

# SMPS Stacked MLC Capacitors



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

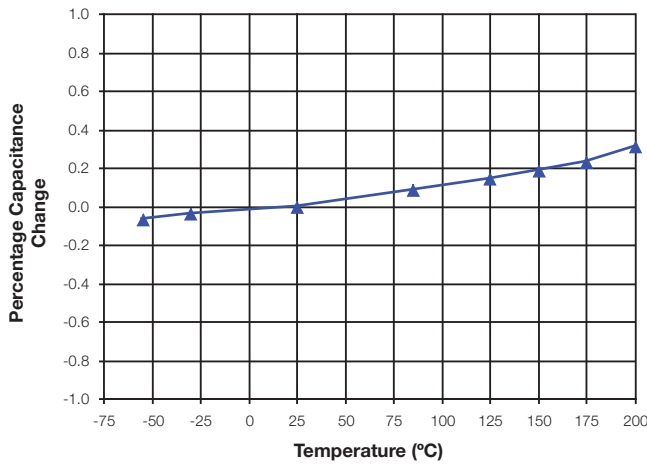


SMX-style, stacked Switch Mode Power Supply Capacitors (SMPS) utilizing Multilayer Ceramic (MLCC) construction are ideally suited for high temperature applications up to 200°C. This product is intended for downhole oil exploration, including logging while drilling, geophysical probes, as well as space 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.

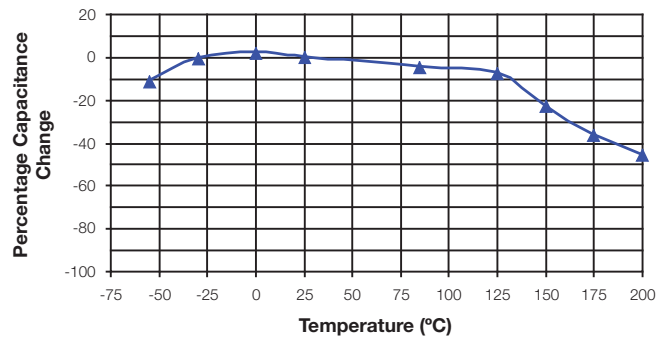
SMX-style, SMPS capacitors are characterized with excellent performance in comparison to wet tantalum products. The main benefits of SMX-product over wet tantalum capacitors include:

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

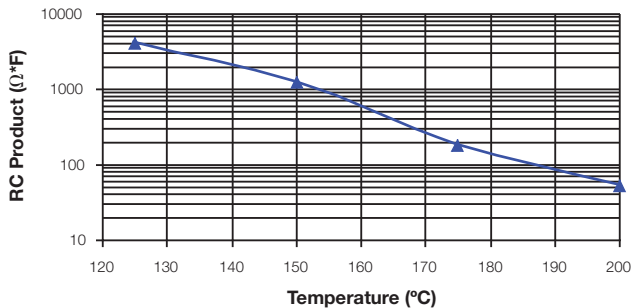
**Typical Extended Temperature TCC**  
**Characterization of C0G, SMPS Capacitors**  
 Test conditions: 1 Vrms, 1 kHz, 0 VDC bias



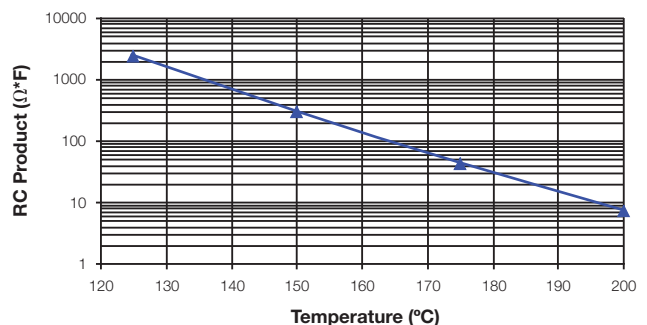
**Typical Extended Temperature TCC**  
**Characterization of X7R/X9U, SMPS Capacitors**  
 Test conditions: 1 Vrms, 1 kHz, 0 VDC bias



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



**Typical Extended Temperature IR Characterization of**  
**X7R/X9U, SMPS Capacitors**



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### ELECTRICAL SPECIFICATIONS

#### Temperature Coefficient

C0G: A Temperature Coefficient 0 ±30 ppm/°C, -55° to +200°C  
 X7R/X9U: 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

C0G: 0.15% Max @ 25°C, 1.0±0.2 Vrms (open circuit voltage) at 1KHz  
 X7R/X9U: 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)

100 MΩ or 1 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)

### HOW TO ORDER

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

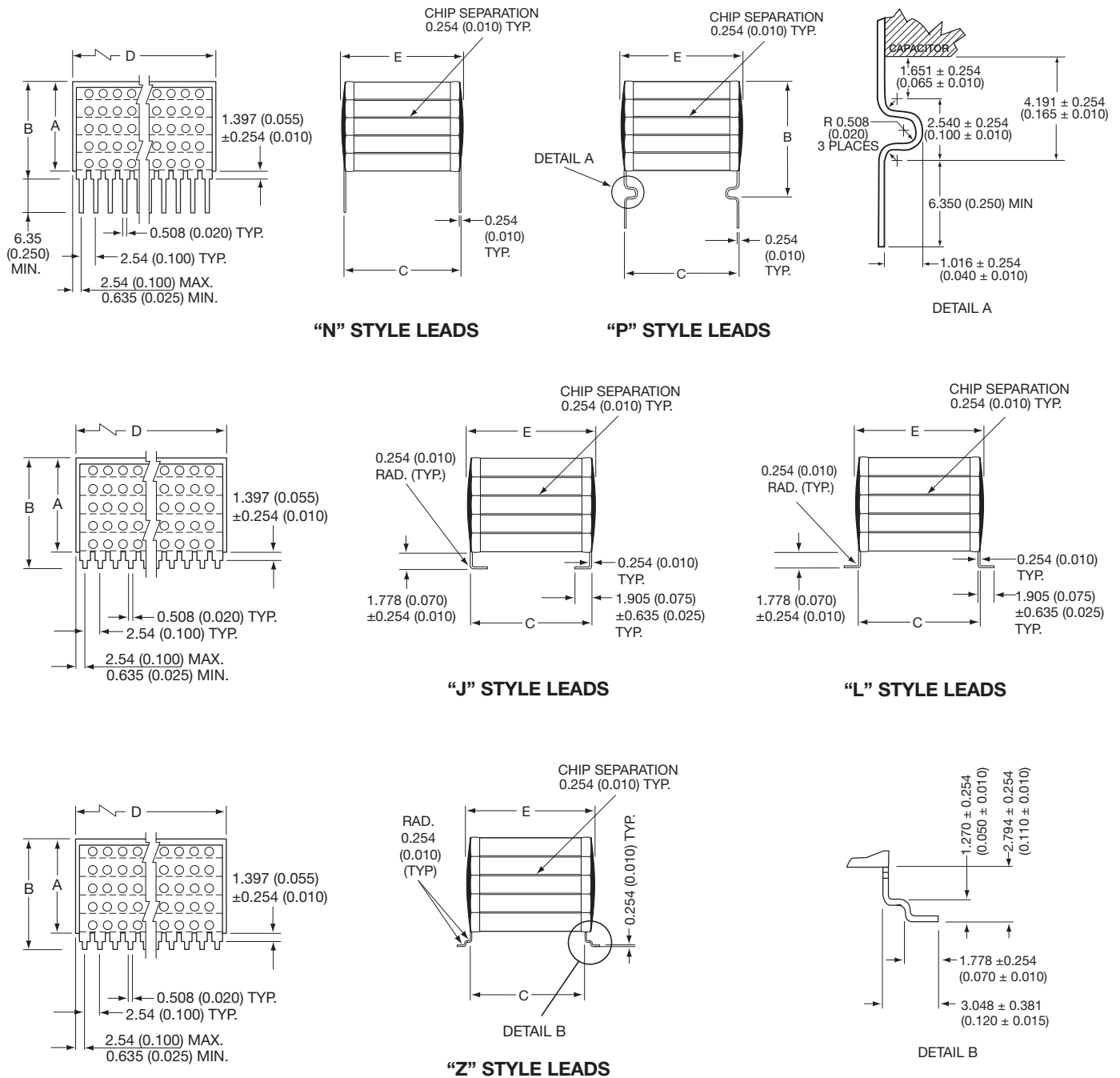
SMX	1	7	C	106	M	A	N	650
<b>AVX Style</b> SMX = Uncoated	<b>Size</b> See Dimensions chart	<b>Voltage</b> 25 = 3 50V = 5 100V = 1 200V = 2 500V = 7	<b>Temperature Coefficient</b> C0G = A X7R/X9U = C	<b>Capacitance Code</b> (2 significant digits + number of zeros) 10 pF = 100 100 pF = 101 1,000 pF = 102 22,000 pF = 223 220,000 pF = 224 1 μF = 105 10 μF = 106 100 μF = 107	<b>Capacitance Tolerance</b> C0G: 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.

# SMPS Stacked MLC Capacitors



## 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 35 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



# SMPS Stacked MLC Capacitors



## 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	22	12	7.0	2.6	1.0	33	18	11	4.0	1.5	11	6.0	3.6	1.3	.50	3.3	1.8	1.1	.40	.15	1.2	.68	.40	.16	.056	68	40	24	9.4	3.3
X7R/X9U	22	12	7.0	2.6	1.0	33	18	11	4.0	1.5	11	6.0	3.6	1.3	.50	3.3	1.8	1.1	.40	.15	1.2	.68	.40	.16	.056	68	40	24	9.4	3.3																														

### 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	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	44	24	14	5.2	2.0	66	36	22	8.0	3.0	22	12	7.2	2.6	1.0	6.6	3.6	2.2	.80	.30	2.4	1.3	.80	.32	.110	130	80	48	18	6.6
X7R/X9U	44	24	14	5.2	2.0	66	36	22	8.0	3.0	22	12	7.2	2.6	1.0	6.6	3.6	2.2	.80	.30	2.4	1.3	.80	.32	.110	130	80	48	18	6.6																														

### 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	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	68	36	21	7.8	3.0	100	54	33	12	4.5	33	18	10	3.9	1.5	10	5.4	3.3	1.2	.47	3.6	2.0	1.2	.48	.160	200	120	72	28	10
X7R/X9U	68	36	21	7.8	3.0	100	54	33	12	4.5	33	18	10	3.9	1.5	10	5.4	3.3	1.2	.47	3.6	2.0	1.2	.48	.160	200	120	72	28	10																														

### 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	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	88	48	28	10	4.0	130	72	44	16	6.0	44	24	14	5.2	2.0	13	7.2	4.4	1.6	.60	4.8	2.7	1.6	.64	.22	270	160	96	37	13
X7R/X9U	88	48	28	10	4.0	130	72	44	16	6.0	44	24	14	5.2	2.0	13	7.2	4.4	1.6	.60	4.8	2.7	1.6	.64	.22	270	160	96	37	13																														

### 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	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	110	60	35	13	5.0	160	90	55	20	7.5	56	30	18	6.5	2.5	16	9.0	5.5	2.0	.80	6.0	3.4	2.0	.80	.28	340	200	120	47	16
X7R/X9U	110	60	35	13	5.0	160	90	55	20	7.5	56	30	18	6.5	2.5	16	9.0	5.5	2.0	.80	6.0	3.4	2.0	.80	.28	340	200	120	47	16																														