Ceramic Type

Introduction

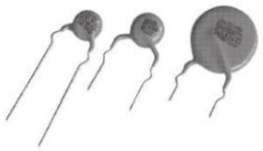
SAMWHA disc ceramic capacitors are designed and produced to offer the user capacitors with high reliability and small size.

With wide selection of temperature characteristics and voltage ratings, the user can make use for in various circuit application.

※ Special specification like a Automobile, Medical, Military, Aviation should be discuss with our sales representative

How to Order

EK	R	3A	101	K	09	F	K	5
1	2	3	4	5	6	7	8	9



1 Style & Class

Mark	Product Name	Mark	Product Name
EC	Temperature Compensating Type	SD	AC250/400V(Testing Voltage : AC4000V)
EK	High Dielectric Type	SC	AC250(Testing Voltage : AC2500V)

2 Temp. Char.

EC Type (PPM/℃)		EK, SC, SD	
C	NPO (0± 60)	B	Y5P (+10%~-10%)
O	SL (+350 ~ -1000)	R	Y5R (+15%~-15%)
N	N4700 (-4700± 1000)	E	Y5U (+22%~-56%)
		F	Y5V (+22%~-82%)

3 Rating Voltage

DC Class				AC Class	
Code	Rating Voltage	Code	Rating Voltage	Code	Rating Voltage
3A	1kV	4A	10kV	2E	250V
3D	2kV	4B	12kV	2G	400V
3F	3.15kV	4C	15kV		
3J	6.3kV	4D	20kV		

4 Capacitance

(in picofarads) The first two digits indicate significant digits. The 3rd digit indicate the number of zero following.
R denotes decimal.

Ex.) 100 = 10 x 10^0 = 10pF

102 = 10 x 10^2 = 1000pF

5 Cap. Tolerance

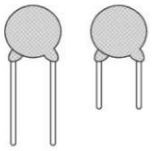
Mark	Cap. Tolerance	Mark	Cap. Tolerance
J	±5%	M	±20%
K	±10%	Z	-20%~+80%

6 Disc Diameter

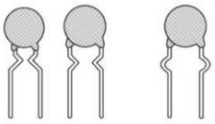
Code	Dia(Ømm)	Code	Dia(Ømm)	Code	Dia(Ømm)	Code	Dia(Ømm)	Code	Dia(Ømm)
06	6.3	09	9.0	12	12.5	15	15.0	18	18.0
07	7.0	10	10. 0	13	13.0	16	16.0	19	19.0
08	8.0	11	11.0	14	14.0	17	17.0	20	20.0

7 Packing Style
8 Lead Variation

Packing Style		Lead Variation	
F	Taping Type Flat Pack	F	Out-Kink type
		K	In-Kink type
		S	Straight type
		R / A	Parallel type
B	Bulk	W / L	Out-Kink Short type
		K	Out-Kink Long type
		N	Straight Short type
		S	Straight Long type
		J	Parallel Short type
		R	Parallel Long Type



Straight Type



In-kink Out-kink

Forming(Kink) Type

9 Lead Spacing & Pitch of Component

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	25.4/15.0		
2/3	10.0	30.0		

CLASS II High Dielectric Constant Ceramic Capacitors

Specification

Temp . Range : −25 ~ +85℃(Y class)

Capacitance : Measured at 1㎑, 1 Vrms and 20℃±2℃

Testing Voltage

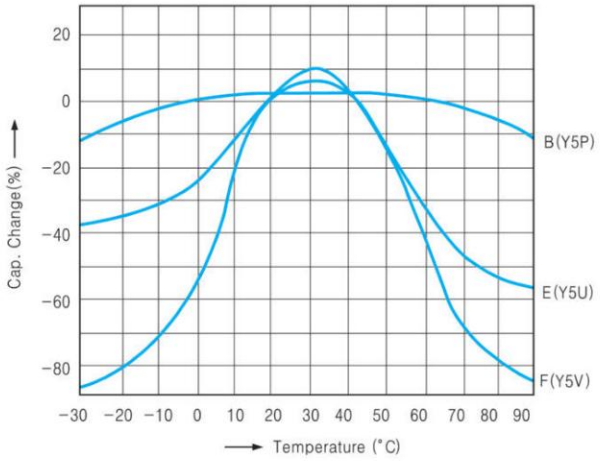
R.V	1 ~ 2kV DC	3kV DC	4 ~ kV DC
T.V	R.V x 2	R.V x 1.75	R.V x 1.5

Insulation Resistance : Min 10,000㏁ at 500 V DC for 1minute

Dissipation Factor(tanδ)

T.C	B	E	F
tanδ	2.5%	2.5%	5.0%

Temp. Char.



DC High Voltage Ceramic Capacitors

High Voltage Ceramic Capacitor (Epoxy Coated Ceramic Capacitor)

T.C / R.V	Capacitance(pF)			Dimensions(mm)				Part No. (How to order)	Marking
	Y5P(B)	Y5U(E)	Y5V(F)	Dmax	Tmax	F ±1.0	Ød±0.05		
1KV DC	100, 120, 150, 180 ,220, 270, 330, 390, 470, 560, 680	1000	1000, 2200	6.3	5.0	5.0	0.50	EK△3A△△△△06△△△	B 101K 1KV 6.3≤D≤9.0
	820, 1000, 1200, 1500		4700	8.0	5.0	5.0	0.50	EK△3A△△△△08△△△	
	1800, 2200	2200	10000	10.0	5.0	5.0(7.5)	0.50(0.60)	EK△3A△△△△10△△△	
	2700, 3300	4700		12.5	5.0	5.0(7.5)	0.50(0.60)	EK△3A△△△△12△△△	
			22000	13.0	5.0	7.5(10.0)	0.60	EK△3A△△△△13△△△	B 222K 1KV SWC D≥10.0
	3900, 4700	10000		14.0	5.0	7.5(10.0)	0.60	EK△3A△△△△14△△△	
	5600, 6800			16.0	5.0	7.5(10.0)	0.60	EK△3A△△△△16△△△	
2KV DC	100, 120, 150, 180, 220 , 270, 330, 390, 470, 560		1000, 2200	6.3	5.0	5.0	0.50	EK△3D△△△△06△△△	B 101K 2KV 6.3≤D≤9.0
	680, 820, 1000	1000,2200		8.0	5.0	7.5	0.60	EK△3D△△△△08△△△	
	1200, 1500	4700	4700	10.0	5.0	5.0(7.5)	0.50(0.60)	EK△3D△△△△10△△△	
	1800, 2200, 2700		6800, 10000	12.5	5.0	7.5(10.0)	0.60	EK△3D△△△△12△△△	B 222K 2KV SWC D≥10.0
	3300, 3900			14.0	5.0	7.5(10.0)	0.60	EK△3D△△△△14△△△	
	4700	10000		16.0	5.0	7.5(10.0)	0.60	EK△3D△△△△16△△△	
	5600			18.0	5.0	7.5(10.0)	0.60	EK△3D△△△△18△△△	
	6800			20.0	5.0	7.5(10.0)	0.60	EK△3D△△△△20△△△	

DC High Voltage Ceramic Capacitors

High Voltage Ceramic Capacitors(Epoxy Coated Ceramic Capacitors)

T.C / R.V	Capacitance(pF)			Dimensions(mm)				Part No. (How to order)	Marking
	Y5P(B)	Y5U(E)	Y5V(F)	Dmax	Tmax	F ±1.0	Ød±0.05		
3.15KV DC	100, 120, 150, 180 ,220, 270, 330, 390, 470, 560	1000		8.0	6.0	7.5(10.0)	0.60	EK△3F△△△△08△△△	
	680	1500		10.0	6.0	7.5(10.0)	0.60	EK△3F△△△△10△△△	B 101K 3KV 6.3≤D≤9.0
				11.0	6.0	7.5(10.0)	0.60	EK△3F△△△△11△△△	
	820, 1000	2200	4700	12.5	6.0	7.5(10.0)	0.60	EK△3F△△△△12△△△	
			6800	13.0	6.0	7.5(10.0)	0.60	EK△3F△△△△13△△△	
	1200, 1500	3300, 4700	10000	14.0	6.0	7.5(10.0)	0.60	EK△3F△△△△14△△△	B 222K 3KV SWC D≥10.0
	1800, 2200			15.0	6.0	7.5(10.0)	0.60	EK△3F△△△△15△△△	
	2700			16.0	6.0	7.5(10.0)	0.60	EK△3F△△△△16△△△	
	3300			16.0	6.0	7.5(10.0)	0.60	EK△3F△△△△18△△△	
6.3KV DC	100, 120, 150, 180, 220 , 330, 470	1000	1000	8.0	7.0	10.0	0.60	EK△3J△△△△08△△△	B 101K 6KV 6.3≤D≤9.0
		1500		9.0	7.0	10.0	0.60	EK△3J△△△△09△△△	
	1000	2200	2200, 4700	12.5	7.0	10.0	0.60	EK△3J△△△△12△△△	
		3300		14.0	7.0	10.0	0.60	EK△3J△△△△14△△△	E 222K 6KV SWC D≥10.0
		3300, 3900		15.5	7.0	10.0	0.60	EK△3J△△△△15△△△	
			10000	20.0	7.0	10.0	0.60	EK△3J△△△△20△△△	

Low Loss Ceramic Capacitors (SL & R Series)

Specification

Temp . Range: -25 ~ +85℃

Operating Temperature Range : -25 ~ +125℃

Capacitance : Measured at 1MHz, 1 Vrms and 20℃ ± 2℃(SL type)

Measured at 1kHz(R type), 1 Vrms and 20℃ ± 2℃(R type)

Testing Voltage

Rating Voltage (R.V)	1~2kV DC	3.15kV DC	6.3kV DC
Testing Voltage (T.V)	R.V x 2	R.V x 1.75	R.V x 1.5

Insulation Resistance : Min 10,000MΩ at 500 V DC for 1minute

Temperature Characteristics & Dissipation Factor(tanδ) / Q

T.C	SL	R(Y5R)
Change Rate	(20 ~ +85℃) +350 ~ -1000ppm/℃	(-25 ~ +85℃) ± 15% (-25 ~ +125℃) +15 ~ - 30%
Q / D.F	30pF and over : 1000min Less than 30pF : 400+(20xC) min.	0.2%max

Item / R.V	Capacitance(pF) SL	Capacitance(pF) R(Y5R)	Dimensions(mm) Dmax	Tmax	F ±1.0	Ød±0.05	Part No. (How to order)	Marking
1KV DC	10, 12, 15, 18, 20, 22, 24, 27 30, 33, 39, 43, 47, 51	100, 150, 220, 270,330, 390	6.3	5.0	5.0	0.50	E△△3A△△△△06△△△	
		470	7.0	5.0	5.0	0.50	E△△3A△△△△07△△△	
	56, 62, 68, 75, 82, 91, 100	560, 680	8.0	5.0	5.0	0.50	E△△3A△△△△08△△△	R 101K 1KV 6.3≤D≤9.0
	110, 120, 150	820, 1000	9.0	5.0	5.0/7.5	0.50/0.60	E△△3A△△△△09△△△	
	180, 200	1200	10.0	5.0	5.0/7.5	0.50/0.60	E△△3A△△△△10△△△	
		1500	11.0	5.0	5.0/7.5	0.50/0.60	E△△3A△△△△11△△△	R 152K 1KV SWC D≥10.0
	220, 240, 270, 300, 330		12.5	5.0	5.0/7.5	0.50/0.60	E△△3A△△△△12△△△	
	390, 430, 470	1800, 2200, 2700	14.0	5.0	10.0	0.60	E△△3A△△△△14△△△	
		3300	15.0	5.0	10.0	0.60	E△△3A△△△△15△△△	
		3900	17.0	5.0	10.0	0.60	E△△3A△△△△17△△△	
		4700	18.0	5.0	10.0	0.60	E△△3A△△△△18△△△	
2KV DC	10, 15, 18, 20, 22, 24, 27, 30 33, 36, 39, 43, 47	100, 120	6.3	5.0	5.0/7.5	0.50/0.60	E△△3D△△△△07△△△	R 101K 2KV 6.3≤D≤9.0
		150, 220, 270	7.0	5.0	5.0/7.5	0.50/0.60	E△△3D△△△△08△△△	
	51, 56, 62, 68, 75, 82, 100	330, 390	8.0	5.0	5.0/7.5/10.0	0.50/0.60	E△△3D△△△△09△△△	
	120, 150		9.0	5.0	5.0/7.5/10.0	0.50/0.60	E△△3D△△△△09△△△	R 152K 2KV SWC D≥10.0
		470, 560, 680	10.0	5.0	5.0/7.5/10.0	0.50/0.60	E△△3D△△△△10△△△	
	180, 200, 220	820, 1000	11.0	5.0	5.0/7.5/10.0	0.50/0.60	E△△3D△△△△11△△△	

High Voltage Ceramic Capacitors(Epoxy Coated Ceramic Capacitors)

Item / R.V	Capacitance(pF)		Dimensions(mm)				Part No. (How to order)	Marking
	SL	R(Y5R)	Dmax	Tmax	F ±1.0	Ød±0.05		
2KV DC	240, 270		12.5	5.0	7.5/10.0	0.60	E△△3D△△△△12△△△	R 101K 2KV 6.3≤D≤9.0
	300, 330, 360		13.5	5.0	7.5/10.0	0.60	E△△3D△△△△13△△△	
	390, 430, 470	1200, 1500	14.5	5.0	7.5/10.0	0.60	E△△3D△△△△14△△△	
		1800, 2200	15.0	5.0	10.0	0.60	E△△3D△△△△15△△△	R 152K 2KV SWC D≥10.0
		2700	17.0	5.0	10.0	0.60	E△△3D△△△△17△△△	
		3300	18.0	5.0	10.0	0.60	E△△3D△△△△18△△△	
3.15KV DC		150, 180, 220, 270	7.0	6.0	5.0/7.5	0.50/0.60	E△△3F△△△△07△△△	
	3, 5, 6, 10, 12, 15, 27, 33	330, 390	8.0	6.0	5.0/7.5	0.50/0.60	E△△3F△△△△08△△△	R 151K 3KV 6.3≤D≤9.0
	82	470, 560, 680	10.0	6.0	7.5/10.0	0.60	E△△3F△△△△10△△△	
		820, 1000	12.5	6.0	7.5/10.0	0.60	E△△3F△△△△12△△△	
		1200, 1500	14.0	6.0	7.5/10.0	0.60	E△△3F△△△△14△△△	R 152K 3KV SWC D≥10.0
		1800	16.0	6.0	10.0	0.60	E△△3F△△△△16△△△	
		2200, 2700	18.0	6.0	10.0	0.60	E△△3F△△△△18△△△	
6.3KV DC		150, 180, 220, 270	7.0	6.0	7.5/10.0	0.60	E△△3J△△△△07△△△	
	3, 5, 6	330, 390	8.0	6.0	7.5/10.0	0.60	E△△3J△△△△08△△△	
	10, 12, 15, 22, 27, 33		9.0	6.0	7.5/10.0	0.60	E△△3J△△△△09△△△	
	39		9.5	6.0	7.5/10.0	0.60	E△△3J△△△△09△△△	R 151K 6KV 6.3≤D≤9.0
	54	470, 560, 680	10.0	6.0	7.5/10.0	0.60	E△△3J△△△△10△△△	
		820, 1000	12.5	6.0	10.0	0.60	E△△3J△△△△12△△△	
	100		13.0	6.0	10.0	0.60	E△△3J△△△△13△△△	R 152K 6KV SWC D≥10.0
	120	1200, 1500	14.0	6.0	10.0	0.60	E△△3J△△△△14△△△	
	150		15.0	6.0	10.0	0.60	E△△3J△△△△15△△△	
		1800	16.0	6.0	10.0	0.60	E△△3J△△△△16△△△	
		2200, 2700	18.0	6.0	10.0	0.60	E△△3J△△△△18△△△	

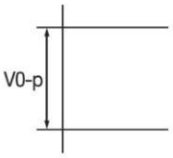
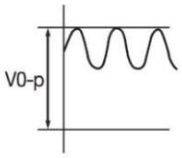
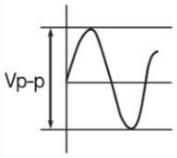
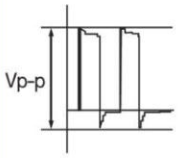
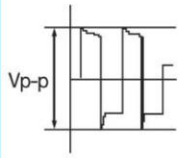
Notices:

Caution(Rating)

1. Operating Voltage

When DC-rated capacitors are to be used in ac or ripple current circuits, be sure to maintain the Vp-p value of the applied voltage or the $V_{0\text{-}p}$ which contains dc bias within the rated voltage range.
When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

When using the series in a high-frequency and high-voltage circuit, be sure to read the instructions in item 4.

Voltage	DV Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage(1)	Pulse Voltage(2)
Positional Measurement					

2. Operating Temperature And Self-Generated Heat(Apply to B/E/F/SL/R char.)

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high frequency current, pulse current or similar current, it may self-generate heat due to dielectric loss. The applied voltage load should be such that the capacitor's self-generated heat is within 20°C (5°C for SL Series) at an atmosphere temperature of 25°C. When measuring, use a thermocouple of small thermal capacity-k of ∅0.1mm in conditions where the capacitor is not affected by radiant heat from other components or surrounding ambient fluctuations.
Excessive heat may lead to deterioration of the capacitor's characteristics and reliability.
(Never attempt to perform measurement with the cooling fan running. otherwise, accurate measurement cannot be ensured.)

3. Fail-Safe

When capacitor is broken, failure may result in a short circuit. Be sure to provide an appropriate fail-safe function like a fuse on your product if failure would follow an electric shock, fire or fume.

Note : details information refer to approval sheet or contact engineer.

Safety Standard Recognized Ceramic Capacitors

Specification

Temp. Range : −25 ~ +85℃(Y class)

Operating Temperature Range : −25 ~ +125℃

Capacitance : Measured at 1kHz, 1 Vrms and 20℃ ± 2℃ (B, E, F type)

Measured at 1MHz, 1 Vrms and 20℃ ± 2℃ (O(=SL) type)

Testing Voltage

Rating Voltage (R.V)	250 Vac	400Vac
Testing Voltage (T.V)	2500 Vac	4000Vac

Insulation Resistance: Min 10,000MΩ at 500V DC for 1 minute.

Dissipation Factor(tanδ)

T.C	O(=SL)	B	E	Fz
tanδ/Q	30pF and over : 1000min Less than 30pF : 400+(20xC) min.	2.5% Max.	2.5% Max.	5.0% Max.

How to Order(Product Identification)

SC B 2E 101 K 08 FF 7

1 2 3 4 5 6 7 8

1. Type
2. Temperature Characteristic
3. Voltage
4. Capacitance
5. Capacitance Tolerance
6. Disc Size
7. Packing and Lead Style
8. Lead Spacing & Pitch of Component

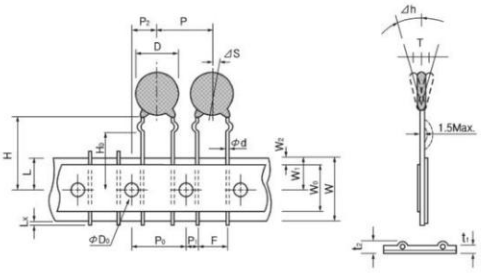
Specification

Type	Temp char.	Capacitance (pF)	Size Dmax	Tmax	F (±1.0)	Ød(±0.05)	Marking
SC	B	100, 150, 220, 330, 390, 470, 560	8.0	6.0	7.5 10.0	0.60	SC101K A X1Y2 10 250~ SWC
		680	9.0				
		820, 1000	10.0				
	E	1000	7.0				
		1500	9.0				
		1800, 2200	10.0				
		3300	12.5				
		3900	13.0				
		4700	14.0				
	F	3300	9.0				
		4700	10.0				
		6800	11.0				
		10000	14.0				
	O(=SL)	10,22, 33, 47	9.0	7.0	10.0	0.60	SC100K A X1Y2 10 250~ SWC
		56	10.0				
		68	11.0				

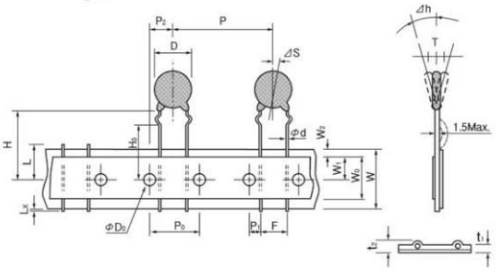
Type	Temp char.	Capacitance (pF)	Size				Marking
			Dmax	Tmax	F (±1.0)	Ød(±0.05)	
SD	B	100, 150, 220, 330, 390, 470, 560, 680	10.0	7.0	10.0	0.60	SD101K A X1Y1 10 400~ SWC
	E	1000	8.0				
		1500	9.0				
		2200	12.5				
		3300	14.0				
		3900, 4700	15.0				
	O(=SL)	10, 22, 33, 47	9.5	6.0	10.0	0.60	SD560K A X1Y1 10 400~ SWC
		56	10.5				
		68	11.5				

Safety Standard Recognized Ceramic Capacitors

FF7 Type



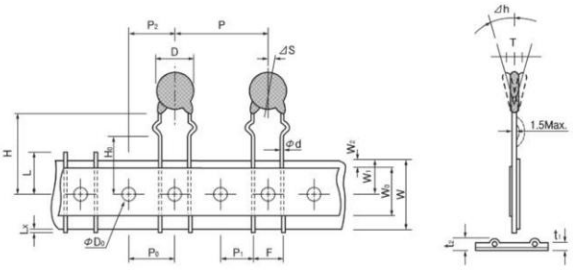
FF8 Type



Unit : mm

Item	Code	Taping Specification			
		FF7	FF8	FF1	FF2
Body Diameter	D	6.3~14.0	15.0~20.0	6.3~20.0	6.3~20.0
Body Thickness	T	6.0 max	6.0 max	7.0 max	7.0 max
Lead Diameter	Ød	0.6±0.05	0.6±0.05	0.6 ±0.05	0.6±0.05
Pich of sprocket Hole	P0	15.0±0.3	15.0±0.3	12.7±0.3	15.0±0.3
Pitch of Component	P	15.0±1.0	30.0±1.0	25.4±1.0	30.0±1.0
Lead Length from Hole Center Lead	P1	3.75±1.0	3.75±1.0	7.7±1.0	10.0±1.0
Lead Length from Hote Center to Component Center	P2	7.5±1.5	7.5±1.5	12.7±1.5	15.0±1.5
Lead Spacing	F	7.5±1.0	7.5±1.0	10.0±1.0	10.0±1.0
Deviation Along Tape Left or Right	△S	0±1.0	0±1.0	0±1.0	0±1.0
Deviation Across Tape	△H	0±2.0	0±2.0	0±2.0	0±2.0
Carrier Tape Width	W	18.0 $^{+1.0}_{-0.5}$	18.0 $^{+1.0}_{-0.5}$	18.0 $^{+1.0}_{-0.5}$	18.0 $^{+1.0}_{-0.5}$
Hold Down Tape Width	W_0	8.0 min	8.0 min	8.0 min	8.0 min
Position of Sprocket Hole	W_1	9.0±0.5	9.0±0.5	9.0±0.5	9.0±0.5
Hole Down Tape Position	W_2	3.0 max	3.0 max	3.0 max	3.0 max
Height of Component From Hole Center	H	20.0 $^{+1.5}_{-1.0}$	20.0 $^{+1.5}_{-1.0}$	20.0 $^{+1.5}_{-1.0}$	20.0 $^{+1.5}_{-1.0}$
Lead-Wire Clinch Height	H_0	16.0±0.5	16.0±0.5	16.0±0.5	16.0±0.5
Diameter of Sprocket Hole	$ØD_0$	4.0±0.2	4.0±0.2	4.0±0.2	4.0±0.2
Total Taps Thickness	t_1	0.7±0.2	0.7±0.2	0.7±0.2	0.7±0.2
Total Thickness. Tape and Lead Wire	t_2	1.7 max	1.7 max	1.7 max	1.7 max
Lead Wire Protrtsion	Lx	1.0 max	1.0 max	1.0 max	1.0 max

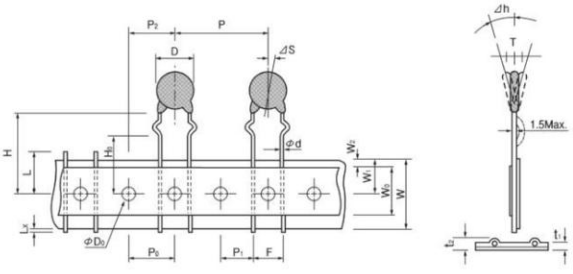
FF1 Type



SC Type : Rating Voltage AC 250V, X1 and Y2 Testing Voltage AC 2500V

UL	File No. E97754
VDE	File No. 40015805
CSA	File No. 2476563
CQC	File No. 10001054594
KTL	File No. SU03004-16001 / SU03004-16003
ENEC	File No. ENEC FI 2016053

FF2 Type



SD Type : Rating Voltage AC 250/440V, X1 and Y1 Testing Voltage AC 4000V

UL	File No. E97754
VDE	File No. 40015804
CSA	File No. 2476564
CQC	File No. 10001054593
KTL	File No. SU03004-16002 / SU03004-16004
ENEC	File No. ENEC FI 2016053

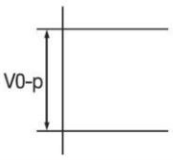
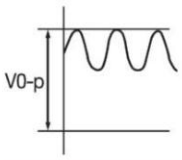
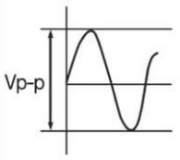
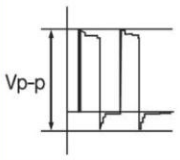
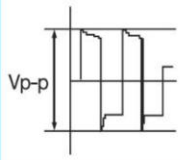
Notices:

Caution(Rating)

1. Operating Voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the V_{p-p} value of the applied voltage or the V_{0-p} that contains DC bias within the rated voltage range.

When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

Voltage	DV Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage(1)	Pulse Voltage(2)
Positional Measurement					

2. Operating Temperature And Self-Generated Heat (Apply to B/E/F/SL char.)

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high frequency current, pulse current or similar current, it may have self-generated heat due to dielectric loss. Applied voltage load should be such that self-generated heat is within 20°C (5°C for SL) under the condition where the capacitor is subjected to an atmospheric temperature of 25°C. When measuring, use a thermocouple of small thermal capacity-K of Ø0.1mm under conditions where the capacitor is not affected by radiant heat from other components or wind from surroundings. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

3. Fail-Safe

1) Test Equipment

Test equipment for AC withstanding voltage should be used with the performance of the wave similar to 50/60Hz sine wave.

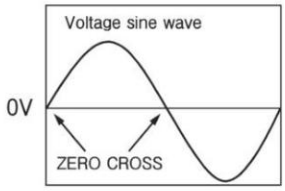
If the distorted sine wave or overload exceeding the specified voltage value is applied, a defect may be caused.

2) Voltage Apply Method

When the withstanding voltage is applied, the capacitor's lead or terminal should be firmly connected to the output of the withstanding voltage test equipment, and then the voltage should be raised from near zero to the test voltage. If the test voltage without the raise from near zero voltage would be applied directly to capacitor, test voltage should be applied with the zero cross. At the end of the test time, the test voltage should be reduced to near zero, and then capacitor's lead or terminal should be taken off the output of the withstanding voltage test equipment.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, the surge voltage may rise, and therefore, a defect may be caused.

*ZERO CROSS is the point where voltage sine wave passes 0V. See the figure at below.



4. Fail-Safe

When the capacitor is broken, failure may result in a short circuit. Be sure to provide an appropriate fail-safe function like a fuse on your product if failure could result in an electric shock, fire or fuming.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

Caution(Storage and Operating Condition)

Operating and Storage Environment.

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulphide gas, acid, alkali, salt or the like present. Also avoid exposure to moisture. Before cleaning, bonding or moulding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or moulded product in the intended equipment.

Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 degrees centigrade and 15 to 85%. Use capacitor within 6 months after delivery, check the solderability after 6 months or more.

Caution(Soldering and Mounting)

1. Vibration and Impact.

Do not expose a capacitor or its lead wires to excessive shock or vibration during use.

Excessive shock or vibration may cause fatigue destruction of lead wires mounted on the circuit board. Please take measures to hold a capacitor on the circuit boards by adhesive, moulding resin or another coating.

2. Soldering.

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specifications of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

Soldering the capacitor with a soldering iron should be performed in the following conditions.

Temperature of iron-tip: 400 degrees C. max.

Soldering iron wattage: 50W max.

Soldering time: 3.5 sec. max.

3. Bonding, Resin Molding and Coating.

For bonding, molding or coating this product, verify that these processes do not affect the quality of the capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.
When the amount of applications, dryness/hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc). are unsuitable, the outer coating resin of a capacitor is damaged by the organic solvents and it may result, worst case, in a short circuit. The variation in thickness of adhesive, molding resin or coating may cause outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

4. Treatment after Bonding, Resin Molding and Coating

When the outer coating is hot (over 100 degrees C.) after soldering, it becomes soft and fragile. Therefore, please be careful not to give it mechanical stress.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

Caution((Handling)

Vibration Impact

Do not expose a capacitor or its lead wires to excessive shock or vibration during use.
Excessive shock or vibration may cause fatigue destruction of lead wires mounted on the circuit board. Please take measures to hold a capacitor on the circuit boards by adhesive, molding resin or another coating.
Please confirm there is no influence of holding measures on the product with the intended equipment.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

Notice (Soldering and Mounting)

Cleaning (ultrasonic cleaning)
To perform ultrasonic cleaning, observe the following conditions.
Rinse bath capacity : output of 20 watts per litre or less.
Rinsing time : 5 min. maximum
Do not vibrate the PCB/PWB directly
Excessive ultrasonic cleaning may lead to fatigue destruction the lead wires.

Notice(Rating)

1. For SL char.

Capacitance might change a little depending on a surrounding temperature or an applied voltage.
Please contact us if you use a strict constant time circuit.

2. Capacitance Change of Capacitor (for B/E/F char.).

Capacitor have an aging characteristics, whereby the capacitor continually decreases its capacitance slightly if the capacitor is left on for a long time. Moreover, capacitance might change greatly depending on the surrounding temperature or an applied voltage.
Therefore, it is not likely to be suitable for use in constant time circuit.

3. Performance Check by Equipment.

Before using capacitor, check that there is no problem in the equipment's performance and the specification.
Generally speaking, ceramic capacitors have voltage dependence characteristics and temperature dependence characteristics in capacitance, so the capacitance value may change depending on the operating condition in the equipment. Therefore, be sure to confirm the apparatus performance of receiving influence in the capacitance value change of capacitor, such as leakage current and noise suppression characteristics.
Moreover, check the surge-proof ability of a capacitor in the equipment, if needed, because the surge voltage may exceed specific value by the inductance of the circuit.

Ultra High Voltage (UHV) Ceramic Capacitor

Introduction

SAMWHA UHV (Ultra High Voltage) Ceramic Capacitor series uses the line up ceramic technology for long life and high reliability in application such as SMPS (X-ray equipment, TV and monitors, DC pulse high voltage) for power electronics.

Various disc types cover a wide range of capacitances and voltages as shown in the following table. Specific properties depend on the dielectric material used. Please consult with SAMWHA for special requirements

Features

- Wide rated voltage range, wide nominal capacitance range
- Flame-retardant insulating coating applied

Applications

- Filter circuit of high voltage power
- High voltage circuit of TV set and monitor
- High voltage circuit of various electronic equipment's
- X-Ray equipment
- DC Pulse High Voltage

How to Order

EK	B	4C	102	K	18	D	S	2
1	2	3	4	5	6	7	8	9

1 Type & Class

EK : High Dielectric Type (Class II)

EC : Temperature Compensating Type (Class I)

2 Temperature Characteristics

Temp. Char.	Operating Temp.	Temp. Range (TCC)	Change Rate (△C)
B (Y5P)	-25℃ ~ +85℃	-25℃ ~ +85℃	-10% ~ +10%
E (Y5U)	-25℃ ~ +85℃	-25℃ ~ +85℃	-56% ~ +22%
F (Y5V)	-25℃ ~ +85℃	-25℃ ~ +85℃	-82% ~ +22%
R (Y5R)	-25℃ ~ +85℃	-25℃ ~ +85℃	-15% ~ +15%
O (SL)	-25℃ ~ +85℃	+20℃ ~ +85℃	+350 ~ -1000ppm/℃
N (N4700)	-25℃ ~ +85℃	+20℃ ~ +85℃	-4700±1000ppm/℃

3 Rating Voltage

Code	Rating Voltage (R.V)	Testing Voltage (In Silicon Oil)
4A	10 kV	R.V x 150%
4C	15 kV	R.V x 150%
4D	20 kV	R.V x 130%

4 Capacitance

In Pico Farads. The first two digits indicate significant digits. The 3rd digits indicate the number of zero following.

For example :220 = 22pF, 221 = 220pF, 222 = 2200pF

5 Tolerance

Mark	K	M	Z
Cap Tolerance	±10%	±20%	-20% ~ +80%

6 Disc Diameter

Code	8	9	10	11	12	13	14	15	16	17	18	19	20	22	23
Max Dia.(Ømm)	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5	22.5	23.5

7 8 Packing Style & Lead Variation

Packing Style		Lead Variation	
B	Bulk	S	Straight Long Type
		W	Kink Short Type
		N	Straight Short Type
D	Double Kink	S	Straight Long Type

9 Lead Spacing & Pitch of Components

Bulk Type	
Code	Lead Spacing (mm)
1	10.0
2	12.5
3	15.0

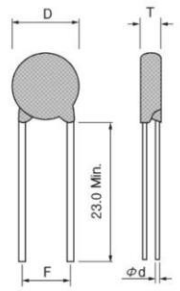
Typical Performance Characteristics

Char.	B (Y5P)	E (Y5U)	F (Y5V)	R (Y5R)	O (SL)	N (4700)
Temp. Range (TCC)	-25°C~ +85°C	-25°C~ +85°C	-25°C~ +85°C	-25°C~ +85°C	+20°C ~ +85°C	+20°C ~ +85°C
Temperature Coefficient	-10% ~ +10%	-56% ~ +22%	-82% ~ +22%	-15% ~ +15%	+350 ~ -1000ppm	-4700±1000ppm
Dissipation Factor	tgδ≤2.5%	tgδ≤3.5%	tgδ≤3.5%	tgδ≤0.2%	C<30pF, Q≥400+20C C≥30pF, Q≥1000	tgδ≤1.0%
Insulation Resistance	Charge at 500VDC for 60 seconds, Min 10,000 MΩ					
Rated Voltage (RV)	10 ~ 15kVdc	10 ~ 15kVdc	10 ~ 15kVdc	10 ~ 15kVdc	10 ~ 20kVdc	10 ~ 15kVdc

Packing Style

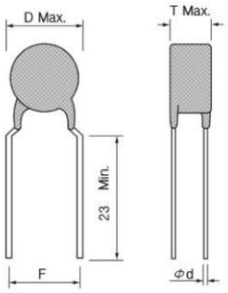
Long Type

BS



Bulk Long Straight

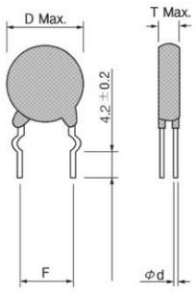
DS



Double Kink
Straight Long

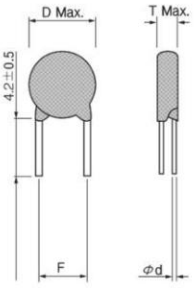
Short Type

BW



Kink Short

BN



Straight Short

Specifications

10kVDC

TCC	Cap. (pF)	TOL. (%)	D Dmax(mm)	T Tmax(mm)	F(LS) mm	WIRE SIZE ORDERING mm	Size Code
B(Y5P) -25~85℃ ±10%	100	±10%	10.5	8.5	10±2.0	0.80±0.05	10
	150	±10%	10.5	8.5	10±2.0	0.80±0.05	10
	220	±10%	10.5	8.5	10±2.0	0.80±0.05	10
	270	±10%	11.5	8.5	10±2.0	0.80±0.05	11
	330	±10%	12.5	8.5	10±2.0	0.80±0.05	12
	470	±10%	14.5	8.5	10±2.0	0.80±0.05	14
	560	±10%	14.5	8.5	10±2.0	0.80±0.05	14
	680	±10%	14.5	8.5	10±2.0	0.80±0.05	14
	1000	±10%	16.5	8.5	10±2.0	0.80±0.05	16
	2000	±20%	18.5	8.5	10±2.0	0.80±0.05	18
E(Y5U) -25~85℃ +22~-56%	1000	±20%	11.5	9.0	10±2.0	0.80±0.05	11
	2000	±20%	14.5	9.0	10±2.0	0.80±0.05	14
	2200	±20%	15.5	9.0	10±2.0	0.80±0.05	15
	3300	±20%	20.5	9.0	10±2.0	0.80±0.05	20
	4700	±20%	22.5	9.0	10±2.0	0.80±0.05	22
F(Y5V) -25~85℃ +22~-82%	1000	±20%	10.5	9.0	10±2.0	0.80±0.05	10
	2000	±20%	12.5	9.0	10±2.0	0.80±0.05	12
	2200	±20%	13.5	9.0	10±2.0	0.80±0.05	13
	3300	±20%	15.5	9.0	10±2.0	0.80±0.05	15
	4700	±20%	18.5	9.0	10±2.0	0.80±0.05	18
	1000	+80~-20%	10.5	9.0	10±2.0	0.80±0.05	10
	2000	+80~-20%	12.5	9.0	10±2.0	0.80±0.05	12
	2200	+80~-20%	13.5	9.0	10±2.0	0.80±0.05	13
	3300	+80~-20%	15.5	9.0	10±2.0	0.80±0.05	15
	4700	+80~-20%	18.5	9.0	10±2.0	0.80±0.05	18
SL +20~85℃ +350~-1000ppm	10	±10%	9.5	8.5	10±2.0	0.80±0.05	9
	15	±10%	9.5	8.5	10±2.0	0.80±0.05	9
	20	±10%	9.5	8.5	10±2.0	0.80±0.05	9
	22	±10%	10.5	8.5	10±2.0	0.80±0.05	10
	27	±10%	10.5	8.5	10±2.0	0.80±0.05	10
	33	±10%	11.5	8.5	10±2.0	0.80±0.05	11
	47	±10%	12.5	8.5	10±2.0	0.80±0.05	12
	56	±10%	13.5	8.5	10±2.0	0.80±0.05	13
	68	±10%	14.5	8.5	10±2.0	0.80±0.05	14
	82	±10%	16.5	8.5	10±2.0	0.80±0.05	16
	100	±10%	18.5	8.5	10±2.0	0.80±0.05	18
R(Y5R) -25~85℃ ±15%	100	±10%	9.5	8.5	10±2.0	0.80±0.05	9
	150	±10%	9.5	8.5	10±2.0	0.80±0.05	9
	220	±10%	10.5	8.5	10±2.0	0.80±0.05	10
	330	±10%	12.5	8.5	10±2.0	0.80±0.05	12
	470	±10%	14.5	8.5	10±2.0	0.80±0.05	14
	680	±10%	14.5	8.5	10±2.0	0.80±0.05	14
	1000	±10%	17.5	8.5	10±2.0	0.80±0.05	17

10kVDC

TCC	Cap. (pF)	TOL. (%)	D Dmax(mm)	T Tmax(mm)	F(LS) mm	WIRE SIZE ORDERING mm	Size Code
N(N4700) +20~85℃ -4700±1000ppm	100	±10%	8.5	7.0	10±2.0	0.80±0.05	8
	150	±10%	8.5	7.0	10±2.0	0.80±0.05	8
	220	±10%	9.5	7.0	10±2.0	0.80±0.05	9
	330	±10%	10.5	7.0	10±2.0	0.80±0.05	10
	470	±10%	12.5	7.0	10±2.0	0.80±0.05	12
	680	±10%	13.5	7.0	10±2.0	0.80±0.05	13
	1000	±10%	16.5	7.0	10±2.0	0.80±0.05	16

15kVDC

TCC	Cap. (pF)	TOL. (%)	D Dmax(mm)	T Tmax(mm)	F(LS) mm	WIRE SIZE ORDERING mm	Size Code
B(Y5P) -25~85℃ ±10%	100	±10%	10.5	10.0	12.5±2.0	0.80±0.05	10
	150	±10%	10.5	10.0	12.5±2.0	0.80±0.05	10
	220	±10%	11.5	10.0	12.5±2.0	0.80±0.05	11
	270	±10%	11.5	10.0	12.5±2.0	0.80±0.05	11
	330	±10%	12.5	10.0	12.5±2.0	0.80±0.05	12
	470	±10%	14.5	10.0	12.5±2.0	0.80±0.05	14
	560	±10%	14.5	10.0	12.5±2.0	0.80±0.05	14
	680	±10%	17.5	10.0	12.5±2.0	0.80±0.05	17
	1000	±10%	18.5	10.0	12.5±2.0	0.80±0.05	18
E(Y5U) -25~85℃ +22~-56%	1000	±20%	11.5/15.5	10.0	12.5±2.0	0.80±0.05	11/15
	2000	±20%	15.5	10.0	12.5±2.0	0.80±0.05	15
	2200	±20%	16.5	10.0	12.5±2.0	0.80±0.05	16
	2400	±20%	17.5	10.0	12.5±2.0	0.80±0.05	17
	3300	±20%	20.5	10.0	12.5±2.0	0.80±0.05	20
	4700	±20%	23.5	10.0	12.5±2.0	0.80±0.05	23
F(Y5V) -25~85℃ +22~-82%	1000	±20%	11.5	10.0	12.5±2.0	0.80±0.05	11
	2000	±20%	14.5	10.0	12.5±2.0	0.80±0.05	14
	2200	±20%	16.5	10.0	12.5±2.0	0.80±0.05	16
	3300	±20%	17.5	10.0	12.5±2.0	0.80±0.05	17
	4700	±20%	0.5	10.0	12.5±2.0	0.80±0.05	20
	1000	+80~-20%	11.5	10.0	12.5±2.0	0.80±0.05	11
	2000	+80~-20%	14.5	10.0	12.5±2.0	0.80±0.05	14
	2200	+80~-20%	16.5	10.0	12.5±2.0	0.80±0.05	16
	3300	+80~-20%	17.5	10.0	12.5±2.0	0.80±0.05	17
	4700	+80~-20%	20.5	10.0	12.5±2.0	0.80±0.05	20
SL +20~85℃ +350~-1000ppm	12	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	15	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	20	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	22	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	27	±10%	11.5	9.0	12.5±2.0	0.80±0.05	11
	33	±10%	12.5	9.0	12.5±2.0	0.80±0.05	12

15kVDC

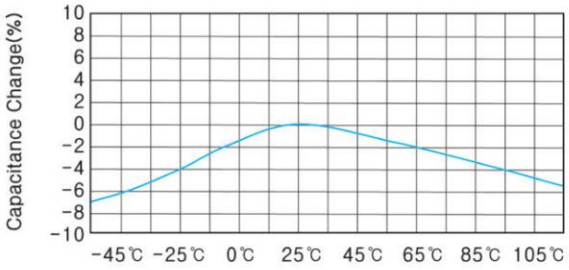
TCC	Cap. (pF)	TOL. (%)	D Dmax(mm)	T Tmax(mm)	F(LS) mm	WIRE SIZE ORDERING mm	Size Code
SL +20~85℃ +350~-1000ppm	47	±10%	13.5	9.0	12.5±2.0	0.80±0.05	13
	56	±10%	14.5	9.0	12.5±2.0	0.80±0.05	14
	68	±10%	16.5	9.0	12.5±2.0	0.80±0.05	16
	82	±10%	17.5	9.0	12.5±2.0	0.80±0.05	17
R(Y5R) -25~85℃ ±15%	100	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	150	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	220	±10%	11.5	9.0	12.5±2.0	0.80±0.05	11
	330	±10%	14.5	9.0	12.5±2.0	0.80±0.05	14
	470	±10%	14.5	9.0	12.5±2.0	0.80±0.05	14
	680	±10%	17.5	9.0	12.5±2.0	0.80±0.05	17
	1000	±20%	20.5 / 24.5	9.0	12.5±2.0	0.80±0.05	20 / 24
N(N4700) +20~85℃ -4700±1000ppm	100	±10%	8.5	9.0	10.0±2.0	0.80±0.05	8
	150	±10%	9.5	9.0	10.0±2.0	0.80±0.05	9
	220	±10%	12.5	9.0	10.0±2.0	0.80±0.05	12
	330	±10%	14.5	9.0	10.0±2.0	0.80±0.05	14
	470	±10%	15.5	9.0	10.0±2.0	0.80±0.05	15
	680	±10%	15.5	9.0	10.0±2.0	0.80±0.05	15
	1000	±10%	18.5/21.5	10.0	12.5±2.0	0.80±0.05	18/21

20kVDC

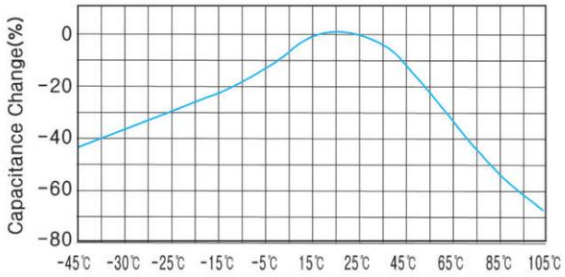
TCC	Cap. (pF)	TOL. (%)	D Dmax(mm)	T Tmax(mm)	F(LS) mm	WIRE SIZE ORDERING mm	Size Code
E(Y5U) -25~+85℃ +22~-56%	2200	±20%	19.5	10.0	15±2.0	0.80±0.05	19
SL +20~85℃ +350~-1000ppm	15	±10%	12.5	10.0	15±2.0	0.80±0.05	12
	20	±10%	12.5	10.0	15±2.0	0.80±0.05	12
	22	±10%	12.5	10.0	15±2.0	0.80±0.05	12
	27	±10%	12.5	10.0	15±2.0	0.80±0.05	12
	33	±10%	13.5	10.0	15±2.0	0.80±0.05	13
	47	±10%	13.5	10.0	15±2.0	0.80±0.05	13
	56	±10%	15.5	10.0	15±2.0	0.80±0.05	15
	68	±10%	17.5	10.0	15±2.0	0.80±0.05	17
	82	±10%	18.5	10.0	15±2.0	0.80±0.05	18

Typical Characteristics Graph

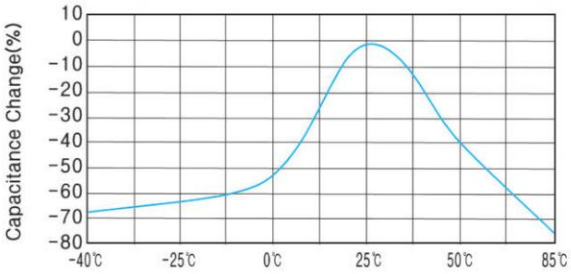
Temperature Characteristics Curve - B(Y5P)



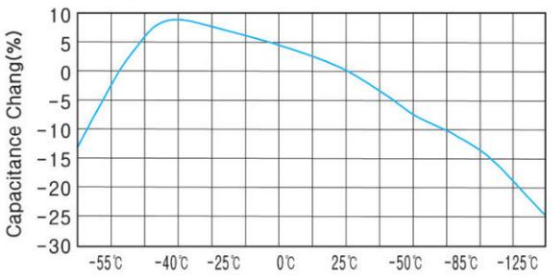
Temperature Characteristics Curve - E(Y5U)



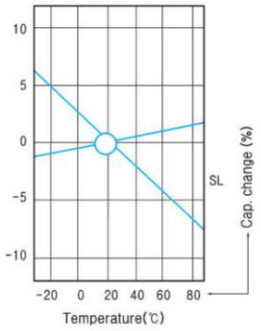
Temperature Characteristics Curve - F(Y5V)



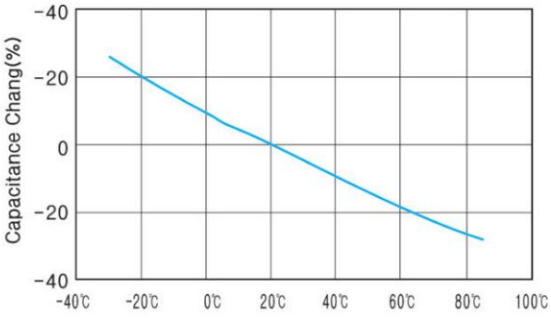
Temperature Characteristics Curve - R(Y5R)



Temperature Characteristics Curve - O(SL)



Temperature Characteristics Curve - N(N4700)

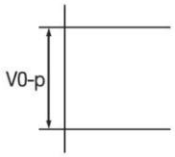
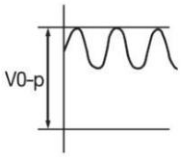
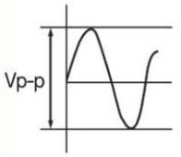
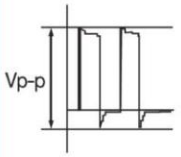
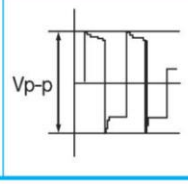


Caution/Notice

Caution (Rating)

1. Operating Voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the Vp-p value of the applied voltage or the Vo-p which contains DC bias within the rated voltage range.
When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

Voltage	DV Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage(1)	Pulse Voltage(2)
Positional Measurement					

2. Temperature and Self-generated Heat

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high frequency current, pulse current or similar current, it may self-generate heat due to dielectric loss.
The applied voltage load should be such that the capacitor's self-generated heat is within 10°C at an atmosphere temperature of 25°C. When measuring, use a thermocouple of small thermal capacity-K of Ø0.1mm in conditions where the capacitor is not affected by radiant heat from other components or surrounding ambient fluctuations. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

Caution/Notice

Caution (Storage and Operation Condition)

Operating and Storage Environment

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture.

The capacitor is designed to be used in insulating media, such as epoxy resin, silicone oil, etc. There must be 3mm or more of insulating media for each direction of the capacitor.

Caution (Soldering and Mounting)

1. Vibration and Impact

Do not expose a capacitor or its leads to excessive shock or vibration during use.

2. Soldering

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

Caution (Handling)

Vibration and Impact

Do not expose a capacitor or its leads to excessive shock or vibration during use.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

Notice (Rating)

Capacitance Change of Capacitor

1. Class 1 Capacitors

Capacitance might change a little depending on the surrounding temperature or an applied voltage. Please contact us if you intend to use this product in a strict time constant circuit.

Before cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment.

Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 degrees centigrade and 15 to 85%. Use capacitors within 6 months after delivered.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

When soldering capacitor with a soldering iron, it should be performed in following conditions.

Temperature of iron-tip: 400 degrees C. max.

Soldering iron wattage : 50W max.

Soldering time : 3.5 sec. max.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

Notice (Soldering and Mounting)

Cleaning (ultrasonic cleaning)

To perform ultrasonic cleaning conditions.

Rinse bath capacity: Output of less.

Rinsing time: 5 min. maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may destruction of the lead wires.

2. Class 2 Capacitors

Class 2 capacitors with temperature characteristics B, E and F have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor is left on for a long time.

Moreover, capacitance might change greatly depending on the surrounding temperature or an applied voltage.

So, it is not likely to be suitable for use in a time constant circuit.

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.

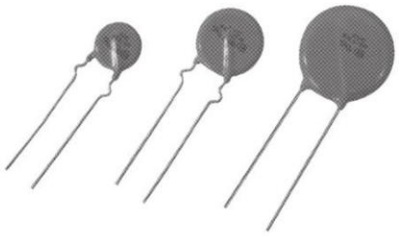
Features

- High discharge current capability up to 4000 Amps.
- Excellent clamping characteristics.
- Fast response time under 50 nanesesconds.
- 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 2 3 4 5 6 7



1 Basic Type
ZnO Varistor

2 Varistor Nominal Voltage
(The first two digit indicate significaticant 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

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				

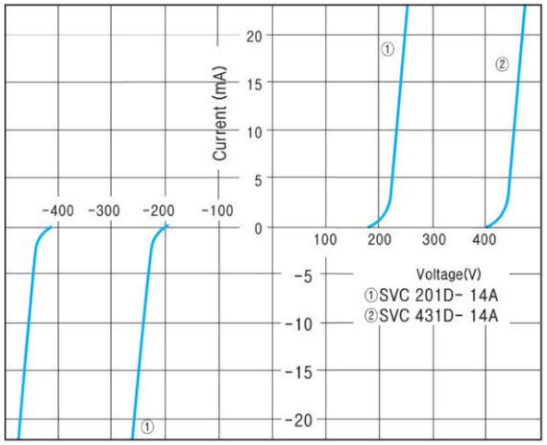
7 Lead Spacing & Pitch of Component (Suffix Code)

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		

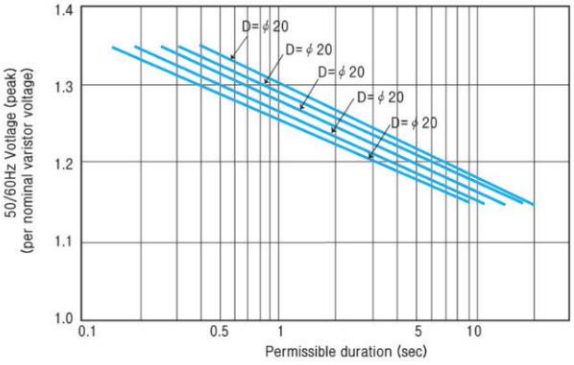
SVC Characteristic Curves

V – I Curve

• Small - current region of V - I curve

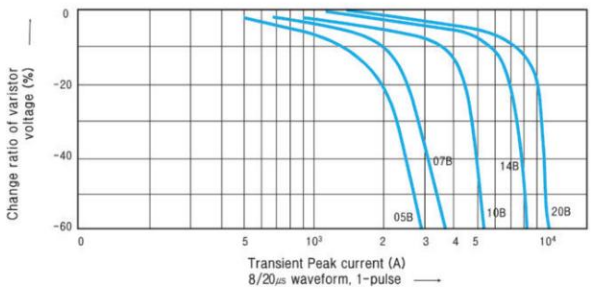


• Temporary power frequency over voltage capability



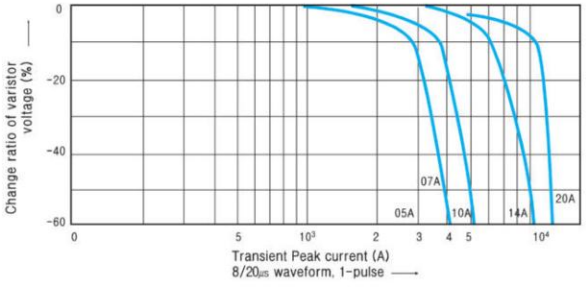
B Type

• 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(8/20μs)	
		RMS 50/60Hz (25℃)	DC (25℃)	Energy	Average Power Dissipation	Peak Current (8/20μs)		Tolerance			
	Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	Itm (Amps)	Vnom (Volts)	Min.(Volts)	Max.(Volts)	Vc (Volts)	Ip (Amps)
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(8/20μs)	
		RMS 50/60Hz (25℃)	DC (25℃)	Energy	Average Power Dissipation	Peak Current (8/20μs)		Tolerance			
	Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	Itm (Amps)	Vnom (Volts)	Min.(Volts)	Max.(Volts)	Vc (Volts)	Ip (Amps)
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(8/20μs)	
		RMS 50/60Hz (25℃)	DC (25℃)	Energy	Average Power Dissipation	Peak Current (8/20μs)		Tolerance			
	Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	Itm (Amps)	Vnom (Volts)	Min.(Volts)	Max.(Volts)	Vc (Volts)	Ip (Amps)
SVC 511D-05A	5	350	460	10.0	0.1	600	510	459	561	875	5
SVC 511D-07A	7			20.0	0.25	1200				840	10
SVC 511D-10A	10			45.0	0.4	2500				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	350	460	10.0	0.1	600	560	504	616	955	5
SVC 561D-07A	7			20.0	0.25	1200				920	10
SVC 561D-10A	10			45.0	0.4	2500				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	385	550	20.0	0.25	1200	620	558	682	1025	10
SVC 621D-10A	10			45.0	0.4	2500				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	420	560	20.0	0.25	1200	680	612	748	1120	10
SVC 681D-10A	10			45.0	0.4	2500				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	460	615	25.0	0.25	1200	750	675	825	1240	10
SVC 751D-10A	10			50.0	0.4	2500				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	485	640	25.0	0.25	1200	780	702	858	1290	10
SVC 781D-10A	10			50.0	0.4	2500				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	510	670	30.0	0.25	1200	820	738	902	1355	10
SVC 821D-10A	10			55.0	0.4	2500				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	550	745	60.0	0.4	2500	910	819	1001	1500	25
SVC 911D-14A	14			120.0	0.6	4500				1500	50
SVC 911D-20A	20			215.0	1.0	6500				1500	100
SVC 102D-10A	10	625	825	65.0	0.4	2500	1000	900	1100	1650	25
SVC 102D-14A	14			130.0	0.6	4500				1650	50
SVC 102D-20A	20			230.0	1.0	6500				1650	100
SVC 112D-10A	10	680	895	70.0	0.4	2500	1100	990	1210	1815	25
SVC 112D-14A	14			140.0	0.6	4500				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 th Vdcm An AC applied voltage(50/60Hz) form a since waveshape. When the distortion in the waveform is extensive make sure that the peak voltage is less than $\sqrt{2}$ times the Vacm.

② Energy : Wtm
Transient energy ratings are given in the Wtm column of the specifications in Joules (watt-second). The rating is themaximum allowable energy with continuous voltage applied. Energy ratings are based on a shift of Vnom of less than 10% of initial value..

③ Transient peak current(Itm)
The peak current rating (Itm) of varistor is based on an 8/20 μs test impulse wave shape. This peak current is the maximum peak current in which nominal varistor voltage shift does not exceed ±10% when the test impulse is applied once at 5 minutes interval

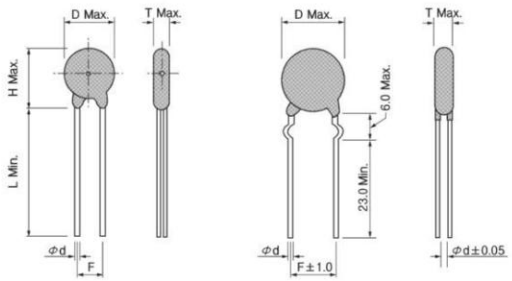
④ Nominal varistor voltage : Vnom
Indicates the varistor terminal voltage measured with a 1mA DC applied. 0.1mA in the case of the 05A and 05B series.

⑤ Maximum clamping voltage : Vc
Indicates the peak teminal voltage measured with an 8/20μs impulse current applied.

- Operating ambient temperature : -40℃ to +85℃
- Storage temperature : -40℃~ +125℃
- 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	Ød±0.05
SVC 180D-05B SVC 220D-05B SVC 270D-05B SVC 330D-05B SVC 390D-05B SVC 470D-05B SVC 560D-05B SVC 680D-05B	7.5	4.5	16.0	23	5.0 (-0.2, +0.8)	0.50/ 0.60
SVC 180D-07B SVC 220D-07B SVC 270D-07B SVC 330D-07B SVC 390D-07B SVC 470D-07B SVC 560D-07B SVC 680D-07B	9.0	4.5	16.0	23	5.0 (-0.2, +0.8)	0.50/ 0.60
SVC 180D-10B SVC 220D-10B SVC 270D-10B SVC 330D-10B SVC 390D-10B SVC 470D-10B SVC 560D-10B SVC 680D-10B	13.5	5.0	22.5	23	7.5±1	0.70
SVC 180D-14B SVC 220D-14B SVC 270D-14B SVC 330D-14B SVC 390D-14B SVC 470D-14B SVC 560D-14B SVC 680D-14B	17.5	5.0	26.0	23	7.5±1	0.70
SVC 180D-20B SVC 220D-20B SVC 270D-20B SVC 330D-20B SVC 390D-20B SVC 470D-20B SVC 560D-20B SVC 680D-20B	23.0	6.0	33.0	23	10.0±1	0.70

A Type

(Unit:mm)

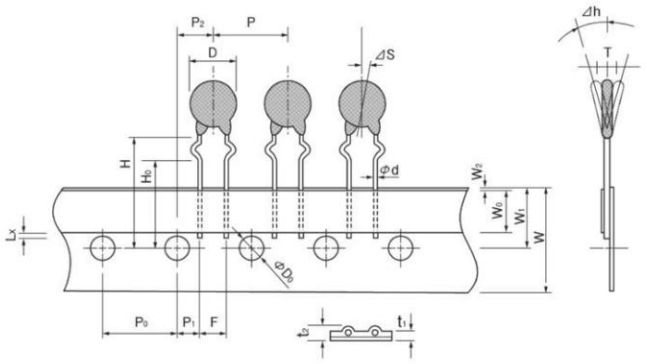
Type	D Max.	T Max.	H Max.	L Min.	F	Ød±0.05
SVC 820D-05A SVC 101D-05A SVC 121D-05A SVC 151D-05A SVC 201D-05A SVC 221D-05A SVC 241D-05A SVC 271D-05A SVC 361D-05A SVC 391D-05A SVC 431D-05A SVC 471D-05A SVC 511D-05A SVC 561D-05A	7.5	4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.5 5.0 5.0 6.0 6.0 6.0 7.5	16.0	23	5.0 (-0.2 +0.8)	0.50/ 0.60

A Type

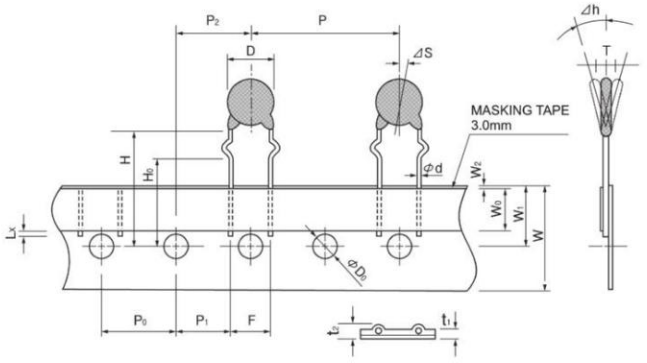
(Unit:mm)

Type	D Max.	T Max.	H Max.	L Min.	F	Ød±0.05
SVC 820D-07A 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	9.0	4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.5 5.0 5.0 6.0 6.0 6.0 7.5 7.5 7.5 8.5 8.5 8.5	18.0	23	5.0 (-0.2 +0.8)	0.50/ 0.60
SVC 820D-10A 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	14.0	4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.5 5.0 5.0 6.0 6.0 6.0 7.5 7.5 7.5 8.5 8.5 8.5 10.5 10.5 10.5	23.0	23	7.5±1	0.70
SVC 820D-14A 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	17.5	4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.5 5.0 5.0 6.0 6.0 6.0 7.5 7.5 7.5 8.5 8.5 8.5 10.5 10.5 10.5 15.5	27.0	23	7.5±1	0.70
SVC 820D-20A 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	14.0	4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.5 5.0 5.0 6.0 6.0 6.0 7.5 7.5 7.5 8.5 8.5 8.5 10.5 10.5 10.5 15.5	34.0	23	10±1	0.80

FF5 Type

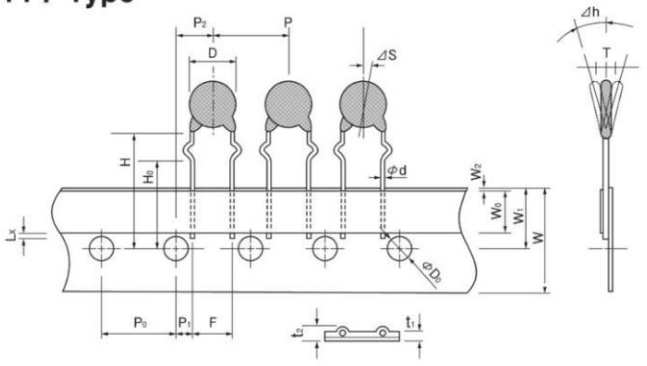


FF9 Type

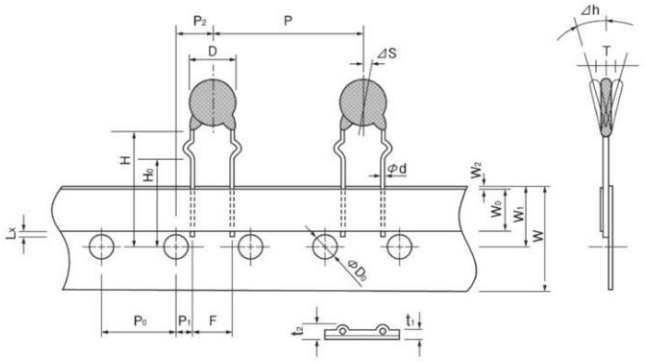


Item	Code	Dimensions(mm)	
		FF5	FF9
Body Diameter	D	See page 119	
Body Thickness	T	See page 119	
Lead Diameter	Ød	0.6±0.05	0.6±0.05
Pitch of sprocket Hole	P_0	12.7±0.3	12.7±0.3
Pitch of Component	P	12.7±1.0	25.4±1.0
Lead Length from Hole Center Lead	P_1	3.85±1.0	8.95±1.0
Lead Length from Hole Center to Component Center	P_2	6.35±1.3	12.7±1.5
Lead Spacing	F	$5.0^{+0.8}_{-0.2}$	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	$18.0^{+1.0}_{-0.5}$	
Hold Down Tape Width	W_0	6.0Min.	8.0Min.
Position of Sprocket Hole	W_1	9.0±0.5	
Hole Down Tape Position	W_2	3.0Max.	
Height of Component From Hole Center	H	$20.0^{+1.5}_{-1.0}$	
Lead-Wire Clinch Height	H_0	16.0±0.5	
Diameter of Sprocket Hole	ØD_0	4.0±0.2	
Total Tape Thickness	t_1	0.7±0.2	
Total Thickness Tape and Lead Wire	t_2	1.7Max.	
Lead Wire Protrtsion	Lx	1.0Max.	

FF7 Type



FF8 Type



Item	Code	Dimensions(mm)	
		FF7	FF8
Body Diameter	D	See page 119	
Body Thickness	T	See page 119	
Lead Diameter	Ød	0.6±0.05	
Pitch of sprocket Hole	P_0	15.0±0.3	
Pitch of Component	P	12.0±1.0	30.0±1.0
Lead Length from Hole Center Lead	P_1	3.75±1.0	
Lead Length from Hole Center to Component Center	P_2	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	$18.0^{+1.0}_{-0.5}$	
Hold Down Tape Width	W_0	8.0Min.	
Position of Sprocket Hole	W_1	9.0±0.5	
Hole Down Tape Position	W_2	3.0Max.	
Height of Component From Hole Center	H	$20.0^{+1.5}_{-1.0}$	
Lead-Wire Clinch Height	H_0	16.0±0.5	
Diameter of Sprocket Hole	ØD_0	4.0±0.2	
Total Tape Thickness	t_1	0.7±0.2	
Total Thickness Tape and Lead Wire	t_2	1.7Max.	
Lead Wire Protrtsion	Lx	1.0Max.	

Characteristics, Curves and Lifetime

Transient V-I Charactic Curves

Current waveform under 10^{-2} A : DC

over 10^{-1} A : 8/20μs

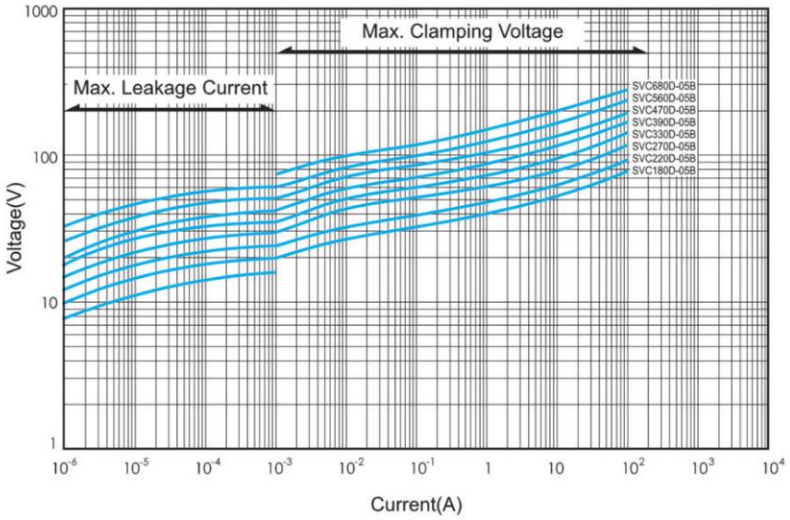
Pulse Lifetime Ratings

Notes : 2-pulse : 5-minute interval

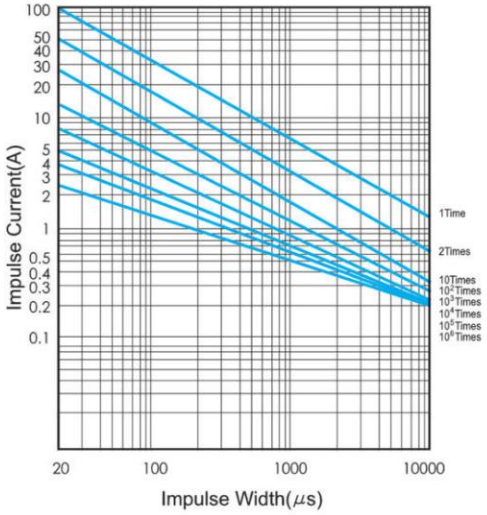
3 to 10-pulse : 2-minute interval

Up to 10^{6} - pulse : 10-second interval

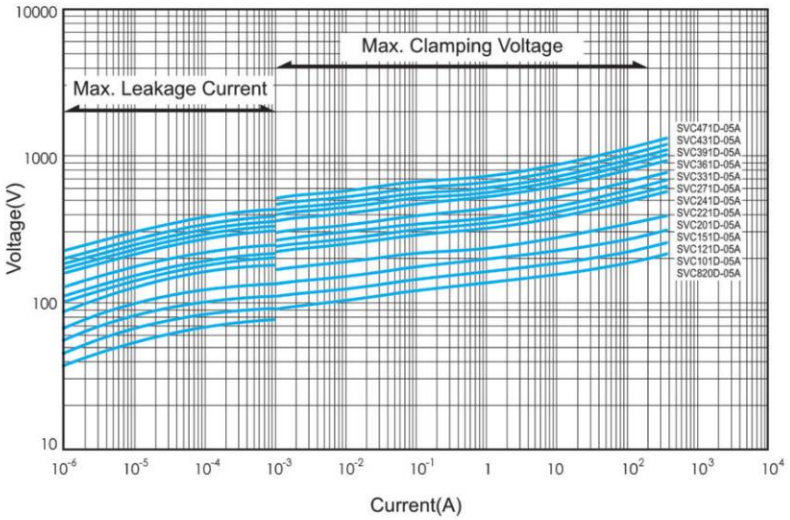
05B(SVC 180D-05B to SVC 680D-05B)



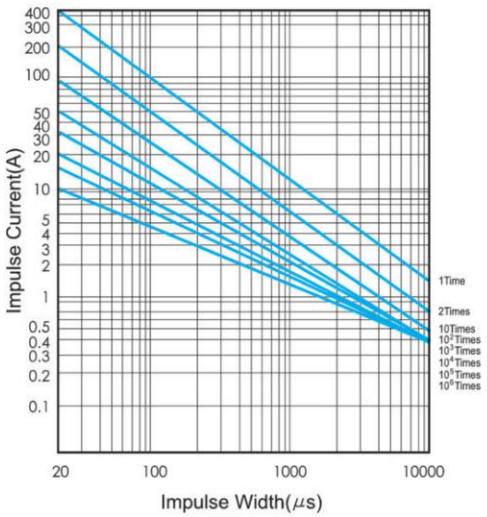
05B(SVC 180D-05B to SVC 680D-05B)



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 : 8/20μs

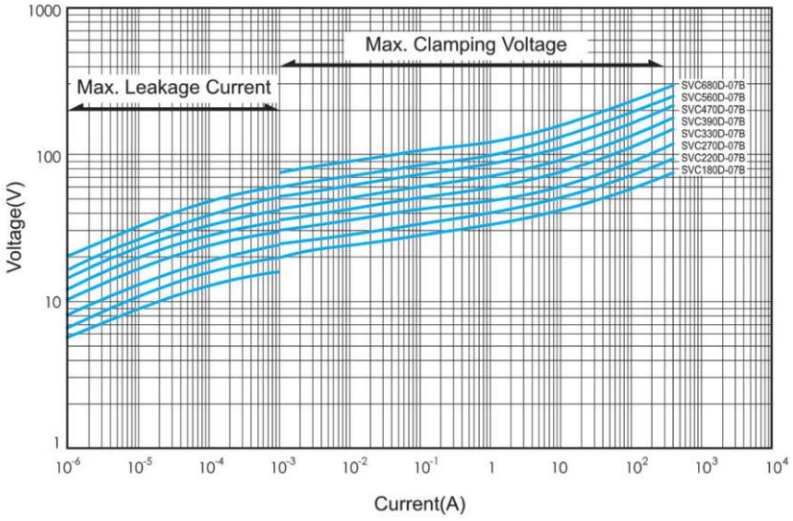
Pulse Lifetime Ratings

Notes : 2-pulse : 5-minute interval

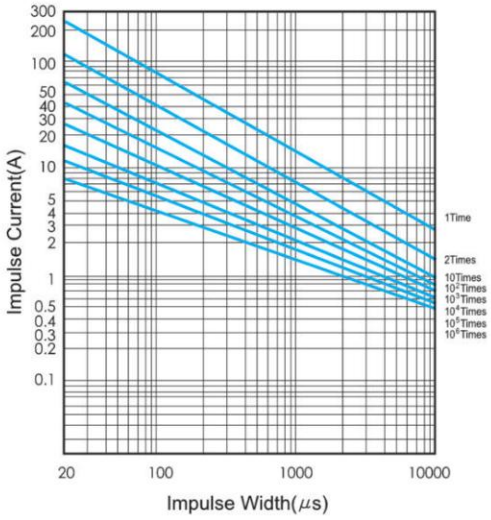
3 to 10-pulse : 2-minute interval

Up to 10^{6}-pulse : 10-second interval

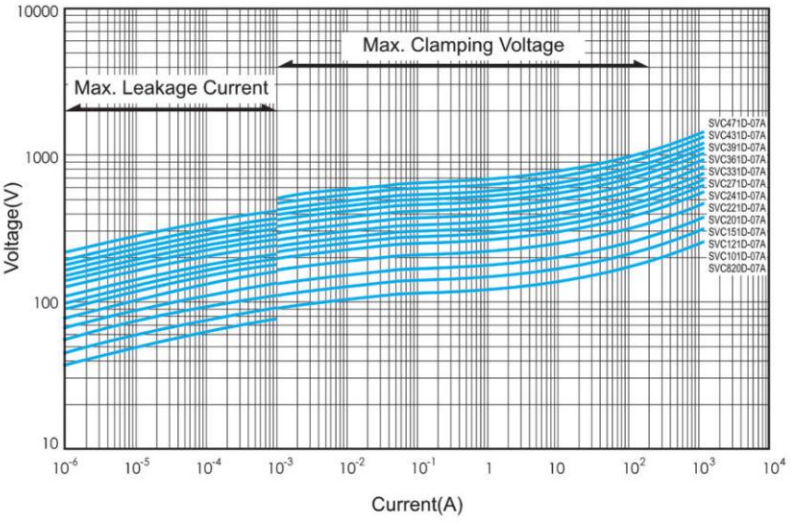
07B(SVC 180D-07B to SVC 680D-07B)



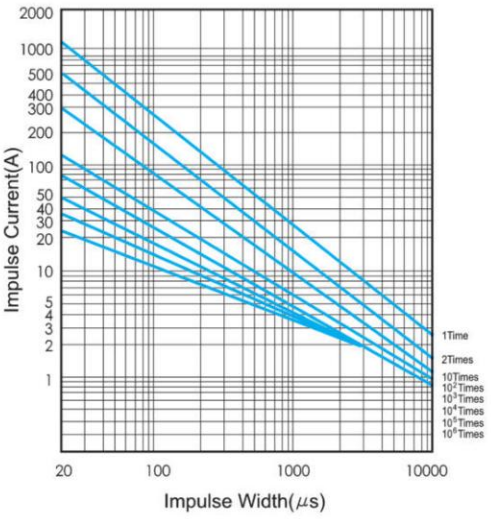
07B(SVC 180D-07B to SVC 680D-07B)



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 : 8/20μS

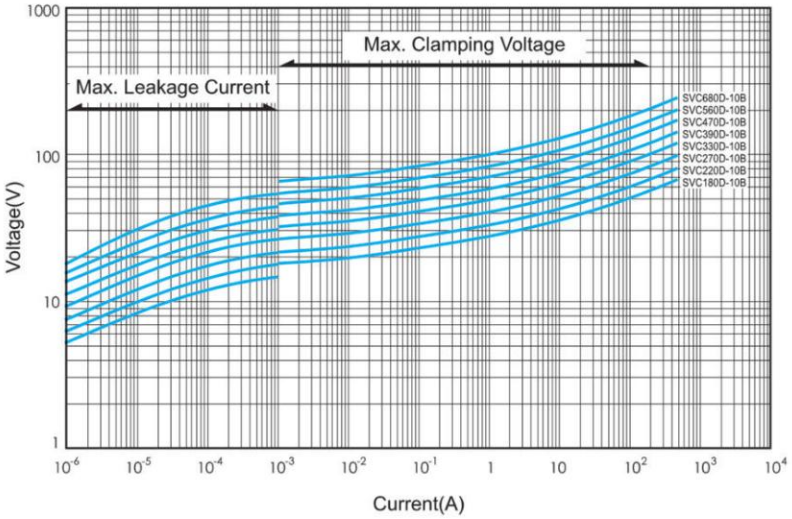
Pulse Lifetime Ratings

Notes : 2-pulse : 5-minute interval

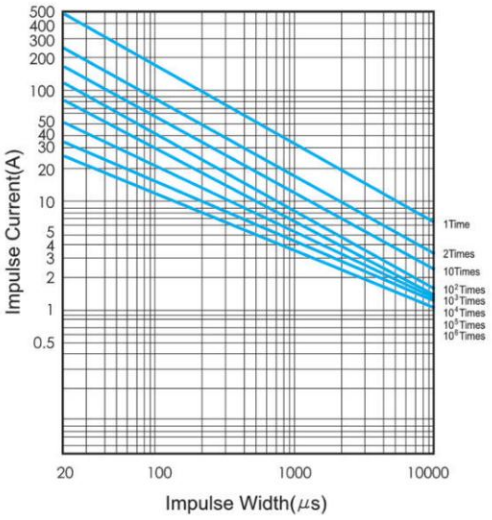
3 to 10-pulse : 2-minute interval

Up to 10^{6}-pulse : 10-second interval

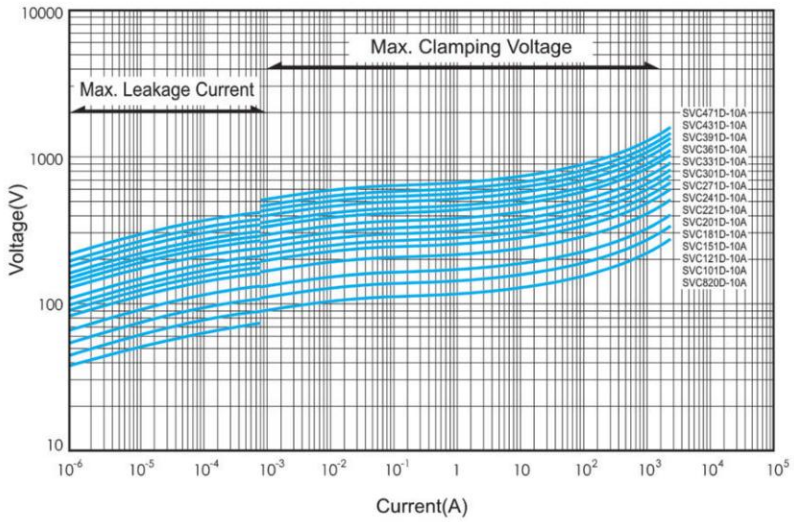
10B(SVC 180D-10B to SVC 680D-10B)



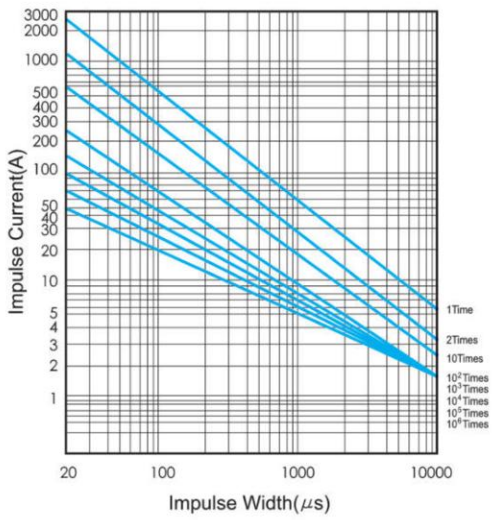
10B(SVC 180D-10B to SVC 680D-10B)



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 : 8/20μs

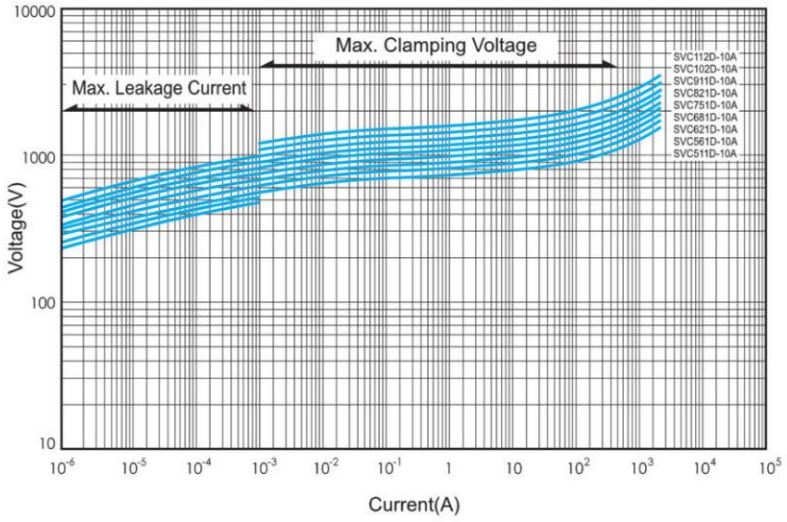
Pulse Lifetime Ratings

Notes : 2-pulse : 5-minute interval

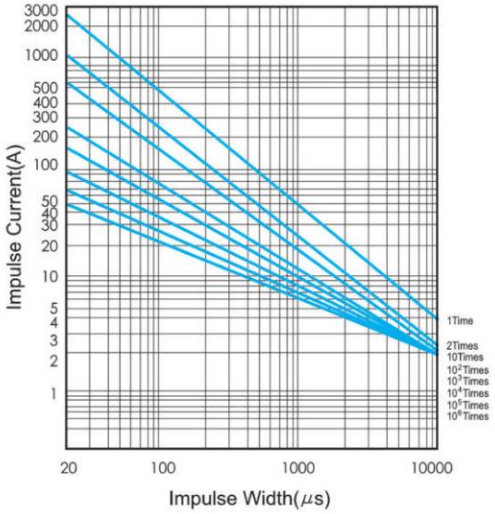
3 to 10-pulse : 2-minute interval

Up to 10^{6}-pulse : 10-second interval

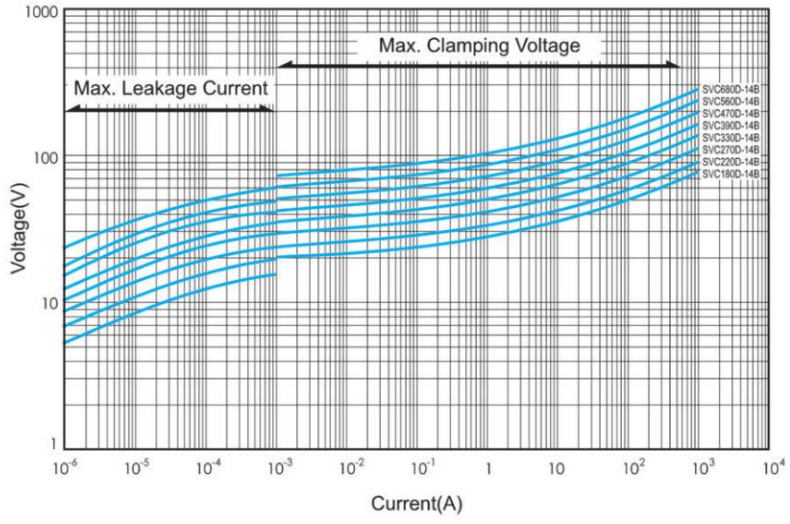
10A(SVC 561D-10A to SVC 112D-10A)



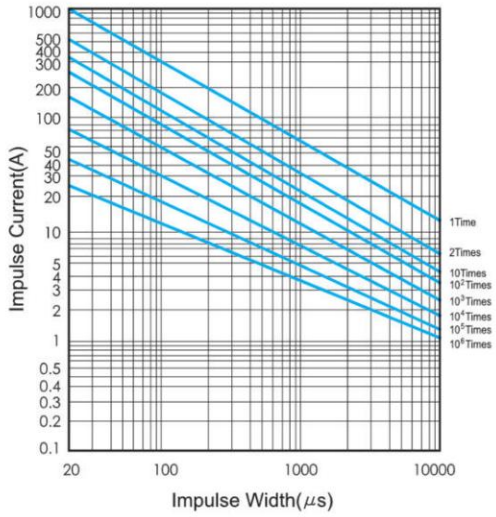
10A(SVC 561D-10A to SVC 112D-10A)



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 : 8/20μS

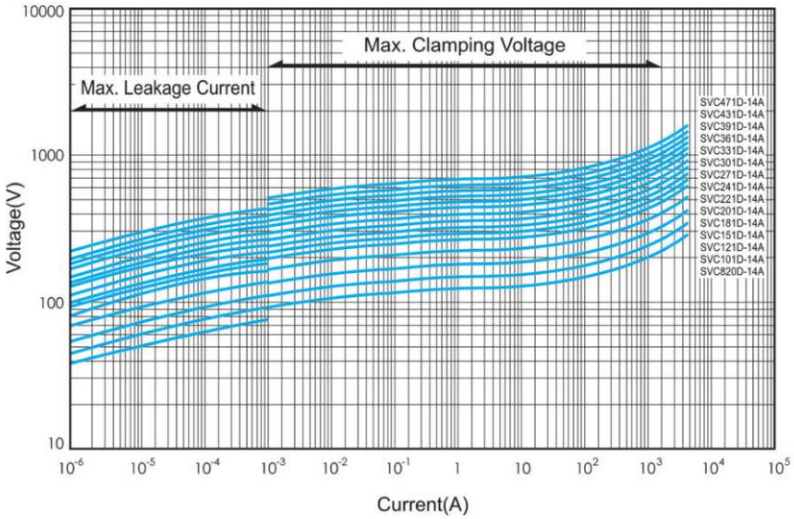
Pulse Lifetime Ratings

Notes : 2-pulse : 5-minute interval

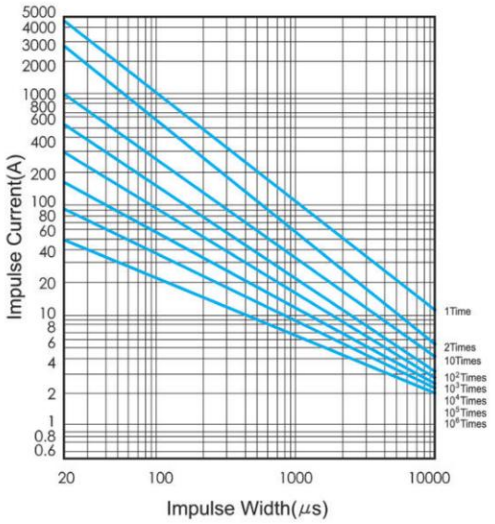
3 to 10-pulse : 2-minute interval

Up to 10^6-pulse : 10-second interval

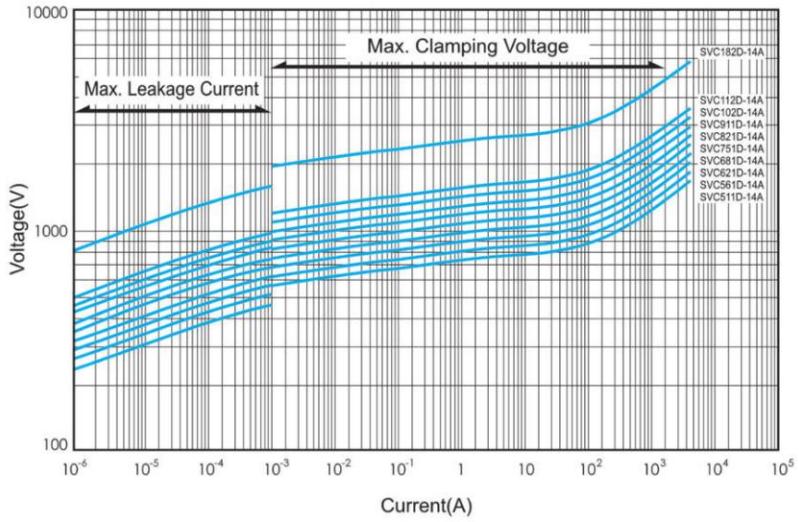
14A(SVC 820D-14A to SVC 471D-14A)



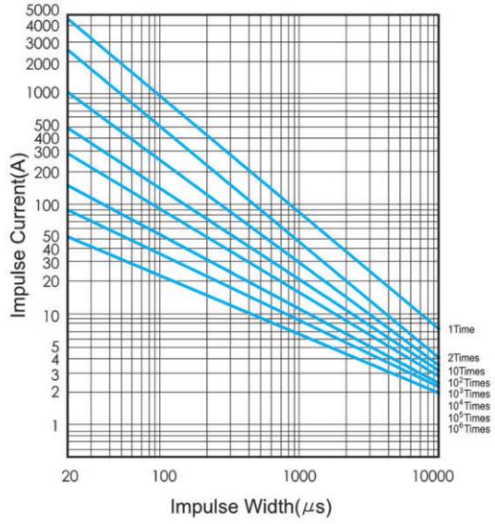
14A(SVC 820D-14A to SVC 471D-14A)



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 : 8/20μS

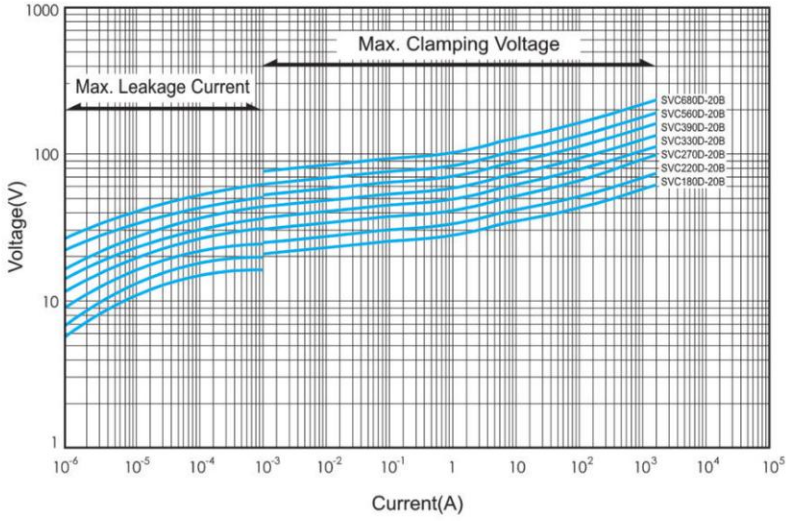
Pulse Lifetime Ratings

Notes : 2-pulse : 5-minute interval

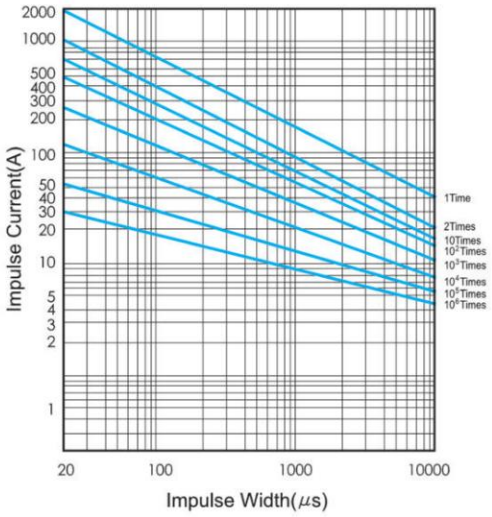
3 to 10-pulse : 2-minute interval

Up to 10^{6}-pulse : 10-second interval

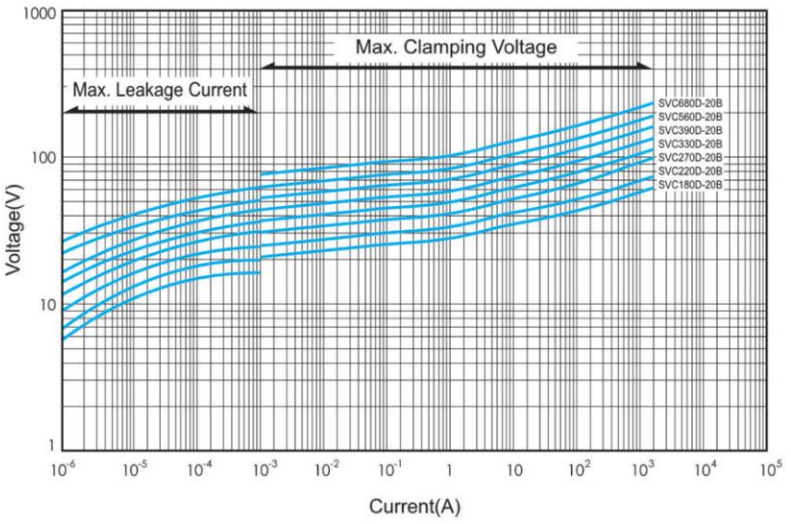
20B(SVC 180D-20B to SVC 680D-20B)



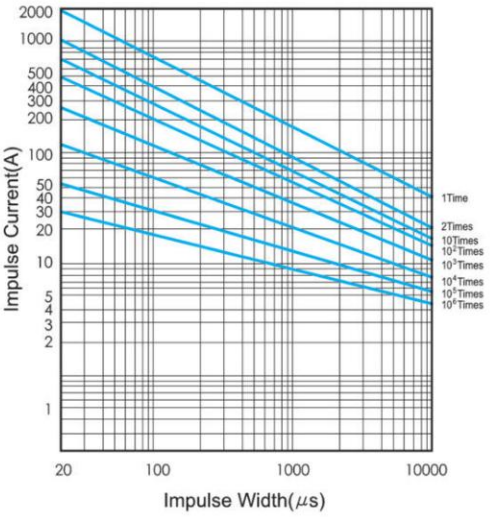
20B(SVC 180D-20B to SVC 680D-20B)



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 : 8/20μs

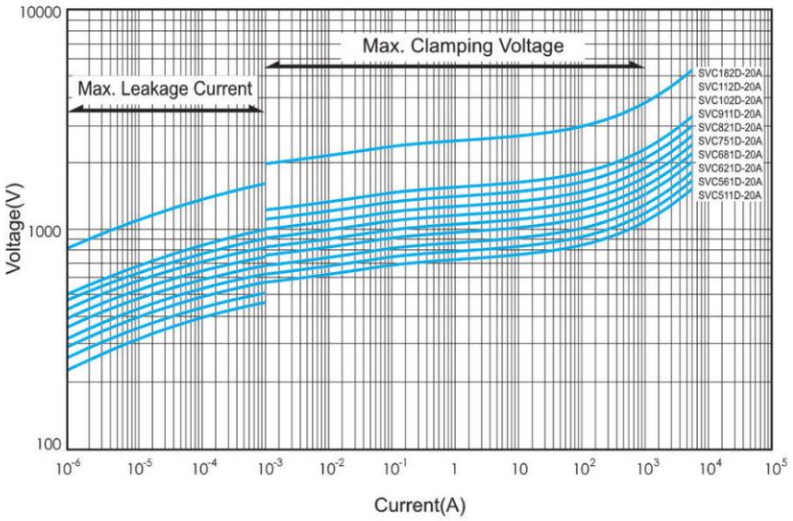
Pulse Lifetime Ratings

Notes : 2-pulse : 5-minute interval

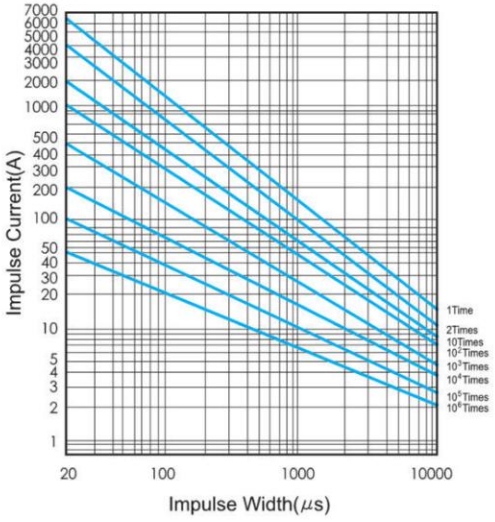
3 to 10-pulse : 2- minute interval

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 mechinery 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

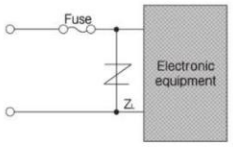
Notes :

① The power supply voltage must not exceed the maximum allowable circuit voltage.

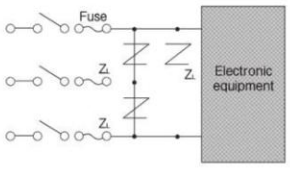
② Since independent wiring loads and capacitive loads cause the voltage build-up at the time of opening or closing the load, use SVC having a varistor voltage as high as possible.(*mark)

③ The bold faced portions of the type letters vary.

AC/DC single-phase circuit



AC three-phase circuit



Line and groud circuit

Varistor voltage selection table(Z_E)

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

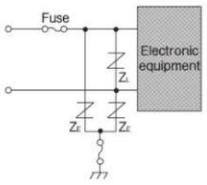
Notes :

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.

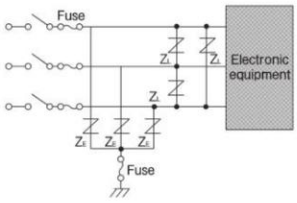
② When subjected to dielectric strength test(1000V AC). remove the SVC or use** marked SVC.

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

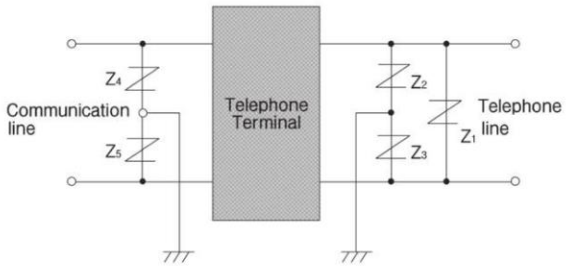
AC/DC single-phase circuit



AC three-phase circuit



Telecommunication Circuit Protection



Varistor voltage selection guied

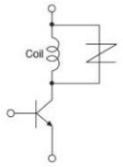
Power Supply Voltage	Type
12V DC	SVC180D-□□B SVC220D-□□B SVC820D-□□A
24V AC	SVC390D-□□B SVC820D-□□A

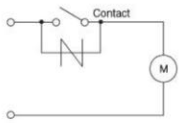
Notes :

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

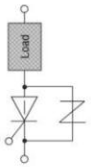
Switching Circuit Protection

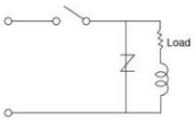
Protection of relay (Contact coil)





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.

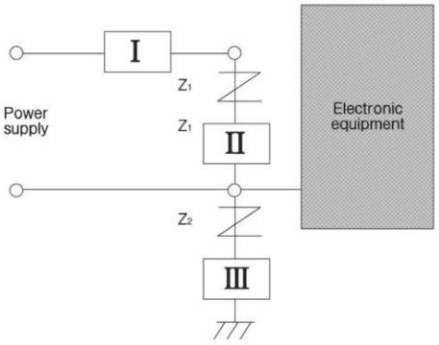
③ Select SVC referring to the pulse lifetime rating.

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

③ When "Z_2" 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

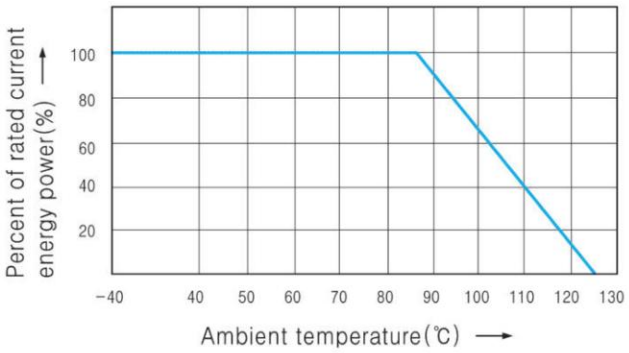
① When operated at location near heating element or exposed to direct sun light, confirm that the ambient temparature range.

② When operated in dusty or dirty locations, or exposed to corrosive atomospheres, 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

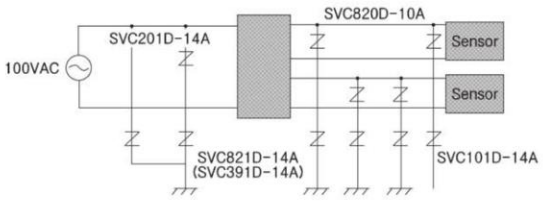
Operating ambient temperature	-40℃ to +85℃
Storage temperature	-40℃ to +125℃
Voltage temperature coefficient	-0.05% ℃
IR change of test condition	
621 ↑ (at 500V)	over 10MΩ
561 ↓ (at Vdc)	over 10MΩ

Recognized standards

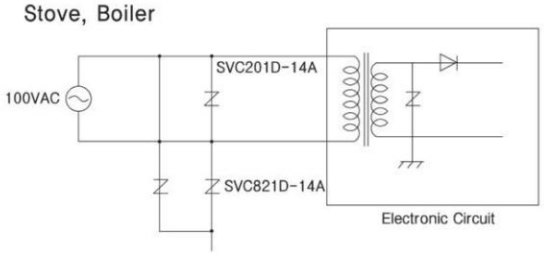
Standard		Content	Applicable SVC series		File No.
UL	UL 1449 3rd edition	Surge-protective Devices - Component	Other SPD Applications : 05/07/10 Series, 14B/20B Series	Type 3 SPD Applications : 14A/20A Series	E332621
	UL 1449	Isolated Loop Circuit Protectors - Component	Model SVC 05 / 07 / 10 / 14 / 20 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

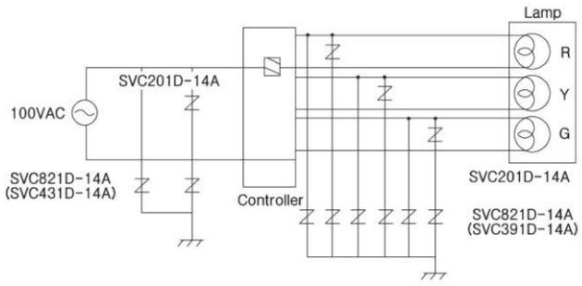
Fire Alarm System



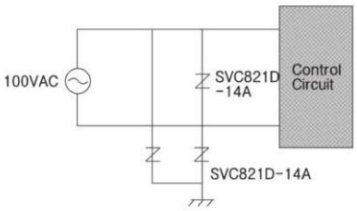
Stove, Boiler



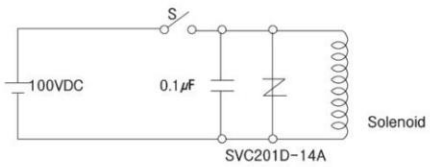
Traffic Signal Control



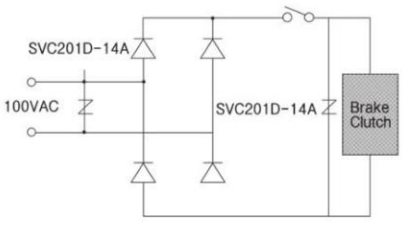
Vending Machine



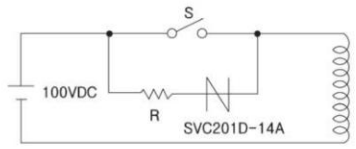
Solenoid



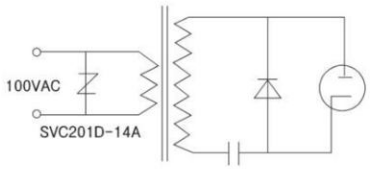
Brake, Clutch



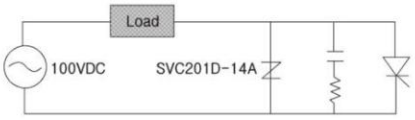
Contect Protection



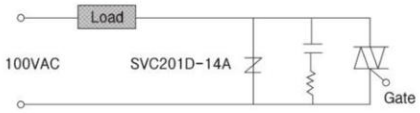
Microwave Oven



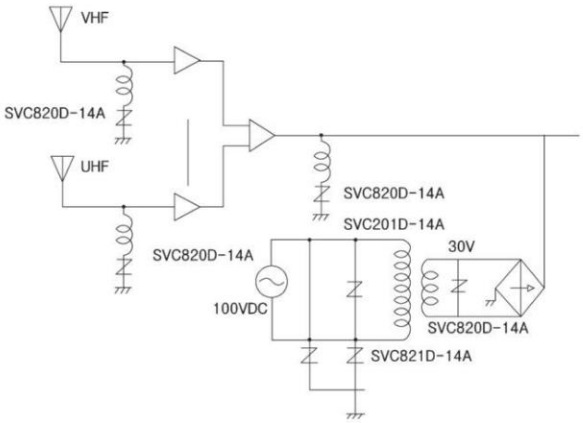
Thytister Protection



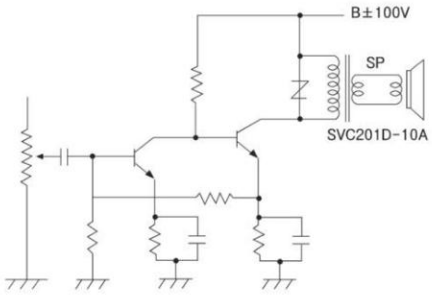
Triac Protection



TV Booster



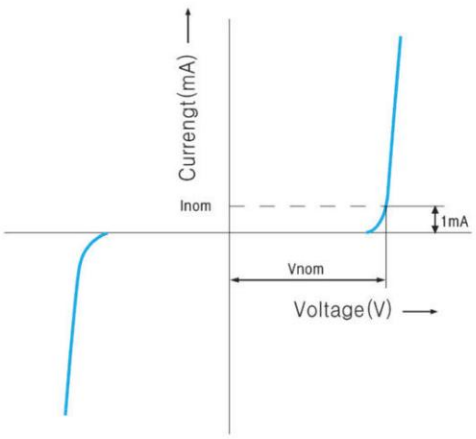
Sound Output Circuit



Varistor Terminology

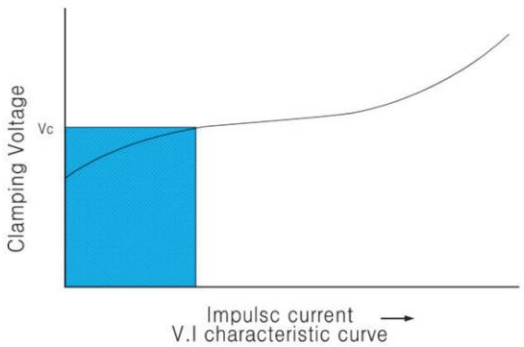
Varistor Voltage : Vnom

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

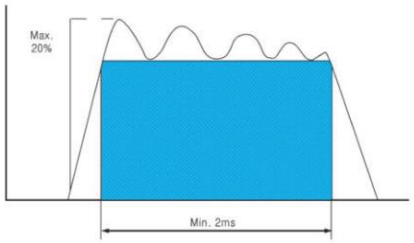
Rated peak transient current : itm

Maximum peak current through the varistor with line voltage applied.

The maximum peak current with in the varistor voltage change ratio of ±10% with the standard 8/20㎲ impulse current applied two times at 5 minute interval.

Rated transient energy : Wtm

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 Vnom of less than ±10% of initial value.



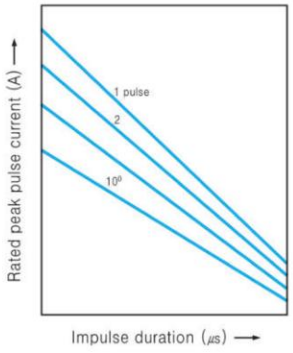
Waveshape of square-wave current

Pulse lifetime rating

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

8/20㎲ impulse current(or 2ms square wave) is applied at prescribed interval.

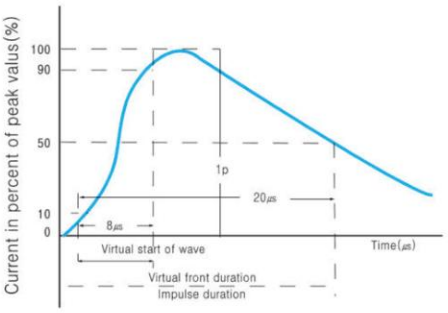
This curve also provides for derating current as required with repetitive pulsing.



Test current waveform

Characteristics tests for Varistors are carried out by using 8/20㎲ test impulses Data such as the maximum clamping voltage(Vc)and the transient peak current(Itm) are obtained by using this impulse current

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



Rated RMS Voltage : Vacm

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

Rated DC Voltage : Vdcm

Maximum continuous DC voltage which may be applied.

Rated average power dissipation : Ptam

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

SVC Varistor High Surge

Introduction

The SAMWHA High Surge Varistor Provides an Ideal circuit protection solution for DC Voltage Application.
This Varistor High Surge are zinc-oxide nonlinear resistor whose resistance changes as a function of the applied voltage. know with S-Type.
S-Type available for size 07, 10, 14 & 20mm.
This item have been used to great advance in many important application in the electrical power, medical, communication and electronic industries

Features

- Improve product safety
- Wide operating temperature range
- Fast response time
- Lead-free, Halogen Free and RoHS Compliant
- High peak current surge rating
- Remarkably symmetrical V-I characteristics

Applications

- Surge Protective Device
- Semiconductor protector
- Home Appliance
- Lighting Product
- Industrial Equipment
- Power Supply
- Medical Equipment

How to Order(Product Identification)

SVC 681 D - 20 A BW 1 S

1 2 3 4 5 6 7 8

1 Basic Type

SVC : Basic type Zinc Oxide (ZnO)

2 Varistor Nominal Voltage

- The first two digit indicate significaticant digits
- The 3rd digit indicate the number of zeros following

3 Style

D : Disk Type Varistor

4 Chip Element Size(Dia)

07 : Ø7mm, 10 : Ø10mm
14 : Ø14mm, 20 :Ø20mm

5 Classification

A : High Voltage

6 Packing Style & Lead Variation

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

7 Lead Spacing & Pitch of Component

Taping			Bulk	
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
1	10	25.4		

8 Optional Suffix

S: Superior Type

Approval Standard & Recognized No.

Agency	Standard	Recognized No.
	UL 1449	File No E332621
	C222101	1513084
VDE	DIN EN 61051-1:2009	116012

Marking Specification.

S – Type

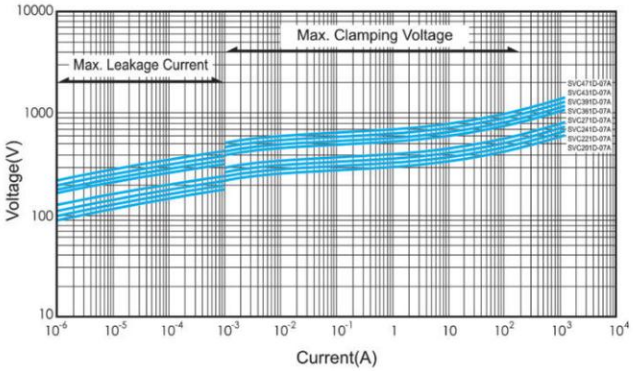
Size ø	Body Mark	Remarks
07~14	SVC.□□□-■■	□ Varistor Nominal Voltage ■ Chip Element Size
20	SVC..□□□-■■	

Characteristics, Curve and Lifetime

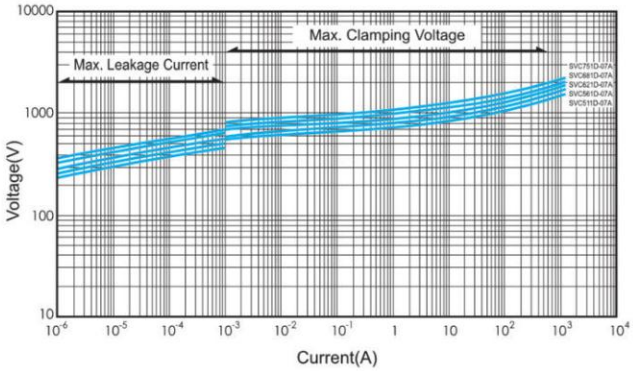
Transient V-I Charactic Curves

Current waveform under 10^{-2} A : DC over 10^{-1} A : 8/20μs

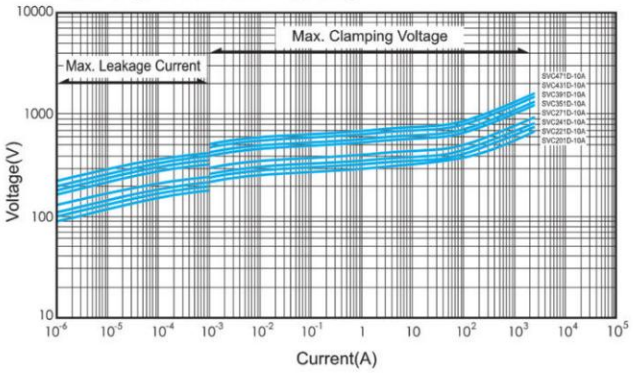
07A (SVC201D~471D)



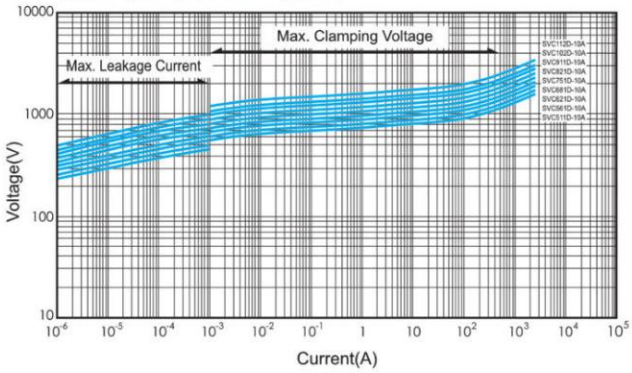
07A (SVC511D~751D)



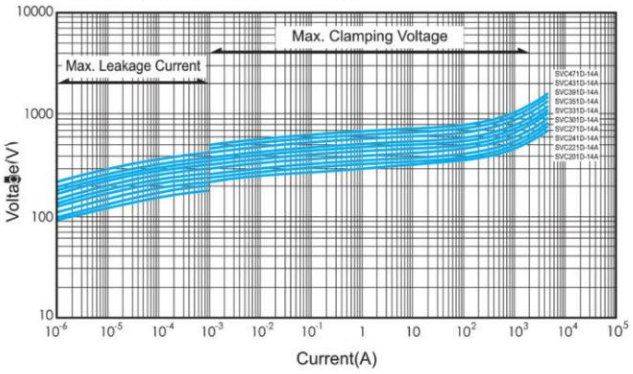
10A (SVC201D~471D)



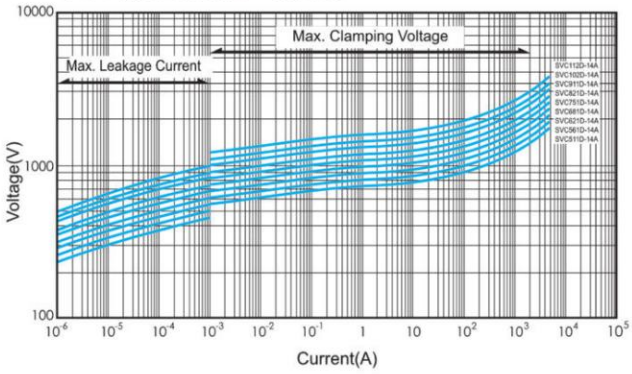
10A (SVC511D~112D)



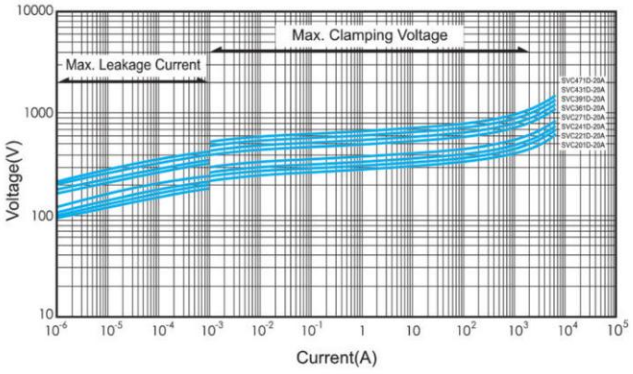
14A (SVC201D~471D)



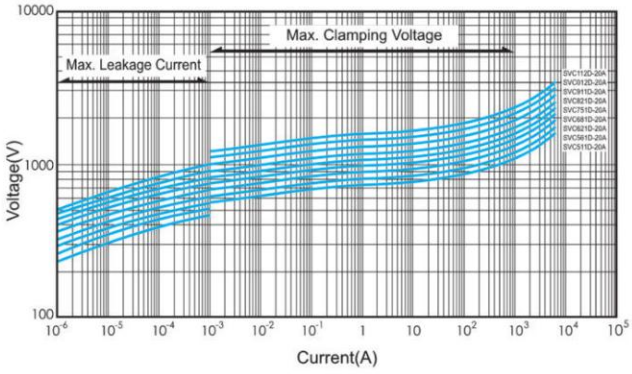
14A (SVC511D~112D)



20A (SVC201D~SVC471D)



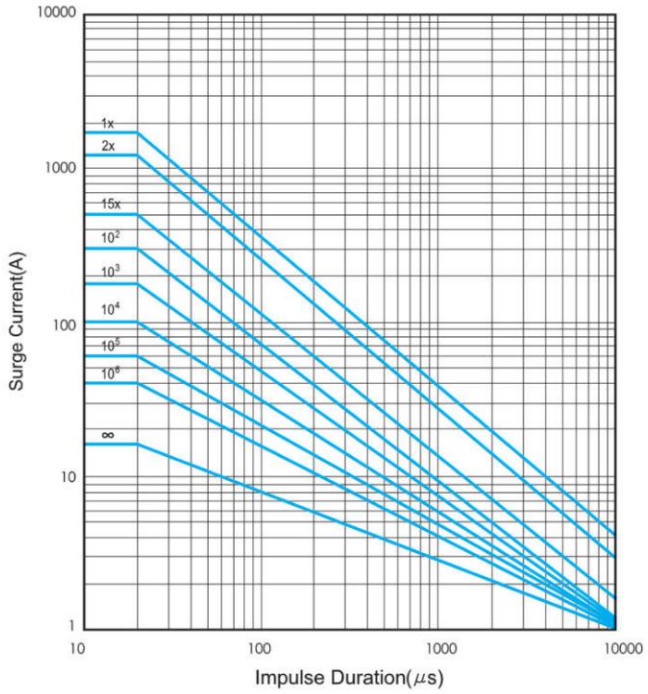
20A (SVC511D~SVC112D)



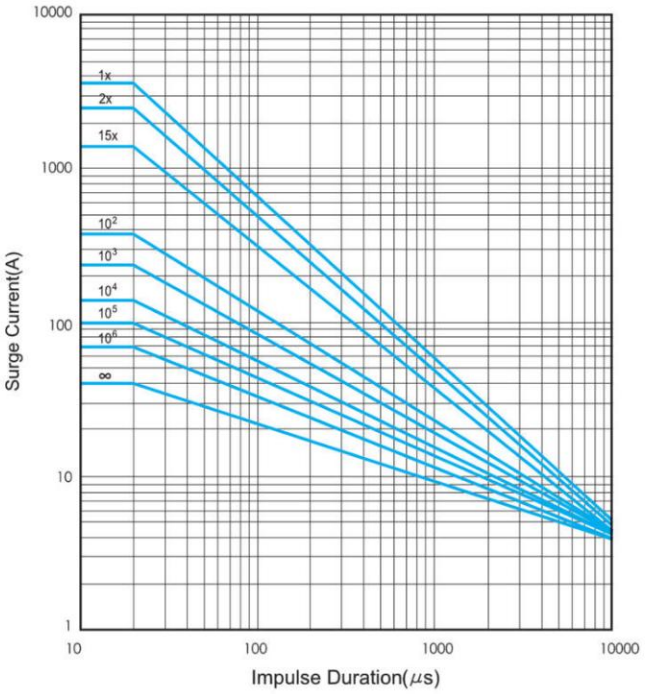
Pulse Lifetime Rating

Notes : 2-pulse : 5-minutes interval

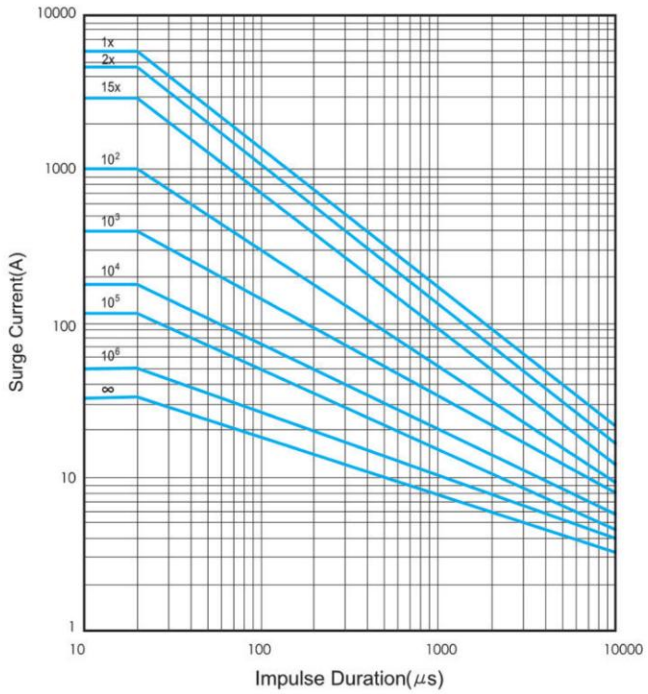
07A (SVC201D~751D) - S-Type



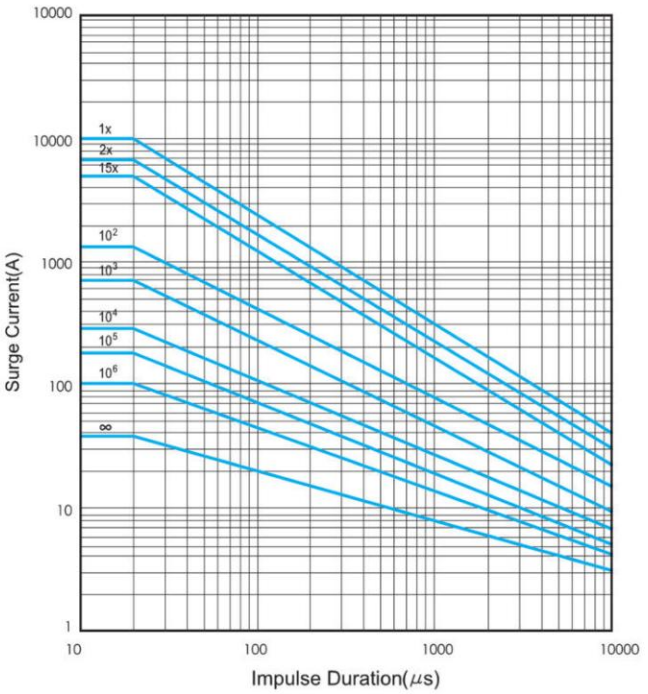
10A (SVC201D~112D) - S-Type



14A (SVC201D~112D) - S-Type

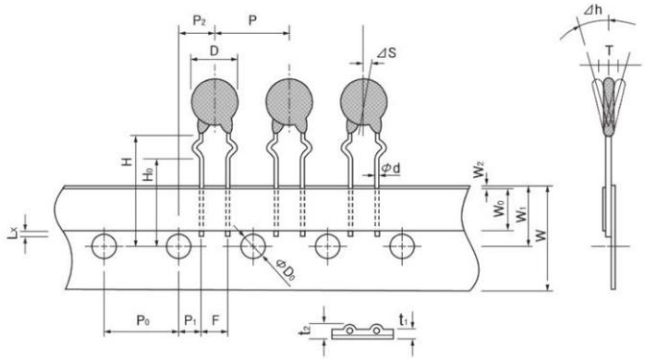


20A (SVC201D~112D) - S-Type



Packing Style

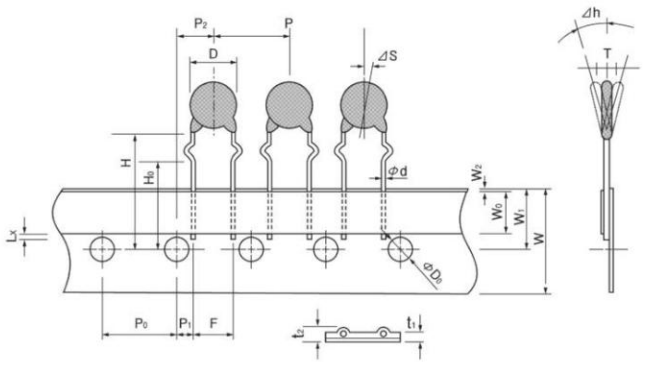
Taping Type (FF5 - for Ø7)



(Unit:mm)

Item	Symbol	Taping Specification	Note
		FF5	
Body Diamete r	D	12.5 Max	
Body Thickness	T	5.0 Max	
Lead Diameter	Ø d	0.60±0.05	
Pitch of Sprocket Hole	Po	12.7±0.3	Accumulative.pitch error : ±1mm/20pitch
Pitch of Component	P	12.7±1.0	
Lead Length from Hole Center to Lead	P1	3.85±0.7	
Lead Length from Hole Center to Center	P2	6.35±1.3	
Lead Spacing	F	$5.0^{+0.8}_{-0.2}$	
Deviation Along Tape	△S	0±1.0	
Deviation Across Tape	△h	0±2.0	
Carrier Tape Width	W	$18.0^{+1.0}_{-0.5}$	
Hold Down Tape Width	Wo	6.0±0.5	
Position of Sprocket Hole	W1	9.0±0.5	
Hold Down Tape Position	W2	3.0 Max	
Diameter of Sprocket Hole	Ø Do	4.0±0.2	
Lead-Wire Clinch Height	Ho	16.0± 0.5	
Total Tape Thickness	t_1	0.7±0.2	
Total Thickness, Tape and Lead Wire	t_2	1.5 Max	

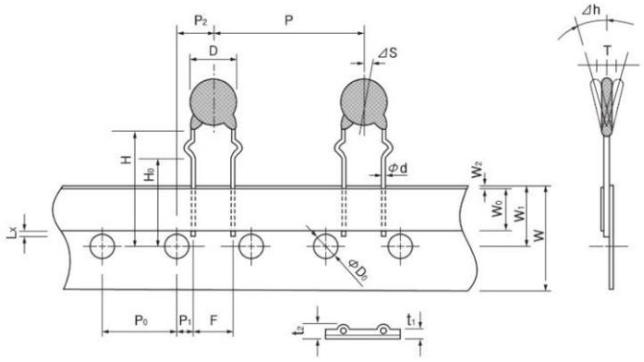
Taping Type (FF7 - for Ø7~10)



(Unit:mm)

Item	Symbol	Taping Specification	Note
		FF7	
Body Diameter	D	6.3≤ D≤14.0	
Body Thickness	T	6.0 Max	
Wire Diameter	dØ	0.70±0.05	
Pitch of Sprocket Hole	Po	15.0±0.3	
Pitch of Component	P	15.0±1.0	
Lead Length from Hole Center to Lead	P1	3.75±1.0	
Lead Length from Hole Center to Component Center	P2	7.5±1.5	
Wire Spacing	F	7.5±1.0	
Deviation Along Tape.Left or Right	△S	0±1.0	
Deviation Across Tape	△h	0±2.0	
Carrier Tape Width	W	18.0 $^{+1.0}_{-0.5}$	
Hold Down Tape Width	Wo	8.0 Min	
Position of Sprocket Hole	W1	9.0±0.5	
Hold Down Tape Position	W2	3.0 Max	
Wire Clinch Height	Ho	16.0±0.5	
Height of Component Hole	H	20.0 $^{+1.5}_{-1.0}$	
Diameter of Sprocket Hole	ØDo	4.0±0.2	
Total Tape Thickness	t_1	0.7±0.2	
Total Thickness, Tape and Wire	t_2	1.7 Max	
Length of Snipped Lead	L_x	1.0 Max	

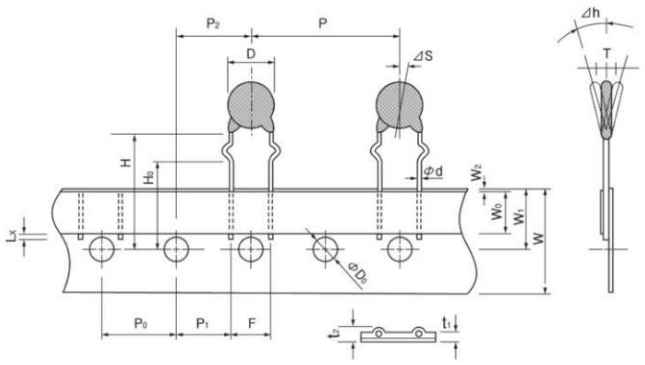
Taping Type (FF8 - for Ø14)



(Unit:mm)

Item	Symbol	Taping Specification	Note
		FF8	
Body Diameter	D	15.0≤D≤20.0	
Body Thickness	T	6.0 Max	
Wire Diameter	dØ	0.80±0.05	
Pitch of Sprocket Hole	Po	15.0±0.3	
Pitch of Component	P	30.0±1.0	
Lead Length from Hole Center to Lead	P1	3.75±1.0	
Lead Length from Hole Center to Component Center	P2	7.5±1.5	
Wire Spacing	F	7.5±1.0	
Deviation Along Tape.Left or Right	△S	0±1.0	
Deviation Across Tape	△h	0±2.0	
Carrier Tape Width	W	$18.0^{+1.0}_{-0.5}$	
Hold Down Tape Width	Wo	8.0 Min	
Position of Sprocket Hole	W1	9.0±0.5	
Hold Down Tape Position	W2	3.0 Max	
Wire Clinch Height	Ho	16.0±0.5	
Height of Component Hole	H	$20.0^{+1.5}_{-1.0}$	
Diameter of Sprocket Hole	ØDo	4.0±0.2	
Total Tape Thickness	t_1	0.7±0.2	
Total Thickness, Tape and Wire	t_2	1.7 Max	
Length of Snipped Lead	L_x	1.0 Max	

Taping Type (FF1 - for Ø20)

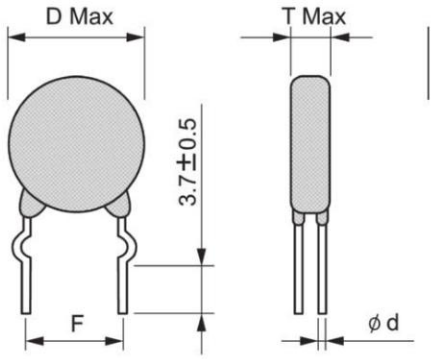


(Unit:mm)

Item	Symbol	Taping Specification	Note
		FF1	
Body Diameter	D	6.3≤D≤20.0	
Body Thickness	T	11 Max	
Wire Diameter	dØ	1.00±0.05	
Pitch of Sprocket Hole	Po	12.7±0.3	
Pitch of Component	P	25.4±1.0	
Lead Length from Hole Center to Lead	P1	7.7±1.0	
Lead Length from Hole Center to Component Center	P2	12.7±1.5	
Wire Spacing	F	10.0±1.0	
Deviation Along Tape.Left or Right	△S	0±1.0	
Deviation Across Tape	△h	0±2.0	
Carrier Tape Width	W	$18.0^{+1.0}_{-0.5}$	
Hold Down Tape Width	Wo	13.0 Min	
Position of Sprocket Hole	W1	9.0±0.5	
Hold Down Tape Position	W2	3.0 Max	
Wire Clinch Height	Ho	16.0±0.5	
Height of Component Hole	H	$20.0^{+1.5}_{-1.0}$	
Diameter of Sprocket Hole	ØDo	4.0±0.2	
Total Tape Thickness	t_1	0.7±0.2	
Total Thickness, Tape and Wire	t_2	1.7 Max	
Length of Snipped Lead	L_x	1.0 Max	

Packing Style Bulk Type (BW)

07Ø (S-TYPE) - 1750A



Kink Short

(Unit:mm)

Type	Dmax	Tmax	L±0.5	F±1.0	ød±0.05
SVC201D-07A	9.0	4.5	3.7	5.0	0.60
SVC221D-07A	9.0	4.5	3.7	5.0	0.60
SVC241D-07A	9.0	4.5	3.7	5.0	0.60
SVC271D-07A	9.0	4.5	3.7	5.0	0.60
SVC361D-07A	9.0	5.0	3.7	5.0	0.60
SVC391D-07A	9.0	5.0	3.7	5.0	0.60
SVC431D-07A	9.0	6.0	3.7	5.0	0.60
SVC471D-07A	9.0	6.0	3.7	5.0	0.60
SVC511D-07A	9.0	6.0	3.7	5.0	0.60
SVC561D-07A	9.0	7.5	3.7	5.0	0.60
SVC621D-07A	9.0	7.5	3.7	5.0	0.60
SVC681D-07A	9.0	7.5	3.7	5.0	0.60
SVC751D-07A	9.0	8.5	3.7	5.0	0.60

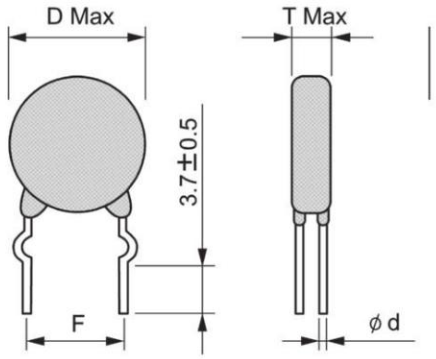
If the F value is 7.5 mm, the thickness of Ød is 0.70 ± 0.05 mm.

10Ø (A-TYPE) - 3500A

(Unit:mm)

Type	Dmax	Tmax	L±0.5	F±1.0	Ød±0.05
SVC201D-10A	14.0	4.5	3.7	7.5	0.70
SVC221D-10A	14.0	4.5	3.7	7.5	0.70
SVC241D-10A	14.0	4.5	3.7	7.5	0.70
SVC271D-10A	14.0	4.5	3.7	7.5	0.70
SVC361D-10A	14.0	5.0	3.7	7.5	0.70
SVC391D-10A	14.0	5.0	3.7	7.5	0.70
SVC431D-10A	14.0	6.0	3.7	7.5	0.70
SVC471D-10A	14.0	6.0	3.7	7.5	0.70
SVC511D-10A	14.0	6.0	3.7	7.5	0.70
SVC561D-10A	14.0	7.5	3.7	7.5	0.70
SVC621D-10A	14.0	7.5	3.7	7.5	0.70
SVC681D-10A	14.0	7.5	3.7	7.5	0.70
SVC751D-10A	14.0	8.5	3.7	7.5	0.70
SVC781D-10A	14.0	8.5	3.7	7.5	0.70
SVC821D-10A	14.0	8.5	3.7	7.5	0.70
SVC911D-10A	14.0	10.5	3.7	7.5	0.70
SVC102D-10A	14.0	10.5	3.7	7.5	0.70
SVC112D-10A	14.0 1	0.5	3.7	7.5	0.70

14Ø (S-TYPE) - 6000A

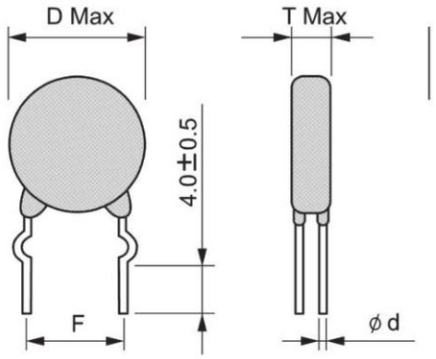


Kink Short

(Unit:mm)

Type	Dmax	Tmax	L±0.5	F±1.0	ød±0.05
SVC201D-14A	17.5	4.5	3.7	7.5	0.80
SVC221D-14A	17.5	4.5	3.7	7.5	0.80
SVC241D-14A	17.5	4.5	3.7	7.5	0.80
SVC271D-14A	17.5	4.5	3.7	7.5	0.80
SVC361D-14A	17.5	5.0	3.7	7.5	0.80
SVC391D-14A	17.5	5.0	3.7	7.5	0.80
SVC431D-14A	17.5	6.0	3.7	7.5	0.80
SVC471D-14A	17.5	6.0	3.7	7.5	0.80
SVC511D-14A	17.5	6.0	3.7	7.5	0.80
SVC561D-14A	17.5	7.5	3.7	7.5	0.80
SVC621D-14A	17.5	7.5	3.7	7.5	0.80
SVC681D-14A	17.5	7.5	3.7	7.5	0.80
SVC751D-14A	17.5	8.5	3.7	7.5	0.80
SVC781D-14A	17.5	8.5	3.7	7.5	0.80
SVC821D-14A	17.5	10.5	3.7	7.5	0.80
SVC911D-14A	17.5	10.5	3.7	7.5	0.80
SVC102D-14A	17.5	10.5	3.7	7.5	0.80
SVC112D-14A	17.5	7.5	3.7	7.5	0.80

20Ø (S-TYPE) - 10000A



Kink Short

(Unit:mm)

Type	Dmax	Tmax	L±0.5	F±1.0	ød±0.05
SVC201D-20A	24.0	4.5	4.0	10.0	1.00
SVC221D-20A	24.0	4.5	4.0	10.0	1.00
SVC241D-20A	24.0	4.5	4.0	10.0	1.00
SVC271D-20A	24.0	4.5	4.0	10.0	1.00
SVC361D-20A	24.0	5.0	4.0	10.0	1.00
SVC391D-20A	24.0	5.0	4.0	10.0	1.00
SVC431D-20A	24.0	6.0	4.0	10.0	1.00
SVC471D-20A	24.0	6.0	4.0	10.0	1.00
SVC511D-20A	24.0	6.0	4.0	10.0	1.00
SVC561D-20A	24.0	7.5	4.0	10.0	1.00
SVC621D-20A	24.0	7.5	4.0	10.0	1.00
SVC681D-20A	24.0	7.5	4.0	10.0	1.00
SVC751D-20A	24.0	8.5	4.0	10.0	1.00
SVC781D-20A	24.0	8.5	4.0	10.0	1.00
SVC821D-20A	24.0	8.5	4.0	10.0	1.00
SVC911D-20A	24.0	10.5	4.0	10.0	1.00
SVC102D-20A	24.0	10.5	4.0	10.0	1.00
SVC112D-20A	24.0	0.5	4.0	10.0	1.00

Specification Table-Superior Type

Device Type	Chip Element Size	Maximum Ratings						Characteristics						SAFETY APPROVAL		
		Applied Voltage		Transient				Nominal Varistor Peak Voltage			Max. Clamping Voltage @ Test Current(8/20μs)		Nominal Discharge Current			
		RMS 50/60Hz (25℃)	DC (25℃)	Energy (2mS)	Average Power Dissipation	Peak Current (8/20μs)										
	Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	Itm(Amps) 1Pulse	Itm(Amps) 2 Pulse	Vnom (Volts)	Tolerance Min.(Volts)	Tolerance Max.(Volts)	Vc (Volts)	Ip (Amps)	In (Amps)	UL	CSA	VDE
SVC 201D-07A***S	7	130	170	10.0	0.25	1750	1250	200	180	220	340	10.0	500	●	●	●
SVC 201D-10A***S	10			20.0	0.40	3500	2500				340	25.0	1500	●	●	●
SVC 201D-14A***S	14			35.0	0.60	6000	4500				340	50.0	3000	●	●	●
SVC 201D-20A***S	20			70.0	1.00	10000	7000				340	100.0	5000	●	●	●
SVC 221D-07A***S	7	140	180	10.0	0.25	1750	1250	200	198	242	360	10.0	500	●	●	●
SVC 221D-10A***S	10			23.0	0.40	3500	2500				360	25.0	1500	●	●	●
SVC 221D-14A***S	14			40.0	0.60	6000	4500				360	50.0	3000	●	●	●
SVC 221D-20A***S	20			75.0	1.00	10000	7000				360	100.0	5000	●	●	●
SVC 241D-07A***S	7	150	200	10.0	0.25	1750	1250	240	216	264	395	10.0	500	●	●	●
SVC 241D-10A***S	10			25.0	0.40	3500	2500				395	25.0	1500	●	●	●
SVC 241D-14A***S	14			40.0	0.60	6000	4500				395	50.0	3000	●	●	●
SVC 241D-20A***S	20			75.0	1.00	10000	7000				395	100.0	5000	●	●	●
SVC 271D-07A***S	7	175	225	12.0	0.25	1750	1250	270	243	297	455	10.0	500	●	●	●
SVC 271D-10A***S	10			30.0	0.40	3500	2500				455	25.0	1500	●	●	●
SVC 271D-14A***S	14			50.0	0.60	6000	4500				455	50.0	3000	●	●	●
SVC 271D-20A***S	20			90.0	1.00	10000	7000				455	100.0	5000	●	●	●
SVC 361D-07A***S	7	230	300	15.0	0.25	1750	1250	360	324	396	596	10.0	500	●	●	●
SVC 361D-10A***S	10			35.0	0.40	3500	2500				596	25.0	1500	●	●	●
SVC 361D-14A***S	14			65.0	0.60	6000	4500				596	50.0	3000	●	●	●
SVC 361D-20A***S	20			120.0	1.00	10000	7000				596	100.0	5000	●	●	●
SVC 391D-07A***S	7	250	320	17.0	0.25	1750	1250	390	351	429	650	10.0	500	●	●	●
SVC 391D-10A***S	10			40.0	0.40	3500	2500				650	25.0	1500	●	●	●
SVC 391D-14A***S	14			70.0	0.60	6000	4500				650	50.0	3000	●	●	●
SVC 391D-20A***S	20			130.0	1.00	10000	7000				650	100.0	5000	●	●	●
SVC 431D-07A***S	7	275	350	20.0	0.25	1750	1250	430	387	479	710	10.0	500	●	●	●
SVC 431D-10A***S	10			45.0	0.40	3500	2500				710	25.0	1500	●	●	●
SVC 431D-14A***S	14			75.0	0.60	6000	4500				710	50.0	3000	●	●	●
SVC 431D-20A***S	20			140.0	1.00	10000	7000				710	100.0	5000	●	●	●
SVC 471D-07A***S	7	300	385	20.0	0.25	1750	1250	470	423	517	775	10.0	500	●	●	●
SVC 471D-10A***S	10			45.0	0.40	3500	2500				775	25.0	1500	●	●	●
SVC 471D-14A***S	14			80.0	0.60	6000	4500				775	50.0	3000	●	●	●
SVC 471D-20A***S	20			150.0	1.00	10000	7000				775	100.0	5000	●	●	●
SVC 511D-07A***S	7	320	420	20.0	0.25	1750	1250	510	459	561	840	10.0	500		●	●
SVC 511D-10A***S	10			45.0	0.40	3500	2500				840	25.0	1500	●	●	●
SVC 511D-14A***S	14			85.0	0.60	6000	4500				840	50.0	3000	●	●	●
SVC 511D-20A***S	20			150.0	1.00	10000	7000				840	100.0	5000	●	●	●
SVC 561D-07A***S	7	350	460	20.0	0.25	1750	1250	560	504	616	920	10.0	500		●	●
SVC 561D-10A***S	10			45.0	0.40	3500	2500				920	25.0	1500	●	●	●
SVC 561D-14A***S	14			85.0	0.60	6000	4500				920	50.0	3000	●	●	●
SVC 561D-20A***S	20			150.0	1.00	10000	7000				920	100.0	5000	●	●	●

Device Type	Chip Element Size	Maximum Ratings						Characteristics						SAFETY APPROVAL		
		Applied Voltage		Transient				Nominal Varistor Peak Voltage			Max. Clamping Voltage @ Test Current(8/20μs)		Nominal Discharge Current			
		RMS 50/60Hz (25℃)	DC (25℃)	Energy (2mS)	Average Power Dissipation	Peak Current (8/20μs)										
	Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	Itm(Amps) 1Pulse	Itm(Amps) 2 Pulse	Vnom (Volts)	Tolerance Min.(Volts)	Tolerance Max.(Volts)	Vc (Volts)	Ip (Amps)	In (Amps)	UL	CSA	VDE
SVC 621D-07A***S	7	385	550	20.0	0.25	1750	1250	620	558	682	1025	10.0	500		●	●
SVC 621D-10A***S	10			45.0	0.40	3500	2500				1025	25.0	1500	●	●	●
SVC 621D-14A***S	14			85.0	0.60	6000	4500				1025	50.0	3000	●	●	●
SVC 621D-20A***S	20			150.0	1.00	10000	7000				1025	100.0	5000	●	●	●
SVC 681D-07A***S	7	420	560	25.0	0.25	1750	1250	680	612	748	1120	10.0	500		●	●
SVC 681D-10A***S	10			45.0	0.40	3500	2500				1120	25.0	1500	●	●	●
SVC 681D-14A***S	14			90.0	0.60	6000	4500				1120	50.0	3000	●	●	●
SVC 681D-20A***S	20			160.0	1.00	10000	7000				1120	100.0	5000	●	●	●
SVC 751D-07A***S	7	460	615	30.0	0.25	1750	1250	750	675	825	1240	10.0	500		●	●
SVC 751D-10A***S	10			50.0	0.40	3500	2500				1240	25.0	1500	●	●	●
SVC 751D-14A***S	14			100.0	0.60	6000	4500				1240	50.0	3000	●	●	●
SVC 751D-20A***S	20			175.0	1.00	10000	7000				1240	100.0	5000	●	●	●
SVC 781D-10A***S	10	485	640	50.0	0.40	3500	2500	780	702	858	1290	25.0	1500	●	●	●
SVC 781D-14A***S	14			105.0	0.60	6000	4500				1290	50.0	3000	●	●	●
SVC 781D-20A***S	20			180.0	1.00	10000	7000				1290	100.0	5000	●	●	●
SVC 821D-10A***S	10	510	670	50.0	0.40	3500	2500	820	738	902	1355	25.0	1500	●	●	●
SVC 821D-14A***S	14			110.0	0.60	6000	4500				1355	50.0	3000	●	●	●
SVC 821D-20A***S	20			190.0	1.00	10000	7000				1355	100.0	5000	●	●	●
SVC 911D-10A***S	10	550	745	60.0	0.40	3500	2500	910	819	1001	1500	25.0	1500	●	●	●
SVC 911D-14A***S	14			120.0	0.60	6000	4500				1500	50.0	3000	●	●	●
SVC 911D-20A***S	20			215.0	1.00	10000	7000				1500	100.0	5000	●	●	●
SVC 102D-10A***S	10	625	825	65.0	0.40	3500	2500	1000	900	1100	1650	25.0	1500	●	●	●
SVC 102D-14A***S	14			130.0	0.60	6000	4500				1650	50.0	3000	●	●	●
SVC 102D-20A***S	20			230.0	1.00	10000	7000				1650	100.0	5000	●	●	●
SVC 112D-10A***S	10	680	895	70.0	0.40	3500	2500	1000	900	1210	1815	25.0	1500	●	●	●
SVC 112D-14A***S	14			140.0	0.60	6000	4500				1815	50.0	3000	●	●	●
SVC 112D-20A***S	20			250.0	1.00	10000	7000				1815	100.0	5000	●	●	●