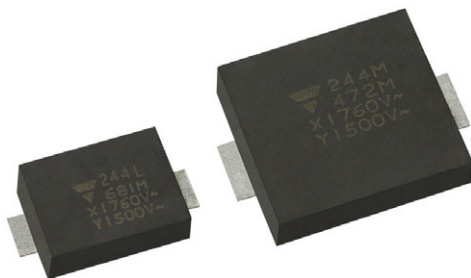


Automotive EMI Suppression Safety Capacitor, Ceramic Disc, Class X1, 760 V_{AC}, Class Y1, 500 V_{AC}



LINKS TO ADDITIONAL RESOURCES



QUICK REFERENCE DATA		
DESCRIPTION	VALUE	
Ceramic class	2	
Ceramic dielectric	Y5U	
Voltage (V _{AC})	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

UL 60384-14

DIN EN 60384-14

CSA E60384-1:14, CSA E60384-14:14

CQC11-471112-2015

FEATURES

- AEC-Q200 qualified
- Withstands 85 / 85 / 1000 h test
- Can pass 1000 temperature cycles (from -55 °C to +125 °C)
- Complying with IEC 60384-14
- High reliability
- Humidity class IIB annex I achieved
- Singlelayer AC disc safety capacitors
- Mounting: surface-mount
- PPAP (AIAG version) is available
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- X1, Y1 according to IEC 60384-14
- Application as Y capacitors for EMI suppression and primary-secondary coupling on battery chargers for PHEV/EV
- Application as filter capacitors on AC/DC converters for PHEV/EV and HEV
- 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_R

IEC 60384-14:

(X1): 760 V_{AC}, 50 Hz

(Y1): 500 V_{AC}, 50 Hz

Annex H: 1500 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 molding (destructive test):

4000 V_{AC}, 50 Hz, 60 s

INSULATION RESISTANCE

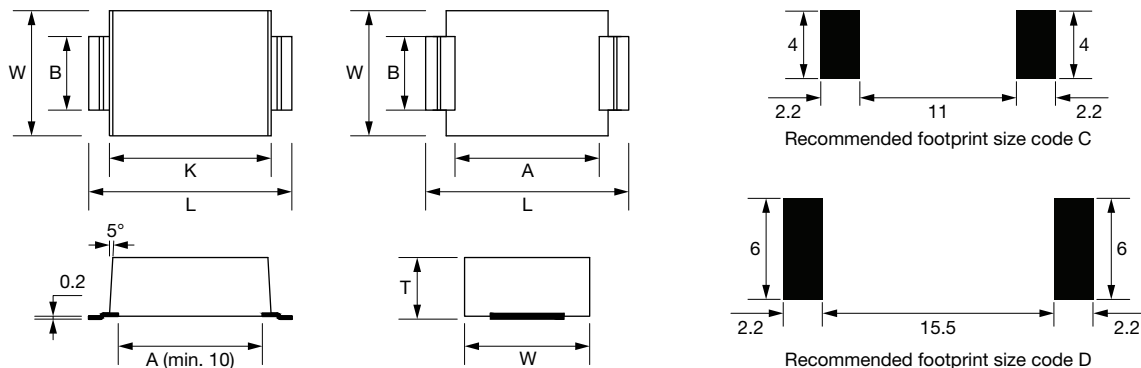
≥ 10 000 MΩ

CAPACITANCE TOLERANCE

± 20 % (code M)

DISSIPATION FACTOR

Class 2: max. 2.5 % (1 kHz)

DIMENSIONS in millimeters


SIZE CODE	W (± 0.5)	L (± 0.5)	A (± 0.5)	B (± 0.5)	K (± 0.1)	T _{max.}
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

TECHNICAL DATA

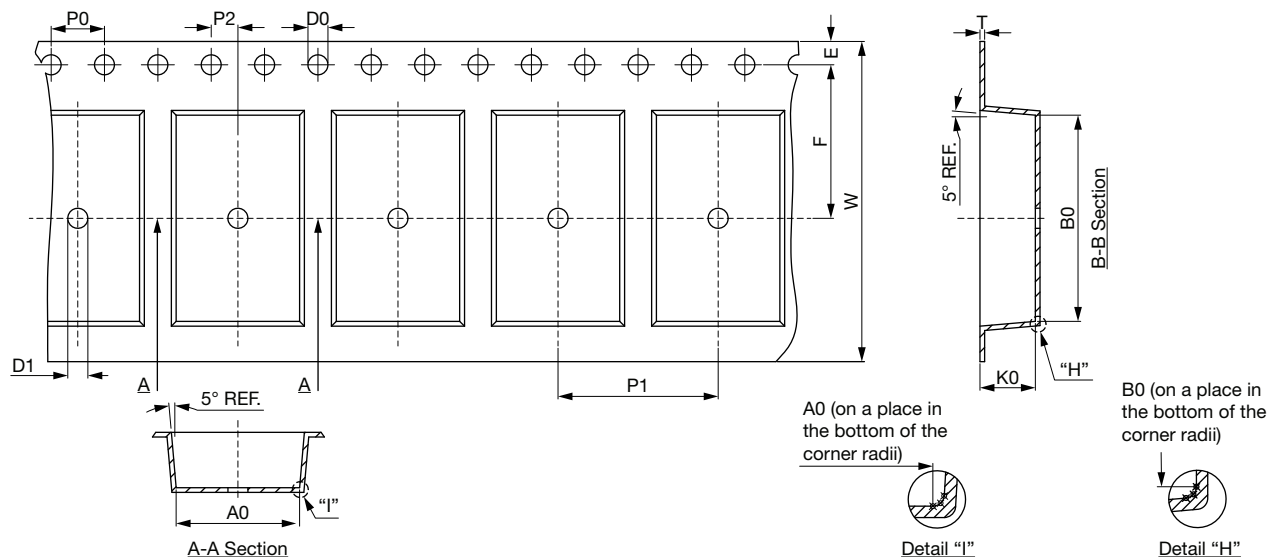
CAPACITANCE (pF)	TOLERANCE (%)	SIZE CODE	PART NUMBER
			MISSING DIGITS SEE ORDERING CODE BELOW
Y5U			
470	± 20	C	SMDY1471MY5UC#A
680		C	SMDY1681MY5UC#A
1000		C	SMDY1102MY5UC#A
1500		C	SMDY1152MY5UC#A
2200		D	SMDY1222MY5UD#A
3300		D	SMDY1332MY5UD#A
3900		D	SMDY1392MY5UD#A
4700		D	SMDY1472MY5UD#A

ORDERING CODE

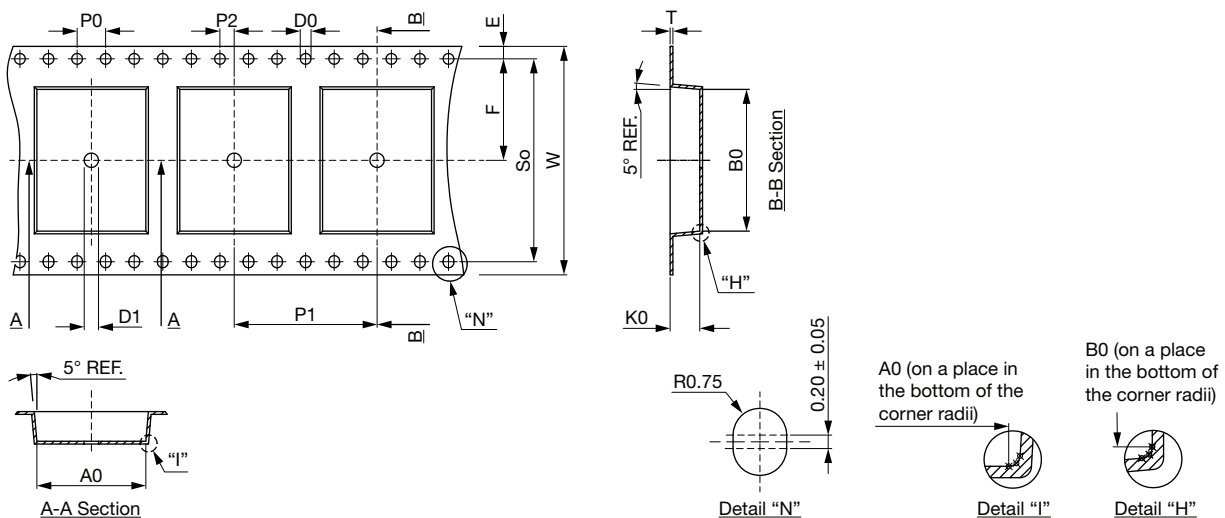
Example	SMDY1	472	M	Y5U	D	R	A
	Series	Capacitance value	Tolerance code	Temperature coefficient	Size code	Packaging code	Automotive
R = tape and reel							

PACKAGING

SIZE CODE	PACKAGING QUANTITIES
C	1000
D	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)Y1-capacitor: CB test certificate: DE1-63889/A2 470 pF to 4.7 nF 500 V_{AC}X1-capacitor: CB test certificate: DE1-63889/A2 470 pF to 4.7 nF 760 V_{AC}**VDE** (www.vishay.com/doc?22269)Y1-capacitor: VDE marks approval: 40052244 470 pF to 4.7 nF 500 V_{AC}X1-capacitor: VDE marks approval: 40052244 470 pF to 4.7 nF 760 V_{AC}

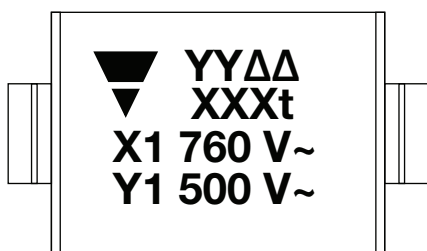
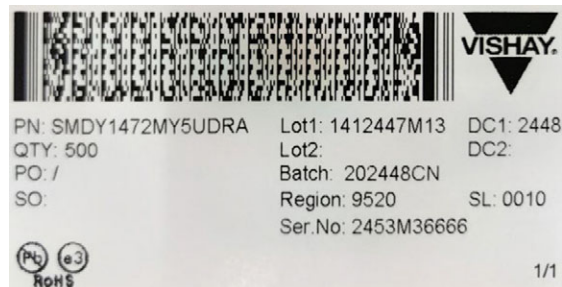
DIN EN 60384-14 (VDE 0565-1-1):2014-04; EN 60384-14:2013-08

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)Y1-capacitor: CSA test certificate: E183844 470 pF to 4.7 nF 500 V_{AC}X1-capacitor: CSA test certificate: E183844 470 pF to 4.7 nF 760 V_{AC}

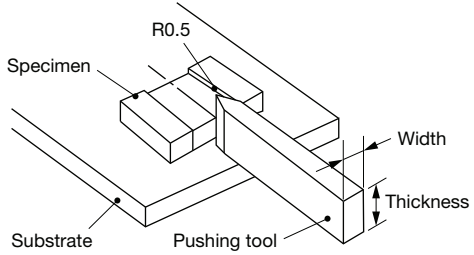
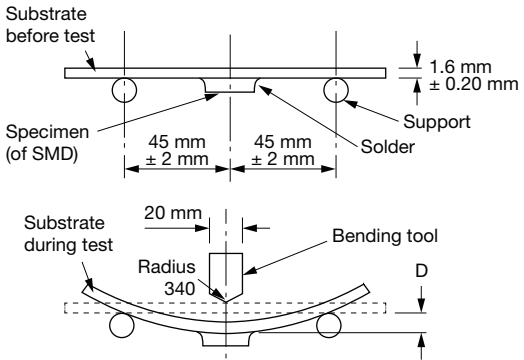
UL 60384-14, CSA E60384-1:14, CSA E60384-14:14

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

**CQC** (www.vishay.com/doc?22270)Y1-capacitor: CQC test certificate: CQC20001274917 470 pF to 4.7 nF 500 V_{AC}X1-capacitor: CQC test certificate: CQC20001274917 470 pF to 4.7 nF 760 V_{AC}**MARKING**YY: year, ΔΔ⁽¹⁾: week,
XXX: capacitance value, t: tolerance code⁽²⁾**Notes**(1) Identify 2nd "Δ" by letter code

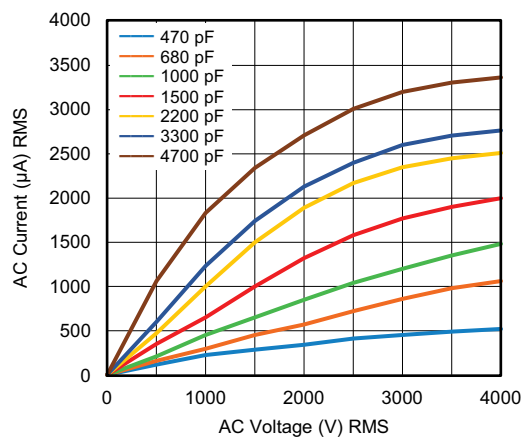
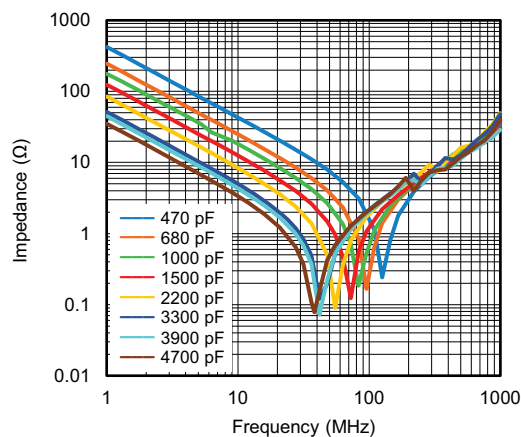
A	C	D	F	H	K	L	M	N	T
1	2	3	4	5	6	7	8	9	0

(2) 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 _{RMS} ± 0.2 V _{RMS} 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 _{DC}	Min. 10 000 MΩ
Dielectric strength	4000 V _{AC} 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
Life test	125 °C; 1.5 kV _{AC} at 50 Hz; 1000 h 125 °C; 2250 V _{DC} ; 1000 h	No visual damage
		ΔC/C < ± 15 %
		DF ≤ 5 %
		IR ≥ 3000 MΩ
		Dielectric strength: no failure
Humidity test	500 h + 48 h / - 0 h; 40 °C ± 2 °C; 90 % to 95 % RH; 760 V _{AC} at 50 Hz	No visual damage
		ΔC/C < ± 15 %
		DF ≤ 5 %
		IR ≥ 3000 MΩ
		Dielectric strength: no failure
	500 h + 48 h / - 0 h; 40 °C ± 2 °C; 90 % to 95 % RH; 1500 V _{DC}	No visual damage
		ΔC/C < ± 15 %
		DF ≤ 5 %
		IR ≥ 3000 MΩ
		Dielectric strength: no failure
	500 h + 48 h / - 0 h; 40 °C ± 2 °C / 90 % to 95 % RH; 0 V loading	No visual damage
		ΔC/C < ± 15 %
		DF ≤ 5 %
		IR ≥ 3000 MΩ
		Dielectric strength: no failure
	1000 h + 48 h / - 0 h; 85 °C ± 3 °C / 85 % RH; 760 V _{AC} at 50 Hz	No visual damage
		ΔC/C < ± 15 %
		DF ≤ 5 %
		IR ≥ 3000 MΩ
		Dielectric strength: no failure
Robustness of termination	Shear test: 17.7 N for 60 s ± 1 s for soldered on PCB 	No damage to capacitor body and pin
		ΔC/C < ± 10 %
		DF ≤ 5 %
		IR ≥ 1000 MΩ
	Bending test: 2 mm bending constant for 60 s ± 5 s 	No damage to capacitor body and pin
		ΔC/C < ± 10 %
		DF ≤ 5 %
		IR ≥ 1000 MΩ

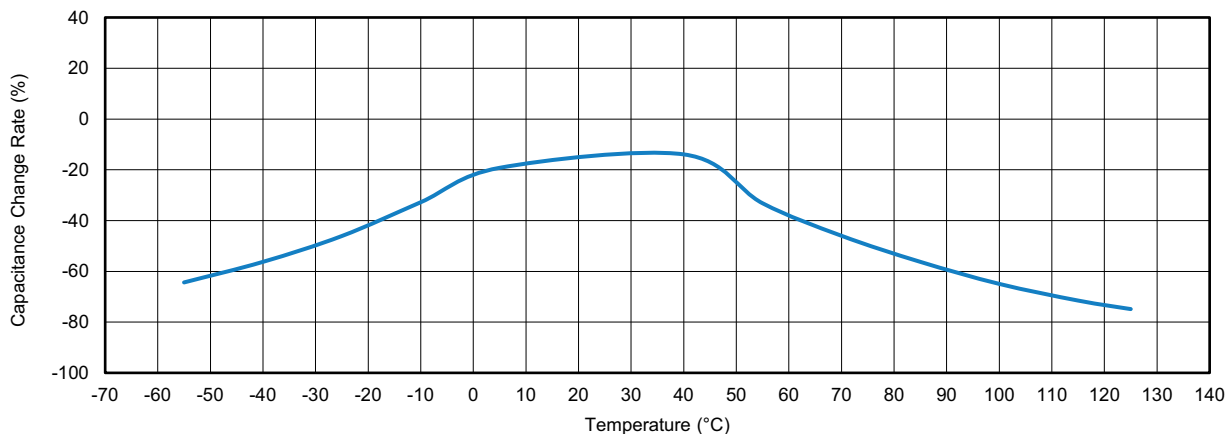


PERFORMANCE				
TEST	TEST CONDITION	TEST LIMITS		
Resistance to soldering heat (IR reflow)	Reflow soldering: peak 260 °C + 0 °C / - 5 °C The area of soldering 230 °C min., 20 s to 40 s	No visual damage		
		$\Delta C/C < \pm 10 \%$		
		$DF \leq 5 \%$		
		$IR \geq 3000 \text{ M}\Omega$		
		Dielectric strength: no failure		
Temperature cycling	-55 °C to +125 °C; 1000 cycles	No visual damage		
		$\Delta C/C < \pm 30 \%$		
		$DF \leq 5 \%$		
		$IR \geq 3000 \text{ M}\Omega$		
		Dielectric strength: no failure		
Electrical characterization	25 °C and -55 °C, +125 °C	Cap.	25 °C	Within tolerance
			-55 °C and 125 °C	Compliance to TCC curve
		DF	25 °C, -55 °C, and 125 °C	< 2.5 %
		IR	25 °C	> 10 000 MΩ
			-55 °C and 125 °C	> 1000 MΩ
		Mechanical shock	Half-sine; 100 g/s; 6 ms; 3 shocks each of 6 orientation	No visual damage
$\Delta C/C < \pm 10 \%$				
$DF \leq 5 \%$				
$IR \geq 10\,000 \text{ M}\Omega$				
Vibration	5 g/s; 1.5 mm amplitude; 20 min; 12 cycles each of orientation; 10 Hz to 2000 Hz	No visual damage		
		$\Delta C/C < \pm 10 \%$		
		$DF \leq 5 \%$		
		$IR \geq 10\,000 \text{ M}\Omega$		
ESD	Per AEC-Q200-002	No visual damage		
		$\Delta C/C < \pm 10 \%$		
		$DF \leq 5 \%$		
		$IR \geq 10\,000 \text{ M}\Omega$		

AC CURRENT VS. VOLTAGE (Typical)

IMPEDANCE VS. FREQUENCY (Typical)




TEMPERATURE CHARACTERISTICS (Typical)



Note

- Unless stated otherwise all electrical values apply at an ambient temperature of $25\text{ °C} \pm 3\text{ °C}$, at normal atmospheric conditions

STORAGE AND OPERATION RECOMMENDATIONS

The molding resin of the molding type ceramic capacitor does not form a perfect seal, avoid corrosive gas and direct sunlight, and use (storage) in the condition without moisture condensation.

This series is declared to MSL 2a.

Solder the enclosed capacitors within 168 h after opening the moisture-proof package.

After opening, store it in the packing condition at the time of delivery or in a similar state.

Temperature: 10 °C to 30 °C

Humidity: 60 % max.

If it has been more than 4 weeks since opening, or if the 10 % display of the HIC (humidity indicator card) is pink, perform baking according to J-STD-033B0.1.

RELATED DOCUMENTS

CB Test Certificate	www.vishay.com/doc?22268
VDE Marks Approval	www.vishay.com/doc?22269
UL Test Certificate	www.vishay.com/doc?22271
CQC Test Certificate	www.vishay.com/doc?22270
Soldering Recommendation	www.vishay.com/doc?28572



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