

# SVC Varistors Type

## Introduction

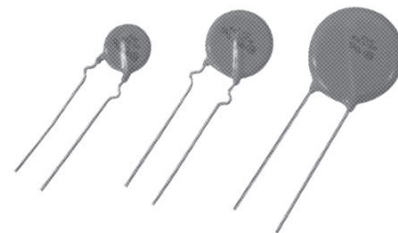
SVC series Varistors are gapless ceramic surge absorbers of a new type made of metal oxide which is designed to protect various kinds of electronic devices and semiconducting elements from surges.

## 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
- special specification like a Automobile, Medical, Military, Aviation should be discuss with our sales representatives

## How to Order

**SVC 471 D-14 A FF 8**



### 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 than 68V)

### 6 Packing Style & Lead Variation

Packing Style		Lead Variation		Packing Style		Lead Variation		Packing Style		Lead Variation		
F	Taping Type Flat Pack	S	Straight Type	B	Bulk	N	Straight Short Type	T	Black Tube	N	Straight Short Type	
		F	Out Kink Type			S	Straight Long Type			W	Out Kink Short Type	
		A or R	Parallel Type			W or L	Out Kink Short Type			M	Bending Type	
			K			Out Kink Long Type						
			J			Parallel Short Type						
			R			Parallel Long Type						

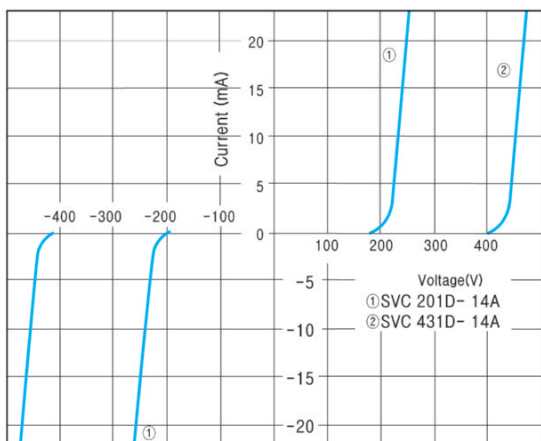
## 7 Lead Spacing & Pitch of Component (Suffix Code)

Taping Type			Bulk Type	
Code	Lead Spacing(mm)	Pitch of Component(mm)	Code	Lead Spacing(mm)
1	10.0	25.4	1	10.0
2	10.0	30.0	5	5.0
3	10.0	30.0	7	7.5
5	5.0	12.7		
7	7.5	15.0		
8	7.5	30.0		
9	7.5	25.4		

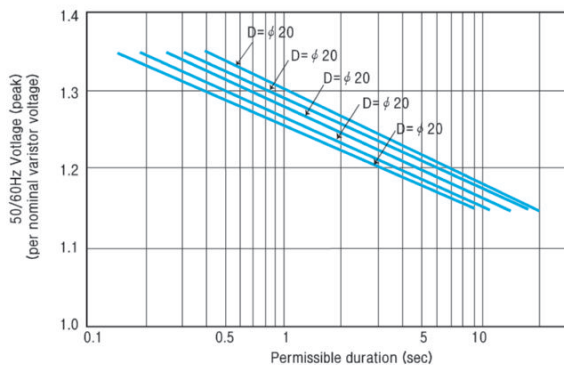
## SVC Characteristic Curves

### V - I Curve

- Small - current region of V - I curve

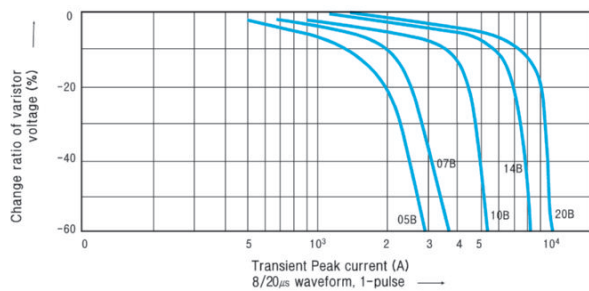


- Temporary power frequency over voltage capability



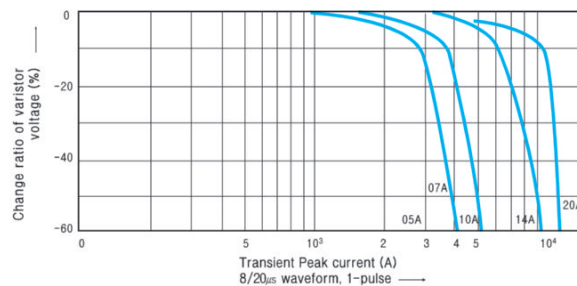
### B Type

- Withstand discharge impulse current characteristics(Typical)



### A Type

- Withstand discharge impulse current characteristics(Typical)



## Specification Table

Device Type	Chip Element Size	Maximum Ratings					Characteristics				
		Applied Voltage		Transient			Nominal Varistor Peak Voltage			Max. Clamping Voltage @ Test Current(8/20 $\mu$ s)	
		RMS 50/60Hz (25 $^{\circ}$ C)	DC (25 $^{\circ}$ C)	Energy	Average Power Dissipation	Peak Current (8/20 $\mu$ s)					
		Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	I <sub>tm</sub> (Amps)	V <sub>nom</sub> (Volts)	Tolerance		V <sub>c</sub> (Volts)
							Min.(Volts)	Max.(Volts)			
SVC 180D-05B	5			0.3	0.01	125				40	1
SVC 180D-07B	7			0.8	0.02	250				36	2.5
SVC 180D-10B	10	11	14	1.5	0.05	500	18	16	20	36	5
SVC 180D-14B	14			3.5	0.1	1000				36	10
SVC 180D-20B	20			10.0	0.2	2000				36	20
SVC 220D-05B	5			0.4	0.01	125				48	1
SVC 220D-07B	7			0.9	0.02	250				43	2.5
SVC 220D-10B	10	14	18	2.0	0.05	500	22	20	24	43	5
SVC 220D-14B	14			4.0	0.1	1000				43	10
SVC 220D-20B	20			13.0	0.2	2000				43	20
SVC 270D-05B	5			0.5	0.01	125				60	1
SVC 270D-07B	7			1.0	0.02	250				53	2.5
SVC 270D-10B	10	17	22	2.5	0.05	500	27	24	30	53	5
SVC 270D-14B	14			5.0	0.1	1000				54	10
SVC 270D-20B	20			15.0	0.2	2000				53	20
SVC 330D-05B	5			0.6	0.01	125				73	1
SVC 330D-07B	7			1.2	0.02	250				65	2.5
SVC 330D-10B	10	20	26	3.0	0.05	500	33	30	36	65	5
SVC 330D-14B	14			6.0	0.1	1000				65	10
SVC 330D-20B	20			20.0	0.2	2000				65	20
SVC 390D-05B	5			0.8	0.01	125				86	1
SVC 390D-07B	7			1.5	0.02	250				77	2.5
SVC 390D-10B	10	25	31	3.5	0.05	500	39	35	43	77	5
SVC 390D-14B	14			7.0	0.1	1000				77	10
SVC 390D-20B	20			24.0	0.2	2000				77	20
SVC 470D-05B	5			1.0	0.01	125				104	1
SVC 470D-07B	7			1.8	0.02	250				93	2.5
SVC 470D-10B	10	30	38	4.5	0.05	500	47	42	52	93	5
SVC 470D-14B	14			8.5	0.1	1000				93	10
SVC 470D-20B	20			30.0	0.2	2000				93	20
SVC 560D-05B	5			1.0	0.01	125				123	1
SVC 560D-07B	7			2.2	0.02	250				110	2.5
SVC 560D-10B	10	35	45	5.5	0.05	500	56	50	62	110	5
SVC 560D-14B	14			10.5	0.1	1000				110	10
SVC 560D-20B	20			35.0	0.2	2000				110	20
SVC 680D-05B	5			1.2	0.01	125				150	1
SVC 680D-07B	7			2.5	0.02	250				135	2.5
SVC 680D-10B	10	40	56	6.5	0.05	500	68	61	75	135	5
SVC 680D-14B	14			12.0	0.1	1000				135	10
SVC 680D-20B	20			40.0	0.2	2000				135	20
SVC 820D-05A	5			1.7	0.1	400				145	5
SVC 820D-07A	7			3.5	0.25	1200				135	10
SVC 820D-10A	10	50	65	8.0	0.4	2500	82	74	90	135	25
SVC 820D-14A	14			14.0	0.6	4500				135	50
SVC 820D-20A	20			27.0	1.0	6500				135	100
SVC 101D-05A	5			2.0	0.1	400				175	5
SVC 101D-07A	7			4.0	0.25	1200				165	10
SVC 101D-10A	10	60	85	10.0	0.4	2500	100	90	110	165	25
SVC 101D-14A	14			18.0	0.6	4500				165	50
SVC 101D-20A	20			30.0	1.0	6500				165	100

Device Type	Chip Element Size	Maximum Ratings					Characteristics				
		Applied Voltage		Transient			Nominal Varistor Peak Voltage			Max. Clamping Voltage @ Test Current(8/20 $\mu$ s)	
		RMS 50/60Hz (25 $^{\circ}$ C )	DC (25 $^{\circ}$ C )	Energy	Average Power Dissipation	Peak Current (8/20 $\mu$ s)					
	Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	Itm (Amps)	Vnom (Volts)	Tolerance		Vc (Volts)	Ip (Amps)
							Min.(Volts)	Max.(Volts)			
SVC 121D-05A	5			2.5	0.1	400				210	5
SVC 121D-07A	7			5.0	0.25	1200				200	10
SVC 121D-10A	10	75	100	12.0	0.4	2500	120	108	132	200	25
SVC 121D-14A	14			20.0	0.6	4500				200	50
SVC 121D-20A	20			40.0	1.0	6500				200	100
SVC 151D-05A	5			3.0	0.1	400				260	5
SVC 151D-07A	7			6.0	0.25	1200				250	10
SVC 151D-10A	10	95	125	16.0	0.4	2500	150	135	165	250	25
SVC 151D-14A	14			25.0	0.6	4500				250	50
SVC 151D-20A	20			50.0	1.0	6500				250	100
SVC 201D-05A	5			4.0	0.1	400				355	5
SVC 201D-07A	7			10.0	0.25	1200				340	10
SVC 201D-10A	10	130	170	20.0	0.4	2500	200	180	220	340	25
SVC 201D-14A	14			35.0	0.6	4500				340	50
SVC 201D-20A	20			70.0	1.0	6500				340	100
SVC 221D-05A	5			4.5	0.1	400				380	5
SVC 221D-07A	7			10.0	0.25	1200				360	10
SVC 221D-10A	10	140	180	23.0	0.4	2500	220	198	242	360	25
SVC 221D-14A	14			40.0	0.6	4500				360	50
SVC 221D-20A	20			75.0	1.0	6500				360	100
SVC 241D-05A	5			5.0	0.1	400				415	5
SVC 241D-07A	7			10.0	0.25	1200				395	10
SVC 241D-10A	10	150	200	25.0	0.4	2500	240	216	264	395	25
SVC 241D-14A	14			40.0	0.6	4500				395	50
SVC 241D-20A	20			80.0	1.0	6500				395	100
SVC 271D-05A	5			6.0	0.1	400				475	5
SVC 271D-07A	7			12.0	0.25	1200				455	10
SVC 271D-10A	10	175	225	30.0	0.4	2500	270	243	297	455	25
SVC 271D-14A	14			50.0	0.6	4500				455	50
SVC 271D-20A	20			90.0	1.0	6500				455	100
SVC 361D-05A	5			7.5	0.1	400				620	5
SVC 361D-07A	7			15.0	0.25	1200				595	10
SVC 361D-10A	10	230	300	35.0	0.4	2500	360	324	396	595	25
SVC 361D-14A	14			65.0	0.6	4500				595	50
SVC 361D-20A	20			120.0	1.0	6500				595	100
SVC 391D-05A	5			8.0	0.1	400				675	5
SVC 391D-07A	7			17.0	0.25	1200				650	10
SVC 391D-10A	10	250	320	40.0	0.4	2500	390	351	429	650	25
SVC 391D-14A	14			70.0	0.6	4500				650	50
SVC 391D-20A	20			130.0	1.0	6500				650	100
SVC 431D-05A	5			9.0	0.1	400				754	5
SVC 431D-07A	7			20.0	0.25	1200				710	10
SVC 431D-10A	10	275	350	45.0	0.4	2500	430	387	473	710	25
SVC 431D-14A	14			75.0	0.6	4500				710	50
SVC 431D-20A	20			140.0	1.0	6500				710	100
SVC 471D-05A	5			10.0	0.1	400				810	5
SVC 471D-07A	7			20.0	0.25	1200				775	10
SVC 471D-10A	10	300	385	45.0	0.4	2500	470	423	517	775	25
SVC 471D-14A	14			80.0	0.6	4500				775	50
SVC 471D-20A	20			150.0	1.0	6500				775	100

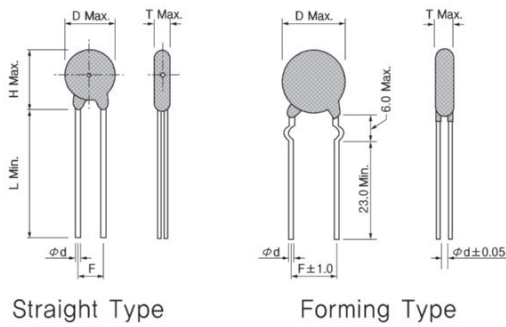
Device Type	Chip Element Size	Maximum Ratings					Characteristics					
		Applied Voltage		Transient			Nominal Varistor Peak Voltage			Max. Clamping Voltage @ Test Current(8/20 $\mu$ s)		
		RMS 50/60Hz (25 $^{\circ}$ C )	DC (25 $^{\circ}$ C )	Energy	Average Power Dissipation	Peak Current (8/20 $\mu$ s)						
		Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	I <sub>tm</sub> (Amps)	V <sub>nom</sub> (Volts)	Tolerance		V <sub>c</sub> (Volts)	I <sub>p</sub> (Amps)
							Min.(Volts)	Max.(Volts)				
SVC 511D-05A	5			10.0	0.1	600				875	5	
SVC 511D-07A	7			20.0	0.25	1200				840	10	
SVC 511D-10A	10	350	460	45.0	0.4	2500	510	459	561	840	25	
SVC 511D-14A	14			85.0	0.6	4500				840	50	
SVC 511D-20A	20			150.0	1.0	6500				840	100	
SVC 561D-05A	5			10.0	0.1	600				955	5	
SVC 561D-07A	7			20.0	0.25	1200				920	10	
SVC 561D-10A	10	350	460	45.0	0.4	2500	560	504	616	920	25	
SVC 561D-14A	14			85.0	0.6	4500				920	50	
SVC 561D-20A	20			150.0	1.0	6500				920	100	
SVC 621D-07A	7			20.0	0.25	1200				1025	10	
SVC 621D-10A	10	385	550	45.0	0.4	2500	620	558	682	1025	25	
SVC 621D-14A	14			85.0	0.6	4500				1025	50	
SVC 621D-20A	20			150.0	1.0	6500				1025	100	
SVC 681D-07A	7			20.0	0.25	1200				1120	10	
SVC 681D-10A	10	420	560	45.0	0.4	2500	680	612	748	1120	25	
SVC 681D-14A	14			90.0	0.6	4500				1120	50	
SVC 681D-20A	20			160.0	1.0	6500				1120	100	
SVC 751D-07A	7			25.0	0.25	1200				1240	10	
SVC 751D-10A	10	460	615	50.0	0.4	2500	750	675	825	1240	25	
SVC 751D-14A	14			100.0	0.6	4500				1240	50	
SVC 751D-20A	20			175.0	1.0	6500				1240	100	
SVC 781D-07A	7			25.0	0.25	1200				1290	10	
SVC 781D-10A	10	485	640	50.0	0.4	2500	780	702	858	1290	25	
SVC 781D-14A	14			105.0	0.6	4500				1290	50	
SVC 781D-20A	20			180.0	1.0	6500				1290	100	
SVC 821D-07A	7			30.0	0.25	1200				1355	10	
SVC 821D-10A	10	510	670	55.0	0.4	2500	820	738	902	1355	25	
SVC 821D-14A	14			110.0	0.6	4500				1355	50	
SVC 821D-20A	20			190.0	1.0	6500				1355	100	
SVC 911D-10A	10			60.0	0.4	2500				1500	25	
SVC 911D-14A	14	550	745	120.0	0.6	4500	910	819	1001	1500	50	
SVC 911D-20A	20			215.0	1.0	6500				1500	100	
SVC 102D-10A	10			65.0	0.4	2500				1650	25	
SVC 102D-14A	14	625	825	130.0	0.6	4500	1000	900	1100	1650	50	
SVC 102D-20A	20			230.0	1.0	6500				1650	100	
SVC 112D-10A	10			70.0	0.4	2500				1815	25	
SVC 112D-14A	14	680	895	140.0	0.6	4500	1100	990	1210	1815	50	
SVC 112D-20A	20			250.0	1.0	6500				1815	100	
SVC 182D-14A	14	1000	1465	240.0	0.6	4500	1800	1620	1980	2970	50	
SVC 182D-20A	20			400.0	1.0	6500				2970	100	

## Notes :

- ① 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  $V_{dc}$ . An AC applied voltage (50/60Hz) form a sine wave shape. When the distortion in the waveform is extensive make sure that the peak voltage is less than  $\sqrt{2}$  times the  $V_{ac}$ .
- ② Energy :  $W_{tm}$   
Transient energy ratings are given in the  $W_{tm}$  column of the specifications in Joules (watt-second). The rating is the maximum allowable energy with continuous voltage applied. Energy ratings are based on a shift of  $V_{nom}$  of less than 10% of initial value..
- ③ Transient peak current ( $I_{tm}$ )  
The peak current rating ( $I_{tm}$ ) of varistor is based on an 8/20  $\mu s$  test impulse wave shape. This peak current is the maximum peak current in which nominal varistor voltage shift does not exceed  $\pm 10\%$  when the test impulse is applied once at 5 minutes interval
- ④ Nominal varistor voltage :  $V_{nom}$   
Indicates the varistor terminal voltage measured with a 1mA DC applied. 0.1mA in the case of the 05A and 05B series.
- ⑤ Maximum clamping voltage :  $V_c$   
Indicates the peak terminal voltage measured with an 8/20  $\mu s$  impulse current applied.
  - Operating ambient temperature :  $-40^{\circ}C$  to  $+85^{\circ}C$
  - Storage temperature :  $-40^{\circ}C \sim +125^{\circ}C$
  - UL, CSA and VDE (UL 1449, CSA, VDE) SVC varistor have been tested by Underwriter's Laboratories, Inc., Canadian Standards Association and VDE  
UL File No. E332621, E154171  
CSA File No. 1513084  
VDE File No. 116012

## Dimensions

(Unit:mm)



Straight Type

Forming Type

## B Type

(Unit:mm)

Type	D Max.	T Max.	H Max.	L Min.	F	φd±0.05
SVC 180D-05B	7.5	4.5	16.0	23	5.0 (-0.2, +0.8)	0.50/ 0.60
SVC 220D-05B						
SVC 270D-05B						
SVC 330D-05B						
SVC 390D-05B						
SVC 470D-05B						
SVC 560D-05B						
SVC 680D-05B						
SVC 180D-07B						
SVC 220D-07B						
SVC 270D-07B						
SVC 330D-07B						
SVC 390D-07B						
SVC 470D-07B						
SVC 560D-07B						
SVC 680D-07B						
SVC 180D-10B	13.5	5.0	22.5	23	7.5±1	0.70
SVC 220D-10B						
SVC 270D-10B						
SVC 330D-10B						
SVC 390D-10B						
SVC 470D-10B						
SVC 560D-10B						
SVC 680D-10B						
SVC 180D-14B						
SVC 220D-14B						
SVC 270D-14B						
SVC 330D-14B						
SVC 390D-14B						
SVC 470D-14B						
SVC 560D-14B						
SVC 680D-14B						
SVC 180D-20B	23.0	6.0	33.0	23	10.0±1	0.70
SVC 220D-20B						
SVC 270D-20B						
SVC 330D-20B						
SVC 390D-20B						
SVC 470D-20B						
SVC 560D-20B						
SVC 680D-20B						

## A Type

(Unit:mm)

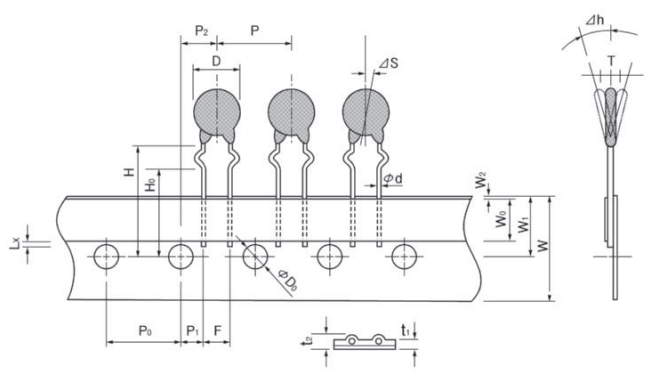
Type	D Max.	T Max.	H Max.	L Min.	F	φd±0.05
SVC 820D-05A	7.5	4.5	16.0	23	5.0 (-0.2, +0.8)	0.50/ 0.60
SVC 101D-05A						
SVC 121D-05A						
SVC 151D-05A						
SVC 201D-05A						
SVC 221D-05A						
SVC 241D-05A						
SVC 271D-05A						
SVC 361D-05A						
SVC 391D-05A						
SVC 431D-05A						
SVC 471D-05A						
SVC 511D-05A						
SVC 561D-05A						

## A Type

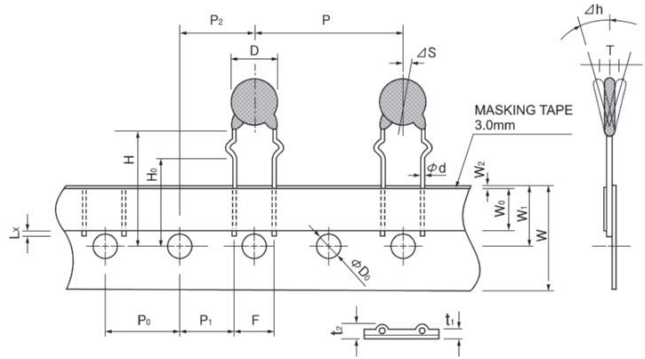
(Unit:mm)

Type	D Max.	T Max.	H Max.	L Min.	F	φd±0.05						
SVC 820D-07A	9.0	4.5	18.0	23	5.0 (-0.2, +0.8)	0.50/ 0.60						
SVC 101D-07A												
SVC 121D-07A												
SVC 151D-07A												
SVC 201D-07A												
SVC 221D-07A												
SVC 241D-07A												
SVC 271D-07A												
SVC 361D-07A												
SVC 391D-07A												
SVC 431D-07A												
SVC 471D-07A												
SVC 511D-07A												
SVC 561D-07A												
SVC 621D-07A												
SVC 681D-07A												
SVC 751D-07A												
SVC 781D-07A												
SVC 821D-07A												
SVC 820D-10A							14.0	4.5	23.0	23	7.5±1	0.70
SVC 101D-10A												
SVC 121D-10A												
SVC 151D-10A												
SVC 201D-10A												
SVC 221D-10A												
SVC 241D-10A												
SVC 271D-10A												
SVC 361D-10A												
SVC 391D-10A												
SVC 431D-10A												
SVC 471D-10A												
SVC 511D-10A												
SVC 561D-10A												
SVC 621D-10A												
SVC 681D-10A												
SVC 751D-10A												
SVC 781D-10A												
SVC 821D-10A												
SVC 911D-10A												
SVC 102D-10A												
SVC 112D-10A												
SVC 820D-14A	17.5	4.5	27.0	23	7.5±1	0.70						
SVC 101D-14A												
SVC 121D-14A												
SVC 151D-14A												
SVC 201D-14A												
SVC 221D-14A												
SVC 241D-14A												
SVC 271D-14A												
SVC 361D-14A												
SVC 391D-14A												
SVC 431D-14A												
SVC 471D-14A												
SVC 511D-14A												
SVC 561D-14A												
SVC 621D-14A												
SVC 681D-14A												
SVC 751D-14A												
SVC 781D-14A												
SVC 821D-14A												
SVC 911D-14A												
SVC 102D-14A												
SVC 112D-14A												
SVC 182D-14A												
SVC 820D-20A	14.0	4.5	34.0	23	10±1	0.80						
SVC 101D-20A												
SVC 121D-20A												
SVC 151D-20A												
SVC 201D-20A												
SVC 221D-20A												
SVC 241D-20A												
SVC 271D-20A												
SVC 361D-20A												
SVC 391D-20A												
SVC 431D-20A												
SVC 471D-20A												
SVC 511D-20A												
SVC 561D-20A												
SVC 621D-20A												
SVC 681D-20A												
SVC 751D-20A												
SVC 781D-20A												
SVC 821D-20A												
SVC 911D-20A												
SVC 102D-20A												
SVC 112D-20A												
SVC 182D-20A												

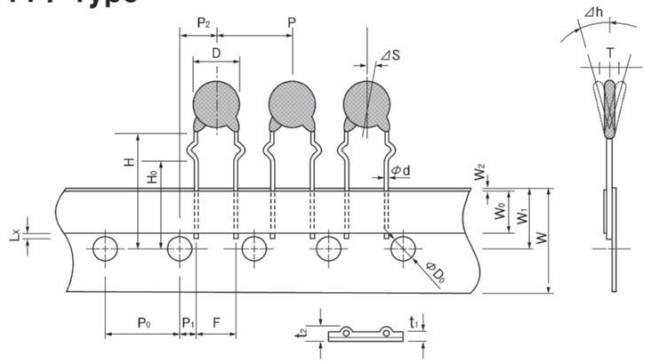
### FF5 Type



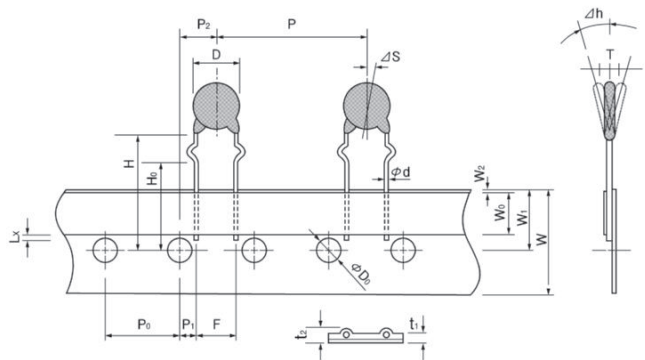
### FF9 Type



### FF7 Type



### FF8 Type



Item	Code	Dimensions(mm)	
		FF5	FF9
Body Diameter	D	See page 119	
Body Thickness	T	See page 119	
Lead Diameter	∅d	0.6±0.05	0.6±0.05
Pitch of sprocket Hole	P <sub>0</sub>	12.7±0.3	12.7±0.3
Pitch of Component	P	12.7±1.0	25.4±1.0
Lead Length from Hole Center Lead	P <sub>1</sub>	3.85±1.0	8.95±1.0
Lead Length from Hole Center to Component Center	P <sub>2</sub>	6.35±1.3	12.7±1.5
Lead Spacing	F	5.0 <sup>+0.8</sup> <sub>-0.2</sub>	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>+1.0</sup> <sub>-0.5</sub>	
Hold Down Tape Width	W <sub>0</sub>	6.0Min.	8.0Min.
Position of Sprocket Hole	W <sub>1</sub>	9.0±0.5	
Hole Down Tape Position	W <sub>2</sub>	3.0Max.	
Height of Component From Hole Center	H	20.0 <sup>+1.5</sup> <sub>-1.0</sub>	
Lead-Wire Clinch Height	H <sub>0</sub>	16.0±0.5	
Diameter of Sprocket Hole	∅D <sub>0</sub>	4.0±0.2	
Total Tape Thickness	t <sub>1</sub>	0.7±0.2	
Total Thickness Tape and Lead Wire	t <sub>2</sub>	1.7Max.	
Lead Wire Protrusion	Lx	1.0Max.	

Item	Code	Dimensions(mm)	
		FF7	FF8
Body Diameter	D	See page 119	
Body Thickness	T	See page 119	
Lead Diameter	∅d	0.6±0.05	
Pitch of sprocket Hole	P <sub>0</sub>	15.0±0.3	
Pitch of Component	P	12.0±1.0	30.0±1.0
Lead Length from Hole Center Lead	P <sub>1</sub>	3.75±1.0	
Lead Length from Hole Center to Component Center	P <sub>2</sub>	7.5±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>+1.0</sup> <sub>-0.5</sub>	
Hold Down Tape Width	W <sub>0</sub>	8.0Min.	
Position of Sprocket Hole	W <sub>1</sub>	9.0±0.5	
Hole Down Tape Position	W <sub>2</sub>	3.0Max.	
Height of Component From Hole Center	H	20.0 <sup>+1.5</sup> <sub>-1.0</sub>	
Lead-Wire Clinch Height	H <sub>0</sub>	16.0±0.5	
Diameter of Sprocket Hole	∅D <sub>0</sub>	4.0±0.2	
Total Tape Thickness	t <sub>1</sub>	0.7±0.2	
Total Thickness Tape and Lead Wire	t <sub>2</sub>	1.7Max.	
Lead Wire Protrusion	Lx	1.0Max.	



## Characteristics, Curves and Lifetime

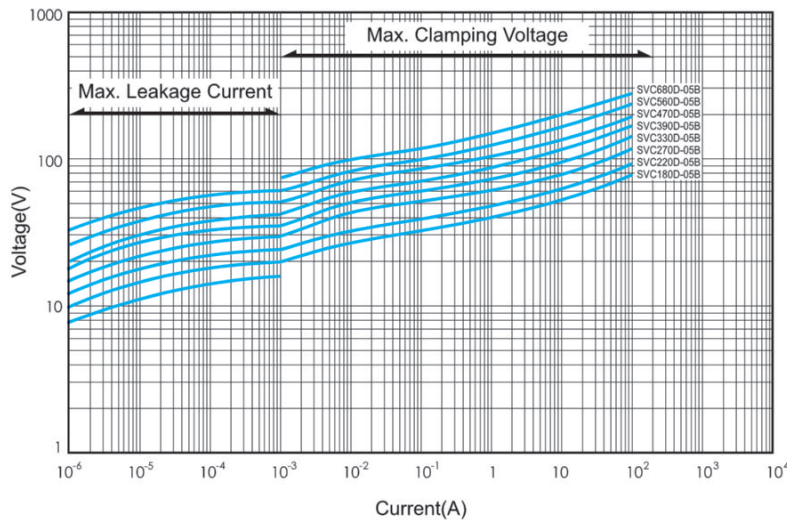
### Transient V-I Charactic Curves

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

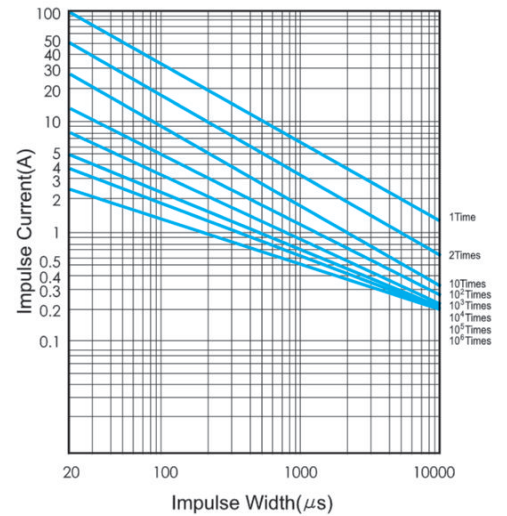
### Pulse Lifetime Ratings

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

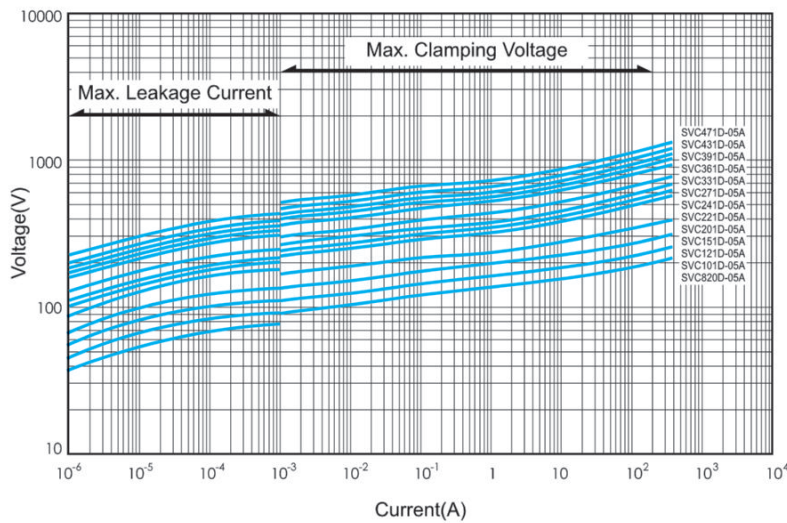
05B(SVC 180D-05B to SVC 680D-05B)



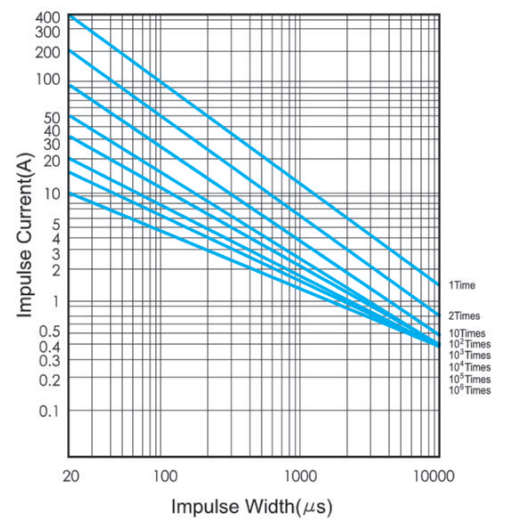
05B(SVC 180D-05B to SVC 680D-05B)



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



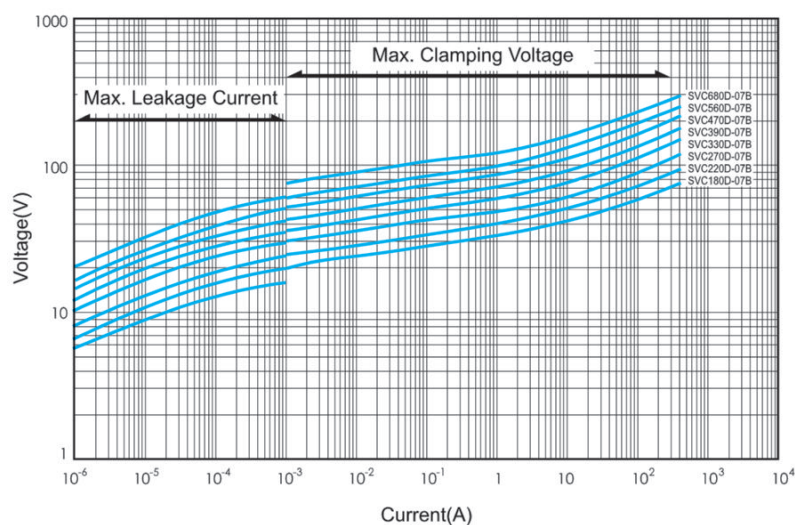
05A(SVC 820D-05A to SVC 471D-05A)



### Transient V-I Characteristic Curves

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

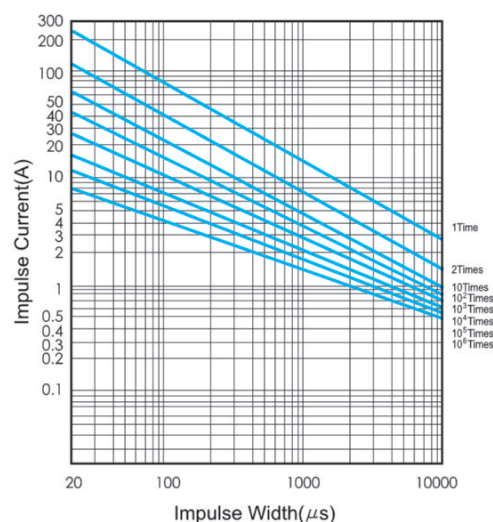
#### 07B(SVC 180D-07B to SVC 680D-07B)



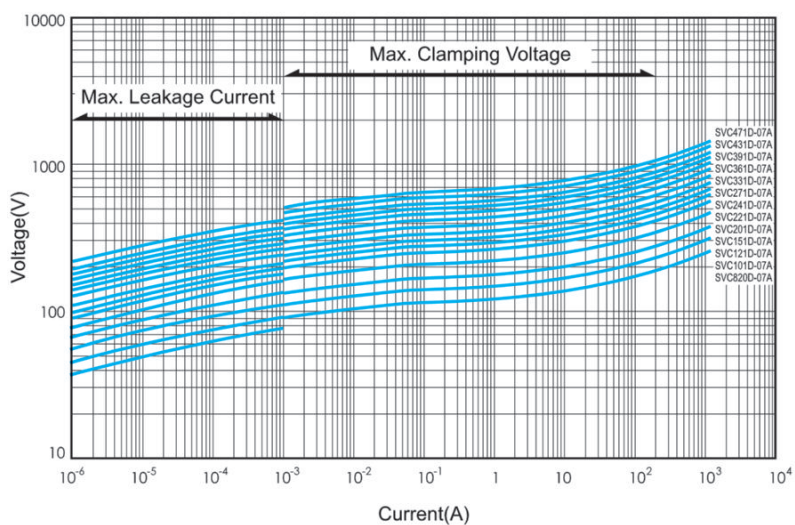
### Pulse Lifetime Ratings

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

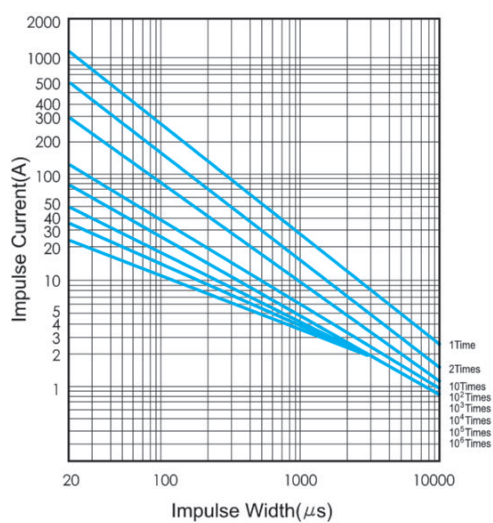
#### 07B(SVC 180D-07B to SVC 680D-07B)



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



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



## Transient V-I Characteristic Curves

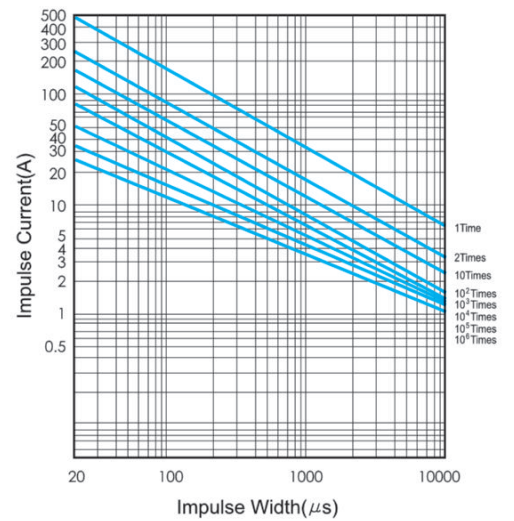
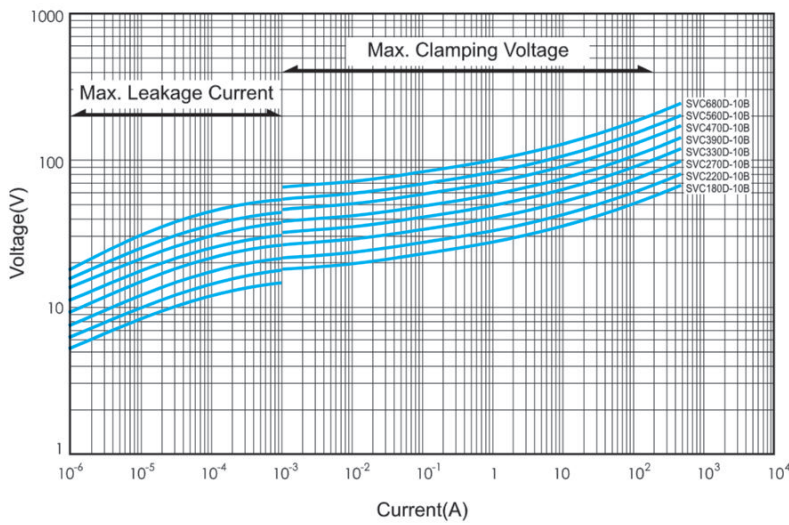
Current waveform under  $10^2$  A : DC  
 over  $10^{-1}$  A :  $8/20\mu\text{s}$

## Pulse Lifetime Ratings

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

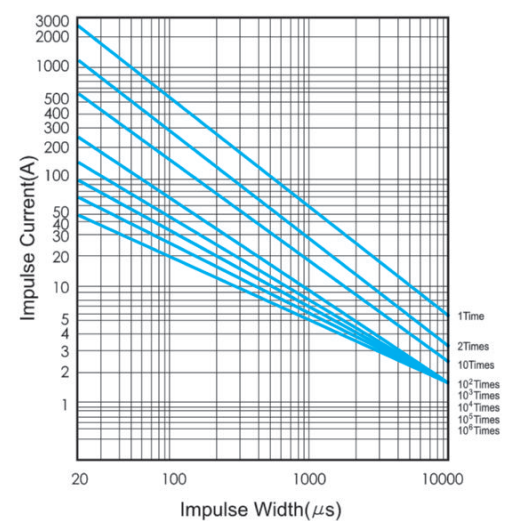
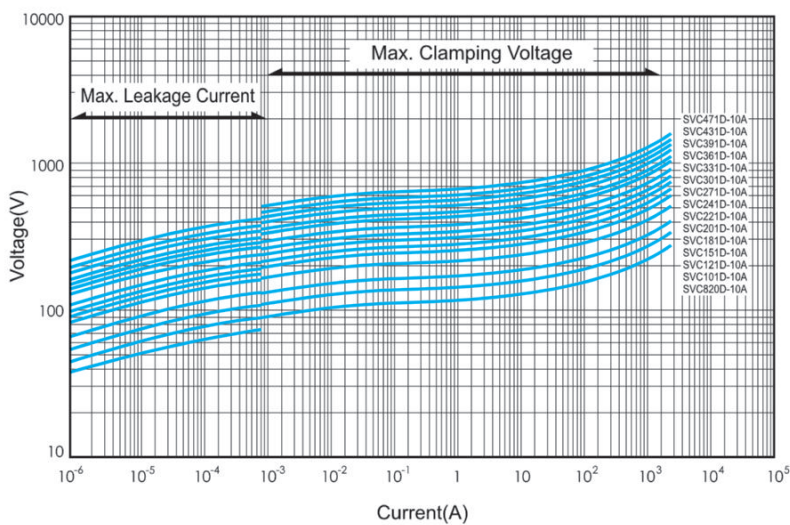
### 10B(SVC 180D-10B to SVC 680D-10B)

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



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

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



### Transient V-I Characteristic Curves

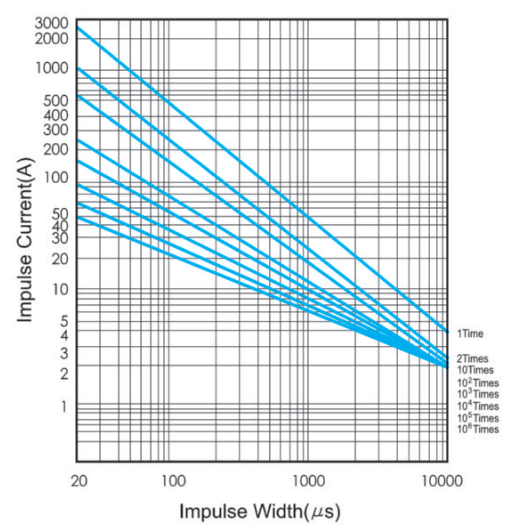
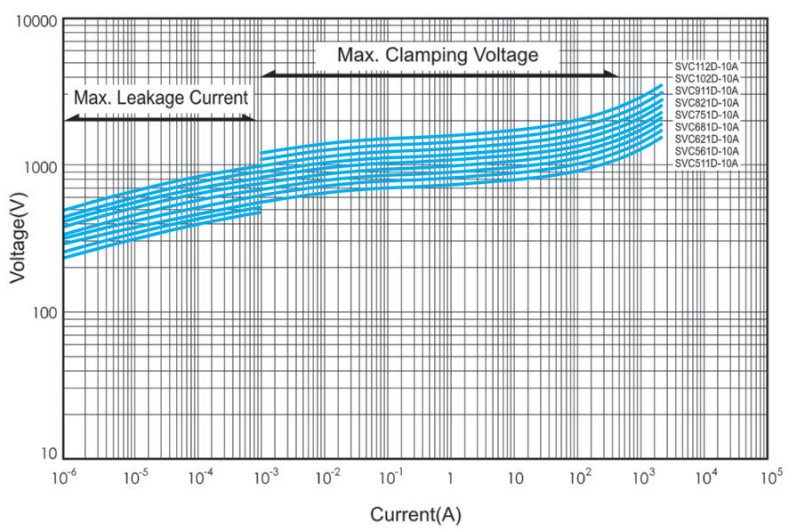
Current waveform under  $10^2$  A : DC  
 over  $10^1$  A :  $8/20\mu\text{s}$

### Pulse Lifetime Ratings

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

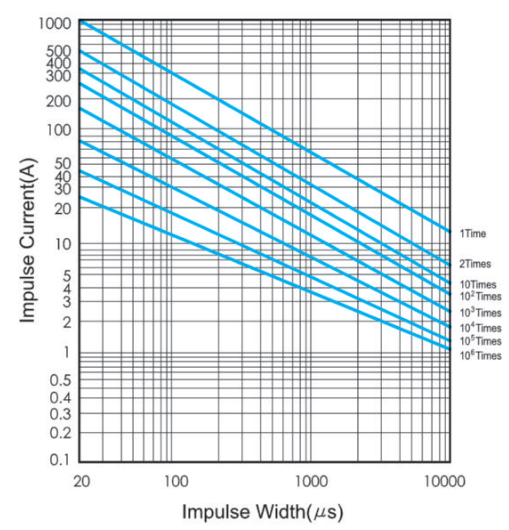
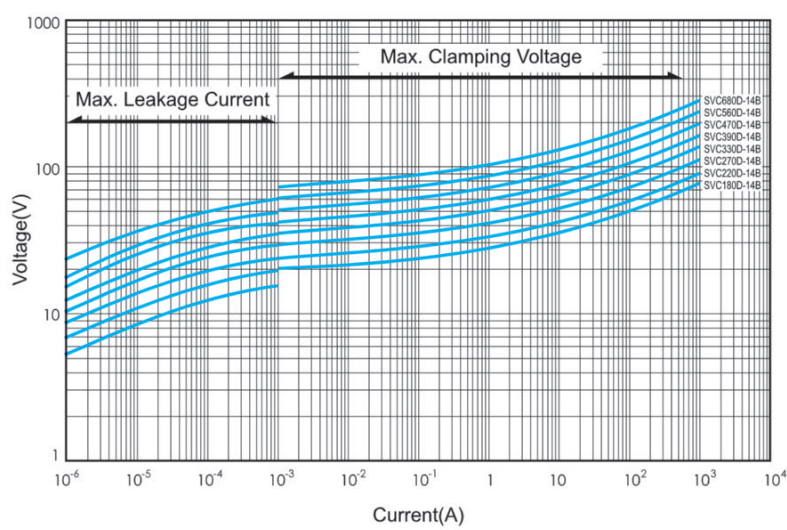
10A(SVC 561D-10A to SVC 112D-10A)

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



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

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



## Transient V-I Characteristic Curves

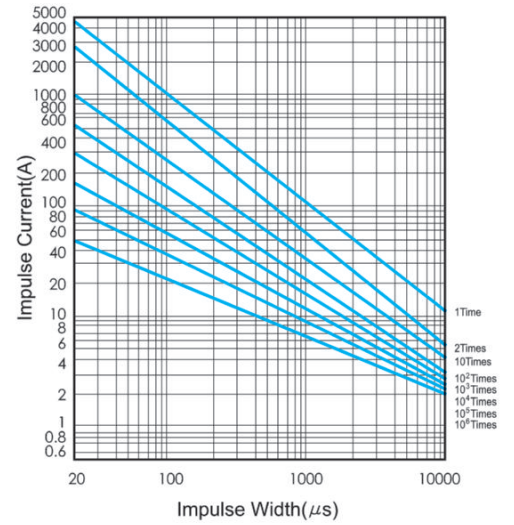
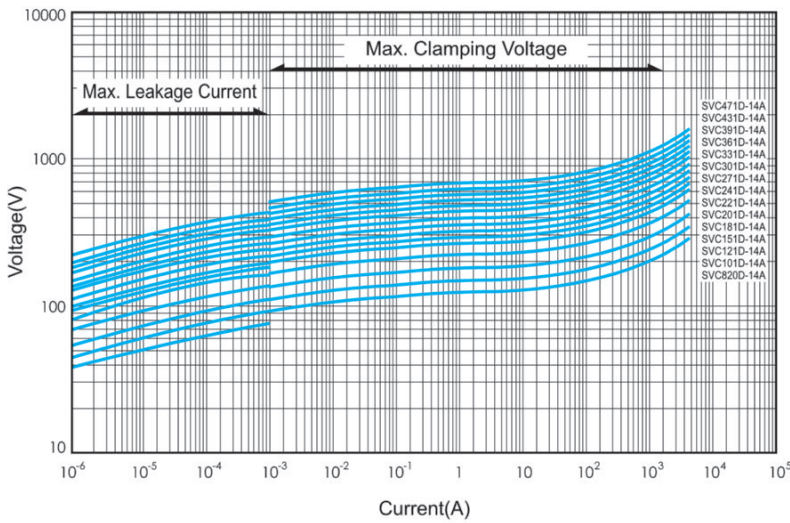
Current waveform under  $10^{-2}$  A : DC  
 over  $10^{-1}$  A :  $8/20\mu\text{s}$

## Pulse Lifetime Ratings

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

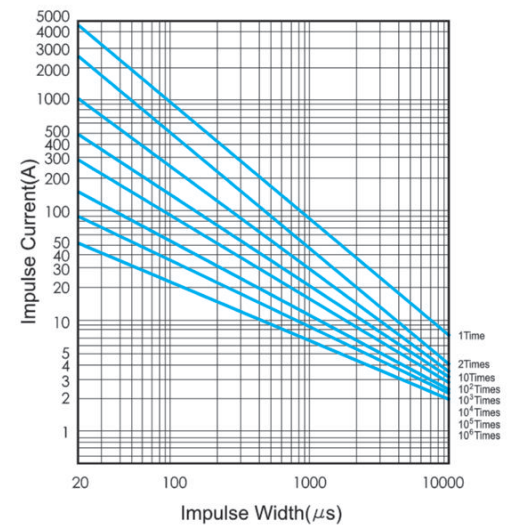
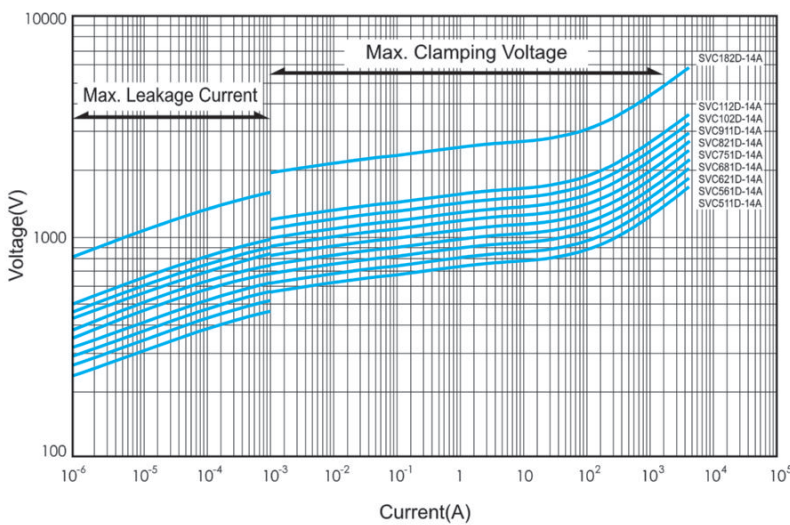
14A(SVC 820D-14A to SVC 471D-14A)

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



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

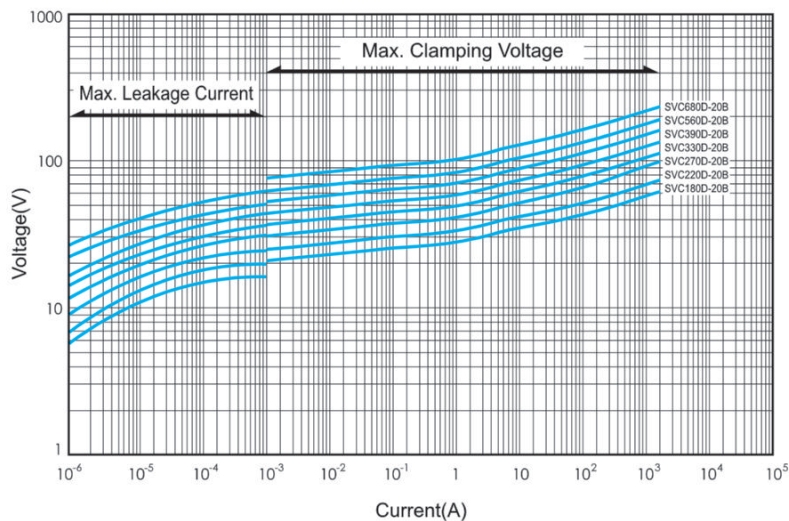
14A(SVC 561D-14A to SVC 182D-14A)



### Transient V-I Characteristic Curves

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

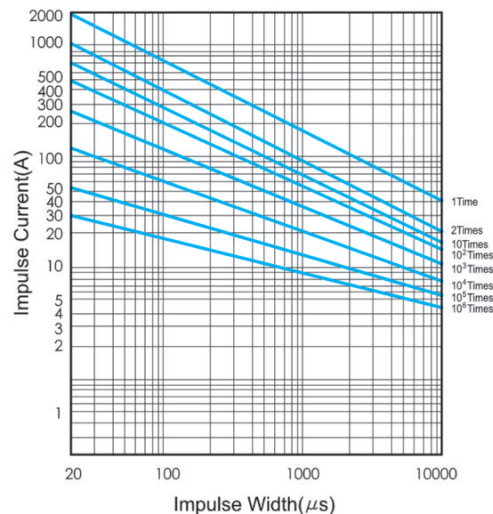
20B(SVC 180D-20B to SVC 680D-20B)



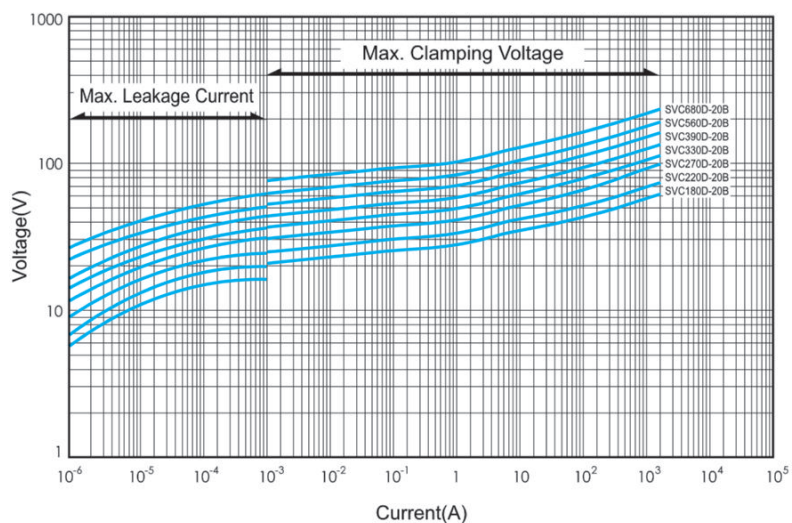
### Pulse Lifetime Ratings

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

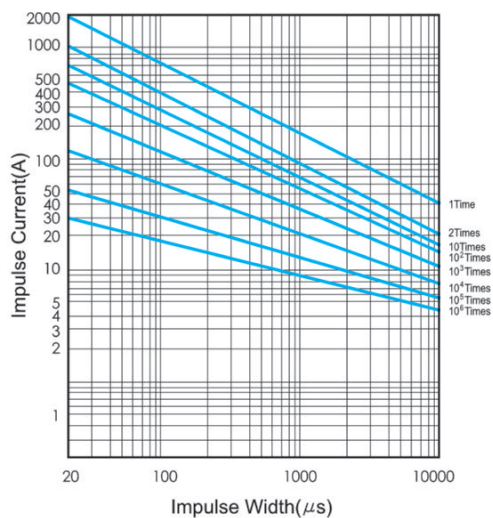
20B(SVC 180D-20B to SVC 680D-20B)



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



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



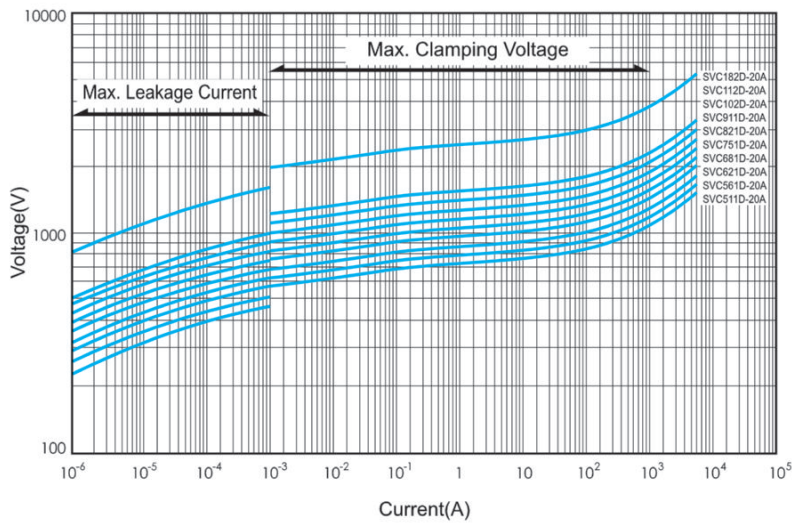
## Transient V-I Characteristic Curves

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

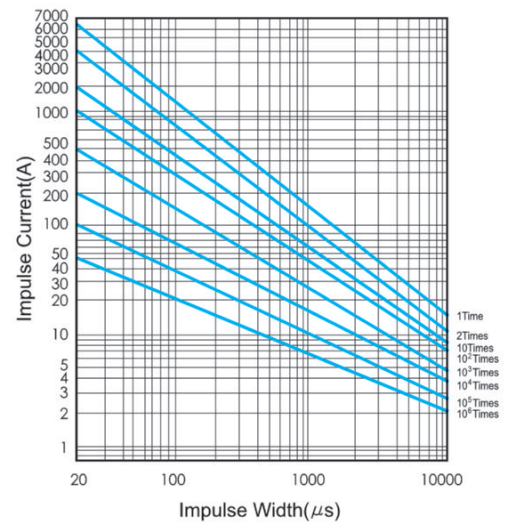
## Pulse Lifetime Ratings

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

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



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

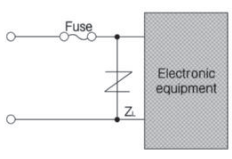
Varistor voltage selection table ( $Z_L$ )

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

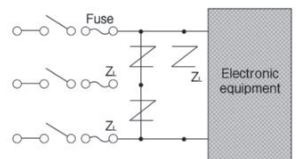
Notes :

- 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 ( $Z_E$ )

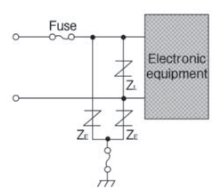
Power Supply Voltage	Type
100V AC	SVC431D - □ □ A
	SVC471D - □ □ A
200V AC	SVC751D - □ □ A to SVC112D - □ □ A*
	SVC182D - □ □ A**

Notes :

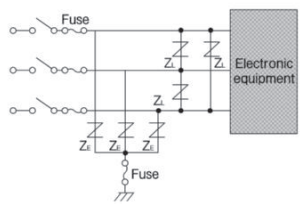
- ① When subjected to megger testing(500V DC), the insulation resistance value can decrease due to the leakage current of the SVC, To avoid this remove the varistor or use\* marked SVC.
- ② When subjected to dielectric strength test(1000V AC). remove the SVC or use\*\* marked SVC.

Select varistors taking a note of operating conditions peculiar to the equipment.

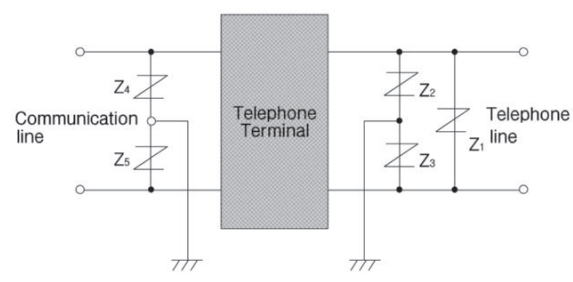
### AC/DC single-phase circuit



### 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

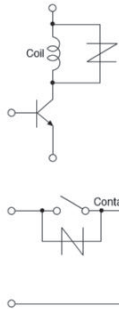
Notes :

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

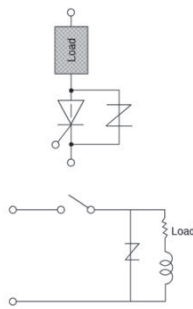


## Switching Circuit Protection

### 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

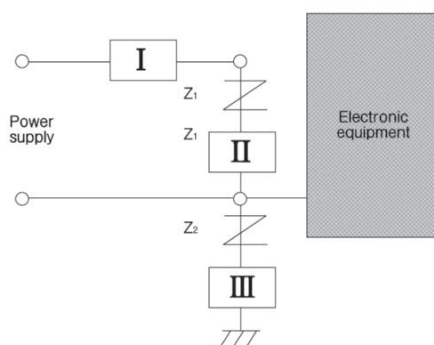
#### Notes :

- 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>2</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.

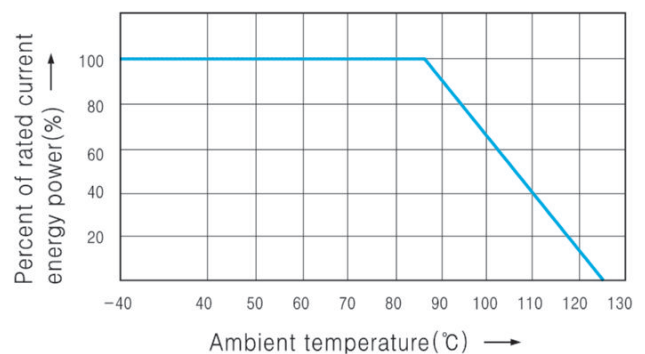
### Installation

- 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

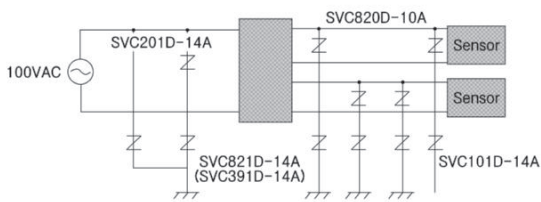
Operating ambient temperature	-40°C to +85°C
Storage temperature	-40°C to +125°C
Voltage temperature coefficient	-0.05% / °C
IR change of test condition	
621 ↑ (at 500V)	over 10M $\Omega$
561 ↓ (at V <sub>dc</sub> )	over 10M $\Omega$

# Recognized standards

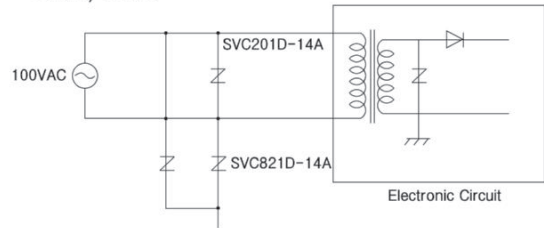
Standard	Content	Applicable SVC series	File No.
UL	UL 1449 3rd edition	Surge-protective Devices - Component Other SPD Applications : 05/07/10 Series, 14B/20B Series	Type 3 SPD Applications : 14A/20A Series E332621
	UL 1449	Isolated Loop Circuit Protectors - Component	Model SVC 05 / 07 / 10 / 14 / 20 Type A / B E154171
VDE	DIN EN 61051-1:2009	Varistor	05/07/10/14 Series 116012
CAS	CLASS C221331	Surge Protective Devices - Components and Subassemblies	05/07/10/14 /20 Series 1513084

## Application Example

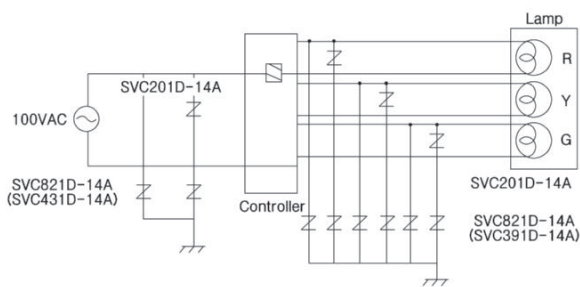
Fire Alarm System



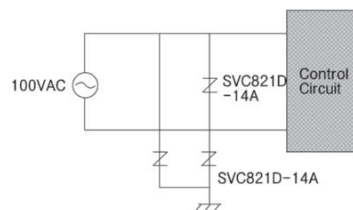
Stove, Boiler



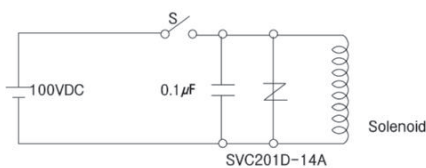
Traffic Signal Control



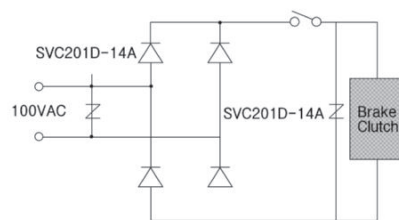
Vending Machine



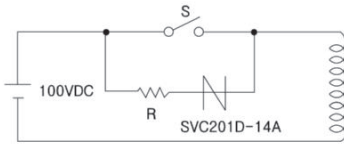
Solenoid



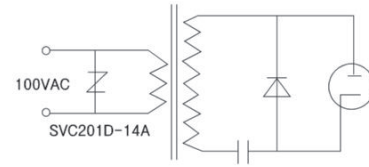
Brake, Clutch



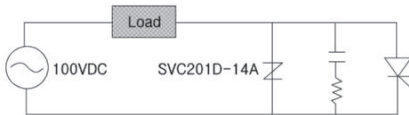
## Contact Protection



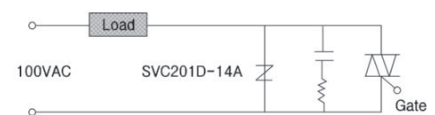
## Microwave Oven



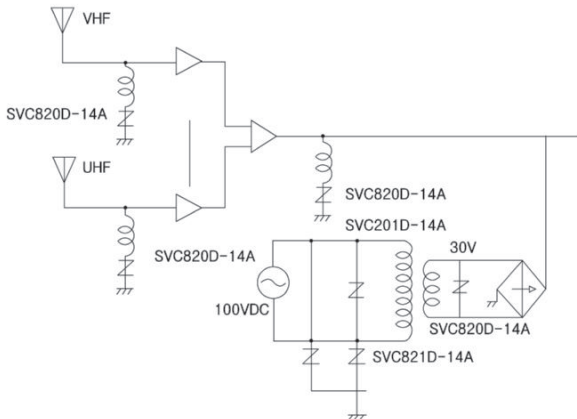
## Thyristor Protection



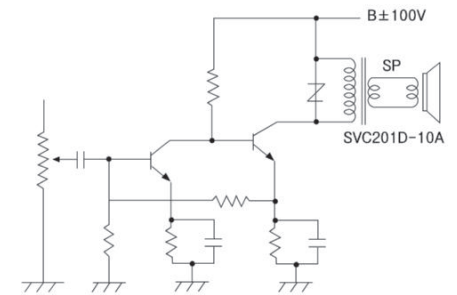
## Triac Protection



## TV Booster



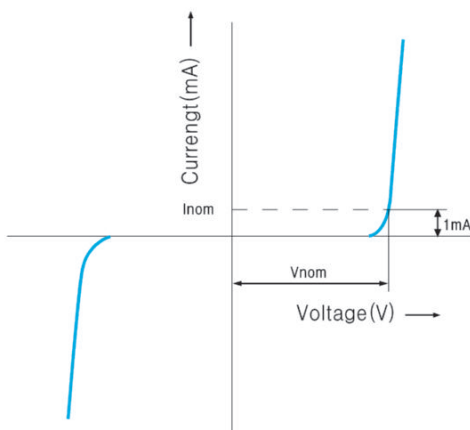
## Sound Output Circuit



## Varistor Terminology

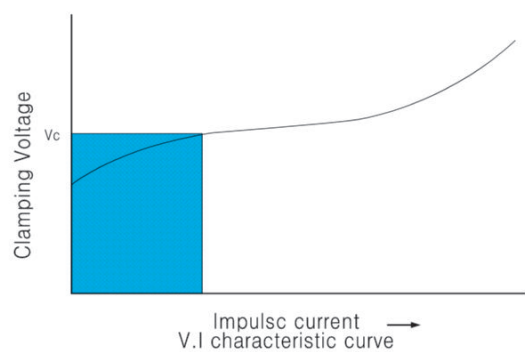
### Varistor Voltage : $V_{nom}$

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



### Clamping Voltage : $V_c$

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



### Capacitance

Typical values measured at a test frequency of 1kHz

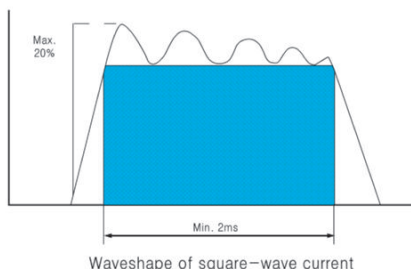
### Rated peak transient current : $I_{tm}$

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.

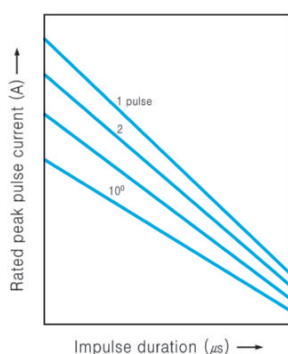


### Pulse lifetime rating

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.

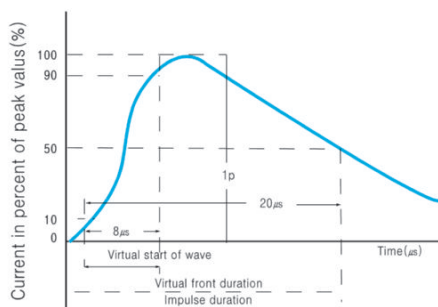
This curve also provides for derating current as required with repetitive pulsing.



### 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.