

## AC Line Rated Ceramic Disc Capacitors Class X1, 760 V<sub>AC</sub>, Class Y1, 500 V<sub>AC</sub>



QUICK REFERENCE DATA				
DESCRIPTION	VALUE			
Ceramic Class	1		2	
Ceramic Dielectric	U2J	U2J	Y5S, Y5U	Y5S, Y5U
Voltage (V <sub>AC</sub> )	500	760	500	760
Min. Capacitance (pF)	10		33	
Max. Capacitance (pF)	22		4700	
Mounting	Radial			

### OPERATING TEMPERATURE RANGE

-40 °C to +125 °C

### TEMPERATURE CHARACTERISTICS

Class 1: N750 (U2J)

Class 2: Y5S, Y5U

### SECTIONAL SPECIFICATIONS

Climatic category (according to EN 60058-1)

Class 1 and class 2: 40/125/21

### COATING

According to UL 94 V-0

Epoxy resin, isolating, flame retardant

Halogen-free available

### APPROVALS

IEC 60384-14.3

UL 60384-14

DIN EN 60384-14

CSA E60384-1:03, CSA E60384-14:09

CQC11-471112-2009

### PACKAGING

Bulk, tape and reel, taped ammpack

### FEATURES

- Complying with IEC 60384-14 3<sup>rd</sup> edition
- High reliability
- Vertical (inline) kinked or straight leads
- Singlelayer AC disc safety capacitors
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- X1, Y1 according to IEC 60384-14.3
- Across-the-line
- Line by-pass
- Antenna coupling

### DESIGN

The capacitor consists of a ceramic disc which is silver plated on both sides. Connection leads are made of tinned copper clad steel having a diameter of 0.6 mm.

The capacitors may be supplied with vertical (inline) kinked leads having a lead spacing of 10.0 mm, or 12.5 mm. Encapsulation is made of flame retardant epoxy resin in accordance with UL 94 V-0.

### CAPACITANCE RANGE

10 pF to 4700 pF

### RATED VOLTAGE U<sub>R</sub>

IEC 60384-14.3:

(X1): 760 V<sub>AC</sub>, 50 Hz

(Y1): 500 V<sub>AC</sub>, 50 Hz

### TEST VOLTAGE

Component test (100 %):

4000 V<sub>AC</sub>, 50 Hz, 2 s

Random sampling test (destructive test):

4000 V<sub>AC</sub>, 50 Hz, 60 s

Voltage proof of coating (destructive test):

4000 V<sub>AC</sub>, 50 Hz, 60 s

### INSULATION RESISTANCE

≥ 10 000 MΩ

### CAPACITANCE TOLERANCE

± 20 % (code M); ± 10 % (code K)

### DISSIPATION FACTOR

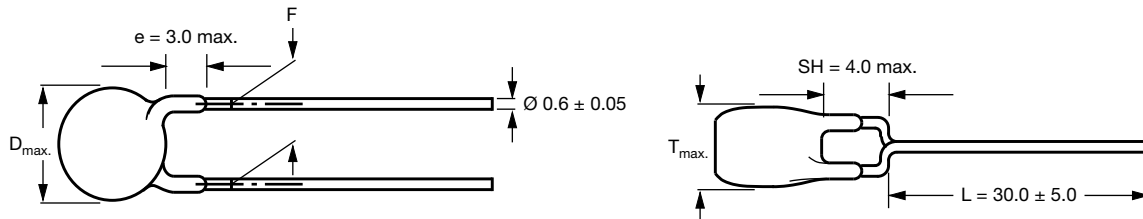
Class 1: max. 0.5 % (1 MHz)

Class 2: max. 2.5 % (1 kHz)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

**GREEN**  
(5-2008)  
Available

**DIMENSIONS** in millimeters


Capacitors with 10.0 mm or 12.5 mm lead spacing

**TECHNICAL DATA**

CAPACITANCE C (pF)	CAPACITANCE TOLERANCE (%)	BODY DIAMETER D <sub>max.</sub> (mm)	BODY THICKNESS T <sub>max.</sub> (mm)	LEAD SPACING F (mm) ± 1 mm	PART NUMBER	
					MISSING DIGITS SEE ORDERING CODE BELOW	
					RoHS COMPLIANT	RoHS AND HALOGEN-FREE
<b>U2J (N750)</b>						
10	± 10	8.0	5.0	10.0 or 12.5	VY1100K31U2JQ6###	VY1100K31U2JG6###
15					VY1150K31U2JQ6###	VY1150K31U2JG6###
22					VY1220K31U2JQ6###	VY1220K31U2JG6###
<b>Y5S (2C3)</b>						
33	± 10	8.0	5.0	10.0 or 12.5	VY1330K31Y5SQ6###	VY1330K31Y5SG6###
47					VY1470K31Y5SQ6###	VY1470K31Y5SG6###
68					VY1680K31Y5SQ6###	VY1680K31Y5SG6###
100					VY1101K31Y5SQ6###	VY1101K31Y5SG6###
150					VY1151K31Y5SQ6###	VY1151K31Y5SG6###
220					VY1221K31Y5SQ6###	VY1221K31Y5SG6###
330	VY1331K31Y5SQ6###	VY1331K31Y5SG6###				
<b>Y5U (2E3)</b>						
470	± 20 <sup>(1)</sup>	8.0	5.0	10.0 or 12.5	VY1471#31Y5UQ6###	VY1471#31Y5UG6###
680		9.0			VY1681#31Y5UQ6###	VY1681#31Y5UG6###
1000		10.5			VY1102#35Y5UQ6###	VY1102#35Y5UG6###
1500		12.0			VY1152#41Y5UQ6###	VY1152#41Y5UG6###
2200		15.0			VY1222#47Y5UQ6###	VY1222#47Y5UG6###
3300		15.5			VY1332#59Y5UQ6###	VY1332#59Y5UG6###
3900		16.0			VY1392#61Y5UQ6###	VY1392#61Y5UG6###
4700		VY1472#63Y5UQ6###			VY1472#63Y5UG6###	

**Notes**

- Straight leads available on request
  - Coating extension DR valid for straight leads only
- <sup>(1)</sup> ± 10 % available on request

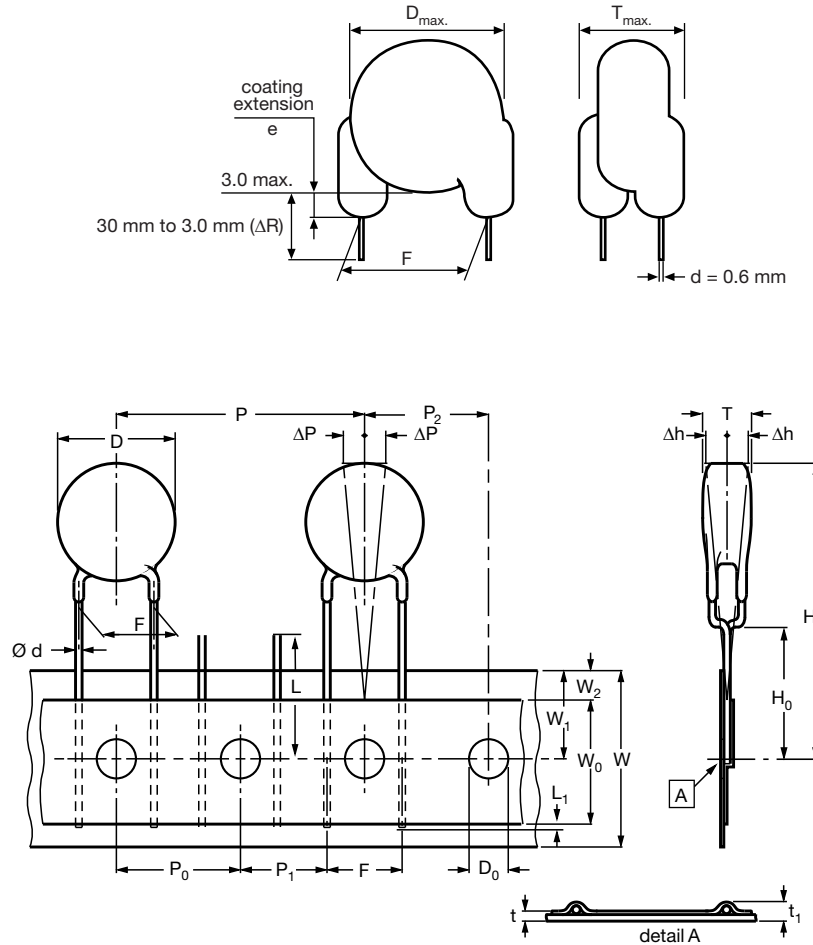
**ORDERING CODE**

#	7 <sup>th</sup> digit	Capacitance tolerance	± 10 % = K, ± 20 % = M							
###	15 <sup>th</sup> to 17 <sup>th</sup> digit	Lead configuration	Available configurations see below							
<b>Example</b>	<b>VY1</b>	<b>101</b>	<b>K</b>	<b>31</b>	<b>Y5S</b>	<b>Q</b>	<b>6</b>	<b>T</b>	<b>V</b>	<b>0</b>
	Series	Capacitance value	Tolerance code	Size code	Temperature coefficient	Rated voltage	Lead wire diameter	Packaging / lead length	Lead style	Lead spacing
						Q = X1/Y1 500 V (AC)		3 = bulk T = tape and reel U = ammopack	L = straight V = inline kinked	0 = 10.0 X = 12.5
						G = X1/Y1 500 V (AC) halogen-free				

PACKAGING					
CAPACITANCE VALUE	SIZE CODE	BODY DIAMETER $D_{max.}$ (mm)	PACKAGING QUANTITIES		
			BULK	REEL	AMMO
10 pF to 2700 pF	31 to 47	12.0	1000	500	750
3300 pF to 4700 pF	51 to 63	16.0	500	500	750

**Note**

- The capacitors are supplied in bulk packaging (cardboard boxes), in tape on reel or in ammopack

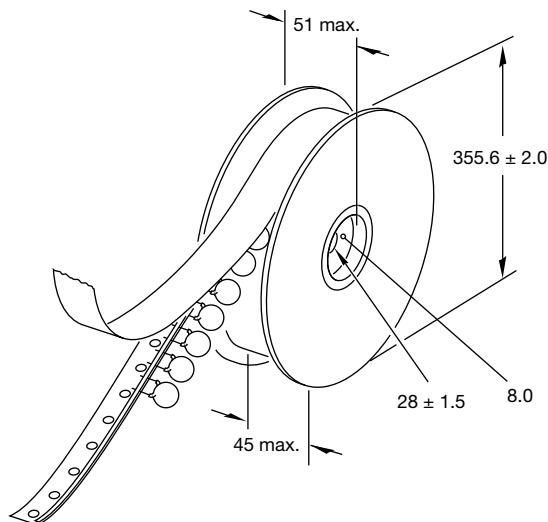
**STRAIGHT LEADS**


The sprocket hole pitch ( $P_0$ ) is 12.7 mm for lead spacing 10.0 mm and 12.5 mm

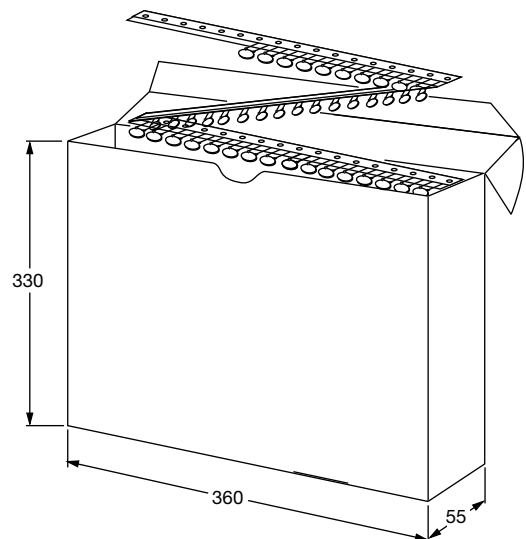
DIMENSIONS OF TAPE		
SYMBOL	PARAMETER	DIMENSIONS (mm)
D <sup>(1)</sup>	Body diameter	16.0 max.
d	Lead diameter	0.6 ± 0.05
P	Pitch of component	25.4 ± 1
P <sub>0</sub> <sup>(2)</sup>	Pitch of sprocket hole	12.7 ± 0.3
P <sub>1</sub> <sup>(3)</sup>	Distance, hole center to lead	7.7 or 6.4 ± 1.0
P <sub>2</sub> <sup>(3)</sup>	Distance, hole to center of component	12.7 ± 1.5
F	Lead spacing	10.0 or 12.5 + 0.6/- 0.4
Δh	Average deviation across tape	± 1.0 max.
ΔP	Average deviation in direction of reeling	± 1.0 max.
W	Carrier tape width	18.0 + 1/- 0.5
W <sub>0</sub>	Hold-down tape width	5.0 min.
W <sub>1</sub>	Position of sprocket hole	9.0 + 0.75/- 0.5
W <sub>2</sub>	Distance of hold-down tape	3.0 max.
H <sub>1</sub>	Maximum component height	40.0
H <sub>0</sub>	Height to seating plane (for kinked leads)	16.0 ± 0.5
H <sub>0</sub>	Height to seating plane (for straight leads)	20.0 ± 0.5
L	Length of cut leads	11.0 max.
L <sub>1</sub>	Length of lead protrusion	1.0 max.
D <sub>0</sub>	Diameter of sprocket hole	4.0 ± 0.2
t	Total tape thickness	0.9 max.
t <sub>1</sub>	Total tape thickness with lead wire	t + d

**Notes**

- (1) See "Technical Data" table
- (2) Cumulative pitch error: ± 1 mm/20 pitches
- (3) Obliquity maximum 3°

**REEL AND TAPE DATA** in millimeters


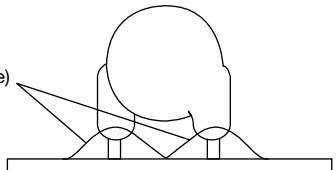
Reel with capacitors on tape



Ammpack with capacitors on tape

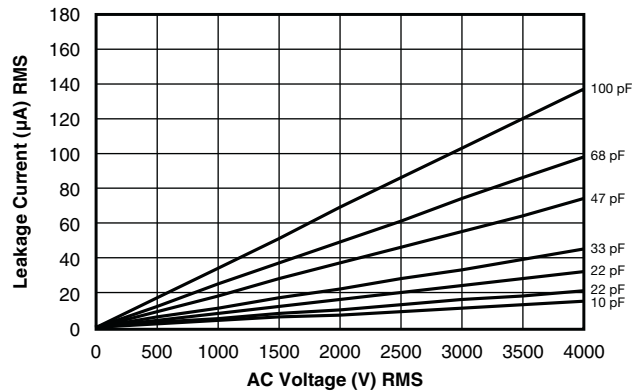
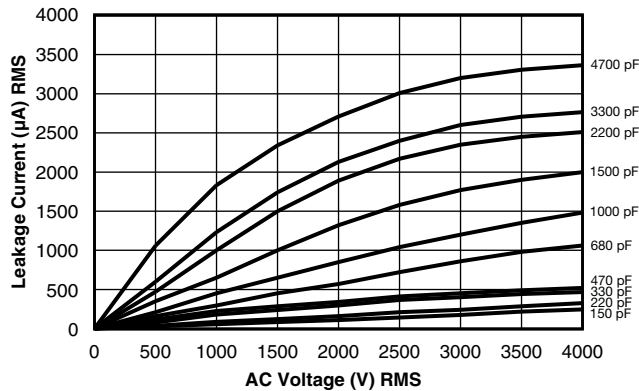
APPROVALS				
IEC 60384-14.3 - Safety tests This approval together with CB test certificate substitutes all national approvals.				
<b>CB Certificate</b>				
Y1-capacitor: CB test certificate:	US-19600-UL	10 pF to 4.7 nF	500 V <sub>AC</sub>	
X1-capacitor: CB test certificate:	US-19600-UL	10 pF to 4.7 nF	760 V <sub>AC</sub>	
<b>VDE</b>				
Y1-capacitor: VDE marks approval:	40012673	10 pF to 4.7 nF	500 V <sub>AC</sub>	
X1-capacitor: VDE marks approval:	40012673	10 pF to 4.7 nF	760 V <sub>AC</sub>	
DIN EN 60384-14 VDE 0565-1-1:2006-04 - Safety tests				
<b>Underwriters Laboratories Inc./Canadian Standards Association</b>				
Y1-capacitor: CSA test certificate:	E183844	10 pF to 4.7 nF	500 V <sub>AC</sub>	
X1-capacitor: CSA test certificate:	E183844	10 pF to 4.7 nF	760 V <sub>AC</sub>	
UL 60384-14, CSA E60384-1:03, CSA E60384-14:09 Fixed capacitors for electromagnetic interference suppression and connection to the supply mains.				
<b>CQC</b>				
Y1-capacitor: CQC test certificate:	CQC05001015032	10 pF to 4.7 nF	500 V <sub>AC</sub>	
X1-capacitor: CQC test certificate:	CQC05001015032	10 pF to 4.7 nF	760 V <sub>AC</sub>	

MARKING	
<p>Sample (2 sides)</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>4 digit date code (year/week; add suffix "C" for down size series)</p> </div> <div style="text-align: center;"> </div> </div>	<div style="text-align: center;"> </div> <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="font-size: small;">                 PN: VY1471M31Y5UQ6XT0                  QTY: 225                  PO:                  SO:             </div> <div style="font-size: small;">                 Lot1: 14Z551S12                  Lot2:                  Batch: 200601CN                  Region: 9520                  Ser.No: 0601H69340             </div> <div style="font-size: small; text-align: right;">                 DC1: 0601                  DC2:                  SL: 0010             </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 10px;"> <div style="font-size: x-small;"> </div> <div style="font-size: x-small; text-align: right;">1/1</div> </div>

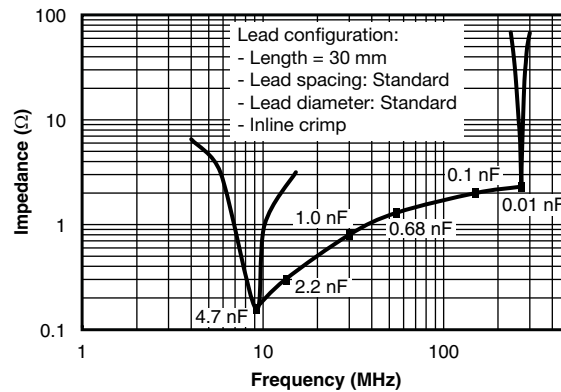
<b>PERFORMANCE</b>		
<b>TEST</b>	<b>TEST CONDITION</b>	<b>TEST LIMITS</b>
Visual and mechanical inspection	Optical inspection, dimensions measured with caliper	No visible damage, marking legible
Capacitance (C)	25 °C ± 3 °C , relative humidity (RH) ≤ 75 % , 1.0 V <sub>RMS</sub> ± 0.2 V <sub>RMS</sub> at 1 kHz for Y5U and Y5S, and 1 MHz for U2J	Capacitance within specified tolerance
Dissipation factor (DF)		DF ≤ 0.3 % for U2J and DF ≤ 2.5 % for Y5S and Y5U
Insulation resistance (IR)	Measured within 60 s ± 5 s after charging at 500 V <sub>DC</sub>	10 000 MΩ min.
Dielectric strength	4000 V <sub>AC</sub> at 50 Hz/60 Hz for 1 min, 50 mA max.	No failure
Temperature characteristic	RH ≤ 75 % , 1.0 V <sub>RMS</sub> ± 0.2 V <sub>RMS</sub> at 1 kHz for Y5U and Y5S, and 1 MHz for U2J	U2J: -750 ppm ± 120 ppm Y5S: ± 22 % Y5U: +22 %/-56 %
Impulse voltage	3 pulses of 8 kV	No failure
Life test	1000 h at 125 °C ± 2 °C, 850 V <sub>AC</sub> /50 Hz; once every hour 1000 V <sub>AC</sub> for 0.1 s	External appearance: no visible damage ΔC/C ≤ ± 15 % DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S and Y5U IR ≥ 3000 MΩ Dielectric strength: no failure
Humidity test	500 h at 500 V <sub>AC</sub> , 50 Hz and 500 h unloaded 40 °C, RH = 90 % to 95%	External appearance: no visible damage ΔC/C ≤ ± 10 % for U2J and ≤ ± 15 % for Y5S and Y5U DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S and Y5U IR ≥ 3000 MΩ Dielectric strength: no failure
Robustness of termination	Pull test: 0.5 kg tensile weight in radial direction for 10 s ± 1 s Bending strength: capacitor body rotated by 90° in both directions	No damage to capacitor body and lead wire
Soldering effect	Immersion of lead wires into 260 °C ± 5 °C solder for 10 s ± 2 s; min. distance from body: 1.5 mm Hand soldering at 400 °C ± 10 °C for 3 s to 4 s; min. distance from body: 1.5 mm	External appearance: no visible damage ΔC/C ≤ ± 5 % for U2J and ≤ ± 10 % for Y5S and Y5U Dielectric strength: no failure
Vibration test	 <p>Solder the capacitor onto test jig (glass epoxy body) and use resin (adhesive) to stick the body to the test jig. The capacitor must be soldered firmly to the supporting lead wire. Vibration change from 10 Hz to 2000 Hz and back to 10 Hz; Total amplitude: 1.5 mm; Acceleration: 100 m/s<sup>2</sup>; Sweep rate: 1 oct/min, each axis 2 h (6 h in total)</p>	External appearance: no visible damage Capacitance within specified tolerance DF ≤ 0.3 % for U2J and ≤ 2.5 % for Y5S and Y5U IR ≥ 10 000 GΩ



LEAKAGE CURRENT VS. VOLTAGE (Typical)



IMPEDANCE VS. FREQUENCY (Typical)



Note

- The capacitors meet the essential requirements of "EIA 198". Unless stated otherwise all electrical values apply at an ambient temperature of 25 °C ± 3 °C, at normal atmospheric conditions.

RELATED DOCUMENTS	
General Information	<a href="http://www.vishay.com/doc?28536">www.vishay.com/doc?28536</a>
CB Test Certificate	<a href="http://www.vishay.com/doc?22249">www.vishay.com/doc?22249</a>
VDE Marks Approval	<a href="http://www.vishay.com/doc?22251">www.vishay.com/doc?22251</a>
UL Test Certificate	<a href="http://www.vishay.com/doc?22250">www.vishay.com/doc?22250</a>
CQC Test Certificate	<a href="http://www.vishay.com/doc?22248">www.vishay.com/doc?22248</a>

SAMPLE KIT	
Part Number	VY11-KIT-HF
Link	<a href="http://www.vishay.com/doc?28552">www.vishay.com/doc?28552</a>



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