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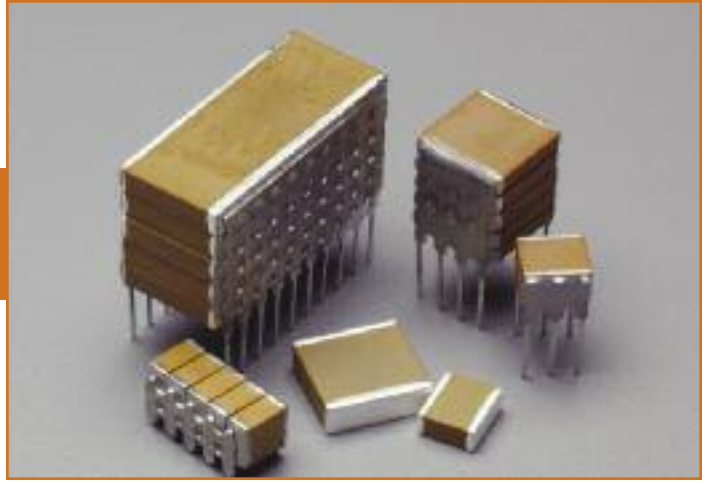
Spectrum Control

Mil Qualified & DSCC Certified
SMPS Capacitor Assemblies



API Technologies' Spectrum Control line of MIL-PRF-49470 qualified and DSCC 87106 certified Switch Mode Power Supply capacitors are designed to provide superior performance in high frequency switching applications. These capacitors are ideal for high energy density products found in both military and commercial markets.

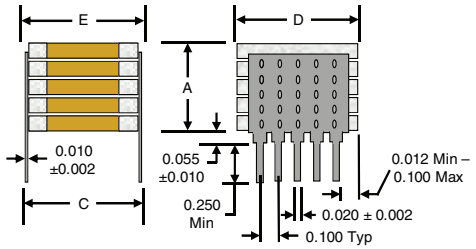
- Capacitance values 0.01µF to 47µF
- Leaded parts safeguard against thermal and mechanical stresses

API's High-speed SMPS capacitors have the following characteristics when compared to other capacitive elements:

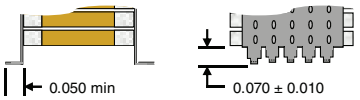
- Lower Equivalent Series Resistance (ESR)
- Lower Equivalent Series Inductance (ESL)
- Lower ripple voltage and less self heating

Style/Size		Dimensions A max	B max	C ±0.025"	D ±0.025"	E max	Leads/ Side
SMP-3	(in)	0.650	0.715	0.450	1.050	0.500	10
	(mm)	16.50	18.16	11.42	26.65	12.69	
SMP-4	(in)	0.650	0.715	0.400	0.400	0.440	4
	(mm)	16.50	18.16	10.15	10.15	11.17	
SMP-5	(in)	0.650	0.715	0.250	0.250	0.300	3
	(mm)	16.50	18.16	6.35	6.35	7.62	

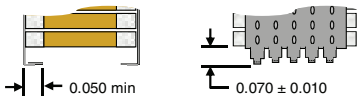
N Lead Configuration



L Lead Configuration



J Lead Configuration



6/M Surface Mount Configuration

Dielectric Characteristics

API offers SMPS capacitors in two basic dielectric classes, with individual designs tailored to meet specific performance characteristics.

Dielectric Type	Stability Class	Description
BP (NPO/COG)	Ultra Stable Class I	Effects on electrical properties are minimal with variations in operating temperature, voltage, frequency or time. Used in applications which require stable performance.
BQ, BR and BX	Stable Class II	Class II dielectrics will exhibit a predictable shift in performance characteristics when exposed to variations in temperature, voltage, frequency or time. Selected for applications where blocking, coupling, by-passing and frequency discriminating elements are used. Offers higher capacitance than Class I (COG).

SMPS Part Numbering System

Example: **SMP3X124KENMB00**

The part number shown represents a size 3 SMPS capacitor. The ceramic type will be BX, capacitance value is 120,000 pF, with a tolerance of ±10%. The voltage rating is 500 VDC, termination will be "N" style leads and the parts will receive marking/ bulk packaging.

SMP3	X	124	K	E	N	M	B	00
Case Size	**Ceramic Code**	**EIA Cap Code**	**EIA Cap Tolerance**	**Voltage Rating**	**Termination**	**Marking**	**Packaging**	**Special Requirements**
SMP3 SMP4 SMP5	P: BP Q: BQ R: BR X: BX	Example: 120,000 pF	J: ±5% K: ±10% M: ±20%	Z: 25 VDC A: 50 VDC B: 100 VDC C: 200 VDC E: 500 VDC	J: Leads in L: Leads out N: Leads straight	M: Marked U: Unmarked	T: Tape & Reel F: Foam carrier/ boxed W: Waffle	GA:87106 Group A HR:Hi-Rel*

* HR: Hi-Rel designation reflects MIL-PRF-49470, level B, QPL approval

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Spectrum Control

Military/Hi-Rel & Commercial/Industrial Grade
SMPS Capacitor Assemblies

API Technologies' Spectrum Control brand offers high reliability/military grade and commercial/industrial grade capacitors designed to provide superior performance in high frequency switch mode power supply applications. These capacitors are ideal for bulk capacitance and pulsing applications and are available in a range of different footprints and mounting configurations. The high reliability/military grade is based on the design principals and test requirements defined by MIL-PRF-49470.

- Leaded options safeguard against thermal and mechanical stresses in larger package sizes
- Capacitance values 0.01 µF to 150 µF
- Stable Class II, BX, BR, BQ and X7R dielectric materials offer reliable operation and predictable performance characteristics related to temperature, frequency and voltage

API's line of Spectrum Control high-speed Switch Mode Power Supply capacitors have the following characteristics when compared to other capacitor technologies:

- Lower Equivalent Series Resistance (ESR)
- Lower Equivalent Series Inductance (ESL)
- Lower ripple voltage and less self heating

Electrical Characteristics

VTC	WVDC	Maximum Capacitance Value									
		2225	2425	3530	3640	3940	4540	5550	6560	7565	44105
X7R	50	156	156	276	396	476	566	826	127	157	157
X7R	100	685	685	126	186	206	256	396	566	686	586
X7R	200	475	475	685	825	106	126	156	256	336	276
X7R	500	155	155	275	395	395	475	685	825	126	126
BX	50	475	565	106	126	156	185	276	396	576	476
BX	100	215	335	475	575	825	825	125	186	226	276
BR	200	125	155	255	395	395	475	685	106	126	126
BQ	500	564	684	125	155	185	185	275	475	565	565

Dimensions (Refer to drawings on page 14)

Dimensions in (mm)	Case Size									
	2225	2425	3530	3640	3940	4540	5550	6560	7565	44A5
C ±0.025 (0.635)	0.235 (5.97)	0.250 (6.35)	0.360 (9.14)	0.370 (9.40)	0.400 (10.16)	0.460 (11.68)	0.560 (14.22)	0.660 (16.76)	0.760 (19.30)	0.450 (11.42)
D Min - Max	0.224–0.275 (5.69–6.99)	0.224–0.275 (5.69–6.99)	0.275–0.325 (6.99–8.26)	0.350–0.425 (8.89–10.80)	0.350–0.425 (8.89–10.80)	0.350–0.425 (8.89–10.80)	0.450–5.25 (11.43–13.34)	0.550–0.625 (13.97–15.88)	0.600–0.675 (15.24–17.15)	0.950–1.075 (24.13–27.31)
E Max	0.300 (7.62)	0.300 (7.62)	0.420 (4.67)	0.430 (10.92)	0.440 (11.17)	0.530 (13.46)	0.630 (16.00)	0.730 (18.54)	0.830 (21.08)	0.500 (12.70)
A Max	0.650 (16.51)	0.650 (16.51)	0.650 (16.51)	0.650 (16.51)	0.650 (16.51)	0.650 (16.51)	0.650 (16.51)	0.650 (16.51)	0.650 (16.51)	0.650 (16.51)
# Leads/Side	3	3	3	4	4	4	5	6	6	10

Note: C dimension for non-leaded chip capacitors equals dimension specified less the thickness of the leads or 0.020" total

SMPS Part Numbering System

Example: **2225X824KAJMBHR**

The part number shown represents a 2225 size SMPS capacitor. The ceramic type is X7R / BX, capacitance value is 0.82 µF, with a tolerance of ±10%. The voltage rating is 50 VDC, termination is "J" style leads, Group A testing is M49470 Group A, Subgroups 1 & 2 and the parts will receive marking / bulk packaging.

2225	X	824	K	A	J	M	B	HR
Case Size Ref Dimensions Table	**Ceramic Code**	**EIA Cap Code**	**EIA Cap Tolerance**	**Working Voltage**	**Lead Configurations**	**Marking**	**Packaging**	**Special Requirements***
A: 1.0 B: 1.1 C: 1.2 D: 1.3 E: 1.4 F: 1.5 G: 1.6 H: 1.7 J: 1.8 K: 1.9 L: 2.0 For dimensions ≥1.000" Substitute letters above eg. 44A5 = 44105 chip size	B: X7R Q: BQ R: BR X: BX	824= 820,000 pF= 0.82 µF 125= 1,200,000 pF= 1.2 µF 156= 15,000,000 pF= 15 µF	K: ±10% M: ±20%	A: 50 VDC B: 100 VDC C: 200 VDC E: 500 VDC	J: Leads in L: Leads out N: Leads straight 6: Ag termination M: PdAg termination	M: Marked U: Unmarked (Std)	B: Bulk F: Foam carrier/ boxed S: Special T: Tape & Reel - 7 in W: Waffle	00: Standard HR: M49470 XX: Custom

* 00 Designation reflects sample visual / mechanical inspection, plus 100% Capacitance, DF, DWV & IR testing @ +25°C
HR designation reflects Group A, Subgroups 1 & 2 inspection per MIL-PRF-49470

Additional package sizes, capacitance values and higher voltage ratings available, please contact factory.

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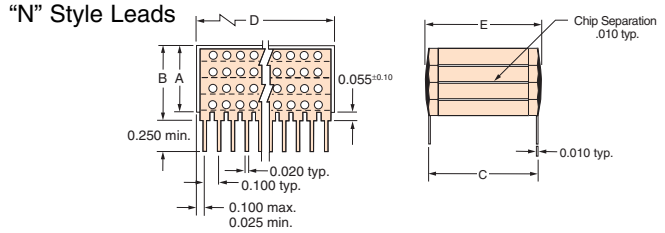
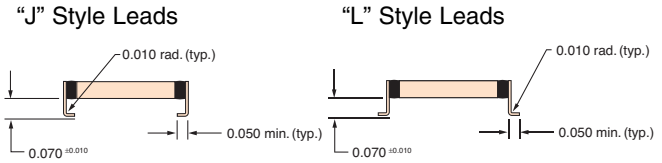
SMPS Specifications





	BP				BX				BR				BQ			
	Working Volts DC				Working Volts DC				Working Volts DC				Working Volts DC			
Cap Value (µF)	500	200	100	50	500	200	100	50	500	200	100	50	500	200	100	50
0.01																
0.012																
0.015																
0.018																
0.022																
0.027																
0.033																
0.039																
0.047																
0.056																
0.068																
0.082																
0.10																
0.12																
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KEY: SMP-3 SMP-4 SMP-5

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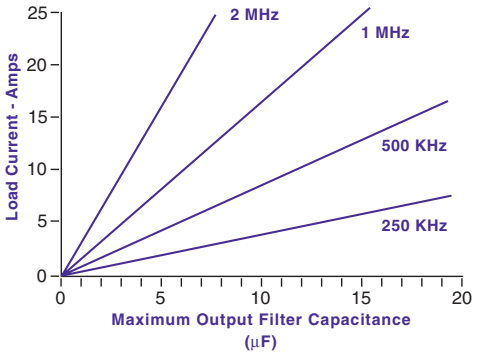
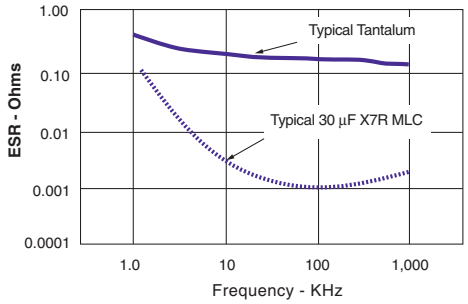
SMPS Capacitor Electrical Testing

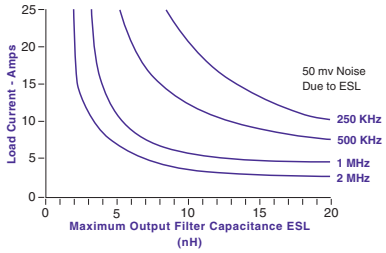
Absolute Maximum Output Capacitance
Assuming no ESL and no ESR



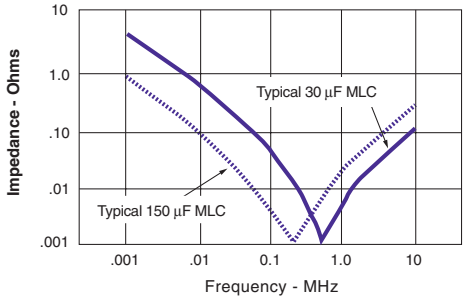
ESR vs. Frequency



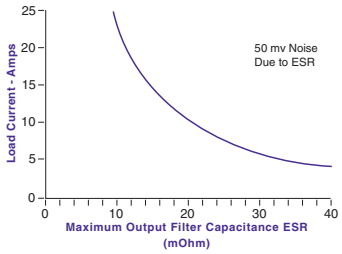
Absolute Maximum Capacitance ESL
Assuming no ESR - Capacitive Induced Ripple



Impedance vs. Frequency



Absolute Maximum Capacitance ESR
Assuming no ESL - Capacitive Induced Ripple



Test Group	*Test Order*	*Test*	*Test Method*	*Post Test Requirements*	*Sampling Procedure*
Group A	1	Visual and Mechanical			13 samples 0 failures
	2	Materials, Designs, Construction and Workmanship			
	3	Physical Dimensions and Marking			
	4	Capacitance and Dissipation Factor	MIL-STD-202 Method 305		100%
	5	Dielectric Withstanding Voltage	MIL-STD-202 Method 301, 2.5x DCWV except 500V @ 1.5x		
	6	Insulation Resistance	MIL-STD-202 Method 302 @ DCWV, 25 C	>100,000 megohms or 1,000 megohm-uF, whichever is less	
Group B Sub Grp I	1	Voltage and Temperature Limits			12 samples 1 failure
	2	Resistance to Solvents	MIL-STD-202 Method 215		
	3	Immersion	MIL-STD-202 Method 104 test condition B	No mechanical damage. Dielectric strength, capacitance, df and 25 C IR to original limits	
	4	Terminal Strength	MIL-STD-202 Method 211 test condition A. Case codes 1-4, 6-5 lbs case code 5-4 lbs	No evidence of loosening or rupturing of terminals	
Group B Sub Grp II	1	Resistance to Soldering Heat	MIL-STD-202 Method 210 N lead style test condition B, J and L styles test condition I	No mechanical damage. Dielectric strength, capacitance, df and 25 C IR to original limits	12 samples 1 failure
	2	Moisture Resistance	MIL-STD-202 Method 106, 20 cycles	No mechanical damage. Dielectric strength, capacitance, df and 25 C IR to original limits	
Group B Sub Grp III	1	Life	MIL-STD-202 Method 108, 1000 hrs. 2x DCWV except 1.2x 500 DCWV	No mechanical damage. Dielectric strength, capacitance, df, 125 C IR and 25 C IR to original limits	12 samples 1 failure
Optional		Solderabililty Group A			
		Thermal Shock and Voltage Conditioning			

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- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
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«FORSTAR» (основан в 1998 г.)

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