VY1 Series



Vishay BCcomponents

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



LINKS TO ADDITIONAL RESOURCES



SPICE Models

QUICK REFERENCE DATA					
DESCRIPTION	VALUE				
Ceramic Class	1 2			2	
Ceramic Dielectric	U2J U2J		Y5S, Y5U, Y5V	Y5S, Y5U, Y5V	
Voltage (V _{AC})	500 760		500	760	
Min. Capacitance (pF)	10 33			3	
Max. Capacitance (pF)	22		47	00	
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

Revision: 28-Jan-2022

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Document Number: 28537

For technical questions, contact: cdc@vishay.com

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 UR

IEC 60384-14: (X1): 760 V_{AC} 50 Hz (Y1): 500 V_{AC}, 50 Hz 1500 VDC

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

 \geq 10 000 M Ω

CAPACITANCE TOLERANCE

± 20 % (code M); ± 10 % (code K)

DISSIPATION FACTOR

Class 1: max. 0.5 % (1 MHz) Class 2: max. 2.5 % (1 kHz)



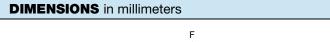
RoHS COMPLIANT HALOGEN FREE GREEN (5-2008)

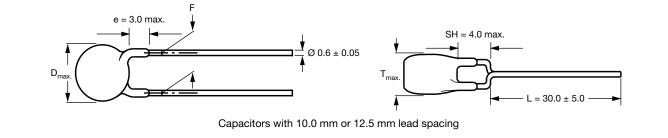
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CAPACITANCE	CAPACITANCE	BODY	BODY	LEAD SPACING	PART NUMBER
CAPACITANCE C (pF)			F (mm) ± 1 mm	MISSING DIGITS SEE ORDERING CODE BELOW	
U2J					
10					VY1100K31U2JQ6###
15	± 10	8.0	5.0	10.0 or 12.5	VY1150K31U2JQ6###
22					VY1220K31U2JQ6###
Y5S					
33					VY1330K31Y5SQ6###
47					VY1470K31Y5SQ6###
68					VY1680K31Y5SQ6###
100	± 10	8.0	5.0	10.0 or 12.5	VY1101K31Y5SQ6###
150					VY1151K31Y5SQ6###
220					VY1221K31Y5SQ6###
330					VY1331K31Y5SQ6###
Y5U					
470		8.0			VY1471#31Y5UQ6###
680		8.0			VY1681#31Y5UQ6###
1000		9.0	-		VY1102#35Y5UQ6###
1500	± 20 ⁽¹⁾	10.5	5.0	10.0 or 12.5	VY1152#41Y5UQ6###
2200	± 20 (1)	12.0	5.0	10.0 01 12.5	VY1222#47Y5UQ6###
3300		15.0			VY1332#59Y5UQ6###
3900		15.5			VY1392#61Y5UQ6###
4700		16.0			VY1472#63Y5UQ6###
Y5V MINI SIZE SEI	RIES				
1000		7.5			VY1102M29Y5VQ6###
1500		8.5		Γ	VY1152M33Y5VQ6###
2200	. 00	9.5		10.0 or 10.5	VY1222M37Y5VQ6###
3300	± 20	11.0	5.5	10.0 or 12.5	VY1332M43Y5VQ6###
3900		12.0	1	l T	VY1392M47Y5VQ6###
4700		13.0	1		VY1472M51Y5VQ6###

Notes

• Straight leads available on request

· Coating extension DR valid for straight leads only

 $^{(1)}$ ± 10 % available on request

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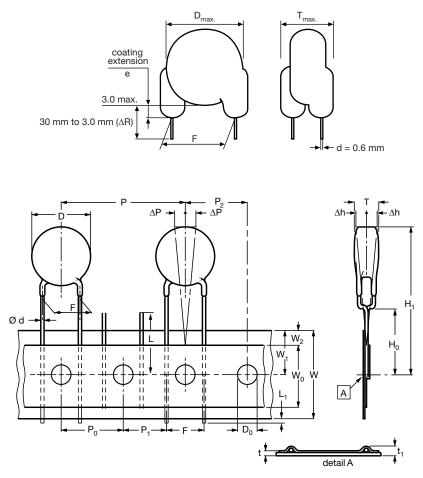
ORDERING CODE										
#	7 th digit		Capacitance tolerance		± 10 % =	± 10 % = K, ± 20 % = M				
###	15 th to 17	7 th digit	Lead configuration		Available	Available configurations see below				
Example	VY1	101	К	31	Y5S	Q	6	т	V	0
	Series	Capacitance value	Tolerance code	Size code	Temperature coefficient	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	PACKAGING QUANTITIES			
SIZE CODE	D _{max.} (mm)	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 (P₀) is 12.7 mm for lead spacing 10.0 mm and 12.5 mm

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DIMENSIONS OF TAPE					
SYMBOL	PARAMETER	DIMENSIONS (mm)			
D ⁽¹⁾	Body diameter	16.0 max.			
d	Lead diameter	0.6 ± 0.05			
Р	Pitch of component	25.4 ± 1			
P ₀ ⁽²⁾	Pitch of sprocket hole	12.7 ± 0.3			
P1 ⁽³⁾	Distance, hole center to lead	7.7 or 6.4 ± 1.0			
P2 ⁽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.			
ΔΡ	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			

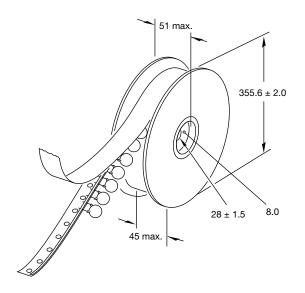
Notes

⁽¹⁾ See "Technical Data" table

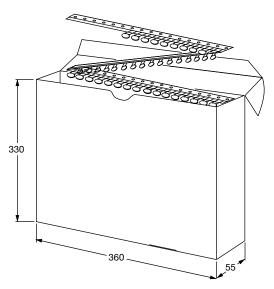
⁽²⁾ Cumulative pitch error: ± 1 mm/20 pitches

⁽³⁾ Obliquity maximum 3°

REEL AND TAPE DATA in millimeters



Reel with capacitors on tape



Ammopack with capacitors on tape

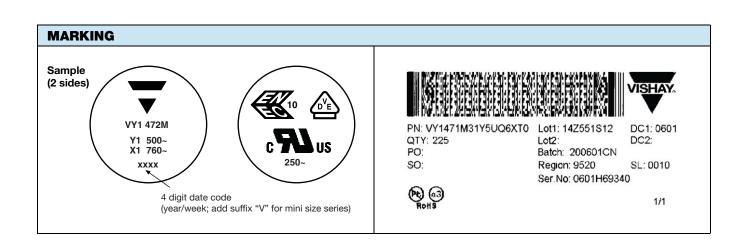
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APPROVALS					
IEC 60384-14 - Safety tests This approval together with CB test certificate substit	utes all national approvals				
CB Certificate					
Y1-capacitor: CB test certificate:	US-26561-UL	10 pF to 4.7 nF	500 V _{AC}	(Ui)	
X1-capacitor: CB test certificate:	US-26561-UL	10 pF to 4.7 nF	760 V _{AC}		
VDE				\wedge	
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 tes	sts				
Underwriters Laboratories Inc./Canadian Standard	ds Association				
Y1-capacitor: CSA test certificate:	E183844	10 pF to 4.7 nF	500 V _{AC}	R	
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				\frown	
Y1-capacitor: CQC test certificate:	CQC05001015032	10 pF to 4.7 nF	500 V _{AC}	(COC)	
X1-capacitor: CQC test certificate:	CQC05001015032	10 pF to 4.7 nF	760 V _{AC}		



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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} \pm 0.2 V_{RMS} at 1 kHz for Y5U and Y5S, and 1 MHz for U2J	DF \leq 0.3 % for U2J and DF \leq 2.5 % for Y5S and Y5U		
Insulation resistance (IR)	Measured within 60 s \pm 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 \leq 75 %, 1.0 V_{RMS} \pm 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 \pm 2 °C, 850 V _{AC} /50 Hz; once every hour 1000 V _{AC} for 0.1 s	External appearance: no visible damage $\Delta C/C \le \pm 15 \%$ DF $\le 0.5 \%$ for U2J and $\le 5 \%$ for Y5S and Y5U IR $\ge 3000 M\Omega$ 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 $\Delta C/C \le \pm 10$ % for U2J and $\le \pm 15$ % for Y5S and Y5U DF ≤ 0.5 % for U2J and ≤ 5 % for Y5S and Y5U IR $\ge 3000 M\Omega$ Dielectric strength: no failure		
Robustness of termination	Pull test: 0.5 kg tensile weight in radial direction for 10 s \pm 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 \pm 5 °C solder for 10 s \pm 2 s; min. distance from body: 1.5 mm Hand soldering at 400 °C \pm 10 °C for 3 s to 4 s; min. distance from body: 1.5 mm	External appearance: no visible damage $\Delta C/C \le \pm 5$ % for U2J and $\le \pm 10$ % for Y5S and Y5U Dielectric strength: no failure		
Vibration test	Resin (adhesive) 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/s ² ; Sweep rate: 1 oct/min, each axis 2 h (6 h in total)	External appearance: no visible damage Capacitance within specified tolerance DF \leq 0.3 % for U2J and \leq 2.5 % for Y5S and Y5U IR \geq 10 000 G Ω		

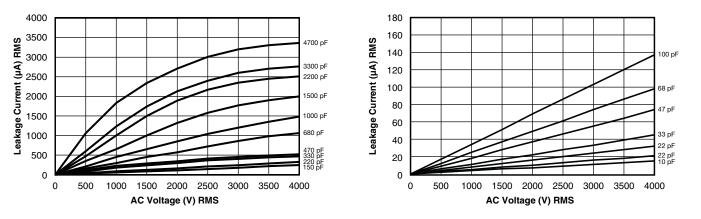
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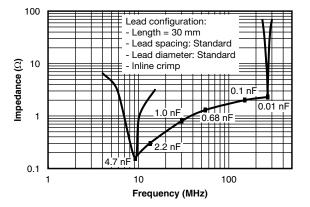
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LEAKAGE CURRENT VS. VOLTAGE (Typical)



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		
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 (VY1Y5V Sample Kit)	VY1-KIT-MS	
Link (VY1Y5V Sample Kit)	www.vishay.com/doc?28561	

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Revision: 01-Jul-2024