

EMI Suppression Capacitor, Ceramic Disc, Class X1, 400 V_{AC}, Class Y2, 300 V_{AC} / 250 V_{AC}


**RoHS
COMPLIANT**
FEATURES

- Complying with IEC 60384-14
- High reliability
- Complete range of capacitance values
- Radial 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
- Line-to-line filtering (Class X)
- Line-to-ground filtering (Class Y)
- Primary and secondary coupling (SMPS)
- EMI / RFI suppression and filtering

DESIGN

The capacitors consist of a ceramic disc of which both sides are silver-plated. Connection leads are made of tinned copper having a diameter of 0.032" (0.81 mm) or 0.025" (0.64 mm). The capacitors may be supplied with radial kinked or straight leads having a lead spacing of 0.375" (9.5 mm) or 0.250" (6.4 mm). The standard tolerance is $\pm 20\%$. Coating is made of flame retardant epoxy resin in accordance with "UL 94 V-0."

CAPACITANCE RANGE

1.0 nF to 8.0 nF

RATED VOLTAGE

IEC 60384-14:

- X1: 400 V_{AC}, 50 Hz
- Y2: 300 V_{AC}, 50 Hz (LS \geq 5.5 mm)
- Y2: 250 V_{AC}, 50 Hz (LS < 5.5 mm)

DIELECTRIC STRENGTH BETWEEN LEADS

Component test, 100 % test at product line:
2500 V_{AC}, 50 Hz, 2 s

As repeated test at customer side admissible only once with:
2250 V_{AC}, 50 Hz, 2 s

Random sampling test (destructive test):
2500 V_{AC}, 50 Hz, 60 s

DIELECTRIC STRENGTH OF BODY INSULATION

 2300 V_{AC}, 50 Hz, 60 s (destructive test)

| QUICK REFERENCE DATA | | | |
|----------------------------|--------|-----|-----|
| DESCRIPTION | VALUE | | |
| Ceramic Class | 2 | | |
| Ceramic Dielectric | Y5S | | |
| Voltage (V _{AC}) | 250 | 300 | 400 |
| Min. Capacitance (pF) | 1000 | | |
| Max. Capacitance (pF) | 8000 | | |
| Mounting | Radial | | |

INSULATION RESISTANCE

 Min. 1000 Ω F

TOLERANCE ON CAPACITANCE
 $\pm 20\%$
DISSIPATION FACTOR

2.0 % max. at 1 kHz; 1 V

CERAMIC DIELECTRIC

Y5S (Class 2)

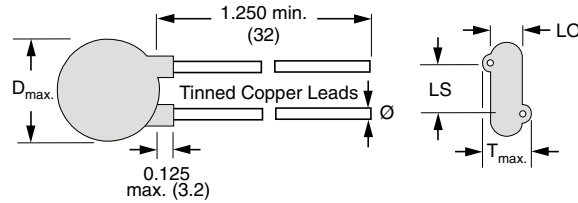
CLIMATIC CATEGORY ACC. TO EN 60068-1

25/125/21

OPERATING TEMPERATURE RANGE

 -30 °C to +125 °C ⁽¹⁾
Note

- ⁽¹⁾ For explanation about the difference of operating temperature range and temperature characteristic of capacitance, please see www.vishay.com/doc?48299

DIMENSIONS in inches (millimeters)

ORDERING INFORMATION, CERAMIC X1 / Y2 CAPACITORS 25Y

| C (pF) | TOL. (%) | D _{max.} DIAMETER INCH (mm) | T _{max.} THICKNESS INCH (mm) | WIRE SIZE | | LS LEAD SPACE INCH (mm) ± 1 mm | LO LEAD OFFSET INCH (mm) ± 0.5 mm | ORDERING CODE |
|--|--------------|--|---|-------------|--------------|---|--|------------------|
| | | | | AWG | INCH (mm) | | | |
| Y5S TEMPERATURE STABLE (± 22 %, -30 °C TO +85 °C) | | | | | | | | |
| 1000 | ± 20 | 0.330 (8.4) | 0.170 (4.3) | 22 | 0.025 (0.64) | 0.250 (6.4) | 0.075 (1.9) | 25YD10-R |
| 1500 | | 0.400 (10.2) | 0.175 (4.4) | | | | 0.079 (2.0) | 25YD15-R |
| 2000 | | 0.430 (10.9) | 0.170 (4.3) | | | | 0.075 (1.9) | 25YD20-R |
| 2200 | | 0.460 (11.7) | | | | | 0.079 (2.0) | 25YD22-R |
| 2700 | | 0.490 (12.4) | 0.075 (1.9) | | | | 25YD27-R | |
| 2800 | | 0.530 (13.5) | 0.175 (4.4) | | | | 0.079 (2.0) | 25YD28-R |
| 3000 | | 0.530 (13.5) | 0.175 (4.4) | 0.079 (2.0) | 25YD30-R | | | |
| 3200 | | 0.560 (14.2) | 0.185 (4.7) | 20 | 0.032 (0.81) | 0.375 (9.5) | 0.087 (2.2) | 25YD32-R |
| 3300 | | 0.560 (14.2) | | | | | 0.087 (2.2) | 25YD33-R |
| 3900 | | 0.620 (15.7) | | | | | 0.087 (2.2) | 25YD39-R |
| 4000 | | 0.620 (15.7) | | | | | 0.175 (4.4) | 0.083 (2.1) |
| 4700 | | 0.680 (17.3) | 0.185 (4.7) | | | | 0.087 (2.2) | 25YD47-R |
| 5000 | | 0.680 (17.3) | 0.185 (4.7) | | | | 0.087 (2.2) | 25YD50-R |
| 5500 | | 0.720 (18.3) | 0.190 (4.7) | | | | 0.091 (2.3) | 25YD55-R |
| 5600 | | 0.720 (18.3) | 0.190 (4.7) | | | | 0.091 (2.3) | 25YD56-R |
| 6800 | | 0.790 (20.1) | 0.185 (4.7) | 0.087 (2.2) | 25YD68-R | | | |
| 8000 | 0.900 (22.9) | 0.200 (5.1) | 0.102 (2.6) | 25YD80-R | | | | |

Notes

- Alternate lead spacings of 7.5 mm and 10 mm are available bulk or tape and reel on request
- Minimum lead clearance according to IEC 60384-14: 0.118" (3 mm)

TAPE AND REEL OPTIONS

Part number codes and specifications for tape and reel packaging are found in the general information document www.vishay.com/doc?23140.



| APPROVALS | | | | |
|--|-----------|--------------|------------------------------------|--|
| IEC 60384-14 - Safety tests This approval together with CB test certificate substitutes all national approvals. | | | | |
| CB Certificate (www.vishay.com/doc?22240) | | | | |
| Y2-capacitor: CB test certificate: | DE1-63498 | 1 nF to 8 nF | 250 V _{AC} | |
| X1-capacitor: CB test certificate: | DE1-63498 | 1 nF to 8 nF | 400 V _{AC} | |
| VDE (www.vishay.com/doc?22241) | | | | |
| Y2-capacitor: VDE marks approval: | 40003978 | 1 nF to 8 nF | 250 V _{AC} | |
| X1-capacitor: VDE marks approval: | 40003978 | 1 nF to 8 nF | 400 V _{AC} | |
| DIN EN 60384-14 VDE 0565-1-1 - Safety tests | | | | |
| Underwriters Laboratories Inc. (www.vishay.com/doc?22242) | | | | |
| Y2-capacitor: UL test certificate: | E99264 | 1 nF to 8 nF | 300 V _{AC} ⁽¹⁾ | |
| Y2-capacitor: UL test certificate: | E99264 | 1 nF to 8 nF | 250 V _{AC} ⁽¹⁾ | |
| X1-capacitor: UL test certificate: | E99264 | 1 nF to 8 nF | 400 V _{AC} | |
| UL 60384-14, CSA E60384-1, CSA E60384-14 | | | | |
| Fixed capacitors for electromagnetic interference suppression and connection to the supply mains. | | | | |

Note

⁽¹⁾ LS ≥ 5.5 mm: 300 V_{AC}; LS < 5.5 mm: 250 V_{AC}

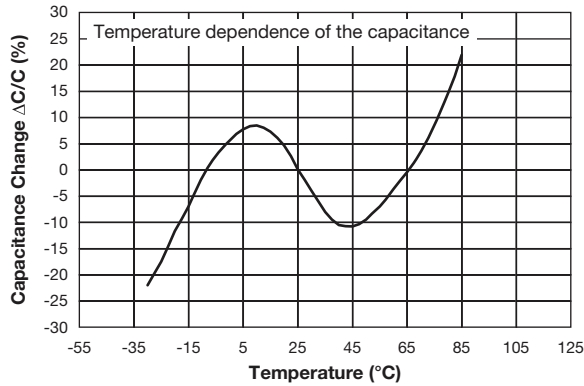
| MARKING | |
|---------------|--|
| <p>Sample</p> | <p>PN:25YD22-R LOT1:34658941 DC1:1949 Cap.:2200PF ±20% LOT2: DC2: Ur.:Y2(250~),X1(400~) BATCH NO.:201949CZ Qty.:250 R.C.:7032 S.L.:0010 IEC 60384-14:2013: PO:0034658941/0001 SN:29210DA7D007 </p> |

Notes

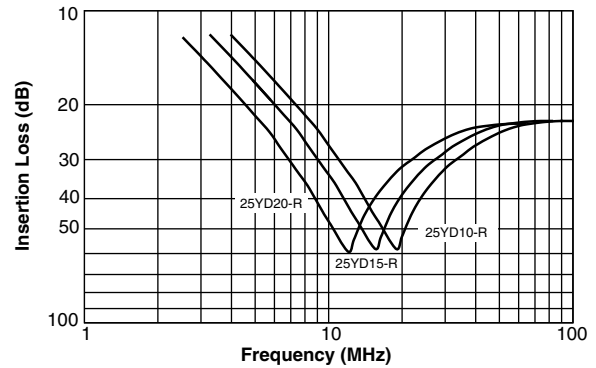
- Marking IEC 60384-14 does not apply for Ø ≤ 9 mm
- “XX - XXX” is a placeholder for date code and lot number:
“XX -” is the year and month according to IEC 60062
“- XXX” is the last 3 digits of the lot number



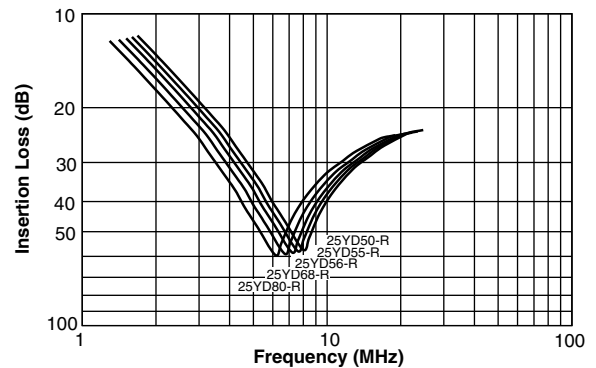
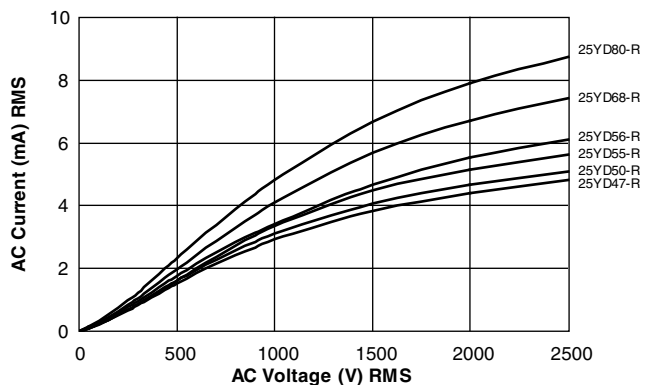
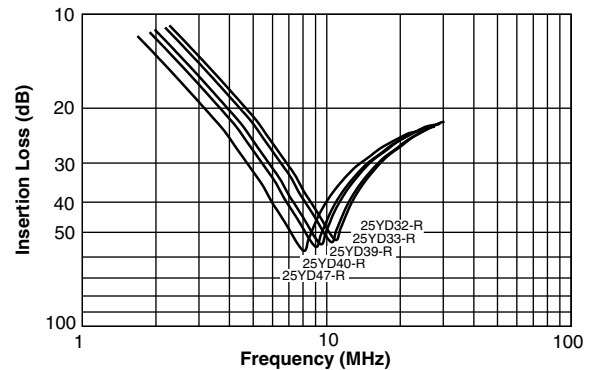
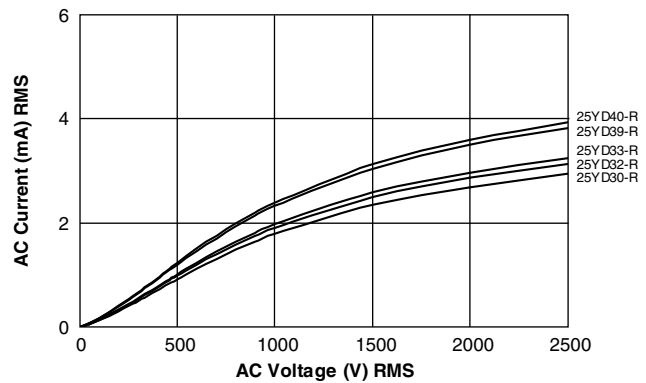
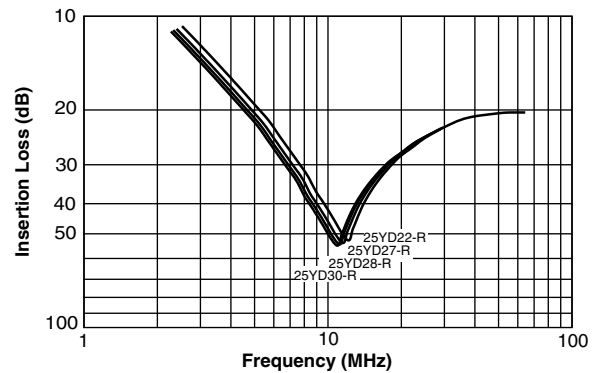
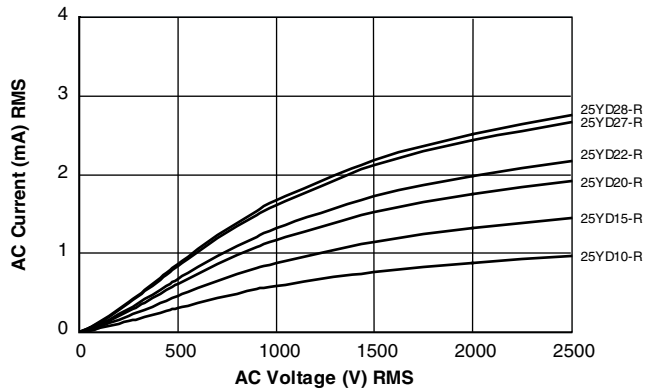
CAPACITANCE CHANGE VS. TEMPERATURE (Typical)



INSERTION LOSS VS. FREQUENCY (Typical)



AC CURRENT VS. VOLTAGE (Typical)





STORAGE

The capacitors must not be stored in a corrosive atmosphere, where sulphide or chloride gas, acid, alkali or salt are present. Exposure of the components to moisture, should be avoided. The solderability of the leads is not affected by storage of up to 24 months (temperature +10 °C to +40 °C, relative humidity up to 60 % RH). Class 2 ceramic dielectric capacitors are also subject to aging see general information (www.vishay.com/doc?23140).

SOLDERING

| SOLDERING SPECIFICATIONS | | |
|--|----------------------|-------------------------------------|
| Soldering test for capacitors with wire leads: (according to IEC 60068-2-20, solder bath method) | | |
| | SOLDERABILITY | RESISTANCE TO SOLDERING HEAT |
| Soldering temperature | (235 ± 5) °C | (260 ± 5) °C |
| Soldering duration | (2 ± 0.5) s | (10 ± 1) s |
| Distance from component body | ≥ 2 mm | ≥ 5 mm |

SOLDERING RECOMMENDATIONS

Ceramic capacitors are very sensitive to rapid changes in temperature (thermal shock) therefore the solder heat resistance specification (see table above) should not be exceeded. Exposing the capacitor to excessive heating may result in thermal shocks that can crack the ceramic body. Similarly, excessive heating can cause the internal solder junction to melt.

When soldering radial leaded ceramic capacitors with a soldering iron, it should be performed under the following conditions and should not exceed:

- Maximum temperature of iron-tip: 400 °C
- Maximum soldering iron wattage: 50 W
- Maximum soldering time: 3.5 s

Failure to follow the above cautions may result, in worst case, in short circuit or cause fuming or thermo-mechanical damage when the product is used.

Leaded ceramic capacitors are not designed for reflow process or dipping the body into a solder melt.

CLEANING

The components should be cleaned immediately following the soldering operation with vapor degreasers.

CLEANING (ULTRASONIC CLEANING)

To perform ultrasonic cleaning, observe the following conditions:

- Maximum rinse bath capacity output: 20 W/liter
- Maximum rinsing time: 300 s
- Do not vibrate the PCB/PWB directly
- Excessive ultrasonic cleaning may lead to mechanical damage

SOLVENT RESISTANCE

The coating and marking of the capacitors are resistant to the following test method:

IEC 60068-2-45 (method XA)

MOUNTING

We do not recommend modifying the lead terminals, e.g. bending or cropping. This action could break the coating or crack the ceramic insert. In order to avoid such failures we are offering different lead wire designs (e.g. straight, inline, inside crimp, outside crimp etc.) If however, the lead must be modified in any way, we recommend support of the lead with a clamping fixture next to the coating. If a defined product stop is required for mounting on a PCB, a mechanically formed product stop or a mounting tool should be used.



OPERATING VOLTAGE

In case the voltage is applied to the circuit, starting as well as stopping, may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

OPERATING TEMPERATURE AND SELF-GENERATED HEAT

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high frequency, pulse, or similar application, it may have self-generated heat due to dielectric dissipation.

Temperature increase due to self-generated heating should not exceed 20 °C while operating at an atmosphere temperature of 25 °C.

When measuring, the surface temperature, make sure that the capacitor is not affected by radiant, conductive and convective heat by its surroundings. Excessive heat may lead to thermo-mechanical deterioration of the capacitor's characteristics and reliability.

| RELATED DOCUMENTS | |
|--------------------------|--|
| General Information | www.vishay.com/doc?23140 |
| CB Test Certificate | www.vishay.com/doc?22240 |
| VDE Marks Approval | www.vishay.com/doc?22241 |
| UL Test Certificate | www.vishay.com/doc?22242 |



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.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

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.