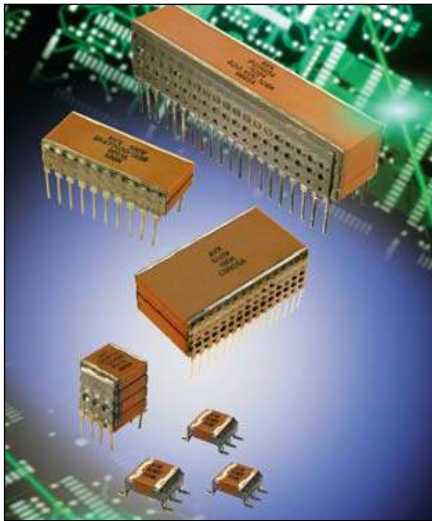


SMPS Stacked MLC Capacitors

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.

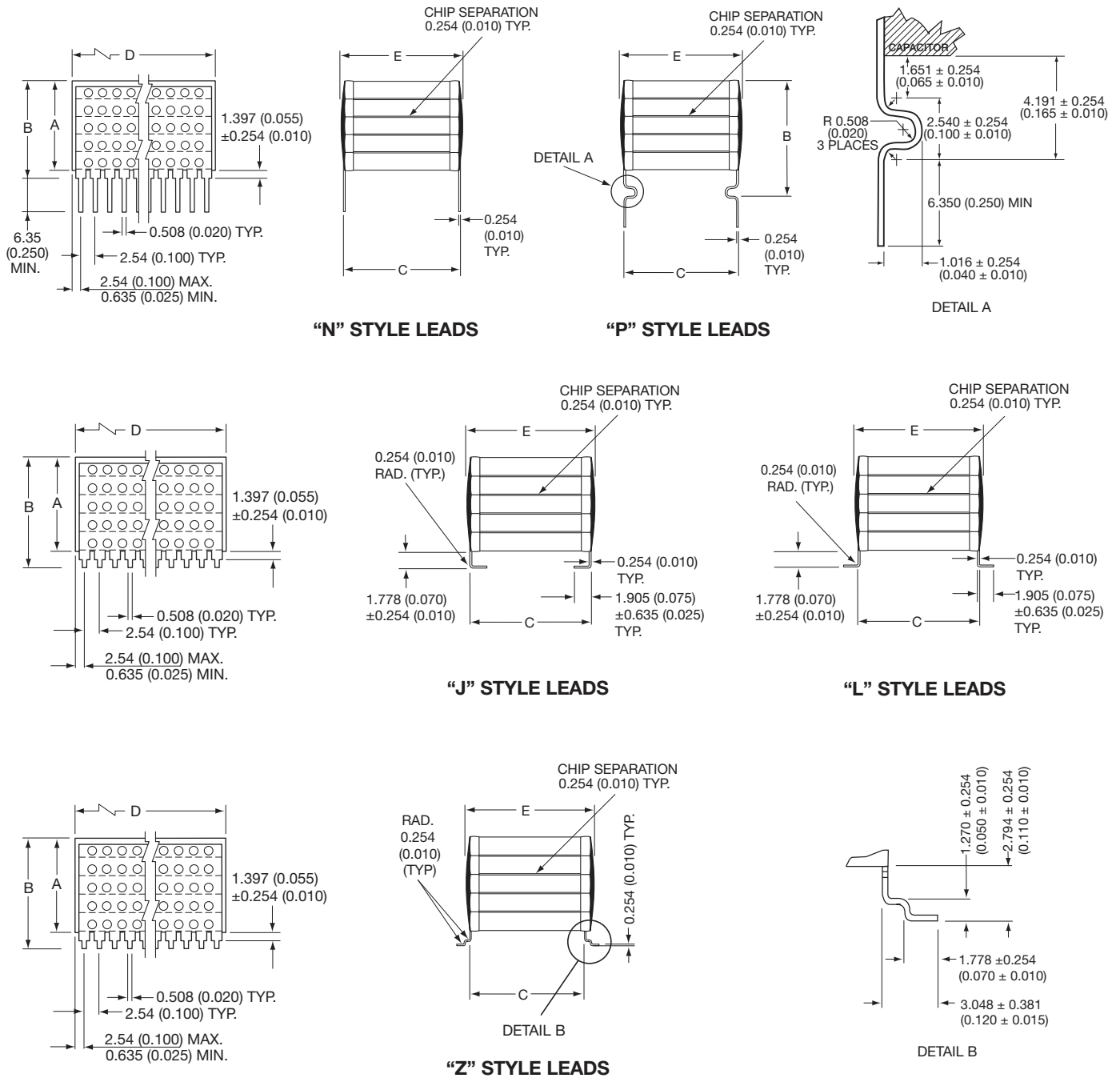
Typical ESR Performance (mΩ)

	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	240
0.015																							120	240
0.018																							120	240
0.022																							240	360
0.027																							240	360
0.033																							240	480
0.039																							240	480
0.047																							240	650
0.056												120											120	360
0.068												120											120	360
0.082												120											120	480
0.1												240											120	480
0.12				120								120											120	650
0.15				120				120				120											360	480
0.18				120				120				120											480	650
0.22				240				120				240											240	480
0.27			120	240				240				120											240	480
0.33			120	240				240				120											360	650
0.39			120	360				120				120											360	650
0.47			240	360				120				240											360	480
0.56		120	240	480				120				360											480	650
0.68		120	240	480				120				360											650	
0.82	120	240	360	650	120			120				240											480	650
1	120	240	360		120			120				240											650	
1.2	240	240	360		120			240				360											360	
1.5	240	360	480		240			360				480											480	
1.8	240	360	650		240			360				480											650	
2.2	360	480			240			360				480											650	
2.7	360	480			360			360				650												
3.3	480	650			360			480																
3.9	480				480			480																
4.7	650				480			650																
5.6					650																			
6.8																								
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				120	240					
0.039																120				120	240					
0.047																120				120	240					
0.056																120				120	360					
0.068																120			120	120	360					
0.082																240	120	120	240	360						
0.1																120	240	120	120	240	480					
0.12																120	240	120	240	240	650					
0.15																120	240	240	240	360						
0.18												120		120	120	360	240	240	360							
0.22												120	120	120	240	480	240	360	480							
0.27												120	120	120	240	480	360	360	480							
0.33				120								240	120	240	240	650	360	480	650							
0.39				120				120				240	240	240	360		480	480								
0.47				120				120		120	240	240	240	360		480	650									
0.56				240				120		120	360	240	360	480		650										
0.68				240				240		120	120	360	240	360	480											
0.82			120	240				240	120	120	240	360	360	360	650											
1			120	360				240	120	120	240	480	360	480											120	
1.2		120	120	360				120	360	120	240	240	650	480	650										120	
1.5		120	240	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	240	
3.3	240	240	360		120	240	240		360	480	650													120	360	
3.9	240	360	480		240	240	360		480	480														120	120	360
4.7	360	360	480		240	240	360		480	650													120	120	240	480
5.6	360	480	650		240	360	480		650														120	120	240	480
6.8	480	480			360	360	480																120	240	240	650
8.2	480	650			360	360	650																240	240	360	
10	650				360	480																	240	240	360	
12					480	650																	240	360	480	
15					650																		360	360	480	
18																							360	480	650	
22																							480	480		
27																							480	650		
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.

