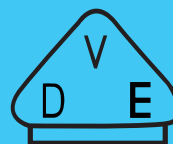


DISC Ceramic Capacitors



Ceramic Type	96
Ultra High Voltage(UHV)	106
Ceramic Capacitor	
SVC Varistors Type	114



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 representatives

How to Order

EK R 3A 102 K 09 F K 5

1 2 3 4 5 6 7 8 9



1 Style & Class

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

2 Temp. Char.

CC, EC Type (PPM/°C)				CK, EK, CG, SC, SD Type	
C	NPO(0)	T	N470(-470)	B	Y5P(+10~ -10%)
L	N80(-80)	U	N750(-750)	R	Y5R(+15~ -15%)
P	N150(-150)	O	SL(+350~ -1000)	E	Y5U(+22~ -56%)
R	N220(-220)			F	Y5V(+22~ -82%)
S	N330(-330)				

3 Rating Voltage

1A	10V	1B	12.5V	1C	16V	1E	25V				1H	50V			
2A	100V	2B	125V			2E	250V			2G	400V	2H	500V		
3A	1KV	3B	1.25KV	3D	2KV			3F	3.15KV	3G	4KV	3H	5KV	3J	6.3KV
4A	10KV	4B	12.5KV	4C	16KV										

4 Capacitance

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

Ex.)0.5 μ F-OR5, 10 μ F-100, 100 μ F-101

5 Cap. Tolerance

Mark	Cap. Tolerance	Mark	Cap. Tolerance	Mark	Cap. Tolerance
C	$\pm 0.25\mu\text{F}$	J	$\pm 5\%$	P	+100%–0%
D	$\pm 0.5\mu\text{F}$	K	$\pm 10\%$	Z	+80%–20%
F	$\pm 1.0\mu\text{F}$	M	$\pm 20\%$		

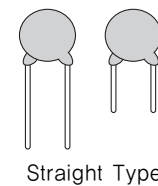
6 Disc Diameter

Code	Dia(\varnothing mm)	Code	Dia(\varnothing mm)	Code	Dia(\varnothing mm)	Code	Dia(\varnothing mm)	Code	Dia(\varnothing mm)
04	4.0	08	8.0	11	11.0	15	15.0	20	20.0
05	5.0	09	9.0	12	12.5	16	16.0		
06	6.3	10	10.0	14	14.0	18	18.0		
07	7.0	08	8.0						

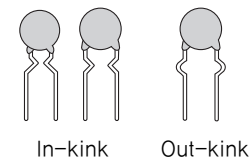
7 Packing Style

8 Lead Variation

Packing Style		Lead Variation	
F	Taping Type Flat Pack	S	Straight Type
		K	In - Kink Type
		F	Out - Kink Type
B	Bulk	S	Straight Long Type
		W	Kink Short Type
		K	Kink Long Type
		L	Kink Short Type
		N	Straight Short 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	2	2.5
7	7.5	15.0	5	5.0
8	7.5	30.0	7	7.5
9	7.5	25.4	1	10.0
1	10.0	25.4		
2	10.0	30.0		

CLASS | Temperature Compensating Ceramic Capacitors

Specification

Temp. Range : -25 ~ +85°C (Y class)

Capacitance : Measured at 1MHz, 1 Vrms and 20°C ± 2°C

Testing Voltage

R.V	T.V
50V DC	150V DC
500V DC	1,250V DC
1~2KV DC	R.V × 2

Quality Factor(Q)

Capacitance	Q value
30pF and over	≥ 1000
less than 30pF	≥ 400 + (20 × C)

Insulation Resistance : 10,000MΩ Min. at Rating voltage for 1 minute (500V and above : 500V)

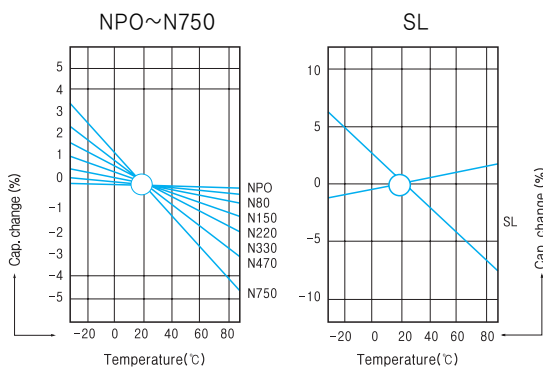
Color Code

TC.	Color	TC.	Color	TC.	Color
NPO(C)	Black	N 80(L)	Red	N150(P)	Orange
N220(R)	Yellow	N330(S)	Green	N470(T)	Blue
N750(U)	Purple	SL	Omitted		

Temp. Coefficient Tolerance

Code	Tol.(PPM/°C)	Code	Tol.(PPM/°C)
G	± 30	L	± 500
H	± 60	M	± 1000
J	± 120	N	± 2500
K	± 250		

Temp. Coefficient



Combination of the Capacitance Value and the TC.

Cap.	TC. PPM/°C							P350 ~1000
	NPO	N80	N150	N220	N330	N470	N750	
	C ■	L ■	P ■	R ■	S ■	T ■	U ■	SL
Less than 2pF	CK	LK	PK	RK	SK	TK	UK	SL
3pF	CJ	LJ	PJ	RJ	SJ	TJ	UJ	SL
4pF and above	CH	LH	PH	RH	SH	TH	UH	SL

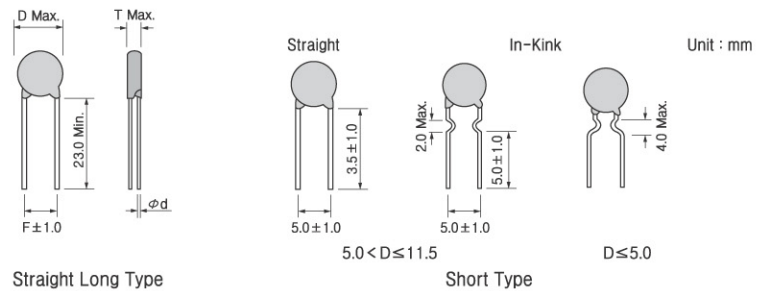
SAMWHA Standard (Cap. and Cap. Tol)

T.C Cap.(pF)	Cap.Tol C~U, SL	T.C Cap.(pF)	Cap.Tol C~U, SL	T.C Cap.(pF)	Cap.Tol C~U, SL	T.C Cap.(pF)	Cap.Tol C~U, SL
0.5	C, D	9	D, F	22	J, K	51	J
1	C, D	10	D, F	24	J	56	J, K
2	C, D	11	J	27	J, K	62	J
3	C, D	12	J, K	30	J	68	J, K
4	C, D	13	J	33	J, K	75	J
5	C, D	15	J, K	36	J	82	J, K
6	D, F	16	J	39	J, K	91	J
7	D, F	18	J, K	43	J	100	J, K
8	D, F	20	J	47	J, K	110	J

T.C Cap.(pF)	Cap.Tol C~U, SL	T.C Cap.(pF)	Cap.Tol C~U, SL	T.C Cap.(pF)	Cap.Tol C~U, SL	T.C Cap.(pF)	Cap.Tol C~U, SL
120	J, K	200	J	330	J, K	510	J
130	J	220	J, K	360	J	560	J, K
150	J, K	240	J	390	J, K	620	J
160	J	270	J, K	430	J	680	J, K
180	J, K	300	J	470	J, K	820	J

Lead Variation(Bulk Type)

R.V(V.DC)	Unit : mm
50	1.5Max.
500	2.0Max.
Above 1KV	3.0Max.



Capacitance Value According to Type(pF)

T.C R.V	Capacitance(pF)								Dimensions(mm)				Part No. (How to order)	Marking
	NPO (C)	N80 (I)	N150 (P)	N220 (R)	N330 (S)	N470 (T)	N750 (U)	P350~ N1000 (SL)	D	T	F	φd		
50V DC	0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24	0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91	4.0	3.5	5.0 (2.5)	0.50	CC * 1H * * * * 04 * * *	 D ≤ 5.0
	33, 36, 39, 43, 47	20, 22, 24, 27, 30	22, 24, 27, 30	27, 30, 33, 36	22, 24, 27, 30, 33, 36, 39	27, 30, 33, 36, 39	39, 43, 47	100, 110, 120	5.0	3.5	5.0 (2.5)	0.50	CC * 1H * * * * 05 * * *	 6.3 ≤ D ≤ 9.0
	51, 56, 62, 68, 75	33, 36, 39, 43, 47	33, 36, 39, 43, 47	39, 43, 47, 51, 56, 62, 68	43, 47, 51, 56, 62	43, 47, 51, 56	51, 56, 62, 68, 75, 82, 91	150, 180, 200, 220, 240	6.3	3.5	5.0	0.50	CC * 1H * * * * 06 * * *	 D ≥ 10.0
	82, 91, 100, 110, 120, 130, 150	51, 56, 62, 68, 75, 82	51, 56, 62, 68, 75, 82	75, 82, 91, 100, 110, 120	68, 75, 82, 91, 100	62, 68, 75, 82, 91, 100, 110, 120	100, 110, 120, 150, 180, 200	270, 300, 330, 360, 390, 430, 470	8.0	3.5	5.0	0.50	CC * 1H * * * * 08 * * *	
	160, 180, 200, 220, 240	91, 100, 110, 120	91, 100, 110, 120	130, 150, 180, 200	110, 120, 150, 180	150, 180, 200		510, 560, 620, 680, 820	10.0	3.5	5.0	0.50	CC * 2H * * * * 10 * * *	
500V DC	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24			2, 3, 4, 5, 6, 12, 13, 15			2, 3, 4, 5, 6, 7, 8, 9, 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68	5.0	4.0	5.0	0.50	CC * 2H * * * * 05 * * *	 D ≥ 5.0
	27, 30, 33, 36, 39, 43	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30	7, 8, 9, 10, 11, 18, 20, 22, 24, 27, 30, 33	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43	11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68	27, 30, 33, 36, 39, 43, 47, 51, 100, 110, 120	6.3	4.0	5.0	0.50	CC * 2H * * * * 05 * * *	 6.3 ≤ D ≤ 9.0
	47, 51, 56, 62, 68, 75, 82	22, 24, 27, 30, 33, 36	33, 36, 39, 43, 47	36, 39, 43, 47, 51, 56	39, 43, 47, 51, 56	47, 51, 56, 62	75, 82, 91, 100	130, 150, 160, 180, 200, 220	8.0	4.0	5.0	0.50	CC * 2H * * * * 08 * * *	
	91, 100, 110, 120, 130	39, 43, 47, 51, 56, 62	51, 56, 62, 68, 75	62, 68, 75, 82, 91, 100	62, 68, 75, 82, 91	68, 75, 82, 91, 100, 110	110, 120, 150, 180	240, 270, 300, 330, 360, 430, 390, 470, 510, 560	10.0	4.0	5.0	0.50	CC * 2H * * * * 10 * *	 D ≥ 10.0
	150, 160, 180, 200	68, 75, 82, 91, 100	82, 91, 100, 110, 120	100, 120, 150	100, 110, 120, 150	120, 150, 180	200, 220, 240, 270, 300		12.5	4.0	5.0	0.50	CC * 2H * * * * 12 * *	

CLASS || High Dielectric Constant Ceramic Capacitors

Specification

Temp. Range : -25 ~ +85°C(Y class)

Capacitance : Measured at 1KHz, 1 Vrms and 20 °C ± 2°C

Testing Voltage

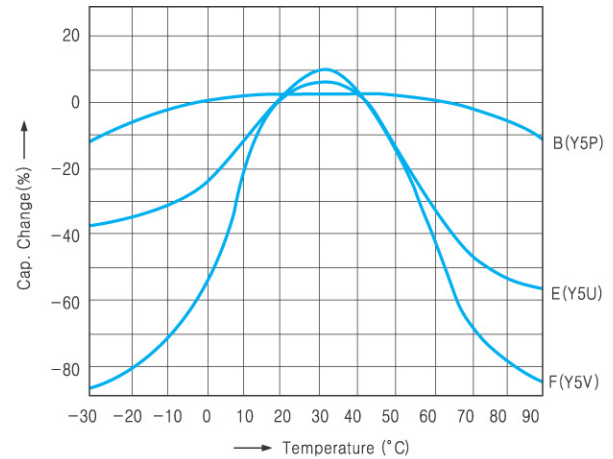
R.V	50V DC	500V DC	1~2KV DC	3KV DC	4~KV DC
T.V	R.V×3	R.V×2.5	R.V×2	R.V×1.75	R.V×1.5

Insulation Resistance : 10,000MΩ or 200MΩ · μF Whichever less at Rating Voltage for 1minute

Dissipation Factor(tanδ)

T.C	B	E	Fz
tanδ	2.5% Max.	2.5% Max.	5.0% Max.

Temp. Char.











Capacitance Value According to Type(μF)

T.C R.V	Capacitance(μF)			Dimensions(mm)				Part No. (How to order)	Marking
	Y5P(B)	Y5U(E)	Y5V(F)	D	T	F	Ød		
50V DC	150, 180, 220, 270, 330, 390, 470, 560, 680	-	2200, 3300	4.0	3.5	5.0(2.5)	0.50	CK * 1H *** 04 **	
	100, 120, 820, 1000, 1200, 1500	-	1000, 15000, 4700	5.0	3.5	5.0(2.5)	0.50	CK * 1H *** 05 **	
	1800, 2200	-	5600, 10000	6.3	3.5	5.0	0.50	CK * 1H *** 06 **	
	2700, 3300, 3900, 4700, 5600	-	15000, 22000, 27000	8.0	3.5	5.0	0.50	CK * 1H *** 08 **	
	6800, 8200	-	3300, 40000	10.0	3.5	5.0	0.50	CK * 1H *** 10 **	
	10000	-	47000	12.5	3.5	5.0	0.50	CK * 1H *** 12 **	
500V DC	120, 150, 180, 220, 270, 330, 390, 470, 560, 680	-	2200	5.0	4.0	5.0	0.50	CK * 2H *** 05 **	
	100, 820, 1000, 1200, 1500	1000	1000, 4700	6.3	4.0	5.0	0.50	CK * 2H *** 06 **	
	1800, 2200	2200	10000	8.0	4.0	5.0	0.50	CK * 2H *** 08 **	
	2700, 3900	4700	-	10.0	4.0	5.0	0.50	CK * 2H *** 10 **	
	4700, 5600, 6800	6800	20000, 22000	12.5	4.0	5.0	0.50	CK * 2H *** 12 **	
	8200, 10000	10000	-	16.0	4.0	10.0	0.60	CK * 2H *** 16 **	

DC High Voltage Ceramic Capacitors

High Voltage Ceramic Capacitors(Epoxy Coated Ceramic Capacitors)

T.C R.V	Capacitance(μF)			Dimensions(mm)				Part No. (How to order)	Marking
	Y5P(B)	Y5U(E)	Y5V(F)	D	T	F	∅d		
500V DC	10000			16.0	4.0	10.0	0.60	EK△2H△△△16△△	
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△△	 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△△	 D≥10.0
	3900, 4700			14.0	5.0	7.5(10.0)	0.60	EK△3A△△△14△△	
	5600, 6800		22000	16.0	5.0	7.5(10.0)	0.60	EK△3A△△△16△△	
		8200, 10000	10000		18.0	5.0	7.5(10.0)	0.60	EK△3A△△△18△△
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△△	 6.3≤D≤9.0
	680, 820, 1000	1000		8.0	5.0	7.5(5.0)	0.60(0.50)	EK△3D△△△08△△	
	1200, 1500		4700	10.0	5.0	10.0(7.5)	0.60	EK△3D△△△10△△	
	1800, 2200, 2700	2200	6800, 10000	12.5	5.0	10.0(7.5)	0.60	EK△3D△△△12△△	 D≥10.0
	3300, 3900	4700		14.0	5.0	10.0(7.5)	0.60	EK△3D△△△14△△	
	4700	6800, 10000		16.0	5.0	10.0(7.5)	0.60	EK△3D△△△16△△	
		5600			18.0	5.0	10.0(7.5)	0.60	EK△3D△△△18△△
		6800, 8200, 10000	10000		20.0	5.0	10.0(7.5)	0.60	EK△3D△△△20△△
3.15KV DC		1000		7.0	6.0	7.5(10.0)	0.60	EK△3F△△△07△△	 6.3≤D≤9.0
	100, 120, 150, 180, 220, 270, 330, 390, 470, 560			8.0	6.0	7.5(10.0)	0.60	EK△3F△△△08△△	
	680	1500		9.0	6.0	7.5(10.0)	0.60	EK△3F△△△09△△	
	820, 1000	2200	4700	10.0	6.0	7.5(10.0)	0.60	EK△3F△△△10△△	 D≥10.0
			6800	11.0	6.0	7.5(10.0)	0.60	EK△3F△△△11△△	
	1200, 1500	3300		12.5	6.0	7.5(10.0)	0.60	EK△3F△△△12△△	
	1800, 2200	4700	10000	14.0	6.0	7.5(10.0)	0.60	EK△3F△△△14△△	
	2700			16.0	6.0	7.5(10.0)	0.60	EK△3F△△△16△△	
3300			18.0	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△△	 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△△	 D≥10.0
		3300		14.0	7.0	10.0	0.60	EK△3J△△△14△△	
		3900, 4700		15.5	7.0	10.0	0.60	EK△3J△△△15△△	
		10000	20.0	7.0	10.0	0.60	EK△3J△△△20△△		
10KV DC	100, 120, 150, 180, 220			8.0	8.0	10.0	0.60	EK△4A△△△08△△	
	270		1000	10.0	8.0	10.0	0.60	EK△4A△△△10△△	
	330, 390, 470	1000	2200	12.5	8.0	10.0	0.60	EK△4A△△△12△△	
	560, 680, 820, 1000	2200	4700	16.0	8.0	10.0	0.60	EK△4A△△△16△△	

CLASS III Semi-Conductor Capacitors

Specification

Temp. Range : -25 ~ +85°C(Y class)

Capacitance : Measured at 1KHz, 0.1 Vrms and 25°C ± 2°C

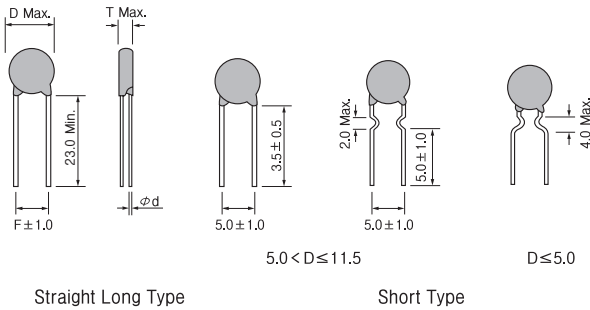
Testing Voltage

Rating Voltage	25V DC	50V DC
Testing Voltage	R.V×1.5	R.V×1.5

Insulation Resistance

T.C	Y5P	Y5R	Y5V
I.R(MΩ)	5MΩ · μF Min.	1000MΩ · or 20MΩ · μF Whichever less	5MΩ · μF Min.

Lead Variation



Dissipation Factor(tanδ)

T.C	Y5P	Y5R	Y5V
R.V	25V, 50V	25V	25V, 50V
Tanδ	5.0% Max.	1.5% Max.	5.0% Max.

Temperature Characteristics

T.C	Y5P	Y5R	Y5V
Change Rate	±10%	±15%	+22% -82%

Capacitance Value According to Type(μF)

R.V	T.C	Capacitance(μF)			Dimensions(mm)				Part No. (How to order)	Marking
		Y5P(B)	Y5U(E)	Y5V(F)	D	T	F	∅d		
25V DC		10000	2200, 2700, 3300, 3900, 4700, 6800	10000	4.0	3.0	5.0(2.5)	0.5	CG * 1E **** 04 **	B 103 25V D ≤ 5.0
			10000, 15000	22000	5.0	3.0	5.0(2.5)	0.5	CG * 1E **** 05 **	R 222M 25V 6.3 ≤ D ≤ 9.0
		22000	22000, 27000, 33000	47000, 56000, 100000	6.3	3.0	5.0	0.5	CG * 1E **** 06 **	R 104M 25V SWC D ≥ 10.0
		47000	47000		8.0	3.0	5.0	0.5	CG * 1E **** 08 **	
			56000, 68000	220000	10.0	3.0	5.0	0.5	CG * 1E **** 10 **	
50V DC				10000	4.0	3.0	5.0(2.5)	0.5	CG * 1H **** 04 **	B 103 D ≤ 5.0
		10000		22000, 33000	5.0	3.0	5.0(2.5)	0.5	CG * 1H **** 05 **	
				47000, 56000	6.3	3.0	5.0	0.5	CG * 1H **** 06 **	104
		22000		68000, 100000	8.0	3.0	5.0	0.5	CG * 1H **** 08 **	6.3 ≤ D ≤ 9.0

Low Loss Ceramic Capacitors(SL & R Series)

Specification

Temp. Range : -25 ~ +85°C

Operating Temperature Range : -25 ~ +125°C

Capacitance : Measured at 1KHz, 0.1 Vrms and 20°C ± 2°C

Testing Voltage : R.V × 2

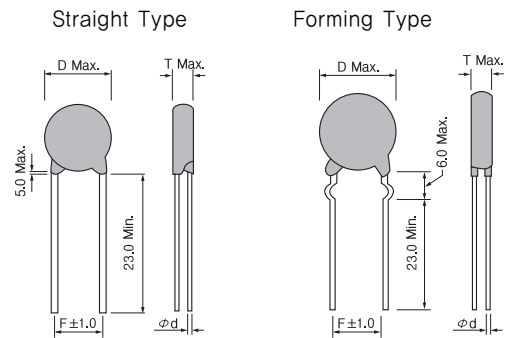
Insulation Resistance : 10,000MΩ Min.

at 500V DC for 1 minute

(Unit:mm)

Temperature Characteristics & Dissipation Factor

T.C	SL	R(Y5V)
Change Rate	-1000~350PPM	±15%
D.F	30pF and over : 1000Min. less than 30pF : 400+(20 × C)Min.	0.2%Max.



Epoxy - Coated

R.V	Capacitance (pF)		Dimensions(mm)				Part No. (How to order)	Marking
	SL	R(Y5R)	D	T	F	φd		
1KV DC	10, 11, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 43, 47, 51	220, 270, 330, 390	6.3	5.0	5.0	0.50	EK△3A△△△△06△△	
		470	7.0	5.0	5.0	0.50	EK△3A△△△△07△△	
	56, 62, 68, 75, 82, 91, 100	560, 680	8.0	5.0	5.0	0.50	EK△3A△△△△08△△	
		820, 1000	9.0	5.0	5.0(7.5)	0.50(0.60)	EK△3A△△△△09△△	
	110, 120, 150	1200	10.0	5.0	5.0(7.5)	0.50(0.60)	EK△3A△△△△10△△	
		1500	11.0	5.0	5.0(7.5)	0.50(0.60)	EK△3A△△△△11△△	
	180, 200, 220, 240, 270	1800, 2200, 2700	12.5	5.0	5.0(7.5)	0.50(0.60)	EK△3A△△△△12△△	
	300, 330, 360	3300	14.0	5.0	10.0	0.60	EK△3A△△△△14△△	
		3900	15.0	5.0	10.0	0.60	EK△3A△△△△15△△	
	390, 430, 470, 510	4700	16.0	5.0	10.0	0.60	EK△3A△△△△16△△	
560, 620		17.0	5.0	10.0	0.60	EK△3A△△△△17△△		
		18.0	5.0	10.0	0.60	EK△3A△△△△18△△		
2KV DC	18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47	120	6.3	5.0	5.0	0.50	EK△3D△△△△06△△	
		220, 270	7.0	5.0	5.0	0.50	EK△3D△△△△06△△	
	51, 56, 62, 68, 75, 82, 91, 100	330, 390	8.0	5.0	10.0	0.60	EK△3D△△△△07△△	
		470, 560, 680	10.0	5.0	10.0	0.60	EK△3D△△△△08△△	
		820, 1000	11.0	5.0	10.0	0.60	EK△3D△△△△11△△	
	120, 150, 180, 200	1200, 1500	12.5	5.0	10.0	0.60	EK△3D△△△△12△△	
	220, 240	1800, 2200	14.0	5.0	10.0	0.60	EK△3D△△△△14△△	
		2700	15.0	5.0	10.0	0.60	EK△3D△△△△15△△	
	270, 300, 330, 360	3300	16.0	5.0	10.0	0.60	EK△3D△△△△16△△	
		4700	17.0	5.0	10.0	0.60	EK△3D△△△△17△△	
390, 430, 470		18.0	5.0	10.0	0.60	EK△3D△△△△18△△		
3.15KV DC	15, 16, 18, 20, 22, 27, 30	150, 180, 220, 270	6.3	6.0	5.0	0.50	EK△3F△△△△06△△	
		330, 390	7.0	6.0	5.0	0.50	EK△3F△△△△07△△	
	33, 36, 39, 43, 47, 51, 56	470, 560, 680	8.0	6.0	5.0	0.50	EK△3F△△△△08△△	
	62, 68, 75, 82	820, 1000	10.0	6.0	10.0	0.60	EK△3F△△△△10△△	
	91, 100, 110, 120, 150	1200, 1500	12.5	6.0	10.0	0.60	EK△3F△△△△12△△	
	180, 200	1800	14.0	6.0	10.0	0.60	EK△3F△△△△14△△	
	220, 240	2200, 2700	16.0	6.0	10.0	0.60	EK△3F△△△△16△△	
	270, 300, 330, 360		18.0	6.0	10.0	0.60	EK△3F△△△△18△△	
6.3KV DC	22, 24, 27, 30, 33, 36		8.0	7.0	10.0	0.60	EK△3J△△△△08△△	
	43, 47	220, 270, 330	10.0	7.0	10.0	0.60	EK△3J△△△△10△△	
	51, 56, 62, 68, 75	390, 470	12.5	7.0	10.0	0.60	EK△3J△△△△12△△	
	120	560, 680	16.0	7.0	10.0	0.60	EK△3J△△△△16△△	

Safety Standard Recognized Ceramic Capacitors

Specification

Temp. Range : -25 ~ +85°C(Y class)

(Unit:mm)

Operating Temperature Range : -25 ~ +125°C

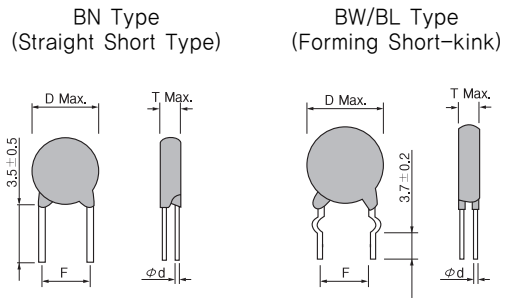
Capacitance : Measured at 1KHz, 1 Vrms and 20°C ±2°C

Testing Voltage

R.V	T.V
250V AC	2,500V AC
400V AC	4,000V AC

Dissipation Factor(tanδ)

T.C	B	E	Fz
tanδ	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

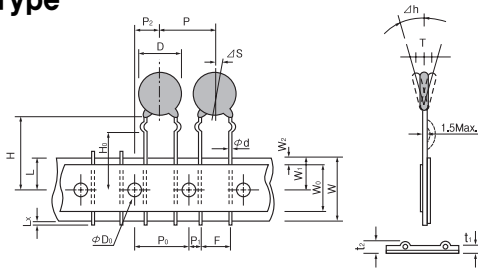
Specification

Type	Temp char.	Capacitance	Size				Marking
		(pF)	D	T	F	Ød	
SC	B	100, 150, 220, 330, 390, 470, 560	8.0	6.0	7.5 (10.0)	0.60	<p>SC102M V</p> <p>X1Y2</p> <p>10 250~</p> <p>RL SP SWC</p>
		680, 820	10.0				
		1000	10.0				
	E	1000	7.0				
		1500	9.0				
		1800, 2200	10.0				
		3300, 3900	12.5				
	Fz	4700	14.0				
		4700	10.0				
		6800	14.0				
SD	B	100, 150, 220, 390, 470	10.0	7.0	10.0	0.60	<p>SD102M V</p> <p>X1Y1</p> <p>10 400~</p> <p>RL SP SWC</p>
		1000	8.0				
	E	1500	9.0				
		2200	12.5				
		3300, 3900	14.0				
		4700	15.0				

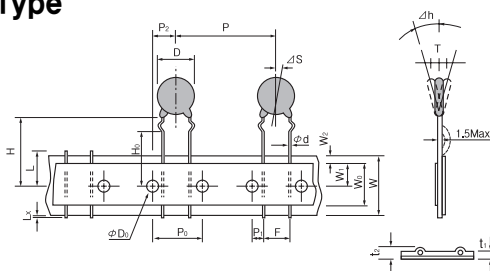
Safety Standard Recognized Ceramic Capacitors

Design

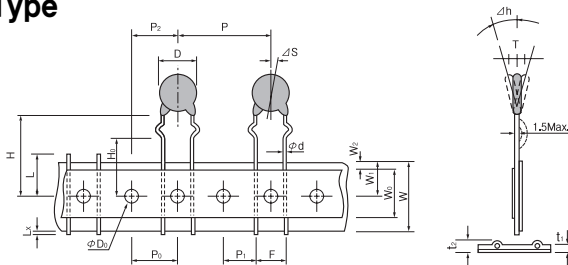
FF7 Type



FF8 Type



FF1 Type



Item	Code	Taping Specification	
		FF7	FF8
Body Diameter	D	$6.3 \leq D \leq 14.0$	$15.0 \leq D \leq 20.0$
Body Thickness	T	6.0Max.	
Lead Diameter	$\varnothing d$	$0.6-0.8 \pm 0.05$	
Pitch of sprocket Hole	P_0	15.0 ± 0.3	
Pitch of Component	P	15.0 ± 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	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	5.0Min.	
Position of Sprocket Hole	W_1	9.0 ± 0.5	
Hold Down Tape Position	W_2	3.0Max.	
Lead Wire Clinch Height	H_0	16.0 ± 0.5	
Height of Component Height	H	$20.0^{+1.5}_{-1.0}$	
Diameter of Sprocket Hole	$\varnothing D_0$	4.0 ± 0.2	
Length of Snipped Lead	L	11.0Max.	
Total Tape Thickness	t	0.7 ± 0.2	
Lead Wire Protrusion	L_x	1.0Max.	

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
KC SC	SU03004-16001/SU 03004-16003
ENEC	NCS/FI 25650 MI(SC&SD)

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
KC SD	SU 03004-16002/SU03004-16004

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

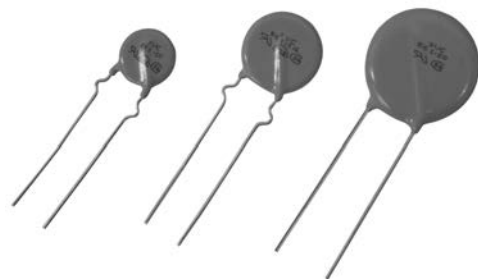
Applications

- 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 17 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	Temp. Range	Change Rate
B (Y5P)	-25°C ~ +85°C	-10% ~ +10%
E (Y5U)	-25°C ~ +85°C	-56% ~ +22%
F (Y5V)	-25°C ~ +85°C	-82% ~ +22%
R (Y5R)	-25°C ~ +85°C	-15% ~ +15%
O (SL)	+20°C ~ +85°C	-1000 ~ +350ppmX7R

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 150%

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	10	11	12	13	14	15	16	17	18	19	20	22	23
Max Dia.(∅mm)	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 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

8 Lead Spacing & Pitch of Components

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

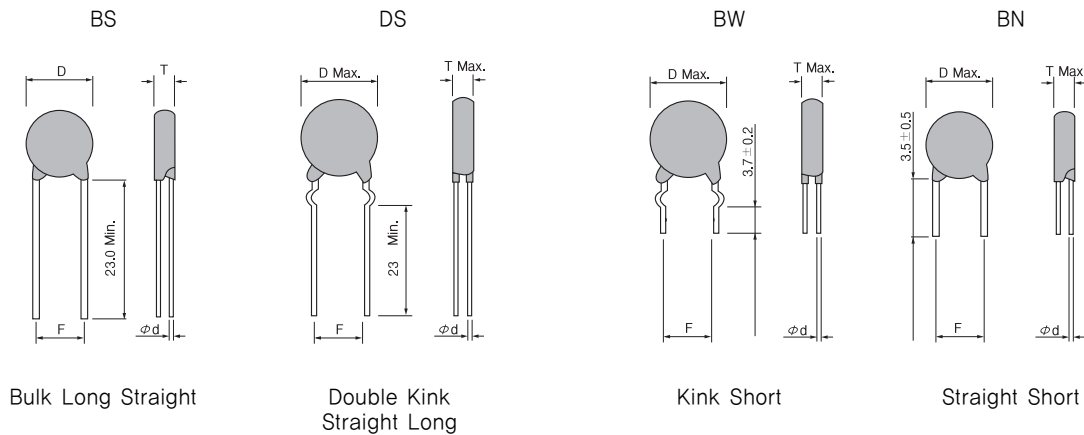
9 Typical Performance Characteristics

Characteristics	B (Y5P)	E (Y5U)	F (Y5V)	R (Y5R)	O (SL)
Rated Temp. Range	25°C ~ +85°C	25°C ~ +85°C	25°C ~ +85°C	25°C ~ +85°C	+20°C ~ +85°C
Temperature Coefficient	-10% ~ +10%	-56% ~ +22%	-82% ~ +22%	-15% ~ +15%	-1000 ~ +350ppm
Dissipation Factor	$\text{tg } \delta \leq \delta 2.5\%$	$\text{tg } \delta \leq \delta 3.5\%$	$\text{tg } \delta \leq \delta 3.5\%$	$\text{tg } \delta \leq \delta 0.2\%$	$C < 30\text{pF}, Q \geq 400+20C$ $C \geq 30\text{pF}, Q \geq 1000$
Insulation Resistance	Charge at 500VDC for 60 seconds, $R \geq 10000 \text{ MW}$				
Rated Voltage (RV) 1	0 ~ 15kVdc	10 ~ 15kVdc	10 ~ 15kVdc	10 ~ 15kVdc	10 ~ 20kVdc
Dielectric Strength (TV) 1	50% x RV	150% x RV	150% x RV	150% x RV	150% x RV

PACKING STYLE

Long Type

Short Type



Bulk Long Straight

Double Kink
Straight Long

Kink Short

Straight Short

Specifications

10kVDC

TCC	Cap.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Min L/W	Lead style	Size Code
	(pF)	(%)	Dmax (mm)	Tmax (mm)	mm	mm	Length (mm)		
B(Y5P) -25~85°C ±10%	100	±10%	10.5	8.5	10±2.0	0.80±0.05	23	Bulk Long	10
	150	±10%	10.5	8.5	10±2.0	0.80±0.05			10
	220	±10%	11.5	8.5	10±2.0	0.80±0.05			11
	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%	17.5	8.5	10±2.0	0.80±0.05			17
E(Y5U) -25~85°C +22~-56%	1000	±20%	12.5	9	10±2.0	0.80±0.05	23	Bulk Long	12
	2000	±20%	14.5	9	10±2.0	0.80±0.05			14
	2200	±20%	15.5	9	10±2.0	0.80±0.05			15
	3300	±20%	20.5	9	10±2.0	0.80±0.05			20
	4700	±20%	22.5	9	10±2.0	0.80±0.05			22
F(Y5V) -25~85°C +22~-82%	1000	±20%	10.5	9	10±2.0	0.80±0.05	23	Bulk Long	10
	2000	±20%	12.5	9	10±2.0	0.80±0.05			12
	2200	±20%	13.5	9	10±2.0	0.80±0.05			13
	3300	±20%	15.5	9	10±2.0	0.80±0.05			15
	4700	±20%	18.5	9	10±2.0	0.80±0.05			18
	1000	+80~-20%	10.5	9	10±2.0	0.80±0.05			10
	2000	+80~-20%	12.5	9	10±2.0	0.80±0.05			12
	2200	+80~-20%	13.5	9	10±2.0	0.80±0.05			13
	3300	+80~-20%	15.5	9	10±2.0	0.80±0.05			15
	4700	+80~-20%	18.5	9	10±2.0	0.80±0.05			18
SL +20~85°C +350~-100 0ppm	10	±10%	9.5	8.5	10±2.0	0.80±0.05	23	Bulk Long	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°C ±15%	100	±10%	9.5	8.5	10±2.0	0.80±0.05	23	Bulk Long	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

Specifications

15kVDC

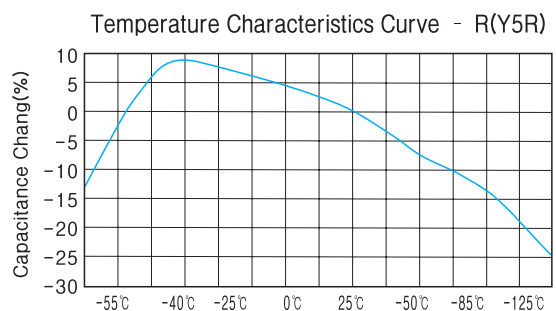
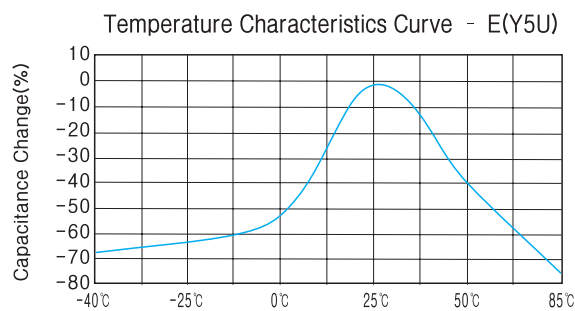
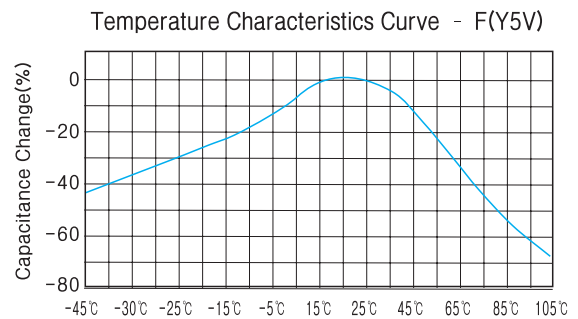
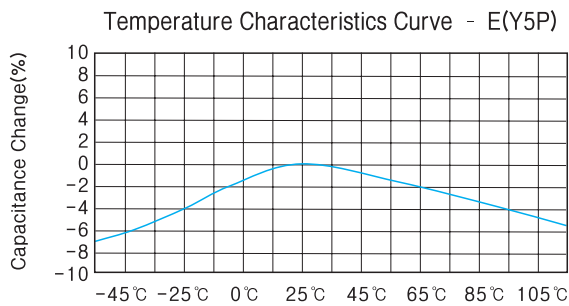
TCC	Cap.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Min L/W	Lead style	Size Code
	(pF)	(%)	Dmax (mm)	Tmax (mm)	mm	mm	Length (mm)		
B(Y5P) -25~85°C ±10%	100	±10%	10.5	10	12.5±2.0	0.80±0.05	23	Bulk Long	10
	150	±10%	10.5	10	12.5±2.0	0.80±0.05			10
	220	±10%	11.5	10	12.5±2.0	0.80±0.05			11
	270	±10%	11.5	10	12.5±2.0	0.80±0.05			11
	330	±10%	12.5	10	12.5±2.0	0.80±0.05			12
	470	±10%	14.5	10	12.5±2.0	0.80±0.05			14
	560	±10%	14.5	10	12.5±2.0	0.80±0.05			14
	680	±10%	17.5	10	12.5±2.0	0.80±0.05			17
	1000	±10%	20.5	10	12.5±2.0	0.80±0.05			20
E(Y5U) -25~85°C +22~-56%	1000	±20%	12.5	10	12.5±2.0	0.80±0.05	23	Bulk Long	12
	2000	±20%	15.5	10	12.5±2.0	0.80±0.05			15
	2200	±20%	16.5	10	12.5±2.0	0.80±0.05			16
	3300	±20%	20.5	10	12.5±2.0	0.80±0.05			20
	4700	±20%	22.5	10	12.5±2.0	0.80±0.05			23
F(Y5V) -25~85°C +22~-82%	1000	±20%	11.5	10	12.5±2.0	0.80±0.05	23	Bulk Long	11
	2000	±20%	14.5	10	12.5±2.0	0.80±0.05			14
	2200	±20%	16.5	10	12.5±2.0	0.80±0.05			16
	3300	±20%	17.5	10	12.5±2.0	0.80±0.05			17
	4700	±20%	20.5	10	12.5±2.0	0.80±0.05			20
	1000	+80~-20%	11.5	10	12.5±2.0	0.80±0.05			11
	2000	+80~-20%	14.5	10	12.5±2.0	0.80±0.05			14
	2200	+80~-20%	16.5	10	12.5±2.0	0.80±0.05			16
	3300	+80~-20%	17.5	10	12.5±2.0	0.80±0.05			17
4700	+80~-20%	20.5	10	12.5±2.0	0.80±0.05	20			
SL +20~85°C +350~-100 0ppm	15	±10%	10.5	9	12.5±2.0	0.80±0.05	23	Bulk Long	10
	20	±10%	10.5	9	12.5±2.0	0.80±0.05			10
	22	±10%	10.5	9	12.5±2.0	0.80±0.05			10
	27	±10%	11.5	9	12.5±2.0	0.80±0.05			11
	33	±10%	12.5	9	12.5±2.0	0.80±0.05			12
	47	±10%	13.5	9	12.5±2.0	0.80±0.05			13
	56	±10%	14.5	9	12.5±2.0	0.80±0.05			14
	68	±10%	16.5	9	12.5±2.0	0.80±0.05			16
	82	±10%	17.5	9	12.5±2.0	0.80±0.05			17
R(Y5R) -25~85°C ±15%	100	±10%	10.5	9	12.5±2.0	0.80±0.05	23	Bulk Long	10
	150	±10%	0.5	9	12.5±2.0	0.80±0.05			10
	220	±10%	11.5	9	12.5±2.0	0.80±0.05			11
	330	±10%	14.5	9	12.5±2.0	0.80±0.05			14
	470	±10%	14.5	9	12.5±2.0	0.80±0.05			14
	680	±10%	17.5	9	12.5±2.0	0.80±0.05			17
	1000	±10%	20.5	9	12.5±2.0	0.80±0.05			20

Specifications

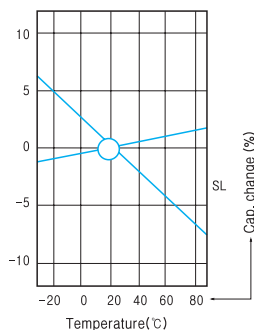
20kVDC

TCC	Cap.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Min L/W	Lead style	Size Code
	(pF)	(%)	Dmax (mm)	Tmax (mm)	mm	mm	Length (mm)		
SL +20~85°C +350~-100 0ppm	15	±10%	10.5	10	15±2.0	0.80±0.05	23	Bulk Long	10
	20	±10%	10.5	10	15±2.0	0.80±0.05			10
	22	±10%	11.5	10	15±2.0	0.80±0.05			11
	27	±10%	11.5	10	15±2.0	0.80±0.05			11
	33	±10%	13.5	10	15±2.0	0.80±0.05			13
	47	±10%	13.5	10	15±2.0	0.80±0.05			13
	56	±10%	15.5	10	15±2.0	0.80±0.05			15
	68	±10%	17.5	10	15±2.0	0.80±0.05			17
	82	±10%	18.5	10	15±2.0	0.80±0.05			18

Typical Characteristics Graph



Temperature Characteristics Curve - O(SL)

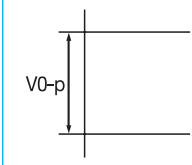
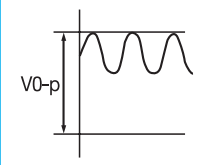
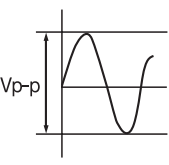
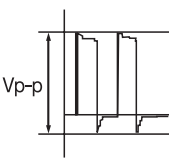
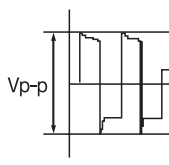


Caution(Rating)

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} 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. Operating 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 $10^{\circ}\Delta C$ at an atmosphere temperature of $25^{\circ}\Delta C$. When measuring, use a thermocouple of small thermal capacity-K of $\text{TM}0.1\text{mm}$ 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

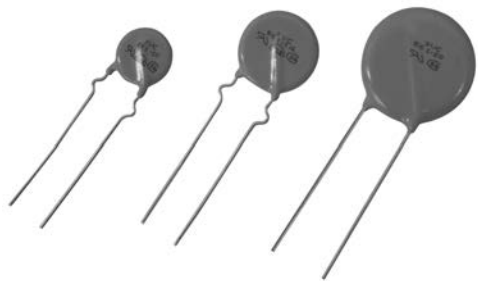
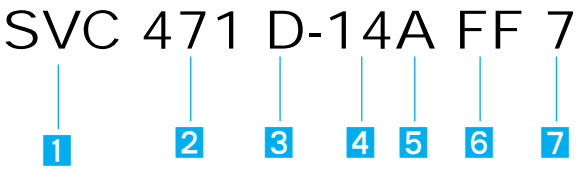
Introduction

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 nanoseconds.
 - Improve Product safety
 - UL, CSA, VDE recognized
- ※ special specification like a Automobile, Medical, Military, Aviation should be discuss with our sales representatives

How to Order



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

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

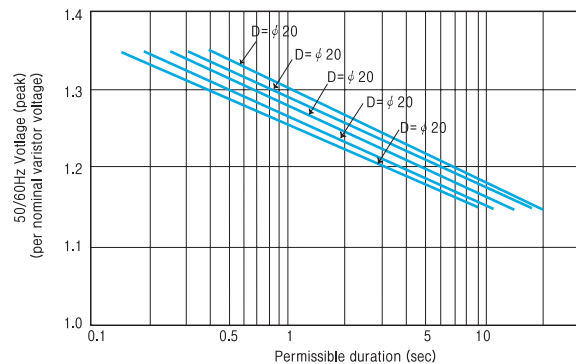
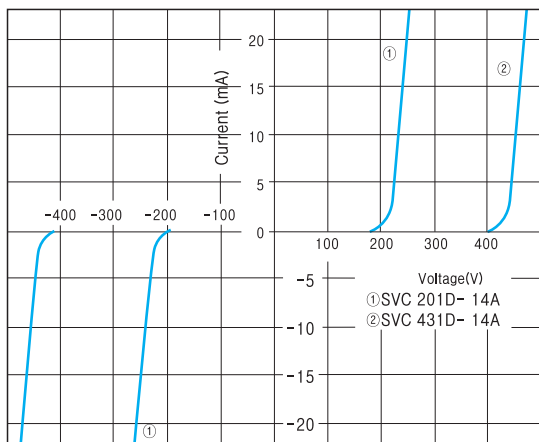
Suffix Code

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

SVC Characteristic Curves

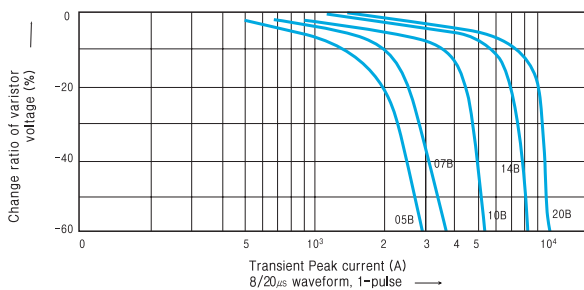
V - I Curve

- Small - current region of V - I curve
- Temporary power frequency over voltage capability



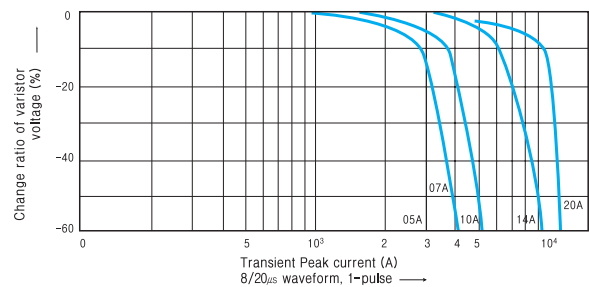
B Type

- Withstand discharge impulse current characteristics(Typical)



A Type

- Withstand discharge impulse current characteristics(Typical)



Specification

Device Type	Chip Element Size	Maximum Ratings					Characteristics				
		Applied Voltage		Transient			Nominal Varistor ^④ Peak Voltage			Max. Clamping ^⑤ Voltage @ Test Current(8/20 μ S)	
		RMS 50/60Hz (25 $^{\circ}$ C)	DC (25 $^{\circ}$ C)	Energy ^②	Average Power Dissipation	Peak ^③ Current (8/20 μ S)					
		Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	I _{tm} (Amps)	V _{nom} (Volts)	Tolerance		V _c (Volts)
							Min.(Volts)	Max.(Volts)			
SVC 180D-05B	5			0.3	0.01	125				40	1
SVC 180D-07B	7			0.8	0.02	250				36	2.5
SVC 180D-10B	10	11	14	1.5	0.05	500	18	16	20	36	5
SVC 180D-14B	14			3.5	0.1	1000				36	10
SVC 180D-20B	20			10.0	0.2	2000				36	20
SVC 220D-05B	5			0.4	0.01	125				48	1
SVC 220D-07B	7			0.9	0.02	250				43	2.5
SVC 220D-10B	10	14	18	2.0	0.05	500	22	20	24	43	5
SVC 220D-14B	14			4.0	0.1	1000				43	10
SVC 220D-20B	20			13.0	0.2	2000				43	20
SVC 270D-05B	5			0.5	0.01	125				60	1
SVC 270D-07B	7			1.0	0.02	250				53	2.5
SVC 270D-10B	10	17	22	2.5	0.05	500	27	24	30	53	5
SVC 270D-14B	14			5.0	0.1	1000				54	10
SVC 270D-20B	20			15.0	0.2	2000				53	20
SVC 330D-05B	5			0.6	0.01	125				73	1
SVC 330D-07B	7			1.2	0.02	250				65	2.5
SVC 330D-10B	10	20	26	3.0	0.05	500	33	30	36	65	5
SVC 330D-14B	14			6.0	0.1	1000				65	10
SVC 330D-20B	20			20.0	0.2	2000				65	20
SVC 390D-05B	5			0.8	0.01	125				86	1
SVC 390D-07B	7			1.5	0.02	250				77	2.5
SVC 390D-10B	10	25	31	3.5	0.05	500	39	35	43	77	5
SVC 390D-14B	14			7.0	0.1	1000				77	10
SVC 390D-20B	20			24.0	0.2	2000				77	20
SVC 470D-05B	5			1.0	0.01	125				104	1
SVC 470D-07B	7			1.8	0.02	250				93	2.5
SVC 470D-10B	10	30	38	4.5	0.05	500	47	42	52	93	5
SVC 470D-14B	14			8.5	0.1	1000				93	10
SVC 470D-20B	20			30.0	0.2	2000				93	20
SVC 560D-05B	5			1.0	0.01	125				123	1
SVC 560D-07B	7			2.2	0.02	250				110	2.5
SVC 560D-10B	10	35	45	5.5	0.05	500	56	50	62	110	5
SVC 560D-14B	14			10.5	0.1	1000				110	10
SVC 560D-20B	20			35.0	0.2	2000				110	20
SVC 680D-05B	5			1.2	0.01	125				150	1
SVC 680D-07B	7			2.5	0.02	250				135	2.5
SVC 680D-10B	10	40	56	6.5	0.05	500	68	61	75	135	5
SVC 680D-14B	14			12.0	0.1	1000				135	10
SVC 680D-20B	20			40.0	0.2	2000				135	20
SVC 820D-05A	5			1.7	0.1	400				145	5
SVC 820D-07A	7			3.5	0.25	1200				135	10
SVC 820D-10A	10	50	65	8.0	0.4	2500	82	74	90	135	25
SVC 820D-14A	14			14.0	0.6	4500				135	50
SVC 820D-20A	20			27.0	1.0	6500				135	100
SVC 101D-05A	5			2.0	0.1	400				175	5
SVC 101D-07A	7			4.0	0.25	1200				165	10
SVC 101D-10A	10	60	85	10.0	0.4	2500	100	90	110	165	25
SVC 101D-14A	14			18.0	0.6	4500				165	50
SVC 101D-20A	20			30.0	1.0	6500				165	100

Device Type	Chip Element Size	Maximum Ratings					Characteristics					
		Applied Voltage		Transient			Nominal Varistor ④ Peak Voltage			Max. Clamping ⑤ Voltage @ Test Current(8/20 μ s)		
		RMS 50/60Hz (25 $^{\circ}$ C)	DC (25 $^{\circ}$ C)	Energy ②	Average Power Dissipation	Peak ③ Current (8/20 μ s)						
	Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	I _{tm} (Amps)	V _{nom} (Volts)	Tolerance		V _c (Volts)	I _p (Amps)	
							Min.(Volts)	Max.(Volts)				
SVC 121D-05A	5			2.5	0.1	400				210	5	
SVC 121D-07A	7			5.0	0.25	1200				200	10	
SVC 121D-10A	10	75	100	12.0	0.4	2500	120	108	132	200	25	
SVC 121D-14A	14			20.0	0.6	4500				200	50	
SVC 121D-20A	20			40.0	1.0	6500				200	100	
SVC 151D-05A	5			3.0	0.1	400				260	5	
SVC 151D-07A	7			6.0	0.25	1200				250	10	
SVC 151D-10A	10	95	125	16.0	0.4	2500	150	135	165	250	25	
SVC 151D-14A	14			25.0	0.6	4500				250	50	
SVC 151D-20A	20			50.0	1.0	6500				250	100	
SVC 201D-05A	5			4.0	0.1	400				355	5	
SVC 201D-07A	7			10.0	0.25	1200				340	10	
SVC 201D-10A	10	130	170	20.0	0.4	2500	200	180	220	340	25	
SVC 201D-14A	14			35.0	0.6	4500				340	50	
SVC 201D-20A	20			70.0	1.0	6500				340	100	
SVC 221D-05A	5			4.5	0.1	400				380	5	
SVC 221D-07A	7			10.0	0.25	1200				360	10	
SVC 221D-10A	10	140	180	23.0	0.4	2500	220	198	242	360	25	
SVC 221D-14A	14			40.0	0.6	4500				360	50	
SVC 221D-20A	20			75.0	1.0	6500				360	100	
SVC 241D-05A	5			5.0	0.1	400				415	5	
SVC 241D-07A	7			10.0	0.25	1200				395	10	
SVC 241D-10A	10	150	200	25.0	0.4	2500	240	216	264	395	25	
SVC 241D-14A	14			40.0	0.6	4500				395	50	
SVC 241D-20A	20			80.0	1.0	6500				395	100	
SVC 271D-05A	5			6.0	0.1	400				475	5	
SVC 271D-07A	7			12.0	0.25	1200				455	10	
SVC 271D-10A	10	175	225	30.0	0.4	2500	270	243	297	455	25	
SVC 271D-14A	14			50.0	0.6	4500				455	50	
SVC 271D-20A	20			90.0	1.0	6500				455	100	
SVC 361D-05A	5			7.5	0.1	400				620	5	
SVC 361D-07A	7			15.0	0.25	1200				595	10	
SVC 361D-10A	10	230	300	35.0	0.4	2500	360	324	396	595	25	
SVC 361D-14A	14			65.0	0.6	4500				595	50	
SVC 361D-20A	20			120.0	1.0	6500				595	100	
SVC 391D-05A	5			8.0	0.1	400				675	2.55	
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	

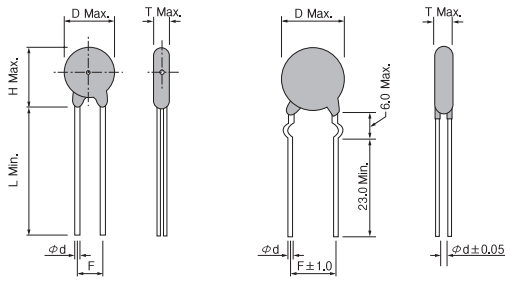
Device Type	Chip Element Size	Maximum Ratings					Characteristics				
		Applied Voltage		Transient			Nominal Varistor ^④ Peak Voltage			Max. Clamping ^⑤ Voltage @ Test Current(8/20 μ S)	
		RMS 50/60Hz (25 $^{\circ}$ C)	DC (25 $^{\circ}$ C)	Energy ^②	Average Power Dissipation	Peak ^③ Current (8/20 μ S)					
	Dia (mm)	Vacm (Volts)	Vdcm (Volts)	Wtm (Joules)	Ptam (Watts)	I _{tm} (Amps)	V _{nom} (Volts)	Tolerance		V _c (Volts)	I _p (Amps)
							Min.(Volts)	Max.(Volts)			
SVC 561D-10A	10			45.0	0.4	2500				920	25
SVC 561D-14A	14	350	460	85.0	0.6	4500	560	504	616	920	50
SVC 561D-20A	20			150.0	1.0	6500				920	100
SVC 621D-10A	10			45.0	0.4	2500				1025	25
SVC 621D-14A	14	385	550	85.0	0.6	4500	620	558	682	1025	50
SVC 621D-20A	20			150.0	1.0	6500				1025	100
SVC 681D-10A	10			45.0	0.4	2500				1120	25
SVC 681D-14A	14	420	560	90.0	0.6	4500	680	612	748	1120	50
SVC 681D-20A	20			160.0	1.0	6500				1120	100
SVC 751D-10A	10			50.0	0.4	2500				1240	25
SVC 751D-14A	14	460	615	100.0	0.6	4500	750	675	825	1240	50
SVC 751D-20A	20			175.0	1.0	6500				1240	100
SVC 781D-10A	10			50.0	0.4	2500				1290	25
SVC 781D-14A	14	485	640	105.0	0.6	4500	780	702	858	1290	50
SVC 781D-20A	20			180.0	1.0	6500				1290	100
SVC 821D-10A	10			55.0	0.4	2500				1355	25
SVC 821D-14A	14	510	670	110.0	0.6	4500	820	738	902	1355	50
SVC 821D-20A	20			190.0	1.0	6500				1355	100
SVC 911D-10A	10			60.0	0.4	2500				1500	25
SVC 911D-14A	14	550	745	120.0	0.6	4500	910	819	1001	1500	50
SVC 911D-20A	20			215.0	1.0	6500				1500	100
SVC 102D-10A	10			65.0	0.4	2500				1650	25
SVC 102D-14A	14	625	825	130.0	0.6	4500	1000	900	1100	1650	50
SVC 102D-20A	20			230.0	1.0	6500				1650	100
SVC 112D-10A	10			70.0	0.4	2500				1815	25
SVC 112D-14A	14	680	895	140.0	0.6	4500	1100	990	1210	1815	50
SVC 112D-20A	20			250.0	1.0	6500				1815	100
SVC 182D-14A	14			24.0	0.6	4500				2970	50
SVC 182D-20A	20	1000	1465	400.0	1.0	6500	1800	1620	1980	2970	100

Notes :

- ① The waveform of the maximum DC applied voltage is flat. When a ripple voltage as from a rectifier source is supplied make sure that the peak voltage is kept under the V_{dcm}. An AC applied voltage(50/60Hz) form a sine wave shape. When the distortion in the waveform is extensive make sure that the peak voltage is less than $\sqrt{2}$ times the V_{acm}.
 - ② Energy : W_{tm}
Transient energy ratings are given in the W_{tm} column of the specifications in Joules(watt-second). The rating is the maximum allowable energy for a single impulse of 2ms square-waveform current with continuous voltage applied. Energy ratings are based on a shift of V_{nom} of less than $\pm 10\%$ of initial value.
 - ③ Transient peak current(I_{tm})
The peak current rating. I_{tm} of varistor is based on an 8/20 μ s test impulse wave shape. This peak current is the maximum peak current in which the nominal varistor voltage shift does not exceed $\pm 10\%$ when the test impulse is applied once at 5 minutes intervals.
 - ④ Nominal varistor voltage : V_{nom}
Indicates the varistor terminal voltage measured with a 1mA DC applied. -0.1mA DC in the case of the 0.5A and 05B series.
 - ⑤ Maximum clamping voltage : V_c
Indicates the peak terminal voltage measured with an 8/20 μ s impulse current applied.
- Operating ambient temperature : -40 $^{\circ}$ C to +80 $^{\circ}$ C
 - Storage temperature : -40 $^{\circ}$ C to +125 $^{\circ}$ C
 - UL and CSA recognized(UL 1449, UL 497B or UL 1414, CSA)
SVC varistors have been tested by Underwriter's Laboratories, Inc. and Canadian Standards Association
UL File No. E97754, E151195, E154171.
CSA File No. LR78923.

Dimensions

(Unit:mm)



Straight Type

Forming Type

B Type

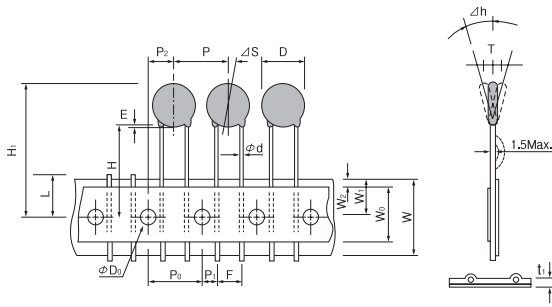
Type	T Max.	D Max.	H Max.	L Min.	F	ϕd
SVC 180D-05B	4.5	7.5	10.0	23	5.0	0.50
SVC 220D-05B	4.5	7.5	10.0	23	5.0	0.50
SVC 270D-05B	4.5	7.5	10.0	23	5.0	0.50
SVC 330D-05B	4.5	7.5	10.0	23	5.0	0.50
SVC 390D-05B	4.5	7.5	10.0	23	5.0	0.50
SVC 470D-05B	4.5	7.5	10.0	23	5.0	0.50
SVC 560D-05B	4.5	7.5	10.0	23	5.0	0.50
SVC 680D-05B	4.5	7.5	10.0	23	5.0	0.50
SVC 180D-07D	4.5	9.0	10.0	23	5.0	0.50
SVC 220D-07D	4.5	9.0	10.0	23	5.0	0.50
SVC 270D-07D	4.5	9.0	10.0	23	5.0	0.50
SVC 330D-07D	4.5	9.0	10.0	23	5.0	0.50
SVC 390D-07D	4.5	9.0	10.0	23	5.0	0.50
SVC 470D-07D	4.5	9.0	10.0	23	5.0	0.50
SVC 560D-07D	4.5	9.0	10.0	23	5.0	0.50
SVC 680D-07D	4.5	9.0	10.0	23	5.0	0.50
SVC 180D-10B	5.0	13.5	16.5	23	7.5	0.70
SVC 220D-10B	5.0	13.5	16.5	23	7.5	0.70
SVC 270D-10B	5.0	13.5	16.5	23	7.5	0.70
SVC 330D-10B	5.0	13.5	16.5	23	7.5	0.70
SVC 390D-10B	5.0	13.5	16.5	23	7.5	0.70
SVC 470D-10B	5.0	13.5	16.5	23	7.5	0.70
SVC 560D-10B	5.0	13.5	16.5	23	7.5	0.70
SVC 680D-10B	5.0	13.5	16.5	23	7.5	0.70
SVC 180D-14B	5.0	17.0	20.0	23	7.5	0.70
SVC 220D-14B	5.0	17.0	20.0	23	7.5	0.70
SVC 270D-14B	5.0	17.0	20.0	23	7.5	0.70
SVC 330D-14B	5.0	17.0	20.0	23	7.5	0.70
SVC 390D-14B	5.0	17.0	20.0	23	7.5	0.70
SVC 470D-14B	5.0	17.0	20.0	23	7.5	0.70
SVC 560D-14B	5.0	17.0	20.0	23	7.5	0.70
SVC 680D-14B	5.0	17.0	20.0	23	7.5	0.70
SVC 180D-20B	6.0	23.0	27.0	23	10.0	0.80
SVC 220D-20B	6.0	23.0	27.0	23	10.0	0.80
SVC 270D-20B	6.0	23.0	27.0	23	10.0	0.80
SVC 330D-20B	6.0	23.0	27.0	23	10.0	0.80
SVC 390D-20B	6.0	23.0	27.0	23	10.0	0.80
SVC 470D-20B	6.0	23.0	27.0	23	10.0	0.80
SVC 560D-20B	6.0	23.0	27.0	23	10.0	0.80
SVC 680D-20B	6.0	23.0	27.0	23	10.0	0.80

Type	T Max.	D Max.	H Max.	L Min.	F	ϕd
SVC 820D-05A	4.5	7.0	10.0	23	5.0	0.50
SVC 101D-05A	4.5	7.0	10.0	23	5.0	0.50
SVC 121D-05A	4.5	7.0	10.0	23	5.0	0.50
SVC 151D-05A	4.5	7.0	10.0	23	5.0	0.50
SVC 201D-05A	4.5	7.0	10.0	23	5.0	0.50
SVC 221D-05A	4.5	7.0	10.0	23	5.0	0.50
SVC 241D-05A	4.5	7.0	10.0	23	5.0	0.50
SVC 271D-05A	4.5	7.0	10.0	23	5.0	0.50
SVC 361D-05A	5.0	7.0	10.0	23	5.0	0.50
SVC 391D-05A	5.0	7.0	10.0	23	5.0	0.50
SVC 431D-05A	6.0	7.0	10.0	23	5.0	0.50

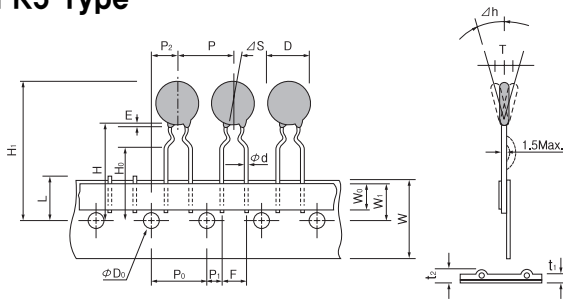
A Type

Type	T Max.	D Max.	H Max.	L Min.	F	ϕd
SVC 471D-05A	6.0	7.0	10.0	23	5.0	0.50
SVC 820D-07A	4.5	9.0	12.0	23	5.0	0.50
SVC 101D-07A	4.5	9.0	12.0	23	5.0	0.50
SVC 121D-07A	4.5	9.0	12.0	23	5.0	0.50
SVC 151D-07A	4.5	9.0	12.0	23	5.0	0.50
SVC 201D-07A	4.5	9.0	12.0	23	5.0	0.50
SVC 221D-07A	4.5	9.0	12.0	23	5.0	0.50
SVC 241D-07A	4.5	9.0	12.0	23	5.0	0.50
SVC 271D-07A	4.5	9.0	12.0	23	5.0	0.50
SVC 361D-07A	5.0	9.0	12.0	23	5.0	0.50
SVC 391D-07A	5.0	9.0	12.0	23	5.0	0.50
SVC 431D-07A	6.0	9.0	12.0	23	5.0	0.50
SVC 471D-07A	6.0	9.0	12.0	23	5.0	0.50
SVC 820D-10A	4.5	14.0	17.0	23	7.5	0.70
SVC 101D-10A	4.5	14.0	17.0	23	7.5	0.70
SVC 121D-10A	4.5	14.0	17.0	23	7.5	0.70
SVC 151D-10A	4.5	14.0	17.0	23	7.5	0.70
SVC 201D-10A	4.5	14.0	17.0	23	7.5	0.70
SVC 221D-10A	4.5	14.0	17.0	23	7.5	0.70
SVC 241D-10A	4.5	14.0	17.0	23	7.5	0.70
SVC 271D-10A	4.5	14.0	17.0	23	7.5	0.70
SVC 361D-10A	5.0	14.0	17.0	23	7.5	0.70
SVC 391D-10A	5.0	14.0	17.0	23	7.5	0.70
SVC 431D-10A	6.0	14.0	17.0	23	7.5	0.70
SVC 561D-10A	7.5	14.0	17.0	23	7.5	0.70
SVC 621D-10A	7.5	14.0	17.0	23	7.5	0.70
SVC 681D-10A	7.5	14.0	17.0	23	7.5	0.70
SVC 751D-10A	8.5	14.0	17.0	23	7.5	0.70
SVC 781D-10A	8.5	14.0	17.0	23	7.5	0.70
SVC 821D-10A	8.5	14.0	17.0	23	7.5	0.70
SVC 911D-10A	10.5	14.0	17.0	23	7.5	0.70
SVC 102D-10A	10.5	14.0	17.0	23	7.5	0.70
SVC 112D-10A	10.5	14.0	17.0	23	7.5	0.70
SVC 820D-14A	4.5	17.5	21.0	23	7.5	0.70
SVC 101D-14A	4.5	17.5	21.0	23	7.5	0.70
SVC 121D-14A	4.5	17.5	21.0	23	7.5	0.70
SVC 151D-14A	4.5	17.5	21.0	23	7.5	0.70
SVC 201D-14A	4.5	17.5	21.0	23	7.5	0.70
SVC 221D-14A	4.5	17.5	21.0	23	7.5	0.70
SVC 241D-14A	4.5	17.5	21.0	23	7.5	0.70
SVC 271D-14A	4.5	17.5	21.0	23	7.5	0.70
SVC 361D-14A	5.0	17.5	21.0	23	7.5	0.70
SVC 391D-14A	5.0	17.5	21.0	23	7.5	0.70
SVC 431D-14A	6.0	17.5	21.0	23	7.5	0.70
SVC 471D-14A	6.0	17.5	21.0	23	7.5	0.70
SVC 561D-14A	7.5	17.5	21.0	23	7.5	0.70
SVC 621D-14A	7.5	17.5	21.0	23	7.5	0.70
SVC 681D-14A	7.5	17.5	21.0	23	7.5	0.70
SVC 751D-14A	8.5	17.5	21.0	23	7.5	0.70
SVC 781D-14A	8.5	17.5	21.0	23	7.5	0.70
SVC 821D-14A	8.5	17.5	21.0	23	7.5	0.70
SVC 911D-14A	10.5	17.5	21.0	23	7.5	0.70
SVC 102D-14A	10.5	17.5	21.0	23	7.5	0.70
SVC 112D-14A	10.5	17.5	21.0	23	7.5	0.70
SVC 182D-14A	15.0	17.5	21.0	23	7.5	0.70
SVC 820D-20A	4.5	23.0	28.0	23	10.0	0.70
SVC 101D-20A	4.5	23.0	28.0	23	10.0	0.70
SVC 121D-20A	4.5	23.0	28.0	23	10.0	0.70
SVC 151D-20A	4.5	23.0	28.0	23	10.0	0.70
SVC 201D-20A	4.5	23.0	28.0	23	10.0	0.70
SVC 221D-20A	4.5	23.0	28.0	23	10.0	0.70
SVC 241D-20A	4.5	24.0	28.0	23	10.0	0.70
SVC 271D-20A	4.5	24.0	28.0	23	10.0	0.70
SVC 361D-20A	5.0	24.0	28.0	23	10.0	0.70
SVC 391D-20A	5.0	24.0	28.0	23	10.0	0.70
SVC 431D-20A	6.0	24.0	28.0	23	10.0	0.70
SVC 471D-20A	6.0	24.0	28.0	23	10.0	0.70
SVC 561D-20A	7.5	24.0	28.0	23	10.0	0.80
SVC 621D-20A	7.5	24.0	28.0	23	10.0	0.80
SVC 681D-20A	7.5	24.0	28.0	23	10.0	0.80
SVC 751D-20A	8.5	24.0	28.0	23	10.0	0.80
SVC 781D-20A	8.5	24.0	28.0	23	10.0	0.80
SVC 821D-20A	8.5	24.0	28.0	23	10.0	0.80
SVC 911D-20A	10.5	24.0	28.0	23	10.0	0.80
SVC 102D-20A	10.5	24.0	28.0	23	10.0	0.80
SVC 112D-20A	10.0	24.0	28.0	23	10.0	0.80
SVC 182D-20A	15.0	24.0	28.0	23	10.0	0.80

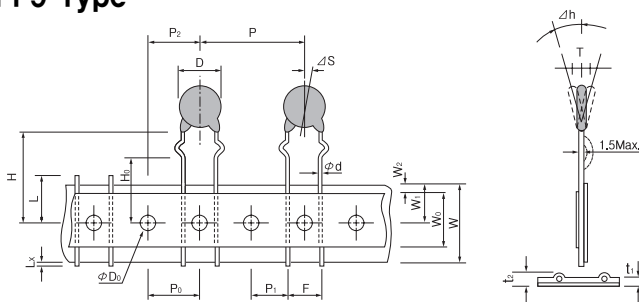
FS5 Type



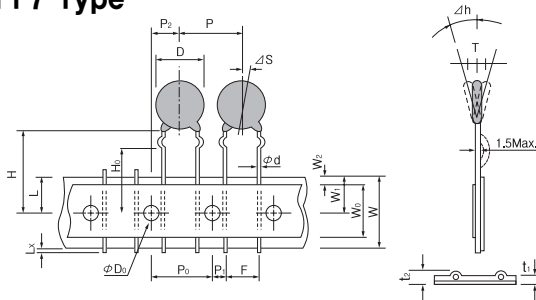
FK5 Type



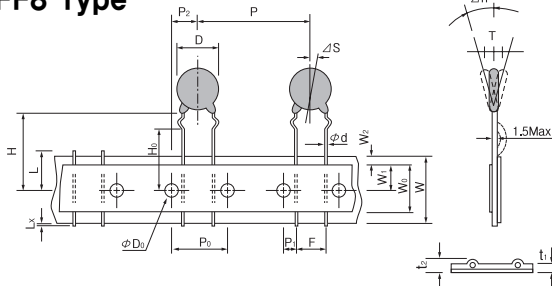
FF9 Type



FF7 Type



FF8 Type



Item	Code	Dimensions(mm)	
		FS5 or FK5	FF9
Body Diameter	D	See page 119	
Body Thickness	T	See page 119	
Lead Diameter	∅d	0.5/0.50±0.05	0.6-0.8±0.05
Pitch of sprocket Hole	P ₀	12.7±0.3	
Pitch of Component	P	6.35±1.3	25.4±1.0
Lead Length from Hole Center Lead	P ₁	3.85±0.7	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	5.0Min.	9.0Min.
Position of Sprocket Hole	W ₁	9.0±0.5	
Hole Down Tape Position	W ₂	3.0Max.	
Lead-Wire Clinch Height	H ₀	16.0±0.5	
Height of Component Hole	H	20.0 ^{+1.5} _{-1.0}	
Component Height	H _i	32.25Max.	
Diameter of Sprocket Hole	∅D ₀	4.0±0.2	
Length of Snipped Lead	L	11.0Max.	
Total Tape Thickness	t ₁	0.7±0.2	
Total Thickness Tape and Lead Wire	t ₂	1.5Max.	1.7Max.
Length of Snipped Lead	Lx	1.0Max.	

Item	Code	Dimensions(mm)	
		FF7	FF8
Body Diameter	D	See page 119	
Body Thickness	T	See page 119	
Lead Diameter	∅d	0.6-0.8±0.05	
Pitch of sprocket Hole	P ₀	15.0±0.3	
Pitch of Component	P	15.0±0.3	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	7.50±1.5	
Lead Spacing	F	7.5±1.0	
Deviation Along Tape. Left or Right	ΔS	0±1.0	
Deviation Across Tape	Δh	0±2.0	
Carrier Tape Width	W	18.0 ^{+1.0} _{-0.5}	
Hold Down Tape Width	W ₀	5.0Min.	
Position of Sprocket Hole	W ₁	9.0±0.5	
Hole Down Tape Position	W ₂	3.0Max.	
Lead-Wire Clinch Height	H ₀	16.0±0.5	
Height of Component Hole	H	20.0 ^{+1.5} _{-1.0}	
Component Height	H _i	40.00Max.	
Diameter of Sprocket Hole	∅D ₀	4.0±0.2	
Length of Snipped Lead	L	11.0Max.	
Total Taps Thickness	t ₁	0.7±0.2	
Total Thickness Tape and Lead Wire	t ₂	1.7Max.	
Length of Snipped Lead	Lx	1.0Max.	

Char, Curves and Lifetime

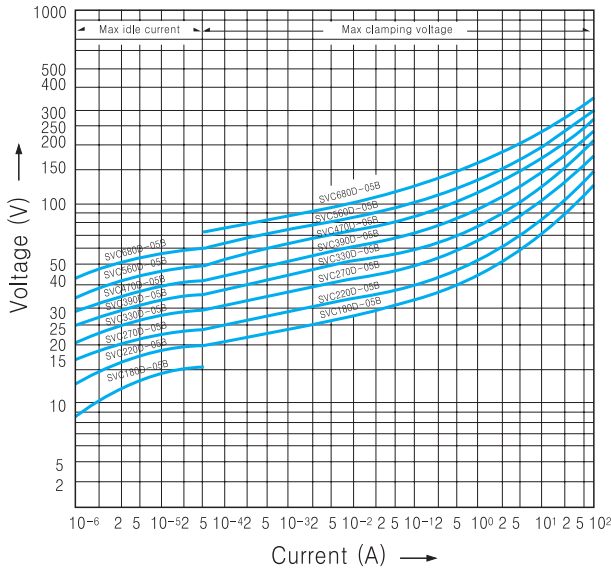
Transient V-I Charactic Curves

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

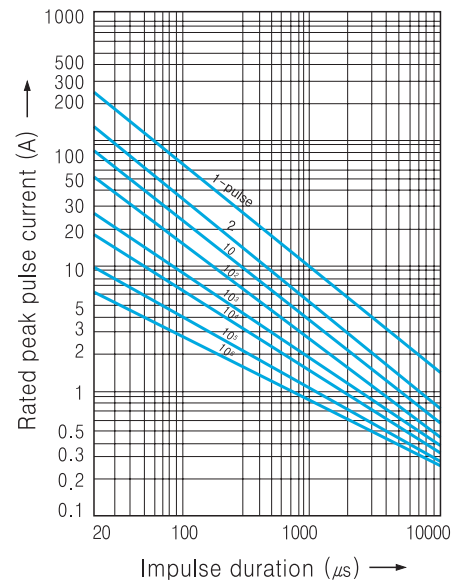
Pulse Lifetime Ratings

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

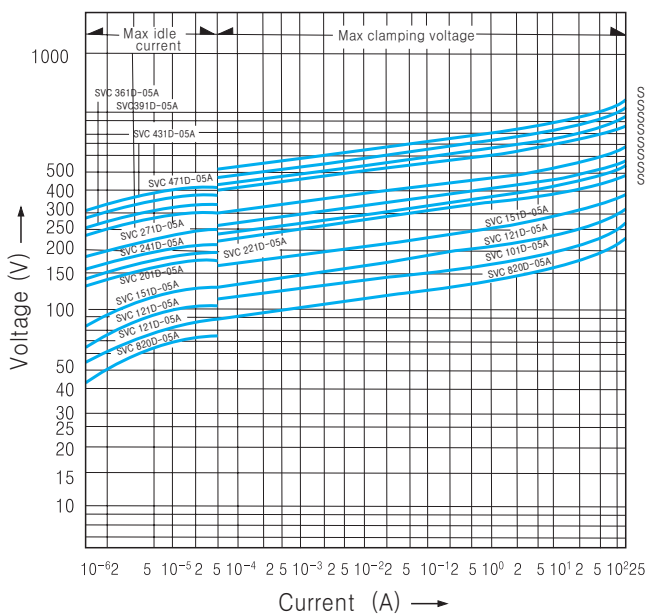
05B(SVC 180D-05B to SVC 680D-05B)



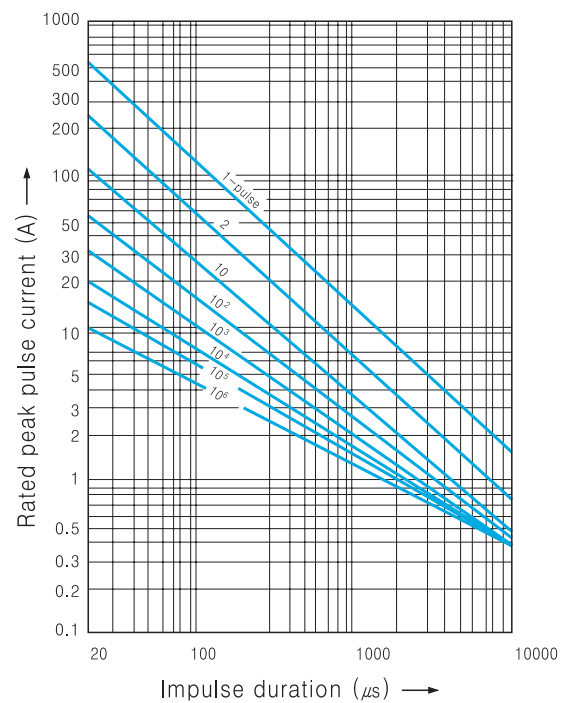
05B(SVC 180D-05B to SVC 680D-05B)



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



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



Transient V-I Characteristic Curves

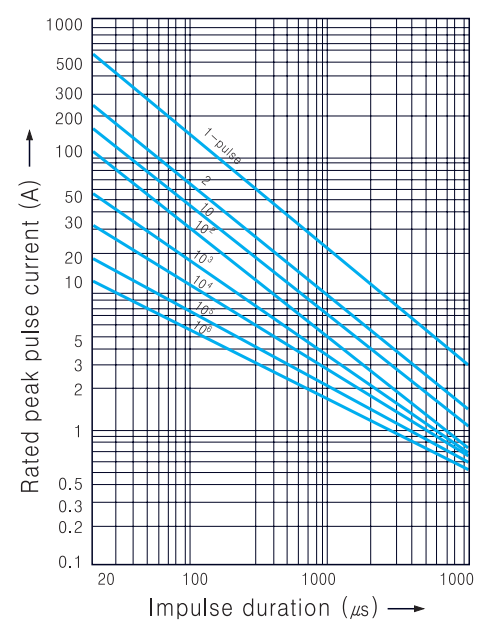
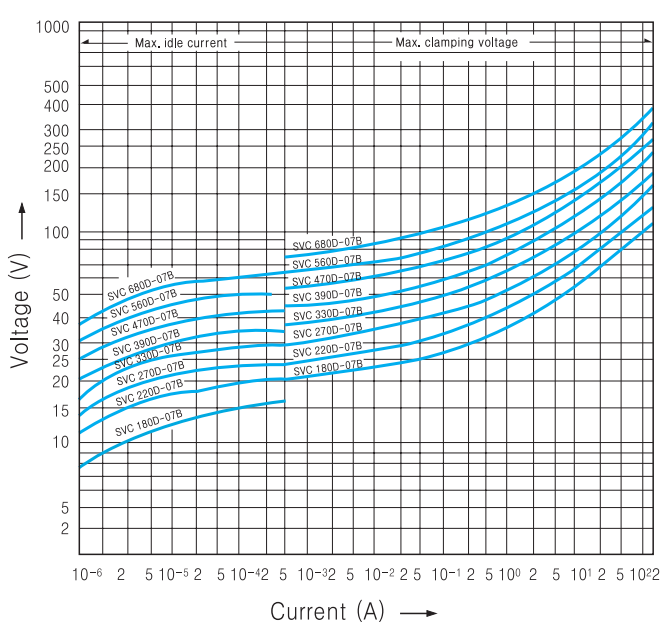
Current waveform under 10^{-2} A : DC
 over 10^{-1} A : $8/20\mu s$

Pulse Lifetime Ratings

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

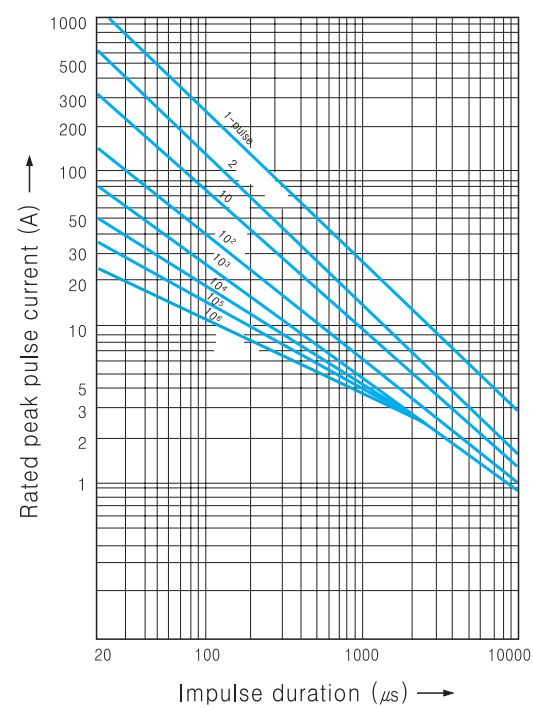
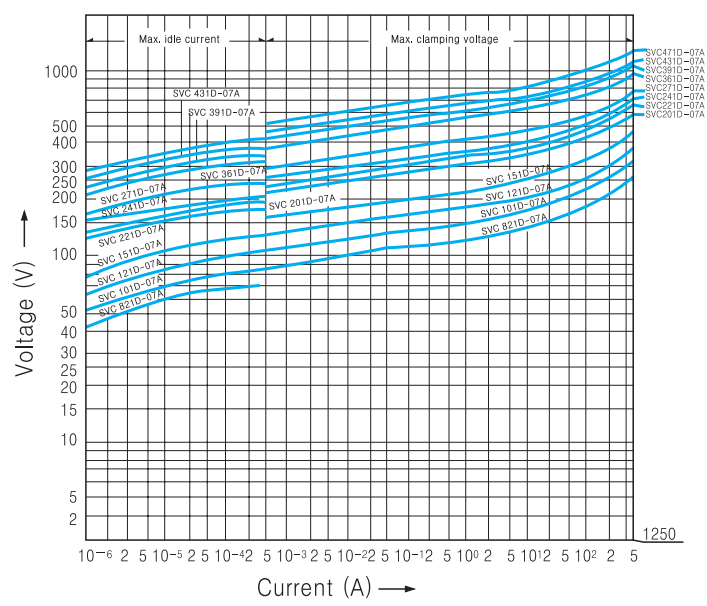
07B(SVC 180D-07B to SVC 680D-07B)

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



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

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



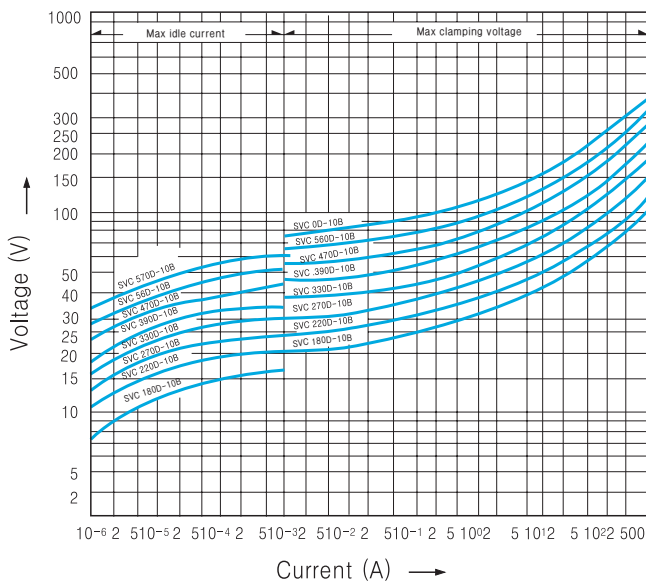
Transient V-I Characteristic Curves

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

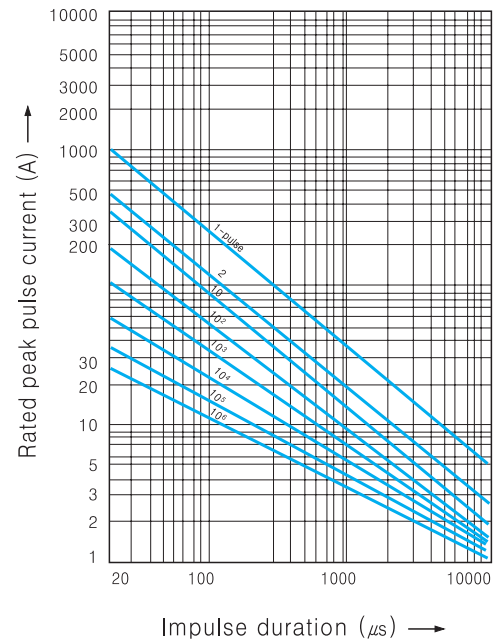
Pulse Lifetime Ratings

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

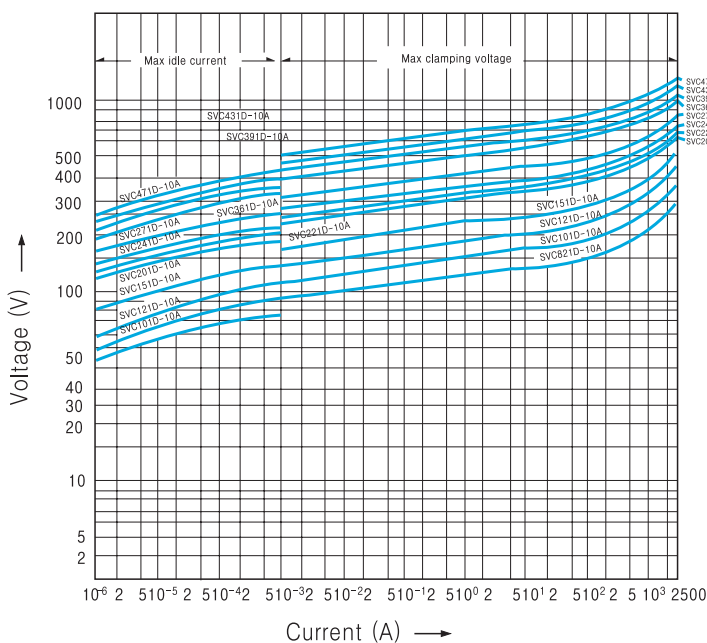
10B(SVC 180D-10B to SVC 680D-10B)



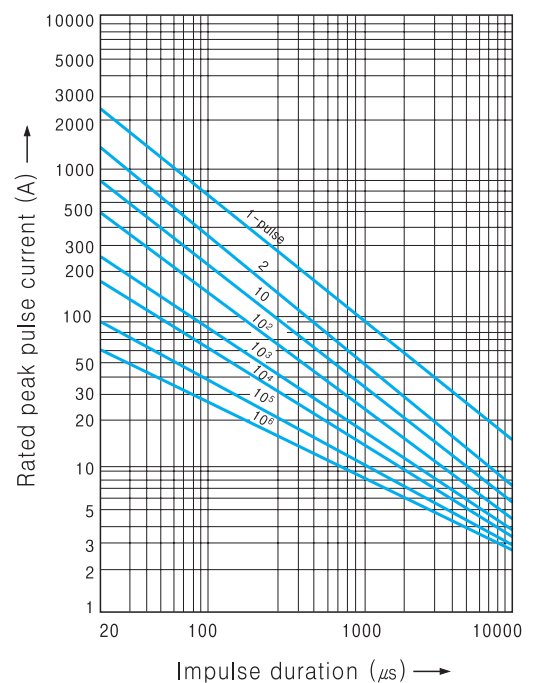
10B(SVC 180D-10B to SVC 680D-10B)



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



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



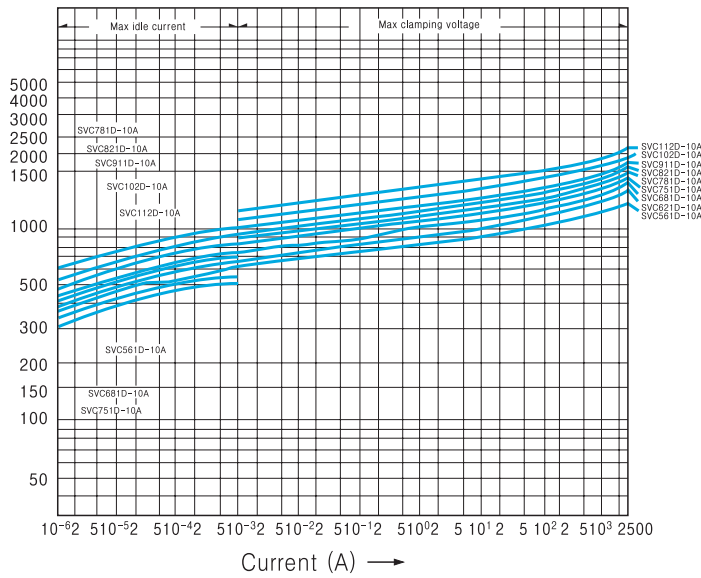
Transient V-I Characteristic Curves

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

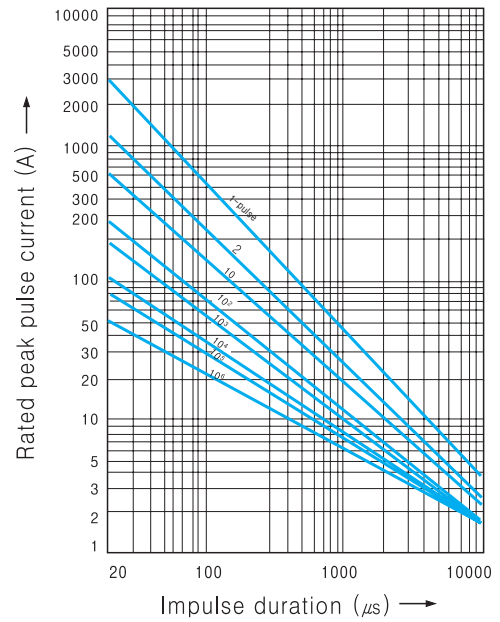
Pulse Lifetime Ratings

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

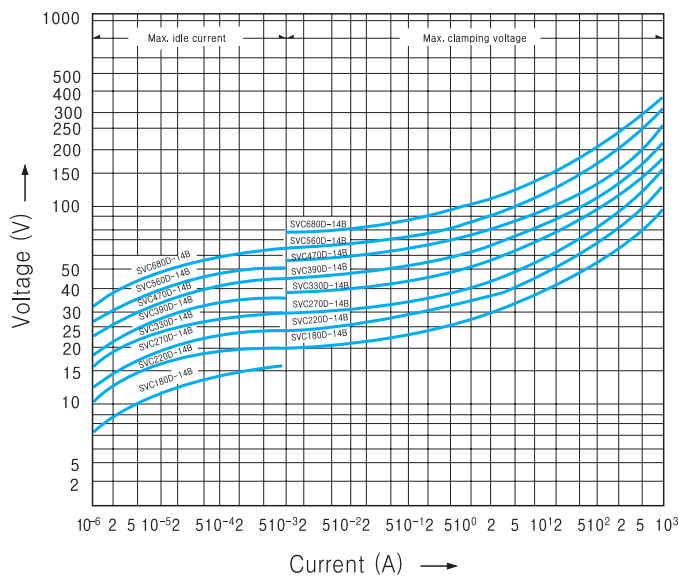
10A(SVC 561D-10A to SVC 112D-10A)



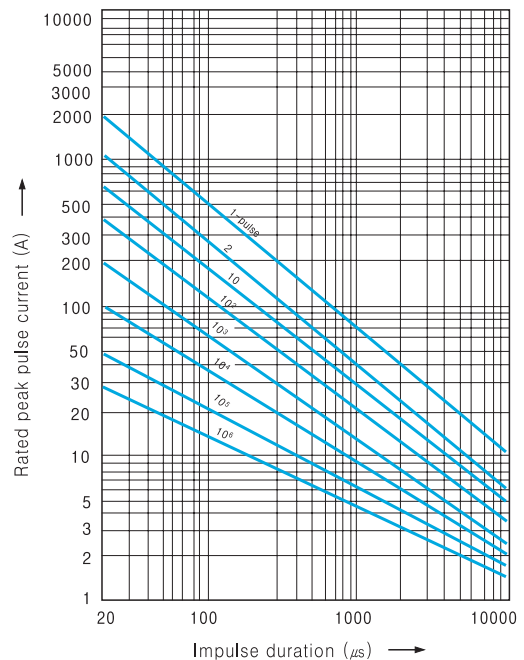
10A(SVC 561D-10A to SVC 112D-10A)



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



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



Transient V-I Characteristic Curves

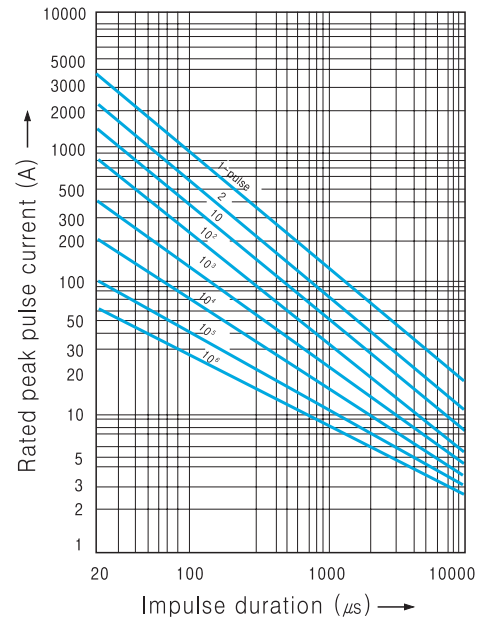
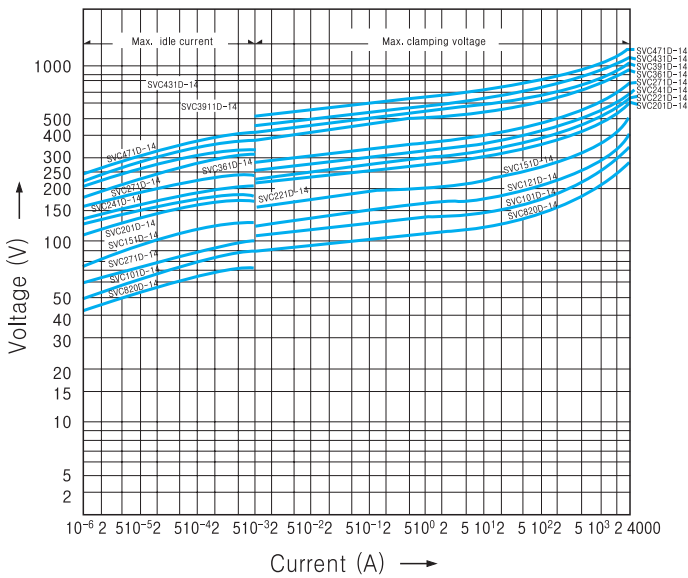
Current waveform under 10^{-2} A : DC
 over 10^{-1} A : $8/20\mu\text{s}$

Pulse Lifetime Ratings

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

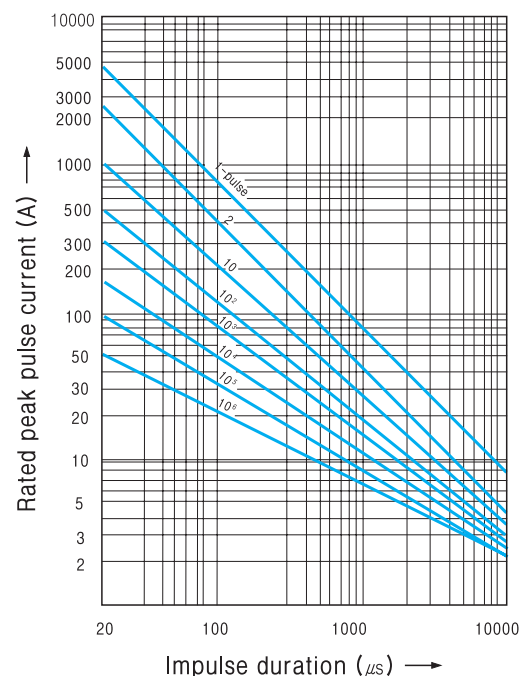
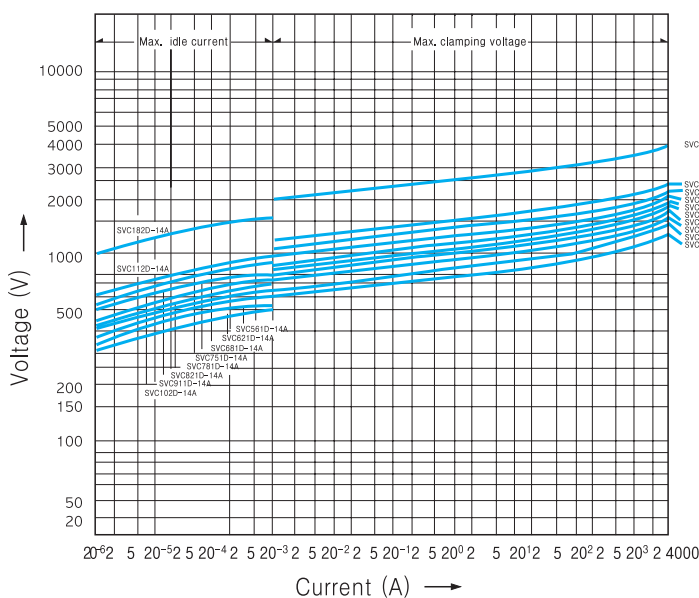
14A(SVC 820D-14A to SVC 471D-14A)

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



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

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



Transient V-I Characteristic Curves

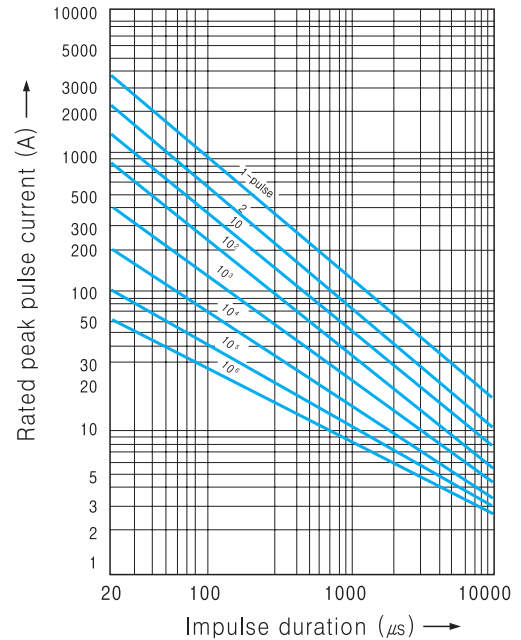
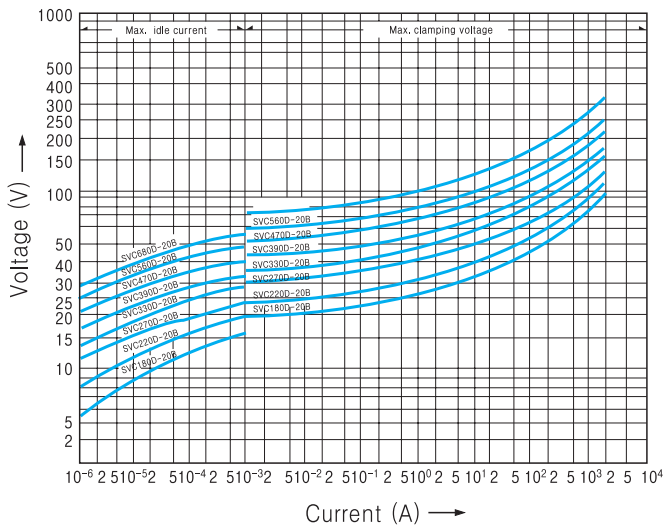
Current waveform under 10^{-2} A : DC
 over 10^1 A : $8/20\mu s$

Pulse Lifetime Ratings

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

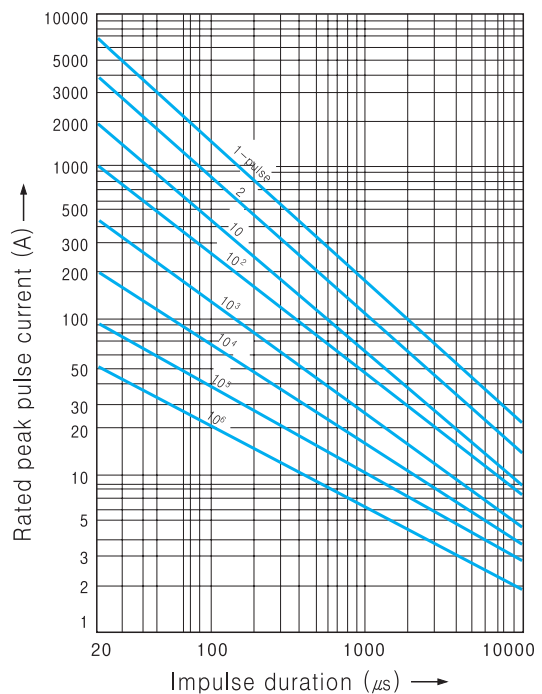
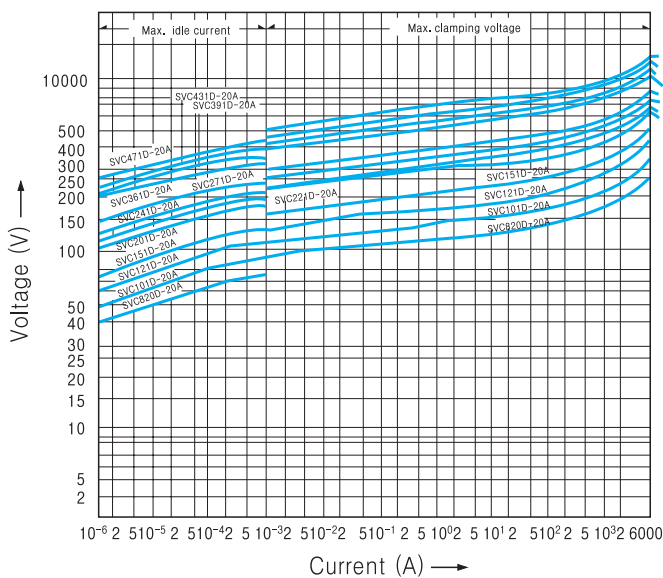
20B(SVC 180D-20B to SVC 680D-20B)

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

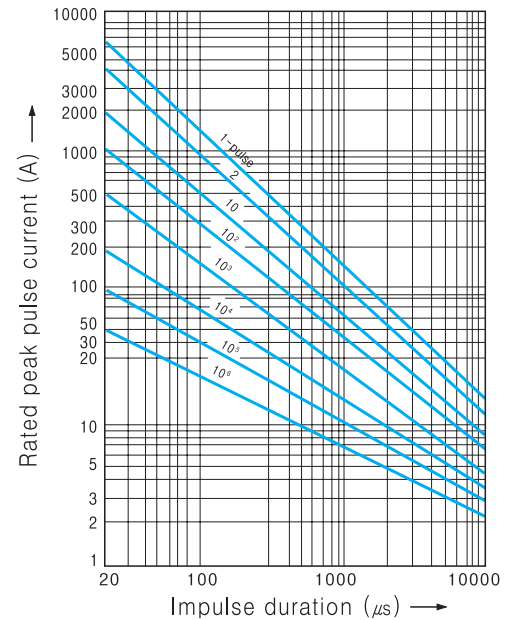
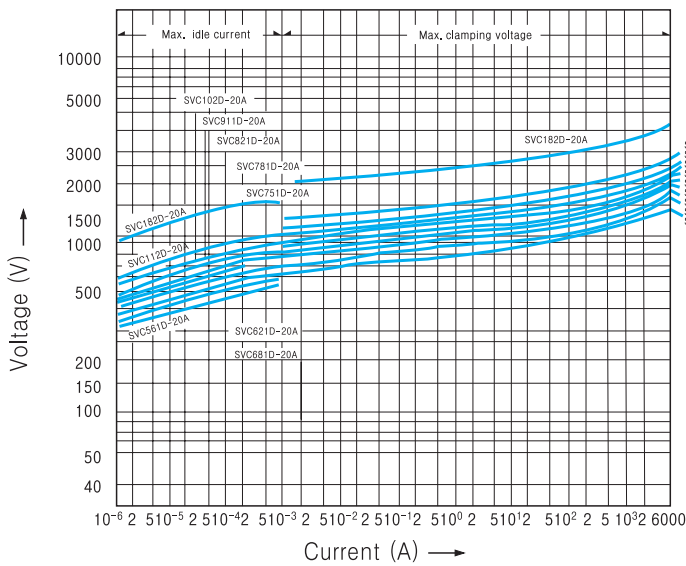
Current waveform under 10^{-2} A : DC
 over 10^{-1} A : $8/20\mu\text{s}$

Pulse Lifetime Ratings

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

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

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



Applications

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

Power Supply Circuit Protection

Line circuit

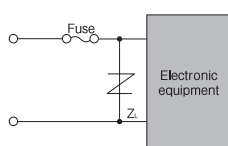
Varistor voltage selection table (Z_L)

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

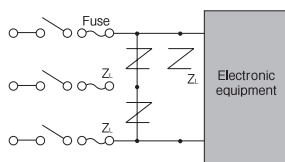
Notes :

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

AC/DC single-phase circuit



AC three-phase circuit



Line and ground circuit

Varistor voltage selection table (Z_E)

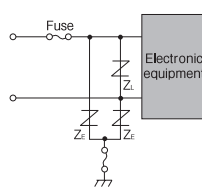
Power Supply Voltage	Type
100V AC	SVC431D - □ □ A
	SVC471D - □ □ A
200V AC	SVC751D - □ □ A to SVC112D - □ □ A*
	SVC182D - □ □ A**

Notes :

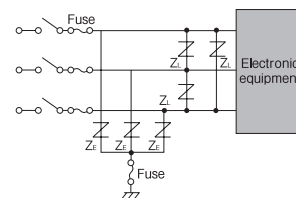
- ① When subjected to megger testing (500V DC), the insulation resistance value can decrease due to the leakage current of the SVC. To avoid this remove the varistor or use* marked SVC.
- ② When subjected to dielectric strength test (1000V AC). remove the SVC or use** marked SVC.

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

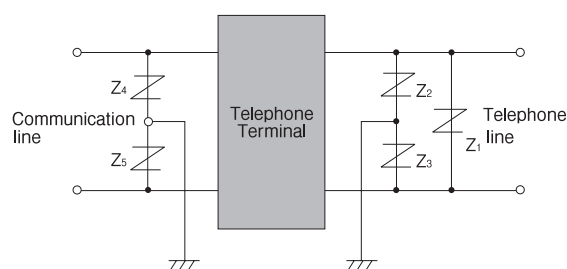
AC/DC single-phase circuit



AC three-phase circuit



Telecommunication Circuit Protection



Varistor voltage selection guided

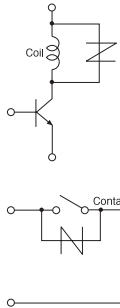
Power Supply Voltage	Type
12V DC	SVC180D - □ □ B
	SVC220D - □ □ B
	SVC820D - □ □ A
24V AC	SVC390D - □ □ B
	SVC820D - □ □ A

Notes :

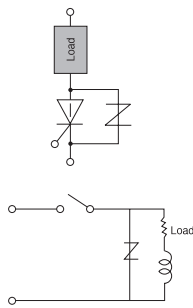
The varistor SVC has a capacitance value. Take not of this when applying them to high-frequency signal circuits.

Switching Circuit Protection

Protection of relay (Contact coil)



Protection of semiconductors



Varistor voltage selection guide

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

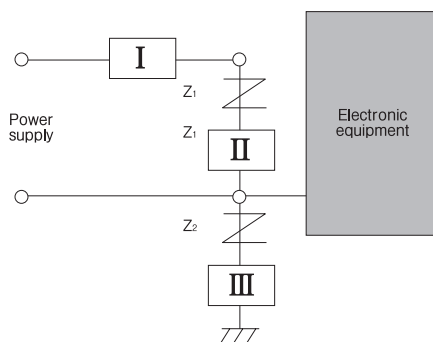
Notes :

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

Application Notes

Overcurrent protection

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



- ① Connect the SVC at a position nearer to the equipment than the overcurrent protection device "I" (fuse, MCCB) as is shown in the diagram.

When the SVC is shorted, the overcurrent protection device "I" operates (trips or blow off the fuse).

- ② If the overcurrent protection device "I" can not be installed in "I" position, connect a fuse at "II" position. Select fuse rated current for the SVC referring to the following table.

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

- ③ When "Z₂" SVC is connected between the equipment and ground install an ELCB (Earth Leakage Circuit Breaker). If not possible, connect a fuse or thermal fuse at "III" position.

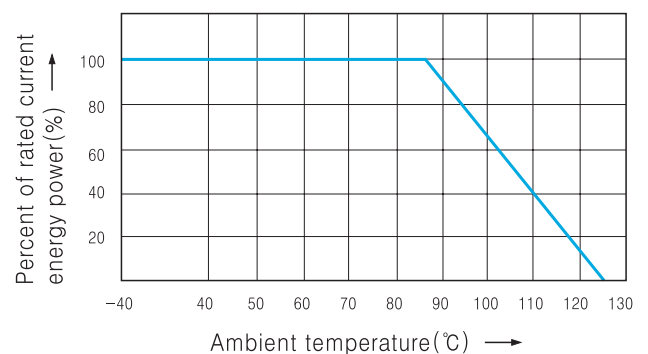
Installation

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

Molding

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

Current, power and energy rating vs, temperature



Electrical Characteristics

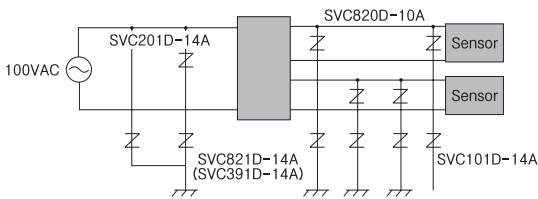
Operating ambient temperature	-40°C to +85°C
Storage temperature	-40°C to +125°C
Voltage temperature coefficient	-0.05% / °C
IR change of test condition	
621 ↑ (at 500V)	over 10M Ω
561 ↓ (at V _{dc})	over 10M Ω

Recognized standards

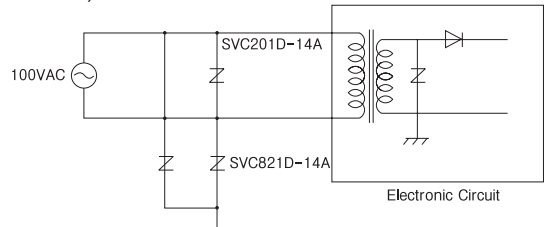
Standard	Content	Applicable SVC series	File No.	
UL	UL 1449 3rd edition	Surge-protective Devices - Component	Other SPD Applications : 05/07/10 Series, 14B/20B Series Type 3 SPD Applications : 14A/20A Series	E332621
VDE	IEC61051-1:2007-04 IEC61051-2:1991-01 IEC61051-2-2:1991-01	Varistor	05/07/10/14 Series	116012
CAS	CLASS 2221 01	AUDIO AND VIDEO EQUIPMENT - Accessories and Parts for Electronic Equipment	SVC201D - □ ~SVC182D - □	1577876

Application Example

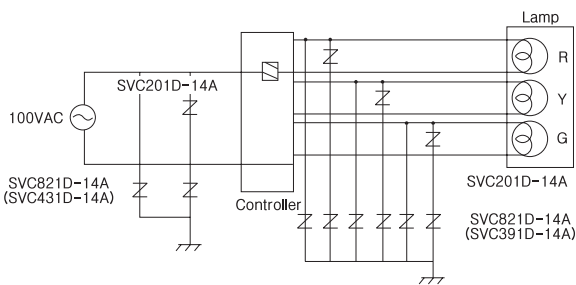
Fire Alarm System



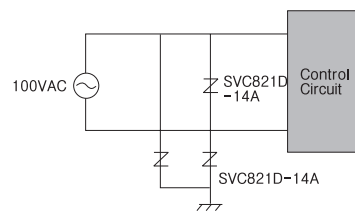
Stove, Boiler



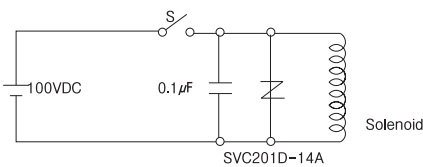
Traffic Signal Control



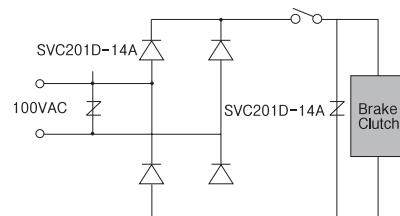
Vending Machine



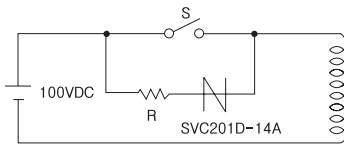
Solenoid



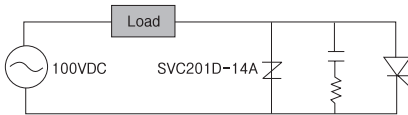
Brake, Clutch



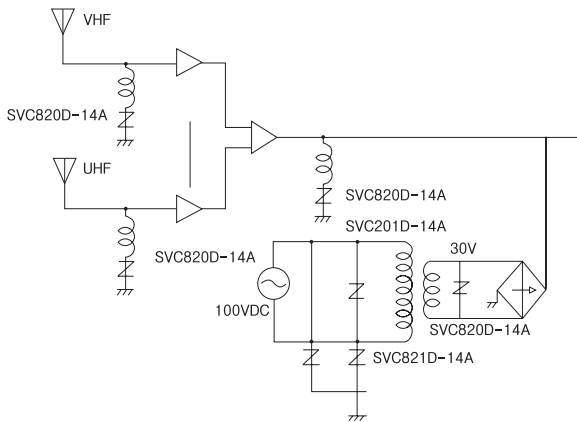
Contact Protection



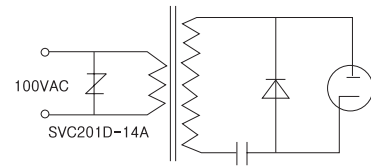
Thyristor Protection



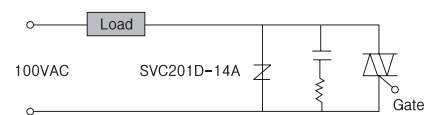
TV Booster



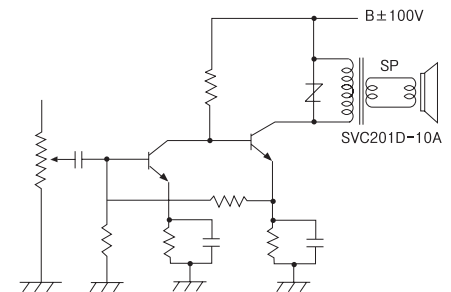
Microwave Oven



Triac Protection



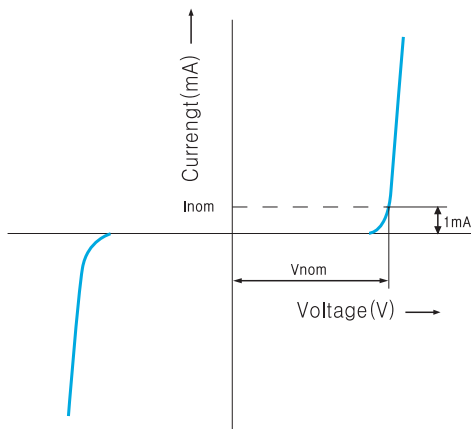
Sound Output Circuit



Varistor Terminology

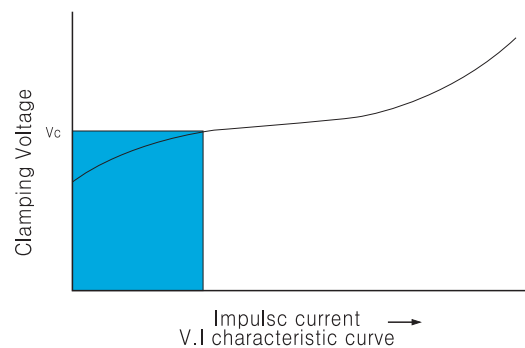
Varistor Voltage : Vnom

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



Clamping Voltage : Vc

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



Capacitance

Typical values measured at a test frequency of 1kHz

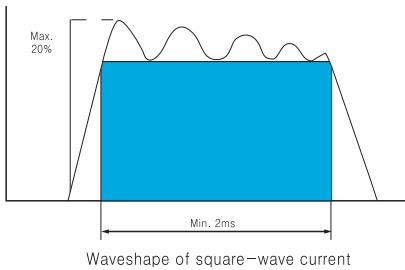
Rated peak transient current : itm

Maximum peak current through the varistor with line voltage applied.

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

Rated transient energy : 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 V_{nom} of less than $\pm 10\%$ of initial value.

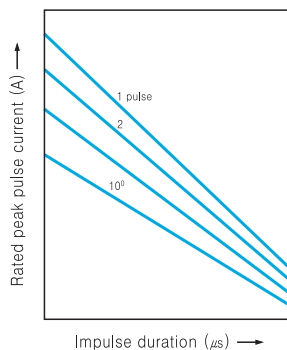


Pulse lifetime rating

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

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

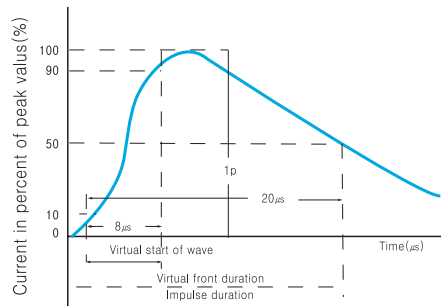
This curve also provides for derating current as required with repetitive pulsing.



Test current waveform

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

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



Rated RMS Voltage : Vacm

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

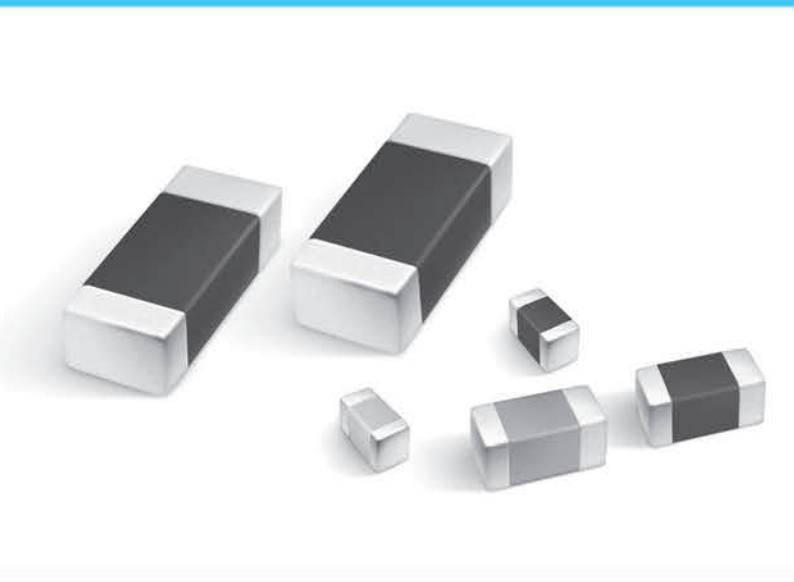
Rated DC Voltage : Vdcm

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.

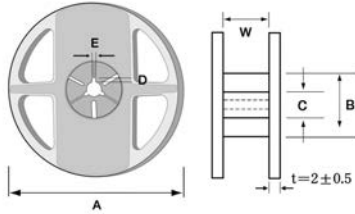
Appendix



SMD Type Packing	134
CHIP B/I Packing	136

SMD Type Packing

Reel Packing



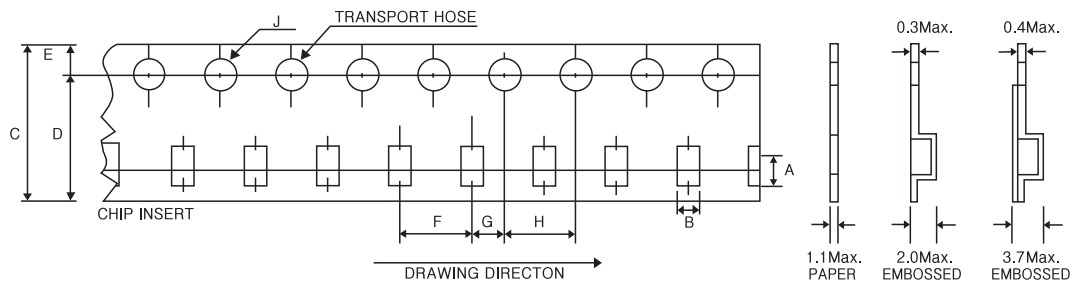
- 4000 pcs(standard) per Reel(option)
- 10 Reels per Inner BOX
- 6 Inner BOXES per Out BOX

Mark	SIZE	A	B	C	D	E	W
7" REEL	0603~3225	$\varnothing 178 \pm 2$	$\varnothing 150 \text{Min.}$	$\varnothing 10 \pm 0.5$	$\varnothing 21 \pm 0.8$	2 ± 0.5	10 ± 1.5
	4520~4532	$\varnothing 180 +0, -0$	$\varnothing 60 -0, +1$	$\varnothing 13 \pm 0.2$	$\varnothing 57 -0 +1$	3 ± 0.2	13 ± 0.5
13" REEL	1005~3225	$\varnothing 330 \pm 2$	$\varnothing 70 \text{Min.}$	$\varnothing 13 \pm 0.5$	$\varnothing 21 \pm 0.8$	2 ± 0.5	10 ± 1.5

Number of Packages

Type	EIA CODE	7" QT/REEL	13" QT/REEL
CS0603	CC0201	15,000	
CS1005	CC0402	10,000	50,000
CS1608	CC0603	4,000	16,000
CS2012	CC0805	3,000~4,000	10,000
CS3216	CC1206	2,000~4,000	6,000~10,000
CS3225	CC1210	1,000~3,000	4,000~10,000
CS4520	CC1808	1,500~3,000	-
CS4532	CC1812	500~1000	-

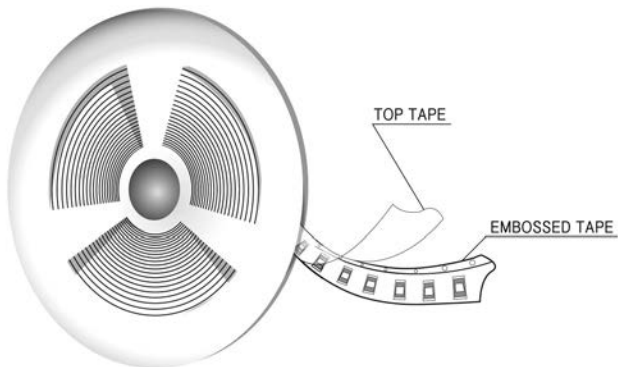
Tape Dimensions



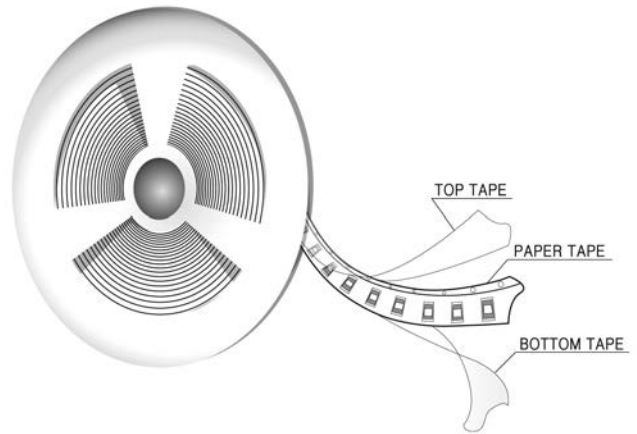
TYPE	EIA CODE	A	B	C	D	E	F	G	H	J
CS0603	CC0201	0.67 ± 0.05	0.37 ± 0.05	8.0 ± 0.3	3.5 ± 0.005	1.75 ± 0.1	2.0 ± 0.05	2.0 ± 0.1	4.0 ± 0.1	1.5 ± 0.1
CS1005	CC0402	1.15 ± 0.1	0.65 ± 0.1	8.0 ± 0.3	3.5 ± 0.005	1.75 ± 0.1	2.0 ± 0.05	2.0 ± 0.1	4.0 ± 0.1	1.5 ± 0.1
CS1608	CC0603	1.9 ± 0.2	1.10 ± 0.2	8.0 ± 0.3	3.5 ± 0.005	1.75 ± 0.1	4.0 ± 0.1	2.0 ± 0.1	4.0 ± 0.1	1.5 ± 0.1
CS2012	CC0805	2.4 ± 0.2	1.65 ± 0.2	8.0 ± 0.3	3.5 ± 0.005	1.75 ± 0.1	4.0 ± 0.1	2.0 ± 0.1	4.0 ± 0.1	1.5 ± 0.1
CS3216	CC1206	3.6 ± 0.2	2.00 ± 0.2	8.0 ± 0.3	3.5 ± 0.005	1.75 ± 0.1	4.0 ± 0.1	2.0 ± 0.1	4.0 ± 0.1	1.5 ± 0.1
CS3225	CC1210	3.6 ± 0.2	2.80 ± 0.2	8.0 ± 0.3	3.5 ± 0.005	1.75 ± 0.1	4.0 ± 0.1	2.0 ± 0.1	4.0 ± 0.1	1.5 ± 0.1
CS4520	CC1808	4.8 ± 0.2	2.3 ± 0.2	12.0 ± 0.3	5.5 ± 0.1	1.75 ± 0.1	4.0 ± 0.1 8.0 ± 0.1	2.0 ± 0.1	4.0 ± 0.1	1.5 ± 0.1
CS4532	CC1812	4.9 ± 0.2	3.6 ± 0.2	12.0 ± 0.3	5.5 ± 0.1	1.75 ± 0.1	8.0 ± 0.1	2.0 ± 0.1	4.0 ± 0.1	1.5 ± 0.1

Typical Performance Characteristics

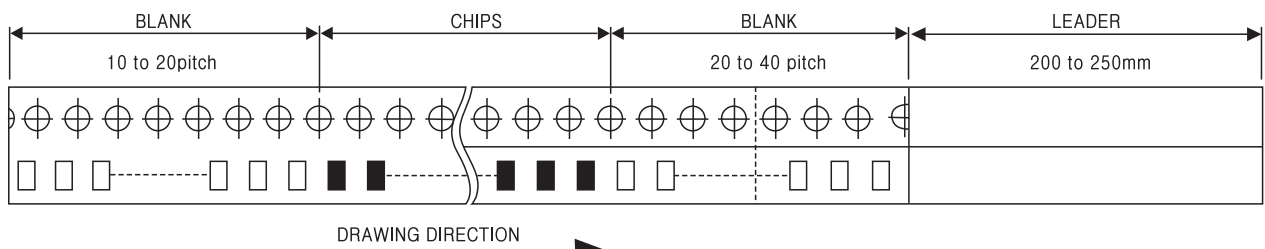
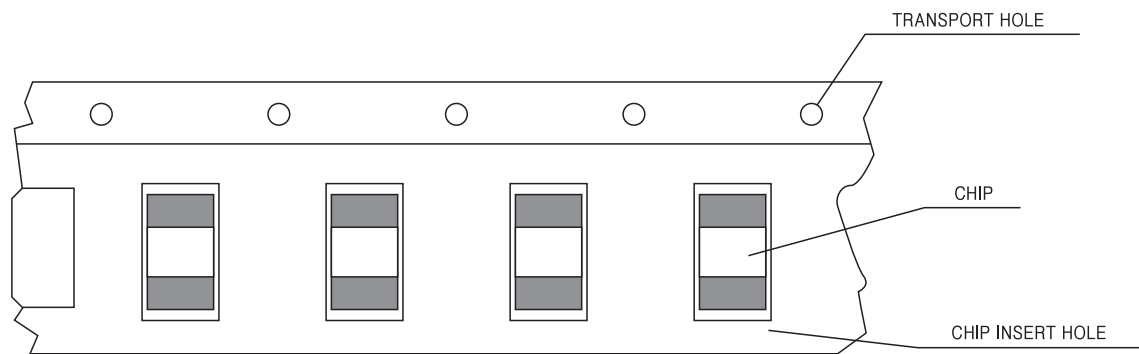
Embossed Type



Paper Tape



Chip Inserting



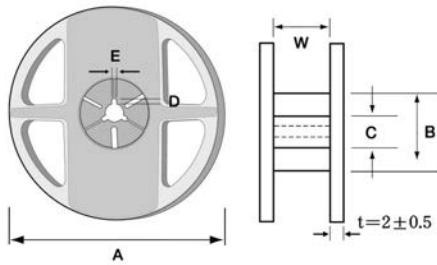
Chip B/I Packing

Standard Quantity

○ Chip Beads ◎ Chip Inductors ● Chip Power Inductors

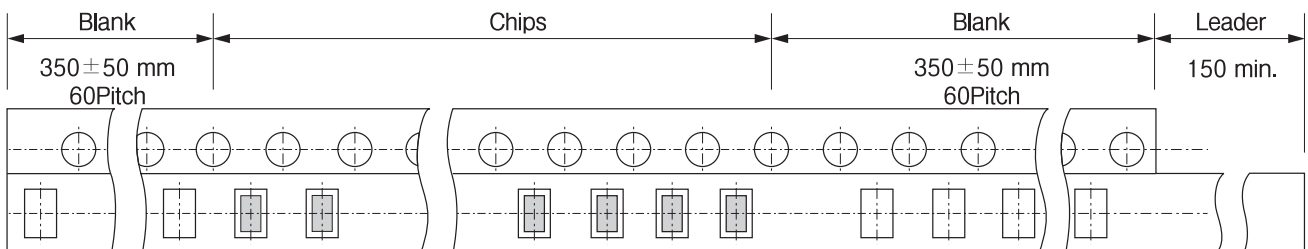
Size	QTY(PCS)	Remarks	Section		
1005	10,000		○	◎	
1608	4,000		○	◎	●
2012	4,000	0.85 T size	○	◎	●
	3,000	1.25 T size		◎	
3216	4,000	0.60 T size			●
	3,000		○	◎	
3225	3,000				●
4516	2,000		○		
4532	1,000		○		

Reel Packing



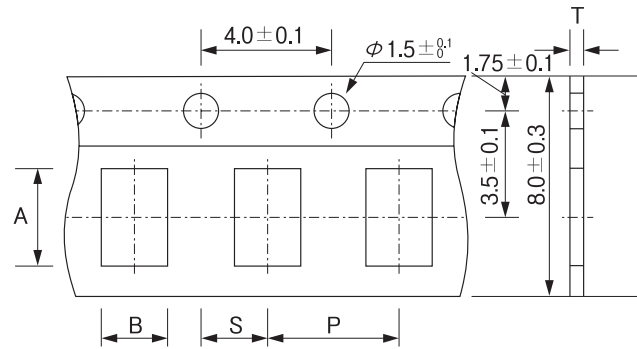
A	B	C
$\varnothing 178 \pm 2$	$\varnothing 50$ Min.	$\varnothing 13 \pm 0.5$
D	E	W
4 ± 0.8	2 ± 0.2	9 ± 1.5

Leader & Blank Portion



Tape Dimensions

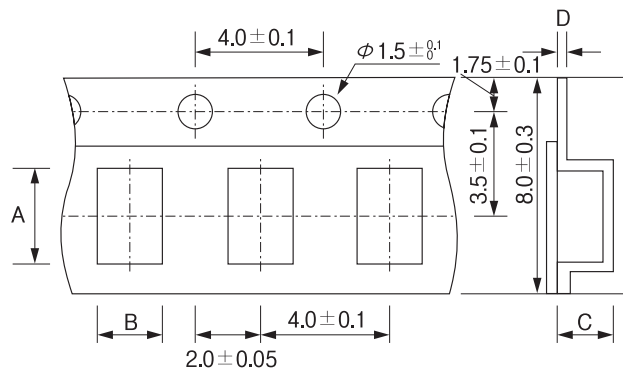
Paper tape



(Unit:mm)

Type	A ± 0.1	B ± 0.1	P ± 0.1	S ± 0.1	T(max.)
1005	1.15	0.65	2.0	1.0	0.8
1608	1.80	1.00	4.0	2.0	1.1
2012	2.30	1.55	4.0	2.0	1.1

Emboss tape



○ Chip Beads ◎ Chip Inductors ● Chip Power Inductors

Type	A ± 0.1	B ± 0.1	C ± 0.1	D ± 0.1	Section		
2012	2.25	1.45	1.50	0.23	○	◎	
			1.20				●
2016	2.50	2.00	1.20	0.22			●
2520	2.74	2.29	1.14	0.23			●
3216	3.50	1.85	1.25	0.23	○	◎	
			0.73				●
3225	3.56	2.80	1.25	0.23			●
4516	4.90	1.90	1.35	0.30	○		
4532	4.85	3.60	1.40	0.30	○		