

## AC Line Rated Ceramic Disc Capacitors

### Class X1, 440 V<sub>AC</sub>, Class Y2, 300 V<sub>AC</sub>



#### ADDITIONAL RESOURCES



| 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

#### 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 tin plated 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 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 UL 60384-14:

(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)

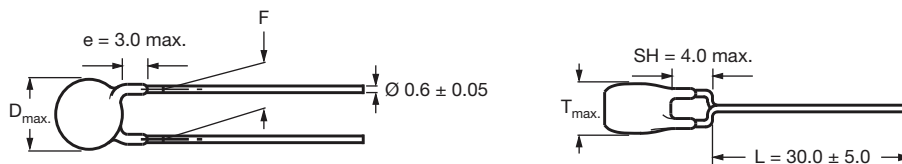
#### DISSIPATION FACTOR

Class 1: max. 0.5 % (1 MHz)

Class 2: max. 2.5 % (1 kHz)



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

**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<br>C (pF)      | CAPACITANCE<br>TOLERANCE<br>(%) | BODY<br>DIAMETER<br>D <sub>max.</sub> (mm) | BODY<br>THICKNESS<br>T <sub>max.</sub> (mm) | LEAD SPACING <sup>(1)</sup><br>F (mm) ± 1 mm | PART NUMBER                               |
|----------------------------|---------------------------------|--------------------------------------------|---------------------------------------------|----------------------------------------------|-------------------------------------------|
|                            |                                 |                                            |                                             |                                              | MISSING DIGITS SEE<br>ORDERING CODE BELOW |
| U2J (N750)                 |                                 |                                            |                                             |                                              |                                           |
| 10                         | ± 10                            | 7.5                                        | 5.0                                         | 5.0, 7.5, 10.0, or 12.5                      | VY2100K29U2JS6###                         |
| 15                         |                                 |                                            |                                             |                                              | VY2150K29U2JS6###                         |
| 22                         |                                 |                                            |                                             |                                              | VY2220K29U2JS6###                         |
| 33                         |                                 |                                            |                                             |                                              | VY2330K29U2JS6###                         |
| 47                         |                                 |                                            |                                             |                                              | VY2470K29U2JS6###                         |
| Y5S (2C3)                  |                                 |                                            |                                             |                                              |                                           |
| 68                         | ± 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###                         |
| Y5U (2E3)                  |                                 |                                            |                                             |                                              |                                           |
| 680                        | ± 20                            | 7.5                                        | 5.0                                         | 5.0, 7.5, 10.0, or 12.5                      | VY2681M29Y5US6###                         |
| 1000                       |                                 |                                            |                                             |                                              | VY2102M29Y5US6###                         |
| 1500                       |                                 | 8.0                                        |                                             |                                              | VY2152M31Y5US6###                         |
| 2200                       |                                 | 9.0                                        |                                             |                                              | VY2222M35Y5US6###                         |
| 3300                       |                                 | 10.5                                       |                                             |                                              | VY2332M41Y5US6###                         |
| 3900                       |                                 | 11.0                                       |                                             |                                              | VY2392M43Y5US6###                         |
| 4700                       |                                 | 12.5                                       |                                             | 7.5, 10.0, or 12.5                           | VY2472M49Y5US6###                         |
| 6800                       |                                 | 14.5                                       |                                             |                                              | VY2682M59Y5US63##                         |
| 10 000                     |                                 | 16.0                                       |                                             |                                              | VY2103M63Y5US63##                         |
|                            |                                 |                                            |                                             |                                              |                                           |
| Y5V (2F3) MINI SIZE SERIES |                                 |                                            |                                             |                                              |                                           |
| 1000                       | ± 20                            | 7.5                                        | 5.0                                         | 5.0, 7.5, 10.0,<br>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 |                    |                                                     |                                         |                                            |
| Example       | VY2                                        | 221               | K                  | 29        | Y5S                     | S                                  | 6                  | U                                                   | V                                       | 7                                          |
|               | Series                                     | Capacitance value | Tolerance code     | Size code | Temperature coefficient | Rated voltage                      | Lead wire diameter | Packaging / lead length                             | Lead style                              | Lead spacing                               |
|               |                                            |                   |                    |           |                         | S =<br>X1/Y2<br>300 V (AC)         |                    | 3 = bulk<br>T = tape<br>and reel<br>U =<br>ammopack | L =<br>straight<br>V = inline<br>kinked | 5 = 5.0<br>7 = 7.5<br>0 = 10.0<br>X = 12.5 |

### LEADSPACING 5.0 mm AND 7.5 mm

| PACKAGING |                                         |                      |      |      |
|-----------|-----------------------------------------|----------------------|------|------|
| SIZE CODE | BODY DIAMETER<br>D <sub>max.</sub> (mm) | PACKAGING QUANTITIES |      |      |
|           |                                         | BULK                 | REEL | AMMO |
| 29 to 49  | 12.5                                    | 1000                 | 1000 | 1000 |
| 59 to 63  | 16.0                                    | 500                  | -    | -    |

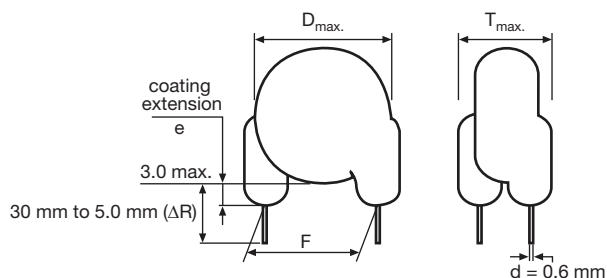
### LEADSPACING 10.0 mm AND 12.5 mm

| PACKAGING          |           |                                         |                      |      |      |
|--------------------|-----------|-----------------------------------------|----------------------|------|------|
| CAPACITANCE VALUE  | SIZE CODE | BODY DIAMETER<br>D <sub>max.</sub> (mm) | PACKAGING QUANTITIES |      |      |
|                    |           |                                         | BULK                 | REEL | AMMO |
| 10 pF to 4700 pF   | 29 to 49  | 12.5                                    | 1000                 | 500  | 750  |
| 6800 pF to 0.01 µF | 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



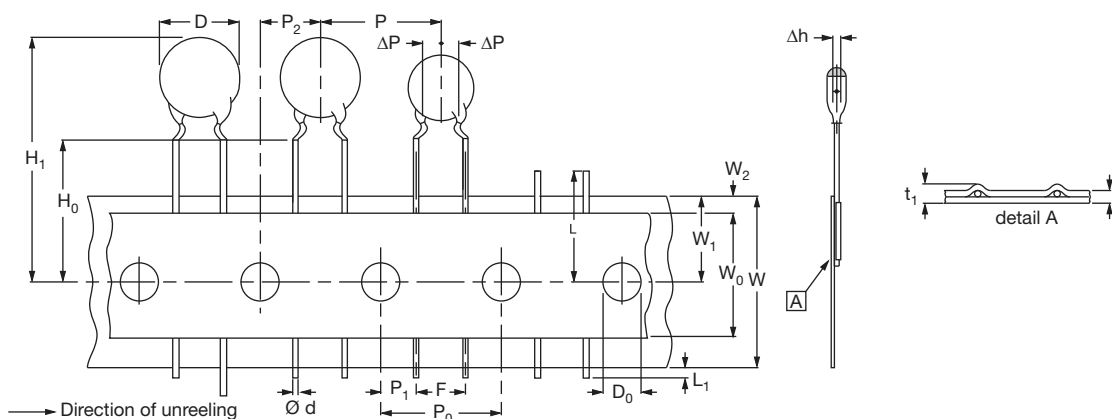


Fig. 1 - Kinked capacitors on tape, lead spacing 5.0 mm (0.2") and 7.5 mm (0.3")

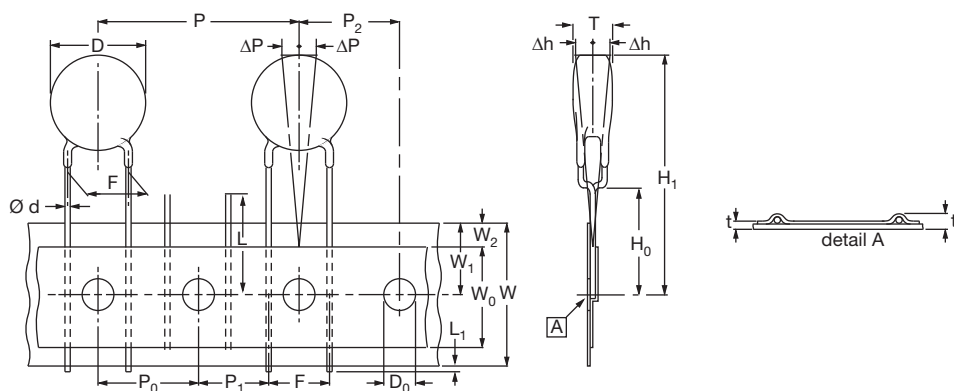


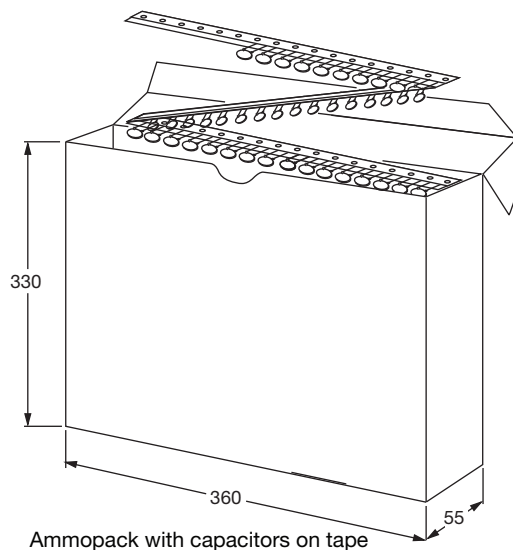
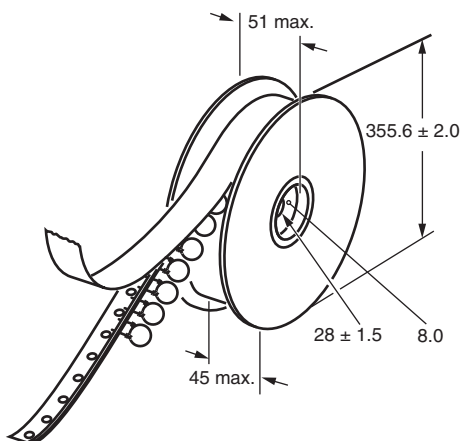
Fig. 2 - Inline kink (V) leaded capacitors on tape, lead spacing 10 mm (0.40")

| 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**
<sup>(1)</sup> See "Technical Data" table

<sup>(2)</sup> Cumulative pitch error: ± 1 mm/20 pitches

<sup>(3)</sup> Obliquity maximum 3°

**REEL AND TAPE DATA** in millimeters

**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>

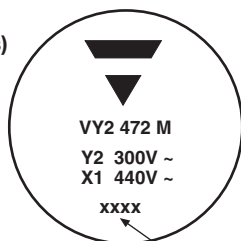
X1-capacitor: CQC test certificate:

CQC05001012316

10 pF to 10 nF

440 V<sub>AC</sub>


**MARKING**

Sample  
(2 sides)


Front



Back

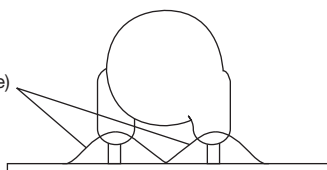
4 digit date code  
(year/week; add suffix "V" for mini size series)

PN: VY2331K29Y5SS6UV7  
QTY: 1000  
PO:  
SO:

Lot1: 14Z549306  
Lot2:  
Batch: 200601CN  
Region: 9520  
Ser.No: 0601H72383  
DC1: 0601  
DC2:

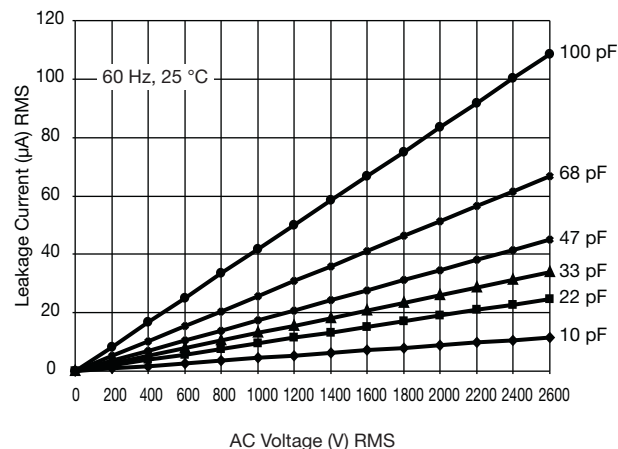
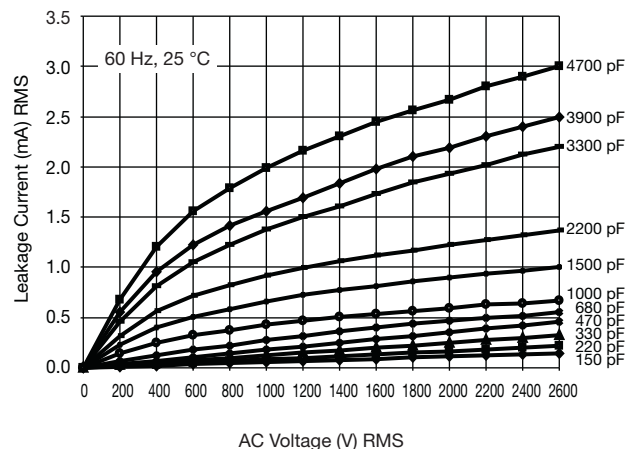

2/5

**PERFORMANCE**

| TEST                             | TEST CONDITION                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TEST LIMITS                                                                                                                                                                                     |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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<br>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              | 2600 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<br>Y5S: ± 22 %<br>Y5U: +22 % / -56 %                                                                                                                                    |
| Impulse voltage                  | 3 pulses of 5 kV                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No failure                                                                                                                                                                                      |
| Life test                        | 1000 h at 125 °C ± 2 °C, 550 V <sub>AC</sub> /50 Hz; once every hour 1000 V <sub>AC</sub> for 0.1 s                                                                                                                                                                                                                                                                                                                                                                       | External appearance: no visible damage<br>ΔC/C ≤ ± 15 %<br>DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S and Y5U<br>IR ≥ 3000 MΩ<br>Dielectric strength: no failure                                      |
| Humidity test                    | 500 h at 440 V <sub>AC</sub> , 50 Hz and 500 h unloaded 40 °C, RH = 90 % to 95 %                                                                                                                                                                                                                                                                                                                                                                                          | External appearance: no visible damage<br>ΔC/C ≤ ± 10 % for U2J and ≤ ± 15 % for Y5S and Y5U<br>DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S and Y5U<br>IR ≥ 3000 MΩ<br>Dielectric strength: no failure |
| Robustness of termination        | Pull test: 0.5 kg tensile weight in radial direction for 10 s ± 1 s<br>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<br>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<br>ΔC/C ≤ ± 5 % for U2J and ≤ ± 10 % for Y5S and Y5U<br>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.<br/>The capacitor must be soldered firmly to the supporting lead wire.<br/>Vibration change from 10 Hz to 2000 Hz and back to 10 Hz;<br/>Total amplitude: 1.5 mm; Acceleration: 100 m/s<sup>2</sup>;<br/>Sweep rate: 1 oct/min, each axis 2 h (6 h in total)</p> | External appearance: no visible damage<br>Capacitance within specified tolerance<br>DF ≤ 0.3 % for U2J and ≤ 2.5 % for Y5S and Y5U<br>IR ≥ 10 000 GΩ                                            |



### 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

#### 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?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> |
| LTspice® Models      | <a href="http://www.vishay.com/doc?28568">www.vishay.com/doc?28568</a> |

#### SAMPLE KITS

|                                    |                                                                        |
|------------------------------------|------------------------------------------------------------------------|
| 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> |



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.