

# SMPS Stacked MLC Capacitors



## SMX Style for High Temperature Applications up to 200°C

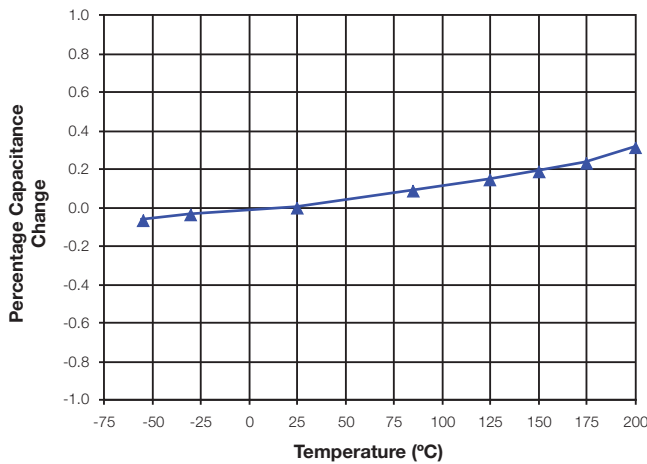


SMX-style, stacked Switch Mode Power Supply Capacitors (SMPS) utilizing Multilayer Ceramic (MLCC) construction are ideally suited for high temperature applications up to 200°C. This product is intended for downhole oil exploration, including logging while drilling, geophysical probes, as well as space and aerospace electronics. The high temperature solder utilized in the construction of SMX-style parts assures reliable operation in harsh environments. The wide product offering provides designers a solution for high capacitance value and high voltage capacitors rated at 200°C. The SMX-style capacitors are ideally suited for applications as DC filters in high power, high frequency motor drives, high pulsed-current circuitry, as well as low power electronics.

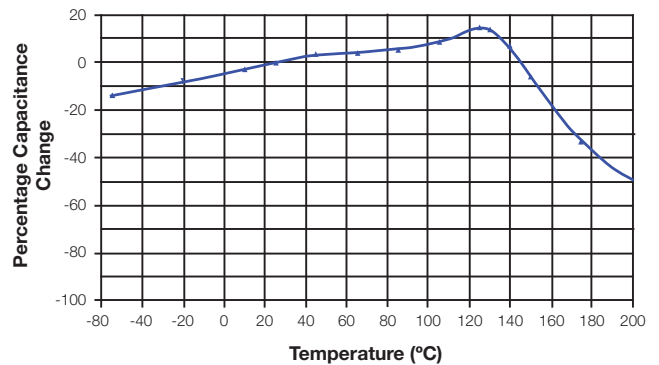
SMX-style, SMPS capacitors are characterized with excellent performance in comparison to wet tantalum products. The main benefits of SMX-product over wet tantalum capacitors include:

- Much lower ESR and lower losses
- Excellent capacitance retention with frequency
- Excellent high frequency performance
- Low DC leakage current
- Much higher current handling capabilities

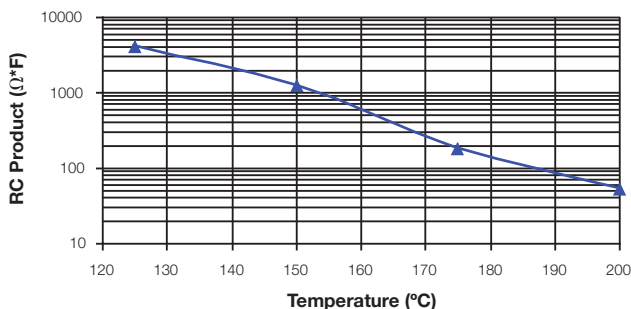
**Typical Extended Temperature TCC**  
**Characterization of C0G, SMPS Capacitors**  
 Test conditions: 1 Vrms, 1 kHz, 0 VDC bias



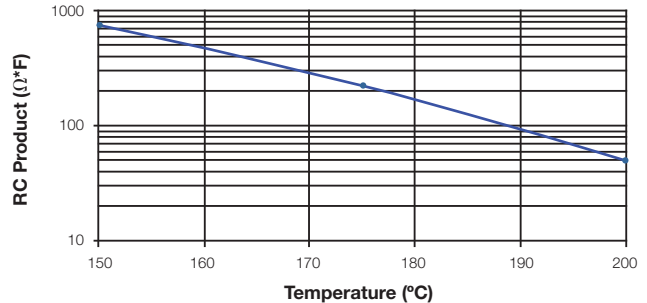
**Typical Extended Temperature TCC**  
**Characterization of VHT, SMPS Capacitors**  
 Test conditions: 1 Vrms, 1 kHz, 0 VDC bias



**Typical Extended Temperature IR Characterization of**  
**C0G, SMPS Capacitors**



**Typical Extended Temperature IR Characterization of**  
**VHT, SMPS Capacitors**



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### ELECTRICAL SPECIFICATIONS

#### Temperature Coefficient

COG: A Temperature Coefficient 0 ±30 ppm/°C, -55° to +200°C  
 VHT: C Temperature Coefficient ±15%, -55°C to +125°C  
 +15% - 56%, -55°C to +200°C

#### Capacitance Test (MIL-STD-202 Method 305)

25°C, 1.0±0.2 Vrms (open circuit voltage) at 1KHz

#### Dissipation Factor 25°C

COG: 0.15% Max @ 25°C, 1.0±0.2 Vrms (open circuit voltage) at 1KHz  
 VHT: 2.5% Max @ 25°C, 1.0±0.2 Vrms (open circuit voltage) at 1KHz

#### Insulation Resistance 25°C (MIL-STD-202 Method 302)

100K MΩ or 1000 MΩ-μF, whichever is less.

#### Insulation Resistance 125°C (MIL-STD-202 Method 302)

10K MΩ or 100 MΩ-μF, whichever is less.

#### Insulation Resistance 200°C (MIL-STD-202 Method 302)

1K MΩ or 10 MΩ -μF, whichever is less.

#### Dielectric Withstanding Voltage 25°C (Flash Test)

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

#### Moisture Resistance (MIL-STD-202 Method 106)

Ten cycles with no voltage applied.

#### Thermal Shock (MIL-STD-202 Method 107, Condition A)

#### Immersion Cycling (MIL-STD-202 Method 104, Condition B)

#### Resistance To Solder Heat (MIL-STD-202, Method 210, Condition B, for 20 seconds)

**Not RoHS Compliant**

### HOW TO ORDER

### AVX Styles: SMX1, SMX2, SMX3, SMX4, SMX5, SMX6

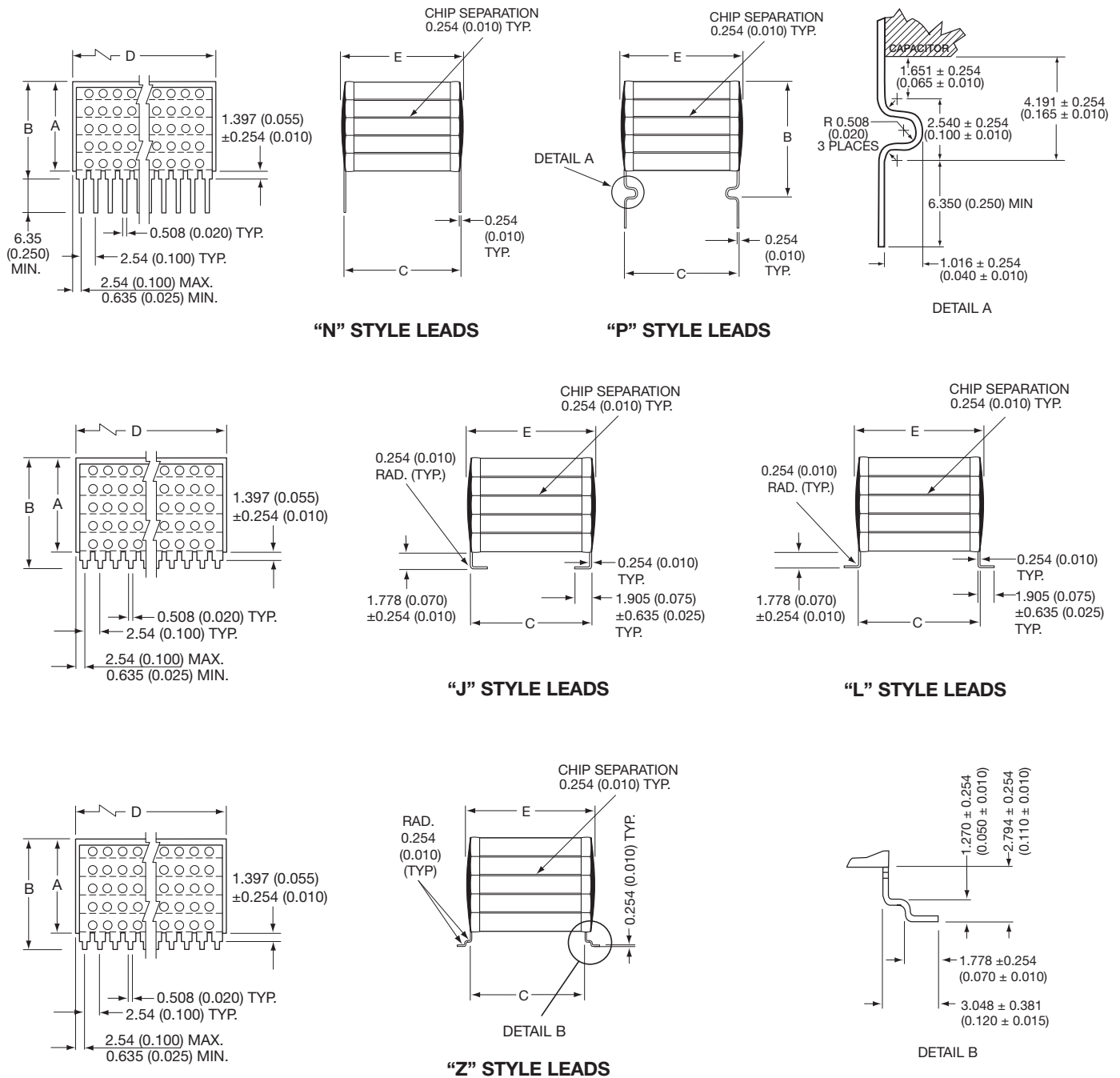
SMX	1	7	C	106	M	A	N	650
<b>AVX Style</b> SMX = Uncoated	<b>Size</b> See Dimensions chart	<b>Voltage</b> 25 = 3 50V = 5 100V = 1 200V = 2 500V = 7	<b>Temperature Coefficient</b> COG = A VHT = C	<b>Capacitance Code</b> (2 significant digits + number of zeros) 10 pF = 100 100 pF = 101 1,000 pF = 102 22,000 pF = 223 220,000 pF = 224 1μF = 105 10 μF = 106 100 μF = 107	<b>Capacitance Tolerance</b> COG: J = ±5% K = ±10% M = ±20% X7R: K = ±10% M = ±20% Z = +80%, -20%	<b>Test Level</b> A = Standard	<b>Termination</b> N = Straight Lead J = Leads formed in L = Leads formed out P = P Style Leads Z = Z Style Leads	<b>Height Max</b> Dimension "A" 120 = 0.120" 240 = 0.240" 360 = 0.360" 480 = 0.480" 650 = 0.650"

Note: Capacitors with X7R/X9U dielectric is not intended for applications across AC supply mains or AC line filtering with polarity reversal. Contact plant for recommendations.

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## SMX Style for High Temperature Applications up to 200°C



### DIMENSIONS

millimeters (inches)

Style	A (max.)	B (max.)	C ±.635 (±0.025)	D ±.635 (±0.025)	E (max.)	No. of Leads per side
SMX1	See page 40 for maximum "A" Dimension	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
SMX2			20.3 (0.800)	38.4 (1.510)	22.1 (0.870)	15
SMX3			11.4 (0.450)	26.7 (1.050)	12.7 (0.500)	10
SMX4			10.2 (0.400)	10.2 (0.400)	11.2 (0.440)	4
SMX5			6.35 (0.250)	6.35 (0.250)	7.62 (0.300)	3
SMX6			31.8 (1.250)	52.1 (2.050)	34.3 (1.350)	20

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## SMX Style for High Temperature Applications up to 200°C

### Max Capacitance (µF) Available Versus Style with Height (A) of 0.120" - 3.05mm

AVX STYLE	SMX1					AN120					SMX2					AN120					SMX3					AN120					SMX4					AN120					SMX5					AN120					SMX6					AN120				
	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V															
COG	1.0	.70	.40	.18	.068	1.2	1.0	.60	.26	.10	.50	.40	.20	.09	.033	.16	.13	.07	.02	.01	.05	.04	.02	.01	.0039	3.2	2.4	1.3	.50	.20																														
VHT	-	18	10	3.9	1.8	-	27	15	5.6	2.7	12	8.2	4.7	1.8	.82	3.9	2.7	1.5	.56	.27	1.5	1.0	.56	.22	.10	-	56	33	12	5.6																														

### Max Capacitance (µF) Available Versus Style with Height (A) of 0.240" - 6.10mm

AVX STYLE	SMX1					AN240					SMX2					AN240					SMX3					AN240					SMX4					AN240					SMX5					AN240					SMX6					AN240				
	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V																				
COG	2.0	1.4	.80	.36	.13	2.4	2.0	1.2	.52	.20	1.0	.80	.40	.18	.068	.33	.26	.14	.05	.02	.10	.08	.05	.02	.0078	6.4	4.8	2.6	1.0	.40																														
VHT	-	33	18	6.8	3.3	-	47	27	10	4.7	22	15	8.2	3.3	1.5	6.8	4.7	2.7	1.0	.47	2.7	1.8	1.0	.39	.18	-	100	56	22	10																														

### Max Capacitance (µF) Available Versus Style with Height (A) of 0.360" - 9.14mm

AVX STYLE	SMX1					AN360					SMX2					AN360					SMX3					AN360					SMX4					AN360					SMX5					AN360					SMX6					AN360				
	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V																				
COG	3.0	2.1	1.2	.54	.22	3.6	3.0	1.8	.78	.30	1.5	1.2	.60	.27	.10	.48	.39	.21	.07	.03	.15	.12	.07	.03	.011	10	7.2	3.9	1.5	.60																														
VHT	-	47	27	10	4.7	-	68	39	15	6.8	33	22	12	5.6	2.2	12	6.8	3.9	1.5	.68	3.9	2.7	1.5	.56	.27	-	150	82	33	15																														

### Max Capacitance (µF) Available Versus Style with Height (A) of 0.480" - 12.2mm

AVX STYLE	SMX1					AN480					SMX2					AN480					SMX3					AN480					SMX4					AN480					SMX5					AN480					SMX6					AN480				
	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V																				
COG	4.0	2.8	1.6	.72	.27	4.8	4.0	2.2	1.0	.40	2.0	1.6	.80	.36	.130	.64	.52	.28	.10	.04	.20	.16	.10	.04	.015	13	9.6	5.2	2.0	.80																														
VHT	-	68	39	15	6.8	-	100	56	22	10	47	33	18	6.8	3.3	15	10	5.6	2.2	1.0	5.6	3.9	2.2	.82	.39	-	220	120	47	22																														

### Max Capacitance (µF) Available Versus Style with Height (A) of 0.650" - 16.5mm

AVX STYLE	SMX1					AN650					SMX2					AN650					SMX3					AN650					SMX4					AN650					SMX5					AN650					SMX6					AN650				
	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V	25V	50V	100V	200V	500V																				
COG	5.0	3.5	2.0	.90	.34	6.0	5.0	3.0	1.3	.50	2.5	2.0	1.0	.45	.160	.82	.65	.35	.12	.05	.25	.20	.12	.05	.019	16	12	6.5	2.5	1.0																														
VHT	-	82	47	18	8.2	-	120	68	27	12	56	39	22	8.2	3.9	18	12	6.8	2.7	1.2	6.8	4.7	2.7	1.0	.47	-	270	150	56	27																														

# SMPS Capacitors

## Custom Geometries and Lead Configurations

For the requirements that cannot be satisfied by standard SMPS style products (SM0-style or SM9-style), AVX offers leading edge solutions in custom configuration and packaging. Ranging from unique geometries, lead configurations, packaging and stress relief mounting options, AVX has optimized solutions for a wide range of customer specific designs. The solutions provided by AVX maintain high reliability of stacked capacitor product originally developed by AVX and historically recognized as the highest reliability product in the market. Custom packaging options provide solutions that eliminate reliability concerns in the next level assembly. These custom options provide the following benefits:

- eliminate soldering requirements altogether by providing means of electrical/mechanical connection to the circuit
- provide options for remote soldering away from large ceramic capacitor body and eliminating the risk of thermal shock (refer to photograph with soft, insulated leads soldered to the stacked capacitor using high melting point SN10 solder)

Many other innovations are available from AVX Olean Advanced Products. Let them apply these ideas to your application specific requirements. Please contact AVX for a solution that will meet demands of your program requirements.

### CUSTOM LEAD CONFIGURATIONS...



### CUSTOM PACKAGING...

