

RoHS Compliant SMPS Stacked MLC Capacitors

(RM Style) Technical Information on SMPS Capacitors



ELECTRICAL SPECIFICATIONS

Temperature Coefficient

C0G: A Temperature Coefficient - 0 $\pm$ 30 ppm/ $^{\circ}$ C, -55 $^{\circ}$ to +125 $^{\circ}$ C
 X7R: C Temperature Coefficient - $\pm$ 15%, -55 $^{\circ}$ to +125 $^{\circ}$ C
 Z5U: E Temperature Coefficient - +22, -56%, +10 $^{\circ}$ to +85 $^{\circ}$ C

Capacitance Test (MIL-STD-202 Method 305)

C0G: 25 $^{\circ}$ C, 1.0 $\pm$ 0.2 Vrms (open circuit voltage) at 1KHz
 X7R: 25 $^{\circ}$ C, 1.0 $\pm$ 0.2 Vrms (open circuit voltage) at 1KHz
 Z5U: 25 $^{\circ}$ C, 0.5 Vrms max (open circuit voltage) at 1KHz

Dissipation Factor 25 $^{\circ}$ C

C0G: 0.15% Max @ 25 $^{\circ}$ C, 1.0 $\pm$ 0.2 Vrms (open circuit voltage) at 1KHz
 X7R: 2.5% Max @ 25 $^{\circ}$ C, 1.0 $\pm$ 0.2 Vrms (open circuit voltage) at 1KHz
 Z5U: 3.0% Max @ 25 $^{\circ}$ C, 0.5 Vrms max (open circuit voltage) at 1KHz

Insulation Resistance 25 $^{\circ}$ C (MIL-STD-202 Method 302)

C0G and X7R: 100K M Ω or 1000 M Ω - μ F, whichever is less.
 Z5U: 10K M Ω or 1000 M Ω - μ F, whichever is less.

Insulation Resistance 125 $^{\circ}$ C (MIL-STD-202 Method 302)

C0G and X7R: 10K M Ω or 100 M Ω - μ F, whichever is less.
 Z5U: 1K M Ω or 100 M Ω - μ F, whichever is less.

Dielectric Withstanding Voltage 25 $^{\circ}$ C (Flash Test)

C0G and X7R: 250% rated voltage for 5 seconds with 50 mA max charging current. (500 Volt units @ 750 VDC)
 Z5U: 200% rated voltage for 5 seconds with 50 mA max charging current.

Life Test (1000 hrs)

C0G and X7R: 200% rated voltage at +125 $^{\circ}$ C. (500 Volt units @ 600 VDC)
 Z5U: 150% rated voltage at +85 $^{\circ}$ C

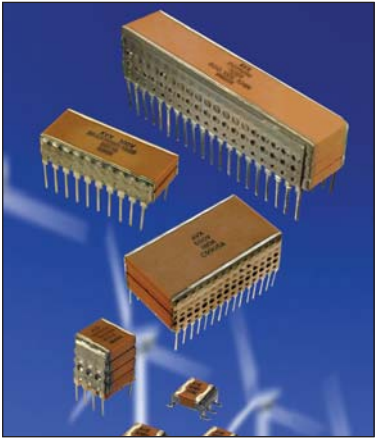
Moisture Resistance (MIL-STD-202 Method 106)

C0G, X7R, Z5U: 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)



Typical ESR Performance (m Ω)

	Aluminum Electrolytic 100 μ F/50V	Low ESR Solid Tantalum 100 μ F/10V	Solid Aluminum Electrolytic 100 μ F/16V	MLCC SMPS 100 μ F/50V	MLCC SMPS 4.7 μ F/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

HOW TO ORDER

AVX Styles: RM-1, RM-2, RM-3, RM-4, RM-5, RM-6

RM0	1	7	C	106	M	A	N	650
AVX Style RM0 = Uncoated RM5 = Epoxy Coated	Size See Dimensions chart	Voltage 50V = 5 100V = 1 200V = 2 500V = 7	Temperature Coefficient C0G = A X7R = C Z5U = E	Capacitance Code (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 μ F = 105 10 μ F = 106 100 μ F = 107	Capacitance Tolerance C0G: J = $\pm$ 5% K = $\pm$ 10% M = $\pm$ 20% X7R: K = $\pm$ 10% M = $\pm$ 20% Z = +80%, -20% Z5U: M = $\pm$ 20% Z = +80%, -20% P = GMV (+100, -0%)	Test Level A = Standard	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"



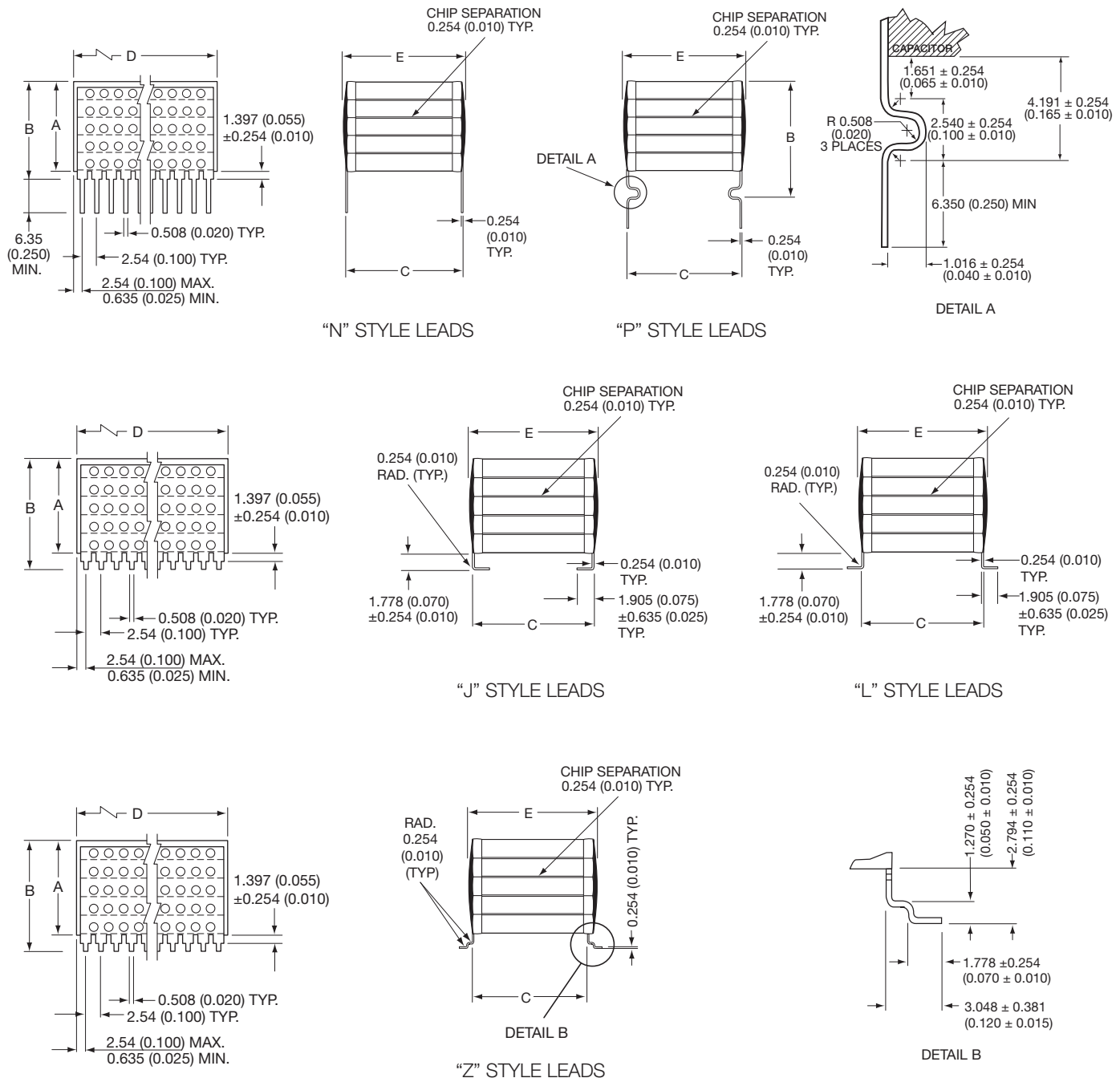
Note: Capacitors with X7R and Z5U dielectrics are not intended for applications across AC supply mains or AC line filtering with polarity reversal. Contact plant for recommendations.



RoHS Compliant SMPS Stacked MLC Capacitors



(RM Style) Surface Mount and Thru-Hole Styles (RM0, RM5)



DIMENSIONS

millimeters (inches)

Style	A (max.)	B (max.)	C ±.635 (±0.025)	D ±.635 (±0.025)	E (max.)	No. of Leads per side
RM-1	See page 10 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
RM-2			20.3 (0.800)	38.4 (1.510)	22.1 (0.870)	15
RM-3			11.4 (0.450)	26.7 (1.050)	12.7 (0.500)	10
RM-4			10.2 (0.400)	10.2 (0.400)	11.2 (0.440)	4
RM-5			6.35 (0.250)	6.35 (0.250)	7.62 (0.300)	3
RM-6			31.8 (1.250)	52.1 (2.050)	34.3 (1.350)	20

Note: For RM5 add 0.127 (0.005) to max. and nominal dimensions A, B, D, & E

RoHS Compliant SMPS Stacked MLC Capacitors (RM Style)



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

AVX STYLE	RM01 _____ AN120				RM02 _____ AN120				RM03 _____ AN120				RM04 _____ AN120				RM05 _____ AN120				RM06 _____ AN120			
	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V
C0G	1.0	.70	.40	.18	1.2	1.0	.60	.26	.47	.40	.20	.09	.16	.13	.07	.02	.05	.04	.02	.01	3.2	2.4	1.3	.50
X7R	27	12	7.0	2.6	41	18	11	4.0	18	6.0	3.6	1.3	7.5	1.8	1.1	.40	2.8	.68	.40	.16	80	40	24	9.4
Z5U	84	32	12	---	110	46	34	---	40	15	6.0	---	12	4.6	3.0	---	4.6	1.8	.72	---	260	140	92	---

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

AVX STYLE	RM01 _____ AN240				RM02 _____ AN240				RM03 _____ AN240				RM04 _____ AN240				RM05 _____ AN240				RM06 _____ AN240			
	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V
C0G	2.0	1.4	.80	.36	2.4	2.0	1.2	.52	1.0	.80	.40	.18	.32	.26	.14	.05	.10	.08	.05	.02	6.4	4.8	2.6	1.0
X7R	54	24	14	5.2	82	36	22	8.0	36	12	7.2	2.6	15	3.6	2.2	.80	5.6	1.3	.80	.32	160	80	48	18
Z5U	160	64	24	---	230	92	68	---	80	30	12	---	24	9.2	6.0	---	9.2	3.6	1.4	---	520	280	180	---

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

AVX STYLE	RM01 _____ AN360				RM02 _____ AN360				RM03 _____ AN360				RM04 _____ AN360				RM05 _____ AN360				RM06 _____ AN360			
	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V
C0G	3.0	2.1	1.2	.54	3.6	3.0	1.8	.78	1.5	1.2	.60	.27	.48	.39	.21	.07	.15	.12	.07	.03	9.6	7.2	3.9	1.5
X7R	82	36	21	7.8	120	54	33	12	54	18	10	3.9	22	5.4	3.3	1.2	8.2	2.0	1.2	.48	240	120	72	28
Z5U	250	96	36	---	350	130	100	---	120	45	18	---	36	13	9.0	---	13	5.4	2.1	---	780	430	270	---

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

AVX STYLE	RM01 _____ AN480				RM02 _____ AN480				RM03 _____ AN480				RM04 _____ AN480				RM05 _____ AN480				RM06 _____ AN480			
	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V
C0G	4.0	2.8	1.6	.72	4.8	4.0	2.2	1.0	2.0	1.6	.80	.36	.64	.52	.28	.10	.20	.16	.10	.04	12	9.6	5.2	2.0
X7R	110	48	28	10	160	72	44	16	72	24	14	5.2	30	7.2	4.4	1.6	10	2.7	1.6	.64	320	160	96	37
Z5U	330	120	48	---	470	180	130	---	160	60	24	---	48	18	12	---	18	7.2	2.8	---	1000	570	360	---

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

AVX STYLE	RM01 _____ AN650				RM02 _____ AN650				RM03 _____ AN650				RM04 _____ AN650				RM05 _____ AN650				RM06 _____ AN650			
	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V
C0G	5.0	3.5	2.0	.90	6.0	5.0	3.0	1.3	2.5	2.0	1.0	.47	.80	.65	.35	.12	.25	.20	.12	.05	16	12	6.5	2.5
X7R	130	60	35	13	200	90	55	20	90	30	18	6.5	36	9.0	5.5	2.0	12	3.4	2.0	.80	400	200	120	47
Z5U	420	160	60	---	590	230	170	---	200	75	30	---	60	23	15	---	23	9.0	3.6	---	1300	720	460	---