

# SVC Varistors Type

## Introduction

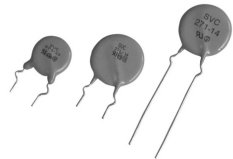
SVC series Varistors are gapless ceramic surge absorbers of a new type made of metal oxide which is designed to protect various kinds of electronic devices and semiconducting elements from surges.

## Features

- High discharge current capability up to 4000 Amps.
- Excellent clamping characteristics.
- Fast response time under 50 nanoseconds.
- Improve Product safety
- UL, CSA, VDE recognized

## How to Order

### SVC 471 D-14A FF 7



- 1 Basic Type**  
ZnO Varistor
- 2 Varistor Nominal Voltage**  
(The first two digit indicate significant digits)  
(The 3rd digit indicate the number of zeros following)
- 3 Style**  
D : Disk Type Varistor
- 4 Chip Element Size(Dia)**  
05 : Ø5mm, 07 : Ø7mm,  
10 : Ø10mm, 14 : Ø14mm,  
20 : Ø20mm
- 5 Classification**  
A : High Voltage(82V and above)  
B : Low Voltage(less then 68V)
- 6 Packing Style & Lead Variation**
- 7 Lead Spacing & Pitch of Component**

Packing Style		Lead Variation		Packing Style		Lead Variation	
F	Taping Type Flat Pack	S	Straight Type	B	Bulk	S	Straight Long Type
		K	In-Kink Type			K	Kink Long Type
		F	Out-Kink Type			L	Kink Short Type
						N	Straight Short Type

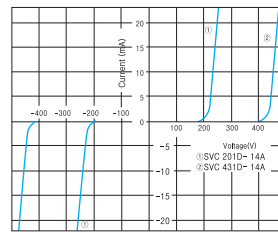
## Suffix Code

Taping Type			Bulk Type	
Code	Lead Spacing(mm)	Pitch of Component(mm)	Code	Lead Spacing(mm)
5	5.0	12.7	5	5.0
7	7.5	15.0	7	7.5
8	7.5	30.0	1	10.0
9	7.5	25.4		
1	10.0	30.0		

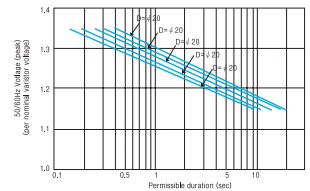
## SVC Characteristic Curves

### V - I Curve

- Small - current region of V - I curve

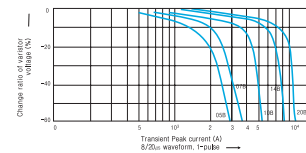


- Temporary power frequency over voltage capability



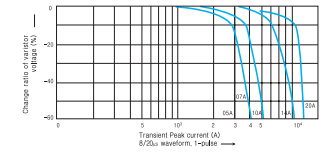
### B Type

- Withstand discharge impulse characteristics(Typical)



### A Type

- Withstand discharge impulse current characteristics(Typical)



# SVC Varistors Type

## Specification

Device Type	Chip Element Size	Maximum Ratings					Characteristics										
		Applied Voltage		Transient			Nominal Varistor Peak Voltage			Max. Clamping Voltage @ Test Current (8/20μs)		Typical Capacitance					
		RMS 50/60Hz (25°C)	DC (25°C)	Energy <sup>②</sup>	Average Power Dissipation	Peak <sup>③</sup> Current (8/20μs)	Vnom (Volts)	Tolerance		Vc (Volts)	Ip (Amps)						
Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	Itm (Amps)	Min.(Volts)	Max.(Volts)	Vc (Volts)	Ip (Amps)	f=1kHz (F)							
SVC 180D-05B	5			0.3	0.01	125			40	1	1700						
SVC 180D-07B	7			0.8	0.02	250			36	2.5	3500						
SVC 180D-10B	10	11	14	1.5	0.05	500	18	16	20	5	7000						
SVC 180D-14B	14			3.5	0.1	1000			36	10	1400						
SVC 180D-20B	20			10.0	0.2	2000			36	20	28000						
SVC 220D-05B	5			0.4	0.01	125			48	1	1200						
SVC 220D-07B	7			0.9	0.02	250			43	2.5	2500						
SVC 220D-10B	10	14	18	2.0	0.05	500	22	20	24	5	5000						
SVC 220D-14B	14			4.0	0.1	1000			43	10	11000						
SVC 220D-20B	20			13.0	0.2	2000			43	20	22000						
SVC 270D-05B	5			0.5	0.01	125			60	1	1100						
SVC 270D-07B	7			1.0	0.02	250			53	2.5	2000						
SVC 270D-10B	10	17	22	2.5	0.05	500	27	24	30	5	4500						
SVC 270D-14B	14			5.0	0.1	1000			54	10	9000						
SVC 270D-20B	20			15.0	0.2	2000			53	20	18000						
SVC 330D-05B	5			0.6	0.01	125			73	1	1000						
SVC 330D-07B	7			1.2	0.02	250			65	2.5	2000						
SVC 330D-10B	10	20	26	3.0	0.05	500	33	30	36	5	4000						
SVC 330D-14B	14			6.0	0.1	1000			65	10	8000						
SVC 330D-20B	20			20.0	0.2	2000			65	20	16000						
SVC 390D-05B	5			0.8	0.01	125			86	1	800						
SVC 390D-07B	7			1.5	0.02	250			77	2.5	1600						
SVC 390D-10B	10	25	31	3.5	0.05	500	39	35	43	5	3200						
SVC 390D-14B	14			7.0	0.1	1000			77	10	6500						
SVC 390D-20B	20			24.0	0.2	2000			77	20	13000						
SVC 470D-05B	5			1.0	0.01	125			104	1	700						
SVC 470D-07B	7			1.8	0.02	250			93	2.5	1400						
SVC 470D-10B	10	30	38	4.5	0.05	500	47	42	52	5	2800						
SVC 470D-14B	14			8.5	0.1	1000			93	10	5500						
SVC 470D-20B	20			30.0	0.2	2000			93	20	11000						
SVC 560D-05B	5			1.0	0.01	125			123	1	600						
SVC 560D-07B	7			2.2	0.02	250			110	2.5	1300						
SVC 560D-10B	10	35	45	5.5	0.05	500	56	50	62	5	2500						
SVC 560D-14B	14			10.5	0.1	1000			110	10	5000						
SVC 560D-20B	20			35.0	0.2	2000			110	20	10000						
SVC 680D-05B	5			1.2	0.01	125			150	1	500						
SVC 680D-07B	7			2.5	0.02	250			135	2.5	1000						
SVC 680D-10B	10	40	56	6.5	0.05	500	68	61	75	5	2000						
SVC 680D-14B	14			12.0	0.1	1000			135	10	4000						
SVC 680D-20B	20			40.0	0.2	2000			135	20	8000						
SVC 820D-05A	5			1.7	0.1	400			145	5	400						
SVC 820D-07A	7			3.5	0.25	1200			135	10	800						
SVC 820D-10A	10	50	65	8.0	0.4	2500	82	74	90	25	1500						
SVC 820D-14A	14			14.0	0.6	4500			135	50	3000						
SVC 820D-20A	20			27.0	1.0	6500			135	100	6000						
SVC 101D-05A	5			2.0	0.1	400			175	5	350						
SVC 101D-07A	7			4.0	0.25	1200			165	10	700						
SVC 101D-10A	10	60	85	10.0	0.4	2500	100	90	110	25	1500						
SVC 101D-14A	14			18.0	0.6	4500			165	50	3000						
SVC 101D-20A	20			30.0	1.0	6500			165	100	6000						

Device Type	Chip Element Size	Maximum Ratings					Characteristics										
		Applied Voltage		Transient			Nominal Varistor Peak Voltage			Max. Clamping Voltage @ Test Current (8/20μs)		Typical Capacitance					
		RMS 50/60Hz (25°C)	DC (25°C)	Energy <sup>②</sup>	Average Power Dissipation	Peak <sup>③</sup> Current (8/20μs)	Vnom (Volts)	Tolerance		Vc (Volts)	Ip (Amps)						
Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	Itm (Amps)	Min.(Volts)	Max.(Volts)	Vc (Volts)	Ip (Amps)	f=1kHz (F)							
SVC 121D-05A	5			2.5	0.1	400			210	5	350						
SVC 121D-07A	7			5.0	0.25	1200			200	10	700						
SVC 121D-10A	10	75	100	12.0	0.4	2500	120	108	132	25	1300						
SVC 121D-14A	14			20.0	0.6	4500			200	50	2600						
SVC 121D-20A	20			40.0	1.0	6500			200	100	5200						
SVC 151D-05A	5			3.0	0.1	400			260	5	250						
SVC 151D-07A	7			6.0	0.25	1200			250	10	500						
SVC 151D-10A	10	95	125	16.0	0.4	2500	150	135	165	25	1000						
SVC 151D-14A	14			25.0	0.6	4500			250	50	2000						
SVC 151D-20A	20			50.0	1.0	6500			250	100	4000						
SVC 201D-05A	5			4.0	0.1	400			355	5	200						
SVC 201D-07A	7			10.0	0.25	1200			340	10	400						
SVC 201D-10A	10	130	170	20.0	0.4	2500	200	185	225	25	800						
SVC 201D-14A	14			35.0	0.6	4500			340	50	1600						
SVC 201D-20A	20			70.0	1.0	6500			340	100	3200						
SVC 221D-05A	5			4.5	0.1	400			380	5	170						
SVC 221D-07A	7			10.0	0.25	1200			360	10	350						
SVC 221D-10A	10	140	180	23.0	0.4	2500	220	198	242	25	700						
SVC 221D-14A	14			40.0	0.6	4500			360	50	1400						
SVC 221D-20A	20			75.0	1.0	6500			360	100	2800						
SVC 241D-05A	5			5.0	0.1	400			415	5	170						
SVC 241D-07A	7			10.0	0.25	1200			395	10	350						
SVC 241D-10A	10	150	200	25.0	0.4	2500	240	216	264	25	700						
SVC 241D-14A	14			40.0	0.6	4500			395	50	1300						
SVC 241D-20A	20			80.0	1.0	6500			395	100	2600						
SVC 271D-05A	5			6.0	0.1	400			475	5	150						
SVC 271D-07A	7			12.0	0.25	1200			455	10	300						
SVC 271D-10A	10	175	225	30.0	0.4	2500	270	247	305	25	600						
SVC 271D-14A	14			50.0	0.6	4500			455	50	1200						
SVC 271D-20A	20			90.0	1.0	6500			455	100	2400						
SVC 361D-05A	5			7.5	0.1	400			620	5	120						
SVC 361D-07A	7			15.0	0.25	1200			595	10	250						
SVC 361D-10A	10	230	300	35.0	0.4	2500	360	324	396	25	500						
SVC 361D-14A	14			65.0	0.6	4500			595	50	1000						
SVC 361D-20A	20			120.0	1.0	6500			595	100	2000						
SVC 391D-05A	5			8.0	0.1	400			675	2.55	110						
SVC 391D-07A	7			17.0	0.25	1200			650	10	220						
SVC 391D-10A	10	250	320	40.0	0.4	2500	390	351	429	25	450						
SVC 391D-14A	14			70.0	0.6	4500			650	50	900						
SVC 391D-20A	20			130.0	1.0	6500			650	100	1800						
SVC 431D-05A	5			9.0	0.1	400			754	5	100						
SVC 431D-07A	7			20.0	0.25	1200			710	10	200						
SVC 431D-10A	10	275	350	45.0	0.4	2500	430	387	473	25	400						
SVC 431D-14A	14			75.0	0.6	4500			710	50	800						
SVC 431D-20A	20			140.0	1.0	6500			710	100	1600						
SVC 471D-05A	5			10.0	0.1	400			810	5	80						
SVC 471D-07A	7			20.0	0.25	1200			775	10	170		</				

## SVC Varistors Type

Device Type	Chip Element Size	Maximum Ratings						Characteristics							
		Applied Voltage		Transient		Peak ③ Current (8/20µs)	Nominal Varistor Peak Voltage ④			Max. Clamping Voltage ⑤ (Test Current(8/20µs))		Typical Capacitance			
		RMS 50/60Hz (25°C)	DC (25°C)	Energy ②	Average Power Dissipation		Vnom	Tolerance	Vc (Volts)	Ip (Amps)	f=1kHz (µF)				
Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	IIm (Amps)	Vnom (Volts)	Min.(Volts) Max.(Volts)	Vc (Volts)	Ip (Amps)	f=1kHz (µF)					
SVC 561D-10A	10			45.0	0.4	2500			920	25	300				
SVC 561D-14A	14	350	460	85.0	0.6	4500	560	504	616	920	50	600			
SVC 561D-20A	20			150.0	1.0	8000			920	100	1200				
SVC 621D-10A	10			45.0	0.4	2500			1025	25	270				
SVC 621D-14A	14	385	550	85.0	0.6	4500	620	558	682	1025	50	550			
SVC 621D-20A	20			150.0	1.0	8000			1025	100	1100				
SVC 681D-10A	10			45.0	0.4	2500			1120	25	250				
SVC 681D-14A	14	420	560	90.0	0.6	4500	680	612	748	1120	50	500			
SVC 681D-20A	20			160.0	1.0	8000			1120	100	1000				
SVC 751D-10A	10			50.0	0.4	2500			1240	25	220				
SVC 751D-14A	14	460	615	100.0	0.6	4500	750	675	825	1240	50	450			
SVC 751D-20A	20			175.0	1.0	8000			1240	100	900				
SVC 781D-10A	10			50.0	0.4	2500			1290	25	220				
SVC 781D-14A	14	485	640	105.0	0.6	4500	780	702	858	1290	50	440			
SVC 781D-20A	20			180.0	1.0	8000			1290	100	880				
SVC 821D-10A	10			55.0	0.4	2500			1355	25	210				
SVC 821D-14A	14	510	670	110.0	0.6	4500	820	738	902	1355	50	420			
SVC 821D-20A	20			190.0	1.0	8000			1355	100	840				
SVC 911D-10A	10			60.0	0.4	2500			1500	25	180				
SVC 911D-14A	14	550	745	120.0	0.6	4500	910	819	1001	1500	50	380			
SVC 911D-20A	20			215.0	1.0	8000			1500	100	750				
SVC 102D-10A	10			65.0	0.4	2500			1650	25	160				
SVC 102D-14A	14	625	825	130.0	0.6	4500	1000	900	1100	1650	50	350			
SVC 102D-20A	20			230.0	1.0	8000			1650	100	700				
SVC 112D-10A	10			70.0	0.4	2500			1815	25	150				
SVC 112D-14A	14	680	895	140.0	0.6	4500	1100	990	1210	1815	50	300			
SVC 112D-20A	20			250.0	1.0	8000			1815	100	600				
SVC 182D-14A	14	1000	1465	24.0	0.6	4500	1800	1620	1980	2970	50	200			
SVC 182D-20A	20			400.0	1.0	6500			2970	100	400				

### Notes:

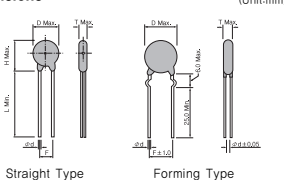
- The waveform of the maximum DC applied voltage is flat. When a ripple voltage as from a rectifier source is supplied make sure that the peak voltage is kept under the Vdcm An AC applied voltage(50/60Hz) form a sine waveshape. When the distortion in the waveform is extensive make sure that the peak voltage is less than  $\sqrt{2}$  times the Vacm.
- Energy: Wtm  
Transient energy ratings are given in the Wtm column of the specifications in Joules(watt-second). The rating is the maximum allowable energy for a single impulse of 2ms square-waveform current with continuous voltage applied. Energy ratings are based on a shift of Vnom of less than  $\pm 10\%$  of initial value.
- Transient peak current(IIm)  
The peak current rating, IIm, of varistor is based on an 8/20 µs test impulse waveshape. This peak current is the maximum peak current in which the nominal varistor voltage shift does not exceed  $\pm 10\%$  when the test impulse

is applied once at 5 minutes intervals.

- Nominal varistor voltage : Vnom  
Indicates the varistor terminal voltage measured with a 1mA DC applied. -0.1mA DC in the case of the 0.5A and 05B series.
- Maximum clamping voltage : Vc  
Indicates the peak terminal voltage measured with an 8/20µs impulse current applied.

- Operating ambient temperature : -40°C to +80°C
- Storage temperature : -40°C to +125°C
- UL and CSA recognized(UL 1449, UL 497B or UL 1414, CSA)  
SVC varistors have been tested by Underwriter's Laboratories, Inc. and Canadian Standards Association  
UL File No. E97754, E151195, E154171.  
CSA File No. LR78923.

### Dimensions



### B Type

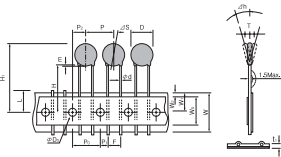
Type	T Max.	D Max.	H Max.	L Min.	F	Ød
SVC 180D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 220D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 270D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 330D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 390D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 470D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 560D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 680D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 820D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 910D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 102D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 112D-05B	4.5	7.5	10.0	25	5.0	0.50
SVC 180D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 220D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 270D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 330D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 390D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 470D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 560D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 680D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 820D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 910D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 102D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 112D-07D	4.5	9.0	10.0	25	5.0	0.50
SVC 180D-10B	5.0	15.5	16.5	25	7.5	0.70
SVC 220D-10B	5.0	15.5	16.5	25	7.5	0.70
SVC 270D-10B	5.0	15.5	16.5	25	7.5	0.70
SVC 330D-10B	5.0	15.5	16.5	25	7.5	0.70
SVC 390D-10B	5.0	15.5	16.5	25	7.5	0.70
SVC 470D-10B	5.0	15.5	16.5	25	7.5	0.70
SVC 560D-10B	5.0	15.5	16.5	25	7.5	0.70
SVC 680D-10B	5.0	15.5	16.5	25	7.5	0.70
SVC 820D-10B	5.0	17.0	20.0	25	7.5	0.70
SVC 910D-10B	5.0	17.0	20.0	25	7.5	0.70
SVC 102D-10B	5.0	17.0	20.0	25	7.5	0.70
SVC 112D-10B	5.0	17.0	20.0	25	7.5	0.70
SVC 180D-14B	5.0	17.0	20.0	25	7.5	0.70
SVC 220D-14B	5.0	17.0	20.0	25	7.5	0.70
SVC 270D-14B	5.0	17.0	20.0	25	7.5	0.70
SVC 330D-14B	5.0	17.0	20.0	25	7.5	0.70
SVC 390D-14B	5.0	17.0	20.0	25	7.5	0.70
SVC 470D-14B	5.0	17.0	20.0	25	7.5	0.70
SVC 560D-14B	5.0	17.0	20.0	25	7.5	0.70
SVC 680D-14B	5.0	17.0	20.0	25	7.5	0.70
SVC 180D-20B	6.0	23.0	27.0	30	10.0	0.80
SVC 220D-20B	6.0	23.0	27.0	30	10.0	0.80
SVC 270D-20B	6.0	23.0	27.0	30	10.0	0.80
SVC 330D-20B	6.0	23.0	27.0	30	10.0	0.80
SVC 390D-20B	6.0	23.0	27.0	30	10.0	0.80
SVC 470D-20B	6.0	23.0	27.0	30	10.0	0.80
SVC 560D-20B	6.0	23.0	27.0	30	10.0	0.80
SVC 680D-20B	6.0	23.0	27.0	30	10.0	0.80

Type	T Max.	D Max.	H Max.	L Min.	F	Ød
SVC 820D-05A	4.5	7.0	10.0	25	5.0	0.50
SVC 101D-05A	4.5	7.0	10.0	25	5.0	0.50
SVC 121D-05A	4.5	7.0	10.0	25	5.0	0.50
SVC 151D-05A	4.5	7.0	10.0	25	5.0	0.50
SVC 201D-05A	4.5	7.0	10.0	25	5.0	0.50
SVC 221D-05A	4.5	7.0	10.0	25	5.0	0.50
SVC 241D-05A	4.5	7.0	10.0	25	5.0	0.50
SVC 271D-05A	4.5	7.0	10.0	25	5.0	0.50
SVC 361D-05A	5.0	7.0	10.0	25	5.0	0.50
SVC 391D-05A	5.0	7.0	10.0	25	5.0	0.50
SVC 431D-05A	6.0	7.0	10.0	25	5.0	0.50

### A Type

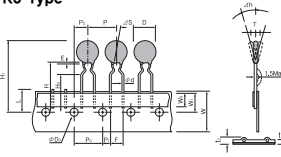
Type	T Max.	D Max.	H Max.	L Min.	F	Ød
SVC 471D-05A	6.0	7.0	10.0	25	5.0	0.50
SVC 820D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 101D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 121D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 151D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 201D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 221D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 241D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 271D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 361D-07A	5.0	9.0	12.0	25	5.0	0.50
SVC 391D-07A	5.0	9.0	12.0	25	5.0	0.50
SVC 431D-07A	4.5	9.0	12.0	25	5.0	0.50
SVC 471D-07A	6.0	9.0	12.0	25	5.0	0.50
SVC 820D-10A	4.5	14.0	17.0	25	7.5	0.70
SVC 101D-10A	4.5	14.0	17.0	25	7.5	0.70
SVC 121D-10A	4.5	14.0	17.0	25	7.5	0.70
SVC 151D-10A	4.5	14.0	17.0	25	7.5	0.70
SVC 201D-10A	4.5	14.0	17.0	25	7.5	0.70
SVC 221D-10A	4.5	14.0	17.0	25	7.5	0.70
SVC 241D-10A	4.5	14.0	17.0	25	7.5	0.70
SVC 271D-10A	4.5	14.0	17.0	25	7.5	0.70
SVC 361D-10A	5.0	14.0	17.0	25	7.5	0.70
SVC 391D-10A	5.0	14.0	17.0	25	7.5	0.70
SVC 431D-10A	6.0	14.0	17.0	25	7.5	0.70
SVC 561D-10A	7.5	14.0	17.0	25	7.5	0.70
SVC 681D-10A	7.5	14.0	17.0	25	7.5	0.70
SVC 821D-10A	7.5	14.0	17.0	25	7.5	0.70
SVC 911D-10A	10.5	14.0	17.0	25	7.5	0.70
SVC 102D-10A	10.5	14.0	17.0	25	7.5	0.70
SVC 112D-10A	10.5	14.0	17.0	25	7.5	0.70
SVC 820D-14A	4.5	17.5	21.0	25	7.5	0.70
SVC 101D-14A	4.5	17.5	21.0	25	7.5	0.70
SVC 121D-14A	4.5	17.5	21.0	25	7.5	0.70
SVC 151D-14A	4.5	17.5	21.0	25	7.5	0.70
SVC 201D-14A	4.5	17.5	21.0	25	7.5	0.70
SVC 221D-14A	4.5	17.5	21.0	25	7.5	0.70
SVC 241D-14A	4.5	17.5	21.0	25	7.5	0.70
SVC 271D-14A	4.5	17.5	21.0	25	7.5	0.70
SVC 361D-14A	5.0	17.5	21.0	25	7.5	0.70
SVC 391D-14A	5.0	17.5	21.0	25	7.5	0.70
SVC 431D-14A	6.0	17.5	21.0	25	7.5	0.70
SVC 471D-14A	6.0	17.5	21.0	25	7.5	0.70
SVC 561D-14A	7.5	17.5	21.0	25	7.5	0.70
SVC 681D-14A	7.5	17.5	21.0	25	7.5	0.70
SVC 821D-14A	7.5	17.5	21.0	25	7.5	0.70
SVC 911D-14A	10.5	17.5	21.0	25	7.5	0.70
SVC 102D-14A	10.5	17.5	21.0	25	7.5	0.70
SVC 112D-14A	10.5	17.5	21.0	25	7.5	

FS5 Type

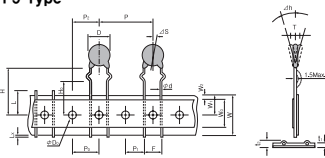


Item	Code	Dimensions(mm)	
		FS5 or FKS	FF9
Body Diameter	D	See page 119	
Body Thickness	T	See page 119	
Lead Diameter	∅d	0.5/0.50±0.05 0.6/0.8±0.05	
Pitch of sprocket Hole	P	12.7±0.3	
Pitch of Component	P	6.35±1.3	25.4±1.0
Lead Length from Hole Center Lead	P	3.85±0.7	8.95±1.0
Lead Length from Hole Center to Component Center	P	6.35±1.3	12.7±1.5
Lead Spacing	F	5.0 <sup>+0.1</sup>	7.5±1.0
Deviation Along Tape, Left or Right	ΔS	0±1.0	
Deviation Across Tape	Δh	0±2.0	
Carrier Tape Width	W	18.0 <sup>+0.1</sup>	
Hold Down Tape Width	W <sub>1</sub>	5.0Min. 9.0Min.	
Position of Sprocket Hole	W <sub>2</sub>	9.0±0.5	
Hole Down Tape Position	W <sub>3</sub>	3.0Max.	
Lead-Wire Clinch Height	H <sub>1</sub>	16.0±0.5	
Height of Component Hole	H	20.0 <sup>+0.1</sup>	
Component Height	H <sub>1</sub>	32.5Max.	
Diameter of Sprocket Hole	∅D	4.0±0.2	
Length of Snipped Lead	L	11.0Max.	
Total Tape Thickness	t	0.7±0.2	
Total Thickness Tape and Lead Wire	t	1.5Max. 1.7Max.	
Length of Snipped Lead	L <sub>x</sub>	1.0Max.	

FK5 Type

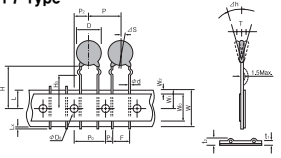


FF9 Type

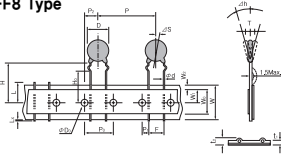


Item	Code	Dimensions(mm)	
		FF7	FF8
Body Diameter	D	See page 119	
Body Thickness	T	See page 119	
Lead Diameter	∅d	0.6/0.8±0.05	
Pitch of sprocket Hole	P	15.0±0.3 30.0±1.0	
Pitch of Component	P	15.0±0.3	30.0±1.0
Lead Length from Hole Center Lead	P	3.75±1.0	
Lead Length from Hole Center to Component Center	P	7.50±1.5	
Lead Spacing	F	7.5±1.0	
Deviation Along Tape, Left or Right	ΔS	0±1.0	
Deviation Across Tape	Δh	0±2.0	
Carrier Tape Width	W	18.0 <sup>+0.1</sup>	
Hold Down Tape Width	W <sub>1</sub>	5.0Min.	
Position of Sprocket Hole	W <sub>2</sub>	9.0±0.5	
Hole Down Tape Position	W <sub>3</sub>	3.0Max.	
Lead-Wire Clinch Height	H <sub>1</sub>	16.0±0.5	
Height of Component Hole	H	20.0 <sup>+0.1</sup>	
Component Height	H <sub>1</sub>	40.0Max.	
Diameter of Sprocket Hole	∅D	4.0±0.2	
Length of Snipped Lead	L	11.0Max.	
Total Taps Thickness	t	0.7±0.2	
Total Thickness Tape and Lead Wire	t	1.7Max.	
Length of Snipped Lead	L <sub>x</sub>	1.0Max.	

FF7 Type



FF8 Type

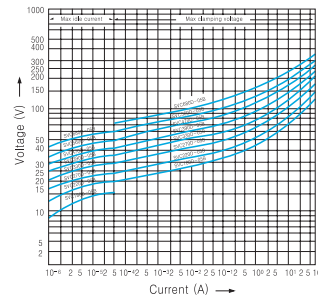


Char, Curves and Lifetime

Transient V-I Charactic Curves

Current waveform under 10<sup>4</sup> A : DC  
over 10<sup>4</sup> A : 8/20μs

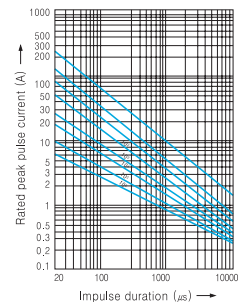
05B(SVC 180D-05B to SVC 680D-05B)



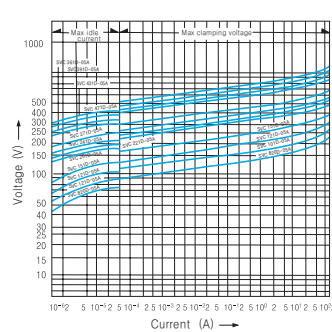
Pulse Lifetime Ratings

Notes : 2-pulse : 5-minute interval  
3 to 10-pulse : 2-minute interval  
Up to 10<sup>4</sup> - pulse : 10-second interval

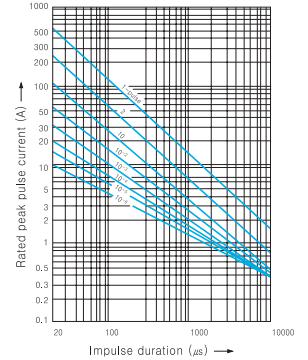
05B(SVC 180D-05B to SVC 680D-05B)



05A(SVC 820D-05A to SVC 471D-05A)



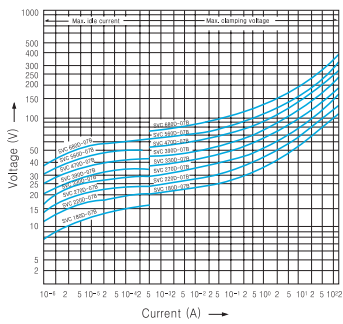
05A(SVC 820D-05A to SVC 471D-05A)



**Transient V-I Characteristic Curves**

Current waveform under  $10^2$  A : DC  
over  $10^1$  A :  $8/20\mu s$

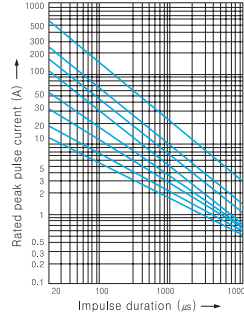
**07B(SVC 180D-07B to SVC 680D-07B)**



**Pulse Lifetime Ratings**

Notes : 2-pulse : 5-minute interval  
3 to 10-pulse : 2-minute interval  
Up to  $10^6$ -pulse : 10-second interval

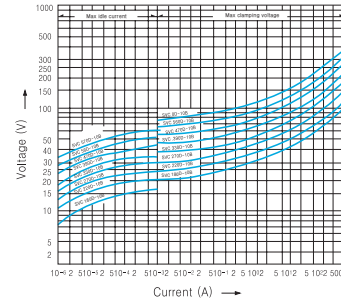
**07B(SVC 180D-07B to SVC 680D-07B)**



**Transient V-I Characteristic Curves**

Current waveform under  $10^2$  A : DC  
over  $10^1$  A :  $8/20\mu s$

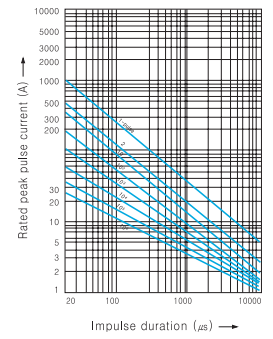
**10B(SVC 180D-10B to SVC 680D-10B)**



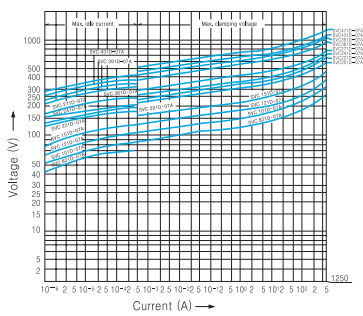
**Pulse Lifetime Ratings**

Notes : 2-pulse : 5-minute interval  
3 to 10-pulse : 2-minute interval  
Up to  $10^6$ -pulse : 10-second interval

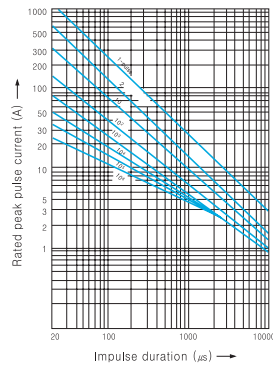
**10B(SVC 180D-10B to SVC 680D-10B)**



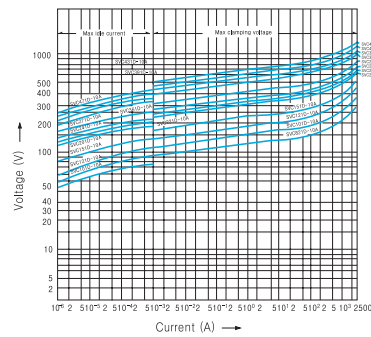
**07A(SVC 820D-07A to SVC 471D-07A)**



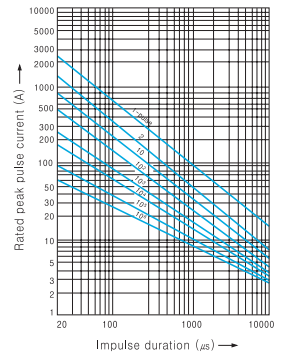
**07A(SVC 820D-07A to SVC 471D-07A)**



**10A(SVC 820D-10A to SVC 471D-10A)**



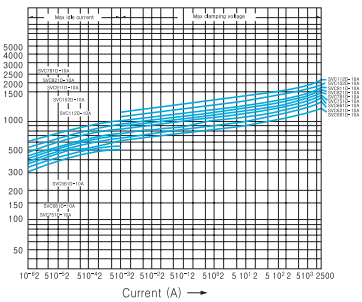
**10A(SVC 820D-10A to SVC 471D-10A)**



**Transient V-I Characteristic Curves**

Current waveform under  $10^3$  A : DC  
 over  $10^1$  A : 8/20 $\mu$ s

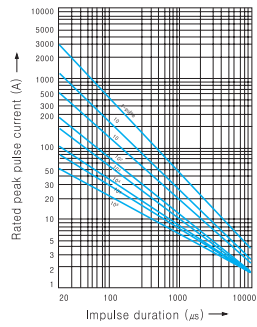
10A(SVC 561D-10A to SVC 112D-10A)



**Pulse Lifetime Ratings**

Notes : 2-pulse : 5-minute interval  
 3 to 10-pulse : 2-minute interval  
 Up to  $10^6$ -pulse : 10-second interval

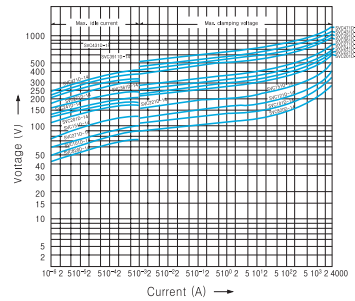
10A(SVC 561D-10A to SVC 112D-10A)



**Transient V-I Characteristic Curves**

Current waveform under  $10^3$  A : DC  
 over  $10^1$  A : 8/20 $\mu$ s

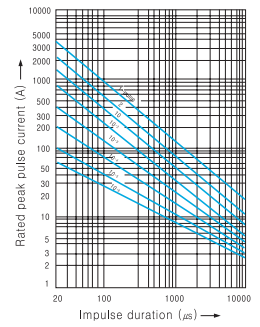
14A(SVC 820D-14A to SVC 471D-14A)



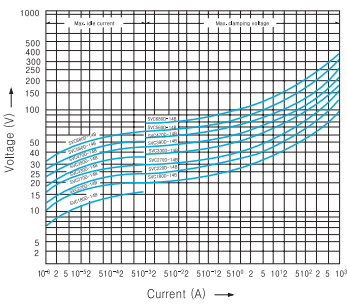
**Pulse Lifetime Ratings**

Notes : 2-pulse : 5-minute interval  
 3 to 10-pulse : 2-minute interval  
 Up to  $10^6$ -pulse : 10-second interval

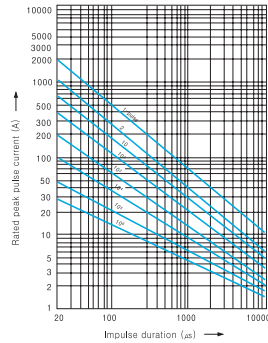
14A(SVC 820D-14A to SVC 471D-14A)



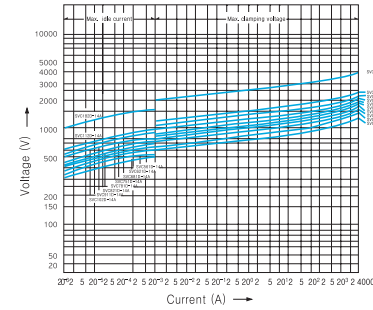
14B(SVC 180D-14B to ENC 680D-14B)



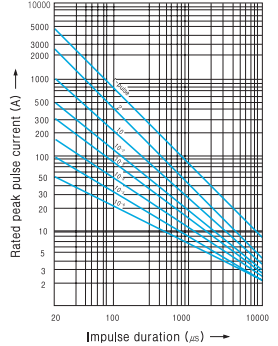
14B(SVC 180D-14B to SVC 680D-14B)



14A(SVC 561D-14A to SVC 182D-14A)



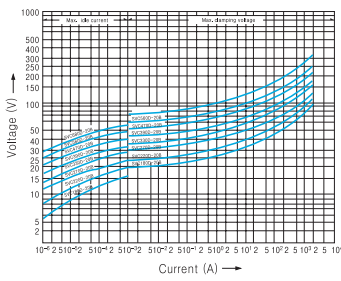
14A(SVC 561D-14A to SVC 182D-14A)



**Transient V-I Characteristic Curves**

Current waveform under  $10^2$  A : DC  
over  $10^1$  A :  $8/20\mu s$

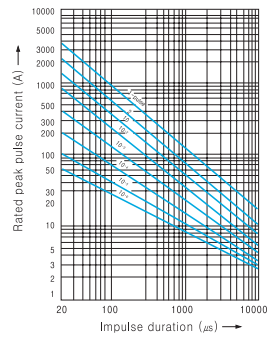
**20B(SVC 180D-20B to SVC 680D-20B)**



**Pulse Lifetime Ratings**

Notes : 2-pulse : 5-minute interval  
3 to 10-pulse : 2-minute interval  
Up to  $10^4$ -pulse : 10-second interval

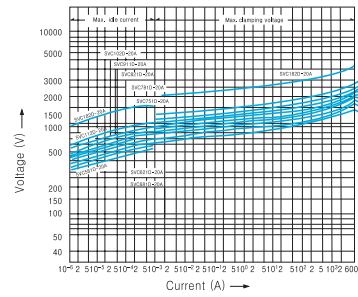
**20B(SVC 180D-20B to SVC 680D-20B)**



**Transient V-I Characteristic Curves**

Current waveform under  $10^2$  A : DC  
over  $10^1$  A :  $8/20\mu s$

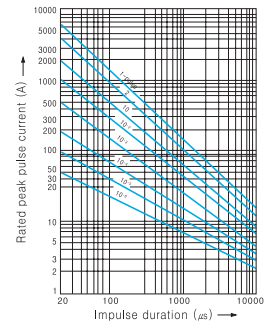
**20A(SVC 561D-20A to SVC 182D-20A)**



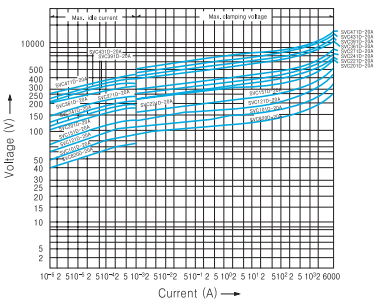
**Pulse Lifetime Ratings**

Notes : 2-pulse : 5-minute interval  
3 to 10-pulse : 2-minute interval  
Up to  $10^4$ -pulse : 10-second interval

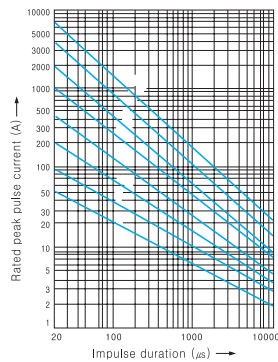
**20A(SVC 561D-20A to SVC 182D-20A)**



**20A(SVC 820D-20A to SVC 471D-20A)**



**20A(SVC 820D-20A to SVC 471D-20A)**



### Applications

- The Protection of semiconducting elements such as diodes, thyristors, transistors, IC and relays against transient Voltages.
- Similar protection of many types of measuring instruments, control machinery and communication equipment and broadcasting equipment against inductive lightning and switching surges.
- Protection of general purpose electrical equipment, domestic machinery and appliances. TV and radios and similar consumer products against lightning and switching surges.

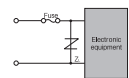
### Power Supply Circuit Protection

Line circuit  
Varistor voltage selection table (Z<sub>i</sub>)

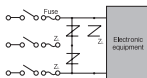
Power Supply Voltage	Type
100V AC	SVC201D - □ □ A
	SVC221D - □ □ A
	SVC241D - □ □ A
	SVC271D - □ □ A*
200V AC	SVC391D - □ □ A
	SVC431D - □ □ A
	SVC471D - □ □ A*
12V DC	SVC220D - □ □ B
24V DC	SVC390D - □ □ B

- Notes :
- ① The power supply voltage must not exceed the maximum allowable circuit voltage.
  - ② Since independent wiring loads and capacitive loads cause the voltage build-up at the time of opening or closing the load, use SVC having a varistor voltage as high as possible. (\* mark)
  - ③ The bold faced portions of the type letters vary.

AC/DC  
single-phase circuit



AC  
three-phase circuit



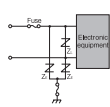
### Line and ground circuit

Varistor voltage selection table(Z<sub>i</sub>)

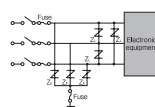
Power Supply Voltage	Type
100V AC	SVC431D - □ □ A
	SVC471D - □ □ A
200V AC	SVC751D - □ □ A to SVC112D - □ □ A*
	SVC182D - □ □ A**

- Notes :
- ① When subjected to megger testing(500V DC), the insulation resistance value can decrease due to the leakage current of the SVC. To avoid this remove the varistor or use\* marked SVC.
  - ② When subjected to dielectric strength test(1000V AC), remove the SVC or use\*\* marked SVC.
- Select varistors taking a note of operating conditions peculiar to the equipment.

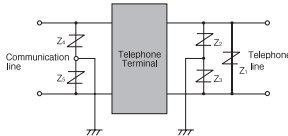
AC/DC  
single-phase circuit



AC  
three-phase circuit



### Telecommunication Circuit Protection



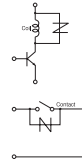
Varistor voltage selection guided

Power Supply Voltage	Type
12V DC	SVC180D - □ □ B
	SVC220D - □ □ B
	SVC820D - □ □ A
24V AC	SVC390D - □ □ B
	SVC820D - □ □ A

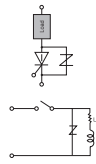
- Notes :
- The varistor SVC has a capacitance value. Take not of this when applying them to high-frequency signal circuits.

### Switching Circuit Protection

Protection of relay  
(Contact coil)



Protection of  
semiconductors



Varistor voltage selection guide

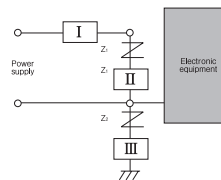
Power Supply Voltage	Type
12V DC	SVC220D - □ □ B
24V DC	SVC390D - □ □ B
100V DC	SVC151D - □ □ A
100V AC	SVC201D - □ □ A
	SVC221D - □ □ A
	SVC241D - □ □ A
	SVC271D - □ □ A

- Notes :
- ① The power supply voltage must not exceed the maximum allowable circuit voltage of the SVC
  - ② Pay due attention to the surge energy generated by the load.
  - ③ Select SVC referring to the pulse lifetime rating.
  - ④ To further reduce the tendency of sparking across the contacts connect a capacitors parallel with the SVC. This will also protect the equipment from electromagnetic wave jamming.

### Application Notes

#### Overcurrent protection

When surges exceed the rating for the SVC, short-circuits or damages can be expected. Take following precautions.



- ① Connect the SVC at a position nearer to the equipment than the overcurrent protection device "I" (fuse, MCCB) as is shown in the diagram. When the SVC is shorted, the overcurrent protection device "I" operates (trips or blow off the fuse).
- ② If the overcurrent protection device "I" can not be installed in "I" position, connect a fuse at "II" position. Select fuse rated current for the SVC referring to the following table.

SVC	05A	07A	10A	14A	20A
	05B	07B	10B	14B	20B
Applicable fuse rated current(A)	1 to 2	2 to 3	3 to 5	3 to 10	5 to 15

- ③ When "Z<sub>i</sub>" SVC is connected between the equipment and ground install an ELCB (Earth Leakage Circuit Breaker). If not possible, connect a fuse or thermal fuse at "III" position.

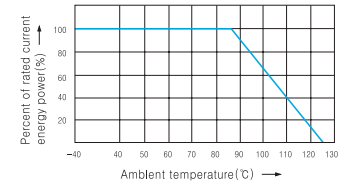
#### Installation

- ① When operated at location near heating element or exposed to direct sun light, confirm that the ambient temperature range.
- ② When operated in dusty or dirty locations, or exposed to corrosive atmospheres, or where metallic powders or salt can be expected, be sure to mount within a protective enclosure.

#### Molding

When shielding the SVC in a resin molding, take a note of the materials used and temperature, since they influence the reliability. For further information please contact SAMWHA

#### Current, power and energy rating vs, temperature



#### Electrical Characteristics

Operating ambient temperature	-40°C to +85°C
Storage temperature	-40°C to +125°C
Voltage temperatur coefficient	-0.05% / °C
Insulation resistance(at500V)	Over 1000MΩ

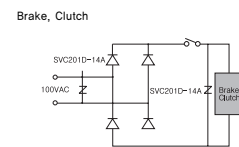
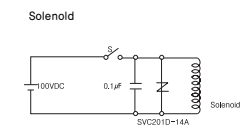
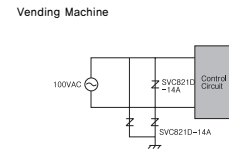
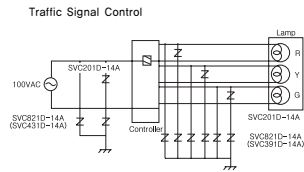
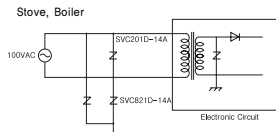
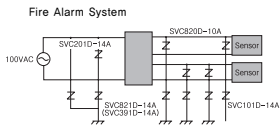


## SVC Varistors Type

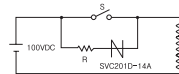
### Recognized standards

Standard	Date	Content	Applicable SVC series	File No.
UL 1449	04.06.02	Transient Voltage surge suppressors	Cord connected and Direct Plug in Type Equipment	E151195
			Permanently connected type equipment	
UL 497B	02.06	Protectors for data communication and fire alarm circuit	SVC 180D - □ - SVC 821D - □	E154171
CAS C22.2 NO.1-M 1981	04.08.02	Varistor for Across - The - Line use as transient protection on 120Vac system	250V AC	LR78923
VDE	02.05.16 02.05.16 99.08.25	Surge Suppression	SVC 180 - □ - SVC 112D - 14	4000153 40001516 116012
ISO 9001:2000	94.12.15			ID03/0294

### Application Exampel



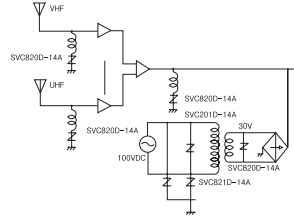
#### Contect Protection



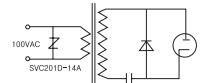
#### Thyristor Protection



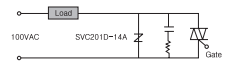
#### TV Booster



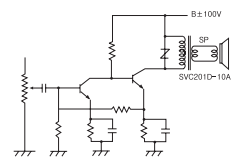
#### Microwave Oven



#### Triac Protection



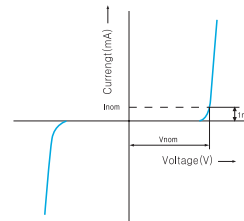
#### Sound Output Circuit



### Varistor Terminology

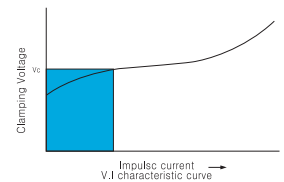
#### Varistor Voltage : Vnom

Varistor peak terminal voltage measured with a specified current applied. The DC current applied is 1mA normally.



#### Clamping Voltage : Vc

Maximum terminal voltage (peak voltage across the varistor) measured with an applied 8/20μs impulse of a given peak current.



## Capacitance

Typical values measured at a test frequency of 1kHz

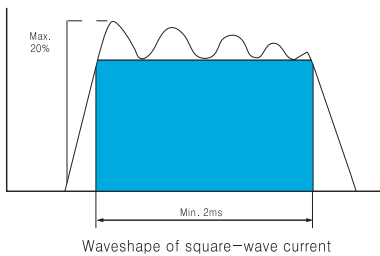
### Rated peak transient current : $I_{tm}$

Maximum peak current through the varistor with line voltage applied.

The maximum peak current with in the varistor voltage change ratio of  $\pm 10\%$  with the standard  $8/20\mu s$  impulse current applied two times at 5 minute interval.

### Rated transient energy : $W_{tm}$

Maximum allowable energy for a single impulse of 2ms square-wave current waveform with rated continuous voltage applied. Maximum energy rating base on a shift of  $V_{nom}$  of less than  $\pm 10\%$  of initial value.

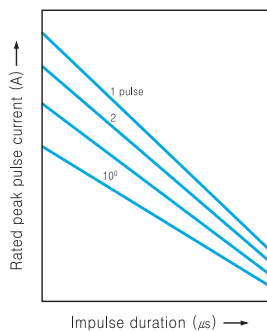


### Pulse lifetime rating

This is expressed as the maximum allowable number of impulse currents applied.

$8/20\mu s$  impulse current(or 2ms square wave) is applied at prescribed interval.

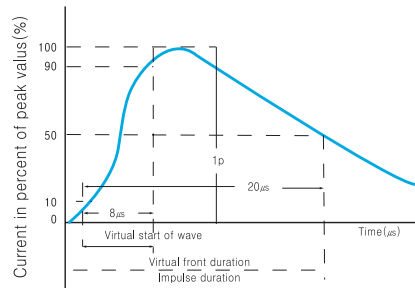
This curve also provides for derating current as required with repetitive pulsing.



## Test current waveform

Characteristics tests for Varistors are carried out by using  $8/20\mu s$  test impulses Data such as the maximum clamping voltage( $V_c$ )and the transient peak current( $I_{tm}$ ) are obtained by using this impulse current

However, for the  $V_c$  characteristics of the Axial Package type a 10mA DC squarewave current is used to carry out the test.



### Rated RMS Voltage : $V_{acm}$

Maximum continuous sinusoidal RMS voltage at 50/60Hz which may be applied.

### Rated DC Voltage : $V_{dcm}$

Maximum continuous DC voltage which may be applied.

### Rated average power dissipation : $P_{tam}$

Maximum average power that can be applied within the specified ambient temperature.