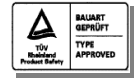
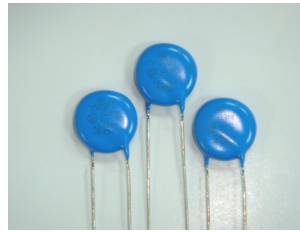


## Ceramic Disc Capacitors [ Safety Disc Capacitors – X1Y1& X1Y2]

### SDC Series



This specification applies to the following Safety Standards that are recognized for Ceramic Capacitors used in Electronic Appliances.

#### ◆ Features

- ❑ Operating temperature range guaranteed up to 125°C (UL/CSA:85°C)
- ❑ Safety capacitors specially designed for use in Modem, Facsimile, Telephone and other electronic equipment for lightning and surge protection, EMI filter and isolation.
- ❑ The series is recognized by U/L,CSA,TUV,CCC
- ❑ Coated with Flame-retardant epoxy resin (conforming to UL 94-0 standards)
- ❑ Suitable for automatic insertion
- ❑ RoHS compliant
- ❑ Halogen Free available

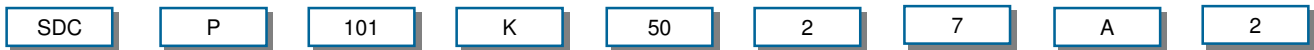
#### ◆ Application

- ❑ Safety capacitors specially designed for use in Modem, Facsimile, Telephone and other electronic equipment for lightning and surge protection, EMI filter and isolation.
- ❑ Interference suppressor for AC line of electronic equipment

#### ◆ Related Standards and Certificate Numbers

Certificated Body	Relation Standard	Number	Rated Voltage
TUV	IEC 60384-14 : 2005 (3 <sup>rd</sup> Edition) EN 60384-14 : 2005 EN 132400 : 1994+A2:1998+A3:1998+A4:2001	R50101887	X1:400 VAC Y2:250 VAC
			X1:440 VAC Y1:250 VAC
			X1:440 VAC Y2:400 VAC
UL	UL 1414 Edition 5	E300818	SDC-Y2 250 VAC
			SDC-Y1L 250 VAC
			SDC-Y1H 250 VAC
CUL/CSA	CSA :C22.2 NO.1	E300818/1686156	250 VAC
ENEC Report	EN 60384-14 : 2005(3 <sup>rd</sup> Edition)	2792364	
CB Report	EN 60384-14 : 2005(3 <sup>rd</sup> Edition)	HU-455/A1	

#### ◆ How To Order

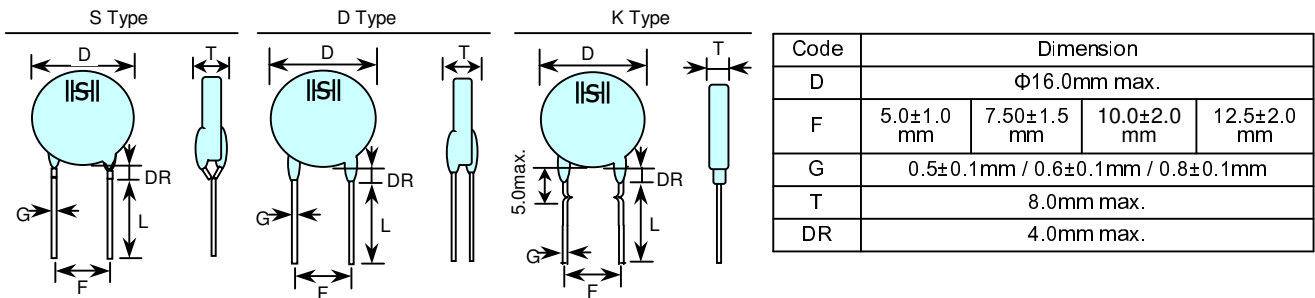


Product Code	Dielectric	Capacitance Unit : pF	Tolerance	Class	Rated Voltage	Lead Space	Lead Length	Lead Shape
SDC: Safety Disc Ceramic Capacitor	Ex.: N : NPO S : SL X : X7R P : Y5P Y : Y5V E : Y5U	Ex.: 100 : 10x10 <sup>0</sup> 151 : 15x10 <sup>1</sup>	Ex.: J: +/-5.0% K: +/- 10% M: +/- 20%	Ex.: 10 : X1/Y1 50 : X1/Y2	Ex.: <b>2:</b> Y Cap:250V X Cap:400V  <b>3:</b> Y Cap:250V X Cap:440V  <b>4:</b> Y Cap:400V X Cap:440V	Ex.: 5 : 5.00mm 6 : 6.35mm 7 : 7.50mm A : 10.0mm B : 12.5mm	Ex.: H:3.1mm C:3.5mm S:5.0mm M:10mm L :25mm min T :Tape Reel A: Ammo Box	<b>S Type</b> 1: φ=0.50mm 2: φ=0.60mm 3: φ=0.65mm 4: φ=0.80mm <b>K Type</b> 5: φ=0.50mm 6: φ=0.60mm 7: φ=0.65mm 8: φ=0.80mm <b>D Type</b> 9: φ=0.50mm A: φ=0.60mm B: φ=0.65mm C: φ=0.80mm

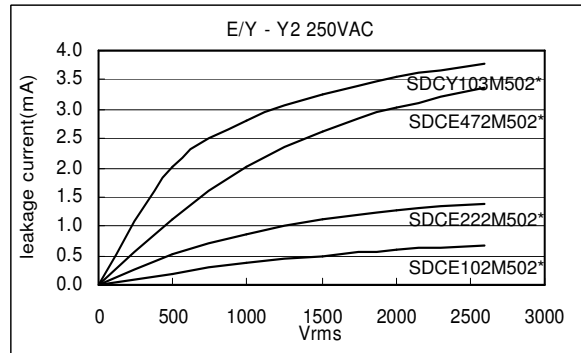
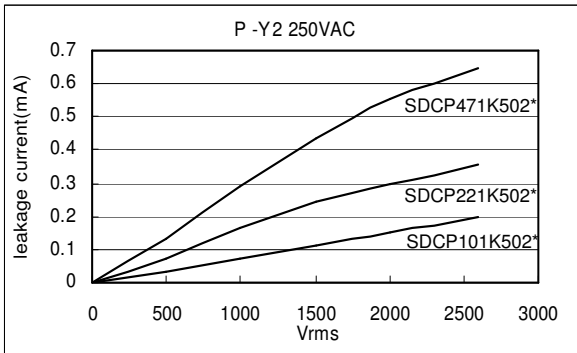
## ◆ Summary of Specification

Operation Temperature	-25~+125 °C
Dielectric Strength	X1:440 VAC / Y1:250 VAC : 4000VAC for 1 minute
	X1:440 VAC / Y1:400 VAC : 4000VAC for 1 minute
	X1:400 VAC / Y2:250 VAC : 2600VAC for 1 minute
Capacitance Range	X1:440 VAC / Y1:250 VAC : 2pF to 4700pF
	X1:440 VAC / Y1:400 VAC : 2pF to 4700pF
	X1:400 VAC / Y2:250 VAC : 2pF to 10,000pF
Dissipation Factor	Class I , NPO/SL : Q ≥ 300 at 1MHz/1Vrms
Insulation Resistance	Class II , Y5P :DF ≤ 2.5% ; Y5U/Y5V :DF ≤ 5.0% at 1KHz/1Vrms
	10,000MΩ min. at 500VDC

## ◆ Dimension



## ◆ Leakage Current Characteristic (Typical Reference)



## ◆ Capacitance Range

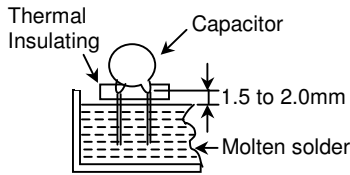
Class	TC	Capacitance Range																																				
		2R0	3R0	5R0	8R0	100	150	220	330	390	470	680	101	121	151	181	221	271	331	391	471	561	681	102	152	182	202	222	332	392	472	682	822	103				
X1: 400VAC Y2: 250VAC	NPO	0.5	0.5	0.5	0.5	0.5																																
	SL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5																										
	Y5P				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	Y5U																																					
	Y5V																																					
X1: 440VAC Y1: 250VAC	NPO	0.5	0.5	0.5																																		
	SL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5																										
	Y5P												0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
	Y5U																																					
X1: 440VAC Y1: 400VAC	NPO	0.5	0.5	0.5																																		
	SL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5																										
	Y5P												0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
	Y5U																																					

Body Diameter(max.) / Body Thickness (max.)

## SDC Series Specification & Test Condition

Item	Specification		Test Condition			
<b>Operation Temperature</b>	Char.	Operation Temp.				
	NPO(N)/SL(S)/Y5P(P)	-25°C ~ +125°C				
	Y5U(E)/Y5V(Y)	-25°C ~ +105°C				
<b>Capacitance</b>	Within specified tolerance.		Char.	Frequency	Voltage	
<b>Quality Fact/or &amp; Dissipation Factor</b>	Char.	Q / D.F.(max.)	NPO/SL	1MHz±10%	5.0Vrms max.	
	NPO(N)/SL(S)	Q ≥ 300	Y5P/Y5U/Y5V	1KHz±10%		
	Y5P(P)	D.F. ≤ 2.5%	The measurement at reference temperature 25 °C.			
	Y5U(E) /Y5V(Y)	D.F. ≤ 5.0%				
<b>Insulation Resistance(I.R.)</b>	10,000MΩ min.		Applied Voltage : 500±5Vdc Charge Time : 60±5sec. Is applied less than 50mA current.			
<b>Dielectric Strength</b>	Between lead wires	No failure	The capacitors shall not be damaged when AC2.6KV(for Y2 Class) and AC4KV (for Y1 Class) are applied between the lead wires for 60 sec. Is applied less than 50mA current.			
	Body insulation	No failure	First the terminals of the capacitor shall be connected together. Then, as shown in the figure to the right, a metal foil shall be closely wrapped around the body of the capacitor to the distance of about 3 to 4mm from each terminal. Then, the capacitor shall be inserted into a container filled with metal balls of about 1mm diameter. Finally VAC(2.6KV for Y2 and 4KV for Y1) is applied for 60sec. between the capacitor lead wires and metal balls. Is applied less than 50mA current.			
<b>Temperature Characteristic</b>	Char.	Temp. Range	Cap. Change	The capacitance measurement shall be made at each step specified as following..		
	NPO(N)	-55 °C ~ +125 °C	0±60ppm/°C	Step.	Temperature(°C)	
	SL(S)	-55 °C ~ +85 °C	+350~-1000%		(SL/Y5P/Y5U/Y5V)	(NPO)
	Y5P(P)	-25 °C ~ +85 °C	±10%	1	+25±2	+25±2
	Y5U(E)	-25 °C ~ +85 °C	+22%~ -56%	2	-25±2	-55±2
	Y5V(Y)	-25 °C ~ +85 °C	+22% ~ -82%	3	+25±2	+25±2
			4	+85±2	+125±2	
			5	+25±2	+25±2	
<b>Robustness of Termination</b>	Tensile	Lead wire shall not separate from the capacitor and shall not be broken.	With the termination in its normal position the specimen is held by its body in such a manner that the axis of the termination is vertical the tensile force of 10N shall be applied to the termination in the direction of its axis and acting in a direction away from the body of the specimen.			
	Bending	Lead wire shall not separate from the capacitor shall not be broken.	With the termination in its normal position the specimen is held by its body in such a manner that the axis of the termination is vertical : a mass applying a force of 5N is then suspended from the end of the termination. The body of the specimen is then inclined within a period of 2 to 3 sec., through an angle of a approximately 90 in the vertical plane and then returned to its initial position over the same period of time; this operation constitutes one bend. One bend immediately followed by a second bend in the opposite direction.			

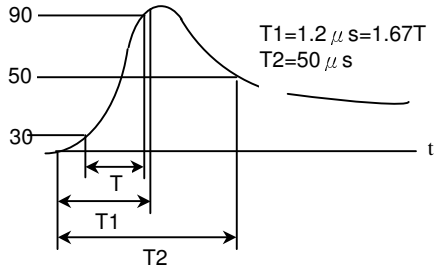
## SDC Series Specification & Test Condition

Item	Specification	Test Condition	
<b>Solderability of leads</b>	Lead wire shall be soldered uniformly and coated on the axial direction over 3/4 of the circumference direction.	Solder temperature: $235 \pm 5^{\circ}\text{C}$ Immersion time: $2 \pm 0.5$ sec The depth of immersion : 1.5~2.0mm	
<b>Soldering Effect</b>	Appearance	No marked defect.	
	Capacitance	Within $\pm 10\%$	
	I.R.	1000M $\Omega$ min.	
	Dielectric Strength	Per Item 5.	
		Solder temperature: $350 \pm 10^{\circ}\text{C}$ or $260 \pm 5^{\circ}\text{C}$ Immersion time: $3.5 \pm 0.5$ sec ( $10 \pm 1$ sec. for $260 \pm 5^{\circ}\text{C}$ )  The depth of immersion is up to about 1.5~2.0mm from the root of lead wires.	
			
		<b>Pre-treatment:</b> Capacitor shall be stored at $85 \pm 2^{\circ}\text{C}$ for 1 hour, then placed at room condition for $24 \pm 2$ hours before initial measurements.	
		<b>Post-treatment:</b> Capacitor shall be stored for 1 to 2 hours at room condition.	
<b>Humidity (Under Steady State)</b>	Appearance	No marked defect	
	Capacitance	Char.	Cap. change
		NPO(N)	$\leq \pm 5\%$ of initial value
		SL(S)	$\leq \pm 5\%$ of initial value
		Y5P(P)	$\leq \pm 10\%$ of initial value
		Y5U(E)	$\leq \pm 15\%$ of initial value
Y5V(Y)	$\leq \pm 30\%$ of initial value		
Q / Tan $\delta$	Class I (NPO/SL) $Q \geq 135$ Class II Y5P : DF $\leq 5.0\%$ Y5U/Y5V : DF $\leq 7.5\%$	Set the capacitor for $500 \pm 12$ hours at $40 \pm 2^{\circ}\text{C}$ , in 90 to 95% humidity.	
Insulation Resistance	3,000M $\Omega$ min.	<b>Pre-treatment:</b> Capacitor shall be stored at $85 \pm 2^{\circ}\text{C}$ for 1 hour, then placed at room condition for $24 \pm 2$ hours before initial measurements.	
Dielectric Strength	Pre Item 5.	<b>Post-treatment:</b> Capacitor shall be stored for 1 to 2 hours at room condition.	
<b>Humidity Loading</b>	Appearance	No marked defect	
	Capacitance	Char.	Cap. change
		NPO(N)	$\leq \pm 5\%$ of initial value
		SL(S)	$\leq \pm 5\%$ of initial value
		Y5P(P)	$\leq \pm 10\%$ of initial value
		Y5U(E)	$\leq \pm 15\%$ of initial value
Y5V(Y)	$\leq \pm 30\%$ of initial value		
Q / Tan $\delta$	Class I (NPO/SL) $Q \geq 135$ Class II Y5P : DF $\leq 5.0\%$ Y5U/Y5V : DF $\leq 7.5\%$	Apply the rated voltage for $500 \pm 12$ hours at $40 \pm 2^{\circ}\text{C}$ , in 90 to 95% humidity.	
Insulation Resistance	3,000M $\Omega$ min.	<b>Pre-treatment:</b> Capacitor shall be stored at $85 \pm 2^{\circ}\text{C}$ for 1 hour, then placed at room condition for $24 \pm 2$ hours before initial measurements.	
Dielectric Strength	Pre Item 5.	<b>Post-treatment:</b> Capacitor shall be stored for 1 to 2 hours at room condition.	

**SDC Series Specification & Test Condition**

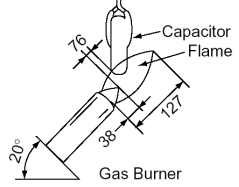
Item	Specification	Test Condition	
<b>Endurance (Life Test)</b>	Appearance	No marked defect.	
	Capacitance	Char.	Cap. change
		NPO(N)	$\leq \pm 5\%$ of initial value
		SL(S)	$\leq \pm 20\%$ of initial value
Y5P(P)		$\leq \pm 20\%$ of initial value	
Y5U(E)	$\leq \pm 20\%$ of initial value		
Y5V(Y)	$\leq \pm 30\%$ of initial value		
Insulation Resistance	3,000M $\Omega$ min.		
Dielectric Strength	Pre Item 5.		

**Impulse Voltage**  
 Each individual capacitor shall be subjected to 5KV(Y2) and 8KV(Y1) impulses for the times below. After impulse testing the capacitors are applied to life test.



The specimen capacitor are placed in a circulating air oven for a period of 1000 hours. The air in the oven is maintained at a temperature of  $125 \pm 2^\circ\text{C}$ . Throughout the test the capacitors are subjected to 1.7Ur (rms) alternating voltage of mains frequency. In addition once per hour the voltage is increased to 1000Vrms for 0.1sec.

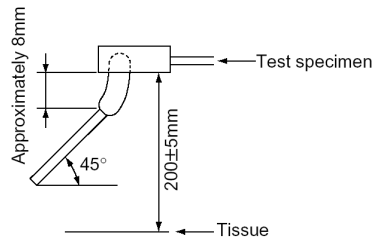
<b>Flame Test</b>	The capacitor flame discontinue as follows		The capacitor shall be subjected to the flame below for 15 sec. then removed for 15 sec, for 5 cycles.
	<u>Cycle</u>	<u>Time</u>	
	1~ 4	30sec. Max.	
	5	60sec. max.	



**Passive Flammability** The burning time shall not be exceeded the time 30sec. The tissue paper shall not ignite.

The capacitor under test shall be held in the flame in the position shown, which best promotes burning. Each specimen shall only be exposed once to the flame.

- Length of flame :  $12 \pm 1\text{mm}$
- Gas burner : Length 35mm min.
- Inside Dia. :  $0.5 \pm 0.1\text{mm}$
- Outside Dia. : 0.9mm max.
- Gas : Butane gas Purity 95% min.
- Time of exposure to flame : 30 sec.



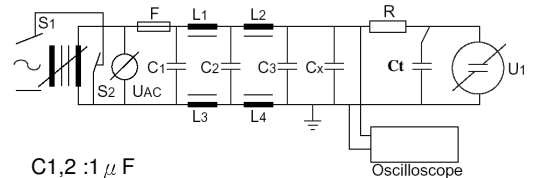
**SDC Series Specification & Test Condition**

Item	Specification	Test Condition
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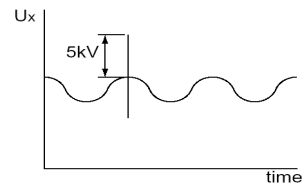
**Active Flammability**

The cheese-cloth shall not catch fire

The specimens shall be individually wrapped in at least one but not more than two complete layers of cheese-cloth. The specimens shall be subjected to 20 discharges. The interval between successive discharges shall be 5 sec. The Uac shall be maintained for 2 min. after the last discharge.



- C1,2 : 1  $\mu$  F
- L1-4 : 1.5mH $\pm$ 20%  
16A Rod core choke
- R : 100  $\Omega$  $\pm$ 2%,
- Uac : Ur $\pm$ 5%
- Cx : Capacitor
- U<sub>1</sub> : Voltage applied to Ct
- C3 : 0.33  $\mu$  F $\pm$ 5% 10KV
- Ct : 3  $\mu$  F $\pm$ 5% 10KV
- Ur : Rated working voltage
- F : Fuse, Rated 10A



**Vibration**

Appearance	No mechanical damage shall occur
Capacitance	Within the specified tolerance
Q / Tan $\delta$	To satisfy the specified initial value

Solder the capacitor on P.C. board.  
Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1 min.  
Repeat this for 2 hours each in 3 perpendicular directions.