

1 Electrical Characteristics

1.1 Technical Data

| | | | |
|---|-----------|---------------|----|
| Maximum allowable continuous AC voltage*1 | V_{RMS} | 7.0 | V |
| Maximum allowable continuous DC voltage | V_{DC} | 9.0 | V |
| Varistor voltage Measured*2 | V_B | 12(10.2-13.8) | V |
| Typical capacitance value measured*3 | C | 150 | pF |
| Typical capacitance value tolerance | | ± 30 | % |
| Maximum clamping voltage measured*4 | V_C | 24 | V |
| Rated peak single pulse transient current at *5 | I_P | 30 | A |

| Symbol | Value | Unit |
|-----------|---------------|------|
| V_{RMS} | 7.0 | V |
| V_{DC} | 9.0 | V |
| V_B | 12(10.2-13.8) | V |
| C | 150 | pF |
| | ± 30 | % |
| V_C | 24 | V |
| I_P | 30 | A |

1.2 Reference Data

| | | | |
|--|------------|----------|--------------|
| Maximum Energy Absorption 10/1000 μ s | E | 0.1 | J |
| Response time | T_{rise} | <2 | ns |
| Leakage current at V_{DC} (At initial state) | I_L | <50 | μ A |
| Leakage current at V_{DC} (After reliability Test) | I_{LA} | <100 | μ A |
| Operating ambient temperature | | -40~+125 | $^{\circ}$ C |
| Storage temperature | | -40~+125 | $^{\circ}$ C |
| Reflow temperature profile(Recommend) | | 260 | $^{\circ}$ C |

| | | |
|------------|----------|--------------|
| E | 0.1 | J |
| T_{rise} | <2 | ns |
| I_L | <50 | μ A |
| I_{LA} | <100 | μ A |
| | -40~+125 | $^{\circ}$ C |
| | -40~+125 | $^{\circ}$ C |
| | 260 | $^{\circ}$ C |

1.3 Other Data

| | |
|------------------------|--------------|
| Body | ZnO |
| End termination | Ag/Ni/Sn |
| Packaging | Bulk/Tape |
| Complies with Standard | IEC61000-4-5 |

Notes:

*1 AC voltage at 50~60Hz

*2 Varistor voltage

*3 Capacitance

*4 Maximum clamping voltage

*5 Rated peak single pulse transient current

Measured at 1mA DC

Measured at $f=1$ MHz, $V_{rms}=0.5$ V

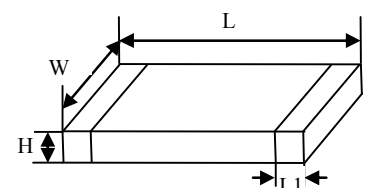
Measured at 1A by 8/20 μ s Pulse

Measured by 8/20 μ s Pulse

Size:

Unit: mm

| Type | Length (L) | Width (W) | High (H) | Termination (L1) |
|------|-----------------|-----------------|-----------|------------------|
| 0603 | 1.60 \pm 0.10 | 0.80 \pm 0.10 | 0.80(max) | 0.35 \pm 0.10 |



2. Ordering information

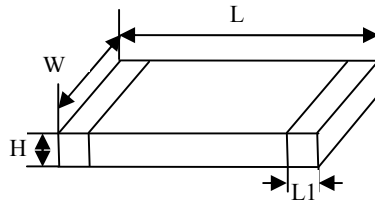
2.1 standards

$\frac{\text{MVR}}{\text{①}}$ $\frac{\text{0603}}{\text{②}}$ - $\frac{\text{120}}{\text{③}}$ $\frac{\text{G}}{\text{④}}$

- ①MVR: Series name
- ②0603 : Chip size - 0603 (1.6 x 0.8 mm) size
- ③120 : Varistor voltage(Breakdown voltage) - 12Vdc
- ④G : General absorption, low clamping voltage

3.Size

| Model | 1005(0402) | 1608(0603) | 2012(0805) | 3216(1206) | 3225(1210) | 4532(1812) | 5750(2220) | 8050(3220) |
|-----------|------------|------------|------------|------------|------------|------------|------------|------------|
| Length(L) | 1.00±0.15 | 1.60±0.20 | 2.00±0.20 | 3.20±0.20 | 3.20±0.20 | 4.50±0.30 | 5.70±0.30 | 8.0±0.30 |
| Width(W) | 0.50±0.15 | 0.80±0.20 | 1.20±0.20 | 1.60±0.20 | 2.50±0.20 | 3.20±0.20 | 5.00±0.30 | 5.00±0.30 |
| High(H) | 0.70max | 0.90max | 1.30max | 1.60max | 2.50max | 3.20max | 4.50max | 4.50max |



5.Surge Wave Form

Wave shape "Short circuit" (Current I_{sc})



IEC61000-4-5 Standards

| SEVERITY LEVEL | T1 | T2 |
|----------------|-------|---------|
| 1 | 8 µS | 20 µS |
| 2 | 10 µS | 1000 µS |

8/20µs waveform current

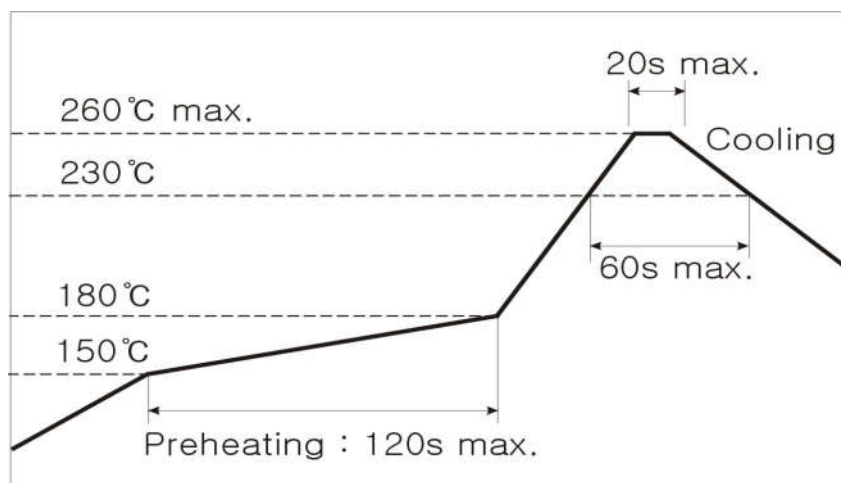
6. Environmental Reliability Test

| Characteristic | Test method and description | | | |
|----------------------------------|---|----------|------------------|----------|
| High Temperature Storage | The specimen shall be subjected to 125°C for 1000 hours in a thermostatic bath without load and then stored at room temperature and humidity for 1 to 2 hours. The change of varistor voltage shall be within 10%. | | | |
| Temperature Cycle | The temperature cycle of specified temperature shall be repeated five times and then stored at room temperature and humidity for one two hours. The change of varistor voltage shall be within 10% and mechanical damage shall be examined. | Step | Temperature | Period |
| | | 1 | -40±3°C | 30min±3 |
| | | 2 | Room Temperature | 1~2hours |
| | | 3 | 125±2°C | 30min±3 |
| 4 | Room Temperature | 1~2hours | | |
| High Temperature Load | After being continuously applied the maximum allowable voltage at 85°C for 1000hours, the specimen shall be stored at room temperature and humidity for one or hours, the change of varistor voltage shall be within 10%. | | | |
| Damp Heat Load/ Humidity Load | The specimen should be subjected to 40°C, 90 to 95%RH environment, and the maximum allowable voltage applied for 1000 hours, then stored at room temperature and humidity for one or two hours. The change of varistor voltage shall be within 10%. | | | |
| Low Temperature Storage | The specimen should be subjected to -40°C, without load for 1000 hours and then stored at room temperature for one two hours. The change of varistor voltage shall be within 10%. | | | |

7. Soldering Recommendation

The principal techniques used for the soldering of components in surface mount technology are infrared reflow and wave soldering.

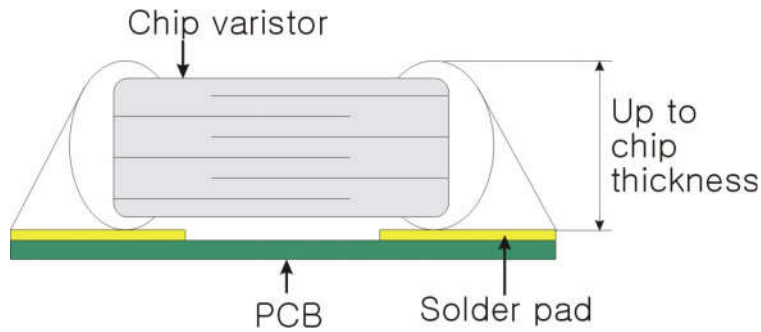
7.1 Pb free solder paste



7.2 Repair soldering

7.2.1 Allowable time and temperature for making correction with a soldering iron: 350 ± 10 °C, 3 sec.

7.2.2 Optimum solder amount when corrections are made using a soldering iron



7.3 Soldering guidelines

7.3.1 Our chip varistors are designed for reflow soldering only. Do not use flow soldering

7.3.2 Use non-activated flux (Cl content 0.2% max.)

7.3.3 Follow the recommended soldering conditions to avoid varistor damage.

8 Packaging Specification

8.1 Carrier tape transparent cover tape should be heat-sealed to carry the products, and the reel should be used to reel the carrier tape.

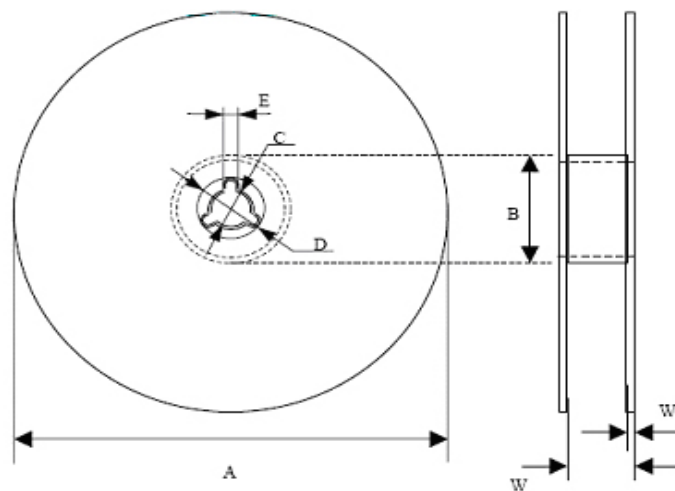
8.2 The adhesion of the heat-sealed cover tape shall be $40 + 20 / - 15$ grams.

8.3 Both the head and the end portion of taping shall be empty for reel package and SMT auto-pickup machine. And a normal paper tape shall be connected in the head of taping for the operator handle.



| type | A ₀ ±0.10 | B ₀ ±0.10 | K ₀ ±0.10 | T ±0.05 | T ₂ ±0.05 | D ₀ +0.10 | D ₁ ±0.05 | P ₁ ±0.10 | P ₂ ±0.05 | P ₀ ±0.05 | W ±0.20 | E ±0.10 | F ±0.05 |
|------|-------------------------|-------------------------|-------------------------|------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|------------|------------|------------|
| 0402 | 1.08 | 1.88 | 1.04 | 0.22 | 0.87 | 1.50 | 1.00 | 4.00 | 2.00 | 4.00 | 8.00 | 1.75 | 3.50 |
| 0603 | 1.08 | 1.88 | 1.04 | 0.22 | 1.17 | 1.50 | 1.00 | 4.00 | 2.00 | 4.00 | 8.00 | 1.75 | 3.50 |
| 0805 | 1.42 | 2.30 | 1.04 | 0.22 | 1.26 | 1.50 | 1.00 | 4.00 | 2.00 | 4.00 | 8.00 | 1.75 | 3.50 |
| 1206 | 1.88 | 3.50 | 1.27 | 0.20 | 1.49 | 1.50 | 1.00 | 4.00 | 2.00 | 4.00 | 8.00 | 1.75 | 3.50 |
| 1210 | 2.18 | 3.46 | 1.45 | 0.22 | 1.77 | 1.50 | 1.00 | 4.00 | 2.00 | 4.00 | 8.00 | 1.75 | 3.50 |
| 1812 | 3.66 | 4.95 | 1.74 | 0.25 | 1.99 | 1.50 | 1.50 | 8.00 | 2.00 | 4.00 | 12.00 | 1.75 | 5.50 |
| 2220 | 5.10 | 5.97 | 2.80 | 0.25 | 3.05 | 1.50 | 1.50 | 8.00 | 2.00 | 4.00 | 12.00 | 1.75 | 5.50 |
| 3220 | 5.50 | 8.50 | 2.80 | 0.30 | 3.50 | 1.50 | 1.50 | 8.00 | 2.00 | 4.00 | 16.00 | 1.75 | 7.50 |

9. reel dimension



| type | A | B | C | D | E | W | W ₁ |
|-----------|-----------|----------|----------|----------|---------|----------|----------------|
| 0402-1210 | 178.0±1.0 | 60.0±0.5 | 13.0±0.2 | 21.0±0.2 | 2.0±0.5 | 9.0±0.50 | 1.5±0.15 |
| 1812-3220 | 178.0±1.0 | 60.0±0.5 | 13.5±0.1 | 21.0±0.2 | 2.0±0.5 | 13.6±0.2 | 1.5±0.15 |

| type | | 0402 | 0603 | 0805 | | 1206 | 1210 | 1812 | 2220 | 3220 |
|----------|---------|-------|------|------|------|------|-----------|------|----------|------|
| quantity | paper | 10000 | 4000 | 4000 | - | - | - | - | - | |
| | plastic | - | - | - | 3000 | 3000 | 2000/3000 | 1000 | 800/1000 | 1000 |

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