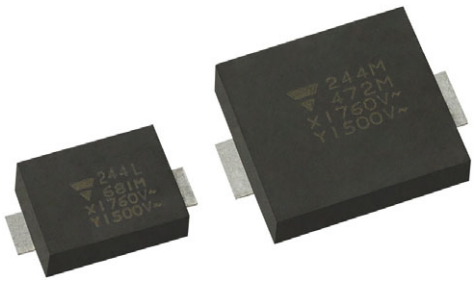
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Automotive Grade EMI Suppression Safety Capacitor, Ceramic Disc, Class X1, 760 V_{AC}, Class Y1, 500 V_{AC}



LINKS TO ADDITIONAL RESOURCES

Related Documents | Infographics | 3D Models | SPICE Models

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

AUTOMOTIVE GRADE

Pb

e3

RoHS COMPLIANT

HALOGEN FREE

- 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

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

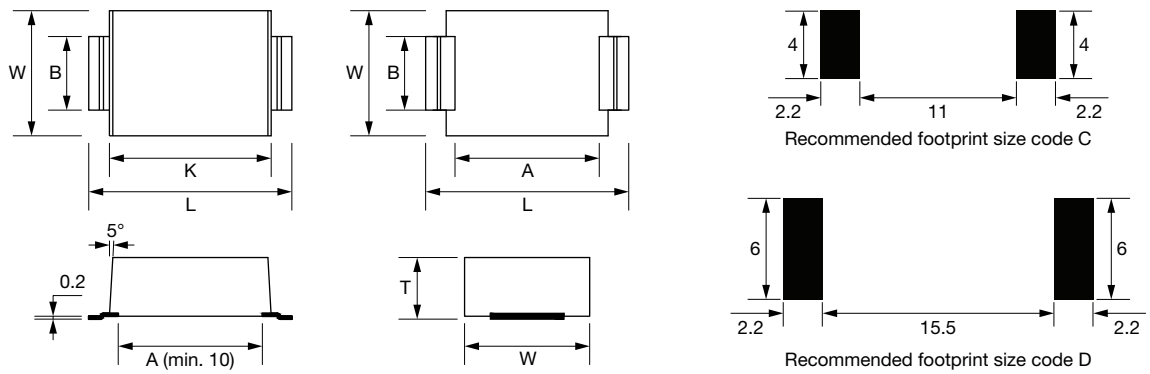
Class 2: max. 2.5 % (1 kHz)

For technical questions, contact: cdc@vishay.com

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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 Grade
						R = tape and reel	

PACKAGING

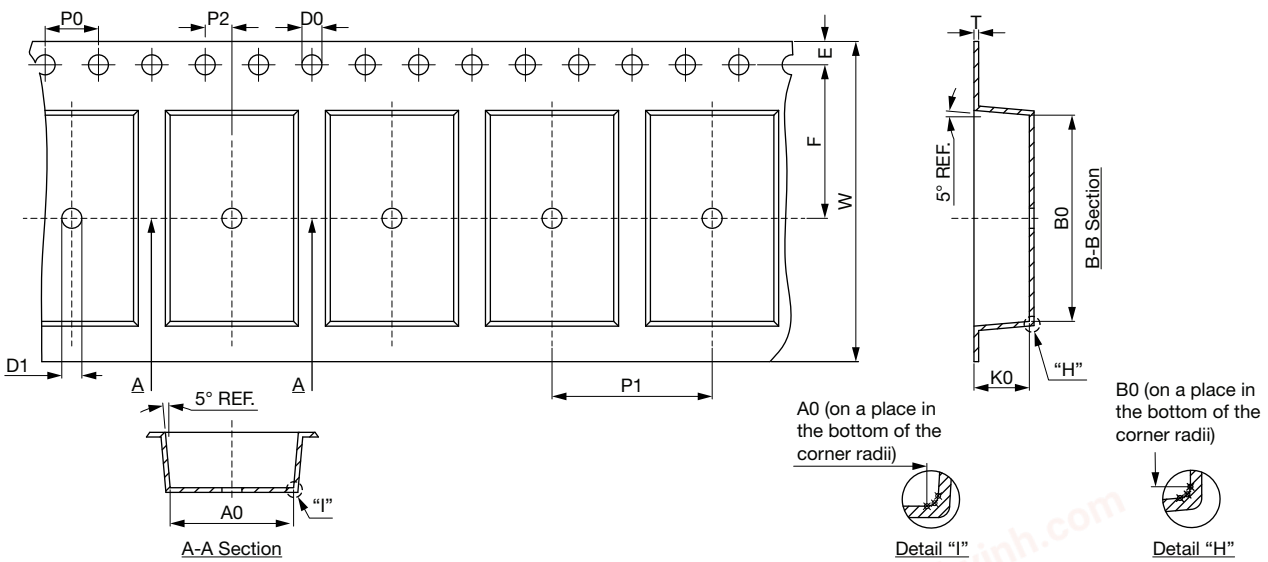
SIZE CODE	PACKAGING QUANTITIES	
	BULK	REEL
C	1000	1000
D	500	500

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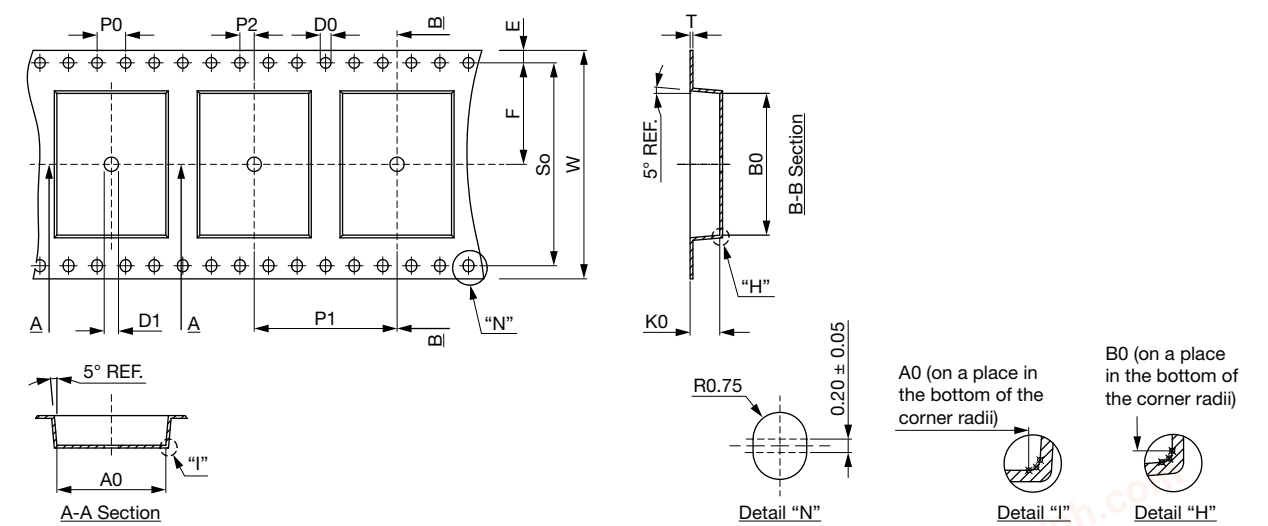
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CARRIER TAPE DIMENSIONS FOR SIZE CODE C in millimeters



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.

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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)

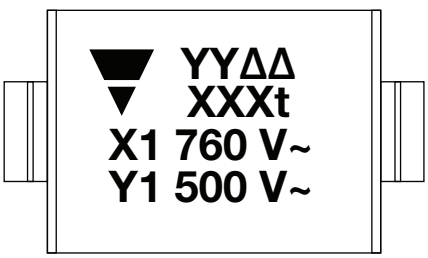
Y1-capacitor: CSA test certificate:	E183844	470 pF to 4.7 nF	500 V_{AC}
X1-capacitor: CSA test certificate:	E183844	470 pF to 4.7 nF	760 V_{AC}

UL 60384-14, CSA E60384-1:14, CSA E60384-14:14
Fixed capacitors for electromagnetic interference suppression and connection to the supply mains.

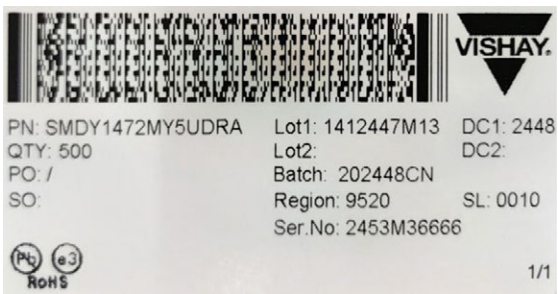
CQC (www.vishay.com/doc?22270)

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

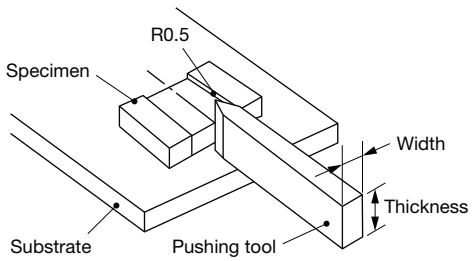
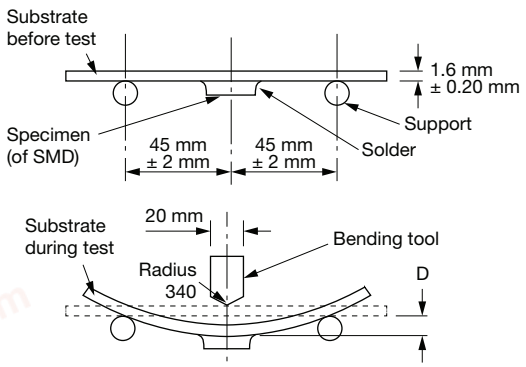
(1) Identify 2nd "Δ" by letter code

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

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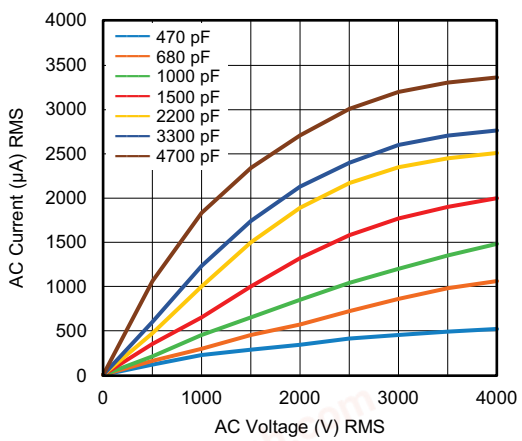
PERFORMANCE		
TEST	**TEST CONDITION**	**TEST LIMITS**
Visual and mechanical inspection	Optical inspection, dimensions measured with caliper	No visual damage, marking legible
Capacitance (C)	25 °C ± 3 °C; RH ≤ 75 %; 1.0 V_{RMS} ± 0.2 V_{RMS} at 1 kHz	Capacitance within specified tolerance
Dissipation 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 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 1000 h + 48 h / - 0 h; 85 °C ± 3 °C / 85 % RH; 1500 V_{DC}	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
	Bending test: 1 mm bending constant for 5 s ± 1 s 	

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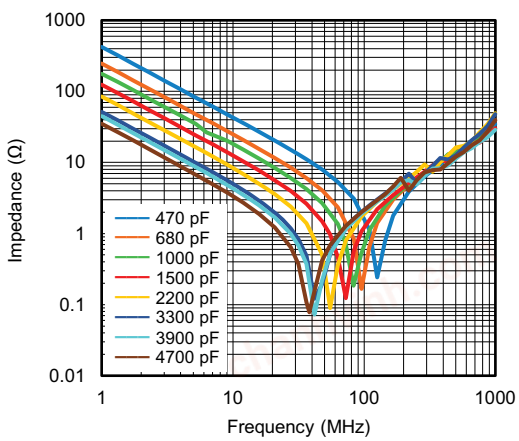
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PERFORMANCE				
TEST	**TEST CONDITION**	**TEST LIMITS**		
Resistance to soldering heat (IR reflow)	Reflow soldering: peak 260 °C + 0 °C / - 5 °C The area of soldering 230 °C min., 20 s to 40 s	No visual damage		
		ΔC/C < ± 10 %		
		DF ≤ 5 %		
		IR ≥ 3000 MΩ		
		Dielectric strength: no failure		
Temperature cycling	-55 °C to +125 °C; 1000 cycles	No visual damage		
		ΔC/C < ± 30 %		
		DF ≤ 5 %		
		IR ≥ 3000 MΩ		
		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		
		ΔC/C < ± 10 %		
		DF ≤ 5 %		
		IR ≥ 10 000 MΩ		
Vibration	5 *g*/s; 1.5 mm amplitude; 20 min; 12 cycles each of orientation; 10 Hz to 2000 Hz	No visual damage		
		ΔC/C < ± 10 %		
		DF ≤ 5 %		
		IR ≥ 10 000 MΩ		
ESD	Per AEC-Q200-002	No visual damage		
		ΔC/C < ± 10 %		
		DF ≤ 5 %		
		IR ≥ 10 000 MΩ		

AC CURRENT VS. VOLTAGE (Typical)



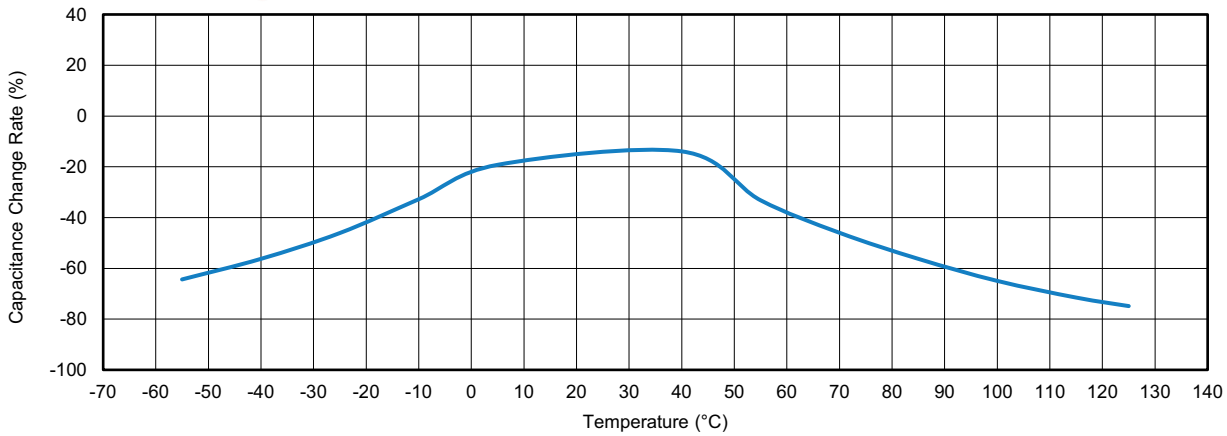
IMPEDANCE VS. FREQUENCY (Typical)



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TEMPERATURE CHARACTERISTICS (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	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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