



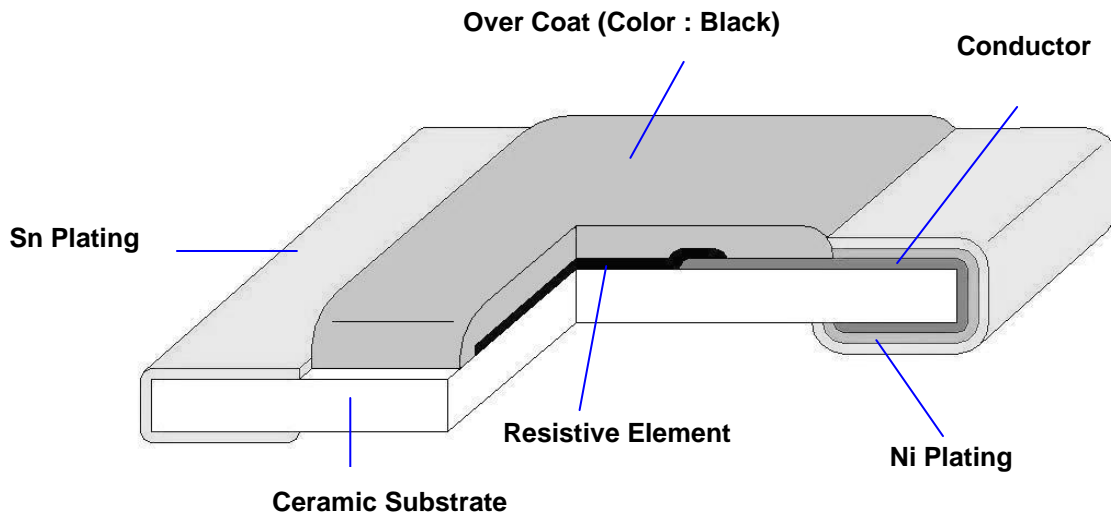
Anti-Surge Chip Resistors
(Lead-Free for RAS series standard)
Halogen-Free
AEC-Q200 qualified

| | |
|--------------|---------------|
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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 :

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

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



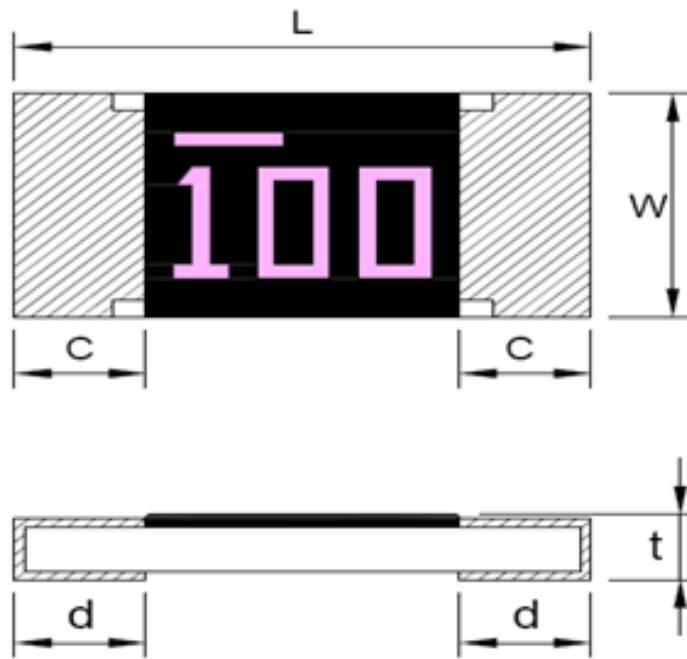
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4. Dimensions :



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.

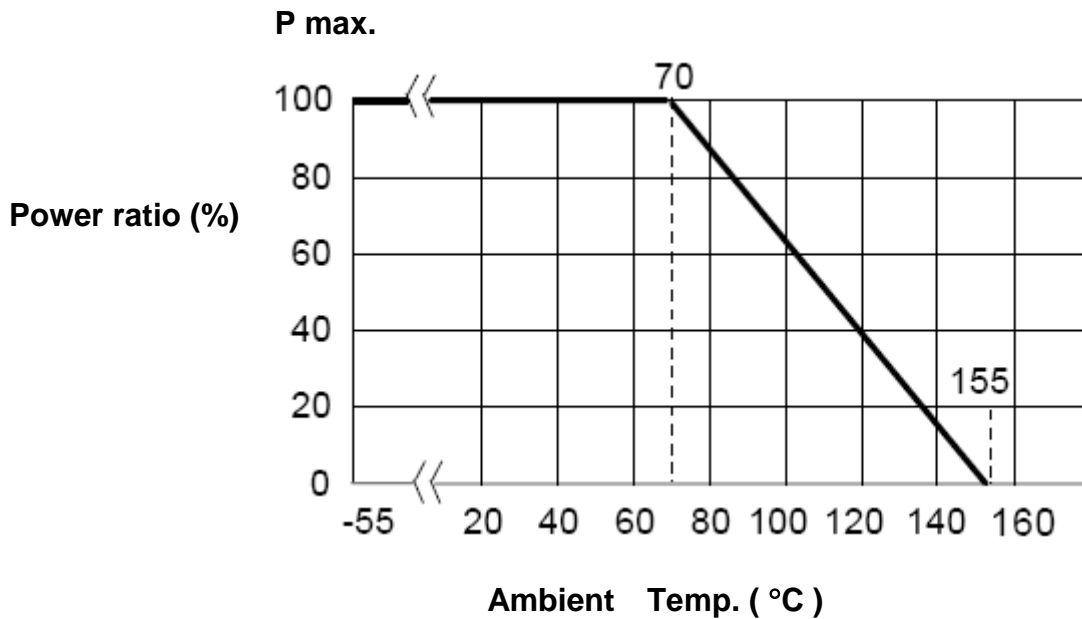


Figure 1



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5.2. Voltage :

The rated voltage is calculated by the following formula:

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

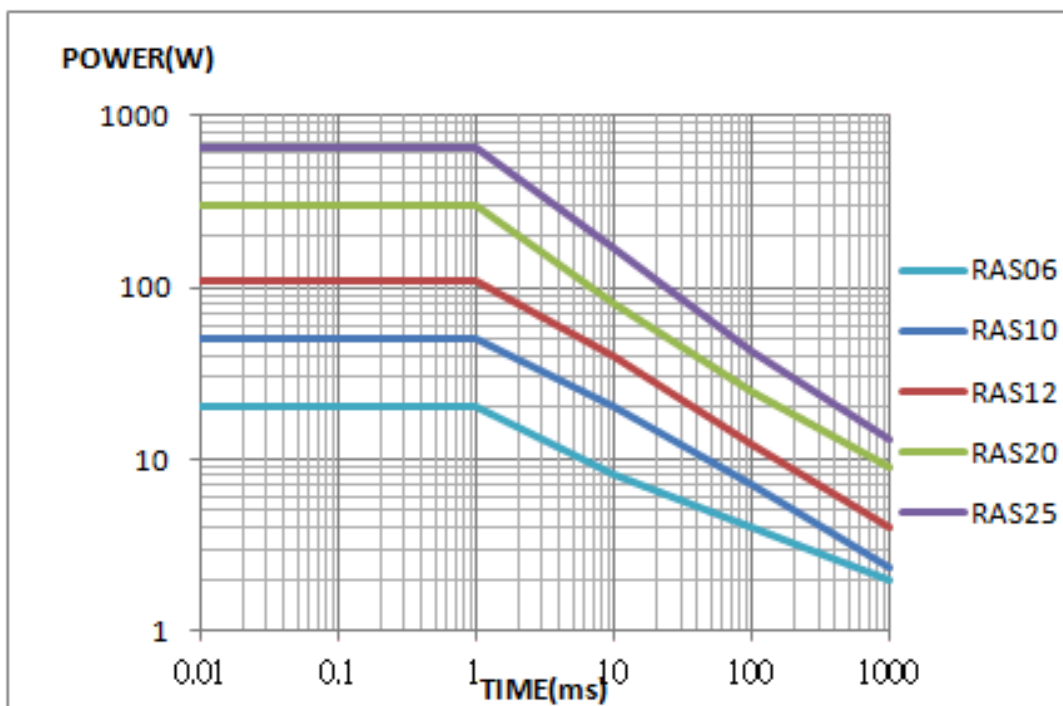
E=Rated Voltage(V)
P=Rated Power(W)
R=Resistance Value(Ω)

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

RAS10JTN101 P:2/5W ; R:101 = 100 Ω

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

5.3. Single Pulse Limiting Power Curve :





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6. Reliability Tests :

| Test Items | Reference standard | Condition of Test | Test Limits ΔR |
|---|---|--|--|
| Temperature Coefficient of Resistance | IEC60115-1-4.8 JIS-C5201-1-4.8 | -55~ +125 °C | Refer 5.0 |
| Short Time Overload | IEC60115-1-4.13 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 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 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 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 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 JIS-C5201-1-4.17 | 245 \pm 5°C solder, 2 \pm 0.5 sec dwell. 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 JIS-C5201-1-4.33 | 3mm deflection | $\pm(1.0\%+0.05\Omega)$ |
| Dielectric Withstanding Voltage (Voltage Proof) | IEC60115-1-4.7 JIS-C5201-1-4.7 | Applying voltage : The 500V for a minute. | No abnormalities such as flashover, burning dielectric breakdown shall appear. |
| Insulation Resistance | IEC60115-1-4.6 JIS-C5201-1-4.6 | Applying voltage 100V for 1 minute. | $\geq 1G\Omega$ |
| Resistance to Dry Heat | IEC60115-1-4.23.2 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 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 ⁰ | 10 ¹ | 10 ² | 10 ³ | 10 ⁴ | 10 ⁵ | 10 ⁶ | 10 ⁷ | 10 ⁻¹ | 10 ⁻² | 10 ⁻³ |

E.G : 01A = 100×10⁰ = 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 .

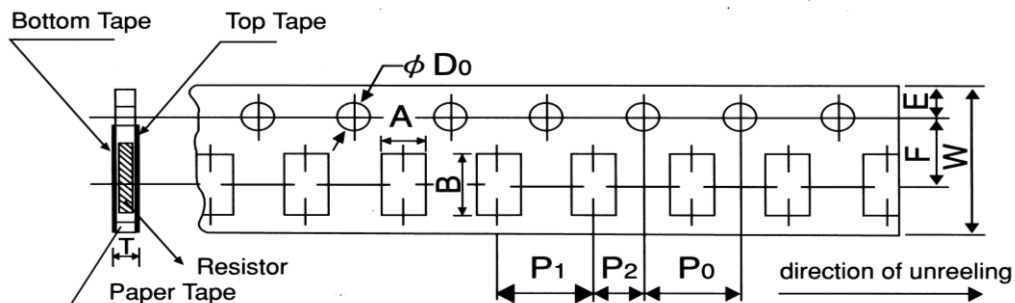
E.G. : 0603 , 120Ω , 1% Marking is 121



8. Taping & Reel :

8.1 Taping Dimensions

8.1.1 4 mm pitch paper:



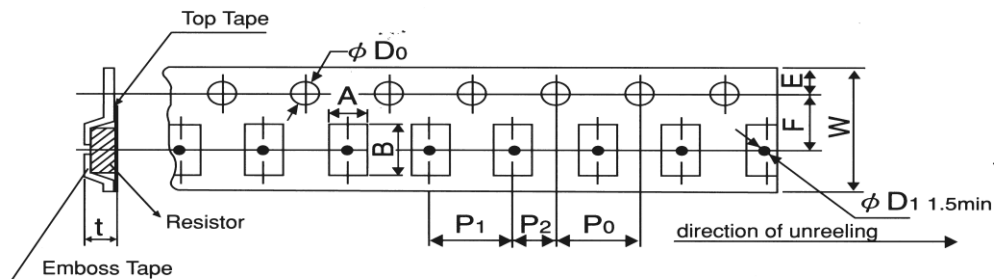


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| Packing | Type | A | B | W | F | E | P ₁ | P ₂ | P ₀ | D ₀ | T |
|---------|-------|----------|---------|---------|----------|----------|----------------|----------------|----------------|---------------------|----------|
| Paper | RAS06 | 1.1±0.1 | 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 +0.1 -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 ₁ | P ₂ | P ₀ | D ₀ | 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 +0.1 -0 | 0.85±0.15 |
| | RAS25 | 3.6±0.2 | 6.9±0.2 | | | | | | | | |

UNIT: mm

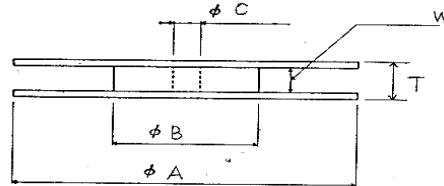
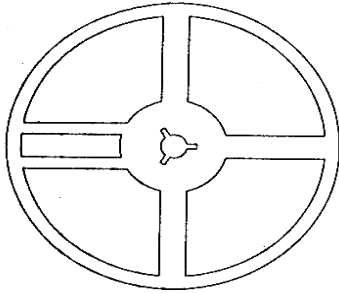
| Package Type / Size | | Paper Tape | Emboss Plastic Tape |
|------------------------|----|------------|---------------------|
| | | 4 mm pitch | 4 mm pitch |
| | | 178mm/R | 178mm/R |
| RAS | 06 | 5000 | |
| RAS | 10 | 5000 | |
| RAS | 12 | 5000 | |
| RAS | 20 | | 4000 |
| RAS | 25 | | 4000 |



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8.2 Reel Specifications:

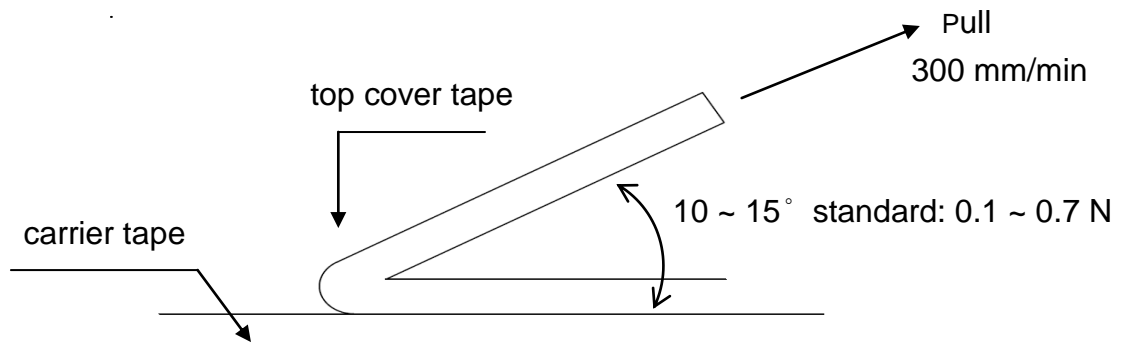


UNIT: mm

| Type | ϕA | ϕB | ϕC | W | T |
|-----------------|-----------------|----------------|----------------|----------------|----------------|
| RAS06 / 10 / 12 | 178.0 ± 2.0 | 60.0 ± 1.0 | 13.0 ± 1.0 | 9.0 ± 1.0 | 11.5 ± 1.0 |
| RAS20 / 25 | | | | 13.0 ± 1.0 | 15.5 ± 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.



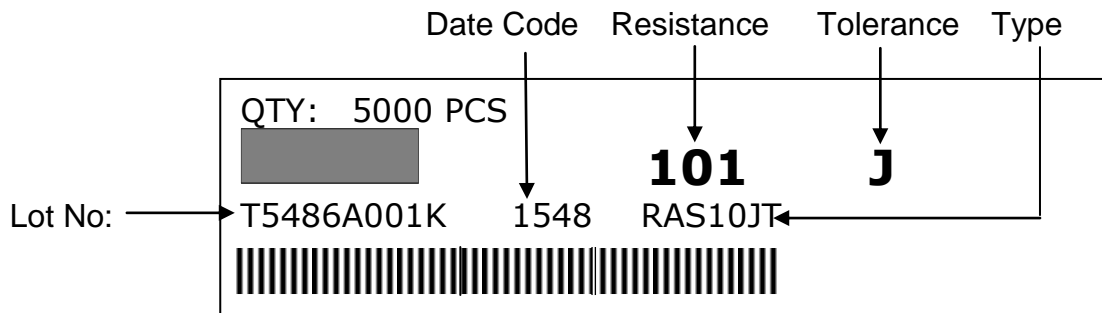


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9. Label :

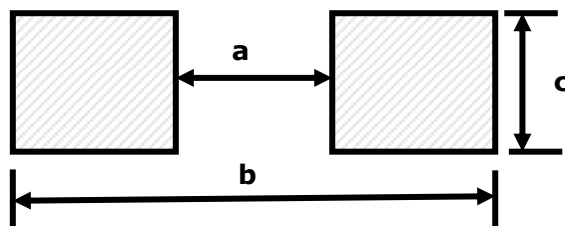
9.1 Manufacture Label :



9.2 Customer Label (By customer request):



10. Recommended land patterns :



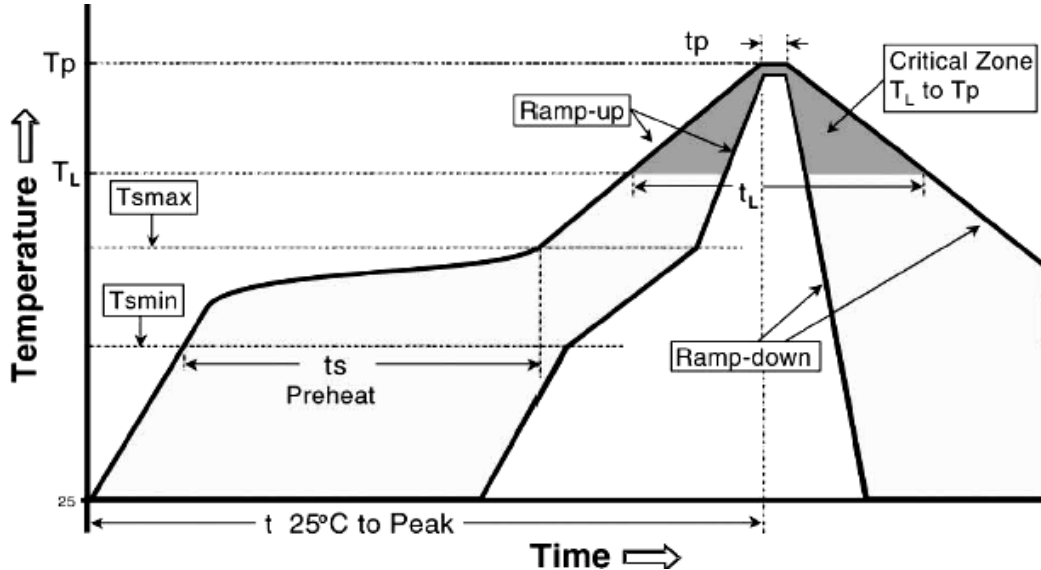
| Land pattern | | Dimension (mm) | | |
|--------------|-------------|------------------|---------|---------|
| Type | Size | a | b | c |
| RAS | 06 (0603) | 0.7~0.9 | 2.0~2.2 | 0.8~1.0 |
| RAS | 10 (0805) | 1.0~1.4 | 3.2~3.8 | 0.9~1.4 |
| RAS | 12 (1206) | 2.0~2.4 | 4.4~5.0 | 1.2~1.8 |
| RAS | 20 (2010) | 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 _{smax} to T _p) | 3°C / second max. |
| Preheat - Temperature Min (T _{smin}) - Temperature Max (T _{smax}) - Time (T _{smin} to T _{smax}) (t _s) | 150°C 200°C 60 -150 seconds |
| Time maintained above : - Temperature (T _L) - Time (T _L) | 217°C 60-120 seconds |
| Peak Temperature (T _p) | 260°C |
| Time within $\pm 5^{\circ}C$ of actual Peak Temperature (t _p) ² | 10 seconds |
| Ramp-down Rate | 6°C/second max. |
| Time 25°C to Peak Temperature | 8minutes max. |

Allowed Re-flow times : 3 times

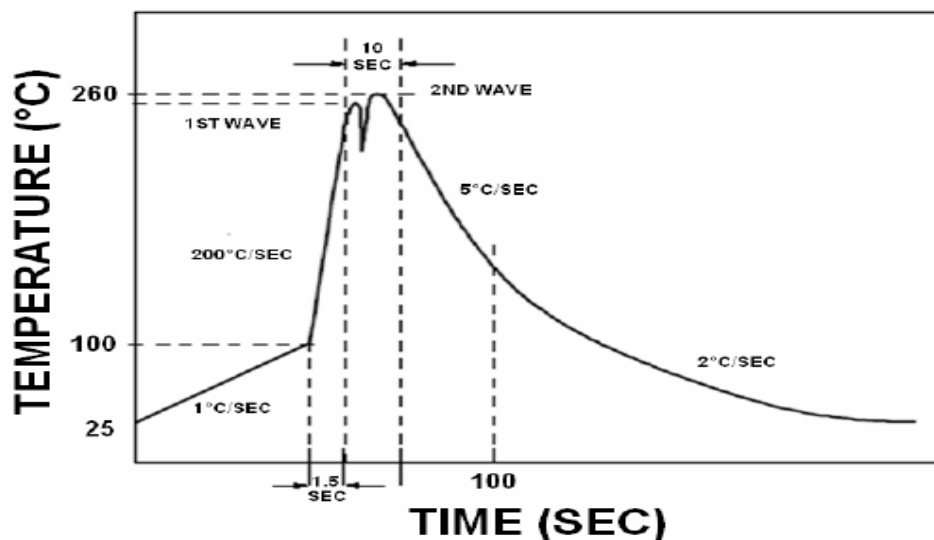
Remark : To avoid discoloration phenomena of chip on terminal electrodes, please use N2 Re-flow furnace .



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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)
Tel: 886-3-3246169 Fax : 886-3-3246167

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

Associated companies :

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Tel : 86-769-8339-4790~3 Fax : 86-769-8339-4794

(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)
Tel :604- 3900480 Fax : 604-3901481

(4) P.T.TAI ELECTRONICS Indonesia (Indonesia – Jakarta)
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[M55342K06B1E78RS3](#) [M55342K06B6E19RWL](#) [M55342K06B6E81RS3](#) [M55342M05B200DRWB](#) [M55342M06B4K70MS3](#) [MC0603-511-](#)
[JTW](#) [742C083750JTR](#) [MCR01MZPF1202](#) [MCR01MZPF1601](#) [MCR01MZPF1800](#) [MCR01MZPF6201](#) [MCR01MZPF9102](#) [MCR01MZPJ113](#)
[MCR01MZPJ121](#) [MCR01MZPJ125](#) [MCR01MZPJ751](#) [MCR03EZHJ103](#) [MCR03EZPFX2004](#) [MCR03EZPJ270](#) [MCR03EZPJ821](#)
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