AC Line Rated Ceramic Disc Capacitors Class X1, 760 V_{AC}, Class Y1, 500 V_{AC}

FEATURES

- Complying with IEC 60384-14, 3rd edition
- High reliability
- Vertical (inline) kinked or straight leads
- Singlelayer AC Disc capacitors
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

- X1, Y1 according to IEC 60384-14.3
- Across-the-line
- Line by-pass
- Antenna coupling

QUICK REFERENCE DATA				
DESCRIPTION	VALUE			
Ceramic Class	1		2	
Ceramic Dielectric	U2J	U2J	Y5S, Y5U	Y5S, Y5U
Voltage (V_{AC})	500	760	500	760
Min. Capacitance (pF)	10		33	
Max. Capacitance (pF)	22		4700	
Mounting	Radial			

OPERATING TEMPERATURE RANGE

- 40 °C to + 125 °C

TEMPERATURE CHARACTERISTICS

See Ordering Information table

CLIMATIC CATEGORY

40/125/21 according to EN 60068-1

COATING

According to UL 94 V-0
Epoxy resin, isolating, flame retardant

APPROVALS

IEC 60384-14.3
UL 60384-14
DIN EN 60384-14
CSA E60384-1:03, CSA E60384-14:09

PACKAGING

Bulk, tape and reel, taped ammopack

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 10.0 mm and 12.5 mm. Encapsulation is made of flammable resistant epoxy resin in accordance with “UL 94 V-0”.

CAPACITANCE RANGE

10 pF to 4700 pF

RATED VOLTAGE U_R

IEC 60384-14.3:
(X1): 760 V_{AC}, 50 Hz
(Y1): 500 V_{AC}, 50 Hz

TEST VOLTAGE

Component test (100 %):
4000 V_{AC}, 50 Hz, 2 s
Random sampling test (destructive test):
4000 V_{AC}, 50 Hz, 60 s
Voltage proof of coating (destructive test):
4000 V_{AC}, 50 Hz, 60 s

INSULATION RESISTANCE

10 000 MΩ minimum

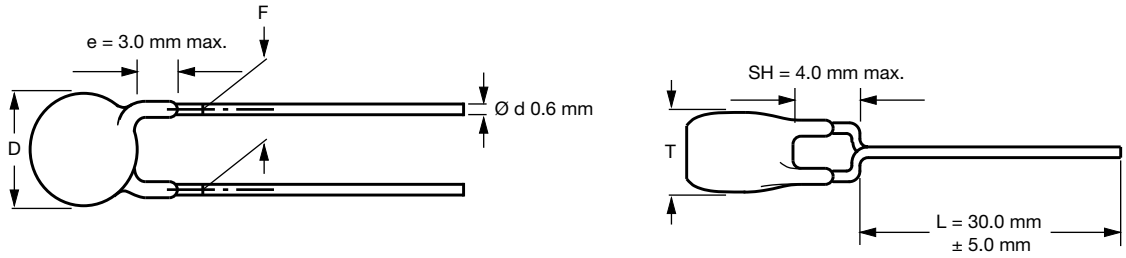
TOLERANCE OF CAPACITANCE

± 20 % (code M); ± 10 % (code K)

DISSIPATION FACTOR

2.5 % maximum

DIMENSIONS



Capacitors with 10.0 mm and 12.5 mm lead spacing

ORDERING INFORMATION

C (pF)	TOL. (%)	TEMP. COEFFICIENT	BODY DIAMETER $D_{MAX.}$ (mm)	BODY THICKNESS $T_{MAX.}$ (mm)	LEAD SPACING F (mm)	CLEAR TEXT CODE 15TH DIGIT: T = REEL; U = AMMO; 3 = BULK (1)	
						RoHS COMPLIANT	RoHS AND HALOGEN-FREE
10	± 10	U2J (N750)	8.0	5.0	10.0	VY1100K31U2JQ6*V0	VY1100K31U2JG6*V0
15						VY1150K31U2JQ6*V0	VY1150K31U2JG6*V0
22						VY1220K31U2JQ6*V0	VY1220K31U2JG6*V0
33		Y5S (2C3)				VY1330K31Y5SQ6*V0	VY1330K31Y5SG6*V0
47						VY1470K31Y5SQ6*V0	VY1470K31Y5SG6*V0
68						VY1680K31Y5SQ6*V0	VY1680K31Y5SG6*V0
100						VY1101K31Y5SQ6*V0	VY1101K31Y5SG6*V0
150						VY1151K31Y5SQ6*V0	VY1151K31Y5SG6*V0
220						VY1221K31Y5SQ6*V0	VY1221K31Y5SG6*V0
330						VY1331K31Y5SQ6*V0	VY1331K31Y5SG6*V0
470	± 20	Y5U (2E3)				VY1471M31Y5UQ6*V0	VY1471M31Y5UG6*V0
680						VY1681M31Y5UQ6*V0	VY1681M31Y5UG6*V0
1000			9.0			VY1102M35Y5UQ6*V0	VY1102M35Y5UG6*V0
1500			10.5			VY1152M41Y5UQ6*V0	VY1152M41Y5UG6*V0
2200			12.0			VY1222M47Y5UQ6*V0	VY1222M47Y5UG6*V0
3300			15.0			VY1332M59Y5UQ6*V0	VY1332M59Y5UG6*V0
3900			15.5			VY1392M61Y5UQ6*V0	VY1392M61Y5UG6*V0
4700			16.0			VY1472M63Y5UQ6*V0	VY1472M63Y5UG6*V0
10	± 10	U2J (N750)	8.0	5.0	12.5	VY1100K31U2JQ6*VX	VY1100K31U2JG6*VX
15						VY1150K31U2JQ6*VX	VY1150K31U2JG6*VX
22						VY1220K31U2JQ6*VX	VY1220K31U2JG6*VX
33		Y5S (2C3)				VY1330K31Y5SQ6*VX	VY1330K31Y5SG6*VX
47						VY1470K31Y5SQ6*VX	VY1470K31Y5SG6*VX
68						VY1680K31Y5SQ6*VX	VY1680K31Y5SG6*VX
100						VY1101K31Y5SQ6*VX	VY1101K31Y5SG6*VX
150						VY1151K31Y5SQ6*VX	VY1151K31Y5SG6*VX
220						VY1221K31Y5SQ6*VX	VY1221K31Y5SG6*VX
330						VY1331K31Y5SQ6*VX	VY1331K31Y5SG6*VX
470	± 20	Y5U (2E3)				VY1471M31Y5UQ6*VX	VY1471M31Y5UG6*VX
680						VY1681M31Y5UQ6*VX	VY1681M31Y5UG6*VX
1000			9.0			VY1102M35Y5UQ6*VX	VY1102M35Y5UG6*VX
1500			10.5			VY1152M41Y5UQ6*VX	VY1152M41Y5UG6*VX
2200			12.0			VY1222M47Y5UQ6*VX	VY1222M47Y5UG6*VX
3300			15.0			VY1332M59Y5UQ6*VX	VY1332M59Y5UG6*VX
3900			15.5			VY1392M61Y5UQ6*VX	VY1392M61Y5UG6*VX
4700			16.0			VY1472M63Y5UQ6*VX	VY1472M63Y5UG6*VX

Notes
- Straight leads are available on request
- Coating extension DR valid for straight leads only
- On request available: ± 10 % tolerance

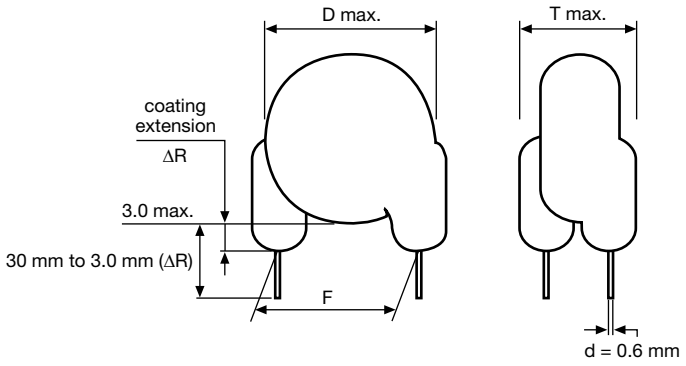
(1) 15th digit of the clear text code number to be completed with the packaging code

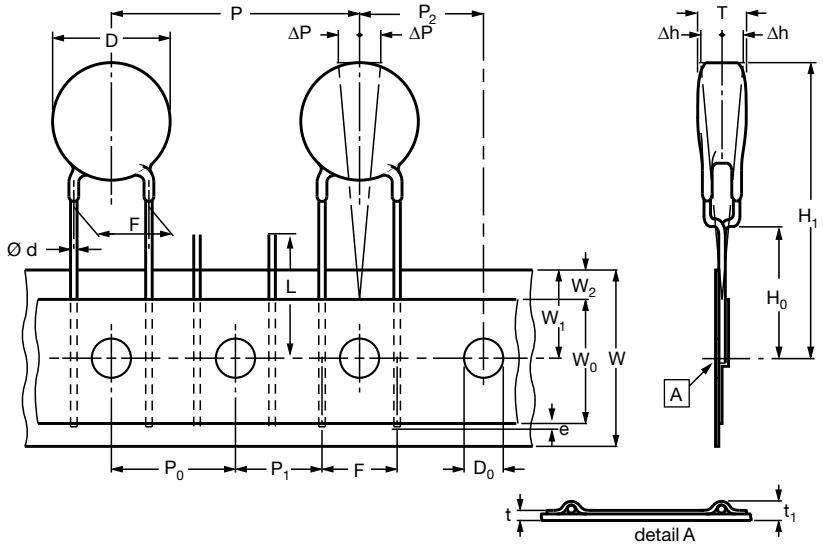
PACKAGING					
CAPACITANCE VALUE	SIZE CODE	BODY DIAMETER $D_{MAX.}$ (mm)	PACKAGING QUANTITIES		
			BULK	REEL	AMMO
10 pF to 2200 pF	31 to 47	12.0	1000	500	750
3300 pF to 4700 pF	51 to 63	16.0	500	500	750

Note

- The capacitors are supplied in bulk packaging (cardboard boxes), in tape on reel in ammopack

STRAIGHT LEADS





Lead spacing 10.0 mm and 12.5 mm, sprocket hole pitch 25.04 mm for lead spacing

DIMENSIONS OF TAPE		
SYMBOL	PARAMETER	DIMENSIONS (mm)
		FIG. 2
D (1)	Body diameter	16.0 max.
d	Lead diameter	0.6 ± 0.05
P	Pitch of component	25.4 ± 1
P_0 (2)	Pitch of sprocket hole	12.7 ± 0.3
P_1 (3)	Distance, hole center to lead	7.7 or 6.4 ± 1.0
P_2 (3)	Distance, hole to center of component	12.7 ± 1.5
F	Lead spacing	10.0 or 12.5 + 0.6/- 0.4
Δh	Average deviation across tape	± 1.0 max.
ΔP	Average deviation in direction of reeling	± 1.0 max.
W	Carrier tape width	18.0 + 1/- 0.5
W_0	Hold-down tape width	5.0 min.
W_1	Position of sprocket hole	9.0 + 0.75/- 0.5
W_2	Distance of hold-down tape	3.0 max.
H_1	Maximum component height	40.0
H_0	Height to seating plane (for kinked leads)	16.0 ± 0.5
H_0	Height to seating plane (for straight leads)	20.0 ± 0.5
L	Length of cut leads	11.0 max.
I	Length of lead protrusion	1.0 max.
D_0	Diameter of sprocket hole	4.0 ± 0.2
t	Total tape thickness	0.9 max.

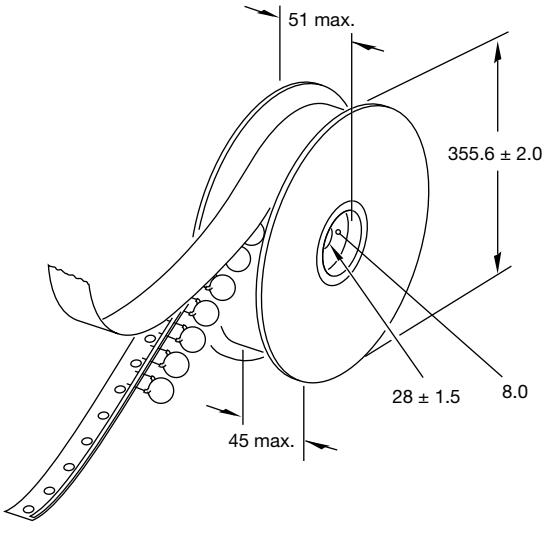
Notes

(1) See Ordering Information table

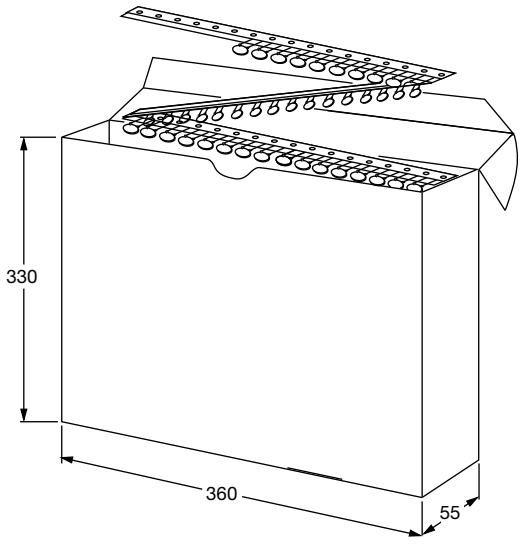
(2) Cumulative pitch error: ± 1 mm/20 pitches

(3) Obliquity maximum 3°

REEL AND TAPE DATA in millimeters



Reel with capacitors on tape



Ammopack with capacitors on tape

APPROVALS

IEC 60384-14.3 - Safety tests
This approval together with CB test certificate substitutes all national approvals.

CB Certificate

Y1-capacitor: CB test certificate:	US-19600-UL	10 pF to 4.7 nF	500 V_{AC}	
X1-capacitor: CB test certificate:	US-19600-UL	10 pF to 4.7 nF	760 V_{AC}	

VDE

Y1-capacitor: VDE marks approval:	40012673	10 pF to 4.7 nF	500 V_{AC}	
X1-capacitor: VDE marks approval:	40012673	10 pF to 4.7 nF	760 V_{AC}	

DIN EN 60384-14 VDE 0565-1-1:2006-04 - Safety tests

Underwriters Laboratories Inc./Canadian Standards Association

Y1-capacitor: CSA test certificate:	E183844	10 pF to 4.7 nF	500 V_{AC}	
X1-capacitor: CSA test certificate:	E183844	10 pF to 4.7 nF	760 V_{AC}	

UL 60384-14, CSA E60384-1:03, CSA E60384-14:09

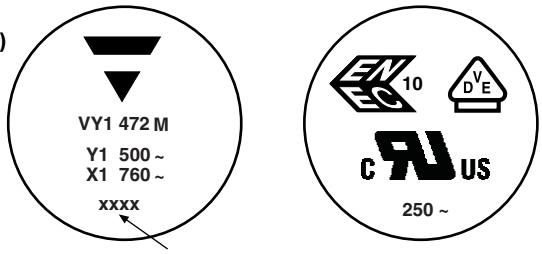
Fixed capacitors for electromagnetic interference suppression and connection to the supply mains.

CQC

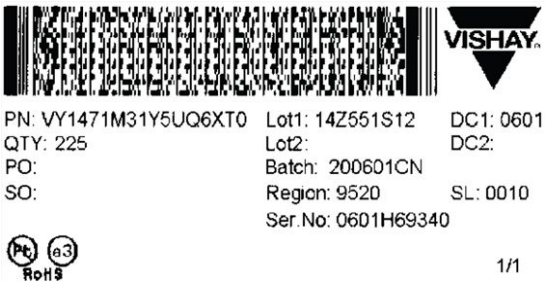
Y1-capacitor: CQC test certificate:	C0042538	10 pF to 4.7 nF	500 V_{AC}	
X1-capacitor: CQC test certificate:	C0042538	10 pF to 4.7 nF	760 V_{AC}	

MARKING

Sample (2 sides)

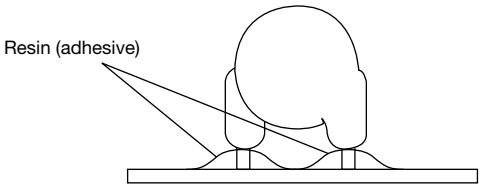


4 digit date code (year/week)

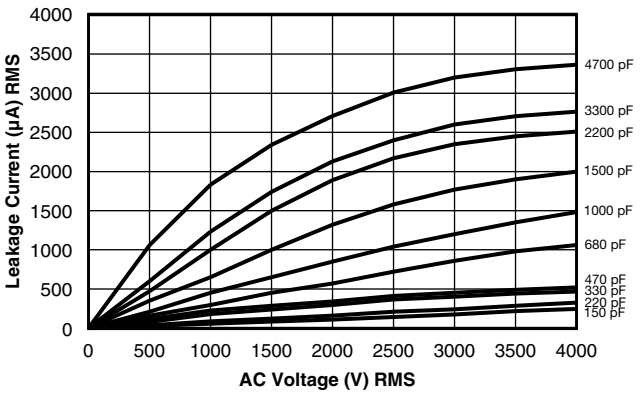


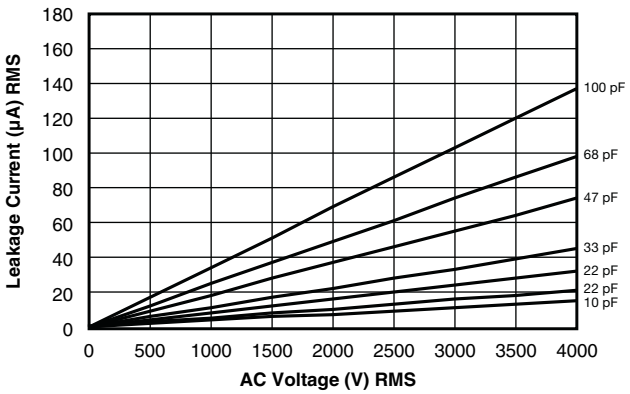
PERFORMANCE

TEST	TEST CONDITION	TEST LIMITS
Visual and mechanical inspection	Optical inspection, dimensions measured with caliper	No visible damage, marking legible
Capacitance (C)	25 °C ± 3 °C , relative humidity (RH) ≤ 75 %, 1.0 V_{RMS} ± 0.2 V_{RMS} at 1 kHz for Y5U and Y5S, and 1 MHz for U2J	Capacitance within specified tolerance
Dissipation factor (DF)		DF ≤ 0.3 % for U2J and DF ≤ 2.5 % for Y5S and Y5U
Insulation resistance (IR)	Measured within 60 s ± 5 s after charging at 500 V_{DC}	10 000 MΩ min.
Dielectric strength	4000 V_{AC} at 50 Hz/60 Hz for 1 min, 50 mA max.	No failure
Temperature characteristic	RH ≤ 75 %, 1.0 V_{RMS} ± 0.2 V_{RMS} at 1 kHz for Y5U and Y5S, and 1 MHz for U2J	U2J: -750 ppm ± 120 ppm Y5S: ± 22 % Y5U: +22 %/-56 %
Impulse voltage	3 pulses of 8 kV	No failure

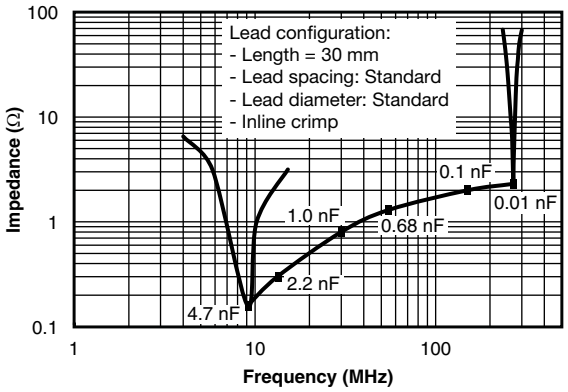
PERFORMANCE		
TEST	**TEST CONDITION**	**TEST LIMITS**
Life test	1000 h at 125 °C ± 2 °C, 850 V_{AC}/50 Hz; once every hour 1000 V_{AC} for 0.1 s	External appearance: No visible damage $\Delta C \leq \pm 15$ % DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S and Y5U IR ≥ 3000 MΩ Dielectric strength: No failure
Humidity test	500 h at 500 V_{AC}, 50 Hz and 500 h unloaded 40 °C, RH = 90 % to 95%	External appearance: No visible damage $\Delta C \leq \pm 10$ % for U2J and ≤ ± 15 % for Y5S and Y5U DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S and Y5U IR ≥ 3000 MΩ Dielectric strength: No failure
Robustness of termination	Pull test: 0.5 kg tensile weight in radial direction for 10 s ± 1 s Bending strength: Capacitor body rotated by 90° in both directions	No damage to capacitor body and lead wire
Soldering effect	Immersion of lead wires into 260 °C ± 5 °C solder for 10 s ± 2 s; min. distance from body: 1.5 mm Hand soldering at 400 °C ± 10 °C for 3 s to 4 s; min. distance from body: 1.5 mm	External appearance: No visible damage $\Delta C \leq \pm 5$ % for U2J and ≤ ± 10 % for Y5S and Y5U Dielectric strength: No failure
Vibration test	 Solder the capacitor onto test jig (glass epoxy body) and use resin (adhesive) to stick the body to the test jig. The capacitor must be soldered firmly to the supporting lead wire. Vibration change from 10 Hz to 2000 Hz and back to 10 Hz; Total amplitude: 1.5 mm; Acceleration: 100 m/s2; Sweep rate: 1 oct/min, each axis 2 h (6 h in total)	External appearance: No visible damage Capacitance within specified tolerance DF ≤ 0.3 % for U2J and ≤ 2.5 % for Y5S and Y5U IR ≥ 10 000 GΩ

LEAKAGE CURRENT VS. VOLTAGE (Typical)





IMPEDANCE VS. FREQUENCY (Typical)



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.

RELATED DOCUMENTS	
General Information	www.vishay.com/doc?28536
CB Test Certificate	www.vishay.com/doc?22249
VDE Marks Approval	www.vishay.com/doc?22251
UL Test Certificate	www.vishay.com/doc?22250
CQC Test Certificate	www.vishay.com/doc?22248

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