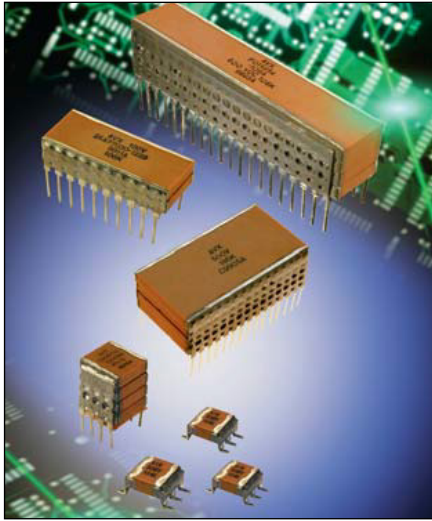


SMPS Stacked MLC Capacitors

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
AVX Style SM0 = Uncoated SM5 = Epoxy Coated	Size See Dimensions chart	Voltage 50V = 5 100V = 1 200V = 2 500V = 7	Temperature Coefficient COG = A N1500 = 4 X7R = C	Capacitance Code (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	Capacitance Tolerance COG/N1500: J = ±5% K = ±10% M = ±20% X7R: K = ±10% M = ±20% Z = +80%, -20%	Test Level A = Standard B = Hi-Rel* 5 = Standard/MIL** 6 = Hi-Rel/MIL***	Termination N = Straight Lead J = Leads formed in L = Leads formed out P = P Style Leads Z = Z Style Leads	Height 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.

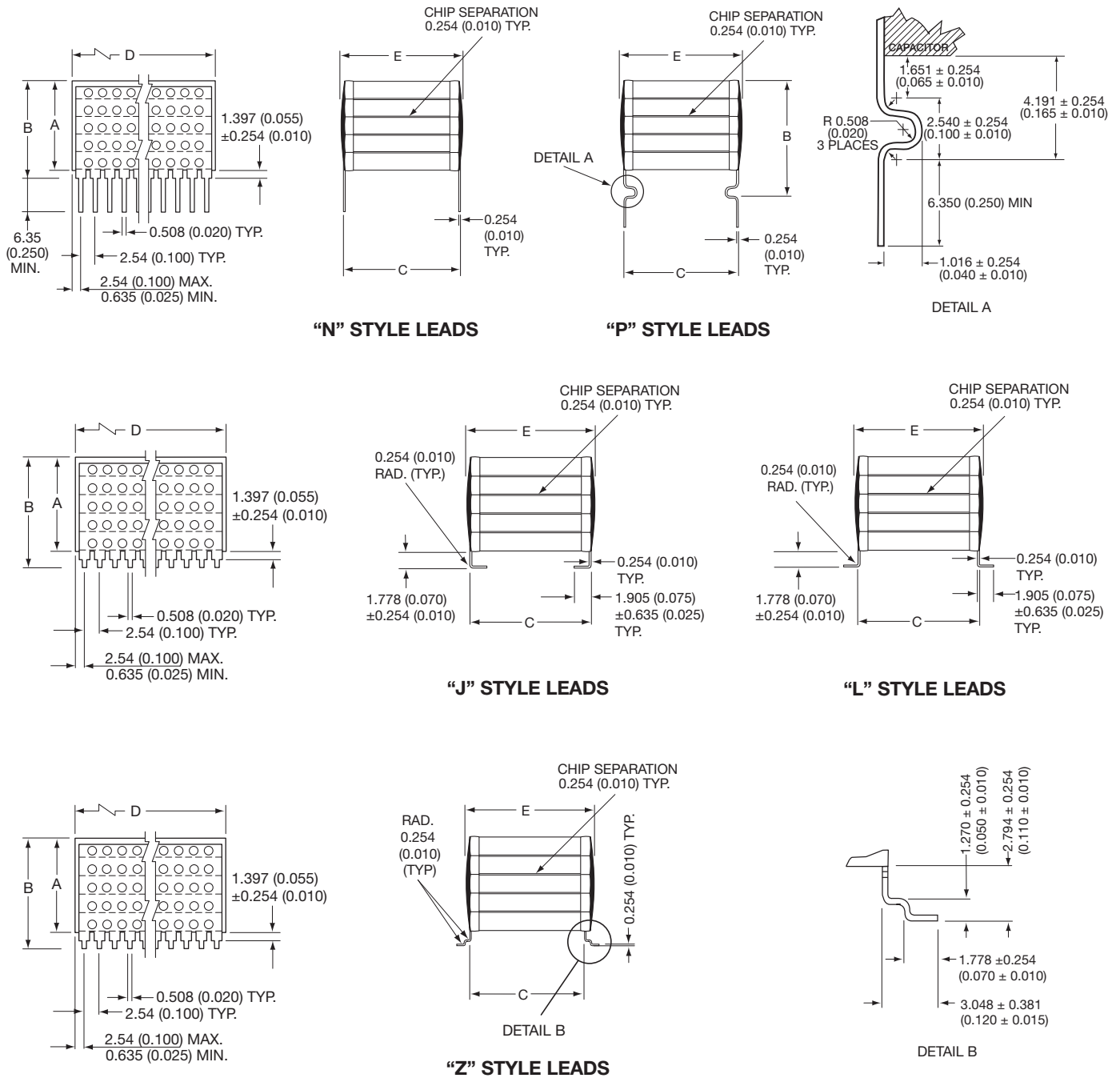
Typical ESR Performance (mΩ)

	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 μ 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	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.

SMPS Stacked MLC Capacitors

SM Style



N1500 CLASS I DIELECTRIC, TEMPERATURE COMPENSATED CERAMIC

Cap μ 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		
0.018																							120			
0.022																										120
0.027																							120	120	120	
0.033																							120	240		
0.039																							120	240		
0.047																							120	240		
0.056																							120	360		
0.068																							120	360		
0.082																							240	360		
0.1																							120	480		
0.12																							120	650		
0.15																							120			
0.18												120											120	360		
0.22												120	120										240	480		
0.27												120	120	120									360	480		
0.33				120								240	120	240	240	650							360	480	650	
0.39				120								240	240	240	360								480	480		
0.47				120								120	240	240	240	360							480	650		
0.56				240								120	360	240	360	480							650			
0.68				240								240	360	240	360	480										
0.82				120	240							240	120	120	240	360	360	650								
1				120	360							240	120	120	240	480	360	480								120
1.2				120	360							120	360	120	240	240	650	480	650							120
1.5				120	480							120	360	240	240	360		650								120
1.8	120	120	240	480								120	480	240	240	360										240
2.2	120	240	240	650	120	120	240	480	240	360	480															240
2.7	240	240	360		120	120	240	650	360	360	480															120
3.3	240	240	360		120	240	240					360	480	650												120
3.9	240	360	480		240	240	360					480	480													120
4.7	360	360	480		240	240	360					480	650													120
5.6	360	480	650		240	360	480					650														120
6.8	480	480			360	360	480																			120
8.2	480	650			360	360	650																			240
10	650				360	480																				240
12					480	650																				240
15					650																					360
18																										360
22																										480
27																										480
33																										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.

SMPS Stacked MLC Capacitors

SM Style



X7R CLASS II DIELECTRIC, STABLE CERAMIC

Cap μ 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				
0.1																									120			
0.12																									120			
0.15																				120	120							
0.18															120				120	240								
0.22															120				120	240								
0.27															120				120	240								
0.33															120				120	360								
0.39															120		120		120	360								
0.47															240		120		240	360								
0.56															120	240		120	240	480								
0.68											120			120	240			120	240	650								
0.82											120			120	360			240	360									
1											120			120	120	360	120	240	360									
1.2											120			120	240	360	120	240	360									
1.5				120							240			120	240	480	120	360	480									
1.8				120							120	240		120	240	650	120	360	650									
2.2				120							120	240		240	240			120	480									
2.7				240							120	360		240	360			120	480									
3.3				240							120	120	360	120	240	360		240	650									
3.9				120	240						120	240	360	120	360	480		240										
4.7				120	240						240	120	240	480	120	360	650		240						120			
5.6				120	360						120	240	650	120	480			240							120			
6.8				120	120	360					120	240		240	240			120	480						120			
8.2				120	240	480					120	360	120	240	360		240	650							120			
10				120	240	480					120	120	360	120	240	360		240							240			
12				120	240	650					120	240	360	120	240	480		240							120	240		
15				120	240	360					120	240	480	120	360	650		240							120	240		
18				120	240	360					120	240	480	120	360	650		360							120	240		
22				120	240	480					120	240	480					360							120	120	360	
27				120	240	480					120	240	360		240	650									120	120	360	
33				240	360	650					120	240	360												120	120	240	480
39				240	480						120	360	480		360										120	120	240	650
47				240	480						240	360	650		360										120	240	240	650
56				360	650						240	480	650		480										120	240	360	
68				360							240	480			480										120	240	360	
82				360							240	650			650										240	360	480	
100				480							360														240	360	650	
120				650							360														240	360	650	
150											480														240	480		
180											650														360	650		
220																									360			
270																									480			
330																									650			
390																									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.