

## AC Line Rated Disc Capacitors

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



#### FEATURES

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



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

#### APPLICATIONS

- Across-the-line
- Line by-pass
- Antenna coupling

#### DESIGN

The capacitors consist of a ceramic disc both sides of which are silver-plated. 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, or 10.0 mm. Encapsulation is made of flammable resistant 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

#### 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 10 mm)

(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 minimum

#### TOLERANCE OF CAPACITANCE

± 20 % (code M); ± 10 % (code K)

#### DISSIPATION FACTOR

2.5 % maximum

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

#### QUICK REFERENCE DATA

| DESCRIPTION                 | CLASS<br>X1<br>(U2J) | CLASS<br>X1<br>(Y5S) | CLASS<br>X1<br>(Y5U) | CLASS<br>Y2<br>(U2J) | CLASS<br>Y2<br>(Y5S) | CLASS<br>Y2<br>(Y5U) |
|-----------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Voltage (V <sub>AC</sub> )  | 440                  |                      |                      | 300                  |                      |                      |
| Min.<br>Capacitance<br>(pF) | 10                   | 68                   | 680                  | 10                   | 68                   | 680                  |
| Max.<br>Capacitance<br>(pF) | 47                   | 680                  | 10 000               | 47                   | 680                  | 10 000               |
| Mounting                    | Through hole         |                      |                      |                      |                      |                      |

#### OPERATING TEMPERATURE RANGE

- 40 °C to + 125 °C

#### TEMPERATURE CHARACTERISTICS

See Ordering Information Tables

#### CLIMATIC CATEGORY

40/125/21 according to EN 60068-1

#### COATING

According to UL 94 V-0

Epoxy resin, isolating, flame retardant

#### APPROVALS

ENEC - VDE DE 1-30691

UL60384-14 file E183844

CSA 22.2

#### PACKAGING

Bulk; tape and reel; taped ammpack

**DIMENSIONS**


Capacitors with 5.0 mm, 7.5 mm and 10 mm lead spacing

**ORDERING INFORMATION**

| C (pF)                     | TOL.<br>(%) | TEMP.<br>COEFFICIENT | BODY<br>DIAMETER<br>D <sub>MAX.</sub><br>(mm) | BODY<br>THICKNESS<br>T <sub>MAX.</sub><br>(mm) | LEAD<br>SPACING<br>F<br>(mm) | COATING<br>EXTENSION<br>DR <sub>MAX.</sub> <sup>(2)</sup><br>(mm) | CLEAR TEXT CODE                                                        |                          |
|----------------------------|-------------|----------------------|-----------------------------------------------|------------------------------------------------|------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------|
|                            |             |                      |                                               |                                                |                              |                                                                   | 15 <sup>TH</sup> DIGIT:<br>T = REEL; U = AMMO; 3 = BULK <sup>(1)</sup> |                          |
|                            |             |                      |                                               |                                                |                              |                                                                   | RoHS COMPLIANT                                                         | RoHS AND<br>HALOGEN-FREE |
| VY2 for leadspacing 5.0 mm |             |                      |                                               |                                                |                              |                                                                   | 2200 V <sub>AC</sub> , 50 Hz, 2 s                                      |                          |
| 10                         | ± 10        | U2J (N750)           | 7.5                                           | 5.0                                            | 5.0                          | 3.0                                                               | VY2100K29U2JS6*V5                                                      | VY2100K29U2JG6*V5        |
| 15                         |             |                      |                                               |                                                |                              |                                                                   | VY2150K29U2JS6*V5                                                      | VY2150K29U2JG6*V5        |
| 22                         |             |                      |                                               |                                                |                              |                                                                   | VY2220K29U2JS6*V5                                                      | VY2220K29U2JG6*V5        |
| 33                         |             |                      |                                               |                                                |                              |                                                                   | VY2330K29U2JS6*V5                                                      | VY2330K29U2JG6*V5        |
| 47                         |             | VY2470K29U2JS6*V5    |                                               |                                                |                              |                                                                   | VY2470K29U2JG6*V5                                                      |                          |
| 68                         |             | VY2680K29Y5SS6*V5    |                                               |                                                |                              |                                                                   | VY2680K29Y5SG6*V5                                                      |                          |
| 100                        |             | VY2101K29Y5SS6*V5    |                                               |                                                |                              |                                                                   | VY2101K29Y5SG6*V5                                                      |                          |
| 150                        |             | VY2151K29Y5SS6*V5    |                                               |                                                |                              |                                                                   | VY2151K29Y5SG6*V5                                                      |                          |
| 220                        | Y5S (2C3)   |                      |                                               |                                                |                              |                                                                   | VY2221K29Y5SS6*V5                                                      | VY2221K29Y5SG6*V5        |
| 330                        |             |                      |                                               |                                                |                              |                                                                   | VY2331K29Y5SS6*V5                                                      | VY2331K29Y5SG6*V5        |
| 470                        |             |                      | VY2471K29Y5SS6*V5                             | VY2471K29Y5SG6*V5                              |                              |                                                                   |                                                                        |                          |
| 680                        |             |                      | VY2681M29Y5US6*V5                             | VY2681M29Y5UG6*V5                              |                              |                                                                   |                                                                        |                          |
| 1000                       |             |                      | VY2102M29Y5US6*V5                             | VY2102M29Y5UG6*V5                              |                              |                                                                   |                                                                        |                          |
| 1500                       |             |                      | VY2152M31Y5US6*V5                             | VY2152M31Y5UG6*V5                              |                              |                                                                   |                                                                        |                          |
| 2200                       |             |                      | VY2222M35Y5US6*V5                             | VY2222M35Y5UG6*V5                              |                              |                                                                   |                                                                        |                          |
| 3300                       |             |                      | VY2332M41Y5US6*V5                             | VY2332M41Y5UG6*V5                              |                              |                                                                   |                                                                        |                          |
| 3900                       | ± 20        | Y5U (2E3)            | 11.0                                          | VY2392M43Y5US6*V5                              | VY2392M43Y5UG6*V5            |                                                                   |                                                                        |                          |

**ORDERING INFORMATION**

| C (pF)                     | TOL.<br>(%) | TEMP.<br>COEFFICIENT | BODY<br>DIAMETER<br>D <sub>MAX.</sub><br>(mm) | BODY<br>THICKNESS<br>T <sub>MAX.</sub><br>(mm) | LEAD<br>SPACING<br>F<br>(mm) | COATING<br>EXTENSION<br>DR <sub>MAX.</sub> <sup>(2)</sup><br>(mm) | CLEAR TEXT CODE                                                        |                          |
|----------------------------|-------------|----------------------|-----------------------------------------------|------------------------------------------------|------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------|
|                            |             |                      |                                               |                                                |                              |                                                                   | 15 <sup>TH</sup> DIGIT:<br>T = REEL; U = AMMO; 3 = BULK <sup>(1)</sup> |                          |
|                            |             |                      |                                               |                                                |                              |                                                                   | RoHS COMPLIANT                                                         | RoHS AND<br>HALOGEN-FREE |
| VY2 for leadspacing 7.5 mm |             |                      |                                               |                                                |                              |                                                                   | 2600 V <sub>AC</sub> , 50 Hz, 2 s                                      |                          |
| 10                         | ± 10        | U2J (N750)           | 7.5                                           | 5.0                                            | 7.5                          | 3.0                                                               | VY2100K29U2JS6*V7                                                      | VY2100K29U2JG6*V7        |
| 15                         |             |                      |                                               |                                                |                              |                                                                   | VY2150K29U2JS6*V7                                                      | VY2150K29U2JG6*V7        |
| 22                         |             |                      |                                               |                                                |                              |                                                                   | VY2220K29U2JS6*V7                                                      | VY2220K29U2JG6*V7        |
| 33                         |             |                      |                                               |                                                |                              |                                                                   | VY2330K29U2JS6*V7                                                      | VY2330K29U2JG6*V7        |
| 47                         |             |                      |                                               |                                                |                              |                                                                   | VY2470K29U2JS6*V7                                                      | VY2470K29U2JG6*V7        |
| 68                         | ± 10        | Y5S (2C3)            |                                               |                                                |                              |                                                                   | VY2680K29Y5SS6*V7                                                      | VY2680K29Y5SG6*V7        |
| 100                        |             |                      |                                               |                                                |                              |                                                                   | VY2101K29Y5SS6*V7                                                      | VY2101K29Y5SG6*V7        |
| 150                        |             |                      |                                               |                                                |                              |                                                                   | VY2151K29Y5SS6*V7                                                      | VY2151K29Y5SG6*V7        |
| 220                        |             |                      |                                               |                                                |                              |                                                                   | VY2221K29Y5SS6*V7                                                      | VY2221K29Y5SG6*V7        |
| 330                        |             |                      |                                               |                                                |                              |                                                                   | VY2331K29Y5SS6*V7                                                      | VY2331K29Y5SG6*V7        |
| 470                        | ± 20        | Y5U (2E3)            |                                               |                                                |                              |                                                                   | VY2471K29Y5SS6*V7                                                      | VY2471K29Y5SG6*V7        |
| 680                        |             |                      |                                               |                                                |                              |                                                                   | VY2681M29Y5US6*V7                                                      | VY2681M29Y5UG6*V7        |
| 1000                       |             |                      |                                               |                                                |                              |                                                                   | VY2102M29Y5US6*V7                                                      | VY2102M29Y5UG6*V7        |
| 1500                       |             |                      |                                               |                                                |                              |                                                                   | VY2152M31Y5US6*V7                                                      | VY2152M31Y5UG6*V7        |
| 2200                       |             |                      |                                               |                                                |                              |                                                                   | VY2222M35Y5US6*V7                                                      | VY2222M35Y5UG6*V7        |
| 3300                       |             |                      |                                               |                                                |                              |                                                                   | VY2332M41Y5US6*V7                                                      | VY2332M41Y5UG6*V7        |
| 3900                       |             |                      |                                               |                                                |                              |                                                                   | VY2392M43Y5US6*V7                                                      | VY2392M43Y5UG6*V7        |
| 4700                       |             |                      |                                               |                                                |                              |                                                                   | VY2472M49Y5US6*V7                                                      | VY2472M49Y5UG6*V7        |
| 6800                       |             |                      |                                               |                                                |                              |                                                                   | VY2682M59Y5US63V7                                                      | VY2682M59Y5UG63V7        |
| 0.01 µF                    |             |                      |                                               |                                                |                              |                                                                   | VY2103M63Y5US63V7                                                      | VY2103M63Y5UG63V7        |

| ORDERING INFORMATION        |           |                   |                                      |                                       |                     |                                                          |                                                                        |                       |
|-----------------------------|-----------|-------------------|--------------------------------------|---------------------------------------|---------------------|----------------------------------------------------------|------------------------------------------------------------------------|-----------------------|
| C (pF)                      | TOL. (%)  | TEMP. COEFFICIENT | BODY DIAMETER D <sub>MAX.</sub> (mm) | BODY THICKNESS T <sub>MAX.</sub> (mm) | LEAD SPACING F (mm) | COATING EXTENSION DR <sub>MAX.</sub> <sup>(2)</sup> (mm) | CLEAR TEXT CODE                                                        |                       |
|                             |           |                   |                                      |                                       |                     |                                                          | 15 <sup>TH</sup> DIGIT:<br>T = REEL; U = AMMO; 3 = BULK <sup>(1)</sup> |                       |
|                             |           |                   |                                      |                                       |                     |                                                          | RoHS COMPLIANT                                                         | RoHS AND HALOGEN-FREE |
| VY2 for leadspacing 10.0 mm |           |                   |                                      |                                       |                     |                                                          | 2600 V <sub>AC</sub> , 50 Hz, 2 s                                      |                       |
| 10                          | ± 10      | U2J (N750)        | 7.5                                  | 5.0                                   | 10.0                | 3.0                                                      | VY2100K29U2JS6*V0                                                      | VY2100K29U2JG6*V0     |
| 15                          |           |                   |                                      |                                       |                     |                                                          | VY2150K29U2JS6*V0                                                      | VY2150K29U2JG6*V0     |
| 22                          |           |                   |                                      |                                       |                     |                                                          | VY2220K29U2JS6*V0                                                      | VY2220K29U2JG6*V0     |
| 33                          |           |                   |                                      |                                       |                     |                                                          | VY2330K29U2JS6*V0                                                      | VY2330K29U2JG6*V0     |
| 47                          |           |                   |                                      |                                       |                     |                                                          | VY2470K29U2JS6*V0                                                      | VY2470K29U2JG6*V0     |
| 68                          |           |                   |                                      |                                       |                     |                                                          | VY2680K29Y5SS6*V0                                                      | VY2680K29Y5SG6*V0     |
| 100                         | Y5S (2C3) | VY2101K29Y5SS6*V0 |                                      |                                       |                     |                                                          | VY2101K29Y5SG6*V0                                                      |                       |
| 150                         |           | VY2151K29Y5SS6*V0 |                                      |                                       |                     |                                                          | VY2151K29Y5SG6*V0                                                      |                       |
| 220                         |           | VY2221K29Y5SS6*V0 |                                      |                                       |                     |                                                          | VY2221K29Y5SG6*V0                                                      |                       |
| 330                         |           | VY2331K29Y5SS6*V0 |                                      |                                       |                     |                                                          | VY2331K29Y5SG6*V0                                                      |                       |
| 470                         |           | VY2471K29Y5SS6*V0 |                                      |                                       |                     |                                                          | VY2471K29Y5SG6*V0                                                      |                       |
| 680                         |           | VY2681M29Y5US6*V0 |                                      |                                       |                     |                                                          | VY2681M29Y5UG6*V0                                                      |                       |
| 1000                        | ± 20      | Y5U (2E3)         |                                      |                                       |                     |                                                          | VY2102M29Y5US6*V0                                                      | VY2102M29Y5UG6*V0     |
| 1500                        |           |                   |                                      |                                       |                     |                                                          | VY2152M31Y5US6*V0                                                      | VY2152M31Y5UG6*V0     |
| 2200                        |           |                   |                                      |                                       |                     |                                                          | VY2222M35Y5US6*V0                                                      | VY2222M35Y5UG6*V0     |
| 3300                        |           |                   |                                      |                                       |                     |                                                          | VY2332M41Y5US6*V0                                                      | VY2332M41Y5UG6*V0     |
| 3900                        |           |                   |                                      |                                       |                     |                                                          | VY2392M43Y5US6*V0                                                      | VY2392M43Y5UG6*V0     |
| 4700                        |           |                   |                                      |                                       |                     |                                                          | VY2472M49Y5US6*V0                                                      | VY2472M49Y5UG6*V0     |
| 6800                        |           |                   | VY2682M59Y5US63V0                    | VY2682M59Y5UG63V0                     |                     |                                                          |                                                                        |                       |
| 0.01 μF                     |           |                   | VY2103M63Y5US63V0                    | VY2103M63Y5UG63V0                     |                     |                                                          |                                                                        |                       |

**Notes**

(1) 15<sup>th</sup> digit of the clear text code number to be completed with the packaging code.

(2) Coating extension DR valid for straight leads only.

- Straight leads are available on request.

**LEADSPACING 5.0 mm and 7.5 mm**

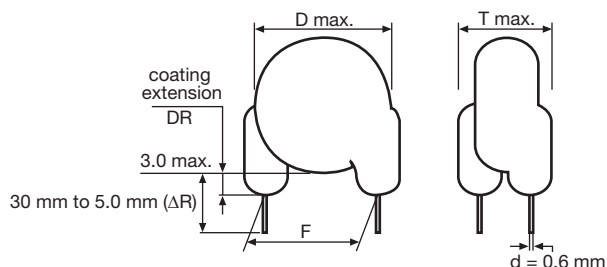
| PACKAGING          |           |                                      |                      |      |      |
|--------------------|-----------|--------------------------------------|----------------------|------|------|
| CAPACITANCE VALUE  | SIZE CODE | BODY DIAMETER D <sub>MAX.</sub> (mm) | PACKAGING QUANTITIES |      |      |
|                    |           |                                      | BULK                 | REEL | AMMO |
| 10 pF to 4700 pF   | 29 to 49  | 12.5                                 | 1000                 | 1000 | 1000 |
| 6800 pF to 0.01 µF | 59 to 63  | 16.0                                 | 500                  | -    | -    |

**LEADSPACING 10.0 mm**

| PACKAGING          |           |                                      |                      |      |      |
|--------------------|-----------|--------------------------------------|----------------------|------|------|
| CAPACITANCE VALUE  | SIZE CODE | BODY DIAMETER 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**


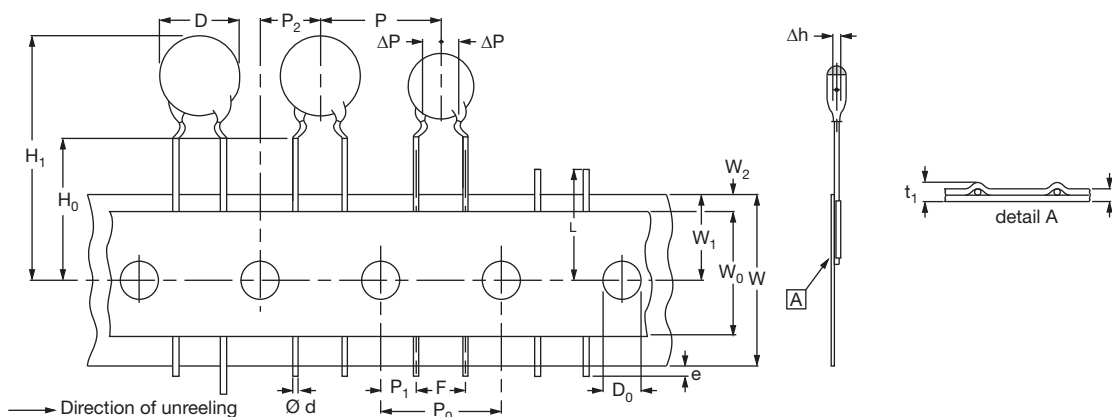


Fig. 1 - Kinked capacitors on tape, lead spacing 5.0 mm (0.2") and 7.5 mm (0.3")

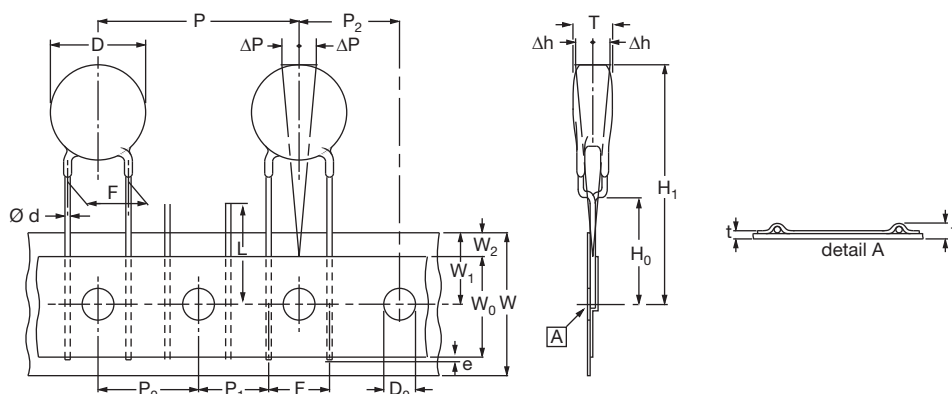


Fig. 2 - Inline kink (V) leaded capacitors on tape, lead spacing 10 mm (0.40")

| 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.          |
| e                             | 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.           |

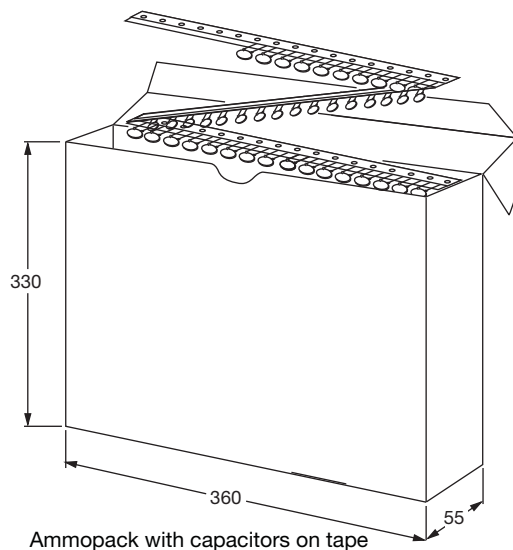
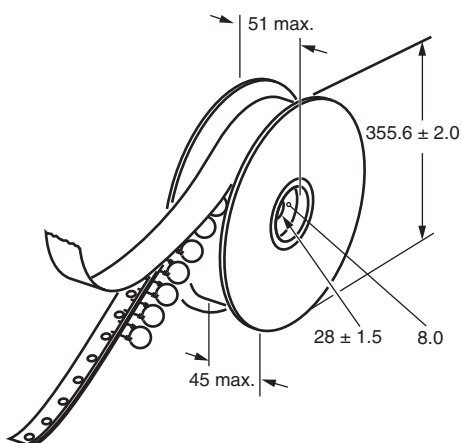
**Notes**
<sup>(1)</sup> See ordering information table

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

<sup>(3)</sup> Obliquity maximum 3°



### REEL AND TAPE DATA in millimeters



### STANDARD RECOGNITION

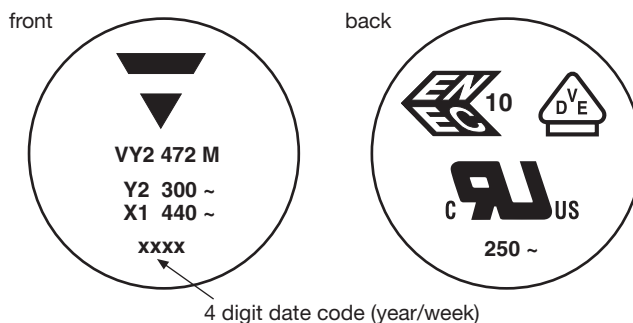
IEC 60384 - 14/3<sup>rd</sup> issue (2005)- Safety Tests

UL60384-14 - Across-the-line, antenna-coupling and line-by-pass component

CQC - China Quality Certification Center-Safety Tests

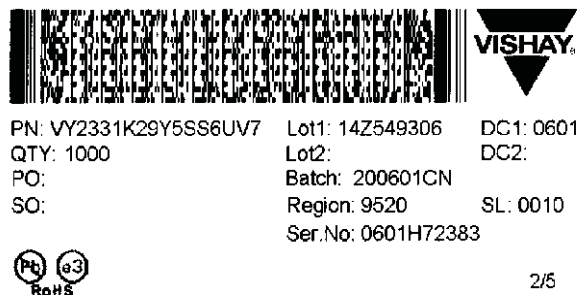
### MARKING: 2 SIDES

#### (EXAMPLE)



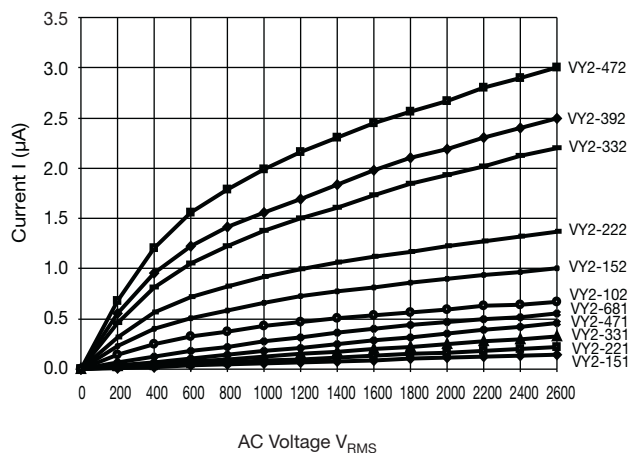
### LABEL

#### (EXAMPLE)

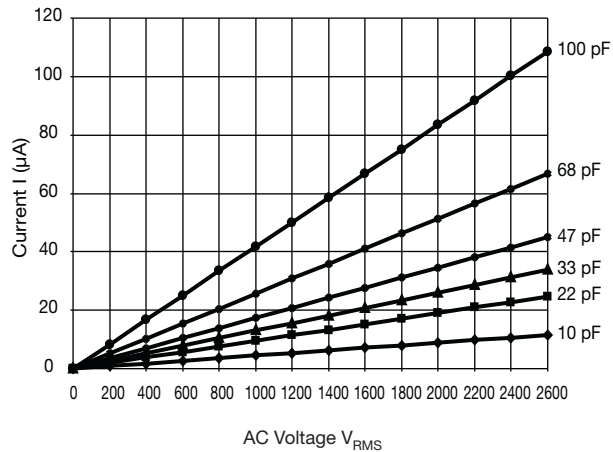




Typical Current vs. Voltage (Leakage Current) at 60 Hz 25 °C



Typical Current vs. Voltage (Leakage Current) at 60 Hz 25 °C



### 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.



## Disclaimer

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

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## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

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