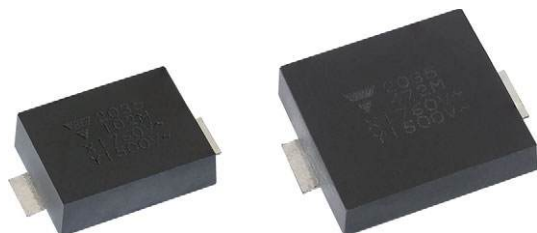


## AC Line Rated Ceramic Disc Capacitors

### Class X1, 760 V<sub>AC</sub>, Class Y1, 500 V<sub>AC</sub>



#### LINKS TO ADDITIONAL RESOURCES



QUICK REFERENCE DATA		
DESCRIPTION	VALUE	
Ceramic class	2	
Ceramic dielectric	Y5U	
Voltage (V <sub>AC</sub> )	500	760
Min. capacitance (pF)	470	
Max. capacitance (pF)	4700	
Mounting	Surface mount (reflow soldering)	

#### OPERATING TEMPERATURE RANGE

-55 °C to +125 °C

#### TEMPERATURE CHARACTERISTICS

Y5U

#### SECTIONAL SPECIFICATIONS

Climatic category (according to EN 60058-1)  
Class 2: 55/125/21

#### MOLDING

According to UL 94 V-0  
Epoxy resin, isolating, flame retardant  
Halogen-free  
Reinforced insulation  
Moisture sensitivity level: MSL 2a

#### APPROVALS

IEC 60384-14.4  
UL 60384-14  
DIN EN 60384-14  
CSA E60384-1:14, CSA E60384-14:14  
CQC11-471112-2015

#### FEATURES

- Complying with IEC 60384-14 4<sup>th</sup> edition
- Humidity class IIB annex I achieved
- Singlelayer AC disc safety capacitors
- Mounting: surface-mount
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

#### APPLICATIONS

- X1, Y1 according to IEC 60384-14.4
- Across-the-line
- Line by-pass
- Antenna coupling
- Industrial and consumer
- EMI / RFI suppression and filtering

#### DESIGN

The capacitor consists of a ceramic disc which is copper plated on both sides. Encapsulation is made of flame retardant epoxy resin in accordance with UL 94 V-0.

#### CAPACITANCE RANGE

470 pF to 4700 pF

#### RATED VOLTAGE U<sub>R</sub>

IEC 60384-14.4:  
(X1): 760 V<sub>AC</sub>, 50 Hz  
(Y1): 500 V<sub>AC</sub>, 50 Hz  
Annex H: 1500 V<sub>DC</sub>

#### TEST VOLTAGE

Component test (100 %):  
4000 V<sub>AC</sub>, 50 Hz, 2 s  
Random sampling test (destructive test):  
4000 V<sub>AC</sub>, 50 Hz, 60 s  
Voltage proof of molding (destructive test):  
4000 V<sub>AC</sub>, 50 Hz, 60 s

#### INSULATION RESISTANCE

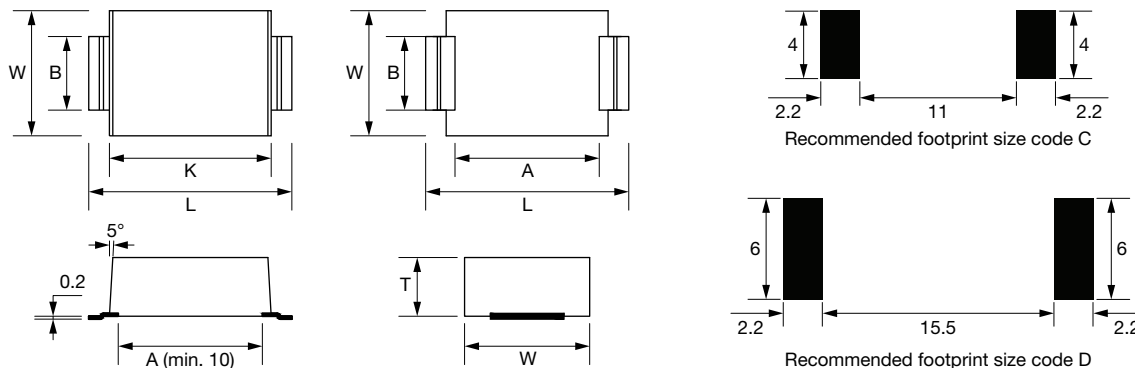
≥ 10 000 MΩ

#### CAPACITANCE TOLERANCE

± 20 % (code M)

#### DISSIPATION FACTOR

Class 2: max. 2.5 % (1 kHz)

**DIMENSIONS** in millimeters


SIZE CODE	W ( $\pm 0.5$ )	L ( $\pm 0.5$ )	A ( $\pm 0.5$ )	B ( $\pm 0.5$ )	K ( $\pm 0.1$ )	T <sub>max.</sub>
C	8.60	14.80	10.50	3.50	11.80	4.00
D	14.60	19.20	15.00	5.00	16.20	4.00

**Note**

- For soldering recommendation please see [www.vishay.com/doc?28572](http://www.vishay.com/doc?28572)

**TECHNICAL DATA**

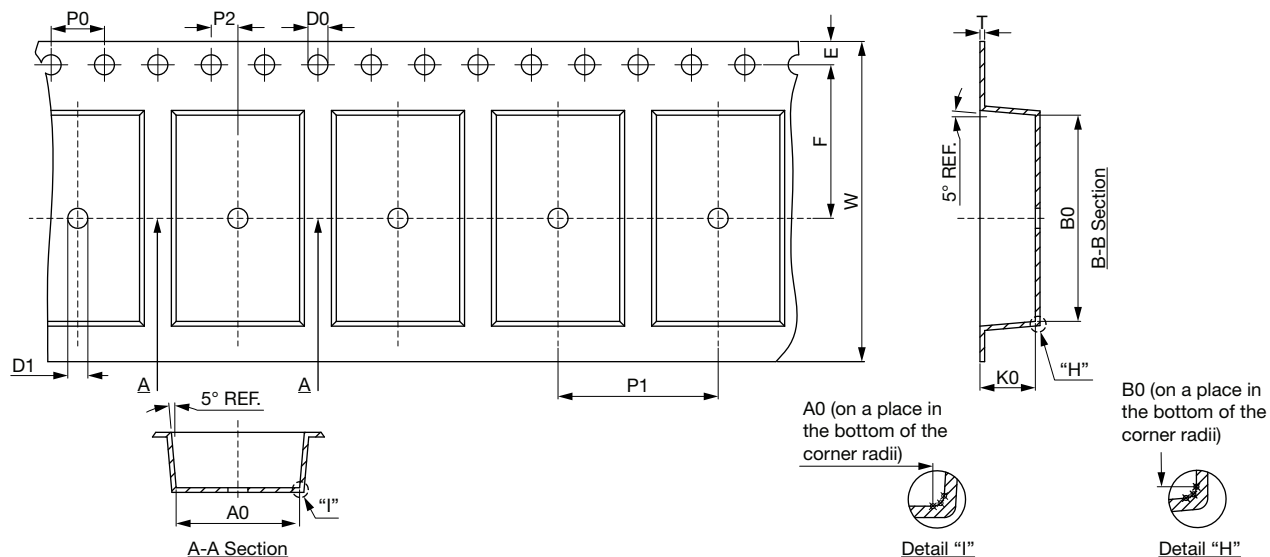
CAPACITANCE (pF)	TOLERANCE (%)	SIZE CODE	PART NUMBER
			MISSING DIGITS SEE ORDERING CODE BELOW
Y5U (2E3)			
470	± 20	C	SMDY1471MY5UC#
680		C	SMDY1681MY5UC#
1000		C	SMDY1102MY5UC#
1500		C	SMDY1152MY5UC#
2200		D	SMDY1222MY5UD#
3300		D	SMDY1332MY5UD#
3900		D	SMDY1392MY5UD#
4700		D	SMDY1472MY5UD#

**ORDERING CODE**

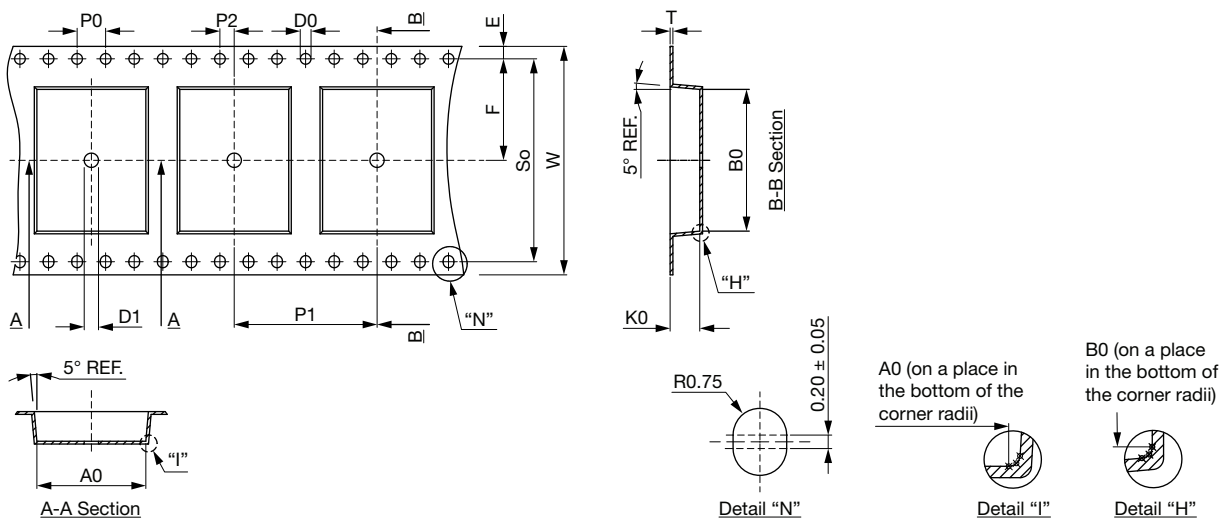
Example	SMDY1	472	M	Y5U	D	B
	Series	Capacitance value	Tolerance code	Temperature coefficient	Size code	Packaging code
						B = bulk R = tape and reel

**PACKAGING**

SIZE CODE	PACKAGING QUANTITIES	
	BULK	REEL
C	1000	1000
D	500	500

**CARRIER TAPE DIMENSIONS FOR SIZE CODE C in millimeters**


A0	B0	K0	P0	P1	P2	T	W	10 P0	E	F	D0	D1
9.25 ± 0.10	15.45 ± 0.10	4.15 ± 0.10	4.00 ± 0.10	12.00 ± 0.10	2.00 ± 0.10	0.35 ± 0.05	24.00 ± 0.30	40.00 ± 0.20	1.75 ± 0.10	11.50 ± 0.10	1.55 ± 0.05	1.5 min.

**CARRIER TAPE DIMENSIONS FOR SIZE CODE D in millimeters**


A0	B0	K0	P0	P1	P2	T	W	10 P0	So	E	F	D0	D1
15.25 ± 0.10	19.85 ± 0.10	4.15 ± 0.10	4.00 ± 0.10	20.00 ± 0.10	2.00 ± 0.10	0.35 ± 0.05	32.00 ± 0.30	40.00 ± 0.20	28.40 ± 0.10	1.75 ± 0.10	14.20 ± 0.10	1.50 ± 0.10	2.0 min.

**APPROVALS**

IEC 60384-14 - Safety tests

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

**CB Certificate** ([www.vishay.com/doc?22268](http://www.vishay.com/doc?22268))Y1-capacitor: CB test certificate: DE1-63889/A2 470 pF to 4.7 nF 500 V<sub>AC</sub>X1-capacitor: CB test certificate: DE1-63889/A2 470 pF to 4.7 nF 760 V<sub>AC</sub>**VDE** ([www.vishay.com/doc?22269](http://www.vishay.com/doc?22269))Y1-capacitor: VDE marks approval: 40052244 470 pF to 4.7 nF 500 V<sub>AC</sub>X1-capacitor: VDE marks approval: 40052244 470 pF to 4.7 nF 760 V<sub>AC</sub>

DIN EN 60384-14 (VDE 0565-1-1):2014-04; EN 60384-14:2013-08

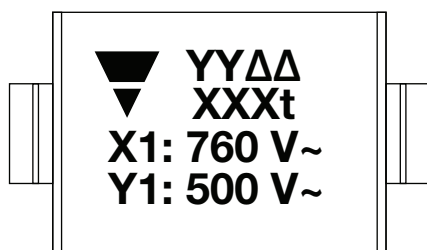
DIN EN 60384-14/A1 (VDE 0565-1-1/A1):2017-04; EN 60384-14:2013/A1:2016

**Underwriters Laboratories Inc. / Canadian Standards Association** ([www.vishay.com/doc?22271](http://www.vishay.com/doc?22271))Y1-capacitor: CSA test certificate: E183844 470 pF to 4.7 nF 500 V<sub>AC</sub>X1-capacitor: CSA test certificate: E183844 470 pF to 4.7 nF 760 V<sub>AC</sub>

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



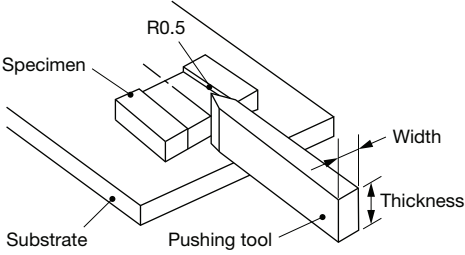
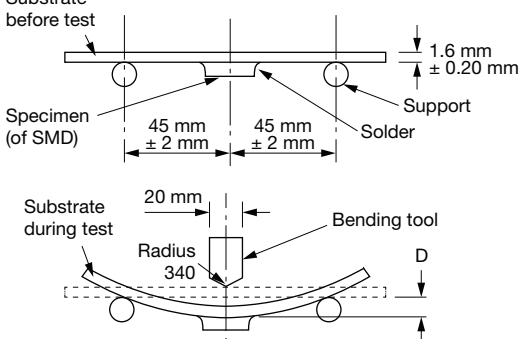
Fixed capacitors for electromagnetic interference suppression and connection to the supply mains.

**CQC** ([www.vishay.com/doc?22270](http://www.vishay.com/doc?22270))Y1-capacitor: CQC test certificate: CQC20001274917 470 pF to 4.7 nF 500 V<sub>AC</sub>X1-capacitor: CQC test certificate: CQC20001274917 470 pF to 4.7 nF 760 V<sub>AC</sub>**MARKING**YY: year, ΔΔ: week,  
XXX: capacitance value, t: tolerance code <sup>(1)</sup>

1/1

**Note**<sup>(1)</sup> Identify "XXX" and "t" by the ordering code**PERFORMANCE**

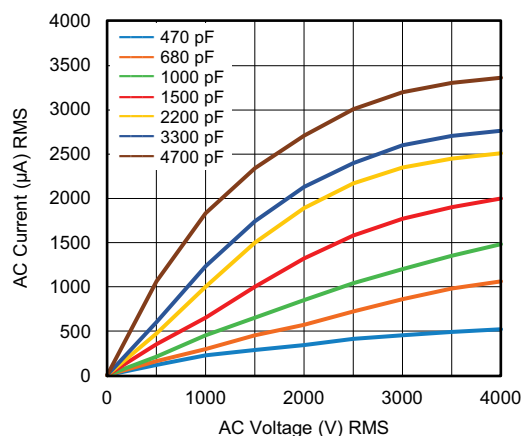
TEST	TEST CONDITION	TEST LIMITS
Visual and mechanical inspection	Optical inspection, dimensions measured with caliper	No visual damage, marking legible
Capacitance (C)	25 °C ± 3 °C; RH ≤ 75 %; 1.0 V <sub>RMS</sub> ± 0.2 V <sub>RMS</sub> at 1 kHz	Capacitance within specified tolerance
Dissipation factor (DF)		DF ≤ 2.5 %
Insulation resistance (IR)	Measured with 60 s ± 5 s after charging at 500 V <sub>DC</sub>	Min. 10 000 MΩ
Dielectric strength	4000 V <sub>AC</sub> at 50 Hz / 60 Hz for 1 min 50 mA max.	No failure
Solderability of termination	Immerse in solder bath for 2 s with 255 °C ± 5 °C after fluxing	95 % of the terminations are to be soldered
Impulse voltage	3 pulses of 8 kV	No failure

PERFORMANCE		
TEST	TEST CONDITION	TEST LIMITS
Life test	125 °C; 1.5 kV <sub>AC</sub> at 50 Hz; 1000 h 125 °C; 2250 V <sub>DC</sub> ; 1000 h	No visual damage
		$\Delta C/C < \pm 15 \%$
		DF $\leq 5 \%$
		IR $\geq 3000 \text{ M}\Omega$
		Dielectric strength: no failure
Humidity test	500 h +48 h / -0 h; 40 °C $\pm$ 2 °C; 90 % to 95 % RH; 760 V <sub>AC</sub> at 50 Hz 500 h +48 h / -0 h; 40 °C $\pm$ 2 °C; 90 % to 95 % RH; 1500 V <sub>DC</sub>	No visual damage
		$\Delta C/C < \pm 15 \%$
		DF $\leq 5 \%$
		IR $\geq 3000 \text{ M}\Omega$
		Dielectric strength: no failure
	500 h +48 h / -0 h; 40 °C $\pm$ 2 °C / 90 % to 95 % RH; 0 V loading	No visual damage
		$\Delta C/C < \pm 15 \%$
		DF $\leq 5 \%$
		IR $\geq 3000 \text{ M}\Omega$
		Dielectric strength: no failure
	500 h +48 h / -0 h; 85 °C $\pm$ 3 °C / 85 % RH; 760 V <sub>AC</sub> at 50 Hz 500 h +48 h / -0 h; 85 °C $\pm$ 3 °C / 85 % RH; 1500 V <sub>DC</sub>	No visual damage
		$\Delta C/C < \pm 15 \%$
		DF $\leq 5 \%$
		IR $\geq 3000 \text{ M}\Omega$
		Dielectric strength: no failure
Robustness of termination	Shear test: 10 N for 10 s $\pm$ 1 s for soldered on PCB	No damage to capacitor body and pin
		
	Bending test: 1 mm bending constant for 5 s $\pm$ 1 s	
		
Resistance to soldering heat (solder bath)	20 mm/s dipping speed; dwell 10 s at 2 mm dipping; 260 °C $\pm$ 5 °C	No visual damage
		$\Delta C/C < \pm 10 \%$
		DF $\leq 5 \%$
		IR $\geq 3000 \text{ M}\Omega$
		Dielectric strength: no failure
Temperature cycling	-55 °C ~ +125 °C; 5 cycles	No visual damage
		$\Delta C/C < \pm 30 \%$
		DF $\leq 5 \%$
		IR $\geq 3000 \text{ M}\Omega$
		Dielectric strength: no failure

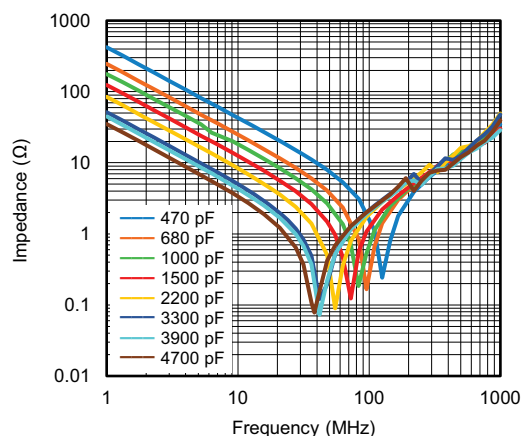


PERFORMANCE		
TEST	TEST CONDITION	TEST LIMITS
Electrical characterization	25 °C and -40 °C, +125 °C	Capacitance within specified tolerance
		DF ≤ 2.5 %
		Min. 10 000 MΩ
Mechanical shock	Half-sine; 100 g/s; 6 ms; 3 shocks each of 6 orientation	No visual damage
		$\Delta C/C < \pm 10 \%$
		DF ≤ 5 %
Vibration	5 g/s; 1.5 mm amplitude; 20 min; 12 cycles each of orientation; 10 Hz ~ 2000 Hz	IR ≥ 10 000 MΩ
		No visual damage
		$\Delta C/C < \pm 10 \%$
		DF ≤ 5 %
		IR ≥ 10 000 MΩ

### AC CURRENT VS. VOLTAGE (Typical)



### IMPEDANCE VS. FREQUENCY (Typical)



#### Note

- Unless stated otherwise all electrical values apply at an ambient temperature of 25 °C ± 3 °C, at normal atmospheric conditions

RELATED DOCUMENTS	
CB Test Certificate	<a href="http://www.vishay.com/doc?22268">www.vishay.com/doc?22268</a>
VDE Marks Approval	<a href="http://www.vishay.com/doc?22269">www.vishay.com/doc?22269</a>
UL Test Certificate	<a href="http://www.vishay.com/doc?22271">www.vishay.com/doc?22271</a>
CQC Test Certificate	<a href="http://www.vishay.com/doc?22270">www.vishay.com/doc?22270</a>
Soldering Recommendation	<a href="http://www.vishay.com/doc?28572">www.vishay.com/doc?28572</a>



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