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

QUICK REFERENCE DATA				
DESCRIPTION	VALUE			
Ceramic Class	1		2	
Ceramic Dielectric	C0G, U2J, P3K, R3L, S3L	C0G, U2J, P3K, R3L, S3L	X7R, Y5U	X7R, Y5U
Voltage (V_{AC})	300	400	300	400
Min. Capacitance (pF)	10		100	
Max. Capacitance (pF)	68		15 000	
Mounting	Radial			

INSULATION RESISTANCE

Min. 1000 ΩF

TOLERANCE ON CAPACITANCE

± 10 %; ± 20 %

DISSIPATION FACTOR

2.0 % max. at 1 kHz; 1 V

CERAMIC DIELECTRIC

C0G, U2J, P3K, R3L (Class 1)
X7R, Y5U (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)

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

Pb e3 RoHS COMPLIANT

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 ± 20 %. Coating is made of flame retardant epoxy resin in accordance with “UL 94 V-0.”

CAPACITANCE RANGE

10 pF to 0.015 µF

RATED VOLTAGE

IEC 60384-14:

- X1:400 V_{AC}, 50 Hz
- Y2: 300 V_{AC}, 50 Hz

DIELECTRIC STRENGTH BETWEEN LEADS

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

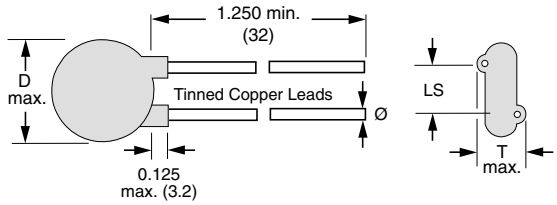
As repeated test at customer side admissible only once with:
2250 V_{AC}, 50 Hz, 2 s

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)

DIMENSIONS in inches (millimeters)



ORDERING INFORMATION, CERAMIC X1/Y2 CAPACITORS 30LV

C (pF)	TOL. (%)	$D_{max.}$ DIAMETER INCH (mm)	$T_{max.}$ THICKNESS INCH (mm)	WIRE SIZE		LS LEAD SPACE INCH (mm)	ORDERING CODE
				AWG	INCH (mm)		
C0G							
10	± 10	0.330 (8.4)	0.190 (4.8)	22	0.025 (0.64)	0.250 (6.4)	30LVQ10-R
U2J							
15	± 10	0.330 (8.4)	0.200 (5.1)	22	0.025 (0.64)	0.250 (6.4)	30LVQ15-R
P3K							
22	± 10	0.330 (8.4)	0.185 (4.7)	22	0.025 (0.64)	0.250 (6.4)	30LVQ22-R
R3L							
33	± 10	0.330 (8.4)	0.190 (4.8)	22	0.025 (0.64)	0.250 (6.4)	30LVQ33-R
47	± 10	0.330 (8.4)	0.170 (4.3)	22	0.025 (0.64)	0.250 (6.4)	30LVQ47-R
S3L							
68	± 10	0.330 (8.4)	0.175 (4.4)	22	0.025 (0.64)	0.250 (6.4)	30LVQ68-R
X7R							
100	± 10	0.330 (8.4)	0.200 (5.1)	22	0.025 (0.64)	0.250 (6.4)	30LVT10-R
150		0.330 (8.4)	0.180 (4.6)				30LVT15-R
220		0.330 (8.4)	0.190 (4.8)				30LVT22-R
330		0.330 (8.4)	0.210 (5.3)				30LVT33-R
470		0.330 (8.4)	0.180 (4.6)				30LVT47-R
560		0.330 (8.4)	0.190 (4.8)				30LVT56-R
680		0.330 (8.4)	0.180 (4.6)				30LVTT68-R
1000		0.365 (9.3)	0.185 (4.7)				30LVTD10-R
1500		0.460 (11.7)	0.180 (4.6)				30LVTD15-R
Y5U							
680	± 20	0.330 (8.4)	0.210 (5.3)	22	0.025 (0.64)	0.250 (6.4)	30LVT68-R
1000		0.330 (8.4)	0.215 (5.5)				30LVD10-R
1500		0.330 (8.4)	0.195 (5.0)				30LVD15-R
2000		0.400 (10.2)	0.210 (5.3)				30LVD20-R
2200		0.400 (10.2)	0.200 (5.1)				30LVD22-R
2700		0.430 (10.9)	0.200 (5.1)				30LVD27-R
2800		0.430 (10.9)	0.200 (5.1)				30LVD28-R
3000		0.460 (11.7)	0.200 (5.1)				30LVD30-R
3200		0.460 (11.7)	0.200 (5.1)				30LVD32-R
3300		0.460 (11.7)	0.195 (5.0)				30LVD33-R
3900		0.490 (12.4)	0.200 (5.1)				30LVD39-R
4000		0.530 (13.5)	0.210 (5.3)				30LVD40-R

ORDERING INFORMATION, CERAMIC X1/Y2 CAPACITORS 30LV

C (pF)	TOL. (%)	$D_{max.}$ DIAMETER INCH (mm)	$T_{max.}$ THICKNESS INCH (mm)	WIRE SIZE		LS LEAD SPACE INCH (mm)	ORDERING CODE
				AWG	INCH (mm)		
Y5U							
4700	± 20	0.620 (15.7)	0.230 (5.8)	20	0.032 (0.81)	0.375 (9.5)	30LVD47-R
5000		0.620 (15.7)	0.225 (5.7)				30LVD50-R
5500		0.560 (14.2)	0.195 (5.0)				30LVD55-R
5600		0.560 (14.2)	0.205 (5.2)				30LVD56-R
6800		0.620 (15.7)	0.215 (5.5)				30LVD68-R
8000		0.680 (17.3)	0.205 (5.2)				30LVD80-R
9000		0.720 (18.3)	0.210 (5.3)				30LVD90-R
10 000		0.790 (20.1)	0.225 (5.7)				30LVS10-R
15 000		0.900 (22.9)	0.210 (5.3)				30LVS15-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?22228)

Y2-capacitor: CB test certificate:	DE1-63499	10 pF to 15 nF	300 V_{AC} (1)
Y2-capacitor: CB test certificate:	DE1-63499	10 pF to 15 nF	250 V_{AC} (1)
X1-capacitor: CB test certificate:	DE1-63499	10 pF to 15 nF	400 V_{AC}

VDE (www.vishay.com/doc?22229)

Y2-capacitor: VDE marks approval:	40003992	10 pF to 15 nF	300 V_{AC} (1)
Y2-capacitor: VDE marks approval:	40003992	10 pF to 15 nF	250 V_{AC} (1)
X1-capacitor: VDE marks approval:	40003992	10 pF to 15 nF	400 V_{AC}

DIN EN 60384-14 VDE 0565-1-1 - Safety tests

Underwriters Laboratories Inc. (www.vishay.com/doc?22230)

Y2-capacitor: UL test certificate:	E99264	10 pF to 15 nF	300 V_{AC}
X1-capacitor: UL test certificate:	E99264	10 pF to 15 nF	400 V_{AC}

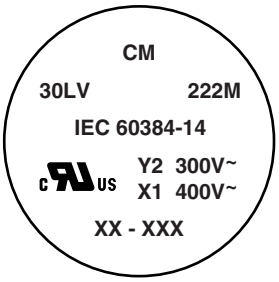
UL 60384-14, CSA E60384-1, CSA E60384-14

Fixed capacitors for electromagnetic interference suppression and connection to the supply mains.

Note
(2) LS ≥ 7.5 mm: 300 V_{AC}; 5.0 mm ≤ LS < 7.5 mm: 250 V_{AC}

MARKING

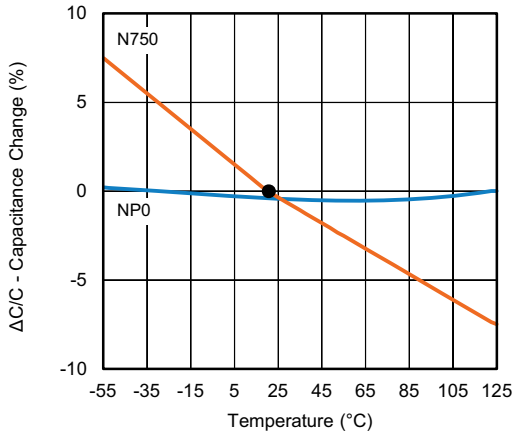
Sample

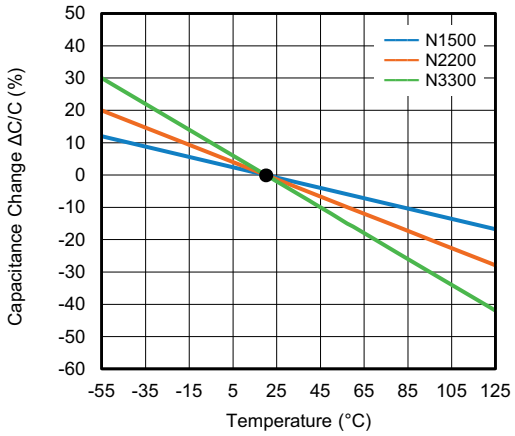


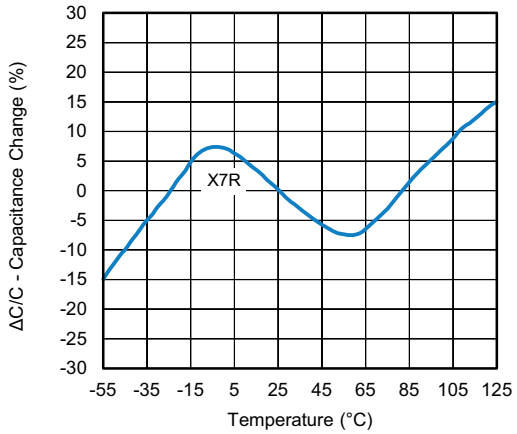
Notes

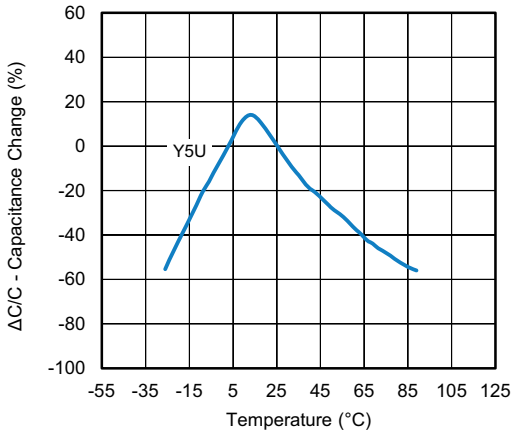
- Marking IEC 60384-14 does not apply for Ø ≤ 9 mm
- "XX - XXX" is a placeholder for date code and lot number:
  "XX -" is the year and month according to IEC 60062
  "- XXX" is the last 3 digits of the lot number

CAPACITANCE CHANGE VS. TEMPERATURE (TYPICAL)

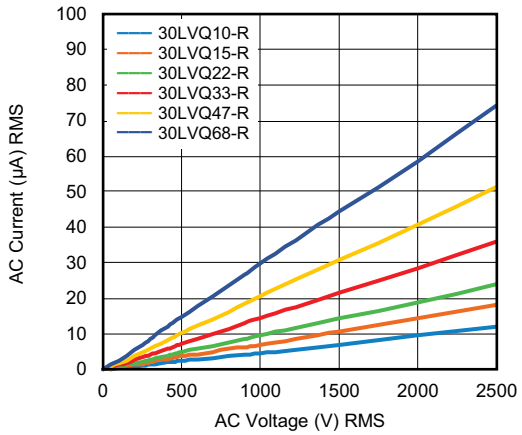


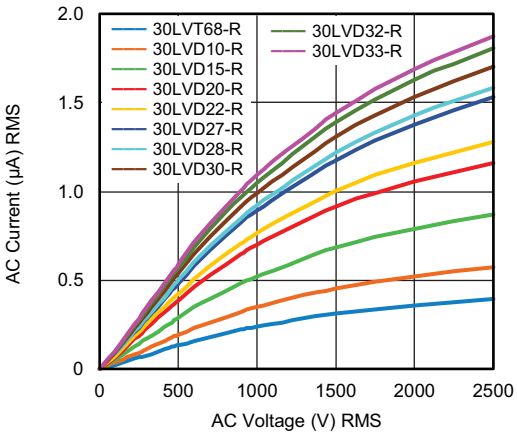


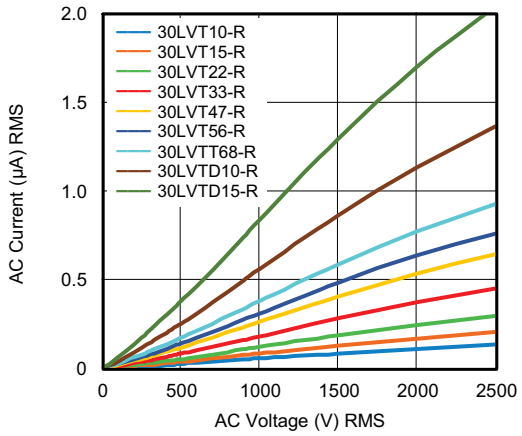


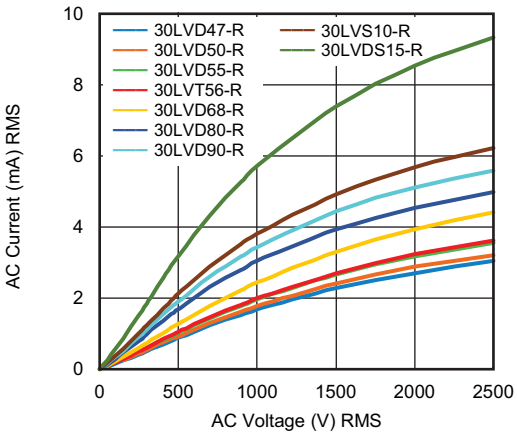


AC CURRENT VS. VOLTAGE (TYPICAL)

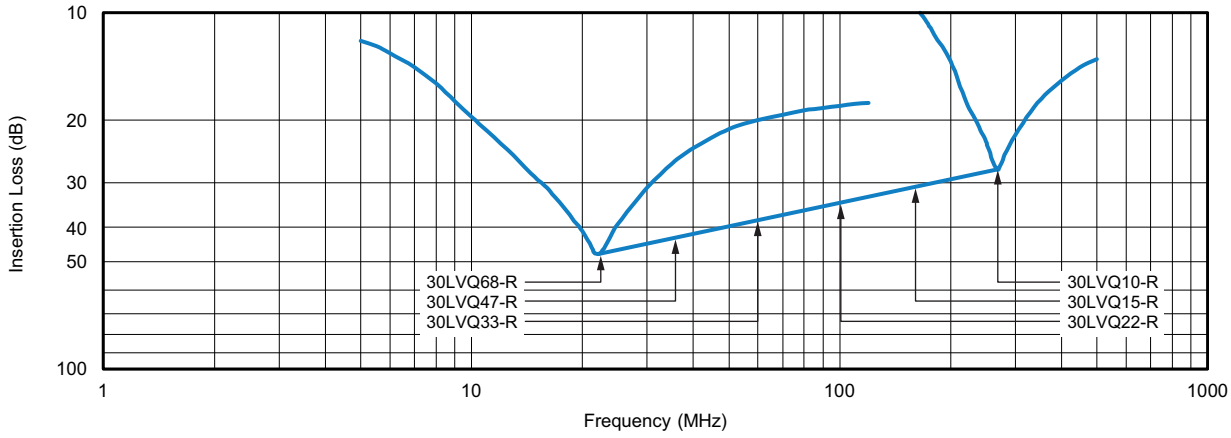


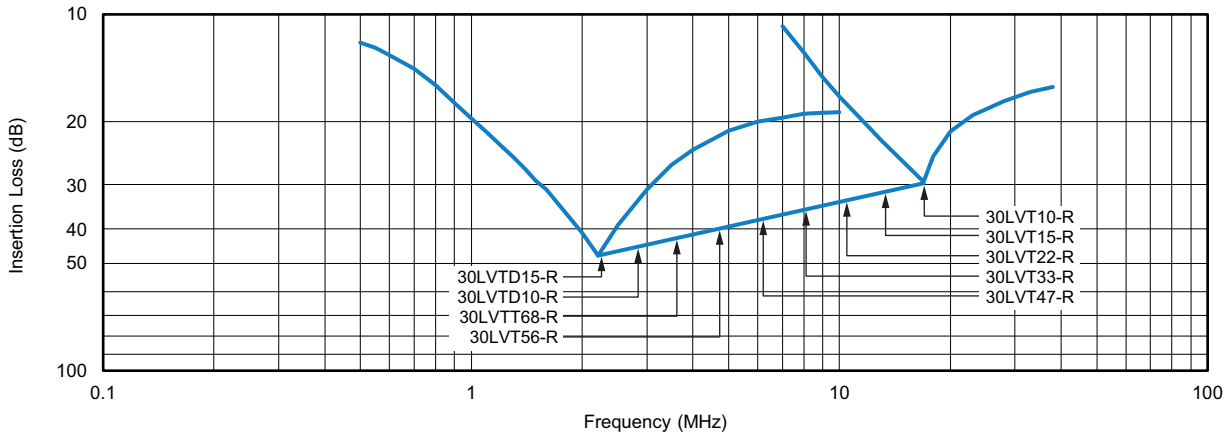


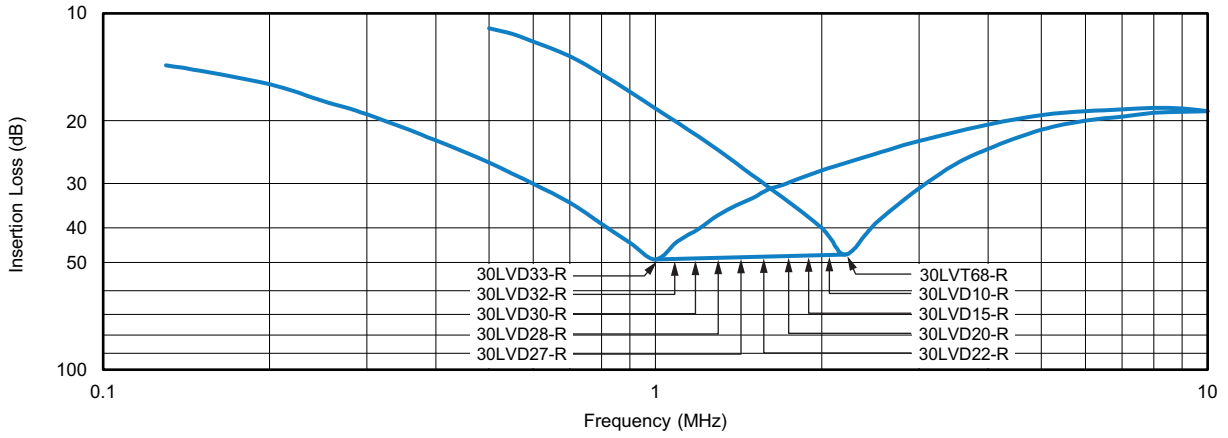


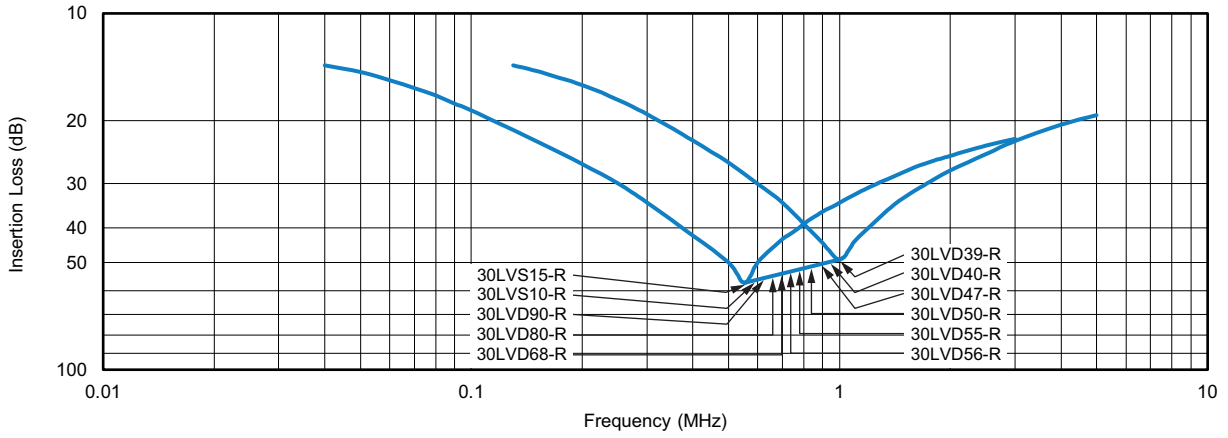


INSERTION LOSS VS. FREQUENCY (Typical)









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?22228
VDE Marks Approval	www.vishay.com/doc?22229
UL Test Certificate	www.vishay.com/doc?22230

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