

## AC Line Rated Ceramic Disc Capacitors Class X1, 440 V<sub>AC</sub>, Class Y2, 300 V<sub>AC</sub>



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### FEATURES

- Complying with IEC 60384-14 4<sup>th</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, Y2 according to IEC 60384-14.4
- 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 having a diameter of 0.6 mm.

The capacitors may be supplied with vertical (inline) kinked leads having a lead spacing of 5.0 mm, 7.5 mm, 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 0.01 μF

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

IEC 60384-14 and UL60384-14:

(X1): 440 V<sub>AC</sub>, 50 Hz

(Y2): 300 V<sub>AC</sub>, 50 Hz

1000 V<sub>DC</sub>

### TEST VOLTAGE

Component test (100 %):

2600 V<sub>AC</sub>, 50 Hz, 2 s

(2600 V<sub>AC</sub> for LS 7.5 mm and above)

(2200 V<sub>AC</sub> for LS 5.0 mm)

Random sampling test (destructive test):

2600 V<sub>AC</sub>, 50 Hz, 60 s

Voltage proof of coating (destructive test):

2600 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)

QUICK REFERENCE DATA				
DESCRIPTION	VALUE			
Ceramic Class	1		2	
Ceramic Dielectric	N750		Y5S, Y5U, Y5V	
Voltage (V <sub>AC</sub> )	300	440	300	440
Min. Capacitance (pF)	10		68	
Max. Capacitance (pF)	47		10 000	
Mounting	Radial			

### OPERATING TEMPERATURE RANGE

-40 °C to +125 °C

### TEMPERATURE CHARACTERISTICS

Class 1: N750 (U2J)

Class 2: Y5S, Y5U, Y5V

### 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

### APPROVALS

IEC 60384-14.4

UL 60384-14

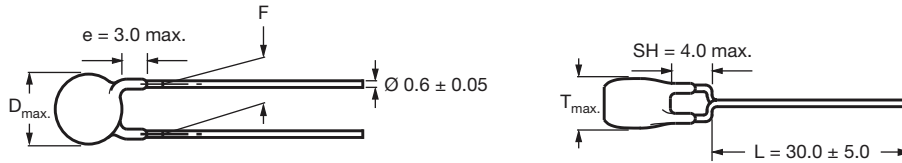
DIN EN 60384-14

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

CQC11-471112

### PACKAGING

Bulk, tape and reel, taped ammpack

**DIMENSIONS** in millimeters

 Capacitors with 5.0 mm, 7.5 mm, 10 mm, or 12.5 mm lead spacing.  
 Coating extension  $e$  valid for straight leads only.

**TECHNICAL DATA**

CAPACITANCE C (pF)	CAPACITANCE TOLERANCE (%)	BODY DIAMETER $D_{max.}$ (mm)	BODY THICKNESS $T_{max.}$ (mm)	LEAD SPACING <sup>(1)</sup> F (mm) $\pm 1$ mm	PART NUMBER				
					MISSING DIGITS SEE ORDERING CODE BELOW				
<b>U2J (N750)</b>									
10	$\pm 10$	7.5	5.0	5.0, 7.5, 10.0, or 12.5	VY2100K29U2JS6###				
15					VY2150K29U2JS6###				
22					VY2220K29U2JS6###				
33					VY2330K29U2JS6###				
47					VY2470K29U2JS6###				
<b>Y5S (2C3)</b>									
68	$\pm 10$	7.5	5.0	5.0, 7.5, 10.0, or 12.5	VY2680K29Y5SS6###				
100					VY2101K29Y5SS6###				
150					VY2151K29Y5SS6###				
220					VY2221K29Y5SS6###				
330					VY2331K29Y5SS6###				
470					VY2471K29Y5SS6###				
<b>Y5U (2E3)</b>									
680	$\pm 20$	7.5	5.0	5.0, 7.5, 10.0, or 12.5	VY2681M29Y5US6###				
1000					VY2102M29Y5US6###				
1500					VY2152M31Y5US6###				
2200					VY2222M35Y5US6###				
3300					VY2332M41Y5US6###				
3900					VY2392M43Y5US6###				
4700		VY2472M49Y5US6###							
6800		7.5, 10.0, or 12.5	14.5	5.0	7.5, 10.0, or 12.5	VY2682M59Y5US63##			
10 000						VY2103M63Y5US63##			
<b>Y5V (2F3) MINI SIZE SERIES</b>									
1000	$\pm 20$					7.5	5.0	5.0, 7.5, 10.0, or 12.5	VY2102M29Y5VS6###
1500		7.5	VY2152M29Y5VS6###						
2200		8.0	VY2222M31Y5VS6###						
3300		9.0	VY2332M35Y5VS6###						
3900		10.0	VY2392M39Y5VS6###						
4700		10.5	VY2472M41Y5VS6###						
6800		12.0	VY2682M47Y5VS6###						
10 000		15.0	VY2103M59Y5VS6###						

**Note**
<sup>(1)</sup> Straight leads are available on request

ORDERING CODE										
###	15 <sup>th</sup> to 17 <sup>th</sup> digit			Lead configuration			Available configurations see below			
<b>Example</b>	<b>VY2</b>	<b>221</b>	<b>K</b>	<b>29</b>	<b>Y5S</b>	<b>S</b>	<b>6</b>	<b>U</b>	<b>V</b>	<b>7</b>
	Series	Capacitance value	Tolerance code	Size code	Temperature coefficient	Rated voltage	Lead wire diameter	Packaging / lead length	Lead style	Lead spacing
						S = X1/Y2 300 V (AC)		3 = bulk T = tape and reel U = ammopack	L = straight V = inline kinked	5 = 5.0 7 = 7.5 0 = 10.0 X = 12.5

**LEADSPACING 5.0 mm AND 7.5 mm**

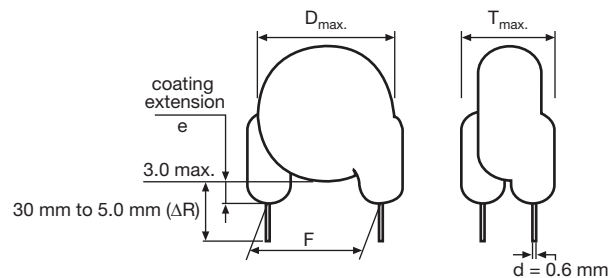
PACKAGING				
SIZE CODE	BODY DIAMETER $D_{max.}$ (mm)	PACKAGING QUANTITIES		
		BULK	REEL	AMMO
29 to 49	12.5	1000	1000	1000
59 to 63	16.0	500	-	-

**LEADSPACING 10.0 mm AND 12.5 mm**

PACKAGING					
CAPACITANCE VALUE	SIZE CODE	BODY DIAMETER $D_{max.}$ (mm)	PACKAGING QUANTITIES		
			BULK	REEL	AMMO
10 pF to 4700 pF	29 to 49	12.5	1000	500	750
6800 pF to 0.01 $\mu$ F	59 to 63	16.0	500	500	750

**Note**

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

**STRAIGHT LEADS**


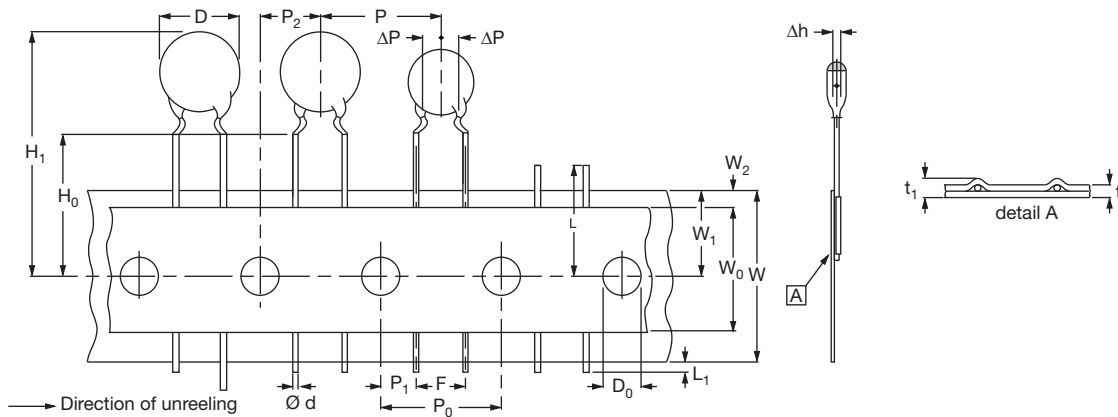


Fig. 1 - Kinked capacitors on tape, lead spacing 5.0 mm (0.2") and 7.5 mm (0.3")

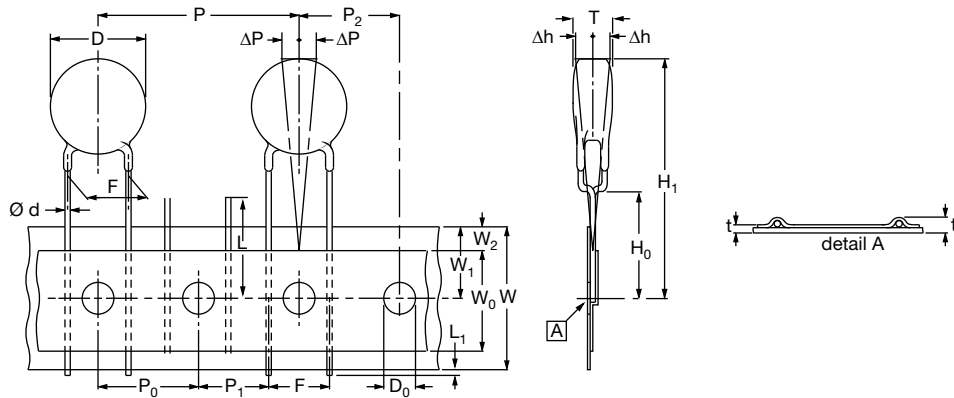
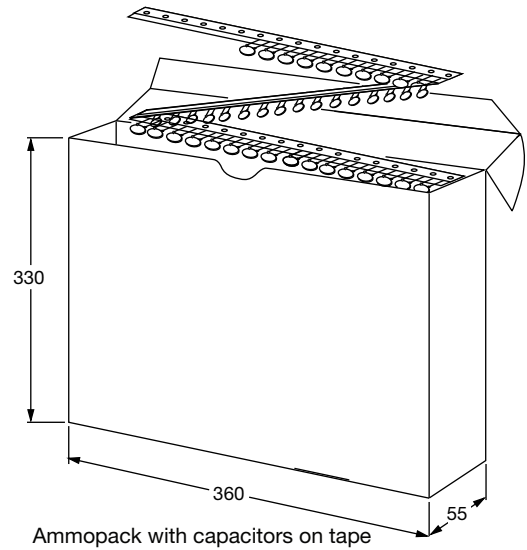
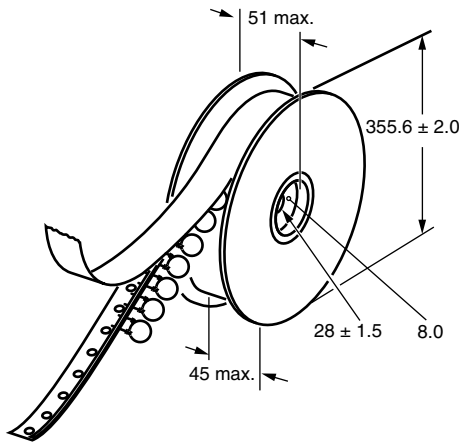


Fig. 2 - Inline kink (V) leaded capacitors on tape, lead spacing 10 mm (0.40")

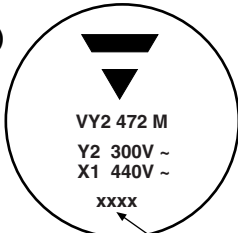
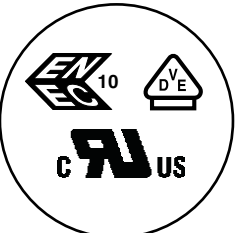



DIMENSION OF TAPE				
SYMBOL	PARAMETER	DIMENSIONS (mm)		
		FIG. 1 (5 mm)	FIG. 1 (7.5 mm)	FIG. 2 (10 mm)
D <sup>(1)</sup>	Body diameter	11.0 max.	14.0 max.	16.0 max.
d	Lead diameter	0.6 ± 0.05	0.6 ± 0.05	0.6 ± 0.05
P	Pitch of component	12.7 ± 1	15.0 ± 1	25.4 ± 1
P <sub>0</sub> <sup>(2)</sup>	Pitch of sprocket hole	12.7 ± 0.3	15.0 ± 0.3	12.7 ± 0.3
P <sub>1</sub> <sup>(3)</sup>	Distance, hole center to lead	3.85 ± 0.7	3.75 ± 0.7	7.7 ± 1.0
P <sub>2</sub> <sup>(3)</sup>	Distance, hole to center of component	6.35 ± 1.3	7.5 ± 1.5	12.7 ± 1.5
F	Lead spacing	5.0 (+ 0.6/- 0.4)	7.5 (+ 0.6/- 0.4)	10.0 (+ 0.6/- 0.4)
Δh	Average deviation across tape	± 1.0 max.	± 1.0 max.	± 1.0 max.
ΔP	Average deviation in direction of reeling	± 1.0 max.	± 1.0 max.	± 1.0 max.
W	Carrier tape width	18.0 + 1/- 0.5	18.0 + 1/- 0.5	18.0 + 1/- 0.5
W <sub>0</sub>	Hold-down tape width	5.0 min.	5.0 min.	5.0 min.
W <sub>1</sub>	Position of sprocket hole	9.0 + 0.75/- 0.5	9.0 + 0.75/- 0.5	9.0 + 0.75/- 0.5
W <sub>2</sub>	Distance of hold-down tape	3.0 max.	3.0 max.	3.0 max.
H <sub>1</sub>	Maximum component height	32	40	40
H <sub>0</sub>	Height to seating plane (for kinked leads)	16.0 ± 0.5	16.0 ± 0.5	16.0 ± 0.5
H <sub>0</sub>	Height to seating plane (for straight leads)	20.0 ± 0.5	20.0 ± 0.5	20.0 ± 0.5
L	Length of cut leads	11.0 max.	11.0 max.	11.0 max.
L <sub>1</sub>	Length of lead protrusion	1.0 max.	1.0 max.	1.0 max.
D <sub>0</sub>	Diameter of sprocket hole	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2
t	Total tape thickness	0.9 max.	0.9 max.	0.9 max.
t <sub>1</sub>	Maximum thickness of tape and wires	1.5 max.	1.5 max.	1.5 max.

**Notes**

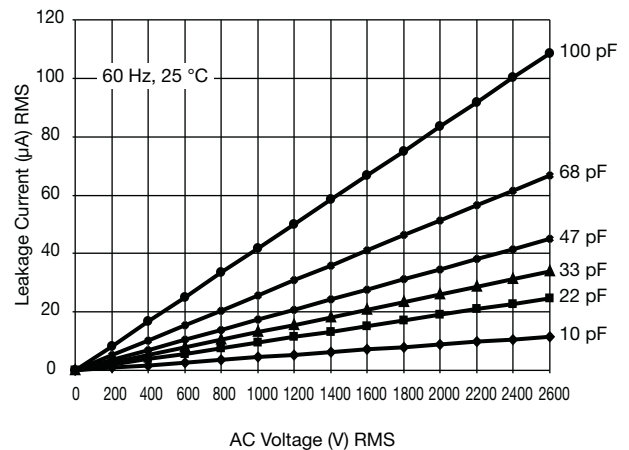
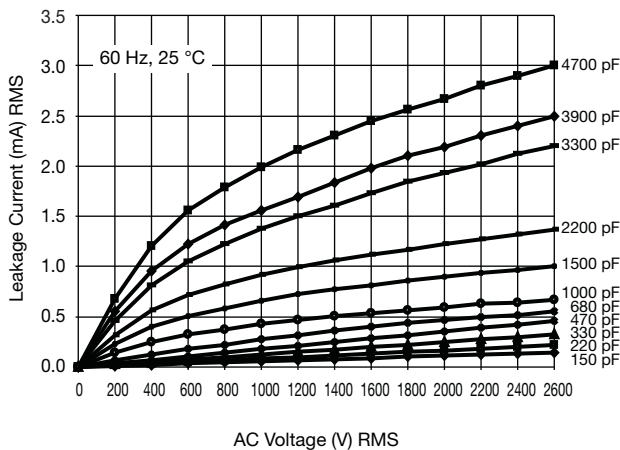
- (1) See "Technical Data" table
- (2) Cumulative pitch error: ± 1 mm/20 pitches
- (3) Obliquity maximum 3°

**REEL AND TAPE DATA** in millimeters


<b>APPROVALS</b>				
IEC 60384-14.4 - Safety tests This approval together with CB test certificate substitutes all national approvals.				
<b>CB Certificate</b>				
Y2-capacitor: CB test certificate:	US-26163-UL	10 pF to 10 nF	300 V <sub>AC</sub>	
X1-capacitor: CB test certificate:	US-26163-UL	10 pF to 10 nF	440 V <sub>AC</sub>	
<b>VDE</b>				
Y2-capacitor: VDE marks approval:	40009669	10 pF to 10 nF	300 V <sub>AC</sub>	
X1-capacitor: VDE marks approval:	40009669	10 pF to 10 nF	440 V <sub>AC</sub>	
DIN EN 60384-14 VDE 0565-1-1:2006-04 - Safety tests				
<b>Underwriters Laboratories Inc. / Canadian Standards Association</b>				
Y2-capacitor: UL-test certificate:	E183844	10 pF to 10 nF	300 V <sub>AC</sub>	
X1-capacitor: UL-test certificate:	E183844	10 pF to 10 nF	440 V <sub>AC</sub>	
UL 60384-14.1, CSA E60384-1:03 2 <sup>nd</sup> edition, CSA E60384-14:09 2 <sup>nd</sup> edition Across-the-line, antenna-coupling, and line-by-pass component				
<b>CQC</b>				
Y2-capacitor: CQC test certificate:	CQC05001012316	10 pF to 10 nF	300 V <sub>AC</sub>	
X1-capacitor: CQC test certificate:	CQC05001012316	10 pF to 10 nF	440 V <sub>AC</sub>	

<b>MARKING</b>	
<p><b>Sample (2 sides)</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Front</p> </div> <div style="text-align: center;">  <p>Back</p> </div> </div> <p style="text-align: center; margin-top: 10px;">4 digit date code (year/week; add suffix "V" for mini size series)</p>	<div style="text-align: center;">   </div> <p>PN: VY2331K29Y5SS6UV7    Lot1: 14Z549306    DC1: 0601            QTY: 1000    Lot2:    DC2:            PO:    Batch: 200601CN            SO:    Region: 9520    SL: 0010            Ser.No: 0601H72383</p> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 10px;">  <span>2/5</span> </div>

**LEAKAGE CURRENT VS. VOLTAGE (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.

<b>RELATED DOCUMENTS</b>	
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?22254">www.vishay.com/doc?22254</a>
VDE Marks Approval	<a href="http://www.vishay.com/doc?22256">www.vishay.com/doc?22256</a>
UL Test Certificate	<a href="http://www.vishay.com/doc?22253">www.vishay.com/doc?22253</a>
CQC Test Certificate	<a href="http://www.vishay.com/doc?22255">www.vishay.com/doc?22255</a>

<b>SAMPLE KITS</b>	
Part Number (VY2 Sample Kit)	VY21-KIT-HF
Link (VY2 Sample Kit)	<a href="http://www.vishay.com/doc?28554">www.vishay.com/doc?28554</a>
Part Number (VY2...Y5V Sample Kit)	VY2-KIT-MS
Link (VY2...Y5V Sample Kit)	<a href="http://www.vishay.com/doc?28562">www.vishay.com/doc?28562</a>



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