

EMI Suppression Safety Capacitor, Ceramic Disc, Class X1, 760 V_{AC}, Class Y1, 500 V_{AC}



LINKS TO ADDITIONAL RESOURCES


[SPICE Models](#)

RoHS
COMPLIANT

HALOGEN

FREE**GREEN**

(5-2008)

FEATURES

- Complying with IEC 60384-14
- High reliability
- Vertical (inline) kinked or straight leads
- Singlelayer AC disc safety capacitors
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- X1, Y1 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 capacitor consists of a ceramic disc which is silver plated on both sides. Connection leads are made of tinned copper clad steel 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, or 12.5 mm. Encapsulation is made of flame retardant epoxy resin in accordance with UL 94 V-0.

CAPACITANCE RANGE

10 pF to 4700 pF

RATED VOLTAGE U_R

IEC 60384-14:

(X1): 760 V_{AC}, 50 Hz(Y1): 500 V_{AC}, 50 Hz1500 V_{DC}

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

CAPACITANCE TOLERANCE

± 20 % (code M); ± 10 % (code K)

DISSIPATION FACTOR

Class 1: max. 0.5 % (1 MHz)

Class 2: max. 2.5 % (1 kHz)

QUICK REFERENCE DATA

DESCRIPTION	VALUE			
Ceramic class	1		2	
Ceramic dielectric	U2J	U2J	Y5S, Y5U, Y5V	Y5S, Y5U, Y5V
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

Class 1: U2J

Class 2: Y5S, Y5U, Y5V

SECTIONAL SPECIFICATIONS

Climatic category (according to EN 60058-1)

Class 1 and class 2: 40 / 125 / 21

COATING

According to UL 94 V-0

Epoxy resin, isolating, flame retardant

Halogen-free available

Reinforced insulation

APPROVALS

IEC 60384-14

UL 60384-14

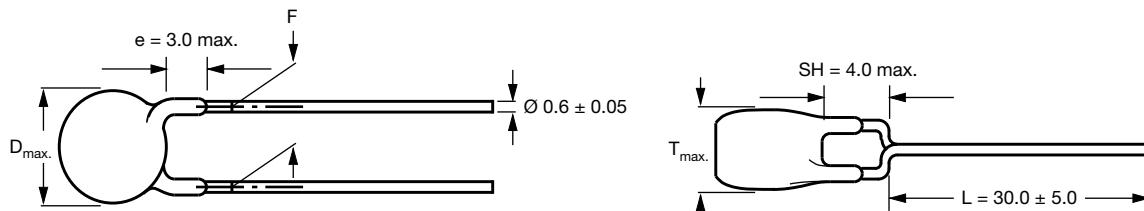
DIN EN 60384-14

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

CQC11-471112-2009

PACKAGING

Bulk, tape and reel, taped ammopack

DIMENSIONS in millimeters


Capacitors with 10.0 mm or 12.5 mm lead spacing

TECHNICAL DATA

CAPACITANCE C (pF)	CAPACITANCE TOLERANCE (%)	BODY DIAMETER $D_{max.}$ (mm)	BODY THICKNESS $T_{max.}$ (mm)	LEAD SPACING F (mm) ± 1 mm	PART NUMBER
					MISSING DIGITS SEE ORDERING CODE BELOW
U2J					
10	± 10	8.0	5.0	10.0 or 12.5	VY1100K31U2JQ6###
15					VY1150K31U2JQ6###
22					VY1220K31U2JQ6###
Y5S					
33	± 10	8.0	5.0	10.0 or 12.5	VY1330K31Y5SQ6###
47					VY1470K31Y5SQ6###
68					VY1680K31Y5SQ6###
100					VY1101K31Y5SQ6###
150					VY1151K31Y5SQ6###
220					VY1221K31Y5SQ6###
330					VY1331K31Y5SQ6###
Y5U					
470	± 20 ⁽¹⁾	8.0	5.0	10.0 or 12.5	VY1471#31Y5UQ6###
680					VY1681#31Y5UQ6###
1000					VY1102#35Y5UQ6###
1500					VY1152#41Y5UQ6###
2200					VY1222#47Y5UQ6###
3300					VY1332#59Y5UQ6###
3900					VY1392#61Y5UQ6###
4700					VY1472#63Y5UQ6###
Y5V					
1000	± 20	7.5	5.5	10.0 or 12.5	VY1102M29Y5VQ6###
1500					VY1152M33Y5VQ6###
2200					VY1222M37Y5VQ6###
3300					VY1332M43Y5VQ6###
3900					VY1392M47Y5VQ6###
4700					VY1472M51Y5VQ6###

Notes

- Straight leads available on request
- Coating extension DR valid for straight leads only

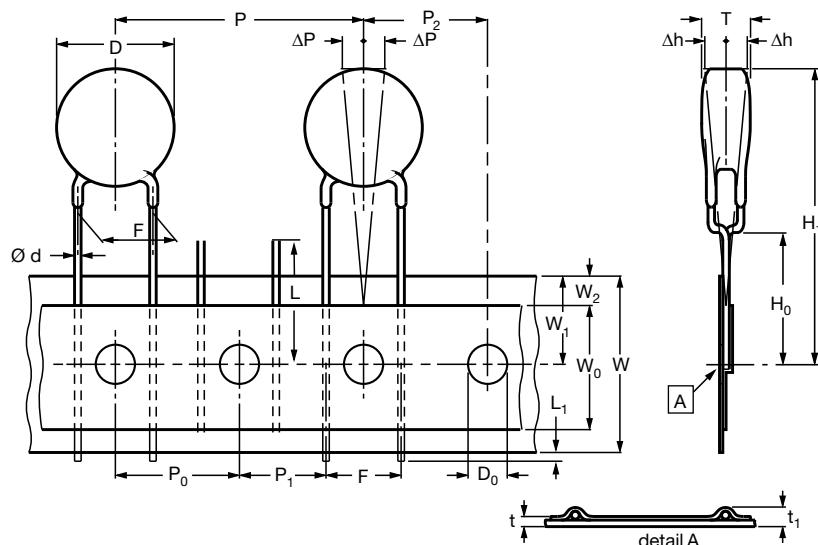
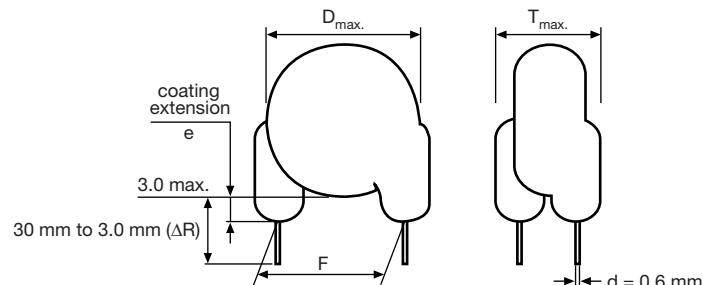
⁽¹⁾ ± 10 % available on request

ORDERING CODE										
#	7 th digit	Capacitance tolerance					$\pm 10\% = K, \pm 20\% = M$			
###	15 th to 17 th digit	Lead configuration			Available configurations see below					
Example	VY1	101	K	31	Y5S	Q	6	T	V	0
	Series	Capacitance value	Tolerance code	Size code	Temperature coefficient	Rated voltage	Lead wire diameter	Packaging / lead length	Lead style	Lead spacing
						Q = X1/Y1 500 V (AC)		3 = bulk T = tape and reel U = ammopack	L = straight V = inline kinked	0 = 10.0 X = 12.5

PACKAGING										
SIZE CODE	BODY DIAMETER $D_{max.}$ (mm)	PACKAGING QUANTITIES								
		BULK	REEL	AMMO						
31 to 47	12.0	1000	500	750						
51 to 63	16.0	500	500	750						

Note

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

STRAIGHT LEADS


The sprocket hole pitch (P_0) is 12.7 mm for lead spacing 10.0 mm and 12.5 mm

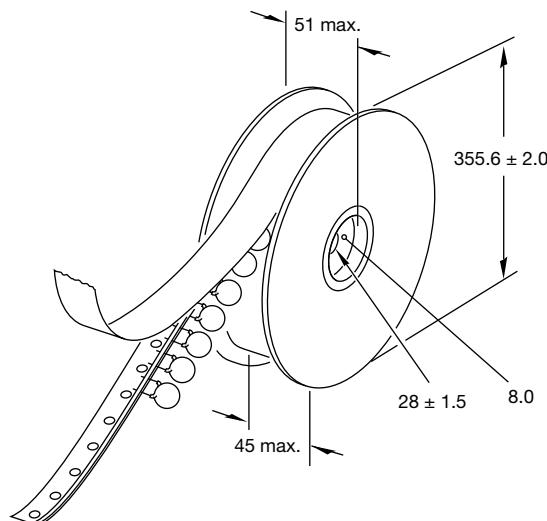
DIMENSIONS OF TAPE		
SYMBOL	PARAMETER	DIMENSIONS (mm)
D ⁽¹⁾	Body diameter	16.0 max.
d	Lead diameter	0.6 ± 0.05
P	Pitch of component	25.4 ± 1
P ₀ ⁽²⁾	Pitch of sprocket hole	12.7 ± 0.3
P ₁ ⁽³⁾	Distance, hole center to lead	7.7 or 6.4 ± 1.0
P ₂ ⁽³⁾	Distance, hole to center of component	12.7 ± 1.5
F	Lead 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.
L ₁	Length of lead protrusion	1.0 max.
D ₀	Diameter of sprocket hole	4.0 ± 0.2
t	Total tape thickness	0.9 max.
t ₁	Total tape thickness with lead wire	t + d

Notes

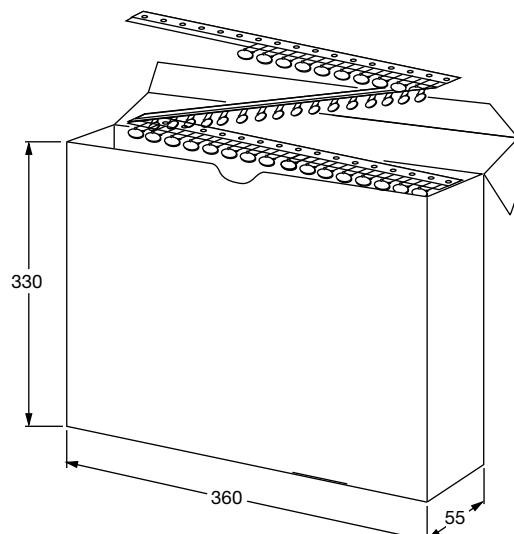
(1) See "Technical Data" table

(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 - Safety tests

This approval together with CB test certificate substitutes all national approvals.

CB Certificate

Y1-capacitor: CB test certificate:

US-26561-UL

10 pF to 4.7 nF

 500 V_{AC}

X1-capacitor: CB test certificate:

US-26561-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:

CQC05001015032

10 pF to 4.7 nF

 500 V_{AC}

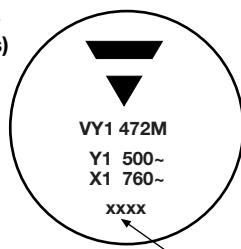
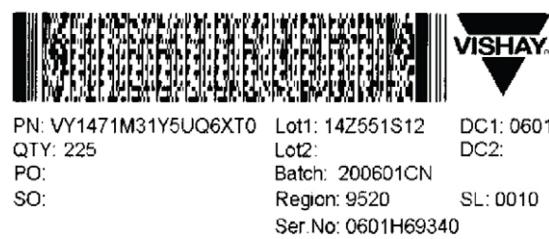
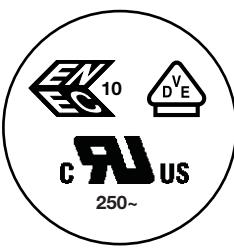
X1-capacitor: CQC test certificate:

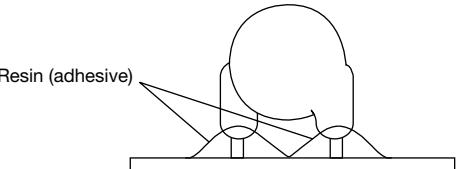
CQC05001015032

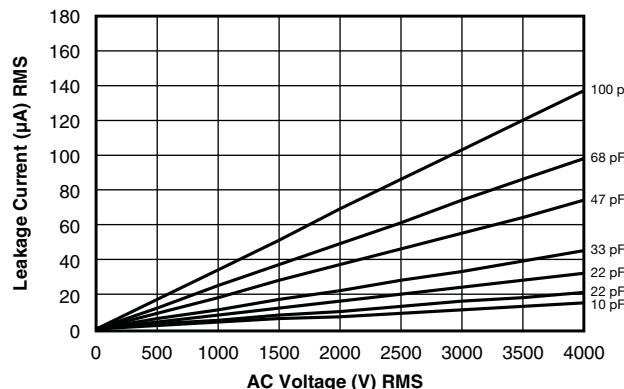
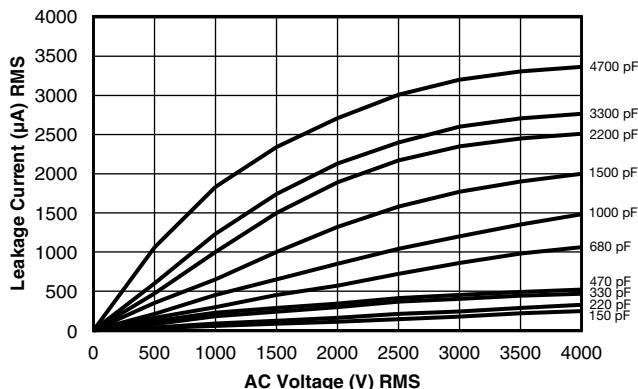
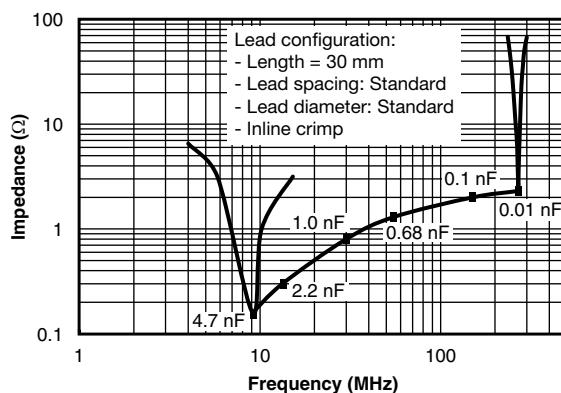
10 pF to 4.7 nF

 760 V_{AC}

MARKING

 Sample
(2 sides)

 4 digit date code
(year/week; add suffix "V" for Y5V)


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 %,	Capacitance within specified tolerance
Dissipation factor (DF)	1.0 V _{RMS} ± 0.2 V _{RMS} at 1 kHz for Y5U and Y5S, and 1 MHz for U2J	DF ≤ 0.3 % for U2J and DF ≤ 2.5 % for Y5S, Y5U, and Y5V
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
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 ΔC/C ≤ ± 15 % DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S, Y5U, and Y5V 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 ΔC/C ≤ ± 10 % for U2J and ≤ ± 15 % for Y5S and Y5U DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S, Y5U, and Y5V 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 ΔC/C ≤ ± 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, Y5U, and Y5V 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 $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$, 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
LTspice® Models	www.vishay.com/doc?28568

SAMPLE KITS

Part Number (VY1 Sample Kit)	VY11-KIT-HF
Link (VY1 Sample Kit)	www.vishay.com/doc?28552
Part Number (VY1...Y5V Sample Kit)	VY1-KIT-MS
Link (VY1...Y5V Sample Kit)	www.vishay.com/doc?28561

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