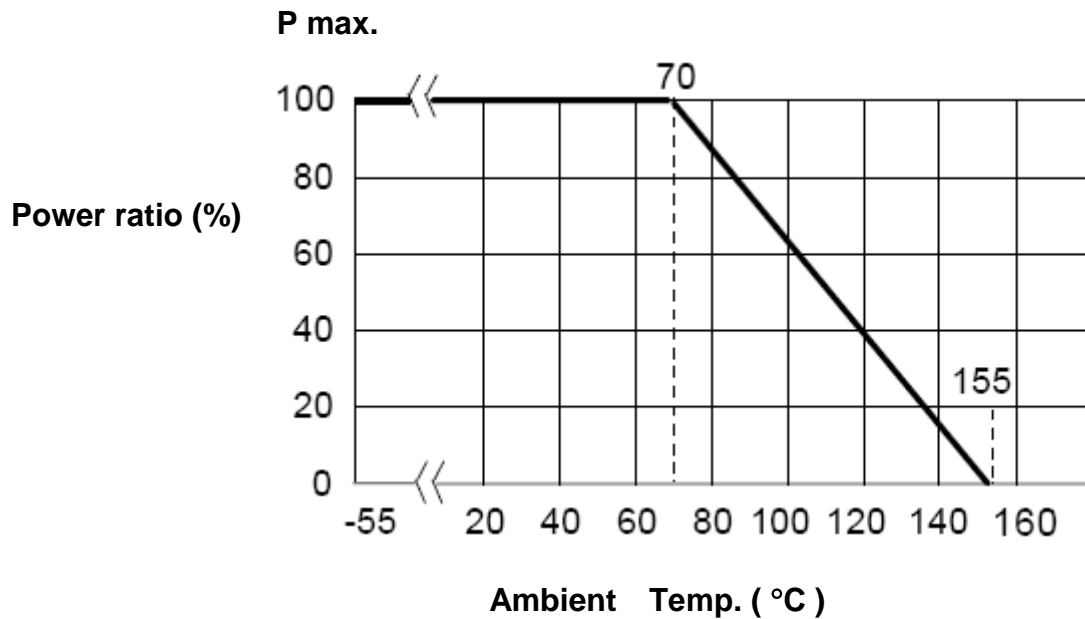
| Type  | Power Rating at 70°C | Rating Voltage | Max. Working Voltage | Max. Over-Load Voltage | T.C.R (PPM/°C) | Resistance Range(Ω) |              |              |
|-------|----------------------|----------------|----------------------|------------------------|----------------|---------------------|--------------|--------------|
|       |                      |                |                      |                        |                | F(±1%) E-96         | J(±5%) E-24  | k(±10%) E-24 |
| RAS06 | 1/5W                 | Refer 5.2      | 50V                  | 100V                   | ±100           | 10Ω-100KΩ           | 10Ω-100KΩ    | 10Ω-100KΩ    |
|       |                      |                |                      |                        | ±200           | 1Ω ≤ R < 10Ω        | 1Ω ≤ R < 10Ω | 1Ω ≤ R < 10Ω |
| RAS10 | 2/5W                 | Refer 5.2      | 150V                 | 300V                   | ±100           | 10Ω-100KΩ           | 10Ω-100KΩ    | 10Ω-100KΩ    |
|       |                      |                |                      |                        | ±200           | 1Ω ≤ R < 10Ω        | 1Ω ≤ R < 10Ω | 1Ω ≤ R < 10Ω |
| RAS12 | 1/2W                 | Refer 5.2      | 200V                 | 400V                   | ±100           | 10Ω-100KΩ           | 10Ω-100KΩ    | 10Ω-100KΩ    |
|       |                      |                |                      |                        | ±200           | 1Ω ≤ R < 10Ω        | 1Ω ≤ R < 10Ω | 1Ω ≤ R < 10Ω |
| RAS20 | 1W                   | Refer 5.2      | 200V                 | 400V                   | ±100           | 10Ω-100KΩ           | 10Ω-100KΩ    | 10Ω-100KΩ    |
|       |                      |                |                      |                        | ±200           | 1Ω ≤ R < 10Ω        | 1Ω ≤ R < 10Ω | 1Ω ≤ R < 10Ω |
| RAS25 | 1W                   | Refer 5.2      | 200V                 | 400V                   | ±100           | 10Ω-100KΩ           | 10Ω-100KΩ    | 10Ω-100KΩ    |
|       |                      |                |                      |                        | ±200           | 1Ω ≤ R < 10Ω        | 1Ω ≤ R < 10Ω | 1Ω ≤ R < 10Ω |

Operating Temp (°C) : -55°C ~ +155°C

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.





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**5.2. Voltage :**

The rated voltage is calculated by the following formula:

$$E = \sqrt{P * R}$$

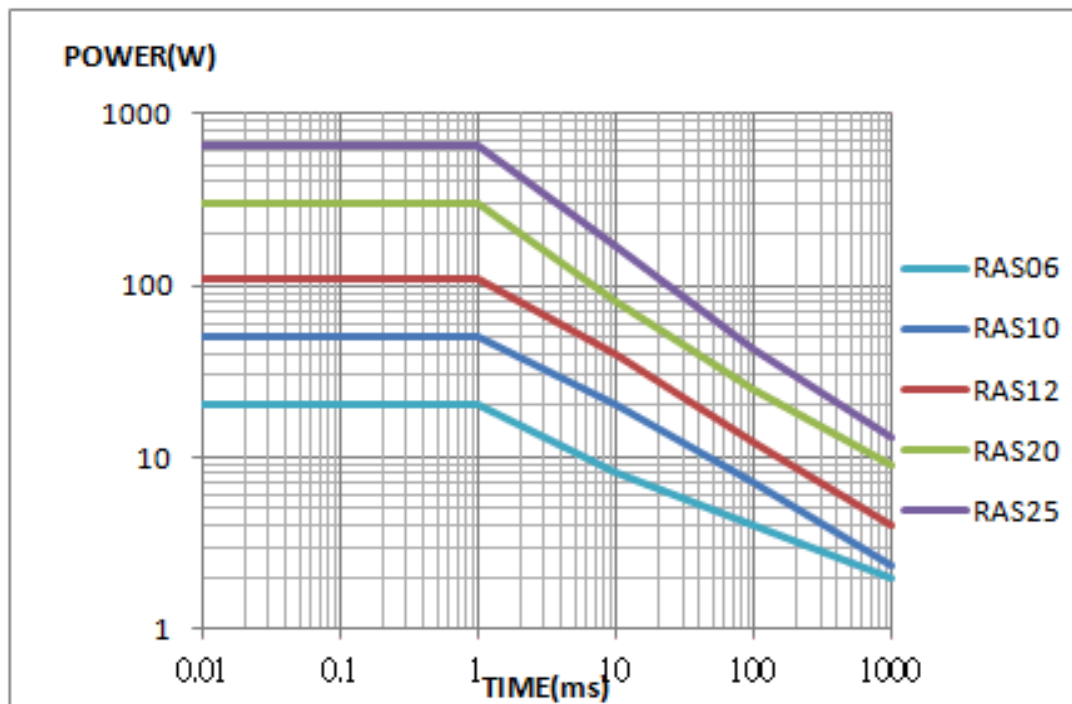
E=Rated Voltage(V)  
P=Rated Power(W)  
R=Resistance Value( $\Omega$ )

E.G. : What is RAS10JTN101 the rated voltage ?

RAS10JTN101 P:2/5W ; R:101 = 100 $\Omega$

$$E = \sqrt{0.4(W) * 100(\Omega)} = 40(V)$$

**5.3. Single Pulse Limiting Power Curve :**





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**6. Reliability Tests :**

| Test Items                                      | Reference standard                      | Condition of Test  | Test Limits $\Delta R$   |
|---|---|--|--|
| Temperature Coefficient of Resistance           | IEC60115-1-4.8<br>JIS-C5201-1-4.8       | -55~ +125 °C   | Refer 5.0  |
| Short Time Overload                             | IEC60115-1-4.13<br>JIS-C5201-1-4.13     | 2.5 X rated voltage for 5 sec  | $\pm(1.0\% + 0.05\Omega)$  |
| Intermittent Overload                           | IEC60115-1-4.39<br>JIS-C5201-1-4.39     | 2.5X rated voltage or Max Overloading voltage ,1sec "ON" , 25sec "OFF" ,10000 cycles | $\pm(5.0\% + 0.1\Omega)$   |
| Endurance (Load Life)                           | IEC60115-1-4.25.1<br>JIS-C5201-1-4.25.1 | 1000 hours at rated voltage, 70°C , 1.5hours "ON" , 0.5hour "OFF"                    | $\pm(3.0\%+0.1\Omega)$   |
| Load Life with Humidity                         | IEC60115-1-4.24<br>JIS-C5201-1-4.24     | 1000 hours at rated voltage , 40 $\pm$ 2°C , 90~95% RH 1.5hours "ON" , 0.5hour "OFF" | $\pm(3.0\%+0.1\Omega)$   |
| Rapid Change of Temperature                     | IEC60115-1-4.19<br>JIS-C5201-1-4.19     | -55°C (30 min. ) / +155 °C(30 min. ) 5 cycles  | $\pm(1.0\%+0.05\Omega)$  |
| Solderability                                   | IEC60115-1-4.17<br>JIS-C5201-1-4.17     | 245 $\pm$ 5°C solder, 2 $\pm$ 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)             | IEC60115-1-4.33<br>JIS-C5201-1-4.33     | 3mm deflection   | $\pm(1.0\%+0.05\Omega)$  |
| Dielectric Withstanding Voltage (Voltage Proof) | IEC60115-1-4.7<br>JIS-C5201-1-4.7       | Applying voltage :<br>The 500V for a minute.   | No abnormalities such as flashover, burning dielectric breakdown shall appear. |
| Insulation Resistance                           | IEC60115-1-4.6<br>JIS-C5201-1-4.6       | Applying voltage 100V for 1 minute.  | $\geq 1G\Omega$  |
| Resistance to Dry Heat                          | IEC60115-1-4.23.2<br>JIS-C5201-1-4.23.2 | 155 $\pm$ 5°C for 96 $\pm$ 4Hrs  | $\pm(2.0\%+0.1\Omega)$   |
| Resistance to Solder Heat                       | IEC60115-1-4.18<br>JIS-C5201-1-4.18     | 270 $\pm$ 5°C solder , 10 $\pm$ 1 sec dwell .  | $\pm(1.0\%+0.05\Omega)$  |

Note\* : RCWV : Rated continuous working voltage.



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## 7. Marking

### 7.1 ±5% , ±10%(E24) : RAS06 / 10 / 12 / 20 / 25

Resistance value is expressed by 3 digits, the first two digits represent the significant figures of nominal resistance value in Ω, and the third digit represents exponent for base of 10.

E.G. :, 100 =  $10 \times 10^0 = 10 \Omega$



### 7.2 ±1% (E96) : RAS10 / 12 / 20 / 25

Resistance value is expressed by 4 digits, the first three digits represent the significant figures of nominal resistance value in Ω, and the fourth digit represents exponent for base of 10.

E.G. : 1000 =  $100 \times 10^0 = 100 \Omega$



### 7.3 ±1% (E96): RAS06

When the marking space is too small in such small-sized resistors as RAS06, the marking can not made by 4 digits and may be made by two digits combined with one English capital.

**Symbol for E96 series nominal resistance value**

| 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 |



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|    |     |    |     |    |     |    |     |
|----|-----|----|-----|----|-----|----|-----|
| 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 : 01A = 100×10<sup>0</sup> = 100Ω



**Notes :**

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

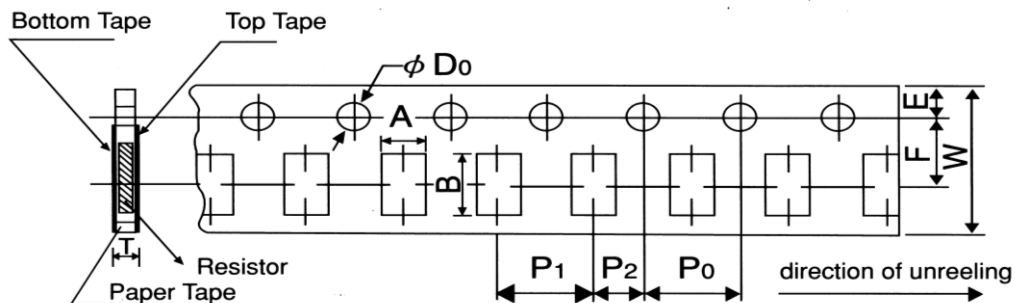
E.G. : 0603 , 120Ω , 1% Marking is 121



**8. Taping & Reel :**

**8.1 Taping Dimensions**

**8.1.1 4 mm pitch paper:**



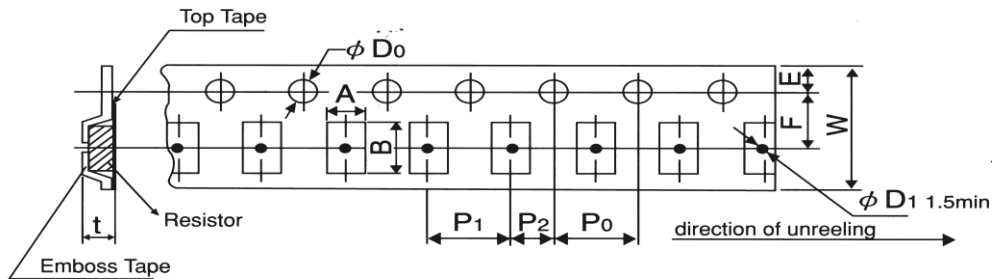


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| Packing | Type  | A        | B       | W       | F        | E        | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | D <sub>0</sub>      | T        |
|---------|-------|----------|---------|---------|----------|----------|----------------|----------------|----------------|---------------------|----------|
| Paper   | RAS06 | 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<br>+0.1<br>-0 | 0.64±0.1 |
|         | RAS10 | 1.6±0.15 | 2.4±0.2 |         |          |          |                |                |                |                     | 0.84±0.1 |
|         | RAS12 | 2.0±0.15 | 3.6±0.2 |         |          |          |                |                |                |                     |          |

**8.1.2 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  | RAS20 | 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 |
|         | RAS25 | 3.6±0.2 | 6.9±0.2 |          |          |          |                |                |                |                     |           |

**UNIT: mm**

| Package<br>Type / Size |    | Paper Tape | Emboss Plastic Tape |
|------------------------|----|------------|---------------------|
|                        |    | 4 mm pitch | 4 mm pitch          |
|                        |    | 178mm/R    | 178mm/R             |
| RAS                    | 06 | 5000       |                     |
| RAS                    | 10 | 5000       |                     |
| RAS                    | 12 | 5000       |                     |
| RAS                    | 20 |            | 4000                |
| RAS                    | 25 |            | 4000                |

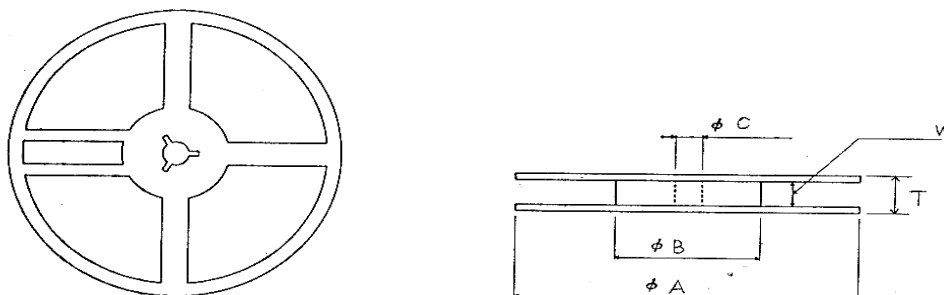




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**8.2 Reel Specifications:**

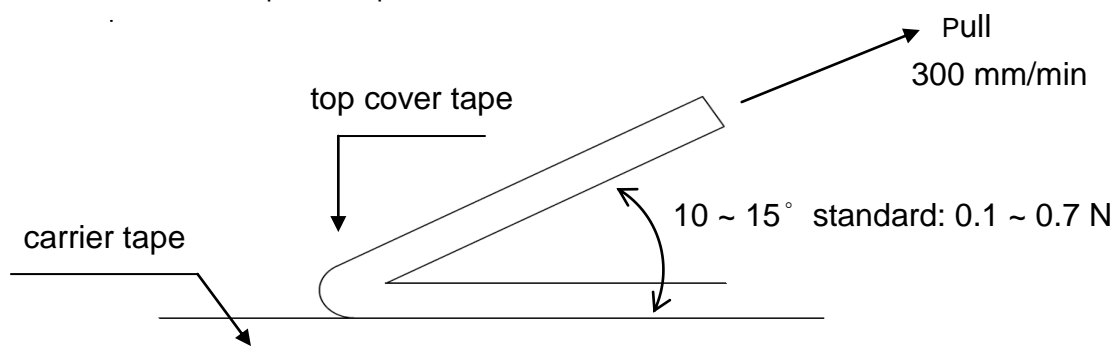


UNIT: mm

| Type            | $\phi A$        | $\phi B$       | $\phi C$       | W              | T              |
|-----------------|-----------------|----------------|----------------|----------------|----------------|
| RAS06 / 10 / 12 | $178.0 \pm 2.0$ | $60.0 \pm 1.0$ | $13.0 \pm 1.0$ | $9.0 \pm 1.0$  | $11.5 \pm 1.0$ |
| RAS20 / 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.



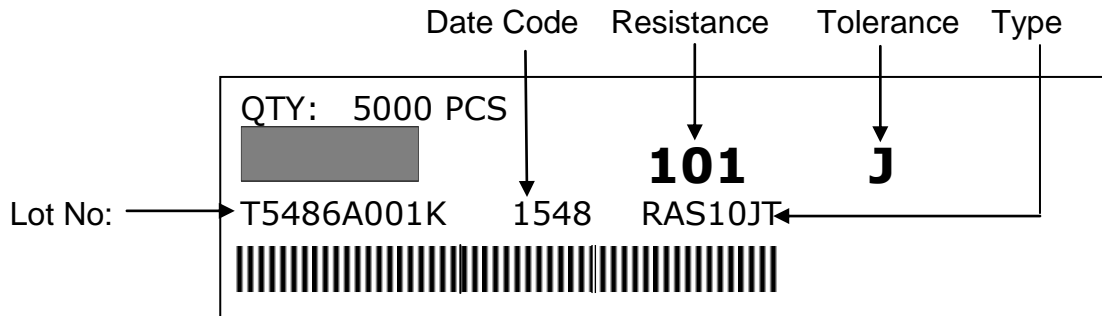


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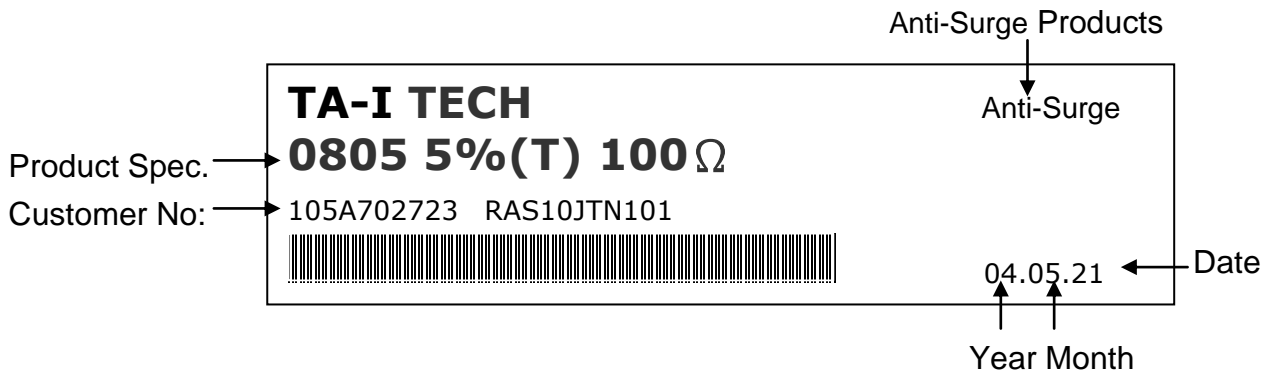
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**9. Label :**

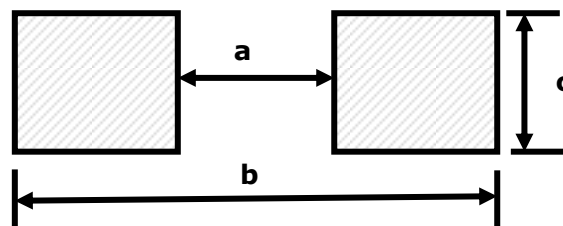
**9.1 Manufacture Label :**



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



**10. Recommended land patterns :**



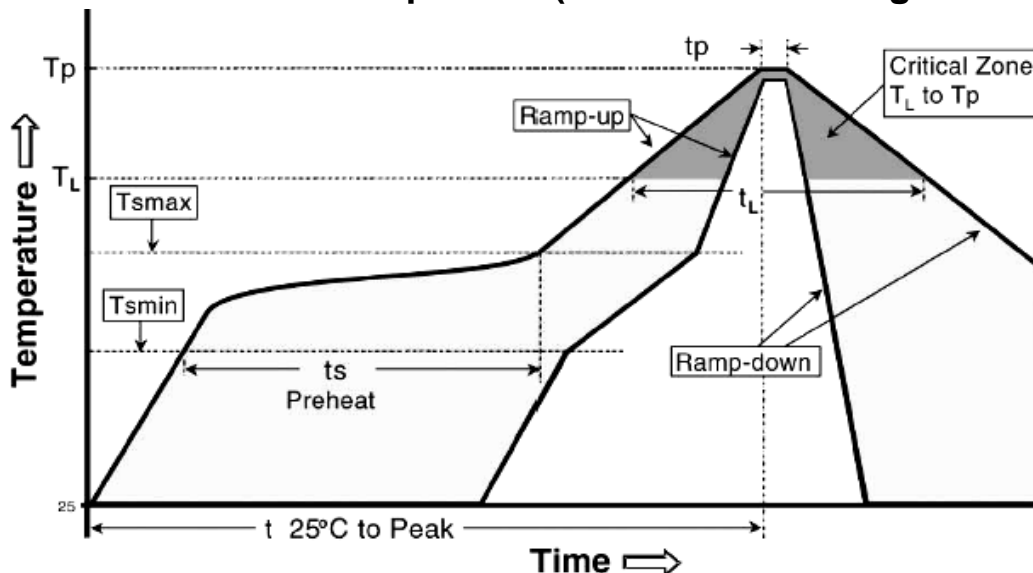
| Land pattern |             | Dimension ( mm ) |         |         |
|--------------|-------------|------------------|---------|---------|
| Type         | Size        | a                | b       | c       |
| RAS          | 06 ( 0603 ) | 0.7~0.9          | 2.0~2.2 | 0.8~1.0 |
| RAS          | 10 ( 0805 ) | 1.0~1.4          | 3.2~3.8 | 0.9~1.4 |
| RAS          | 12 ( 1206 ) | 2.0~2.4          | 4.4~5.0 | 1.2~1.8 |
| RAS          | 20 ( 2010 ) | 3.3~3.7          | 5.7~6.5 | 2.3~3.5 |
| RAS          | 25 ( 2512 ) | 3.6~4.0          | 7.6~8.6 | 2.3~3.5 |



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**11. Recommend IR – Reflow profile : (solder : Sn96.5 / Ag3 / Cu0.5)**



| Profile Feature  | Lead (Pb )-Free Assembly          |
|--|-----------------------------------|
| Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )  | 3°C / second max.                 |
| Preheat<br>- Temperature Min (T <sub>smmin</sub> )<br>- Temperature Max (T <sub>smmax</sub> )<br>- Time (T <sub>smmin</sub> to T <sub>smmax</sub> ) (ts) | 150°C<br>200°C<br>60 -150 seconds |
| Time maintained above :<br>- Temperature (T <sub>l</sub> )<br>- Time (T <sub>l</sub> )   | 217°C<br>60-120 seconds           |
| Peak Temperature (T <sub>p</sub> )   | 260°C                             |
| Time within $\pm 5^{\circ}\text{C}$ 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

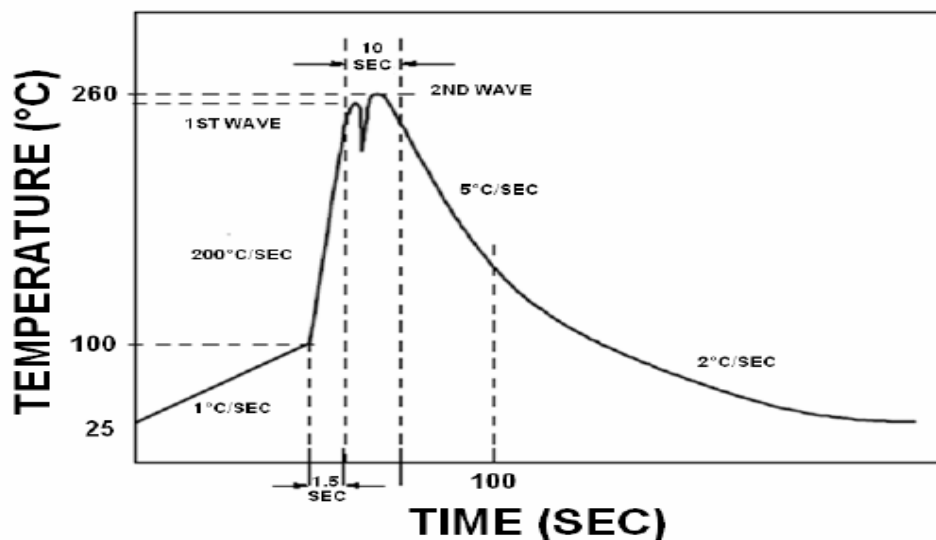
Remark : To avoid discoloration phenomena of chip on terminal electrodes, please use N2 Re-flow furnace .



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**12. Recommend Wave-Solder profile : (solder : Sn96.5 / Ag3 / Cu0.5)**



**13. Solder iron conditions:**

Bit temperature :  $350 \pm 10^{\circ}\text{C}$

Application time of soldering iron : 3 sec

The number of times of work : 1 time

**14. Storage Conditions:**

Temperature:  $5^{\circ}\text{C} \sim 35^{\circ}\text{C}$ , Humidity: 40%~75%

**15. Shelf Life:**

2 years from manufacturing date.

**16. 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.



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**17. Manufacturing Country & City :**

TA-I TECHNOLOGY CO., LTD. ( Taiwan– Tao Yuan )  
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TA-I TECHNOLOGY ( SU ZHOU ) CO., LTD. ( China – Su Zhou)  
Tel :86- 512-63457879 Fax : 86-512-63457869

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

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