



**THE DATASHEET OF
WKO471MCPCRAKR**



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



LINKS TO ADDITIONAL RESOURCES



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

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



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)

DESIGN

The capacitors consist of ceramic disc both sides of which are silver plated. Connection leads are made of tinned copper 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}

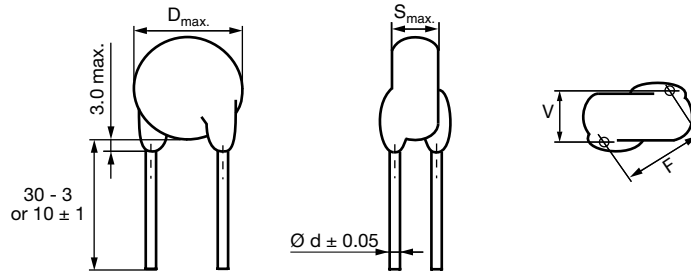
≥ 6000 MΩ (60 s)

DISSIPATION FACTOR

Class 1: max. 0.5 % (1 MHz)

Class 2: max. 2.5 % (1 kHz)

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	WIDTH (2) V (mm) ± 0.5 mm	PART NUMBER MISSING DIGITS SEE ORDERING CODE BELOW		
N750									
33	± 10 %, ± 20 %	8.0	5.0	7.5	0.6	1.6	WKO330#CP###KR		
47							WKO470#CP###KR		
Y5S									
68	± 10 %, ± 20 %	8.0	5.0	7.5	0.6	1.9	WKO680#CP###KR		
100							WKO101#CP###KR		
Y5T									
150	± 10 %, ± 20 %	8.0	5.0	7.5	0.6	1.9	WKO151#CP###KR		
220							WKO221#CP###KR		
330							WKO331#CP###KR		
Y5U									
470	± 10 %, ± 20 %	8.0	5.0	7.5	0.6	2.0	WKO471#CP###KR		
680		9.0					WKO681#CP###KR		
1000		10.0					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			WKO472#CP###KR				
						12.5	0.8	1.6	

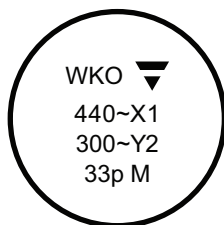
Notes

- Capacitance values from 1 nF to 4.7 nF: the alternative usage of VKO series is recommended for new application
- Standard lead configuration, other lead spacing and diameter available on request

ORDERING CODE

#	7 th digit	Capacitance tolerance	± 10 % = K, ± 20 % = M				
###	10 th to 12 th 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

MARKING



WKO 33 pF to 1.0 nF



WKO 1.5 nF to 4.7 nF

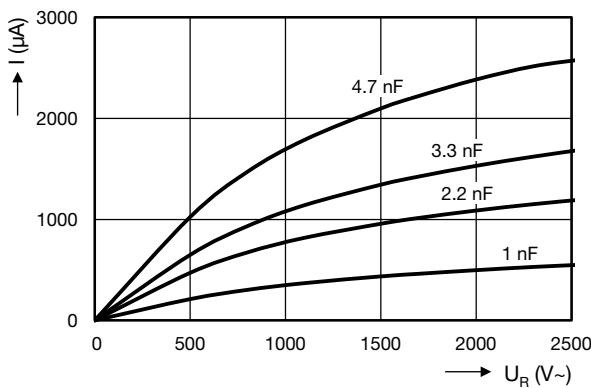
Type: WKO101MCPBRAKR
Cap.: 100pF ±20%
Ur.: 300/440VAC
Qty.: 1500
IEC 60 384-14/2: Y2(300~), X1(440~)
EN132400: 125°C cRus
H= 18+2, **F=** 5.0
PN: WKO101MCPBRAKR

LOT1: 033145 **DC1:** 1134
LOT2: DC2:
BATCH NO.: 201134CZ
REGION: 7032 **S.L.:** 0010

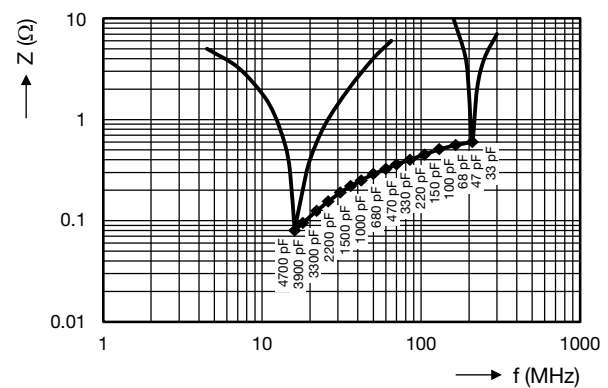
PN: WKO101MCPBRAKR **PO:** 0031254565/0001 **SN:** 28033145B004

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)



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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