

### Features

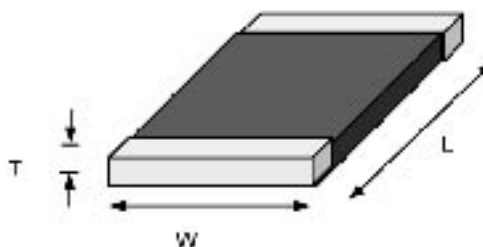
Technology Data	Symbol	Range	Unit
Maximum allowable continuous AC voltage at 50-60 Hz	Vrms	11 - 305	V
Maximum allowable continuous DC voltage	Vdc	14 - 385	V
Varistor voltage measured	Vv	18 - 470	V
Maximum clamping voltage 10A	Vclamp	40 - 775	V
Maximum peak current	Ipeak	250 - 500	A
Reference Data			
Maximum energy absorption 10/1000 us	E	0.8 - 25	J
Typical capacitance value measured at 1KHz	C	35 - 3300	pF
Typical capacitance value tolerance		±20	%
Response time	Trise	<1	ns
Leakage current at Vv x 80%	Ivv	<50	uA
Leakage current at Vv x 80% (after reality test)	Ivva	<200	uA
Operating ambient temperature		-55 ~ +85	°C
Storage temperature		-55 ~ +125	°C
Reflow solder profile temperature (recommended)		225	°C
Body		ZnO	
End termination		Ag	
Packaging		1000pcs / Reel	
Complies with standard		IEC61000-4-5	
Marking		none	

- Notes 1- The varistor voltage was measured at 1 mA current, tolerance at ±10%  
 2- The clamping voltage was measured at 1 mA current, tolerance ±10%

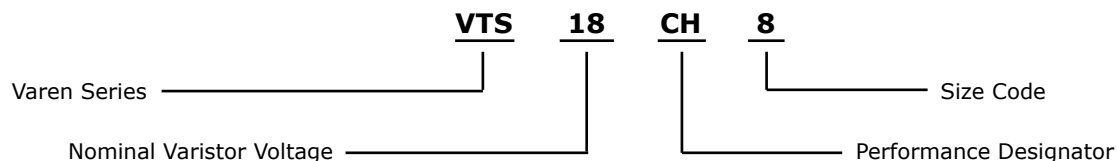
### Size

Unit: mm

Length (L)	8.0±0.3
Width (W)	5.0±0.3
Thickness (T)	See Chart



### Part numbering system



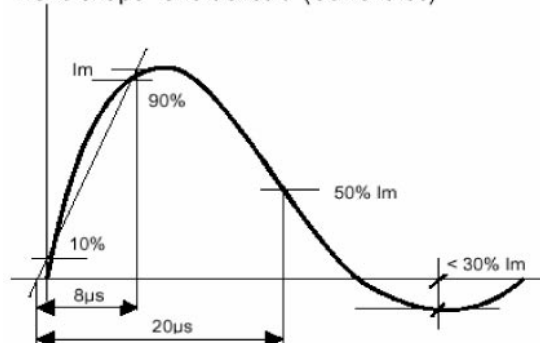
### Ratings and specifications chart

Model Number	Maximum Rating (TA=125°C)				Characteristics (TA=125°C)				Thickness (mm)
	Max Working Voltage		Surge Current	Energy Absorption (10/1000us)	Max Clamping Voltage		Varistor Voltage	Typical Capacitance (±20%)	
	Unit Condition	AC (Vrms)	DC (V)	8/20us (A)	(A)	(V)	(V)	pF (MHz)	
VTS18CH8	11	14	250	0.8	5	40	18(16~20)	3300	1.5
VTS22CH8	14	18	250	1.0	5	46	22(20~24)	1750	1.5
VTS27CH8	17	22	250	1.0	5	56	27(24~30)	1500	1.5
VTS33CH8	20	26	250	1.2	5	67	33(30~36)	1200	1.5
VTS39CH8	25	31	250	1.5	5	76	39(35~43)	820	1.5
VTS47CH8	30	38	250	1.8	5	90	47(42~52)	660	1.5
VTS56CH8	35	45	250	2.3	5	106	56(50~62)	530	2.0
VTS68CH8	40	56	250	3.0	5	124	68(62~74)	360	2.0
VTS82CH8	50	65	500	4.0	10	135	82(74~90)	250	1.5
VTS100CH8	65	85	500	5.0	10	165	100(90~110)	225	1.5
VTS120CH8	75	102	500	6.0	10	198	120(108~132)	200	1.5
VTS150CH8	95	127	500	8.0	10	248	150(135~165)	150	1.5
VTS180CH8	115	153	500	10.0	10	292	180(162~198)	110	1.5
VTS200CH8	130	175	500	11.0	10	340	200(180~220)	100	1.5
VTS220CH8	140	180	500	12.0	10	356	220(198~242)	94	1.5
VTS240CH8	150	200	500	13.0	10	390	240(216~264)	95	1.5
VTS270CH8	175	225	500	14.0	10	450	270(243~297)	76	1.5
VTS300CH8	190	250	500	15.0	10	495	300(270~330)	64	1.5
VTS330CH8	210	275	500	16.0	10	545	330(297~363)	52	1.5
VTS360CH8	230	300	500	20.0	10	593	360(324~396)	45	2.0
VTS390CH8	250	330	500	21.0	10	647	390(351~429)	42	2.0
VTS430CH8	275	369	500	23.0	10	705	430(387~473)	39	2.5
VTS470CH8	300	385	500	25.0	10	775	470(423~517)	35	2.5

### Surge Wave Form

### IEC61000-4-5 Standards

Wave shape "Short circuit" (Current I<sub>sc</sub>)



Security Level	T1	T2
1	8 $\mu s$	10 $\mu s$
2	10 $\mu s$	1000 $\mu s$

### Environmental reliability test

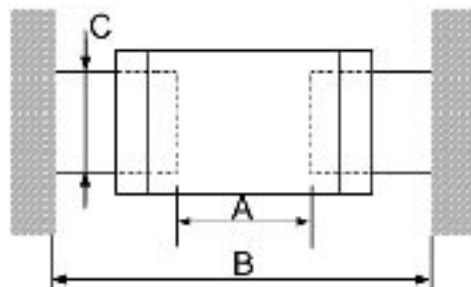
Characteristic	Test method and description			
<b>High temperature storage</b>	The specimen shall be subjected to $150 \pm 2^\circ\text{C}$ for $1000 \pm 12$ hours in a thermostatic bath without load and then stored at room temperature and humidity for 1 to 2 hours. The change of varistor voltage shall be within 10%.			
<b>Temperature cycle</b>	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 mechanical damage shall be examined.	Step	Temperature	Period
		1	$-40 \pm 3^\circ\text{C}$	$30\text{m} \pm 3$
		2	Room Temperature	1-2h
		3	$125 \pm 2^\circ\text{C}$	$30\text{m} \pm 3$
4	Room Temperature	1-2h		
<b>High temperature load</b>	After being continuously applied the maximum allowable voltage at $85 \pm 2^\circ\text{C}$ for $1000 \pm 2$ 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%.			
<b>Damp heat load / humidity load</b>	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 1 or 2 hours. The change of varistor voltage shall be within 10%.			
<b>Low storage temperature</b>	The specimen should be subjected to $-40 \pm 2^\circ\text{C}$ , without load for 1000 hours and then stored at room temperature for 1 or 2 hours. The change of varistor voltage shall be within 10%.			

### Soldering recommendations

1. Recommended solder pad layout

Unit: mm

A	B	C
6.5	9.5	6.8

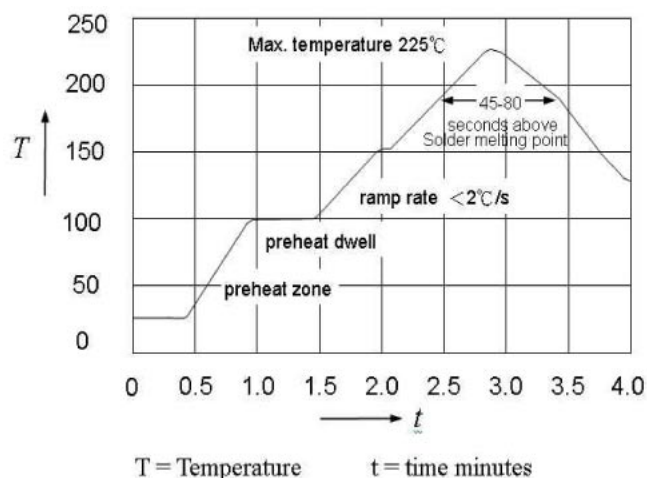


2. The solder paste shall be printed in a thickness of 150 to 200  $\mu\text{m}$ .
3. The SIR test of the solder paste shall be done (Based on JIS-Z-3284)

## Soldering recommendations (continued)

## 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 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) Pre-heat

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

## (b) Heating

1. Careful about sudden rise in temperature as it may worsen the solderability.
2. Set the peak temperature in the range from 215 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. 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.

## 5.1 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) 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 20x max with 3mm soldering tip in diameter.

Temperature of soldering iron tip 300°C 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.

## 5.2 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)

#### 6. Post soldering cleaning

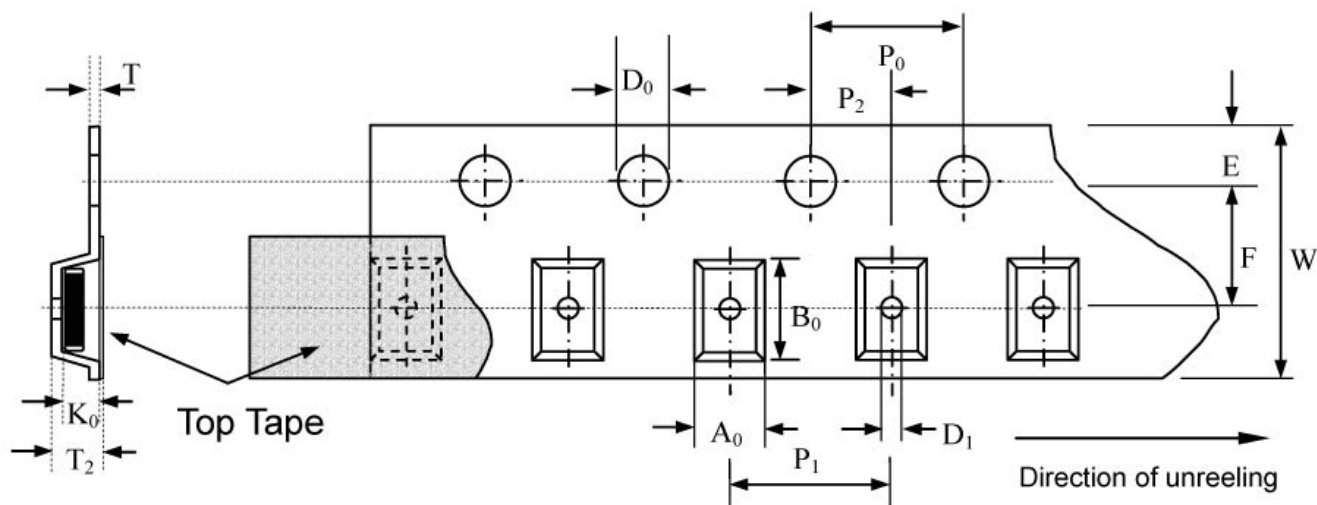
6.1 Residues of corrosive soldering fluxes on the PC board after cleaning may greatly have influences on the electrical characteristic and the reliability (such as humidity resistance) of the varistors which have been mounted on the board. It shall be confirmed that the characteristic and the reliability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

6.2 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

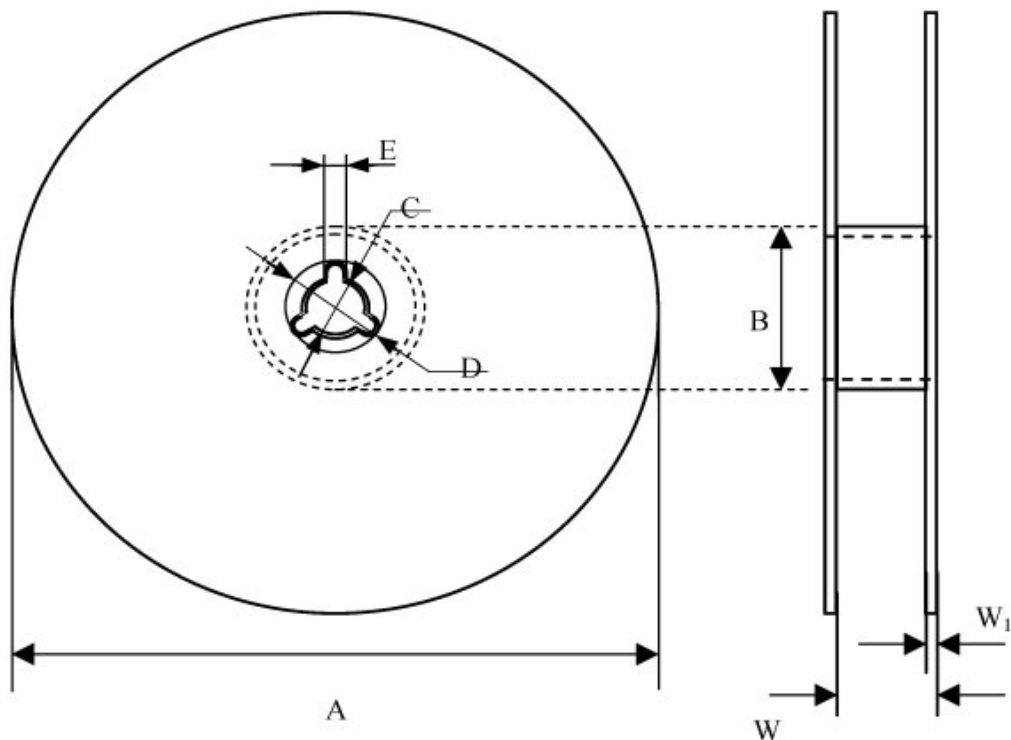
1. Carrier tape and transparent cover tape should be heat-sealed to carry the products, and the reel should be used to reel the carrier tape.
2. The adhesion of the heat-sealed cover tape shall be 40 + 20/ - 15grams.
3. Both the head and the end portion of the taping shall be empty for reel package and SMT auto-pickup machine. And a normal paper tape shall be connected in the head of taping for the operator to handle.



Symbol	$A_0$ $\pm 0.10$	$B_0$ $\pm 0.10$	$K_0$ $\pm 0.10$	$T$ $\pm 0.05$	$T_2$ $\pm 0.05$	$D_0$ $+0.10$ $-0.00$	$D_1$ $\pm 0.05$	$P_1$ $\pm 0.10$	$P_2$ $\pm 0.05$	$P_0$ $\pm 0.05$	$W$ $\pm 0.20$	$E$ $\pm 0.10$	$F$ $\pm 0.05$
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

Packaging specification (continued)

Reel dimension



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