EMI Suppression Capacitor, Ceramic Disc, Class X1, 440 V_{AC}, Class Y2, 300 V_{AC}



FEATURES

- Complying with IEC 60384-14
- High reliability
- Wide range of different leadstyles
- 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 60384-14.4
- Line-to-line filtering (Class X)
- Line-to-ground filtering (Class Y)
- EMI / RFI suppression and filtering
- Primary and secondary coupling (SMPS)

LINKS TO ADDITIONAL RESOURCES

3D Models

QUICK REFERENCE DATA				
DESCRIPTION	VALUE			
Ceramic class	1		2	
Ceramic dielectric	N750	N750	Y5S, Y5T, Y5U	Y5S, Y5T, Y5U
Voltage (V_{AC})	300	440	300	440
Min. capacitance (pF)	33		68	
Max. capacitance (pF)	47		4700	
Mounting	Radial			

OPERATING TEMPERATURE RANGE

-40 °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

TEMPERATURE CHARACTERISTICS

Class 1: N750

Class 2: Y5S, Y5T, Y5U

SECTIONAL SPECIFICATIONS

Climatic category (according to EN 60058-1)

Class 1: 40 / 125 / 21

Class 2: 40 / 125 / 21

APPROVALS

IEC 60384-14

UL 60384-14

CSA E60384-14

DESIGN

The capacitors consist of ceramic disc both sides of which are silver plated. Connection leads are made of tinned copper clad steel having diameters of 0.6 mm or 0.8 mm.

The capacitors may be supplied with straight or kinked leads having a lead spacing of 7.5 mm or 12.5 mm.

Coating is made of blue colored flame retardant epoxy resin in accordance with UL 94 V-0.

CAPACITANCE RANGE

33 pF to 4.7 nF

TOLERANCE ON CAPACITANCE

± 10 %, ± 20 %

RATED VOLTAGE

- X1: 440 V_{AC}, 50 Hz (IEC 60384-14)
  440 V_{AC}, 50 Hz / 60 Hz (US/UL/CSA 60384-14)
- Y2: 300 V_{AC}, 50 Hz (IEC 60384-14)
  300 V_{AC}, 50 Hz / 60 Hz (US/UL/CSA 60384-14)

TEST VOLTAGE

- 2600 V_{AC}, 50 Hz, 2 s Component test (100 %)
- 2600 V_{AC}, 50 Hz, 60 s Random sampling test (destructive)
- 2600 V_{AC}, 50 Hz, 60 s Voltage proof of coating (destructive)

INSULATION RESISTANCE AT 500 V_{DC}

≥ 6000 MΩ (60 s)

DISSIPATION FACTOR

Class 1: max. 0.5 % (1 MHz)

Class 2: max. 2.5 % (1 kHz)

For technical questions, contact: slcap@vishay.com

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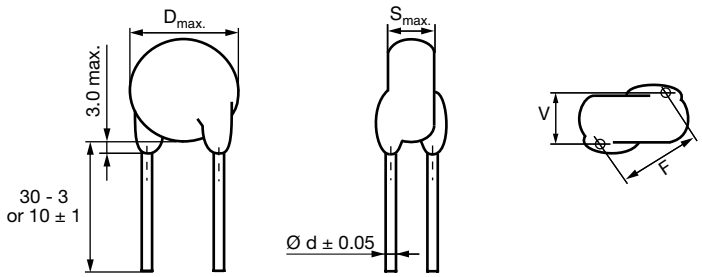
DIMENSIONS in millimeters



TECHNICAL DATA

CAPACITANCE (1) C (pF)	CAPACITANCE TOLERANCE	BODY DIAMETER $D_{MAX.}$ (mm)	BODY THICKNESS $S_{MAX.}$ (mm)	LEAD SPACING (2) F (mm) ± 1 mm	LEAD DIAMETER (2) d (mm) ± 0.05 mm	PART NUMBER MISSING DIGITS SEE ORDERING CODE BELOW
N750						
33	± 10 %, ± 20 %	8.0	5.0	7.5	0.6	WKO330#CP###KR
47						WKO470#CP###KR
Y5S						
68	± 10 %, ± 20 %	8.0	5.0	7.5	0.6	WKO680#CP###KR
100						WKO101#CP###KR
Y5T						
150	± 10 %, ± 20 %	8.0	5.0	7.5	0.6	WKO151#CP###KR
220						WKO221#CP###KR
330						WKO331#CP###KR
Y5U						
470	± 10 %, ± 20 %	8.0	5.0	7.5	0.6	WKO471#CP###KR
680		9.0				WKO681#CP###KR
1000		10.0			0.8	WKO102#CP###KR
1500		12.0				WKO152#CP###KR
2200		13.0				WKO222#CP###KR
3300		15.0				WKO332#CP###KR
3900		16.0				WKO392#CP###KR
4700		18.0		12.5		WKO472#CP###KR

Notes

(1) Capacitance values from 1 nF to 4.7 nF: the alternative usage of VKO series is recommended for new application

(2) Standard lead configuration, other lead spacing and diameter available on request

ORDERING CODE

#	7th digit	Capacitance tolerance	± 10 % = K, ± 20 % = M
###	10th to 12th digit	Lead configuration	See “General Information” www.vishay.com/doc?22001

Example	WKO	222	M	CP	CJ0	K	R
	Series	Capacitance value	Tolerance code	Voltage code	Lead configuration	Internal code	RoHS compliant

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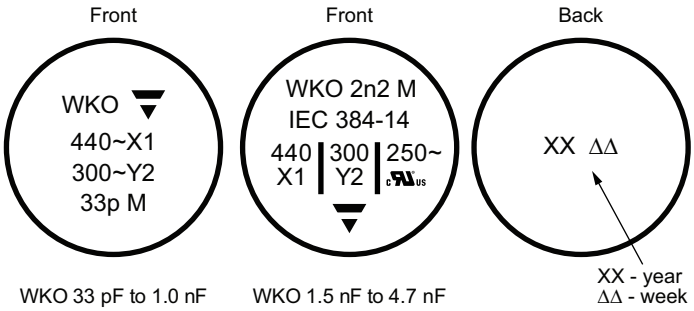
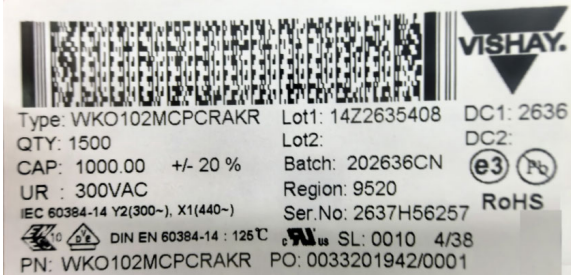
MARKING



WKO 33 pF to 1.0 nF

WKO 1.5 nF to 4.7 nF

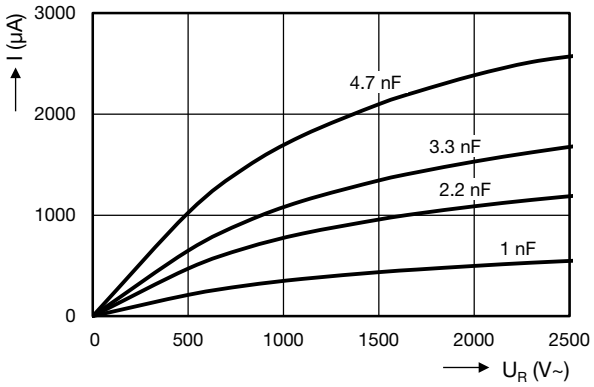


APPROVALS

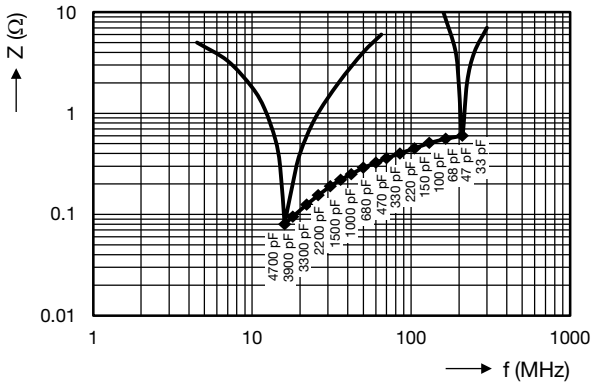
IEC 60384-14 - Safety tests
This approval together with CB test certificate substitutes all national approvals.

CB Certificate (www.vishay.com/doc?22217)				
Y2-capacitor: CB test certificate:	US-26157-UL	33 pF to 4.7 nF	300 V_{AC}	
X1-capacitor: CB test certificate:	US-26157-UL	33 pF to 4.7 nF	440 V_{AC}	
Minimum thickness of insulation: 0.4 mm				
VDE (www.vishay.com/doc?22219)				
Y2-capacitor: VDE marks approval:	136820	33 pF to 4.7 nF	300 V_{AC}	
X1-capacitor: VDE marks approval:	136820	33 pF to 4.7 nF	440 V_{AC}	
DIN EN 60384-14 (VDE 0565-1-1)				
Minimum thickness of insulation: 0.4 mm				
Underwriters Laboratories Inc. / Canadian Standards Association (www.vishay.com/doc?22218)				
Y2-capacitor: UL-test certificate:	E183844	33 pF to 4.7 nF	300 V_{AC}	
X1-capacitor: UL-test certificate:	E183844	33 pF to 4.7 nF	440 V_{AC}	
UL 60384-14, CSA E60384-14				
Minimum thickness of insulation: 0.4 mm				

AC CURRENT VS. VOLTAGE (typical)



IMPEDANCE VS. FREQUENCY (typical)



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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 +35 °C, relative humidity up to 60 %). Class 2 ceramic dielectric capacitors are also subject to aging, see www.vishay.com/doc?22001.

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 °C ± 5 °C	260 °C ± 5 °C
Soldering duration	2 s ± 0.5 s	10 s ± 1 s
Distance from component body	≥ 2 mm	≥ 5 mm

SOLDERING RECOMMENDATIONS

Soldering of the component should be achieved using a Sn60/40 type or a silver-bearing Sn62/36/2Ag type solder. Ceramic capacitors are very sensitive to rapid changes in temperature (thermal shock) therefore the solder heat resistance specification (see Soldering Specifications table) should not be exceeded. Subjecting 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.

CLEANING

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

SOLVENT RESISTANCE

The coating and marking of the capacitors are resistant to the following test method: IEC 60068-2-45 (method XA).

MOUNTING

If a defined product stop is required for mounting on a PCB, a mechanically formed product stop (kinked or inline wire) or a mounting tool should be used.

We do not recommend modifying the lead terminals, e.g. bending or cropping. This action could break the coating or crack the ceramic insert. If however, the lead must be modified in any way, we recommend support of the lead with a clamping fixture next to the coating.

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?22001
CB Test Certificate	www.vishay.com/doc?22217
VDE Marks Approval	www.vishay.com/doc?22219
UL Test Certificate	www.vishay.com/doc?22218

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