

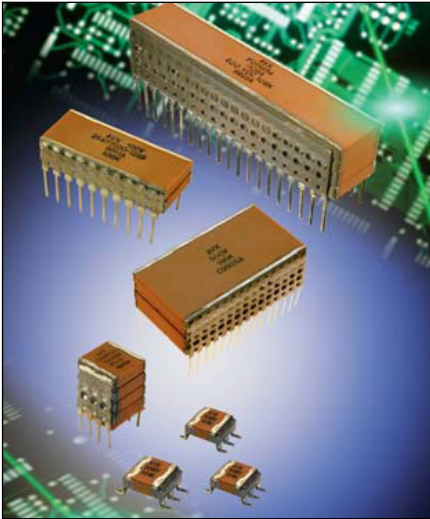


**THE DATASHEET OF  
SM045E606ZAN650**



# SMPS Stacked MLC Capacitors

## SM Style Stacked MLC Capacitors



AVX is the original inventor of large capacitance value, stacked MLCC capacitors constructed with DIP leads. The SM-style, Switch Mode Power Supply (SMPS) capacitors were introduced by AVX in 1980s. These capacitors are the closest to the ideal electrical energy storage devices due to high CV product and extremely low ESR and ESL.

In addition to traditionally offered COG (Class I) and X7R (Class II) type dielectrics, AVX introduces another class I, temperature compensated N1500 dielectric characterized with very low dissipation factor. Thanks to considerably higher relative dielectric constant of N1500 dielectric, the CV product is more than doubled in comparison to ultra-stable COG dielectric, resulting in a significant reduction in the size of capacitor and a significant improvement of volumetric efficiency.

The typical applications for different type dielectrics are:

- COG:** High frequency resonant capacitors, avionic AC line filters (400Hz to 800Hz), snubbers, timing circuits, high current repetitive discharge
- N1500:** Avionic AC line filters (400Hz to 800Hz), snubbers, high current repetitive discharge, capacitive temperature compensation
- X7R:** General filtering, input and output filters in DC/DC converters, bulk filters, DC link capacitors, motor drive filters, high current non-repetitive discharge

**Not RoHS Compliant**

### GENERAL SPECIFICATIONS FOR ALL DIELECTRIC TYPES

**Operating Temperature Range**

-55° to +125°C

**Voltage Ratings**

50VDC through 500VDC (+125°C)

**Dielectric Withstanding Voltage**

250% rated voltage for 5 seconds with 30 to 50mA charging current (500 Volt units @ 750VDC)

**Insulation Resistance (25°C, rated DC voltage)**

100KMΩ min. or 1000MΩ-μF min. whichever is less

**Insulation Resistance (125°C, rated DC voltage)**

10KMΩ min. or 100MΩ-μF min. whichever is less

**Thermal Shock Capabilities**

5 cycles (-55°C to +125°C)

**Life Test Capabilities (1000 hours)**

200% rated voltage at +125°C (500 Volt units @ 600VDC)

### GENERAL SPECIFICATIONS FOR ALL DIELECTRIC TYPES

#### COG Dielectric

**Capacitance Range**

0.01μF to 15μF  
(+25°C, 1.0 ± 0.2Vrms at 1kHz)

**Capacitance Tolerances**

±5%, ±10%, ±20%

**Temperature Characteristic**

0 ± 30 ppm/°C

**Dissipation Factor**

0.15% max.  
(+25°C, 1.0 ± 0.2Vrms at 1kHz)

#### N1500

**Capacitance Range**

0.018μF to 33μF  
(+25°C, 1.0 ± 0.2Vrms at 1kHz)

**Capacitance Tolerances**

±5%, ±10%, ±20%

**Temperature Characteristic**

-1500 ± 250 ppm/°C

**Dissipation Factor**

0.15% max.  
(+25°C, 1.0 ± 0.2Vrms at 1kHz)

#### X7R Dielectric

**Capacitance Range**

0.1μF to 390μF  
(+25°C, 1.0 ± 0.2Vrms at 1kHz)

**Capacitance Tolerances**

±10%, ±20%, +80%, -20%

**Temperature Characteristic**

±15%

**Dissipation Factor**

2.5% max.  
(+25°C, 1.0 ± 0.2Vrms at 1kHz)

# SMPS Stacked MLC Capacitors

## SM Style Stacked MLC Capacitors

### HOW TO ORDER

### AVX Styles: SM-1, SM-2, SM-3, SM-4, SM-5, SM-6

SM0	1	7	C	106	M	A	N	650
<b>AVX Style</b> SM0 = Uncoated SM5 = Epoxy Coated	<b>Size</b> See Dimensions chart	<b>Voltage</b> 50V = 5 100V = 1 200V = 2 500V = 7	<b>Temperature Coefficient</b> COG = A N1500 = 4 X7R = C	<b>Capacitance Code</b> (2 significant digits + number of zeros) 1,000 pF = 102 22,000 pF = 223 220,000 pF = 224 1 μF = 105 10 μF = 106 100 μF = 107	<b>Capacitance Tolerance</b> COG/N1500: J = ±5% K = ±10% M = ±20% X7R: K = ±10% M = ±20% Z = +80%, -20%	<b>Test Level</b> A = Standard B = Hi-Rel* 5 = Standard/MIL** 6 = Hi-Rel/MIL***	<b>Termination</b> N = Straight Lead J = Leads formed in L = Leads formed out P = P Style Leads Z = Z Style Leads	<b>Height</b> Max Dimension "A" 120 = 0.120" 240 = 0.240" 360 = 0.360" 480 = 0.480" 650 = 0.650"

See tables for capacitance available in specific height and dielectric

Note: Capacitors with X7R dielectric are not intended for applications across AC supply mains or AC line filtering with polarity reversal. Contact plant for recommendations.

\* Hi-Rel screening option. Screening consists of 100% Group A (B Level), Subgroup 1 per MIL-PRF-49470.

\*\* Form, fit & function equivalent to MIL-PRF-49470 part.

Applies to 50V rated parts only. No screening.  
\*\*\* Form, fit & function equivalent to MIL-PRF-49470 part.  
Applies to 50V rated parts only. Hi-Rel screening the same as option B.

**Typical ESR Performance (mΩ)**

	Aluminum Electrolytic 100μF/50V	Low ESR Solid Tantalum 100μF/10V	Solid Aluminum Electrolytic 100μF/16V	MLCC SMPS 100μF/50V	MLCC SMPS 4.7μF/50V
ESR @ 10KHz	300	72	29	3	66
ESR @ 50KHz	285	67	22	2	23
ESR @ 100KHz	280	62	20	2.5	15
ESR @ 500KHz	265	56	18	4	8
ESR @ 1MHz	265	56	17	7	7.5
ESR @ 5MHz	335	72	17	12.5	8
ESR @ 10MHz	560	91	22	20	14

Performance of SMPS capacitors can be simulated by downloading SpiCalci software program - <http://www.avx.com/download/software/SpiCalci-AVX.zip>

# SMPS Stacked MLC Capacitors

## SM Style Surface Mount and Thru-Hole Styles (SM0, SM5)



### DIMENSIONS

millimeters (inches)

Style	A (max.)	B (max.)	C ±.635 (±0.025)	D ±.635 (±0.025)	E (max.)	No. of Leads per side
SM-1	See capacitance range table for maximum "A" dimensions	For "N" Style Leads: "A" Dimension Plus 1.651 (0.065) For "J" & "L" Style Leads: "A" Dimension Plus 2.032 (0.080) For "P" Style Leads: "A" Dimension Plus 4.445 (0.175) For "Z" Style Leads: "A" Dimension Plus 3.048 (0.120)	11.4 (0.450)	52.1 (2.050)	12.7 (0.500)	20
SM-2			20.3 (0.800)	38.4 (1.510)	22.1 (0.870)	15
SM-3			11.4 (0.450)	26.7 (1.050)	12.7 (0.500)	10
SM-4			10.2 (0.400)	10.2 (0.400)	11.2 (0.440)	4
SM-5			6.35 (0.250)	6.35 (0.250)	7.62 (0.300)	3
SM-6			31.8 (1.250)	52.1 (2.050)	34.3 (1.350)	20

Note: For SM5 add 0.127 (0.005) to max. and nominal dimensions A, B, D, & E

# SMPS Stacked MLC Capacitors

## SM Style



### COG CLASS I DIELECTRIC, ULTRA STABLE CERAMIC

Cap $\mu$ F	SM01				SM02				SM03				SM04				SM05				SM06					
	50	100	200	500	50	100	200	500	50	100	200	500	50	100	200	500	50	100	200	500	50	100	200	500		
0.01																								120		
0.012																120			120	240						
0.015																120			120	240						
0.018																120			120	240						
0.022																240			240	360						
0.027																240		120	240	360						
0.033																240	120	120	240	480						
0.039																240	120	120	240	480						
0.047																120	240	120	240	240	650					
0.056											120					120	360	240	240	360						
0.068											120					120	360	240	240	360						
0.082											120					120	240	480	240	360	480					
0.1											240	120	120	240	480	240	360	480								
0.12				120							120	240	120	120	240	650	360	360	650							
0.15				120				120			120	240	120	240	360		360	480								
0.18				120				120			120	240	240	240	360		480	650								
0.22				240				120			240	360	240	240	480		650									
0.27			120	240				240		120	240	360	240	360	480											
0.33			120	240				240	120	120	240	480	360	360	650									120		
0.39			120	360				120	240	120	120	240	650	360	360									120		
0.47			240	360				120	240	120	240	360	650	360	480									120		
0.56		120	240	480				120	360	240	240	360		480	650									240		
0.68		120	240	480				120	240	360	240	240	480		650									240		
0.82	120	240	360	650	120	120	240	480	240	360	650												120	240		
1	120	240	360		120	120	240	480	240	360	650												120	240		
1.2	240	240	360		120	240	240	650	360	360													120	120	360	
1.5	240	360	480		240	240	360		360	480													120	240	360	
1.8	240	360	650		240	240	360		480	650													120	120	240	480
2.2	360	480			240	360	480		650														120	120	240	650
2.7	360	480			360	360	650																120	240	360	
3.3	480	650			360	480																	240	240	360	
3.9	480				480	480																	240	240	360	
4.7	650				480	650																	240	240	480	
5.6					650																		240	360	650	
6.8																							360	360		
8.2																							360	480		
10																							480	650		
12																							480	650		
15																							650			

The number represented in each cell corresponds to the maximum "A" dimension (in mils) and to the last 3 digits of the part number.

**CUSTOM VALUES, RATING AND CONFIGURATIONS ARE ALSO AVAILABLE.**





## Looking for pricing, stock, or lifecycle information?

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- ⊖ [View SM045E606ZAN650 on WIN SOURCE](#)
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