



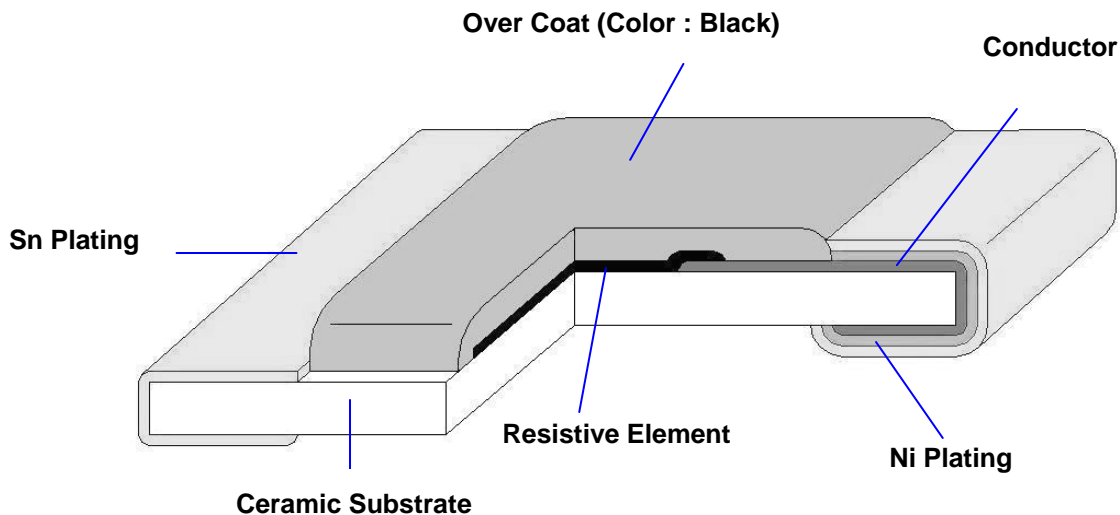
**Anti-Sulfurated Thick Film Chip Resistors
(RMS series standard)
Halogen-Free
AEC-Q200 qualified**

| | |
|--------------|---------------|
| Document No. | TRMS-XX0S001J |
| Revise Date | 2016/06/14 |
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1. Scope :

This specification applies for the RMS series of Anti-Sulfurated thick film chip resistors made by TA-I.

2. Construction:



3. Type Designation:

| | | | | |
|--|------------------|-----------------|-----------------|--------------------|
| <u>RMS</u> | <u>10</u> | <u>J</u> | <u>I</u> | <u>103</u> |
| Product Code | Size | Tolerance | Packaging | Nominal Resistance |
| RMS : Anti-Sulfurated Chip Resistor | Power Rating | | | Resistance |

| | | | |
|--|-----------------------------------|--|---|
| 02-0201(0603) 1/20W 04-0402(1005) 1/16W 06-0603(1608) 1/10W 10-0805(2012) 1/8W 12-1206(3216) 1/4W 13-1210(3226) 1/3W 20-2010(5025) 1/2W 25-2512(6432) 1 W | J-±5% G-±2% F-±1% D-0.5% | T-Paper Tape E-Embossed Tape Special L : 06 – 2mm pitch paper Tape | 3 digits, e.g., : (E-24) 103 = 10kΩ 0 = 0Ω 4 digits, e.g., : (E-96) 1540 = 154Ω 43R2 = 43.2Ω |
|--|-----------------------------------|--|---|



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4. Dimensions :



UNIT: mm

| Type | L | W | C | d | t |
|-------|---------------------------------------|-----------|-----------|--------------------------------------|------------|
| RMS02 | 0.6 ±0.03 | 0.3 ±0.03 | 0.1 ±0.05 | 0.15 ±0.05 | 0.23 ±0.03 |
| RMS04 | 1.00 ^{+0.1} _{-0.05} | 0.50±0.05 | 0.20±0.10 | 0.25±0.10 | 0.32±0.05 |
| RMS06 | 1.60±0.10 | 0.80±0.10 | 0.30±0.20 | 0.30 ^{+0.2} _{-0.1} | 0.45±0.10 |
| RMS10 | 2.00±0.10 | 1.25±0.10 | 0.40±0.20 | 0.40±0.20 | 0.50±0.10 |
| RMS12 | 3.10±0.10 | 1.55±0.10 | 0.50±0.30 | 0.40±0.20 | 0.55±0.10 |
| RMS13 | 3.10±0.10 | 2.55±0.10 | 0.50±0.30 | 0.40±0.20 | 0.60±0.10 |
| RMS20 | 5.00±0.15 | 2.50±0.15 | 0.60±0.30 | 0.50±0.25 | 0.60±0.10 |
| RMS25 | 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) | | | |
|-------|----------------------|----------------|----------------------|-------------------------|----------------|---------------------|--------------------------|-------------|------------------------|
| | | | | | | D(±0.5%) E-96&E-24 | F(±1%) E-96&E-24 | G(±2%) E-24 | J(±5%) E-24 |
| RMS02 | 1/20W | Refer 5.2 | 25V | 50V | ±200 | 100Ω~10KΩ | 10Ω~3MΩ | 10Ω~3MΩ | 10Ω~10MΩ |
| | | | | | +600 -200 | | 1~9.1Ω | 1~9.1Ω | 1~9.1Ω |
| RMS04 | 1/16W | Refer 5.2 | 50V | 100V | ±100 | 100Ω~1MΩ | 100Ω~1MΩ | | |
| | | | | | ±200 | 10Ω≤R<100Ω | 10Ω≤R<100Ω 1MΩ<R≤10MΩ | 10Ω~10MΩ | 10Ω~10MΩ |
| | | | | | +500 -200 | | 1Ω~9.1Ω | 1Ω~9.1Ω | 1Ω~9.1Ω |
| | | | | | ±400 | | | | 10MΩ≤R≤20MΩ |
| RMS06 | 1/10W | Refer 5.2 | 50V | 100V | ±100 | 10Ω~1MΩ | 10Ω~1MΩ | | |
| | | | | | ±200 | | 1M<R≤10MΩ | 10Ω~10MΩ | 10Ω~10MΩ |
| | | | | | ±400 | | 1Ω~9.1Ω | 1Ω~9.1Ω | 1Ω~9.1Ω 10MΩ<R≤20MΩ |
| RMS10 | 1/8W | Refer 5.2 | 150V | 300V | ±100 | 10Ω~1MΩ | 10Ω~1MΩ | | |
| | | | | | ±200 | | 1M<R≤10MΩ | 10Ω~10MΩ | 10Ω~10MΩ |
| | | | | | ±400 | | 1Ω~9.1Ω | 1Ω~9.1Ω | 1Ω~9.1Ω 10MΩ<R≤20MΩ |
| RMS12 | 1/4W | Refer 5.2 | 200V | 400V | ±100 | 10Ω~1MΩ | 10Ω~1MΩ | | |
| | | | | | ±200 | | 1M<R≤10MΩ | 10Ω~10MΩ | 10Ω~10MΩ |
| | | | | | ±400 | | 1Ω~9.1Ω | 1Ω~9.1Ω | 1Ω~9.1Ω 10MΩ<R≤20MΩ |
| RMS13 | 1/3W | Refer 5.2 | 200V | 400V | ±100 | 10Ω~1MΩ | 10Ω~1MΩ | | |
| | | | | | ±200 | | 1M<R≤10MΩ | 10Ω~10MΩ | 10Ω~10MΩ |
| | | | | | ±400 | | 1Ω~9.1Ω | 1Ω~9.1Ω | 1Ω~9.1Ω 10MΩ<R≤20MΩ |
| RMS20 | 1/2W | Refer 5.2 | 200V | 400V | ±100 | 10Ω~1MΩ | 10Ω~1MΩ | | |
| | | | | | ±200 | | 1M<R≤10MΩ | 10Ω~10MΩ | 10Ω~10MΩ |
| | | | | | ±400 | | 1Ω~9.1Ω | 1Ω~9.1Ω | 1Ω~9.1Ω 10MΩ<R≤20MΩ |
| RMS25 | 1W | Refer 5.2 | 200V | 400V | ±100 | 10Ω~1MΩ | 10Ω~1MΩ | | |
| | | | | | ±200 | | 1M<R≤10MΩ | 10Ω~10MΩ | 10Ω~10MΩ |
| | | | | | ±400 | | 1Ω~9.1Ω | 1Ω~9.1Ω | 1Ω~9.1Ω 10MΩ<R≤20MΩ |

Ω THICK FILM CHIP RESISTORS

| Type | Rated Current | Max Overload Current | Resistance Range |
|-------|---------------|----------------------|------------------|
| RMS02 | 0.5A | 1A | 50mΩ MAX |
| RMS04 | 1A | 2.5A | 50mΩ MAX |
| RMS06 | 1A | 2.5A | 50mΩ MAX |
| RMS10 | 2A | 5A | 50mΩ MAX |
| RMS12 | 2A | 5A | 50mΩ MAX |
| RMS13 | 2A | 5A | 50mΩ MAX |
| RMS20 | 2A | 5A | 50mΩ MAX |
| RMS25 | 2A | 5A | 50mΩ MAX |

Operating Temp(°C): -55°C ~ +155°C (RMS02 : -55°C ~ +125°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

5.2 Rated 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 RMS06JT102 the rated voltage ?

RMS06JT102 P:1/10W ; R:102 = 1KΩ = 1000Ω

$$E = \sqrt{0.1(W) * 1000(\Omega)} = 10 (V)$$



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6. Reliability Tests:

| Test Items | Reference standard | Condition of Test | Test Limits ΔR |
|---------------------------------------|--|--|---|
| Temperature Coefficient of Resistance | IEC 60115-1 4.8 | -At +25/-55 °C and +25/+125 °C | Refer 5.0 |
| Short Time Overload | IEC60115-1 4.13 | 2.5 X rated voltage for 5 sec | $\pm(1\% + 0.05\Omega)$ Remarks : 0201: $\pm(3\% + 0.1\Omega)$ 0402: $\pm(2\% + 0.1\Omega)$ 0 Ω : 50m Ω or less |
| High Temperature Exposure (Storage) | AEC-Q200-REV C-Test 3 MIL-STD-202 Method 108 | 1000 hrs. @ T=125°C. Unpowered. Measurement at 24 \pm 2 hours after test conclusion. | 0.5%,1%: $\pm(1.0\%+0.05\Omega)$ 2%,5%: $\pm(2.0\%+0.1\Omega)$ 0201 : $\pm(3\% + 0.1\Omega)$ 0 Ω : 50m Ω or less |
| Moisture Resistance | AEC-Q200-REV C-Test 6 MIL-STD-202 Method 106 | T=24 hours / Cycle ,10Cycles . Notes : Steps 7a& 7b not required. Unpowered . | 0.5%,1%: $\pm(1.0\%+0.05\Omega)$ 2%,5%: $\pm(2.0\%+0.1\Omega)$ 0201 : $\pm(3\% + 0.1\Omega)$ 0 Ω : 50m Ω or less |
| Biased Humidity | AEC-Q200-REV C-Test 7 MIL-STD-202 Method 103 | 1000 hours 85°C/85%RH. Note: Specified conditions: 10% of operating power(not exceeding max working voltage). Measurement at 24 \pm 2 hours after test conclusion. | $\pm(3\% + 0.1\Omega)$ 0201 : $\pm(5\% + 0.1\Omega)$ 0 Ω : 100m Ω or less |
| Operational Life | AEC-Q200-REV C-Test 8 MIL-STD-202 Method 108 | 1000 hours TA=70°C at rated power. Measurement at 24 \pm 2 hours after test conclusion. | 0.5%,1%: $\pm(1\% + 0.1\Omega)$ 2%.5% : $\pm(3\% + 0.1\Omega)$ 0201 : $\pm(5\% + 0.1\Omega)$ 0 Ω : 100m Ω or less |
| External Visual | AEC-Q200-REV C-Test 9 MIL-STD-883 Method 2009 | Electrical test not required. Inspect device construction, marking and workmanship. | |
| Physical Dimension | AEC-Q200-REV C-Test 10 JESD22 Method JB-100 | Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required. | |
| Resistance to Solvents | AEC-Q200-REV C-Test 12 MIL-STD-202 Method 215 | a:Isopropyl Alcohol : Mineral Spirits= 1 : 3 b:Terpene Defluxer (Bioact EC-7R) c:Deionized water : Propylene Glycol Monomethyl Ether : monoethanolamine = 42 : 1 : 1 | Marking and protective layer can not be detached |
| Mechanical Shock | AEC-Q200-REV C-Test 13 MIL-STD-202 Method 213 | Wave Form : Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration(D) is 6(ms) | $\pm(1\% + 0.1\Omega)$ 0 Ω : 50m Ω or less |
| Vibration | AEC-Q200-REV C-Test 14 MIL-STD-202 Method 204 | 5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz. | $\pm(1\% + 0.1\Omega)$ 0 Ω : 50m Ω or less |
| Resistance to Soldering Heat | AEC-Q200-REV C-Test 15 MIL-STD-202 Method 210 | Condition B : Immerse the specimens in and eutectic solder at 260 \pm 5°C for 10 \pm 1S . | 0.5%,1% : $\pm(0.5\% + 0.05\Omega)$ 2%.5% : $\pm(1\% + 0.1\Omega)$ 0201 : $\pm(2\% + 0.1\Omega)$ 0 Ω : 50m Ω or less |
| Thermal Shock | AEC-Q200-REV C-Test 16 MIL-STD-202 Method 107 | -55°C/+155°C. Note: Number of cycles required-300, Maximum transfer time-20 seconds, Dwell time-15 minutes. Air-Air. | $\pm(1\% + 0.1\Omega)$ 0201 : $\pm(2\% + 0.1\Omega)$ 0 Ω : 50m Ω or less |



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| ESD | AEC-Q200-REV C-Test 17 | verify the voltage setting at 500V | ±(1% + 0.1 Ω) 0201 : ±(2% + 0.1 Ω) |
| Solderability | AEC-Q200-REV C-Test 18 J-STD-002 | Method B, aging 4 hours at 155 °C dry heat Lead-free solder bath at 245±3 °C Dipping time: 3±0.5 seconds | > 95% area covered with tin |
| Flammability | AEC-Q200-REV C-Test 17 UL-94 | V-0 or V-1 are acceptable. Electrical test not required. | V-0 or V-1 |
| Board Flex (Bending) | AEC-Q200-REV C-Test 21 | 3mm deflection(RMS02~RMS13) 2mm deflection(RMS20~RMS25) | 0.5%,1% : ±(0.5% + 0.05 Ω) 2%.5% : ±(1% + 0.1 Ω) 0201 : ±(1% + 0.1 Ω) 0 Ω : 50mΩ or less |
| Terminal Strength (SMD) | IEC 60115-1 4.32 | Force of 1.02kg for 10±1 seconds. Remarks : RMS04:0.51kg Remarks : 0201-NA | ±(0.5% + 0.05 Ω) 0 Ω : 50mΩ or less |
| Sulfuration Test | ASTM-B-809-95 | Sulfur(saturated vapor) 1,000 hours,105±2°C, unpowered | 0.5%,1%:±(1%+0.05 Ω) 2%, 5%:±(2%+0.05 Ω) 0201: 0.5%,1%:±(2%+0.05 Ω) 2%, 5%:±(3%+0.05 Ω) 0 Ω : 100mΩ or less |

Note* : RCWV : Rated continuous working voltage .

7. Marking

7.1 ±2% & ±5%(E24) : RMS06 / RMS10 / RMS12 / RMS13 / RMS20 / RMS25

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. : $\overline{102} = 10 \times 10^2 = 1000 \Omega = 1K \Omega$



7.2 ±0.5% , ±1% (E96) : RMS10 / RMS12 / RMS13 / RMS20 / RMS25

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. : $\overline{1000} = 100 \times 10^0 = 100 \Omega$





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7.3 ±0.5% , ±1% (E96): RMS06

When the marking space is too small in such small-sized resistors as RMS06, 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 |
| 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 : $\overline{01}A = 100 \times 10^0 = 100\Omega$



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 , 120Ω , 1% Marking is $\underline{121}$





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7.4 $\pm 0.5\%$, $\pm 1\%$ (E96/3digitals) :

The resistance value by 3 digits is requirement for customer.

7.5 RMS04 :



7.6 RMS02 :

NO Marking

8. Taping & Reel :

8.1 Taping Dimensions

8.1.1 4 mm pitch paper:



| Packing | Type | A | B | W | F | E | P ₁ | P ₂ | P ₀ | D ₀ | T |
|---------|-------|----------|---------|---------|----------|----------|----------------|----------------|----------------|--------------------------|----------|
| Paper | RMS06 | 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 | $\phi 1.5$ +0.1 -0 | 0.64±0.1 |
| | RMS10 | 1.6±0.15 | 2.4±0.2 | | | | | | | | 0.84±0.1 |
| | RMS12 | 2.0±0.15 | 3.6±0.2 | | | | | | | | 0.84±0.1 |
| | RMS13 | 2.8±0.2 | 3.6±0.2 | | | | | | | | 0.84±0.1 |



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8.1.2 2 mm pitch paper :



| Packing | Type | A | B | W | F | E | P ₁ | P ₂ | P ₀ | D ₀ | T |
|---------|-------|-----------|----------|---------|----------|----------|----------------|----------------|----------------|----------------|----------|
| Paper | RMS02 | 0.37±0.05 | 0.67±0.1 | 8.0±0.2 | 3.5±0.05 | 1.75±0.1 | 2.0±0.1 | 2.0±0.05 | 4.0±0.1 | φ 1.5 | 0.37±0.1 |
| | RMS04 | 0.7±0.05 | 1.2±0.05 | | | | 2.0±0.1 | 2.0±0.1 | | | 0.45±0.1 |
| | RMS06 | 1.1±0.1 | 1.9±0.1 | | | | 2.0±0.1 | 2.0±0.1 | | | 0.64±0.1 |

8.1.3 4 mm pitch Emboss :



| Packing | Type | A | B | W | F | E | P ₁ | P ₂ | P ₀ | D ₀ | T |
|---------|-------|---------|---------|----------|----------|----------|----------------|----------------|----------------|----------------|-----------|
| Emboss | RMS20 | 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 | 0.85±0.15 |
| | RMS25 | 3.6±0.2 | 6.9±0.2 | | | | | | | | |

| Package Type Size | | Paper Tape | | | | Emboss Plastic Tape 4 mm pitch |
|----------------------|----|------------|---------|------------|---------|-----------------------------------|
| | | 4 mm pitch | | 2 mm pitch | | |
| | | 178mm/R | 250mm/R | 178mm/R | 250mm/R | |
| RMS | 02 | | | 10000 | | |
| RMS | 04 | | | 10000 | 20000 | |
| RMS | 06 | 5000 | 10000 | 10000 | 20000 | |
| RMS | 10 | 5000 | 10000 | | | |
| RMS | 12 | 5000 | 10000 | | | |
| RMS | 13 | 5000 | | | | |
| RMS | 20 | | | | | 4000 |
| RMS | 25 | | | | | 4000 |



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8.2 Reel Specifications:



UNIT: mm

| Type | ϕA | ϕB | ϕC | W | T |
|---------------------------------|-----------------|----------------|----------------|----------------|----------------|
| RMS02 /04 / 06 RMS10 /12 /13 | 178.0 ± 2.0 | 60.0 ± 1.0 | 13.0 ± 1.0 | 9.0 ± 1.0 | 11.5 ± 1.0 |
| RMS20 / 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 |
| RMS | 02 (0201) | 0.25~0.3 | 0.7~0.9 | 0.3~0.4 |
| RMS | 04 (0402) | 0.50~0.6 | 1.4~1.6 | 0.4~0.6 |
| RMS | 06 (0603) | 0.7~0.9 | 2.0~2.2 | 0.8~1.0 |
| RMS | 10 (0805) | 1.0~1.4 | 3.2~3.8 | 0.9~1.4 |
| RMS | 12 (1206) | 2.0~2.4 | 4.4~5.0 | 1.2~1.8 |
| RMS | 13 (1210) | 2.0~2.4 | 4.4~5.0 | 2.3~3.5 |
| RMS | 20 (2010) | 3.3~3.7 | 5.7~6.5 | 2.3~3.5 |
| RMS | 25 (2512) | 3.6~4.0 | 7.6~8.6 | 2.3~3.5 |



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}) (ts) | 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 $\begin{matrix} +0 \\ -5 \end{matrix}$ °C of actual Peak Temperature (t _p) ² | 10 seconds |
| Ramp-down Rate | 6°C/second max. |
| Time 25°C to Peak Temperature | 8mimutes max. |

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



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12. Storage Conditions:

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

13. Shelf Life:

2 years from manufacturing date.

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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