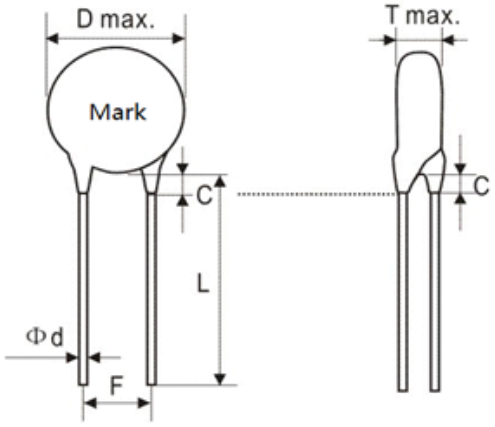
■ Outline Drawing



■ Typical Applications

Line-to-line (class X) filtering

Line-to-ground (class Y) filtering, Antenna coupling

Primary and secondary coupling (switching power supplies) and line disturbances suppression (motors and motor controls, relays, switching power supplies and invertors).

■ Features

Safety Standard Recognized IEC60384–14

Reliable operation up to 125°C

Capacitance offerings ranging from 10~4,700 pF

Lead (Pb)-free and RoHS Compliant, Halogen free

High reliability

Encapsulation meets flammability standard UL 94V–0

■ Safety Approvals

UL	UL60384-14 and E60384-14	E302125	
ENEC/VDE	IEC 60384-14	40050259	
CQC	IEC 60384–14:2005	CQC19001219045	

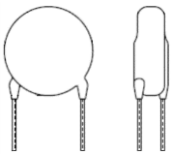
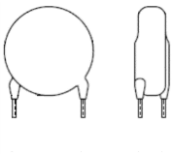
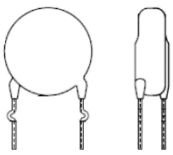
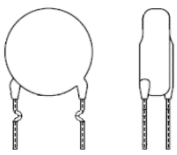
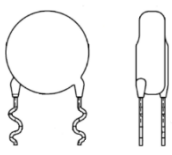
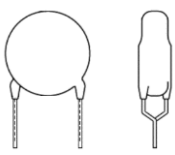
■ Specifications

Dielectric / Temperature Characteristic	**Y5P**	**Y5U**	**Y5V**
Capacitance Change with Reference to +25℃ and 0 VDC Applied	±10%	+22%, -56%	+22, -82%
Operating Temperature Range	-25℃~125℃		
Rated Voltage	X1 440Vac , Y1 400Vac		
Test Voltage Between Terminals	4,000 VAC, 50 Hz, 60 seconds		
Insulation Resistance	> 6000MΩ		
Dissipation Factor (tanδ) at 1KHz and 25°C	2.5% Max	2.5% Max	5.0% Max

■ Product code system

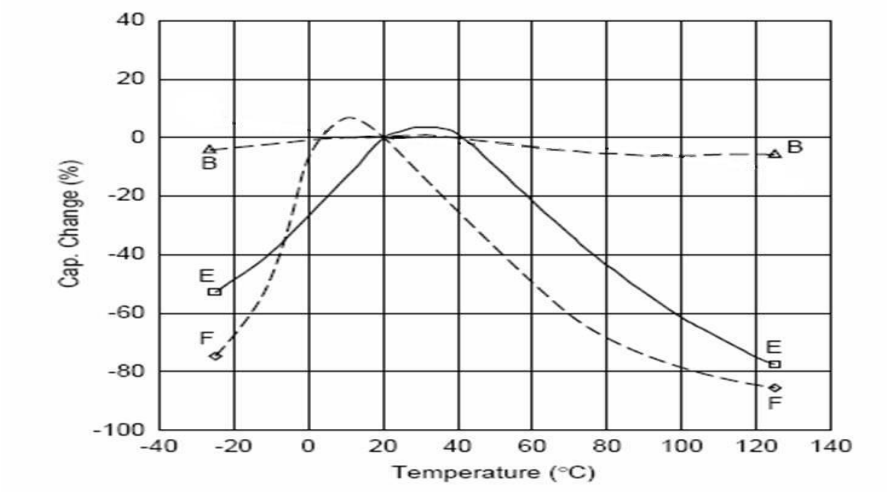
PY1	F	A	102	M	A	400	A	B	10	23
Type	Temperature characteristics	Internal use	Nominal capacity	Tolerance	Internal use	Rated Voltage	Voltage	Lead forming	Lead Pitch	Lead length
PY1= X1/Y1	B=Y5P E=Y5U F=Y5V	--	4R7=4.7pF 220=22pF 471=470pF	K=±10% M=±20%	--	400= 400Vac	A=AC	Shown as Table I	05=5mm 08=7.5mm 10=10mm 13=12.5mm	04= 3.5mm 23= 23mm

Table I

Code	B	K	R	U	W	S
Lead Forming						

■ Temperature Characteristic Curves

B: (Y5P) E: (Y5U) F: (Y5V)



Code	Lower temperature	Limit temperature	Reference temperature	The biggest electric capacity relative change rate
Y5P (B)	-30℃	+85℃	+25℃	±10%
Y5U (E)	-30℃	+85℃	+25℃	+22%, -56%
Y5V (F)	-30℃	+85℃	+25℃	+22, -82%

■ **Dimensions (mm)**

Dielectric/Temp. Char.	Part number	Capacitance	Tolerance	D Max	T Max	F±0.5	ø d± 0.05
± 10% (Y5P)	PY1B_100K_400A*10**	10 pF	±10%	8	6	10	0.55
	PY1B_180K_400A*10**	18 pF		8			
	PY1B_220K_400A*10**	22 pF		8			
	PY1B_330K_400A*10**	33 pF		8			
	PY1B_470K_400A*10**	47 pF		8			
	PY1B_560K_400A*10**	56 pF		8			
	PY1B_680K_400A*10**	68 pF		7.3			
	PY1B_101K_400A*10**	100 pF		7			
	PY1B_151K_400A*10**	150 pF		7			
	PY1B_221K_400A*10**	220 pF		7			
	PY1B_331K_400A*10**	330 pF		8			
	PY1B_471K_400A*10**	470 pF		9			
	PY1B_681K_400A*10**	680 pF		9.8			
+22 ~ -56% (Y5U)	PY1E_331K_400A*10**	330 pF	±10%	6.8			
	PY1E_471K_400A*10**	470 pF		6.8			
	PY1E_681K_400A*10**	680 pF		8			
	PY1E_102M_400A*10**	1000 pF	±20%	8			
	PY1E_152M_400A*10**	1500 pF		9.8			
	PY1E_222M_400A*10**	2200 pF		10.7			
	PY1E_332M_400A*10**	3300 pF		13.5			
	PY1E_472M_400A*10**	4700 pF		13.5			
+22 ~ -82% (Y5V)	PY1F_102M_400A*10**	1000 pF	±20%	6.8			
	PY1F_152M_400A*10**	1500 pF		8			
	PY1F_222M_400A*10**	2200 pF		9			
	PY1F_332M_400A*10**	3300 pF		10.6			
	PY1F_472M_400A*10**	4700 pF		12			

_ = Internal use * = Lead forming ** = Lead length

■ **Marking** (Example)

Trademark	WDC			
Type	CD	X1/Y1	CE	X1/Y2
capacitance	472 (4700pF)			
Tolerance	K (±10%) ， M (±20%)			
Safety recognized	EN 10	VDE	CQC	cULus
Rated Voltage	X1 440 ~ (440Vac) Y1 400 ~ (400Vac)			

■ **Safety Approvals**

Approval marks	Capacitor Class	Certificate	Climatic Category	Rated Cap.	Rated Voltage	
					Y1	Y2
cULus	X1/Y1 (CD)	E302125	25/125/21/B	10 ~ 4700 pF	X1:440Vac Y1:400Vac	X1:400Vac Y2:300Vac
cULus	X1/Y2 (CE)	E302125	25/125/21/B	100 ~ 10000 pF		
EN 10	X1/Y1 (CD)	40050259	25/125/21/B	10 ~ 4700 pF		
VDE	X1/Y2 (CE)	40050253	25/125/21/B	100 ~ 10000 pF		
CQC	X1/Y1 (CD)	CQC19001219045	25/125/21/B	10 ~ 4700 pF		
CQC	X1/Y2 (CE)	CQC19001219046	25/125/21/B	100 ~ 10000 pF		

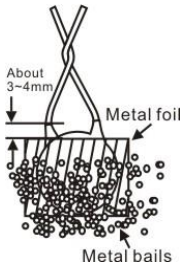
■ Specifications and Test Methods

Test condition：
Test and measurement shall be made at the standard condition
(Temperature 15 ~ 35℃, relative humidity 45 ~ 75% and atmospheric pressure 86 ~ 106Kpa).

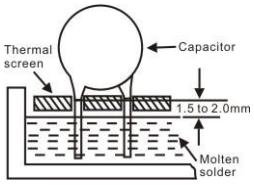
Unless otherwise specified herein. If doubt occurred on the value of measurement, and measurement was requested by customer capacitors shall be measured at the reference condition
(Temperature 25±2℃, relative humidity 60 ~ 70% and atmospheric pressure 86~106Kpa.)

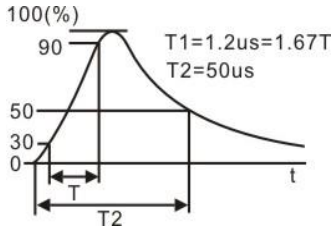
Performance (Apply to Class X1/Y1 & X1/Y2)

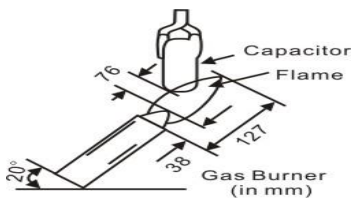
Test items	Performance	Test Method
Climatic category	25/125/21/B	--
Appearance and Dimensions	No marked defect on appearance form and dimensions are within specified range.	The capacitor should be visually inspected for evidence of defect.
Marking	To be easily legible	The capacitor should be visually inspected.
Capacitance	Within specified tolerance	The capacitance and dissipation factor should be measured at 25°C with 1±0.1KHz and AC1.0V (r.m.s.)
Dissipation Factor (D.F.)	B(Y5P), E(Y5U)：D.F. ≤ 2.5% F(Y5V)：D.F. ≤ 5.0%	
Insulation Resistance (I.R.)	>6000MΩ	The insulation resistance should be measured with DC100V within 60±5 sec of charging.

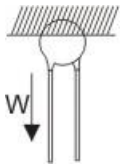
<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="2">Dielectric Strength</td><td>Between Lead Wires</td><td>No failure.</td><td>The capacitor should not be damaged when test voltages of Table 1 are applied between the lead wires for 60 sec. (Charge/Discharge current ≤50mA)
< Table 1>
<table><tr><th>Type</th><th>Test Voltage</th></tr><tr><td>X1Y2</td><td>AC1500V (r.m.s.)</td></tr><tr><td>X1Y1</td><td>AC4000V (r.m.s.)</td></tr></table></td></tr>
<tr><td>Body Insulation</td><td>No failure.</td><td>First, the terminals of the capacitor should be connected together. Then, as shown in figure at right, a metal foil should be closely wrapped around the body of the capacitor to the distance of about 3 to 4mm from each terminal.
 
Then, the capacitor should be inserted into a container filled with metal balls of about 1mm diameter. Finally, AC voltage of Table 2 is applied for 60 sec. between the capacitor lead wires and metal balls.
< Table 2>
<table><tr><th>Type</th><th>Test Voltage</th></tr><tr><td>X1/Y2</td><td>AC1500V(r.m.s.)</td></tr><tr><td>X1/Y1</td><td>AC4000V(r.m.s.)</td></tr></table></td></tr>
<tr><td colspan="2">Temperature Characteristics</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B (Y5P)</td><td>±10%</td></tr><tr><td>E (Y5U)</td><td>+22/-56%</td></tr><tr><td>F (Y5V)</td><td>+22/-82%</td></tr></table>Temp. range: -25 ~+85℃</td><td>The capacitance measurement should be made at each step specified in Table 3.
<Table 3>
<table><tr><th>Step</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr><tr><td>Temperature (℃)</td><td>25 ±2</td><td>-25 ±2</td><td>25 ±2</td><td>85 ±2</td><td>25 ±2</td></tr></table></td></tr>
<tr><td colspan="2">Solderability of Leads</td><td>Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction.</td><td>The lead wire of a capacitor should be dipped into molten solder for 2±0.5 sec. The depth of immersion is up to about 1.5 to 2.0mm from the root of lead
Temp. of solder：
Lead Free Solder (Sn-2Ag-0.5Cu) 250±5°C.</td></tr>
</table>

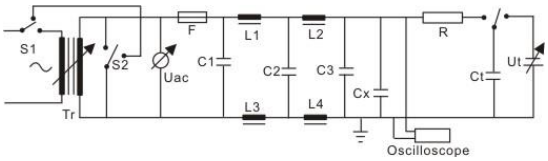
Item		Specification	Testing Method
Soldering Effect (Non -Preheat)	Appearance	No marked defect	As shown in figure, the lead wires should be immersed in solder of 260±5°C up to 1.5 to 2.0mm from the root of terminal for 3.5±0.5 sec. Pre-treatment： Capacitor should be stored at 85±2°C for 1 hr., and then placed at room condition for 24±2 hrs. before initial measurements. Post-treatment： Capacitor should be stored for 1 to 2 hrs. at room condition.
	Capacitance Change	Within ±10%.	
	I.R.	≥1000MΩ。	
	Dielectric Strength	Per Item 6	
Soldering Effect (On -Preheat)	Appearance	No marked defect	First the capacitor should be stored at 120+0/-5°C for60+0/-5 sec. Then, as in figure (see Item 9), the lead wires should be immersed solder of 260+0/-5°C up to 1.5 to 2.0mm from the root of terminal for 7.5+0/-1 sec. Pre-treatment and Post-treatment see Per Item 9.
	Capacitance Change	Within ±10%	
	I.R.	≥ 1000MΩ	
	Dielectric Strength	Per Item 6	
Vibration Resistance	Appearance	No marked defect	The capacitor should be firmly soldered to the supporting lead wire and vibrated at a frequency range of 10 to 55Hz, 1.5mm in total amplitude, with about a 1 minute rate of vibration change from 10Hz to 55Hz and back to 10Hz.Apply for a total of 6 hrs., 2 hrs each in 3 mutually perpendicular directions.
	Capacitance	Within the specified tolerance	
	D.F.	B(Y5P), E(Y5U),F(Y5V)： D.F.≤2.5%	
Humidity (Under Steady State)	Appearance	No marked defect	Set the capacitor for 500±12 hrs. at 40±2°C in 90 to 95% relative humidity. Post-treatment： Capacitor should be stored for 1 to 2 hrs. at room condition.
	Capacitance Change	B(Y5P), E(Y5U)，F(Y5V)： ≤ ±15%。	
	I.R.	>3000MΩ。	
	Dielectric Strength	Per Item 6	



<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="4">Humidity Loading</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">Apply the rated voltage for 500±12 hrs. at 40±2°C in 90 to 95% relative humidity.
Post-treatment：
Capacitor should be stored for 1 to 2 hrs. at room condition.</td></tr>
<tr><td>Capacitance Change</td><td>B(Y5P), E(Y5U)、F(Y5V)：
≤ ±15%</td></tr>
<tr><td>I.R.</td><td>>3000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6</td></tr>
<tr><td rowspan="4">Life Test</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">Impulse Voltage：
Each individual capacitor should be subjected to a 5kV (Type X1Y1: 8kVDC) impulses for three times. After the capacitors are applied to life test.
 

Apply a voltage of Table 4 for 1000 hrs. at 125+2/-0°C, and relative humidity of 50% max.
< Table 4>
<table><tr><th>Applied Voltage</th></tr><tr><td>AC425V(r.m.s.), except that once each hour the voltage is increased to AC1000V(r.m.s.) for 0.1 sec.</td></tr></table>
Post-treatment：
Capacitor should be stored for 1 to 2 hrs.
at room condition.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±20%</td></tr>
<tr><td>I.R.</td><td>>3000MΩ。</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6</td></tr>
<tr><td colspan="2">Flame Test</td><td>The capacitor flame discontinues as follows.
<table><tr><th>Cycle</th><th>Time (sec.)</th></tr><tr><td>1～4</td><td>30</td></tr><tr><td>5</td><td>60</td></tr></table></td><td>The capacitor should be subjected to applied flame for 15 sec. and then removed for 15 sec. until 5 cycles are completed.
 
</td></tr>
</table>

<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="2">Robustness of Terminations</td><td>Tensile</td><td rowspan="2">Lead wire should not be cut off. Capacitor should not be broken.</td><td>As shown in the figure at right, fix the body of the capacitor and apply a tensile weight gradually to each lead wire in the radial direction of the capacitor up to 10N and keep it for 10±1 sec.
 
</td></tr>
<tr><td>Bending</td><td>Each lead wire should be subjected to 5N weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then apply a 90° bend in the opposite direction at the rate of one bend in 2 to 3 sec.</td></tr>
<tr><td rowspan="5">Temperature rapid change</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">The capacitor should be subjected to 5 temperature cycles, then consecutively to 2 immersion cycles.
Temperature Cycle
<table><tr><th>Step</th><th>Temperature (℃)</th><th>Time (min)</th></tr><tr><td>1</td><td>-25+0/-3</td><td>30</td></tr><tr><td>2</td><td>Room temp.</td><td>3</td></tr><tr><td>3</td><td>125+3/-0</td><td>30</td></tr><tr><td>4</td><td>Room temp.</td><td>3</td></tr></table>[Pre-treatment]:
Capacitor should be stored at 85±2°C for 1 hr., then placed at room condition for 24±2 hrs.
[Post-treatment]:
Capacitor should be stored for 24±2 hrs. at room condition.</td></tr>
<tr><td>Capacitance Change</td><td>B(Y5P), E(Y5U)：±20%
F(Y5V)：±30%。</td></tr>
<tr><td>D.F.</td><td>B(Y5P), E(Y5U)：D.F.≤ 5.0%
F(Y5V)：D.F.≤ 7.5%。</td></tr>
<tr><td>I.R.</td><td>>3000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6</td></tr>
</table>

Item	Specification	Testing Method
Active Flammability	The cheese-cloth should not be on fire.	The capacitor should be individually wrapped in at least one but not more than two complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 sec. The UAC should be maintained for 2 min. after the last discharge.  C1, 2:1UF±10%。 C3:0.033UF±5%，10KV。 Ct:3UF±5% 10KV。 Cx: Capacitor under test。 F: Fuse, Rated 10A R:100Ω±5%。 Ur: Rated Voltage Ut: Voltage applied to Ct L1 to 4: 15mH±20% 16A Rod core choke