

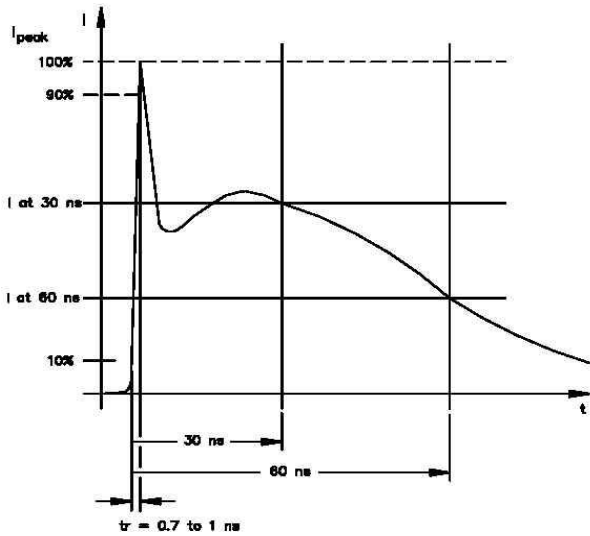
**Temperature and humidity**

Operating Temperature range	-55 <sup>0</sup> C~+85 <sup>0</sup> C
Storage Temperature range	-55 <sup>0</sup> C~+125 <sup>0</sup> C
Max. relative humidity (Without condensation)	<75% annual average, <95% on max. 30 days per annum.

Overheat of the element:

Due to the unpredictable nature of transients, a transient voltage suppressor may be Overload, although it was carefully selected. Overload may result in package rupture Expulsion of hot material. For this reason the TVS should be physically shielded from Adjacent components. The TVS can be additionally protected by a thermal fuse, which is Connected to the TVS body.

ESD Wave Form



IEC61000-4-2 STANDARDS

SEVERITY LEVEL	AIRDIRCHARGE	DIRECT DISCHARGE
1	2 KV	2 KV
2	4 KV	4 KV
3	8 KV	6 KV
4	15 KV	8 KV

Environmental Reliability Test

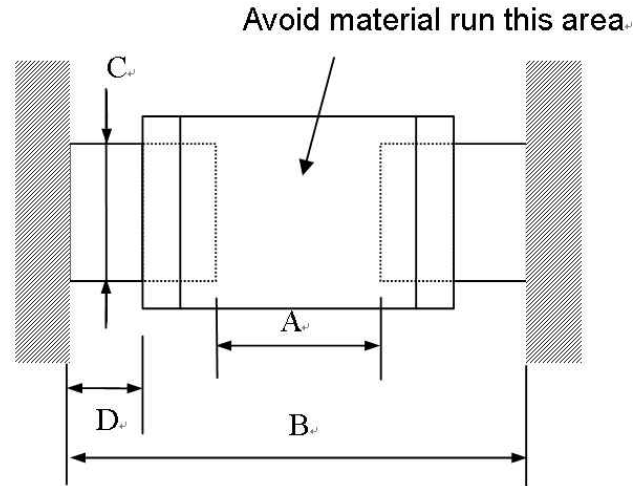
Characteristic	Test method and description			
High Temperature Storage	The specimen shall be subjected to $150 \pm 2^{\circ}\text{C}$ for $1000 \pm 12$ hours in a thermostatic bath without load and then stored at room temperature and humidity for 1 to 2 hours. The change of varistor voltage shall be 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 or two hours. the change of varistor voltage shall be within 10 % and mechanical damage shall be examined.	Step	Temperature	Period
		1	$-40 \pm 3^{\circ}\text{C}$	30Min $\pm$ 3
		2	Room Temperature	1~2 hours
		3	$125 \pm 2^{\circ}\text{C}$	30Min $\pm$ 3
		4	Room Temperature	1~2 hours
High Temperature Load	After being continuously applied the maximum allowable voltage at $125 \pm 2^{\circ}\text{C}$ for $1000 \pm 2$ hours, the specimen shall be stored at room temperature and humidity for one or two hours, the change of varistor voltage shall be within 10% .			
Damp Heat Load/ Humidity Load	The specimen should be subjected to $40 \pm 2^{\circ}\text{C}$ , 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 $40 \pm 2^{\circ}\text{C}$ , without load for 1000 hours and then stored at room temperature for one or two hours. the change of varistor voltage shall be within 10 %			

**Soldering Recommendations**

1 Recommended solder pad layout

(Unit : mm)

	A	B	C	D
0402	0.4~0.6	1.6~1.8	0.5~0.6	0.2~0.4
0603	0.8~1.2	2.5~3.0	0.6~1.0	0.3~0.6
0805	1.0~1.5	3.2~3.8	1.2~1.4	0.3~0.6
1206	1.8~2.5	4.2~5.8	1.2~1.6	0.4~0.8
1210	1.8~2.5	4.2~5.8	1.8~2.5	0.5~1.0
1812	2.5~3.5	5.5~6.1	2.3~3.2	0.6~1.1
2220	3.5~4.6	6.0~7.2	4.8~5.5	1.2~2.3

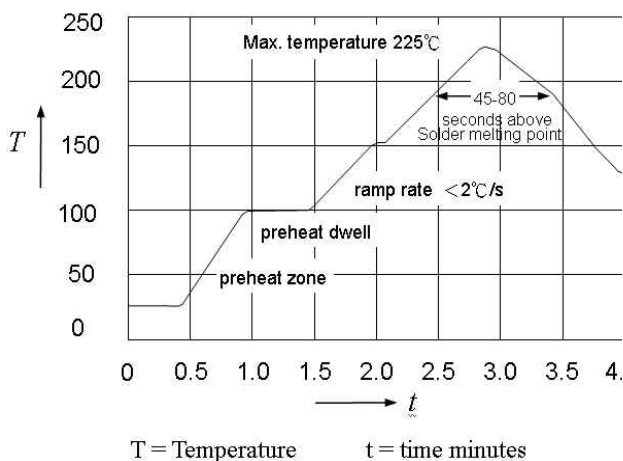


2 The solder paste shall be printed in a thickness of 150 to 200µm.

3 The SIR test of the solder paste shall be done ( Based on JIS-Z-3284 )

4 IR Orderings

Rapid heating, partial heating or rapid cooling will easily cause defect of the component. So preheating and gradual cooling process is suggested. IR soldering has the highest yields due to controlled heating rates and solder liquid us times. Make sure that the element is not subjected to a thermal gradient steeper than 4 degrees per second. 2 degrees per second is the ideal gradient. During the soldering process, pre-heating to within 100 degrees of the solders peak temperature is essential to minimize thermal shock.



(a) Preheat

- 1.The temperature rising speed is suggested to be 2~4°C/s.
- 2.Appropriate preheat time will be from 60 to 120 seconds.

(b) Heating

- 1.Careful about sudden rise in temperature as it may worsen the solder ability.
- 2.Set the peak temperature in the range from 215 °C to 225°C.

(c) Cooling

- 1.Careful about slow cooling as it may cause the position shift of component.

※Perform adequate test in advance as the reflow temperature profile will vary according to the conditions of the manufacturing process, and the specification of the reflow furnace

### 5.5 Hand Soldering

In hand soldering of the Varistors. Large temperature gradient between preheated the Varistors and the tip of soldering iron may cause electrical failures and mechanical damages such as cracklings or breakings of the devices. The soldering shall be carefully controlled and carried out so that the temperature gradient is kept minimum with following recommended conditions for hand soldering.

#### 1 Recommended Soldering Condition 1

- (1) Solder :  
1mm Thread solder (sn63:pb37) with soldering flux in the core.  
Rosin-based and non-activated flux is recommended.
- (2) Preheating  
The Varistors shall be preheated so that Temperature Gradient between the devices and the tip of soldering iron is 150C or below.
- (3) Soldering Iron  
Rated Power of 20w max with 3mm soldering tip in diameter.  
Temperature of soldering iron tip 300C max ( The required amount of solder shall be melted in advance on the soldering tip.)
- (4) Cooling  
After soldering. The Varistors shall be cooled gradually at room ambient temperature.

#### 2 Recommended Soldering Condition 2 ( Without preheating )

- (1) Solder iron tip shall not directly touch to ceramic dielectrics.
- (2) Solder iron tip shall be fully preheated before soldering while soldering iron tip to the external electrode of Varistors.

### 5.6 Post Soldering Cleaning

- 1 Residues of corrosive soldering fluxes on the PC board after cleaning may greatly have influences on the electrical characteristic and the reliability (such as humidity resistance)of the Varistors which have been mounted on the board. It shall be confirmed that the characteristic and the reliability of the devices are not affected by the applied cleaning conditions.
  2. When an ultrasonic cleaning is applied to the mounted Varistors on PC Boards. Following conditions are recommended for preventing failures or damages of the devices due to the large vibration energy and the resonance caused by the ultrasonic waves.
    - (1) Frequency 29MHz max
    - (2) Radiated Power 20w/lithr max
    - (3) Period 5minuets max
-