

DISC Ceramic Capacitors



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Ceramic Type

Introduction

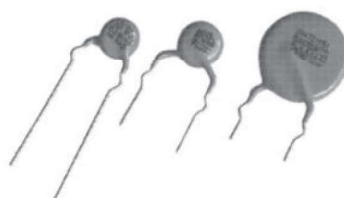
SAMWHA disc ceramic capacitors are designed and produced to offer the user capacitors with high reliability and small size. With wide selection of temperature characteristics and voltage ratings, the user can make use for in various circuit application.

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

How to Order

EK R 3A 101 K 06 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/°C)		EK, SC, SD	
C	NPO (0±60)	B	Y5R(+ 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 = $10 \times 10^0 = 10\text{pF}$

102 = $10 \times 10^2 = 1000\text{pF}$

5 Cap. Tolerance

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

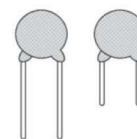
6 Disc Diameter

Code	Dia(φ)	Code	Dia(φ)	Code	Dia(φ)	Code	Dia(φ)	Code	Dia(φ)
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

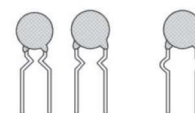
7 Packing Style

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°C

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

Testing Voltage

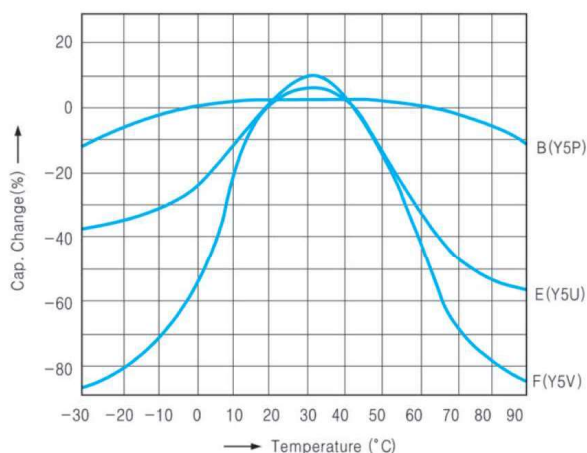
R.V	1~2kV DC	3kV DC	4~kV DC
T.V	R.V×2	R.V×1.75	R.V×1.5

Insulation Resistance : Min 10,000MΩ at 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)

R.V	T.C	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	EKΔ3AΔΔΔΔ06ΔΔΔ	 6.3≤D≤9.0
		820, 1000, 1200, 1500		4700	8.0	5.0	5.0	0.50	EKΔ3AΔΔΔΔ08ΔΔΔ	
		1800, 2200	2200	10000	10.0	5.0	5.0(7.5)	0.50(0.60)	EKΔ3AΔΔΔΔ10ΔΔΔ	
		2700, 3300	4700		12.5	5.0	5.0(7.5)	0.50(0.60)	EKΔ3AΔΔΔΔ12ΔΔΔ	 D≥10.0
				22000	13.0	5.0	7.5(10.0)	0.60	EKΔ3AΔΔΔΔ13ΔΔΔ	
		3900, 4700	10000		14.0	5.0	7.5(10.0)	0.60	EKΔ3AΔΔΔΔ14ΔΔΔ	
		5600, 6800			16.0	5.0	7.5(10.0)	0.60	EKΔ3AΔΔΔΔ16ΔΔΔ	
2KV DC		100, 120, 150, 180, 220, 270, 330, 390, 470, 560		1000, 2200	6.3	5.0	5.0	0.50	EKΔ3DΔΔΔΔ06ΔΔΔ	 6.3≤D≤9.0
		680, 820, 1000	1000, 2200		8.0	5.0	7.5	0.60	EKΔ3DΔΔΔΔ08ΔΔΔ	
		1200, 1500	4700	4700	10.0	5.0	5.0(7.5)	0.50(0.60)	EKΔ3DΔΔΔΔ10ΔΔΔ	
		1800, 2200, 2700		6800, 10000	12.5	5.0	7.5(10.0)	0.60	EKΔ3DΔΔΔΔ12ΔΔΔ	 D≥10.0
		3300, 3900	10000		14.0	5.0	7.5(10.0)	0.60	EKΔ3DΔΔΔΔ14ΔΔΔ	
		4700			16.0	5.0	7.5(10.0)	0.60	EKΔ3DΔΔΔΔ16ΔΔΔ	
		5600			18.0	5.0	7.5(10.0)	0.60	EKΔ3DΔΔΔΔ18ΔΔΔ	
		6800			20.0	5.0	7.5(10.0)	0.60	EKΔ3DΔΔΔΔ20ΔΔΔ	

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		
3.15KV DC	100, 120, 150, 180, 220, 270, 330, 390, 470, 560	1000		8.0	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ08ΔΔΔ	 6.3≤D≤9.0
	680	1500		10.0	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ10ΔΔΔ	
				11.0	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ11ΔΔΔ	
	820, 1000	2200	4700	12.5	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ12ΔΔΔ	
			6800	13.0	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ13ΔΔΔ	 D≥10.0
	1200, 1500	3300, 4700	10000	14.0	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ14ΔΔΔ	
	1800, 2200			15.0	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ15ΔΔΔ	
	2700			16.0	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ16ΔΔΔ	
	3300			16.0	6.0	725(10.0)	0.60	EKΔ3FΔΔΔΔ18ΔΔΔ	
6.3KV DC	100, 120, 150, 180, 220, 270, 330, 470	1000	1000	8.0	7.0	10.0	0.60	EKΔ3JΔΔΔΔ08ΔΔΔ	 6.3≤D≤9.0
		1500		9.0	7.0	10.0	0.60	EKΔ3JΔΔΔΔ09ΔΔΔ	
	1000	2200	2200, 4700	12.5	7.0	10.0	0.60	EKΔ3JΔΔΔΔ12ΔΔΔ	
		3300		14.0	7.0	10.0	0.60	EKΔ3JΔΔΔΔ14ΔΔΔ	 D≥10.0
		3300, 3900		15.5	7.0	10.0	0.60	EKΔ3JΔΔΔΔ15ΔΔΔ	
			10000	20.0	7.0	10.0	0.60	EKΔ3JΔΔΔΔ20ΔΔΔ	

Low Loss Ceramic Capacitors (SL & R Series)

Specification

Temp. Range : - 25~ + 85°C

Operating Temperature Range : - 25~ + 125°C

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

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






Testing Voltage

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







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

Temperature Characteristics & Dissipation Factor(tanδ) / Q

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

Item R.V	Capacitance(pF)		Dimensions(mm)				Part No. (How to order)	Marking
	SL	R(Y5R)	D	T	F	Ød		
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	E△△3A△△△△06△△△	 6.3≤D≤9.0
		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△△△	
		820, 1000	9.30	5.0	5.0/7.5	0.50/0.60	E△△3A△△△△09△△△	
	110, 120, 150	1200	10.0	5.0	5.0/7.5	0.50/0.60	E△△3A△△△△10△△△	
	180, 200, 220	1500	11.0	5.0	5.0/7.5	0.50/0.60	E△△3A△△△△11△△△	 D≥10.0
	240, 270	1800, 2200, 2700, 3300	12.5	5.0	5.0/7.5	0.50/0.60	E△△3A△△△△12△△△	
	300, 330, 360		14.0	5.0	10.0	0.60	E△△3A△△△△14△△△	
		3900	15.0	5.0	10.0	0.60	E△△3A△△△△15△△△	
	390, 450, 470		16.0	5.0	10.0	0.60	E△△3A△△△△16△△△	
			17.0	5.0	10.0	0.60	E△△3A△△△△17△△△	
2KV DC	560, 620	4700	18.0	5.0	10.0	0.60	E△△3A△△△△18△△△	 D≥10.0
	10, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47	120	6.3	5.0	5.0/10.0	0.50/0.60	E△△3D△△△△06△△△	 6.3≤D≤9.0
		220, 270	7.0	5.0	5.0/10.0	0.50/0.60	E△△3D△△△△07△△△	
	51, 56, 62, 68, 75, 82, 91, 100	330, 390	8.0	5.0	5.0/10.0	0.50/0.60	E△△3D△△△△08△△△	 D≥10.0
	120, 150	470, 560, 680	10.0	5.0	5.0/10.0	0.50/0.60	E△△3D△△△△10△△△	
	180, 200, 220	820, 1000	11.0	5.0	5.0/10.0	0.50/0.60	E△△3D△△△△11△△△	

Low Loss Ceramic Capacitors (SL & R Series)

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

Note: All spec size can change based on customer requirement

Notices:

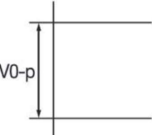
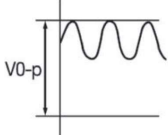
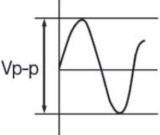
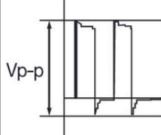
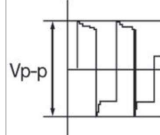
Caution(Rating)

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} 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 Ø 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°C(Y class)

Operating Temperature Range : - 25~ + 125°C

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

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

Testing Voltage

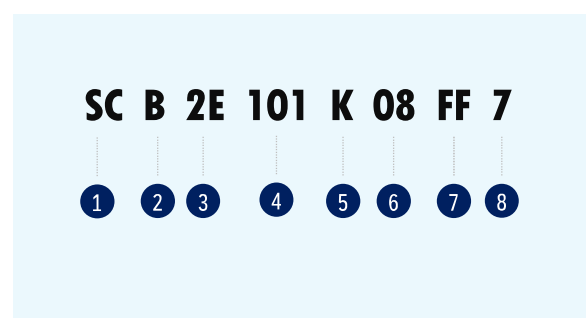
Rating Voltage(R.V)	250 Vac	400 Vac
Testing Voltage(T.V)	2500 Vac	4000 Vac

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

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)



- 1 Packing Style
- 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)	Dmax	Tmax	F(±1.0)	Ød(±0.05)	
SC	B	100, 150, 220, 330, 390, 470, 560	8.0	6.0	6.0	6.0	<div>SC101K A</div> <div>10 X1 300 Y2 250</div> <div></div>
		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	7.0	7.0	<div>SC100K A</div> <div>10 X1 300 Y2 250</div> <div></div>
		56	10.0				
		68	11.0				

Type	Temp char.	Capacitance	Size				Marking
		(pF)	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  X1 400 Y1 250  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	SD100K A  X1 400 Y1 250  SWC
		56	10.5				
		68	11.5				

Automotive Application

Features

- SAMWHA SD, SC Series meet AEC-Q200 requirements
- SAMWHA Series Certify IATF 16949(ISO/TS 16949), ISO 9001, ISO 14001
- SAMWHA Series are RoHS Compliant

Applications

- Automotive Electronic Equipment

Safety Standard Recognized Ceramic Capacitors

Specification

Temp. Range : - 25~ + 85°C(Y class)

Operating Temperature Range : - 40~ + 125°C

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

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

Testing Voltage

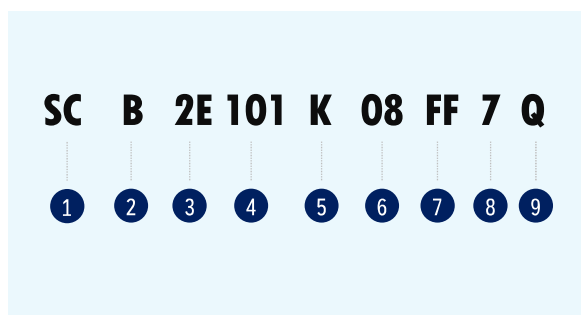
Rating Voltage(R.V)	250 Vac	400 Vac
Testing Voltage(T.V)	2500 Vac	4000 Vac

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

Dissipation Factor(tanδ)

T.C	O(=SL)		B	E	Fx
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)



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

Specification

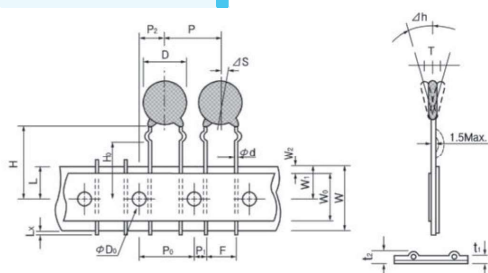
Type	Temp char.	Capacitance	Size				Marking
		(pF)	Dmax	Tmax	F(±1.0)	Ød(±0.05)	
SC	B	100, 150, 220, 330, 390, 470, 560	8.0	6.0	6.0	6.0	SC101K A X1 300 Y2 250
		680	9.0				
		820, 1000	10.0				
	E	1000	7.0				
		1500	9.0				
		1800, 2200	10.0				
		3300	12.5				
		3900	13.0				
		4700	14.0				
	F	3300	9.0				
		4700	10.0				
		6800	11.0				
		10000	14.0				
	O(=SL)	10, 22, 33, 47	9.0	7.0	7.0	7.0	SC100K A X1 300 Y2 250
		56	10.0				
		68	11.0				

Type	Temp char.	Capacitance	Size				Marking
		(pF)	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 X1 400 Y1 250
	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	SD100K A X1 400 Y1 250
		56	10.5				
		68	11.5				

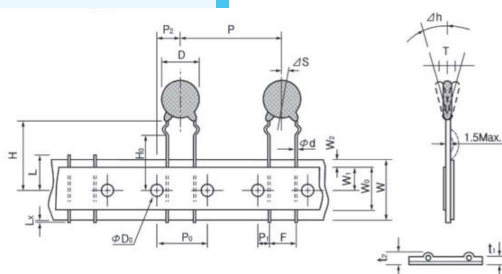
Safety Standard Recognized Ceramic Capacitors

Unit : mm

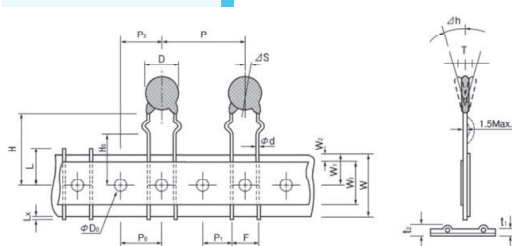
FF7 Type



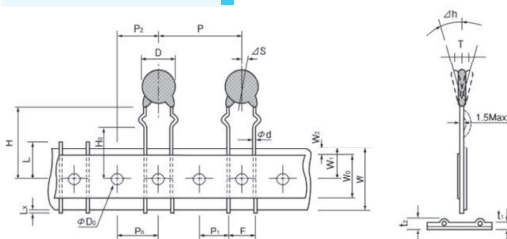
FF8 Type



FF1 Type



FF2 Type



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	6.0max	6.0max	7.0max	7.0max
Lead Diameter	ϕd	0.6 \pm 0.05	0.6 \pm 0.05	0.6 \pm 0.05	0.6 \pm 0.05
Pitch of sprocket Hole	P0	15.0 \pm 0.3	15.0 \pm 0.3	12.7 \pm 0.3	15.0 \pm 0.3
Pitch of Component	P	15.0 \pm 1.0	30.0 \pm 1.0	25.4 \pm 1.0	30.0 \pm 1.0
Lead Length from Hole Center to Lead	P1	3.75 \pm 1.0	3.75 \pm 1.0	7.7 \pm 1.0	10.0 \pm 1.0
Lead Length from Hole Center to Component Center	P2	7.5 \pm 1.5	7.5 \pm 1.5	12.7 \pm 1.5	15.0 \pm 1.5
Lead Spacing	F	7.5 \pm 1.0	7.5 \pm 1.0	10.0 \pm 1.0	10.0 \pm 1.0
Deviation Along Tape Left or Right	ΔS	0 \pm 1.0	0 \pm 1.0	0 \pm 1.0	0 \pm 1.0
Deviation Across Tape	ΔH	0 \pm 2.0	0 \pm 2.0	0 \pm 2.0	0 \pm 2.0
Carrier Tape Width	W	18.0 ^{+1.0} _{-2.5}	18.0 ^{+1.0} _{-2.5}	18.0 ^{+1.0} _{-2.5}	18.0 ^{+1.0} _{-2.5}
Hold Down Tape Width	W ₀	8.0min	8.0min	8.0min	8.0min
Position of Sprocket Hole	W ₁	9.0 \pm 0.5	9.0 \pm 0.5	9.0 \pm 0.5	9.0 \pm 0.5
Hole Down Tape Position	W ₂	3.0max	3.0max	3.0max	3.0max
Height of Component From Hole Center	H	20.0 ^{+1.0} _{-2.5}	20.0 ^{+1.0} _{-2.5}	20.0 ^{+1.0} _{-2.5}	20.0 ^{+1.0} _{-2.5}
Lead-Wire Clinch Height	H ₀	16.0 \pm 0.5	16.0 \pm 0.5	16.0 \pm 0.5	16.0 \pm 0.5
Diameter of Sprocket Hole	ϕD_0	4.0 \pm 0.2	4.0 \pm 0.2	4.0 \pm 0.2	4.0 \pm 0.2
Total Taps Thickness	t ₁	0.7 \pm 0.2	0.7 \pm 0.2	0.7 \pm 0.2	0.7 \pm 0.2
Total Thickness, Tape and Lead Wire	t ₂	1.7max	1.7max	1.7max	1.7max
Lead Wire Protrusion	Lx	1.0max	1.0max	1.0max	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
KTL	File No. SU03004-16001 / SU03004-16003
ENEC	File No. ENEC FI 2016053

SD Type : Rating Voltage AC 250V/400V, X1 and Y1 Testing Voltage AC 4000V

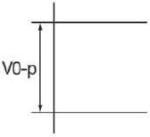
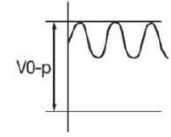
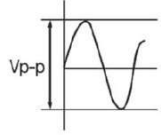
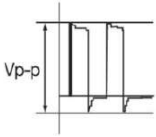
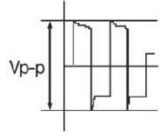
UL	File No. E97754
VDE	File No. 40015804
CSA	File No. 2476564
CQC	File No. 10001054593
KTL	File No. SU03004-16002 / SU03004-16004
ENEC	File No. ENEC FI 2016053

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 $\phi 0.1\text{mm}$ 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

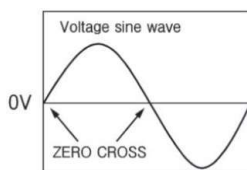
1) Test Equipment

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, supplied gas, acid, alkali, salt or the like present. Also avoid exposure to moisture. 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 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, molding 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 liter 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
- X-Ray Equipment
- DC Pulse High Voltage

How to Order (Product Identification)



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 (ΔC)
B (Y5P)	-25°C ~ +85°C	-25°C ~ +85°C	-10% ~ +10%
E (Y5U)	-25°C ~ +85°C	-25°C ~ +85°C	-56% ~ +22%
F (Y5V)	-25°C ~ +85°C	-25°C ~ +85°C	-82% ~ +22%
R (Y5R)	-25°C ~ +85°C	-25°C ~ +85°C	-15% ~ +15%
O (SL)	-25°C ~ +85°C	-25°C ~ +85°C	+350 ~ -1000ppm/°C
N (N4700)	-25°C ~ +85°C	-25°C ~ +85°C	-4700±1000ppm/°C

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

Mark	K	M	Z
B	Bulk	S	Straight Long Type
		W	Kink Short Type
		N	Straight Short Type
D	Double Kink	S	Straight Long Type

9 Packing Style & Lead Variation

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

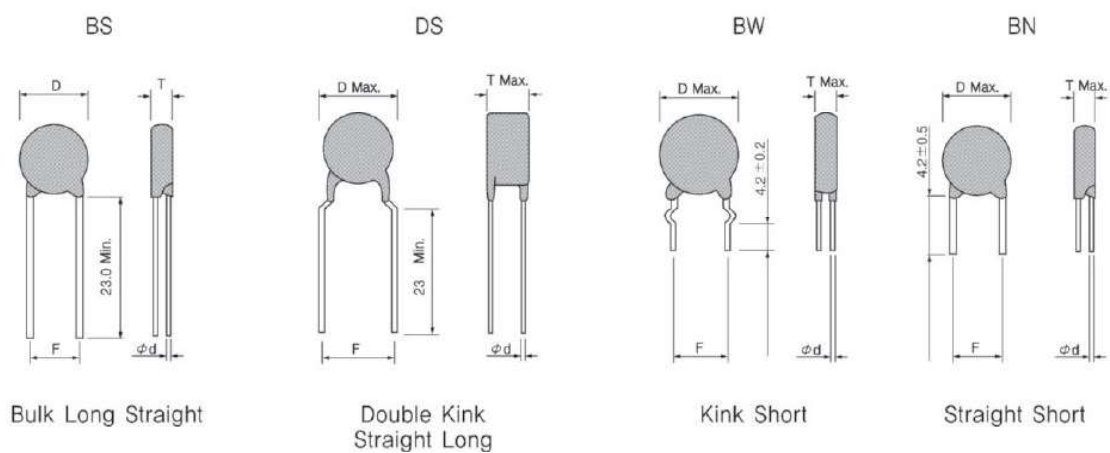
Typical Performance Characteristics

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	-25°C ~ +85°C	-25°C ~ +85°C
Temperature Coefficient	-10% ~ +10%	-56% ~ +22%	-82% ~ +22%	-15% ~ +15%	+350 ~ -1000ppm	-4700±1000ppm
Dissipation Factor	$\text{tg}\delta \leq 2.5\%$	$\text{tg}\delta \leq 3.5\%$	$\text{tg}\delta \leq 3.5\%$	$\text{tg}\delta \leq 0.2\%$	$C < 30\text{pF}, Q \geq 400+20C$ $C \geq 30\text{pF}, Q \geq 1000$	$\text{tg}\delta \leq 1.0\%$
Insulation Resistance	Charge at 500VDC for 60 seconds, Min 10,000 M Ω					
Rated Voltage (RV)	10 ~ 15kVdc	10 ~ 30kVdc	10 ~ 15kVdc	10 ~ 15kVdc	10 ~ 20kVdc	10 ~ 20kVdc

Packing Style

Long Type

Short Type



Specifications

10kVDC

TCC	Cap.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax(mm)	Tmax(mm)	mm	mm	
B(Y5P) -25~85°C ±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
	2200	±20%	18.5	8.5	10±2.0	0.80±0.05	18
E(Y5U) -25~85°C ±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°C ±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°C ±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°C ±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.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax(mm)	Tmax(mm)	mm	mm	
N(N4700) +20~85°C -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.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax(mm)	Tmax(mm)	mm	mm	
B(Y5P) -25~85°C ±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°C ±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°C ±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
	12	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
SL +20~85°C ±350~- 1000ppm	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.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax(mm)	Tmax(mm)	mm	Mm	
SL +20~85°C ±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°C ±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°C -4700± 1000ppm R(Y5R) -25~85°C ±15%	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
	2200	±10%	22.5	10.0	12.5±2.0	0.80±0.05	22

20kVDC

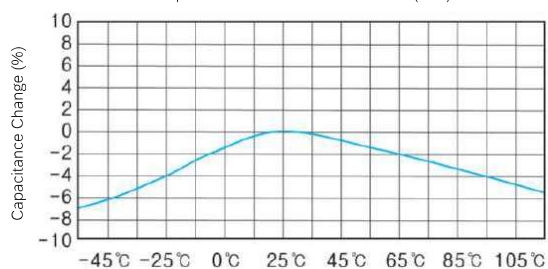
TCC	Cap.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax(mm)	Tmax(mm)	mm	Mm	
E(Y5U) -25~85°C ±22~56%	2200	±20%	19.5	10.0	15±2.0	0.80±0.05	19
SL +20~85°C ±350~ 1000ppm	15	±10%	12.5	10.0	15±2.0	0.80±0.05	12
	20	±10%	12.5	10.0	15±2.0	0.80±0.05	12
	22	±10%	12.5	10.0	15±2.0	0.80±0.05	12
	27	±10%	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
N(N4700) + 25~85°C 4700±1000	330	±10%	14.5	10.0	15±2.0	0.80±0.05	14
	1000	±10%	21.5	10.0	15±2.0	0.80±0.05	21

30kVDC

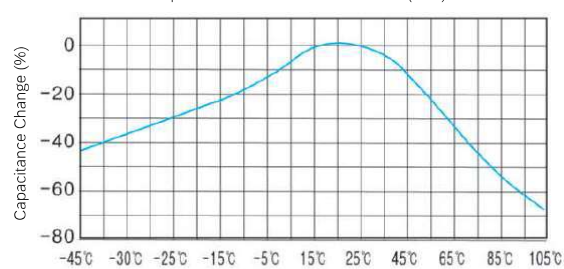
TCC	Cap.	TOL.	D	T	F(LS)	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax(mm)	Tmax(mm)	mm	Mm	
E(Y5U) + 25~85°C + 22~56%	2000	±10%	20.5	12.0	15±2.0	0.80±0.05	20
	2200	±10%	20.5	12.0	15±2.0	0.80±0.05	20

Typical Characteristics Graph

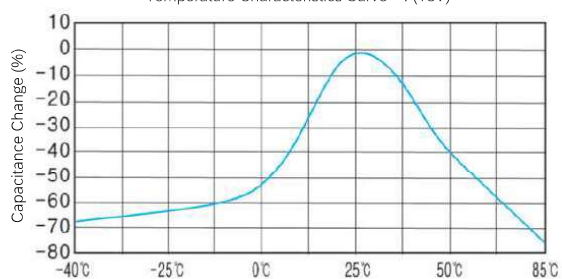
Temperature Characteristics Curve – B(Y5P)



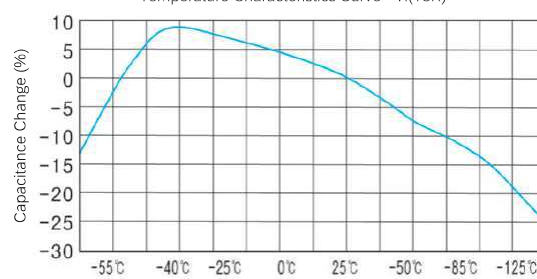
Temperature Characteristics Curve – E(Y5U)



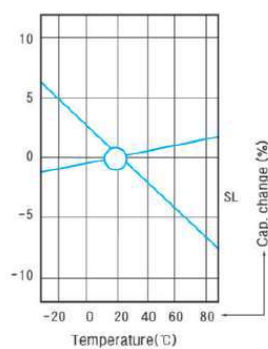
Temperature Characteristics Curve – F(Y5V)



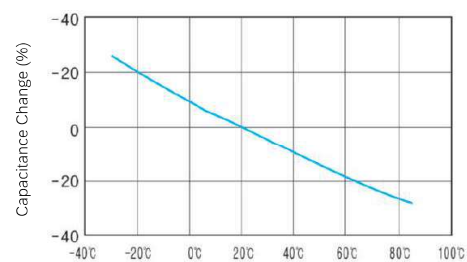
Temperature Characteristics Curve – R(Y5R)



Temperature Characteristics Curve – O(SL)



Temperature Characteristics Curve – N(N4700)



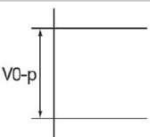
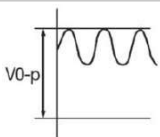
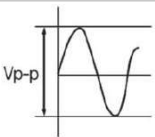
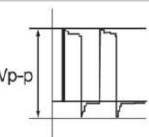
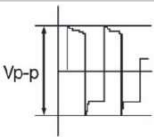
Caution/Notice



Caution (Rating)

1. Operating Voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the 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. 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 $\leq 0.1\text{mm}$ 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.

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.



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

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.



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 (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

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.