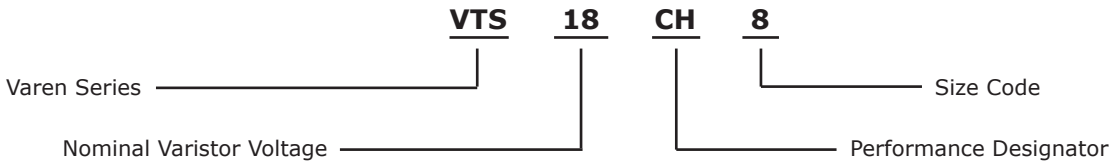
SMD Transient Voltage Suppressors

VTS Series - CH Type

Part numbering system



Performance Characteristics

Model Number	Working Voltage		Varistor Voltage	Max Clamping Voltage		Peak Current	Energy Absorb-tion	Capacitance (ref.)	Thickness
Unit	AC	DC	V (1mA)	A	V	A	J	pF (1KHz)	mm (±0.3)
VTS56CH8	35	45	56(50.4~61.6)	5	106	500	> 2.50	1250	1.5
VTS68CH8	40	56	68(61.2~74.8)	5	124	500	> 3.20	1050	1.5
VTS120CH8	75	102	120(108~132)	10	198	500	> 6.00	600	1.5
VTS150CH8	95	127	150(135~165)	10	248	500	> 7.50	470	1.5
VTS240CH8	150	200	240(216~264)	10	390	500	> 14.5	380	1.7
VTS270CH8	175	225	270(243~297)	10	450	500	> 16.0	340	1.7
VTS390CH8	250	330	390(351~429)	10	647	500	> 20.0	125	2.2
VTS430CH8	275	369	430(387~473)	10	705	450	> 21.0	120	2.2
VTS470CH8	300	385	470(423~517)	10	775	400	> 21.6	115	2.2

* 1. The varistor voltage was measured at 1mA current.
* 2. The clamping voltage was measured at standard 10A current.
* 3. The peak current was tested at 8/20us waveform.
* 4. The capacitance value and energy only for customer reference, it's not formal specification.

Reference Data	Symbol	Value	Unit
Response time	T_{rise}	< 1	ns
Leakage current at V_{1ma} x 80%	I_{Vv}	< 50	uA
Leakage current at V_{1ma} x 80% (After Reliability Test)	I_{VvA}	< 200	uA
Operation ambient temperature		-55 ~ +85	°C
Storage temperature		-55 ~ +125	°C
Reflow solder profile temperature (Recommended)		250	°C
Other Data			
Body		Zno	
End termination		Ag/Ni/Sn	
Packaging		Reel	
Complies with Standard		IEC61000-4-2	
Complies with RoHS Standard		Yes	
Marking		None	
Lead content		< 1000	ppm

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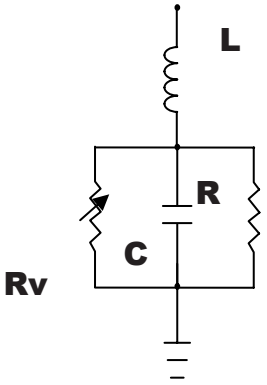
Equivalent Circuit

L: Body Inductance

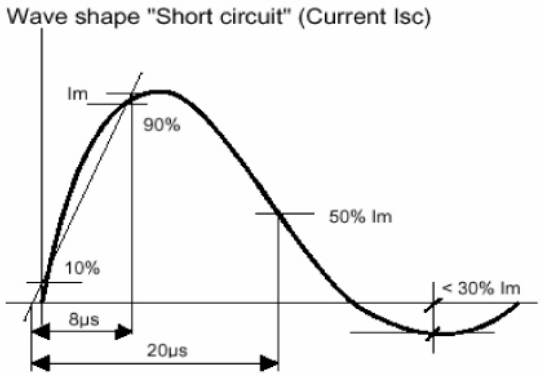
C: Device Capacitance

Rv: Voltage Variable Resistor

R: Insulation Resistor



Surge Wave Shape



8/20μs waveform current (A)

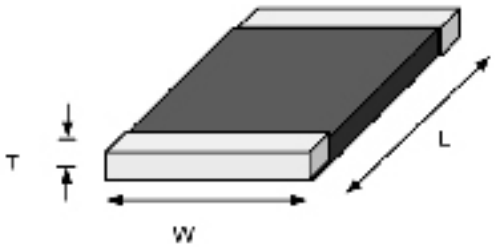
Environmental reliability test

Characteristic	Test method and description			
High temperature storage	The specimen shall be subjected to 150 ± 2°C for 1000 ± 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 1 or 2 hours. The change of varistor voltage shall be within 10% and mecanical damage shall be examined.	Step	Temperature	Period
		1	-40±3°C	30m±3
		2	Room Temperature	1-2h
		3	125±2°C	30m±3
		4	Room Temperature	1-2h
High temperature load	After being continuously applied the maximum allowable voltage at 85 ± 2°C for 1000 ± 2 hours, the specimen shall be stored at room temperature and humidity for 1 or 2 hours, the change of varistor voltage shall be within 10%.			
Damp heat load / humidity load	The specimen should be subjected to 40 ± 2°C, 90 to 95% RH environment, and the maximum allowable voltage applied for 1000 hours, then stored at room temperature and humidity for 1 or 2 hours. The change of varistor voltage shall be within 10%.			
Low storage temperature	The specimen should be subjected to -40 ± 2°C, without load for 500 hours and then stored at room temperature for 1 or 2 hours. The change of varistor voltage shall be within 10%.			

Size

Unit: mm

Length (L)	8.1±0.3
Width (W)	5.0±0.3
Thickness (T)	See Chart
Electrode	0.8+0.5/-0.1

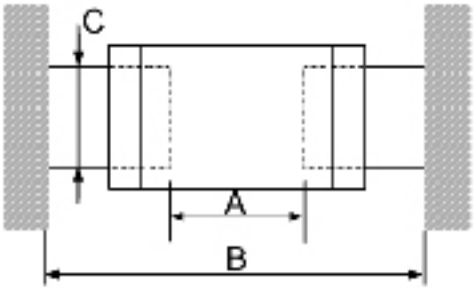


Soldering recommendations

1. Recommended solder pad layout

Unit: mm

A	B	C
6.5	9.5	6.8



Foot distance printing (mm)	Steel Plate thickness(mm)
> 0.65	0.18
0.65 ~ 0.50	0.15
0.50 ~ 0.40	0.12
<= 0.40	0.10

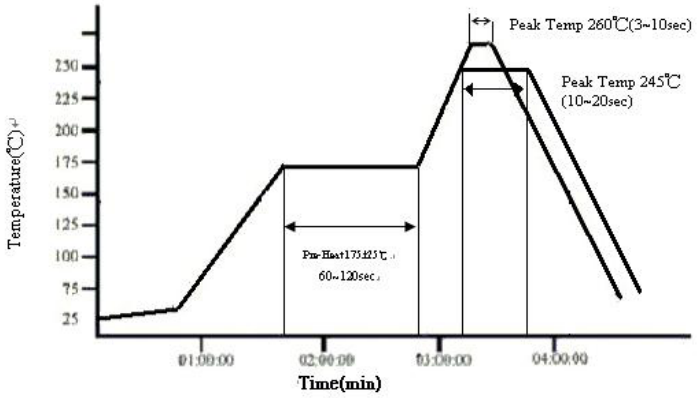
2. The solder paste shall be printed in a thickness of 150 to 200 μm.

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

4. IR soldering

Rapid heating, partial heating or rapid cooling will easily cause defect of the component. So pre-heating and gradual cooling process is suggested. IR soldering has the highest yields due to controlled heating rates and solder liquidus times. Make sure that the element is not 4.4. The IR reflow and temperature of Soldering for Pb Free 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.

IR reflow Pb Free Process suggestion profile



1. The solder recommend is Sn96.5/Ag 3.5 of 120 to 150 μm
2. Ramp-up rate (217°C to Peak) +3°C/second max
3. Temp. maintain at 175 ±25°C 180 seconds max
4. Temp. maintain above 217°C 60-150 seconds
5. Peak temperature 245°C +20°C/-10°C time within 5°C of actually peak temperature (tp) 10~20 seconds
6. Ramp down rate +6°C/second max.

* 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.

4. Resistance to soldering heat-High Temperature Resistance: 260°C, 10sec - 3 times.

6. Hand soldering

In hand soldering of the varistors, large temperature gradient between the pre-heated varistor and the tip of the soldering iron may cause electrical failures and mechanical damages such as crackings or breakings or 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.

6.1 Recommended soldering condition 1

(1) Solder
0.12~0.18mm Thread solder (Sn96.5:Ag3.5) with soldering flux in the core.
Rosin-based and non-activated flux is recommended.
(2) Pre-heating
The varistors shall be pre-heated so that temperature gradient between the devices and the tip of soldering iron is 150°C or below.
(3) Soldering iron
Rated power of 20w max with 3mm soldering tip in diameter.
Temperature of soldering iron tip 380°C max, 3~5 sec (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.

6.2 Recommended soldering condition 2 (without pre-heating)

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

Soldering recommendations (continued)

7. Post soldering cleaning

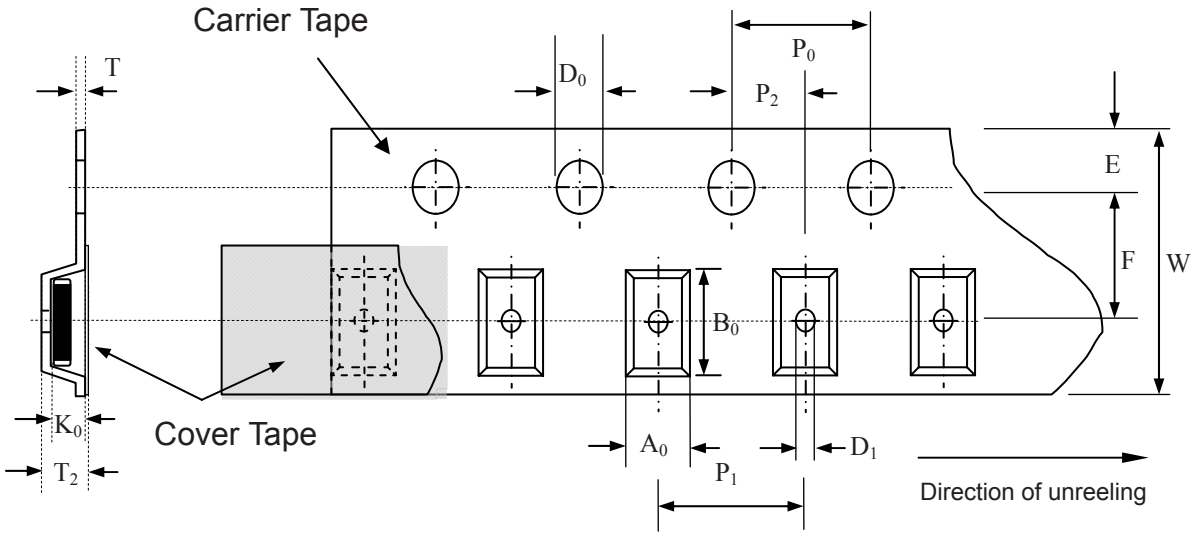
7.1 Residues of corrosive soldering fluxes on the PC board after cleaning may greatly have influences on the electrical charcteristic and the reliability (such as humidity resistance) of the varistors wich have been mounted on the board. It shall be confirmed that the characteristic and the reliability of the devices are not affected by the applied cleaning conditions.

7.2 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 ultrasonic waves.

(1) Frequency 29MHz max.
(2) Radiated power 20w/lithr max.
(3) Periods 5 minutes max.

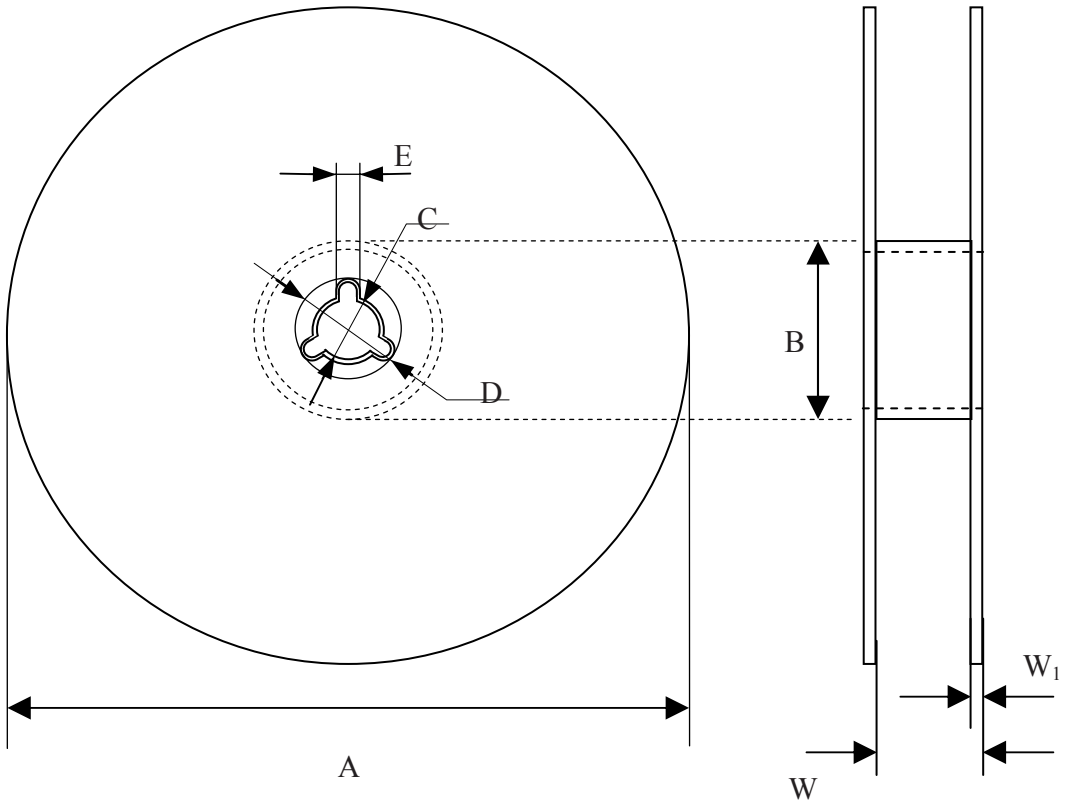
Packaging specification

1. Carrier tape and transparent cover tape should be heat-sealed to carry the products, and the reel should be used to reel the carrier tape.
2. The adhesion of the heat-sealed cover tape shall be 40 + 20/ - 15grams.
3. Both the head and the end portion of the 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 to handle.



Symbol	A_0 ±0.10	B_0 ±0.10	K_0 ±0.10	T ±0.05	T_2 ±0.05	D_0 +0.10 -0.00	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
mm	5.5	8.5	2.0	1.0	0.1	0.1	1.5	8.0	2.0	4.0	16.0	1.75	7.5

Reel Dimension



Symbol	A	B	C	D	E	W	W_1
mm	178±1	60±0.2	13±0.1	21±0.1	2.0±0.5	12±0.15	1.4±0.1

Standard Packaging

1000 pcs/reel.