AC Line Rated Ceramic Disc Capacitors  
Class X1, 440 VAC, Class Y2, 300 VAC

FEATURES
- Complying with IEC 60384-14 4th 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

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 Ur
IEC 60384-14 and UL60384-14:
(X1): 440 VAC, 50 Hz
(Y2): 300 VAC, 50 Hz
1000 VDC

TEST VOLTAGE
Component test (100 %):
2600 VAC, 50 Hz, 2 s
(2600 VAC for LS 7.5 mm and above)
(2200 VAC for LS 5.0 mm)
Random sampling test (destructive test):
2600 VAC, 50 Hz, 60 s
Voltage proof of coating (destructive test):
2600 VAC, 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

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>VALUE</th>
</tr>
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<tbody>
<tr>
<td>Ceramic Class</td>
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<tr>
<td>Ceramic Dielectric</td>
<td>N750</td>
</tr>
<tr>
<td>Y5S, Y5U, Y5V</td>
<td></td>
</tr>
<tr>
<td>Voltage (VAC)</td>
<td>300</td>
</tr>
<tr>
<td>440</td>
<td></td>
</tr>
<tr>
<td>Min. Capacitance (pF)</td>
<td>10</td>
</tr>
<tr>
<td>68</td>
<td></td>
</tr>
<tr>
<td>Max. Capacitance (pF)</td>
<td>47</td>
</tr>
<tr>
<td>10 000</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Radial</td>
</tr>
</tbody>
</table>

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 ammopack
## DIMENSIONS in millimeters

![Diagram](Diagram)

- $e = 3.0 \text{ max.}$
- $F$
- $D_{\text{max.}}$
- $\phi 0.6 \pm 0.05$
- $SH = 4.0 \text{ max.}$
- $T_{\text{max.}}$
- $L = 30.0 \pm 5.0$

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

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>MISSING DIGITS SEE ORDERING CODE BELOW</th>
</tr>
</thead>
</table>

<p>| CAPACITANCE | CAPACITANCE | BODY DIAMETER | BODY THICKNESS | LEAD SPACING (1) | PART NUMBER |</p>
<table>
<thead>
<tr>
<th>C (pF)</th>
<th>TOLERANCE (%)</th>
<th>$D_{\text{max.}}$ (mm)</th>
<th>$T_{\text{max.}}$ (mm)</th>
<th>$F$ (mm) ± 1 mm</th>
<th></th>
</tr>
</thead>
</table>

### U2J (N750)

- **10** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2100K29U2JS6###
- **15** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2150K29U2JS6###
- **22** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2220K29U2JS6###
- **33** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2330K29U2JS6###
- **47** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2470K29U2JS6###

### Y5S (2C3)

- **68** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2680K29Y5SS6###
- **100** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2101K29Y5SS6###
- **150** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2151K29Y5SS6###
- **220** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2221K29Y5SS6###
- **330** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2331K29Y5SS6###
- **470** ± 10 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2471K29Y5SS6###

### Y5U (2E3)

- **680** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2681M29Y5US6###
- **1000** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2102M29Y5US6###
- **1500** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2152M31Y5US6###
- **2200** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2222M35Y5US6###
- **3300** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2332M41Y5US6###
- **3900** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2392M49Y5US6###
- **4700** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2472M49Y5US6###
- **6800** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2682M59Y5US6###
- **10000** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2103M63Y5US6###

### Y5V (2F3) MINI SIZE SERIES

- **1000** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2102M29Y5VS6###
- **1500** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2152M31Y5VS6###
- **2200** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2222M35Y5VS6###
- **3300** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2332M41Y5VS6###
- **3900** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2392M49Y5VS6###
- **4700** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2472M49Y5VS6###
- **6800** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2682M47Y5VS6###
- **10000** ± 20 7.5 5.0 5.0, 7.5, 10.0, or 12.5  VY2103M59Y5VS6###

### Notes:

- (1) Straight leads are available on request.
### ORDERING CODE

<table>
<thead>
<tr>
<th>Example</th>
<th>VY2</th>
<th>221</th>
<th>K</th>
<th>29</th>
<th>Y5S</th>
<th>S</th>
<th>6</th>
<th>U</th>
<th>V</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>Capacitance value</td>
<td>Tolerance code</td>
<td>Size code</td>
<td>Temperature coefficient</td>
<td>Rated voltage</td>
<td>Lead wire diameter</td>
<td>Packaging/lead length</td>
<td>Lead style</td>
<td>Lead spacing</td>
<td></td>
</tr>
<tr>
<td>S = X1/Y2</td>
<td>300 V (AC)</td>
<td>3 = bulk</td>
<td>L = straight</td>
<td>V = inline</td>
<td>5 = 5.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = tape and reel</td>
<td>U = ammopack</td>
<td>7 = 7.5</td>
<td>0 = 10.0</td>
<td>X = 12.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### LEADSPACING 5.0 mm AND 7.5 mm

#### PACKAGING

<table>
<thead>
<tr>
<th>SIZE CODE</th>
<th>BODY DIAMETER $D_{\text{max}}$ (mm)</th>
<th>PACKAGING QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BULK</td>
</tr>
<tr>
<td>29 to 49</td>
<td>12.5</td>
<td>1000</td>
</tr>
<tr>
<td>59 to 63</td>
<td>16.0</td>
<td>500</td>
</tr>
</tbody>
</table>

### LEADSPACING 10.0 mm AND 12.5 mm

#### PACKAGING

<table>
<thead>
<tr>
<th>CAPACITANCE VALUE</th>
<th>SIZE CODE</th>
<th>BODY DIAMETER $D_{\text{max}}$ (mm)</th>
<th>PACKAGING QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 pF to 4700 pF</td>
<td>29 to 49</td>
<td>12.5</td>
<td>BULK</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>6800 pF to 0.01 μF</td>
<td>59 to 63</td>
<td>16.0</td>
<td>500</td>
</tr>
</tbody>
</table>

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

### STRAIGHT LEADS

- $e$ (coating extension) = 3.0 max.
- $F$ (30 mm to 5.0 mm $\Delta R$)
- $T_{\text{max}}$ (lead wire diameter)
- $d = 0.6$ mm
### VY2 Series

**www.vishay.com Vishay BCcomponents**

**Revision:** 29-Mar-18  
**Document Number:** 28535

For technical questions, contact: **cdc@vishay.com**

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**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")**

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** DIMENSION OF TAPE **

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>DIMENSIONS (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FIG. 1 (5 mm)</td>
<td>FIG. 1 (7.5 mm)</td>
</tr>
<tr>
<td>D</td>
<td>Body diameter</td>
<td>11.0 max.</td>
</tr>
<tr>
<td>d</td>
<td>Lead diameter</td>
<td>0.6 ± 0.05</td>
</tr>
<tr>
<td>P</td>
<td>Pitch of component</td>
<td>12.7 ± 1</td>
</tr>
<tr>
<td>P₀ [2]</td>
<td>Pitch of sprocket hole</td>
<td>12.7 ± 0.3</td>
</tr>
<tr>
<td>P₁ [3]</td>
<td>Distance, hole center to lead</td>
<td>3.85 ± 0.7</td>
</tr>
<tr>
<td>P₂ [3]</td>
<td>Distance, hole to center of component</td>
<td>6.35 ± 1.3</td>
</tr>
<tr>
<td>F</td>
<td>Lead spacing</td>
<td>5.0 (+ 0.6/- 0.4)</td>
</tr>
<tr>
<td>Δh</td>
<td>Average deviation across tape</td>
<td>± 1.0 max.</td>
</tr>
<tr>
<td>ΔP</td>
<td>Average deviation in direction of reeling</td>
<td>± 1.0 max.</td>
</tr>
<tr>
<td>W</td>
<td>Carrier tape width</td>
<td>18.0 +1/- 0.5</td>
</tr>
<tr>
<td>W₀</td>
<td>Hold-down tape width</td>
<td>5.0 min.</td>
</tr>
<tr>
<td>W₁</td>
<td>Position of sprocket hole</td>
<td>9.0 ±0.75/- 0.5</td>
</tr>
<tr>
<td>W₂</td>
<td>Distance of hold-down tape</td>
<td>3.0 max.</td>
</tr>
<tr>
<td>H₁</td>
<td>Maximum component height</td>
<td>32</td>
</tr>
<tr>
<td>H₀</td>
<td>Height to seating plane (for kinked leads)</td>
<td>16.0 ± 0.5</td>
</tr>
<tr>
<td>H₀</td>
<td>Height to seating plane (for straight leads)</td>
<td>20.0 ± 0.5</td>
</tr>
<tr>
<td>L</td>
<td>Length of cut leads</td>
<td>11.0 max.</td>
</tr>
<tr>
<td>L₁</td>
<td>Length of lead protrusion</td>
<td>1.0 max.</td>
</tr>
<tr>
<td>D₀</td>
<td>Diameter of sprocket hole</td>
<td>4.0 ± 0.2</td>
</tr>
<tr>
<td>t</td>
<td>Total tape thickness</td>
<td>0.9 max.</td>
</tr>
<tr>
<td>t₁</td>
<td>Maximum thickness of tape and wires</td>
<td>1.5 max.</td>
</tr>
</tbody>
</table>

**Notes**

1. See “Technical Data” table
2. Cumulative pitch error: ± ≤ 1 mm/20 pitches
3. Obliquity maximum 3°

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For technical questions, contact: **cdc@vishay.com**


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Revision: 29-Mar-18  
4
## APPROVALS

**IEC 60384-14.4 - Safety tests**  
This approval together with CB test certificate substitutes all national approvals.

### CB Certificate

- **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>

### VDE

- **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**

### Underwriters Laboratories Inc. / Canadian Standards Association

- **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

### CQC

- **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>
**LEAKAGE CURRENT VS. VOLTAGE** (Typical)

![Graph showing leakage current vs. voltage](image)

**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**

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
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</table>

**SAMPLE KITS**

<table>
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<tr>
<th>Description</th>
<th>Link</th>
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<tbody>
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<td>Part Number (VY2 Sample Kit)</td>
<td><a href="http://www.vishay.com/doc?28554">VY21-KIT-HF</a></td>
</tr>
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<td>Link (VY2 Sample Kit)</td>
<td><a href="http://www.vishay.com/doc?28554">www.vishay.com/doc?28554</a></td>
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<tr>
<td>Part Number (VY2...YSV Sample Kit)</td>
<td>VY2-KIT-MS</td>
</tr>
<tr>
<td>Link (VY2...YSV Sample Kit)</td>
<td><a href="http://www.vishay.com/doc?28562">www.vishay.com/doc?28562</a></td>
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</table>
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