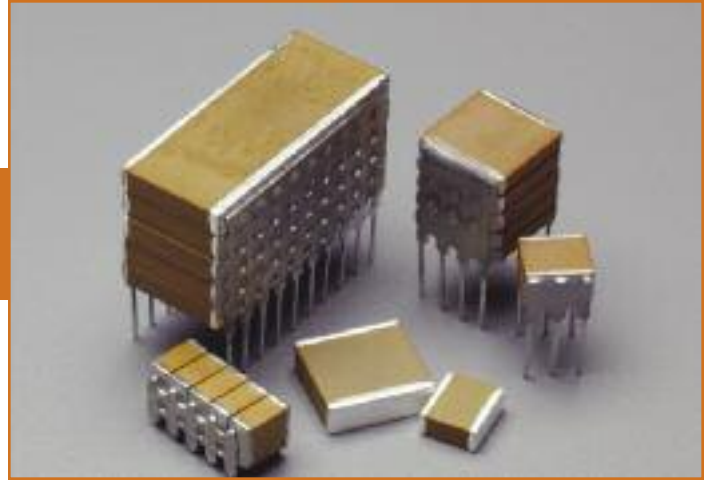


Mil Qualified & DSCC Certified SMPS Capacitor Assemblies



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

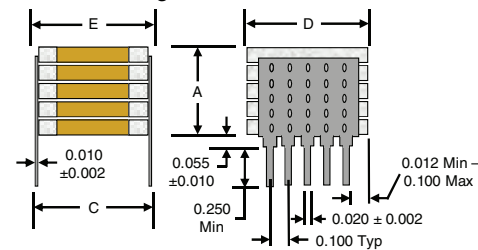
Dielectric Characteristics

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

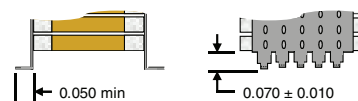
| Dielectric Type | Stability Class | Description |
|------------------|----------------------|--|
| BP (NPO/COG) | Ultra Stable Class I | Effects on electrical properties are minimal with variations in operating temperature, voltage, frequency or time. Used in applications which require stable performance. |
| 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). |

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

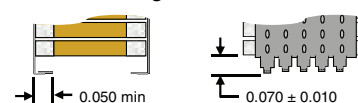
N Lead Configuration



L Lead Configuration



J Lead Configuration



6/M Surface Mount Configuration



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

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 $\pm 10\%$. 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.

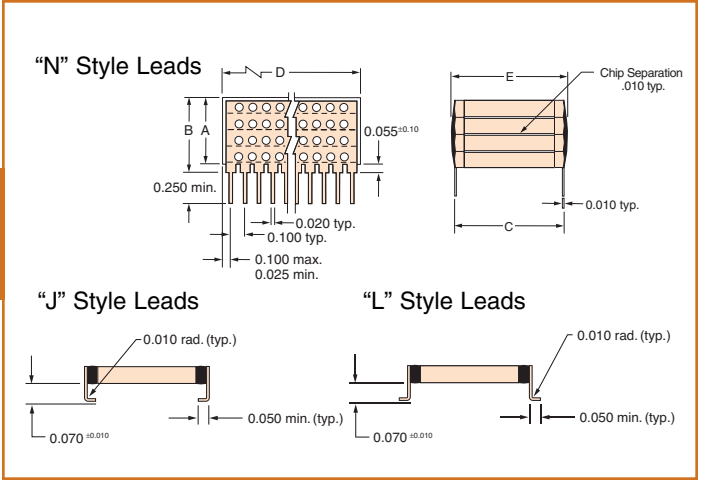
| 2225 | X | 824 | K | A | J | M | B | HR |
|--|-----------------------------------|---|--------------------------------|---|--|--------------------------------|--|--|
| Case Size Ref Dimensions Table | Ceramic Code | EIA Cap Code | EIA Cap Tolerance | Working Voltage | Lead Configurations | Marking | Packaging | Special Requirements* |
| A: 1.0 B: 1.1 C: 1.2 D: 1.3 E: 1.4 F: 1.5 | 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: $\pm 10\%$ M: $\pm 20\%$ | 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 |

For dimensions $\geq 1.000"$
Substitute letters above eg.
44A5 = 44105 chip size

* 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.

SMPS Specifications

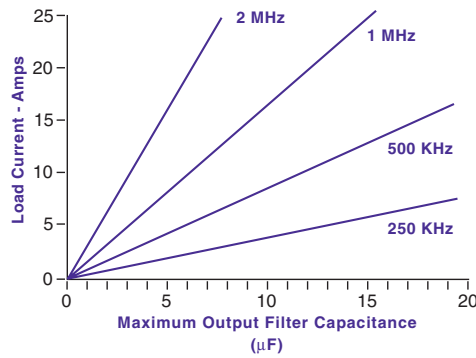


| Cap Value (µF) | BP | | | | BX | | | | BR | | | | BQ | | | |
|----------------|------------------|-----|-----|----|------------------|-----|-----|----|------------------|-----|-----|----|------------------|-----|-----|----|
| | Working Volts DC | | | | Working Volts DC | | | | Working Volts DC | | | | Working Volts DC | | | |
| | 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 | █ | █ | █ | █ | | | | | | | | | █ | | | |
| 0.15 | █ | █ | █ | █ | | | | | | | | | █ | | | |
| 0.18 | █ | █ | █ | █ | | | | | | | | | █ | | | |
| 0.22 | █ | █ | █ | █ | | | | | | | | | █ | | | |
| 0.27 | █ | █ | █ | █ | | | | | | | | | █ | | | |
| 0.33 | █ | █ | █ | █ | | | | | | | | | █ | | | |
| 0.39 | █ | █ | █ | █ | | | | | | | | | █ | | | |
| 0.47 | █ | █ | █ | █ | | | | | | | | | █ | | | |
| 0.56 | | █ | █ | █ | | | | | | | | | █ | | | |
| 0.68 | | █ | █ | █ | | | | | | | | | █ | | | |
| 0.82 | | █ | █ | █ | | | | | | | | | █ | | | |
| 1 | | | █ | █ | | | | | | | | | █ | | | |
| 1.2 | | | █ | █ | | | | | | | | | █ | | | |
| 1.5 | | | █ | █ | | | | | | | | | █ | | | |
| 1.8 | | | | █ | | | | | | | | | █ | | | |
| 2.2 | | | | █ | | | | | | | | | █ | | | |
| 2.7 | | | | █ | | | | | | | | | █ | | | |
| 3.3 | | | | █ | | | | | | | | | █ | | | |
| 3.9 | | | | █ | | | | | | | | | █ | | | |
| 4.7 | | | | █ | | | | | | | | | █ | | | |
| 5.6 | | | | █ | | | | | | | | | █ | | | |
| 6.8 | | | | █ | | | | | | | | | █ | | | |
| 8.2 | | | | █ | | | | | | | | | █ | | | |
| 10 | | | | █ | | | | | | | | | █ | | | |
| 12 | | | | █ | | | | | | | | | █ | | | |
| 15 | | | | █ | | | | | | | | | █ | | | |
| 18 | | | | █ | | | | | | | | | █ | | | |
| 22 | | | | █ | | | | | | | | | █ | | | |
| 27 | | | | █ | | | | | | | | | █ | | | |
| 33 | | | | █ | | | | | | | | | █ | | | |
| 39 | | | | █ | | | | | | | | | █ | | | |
| 47 | | | | █ | | | | | | | | | █ | | | |

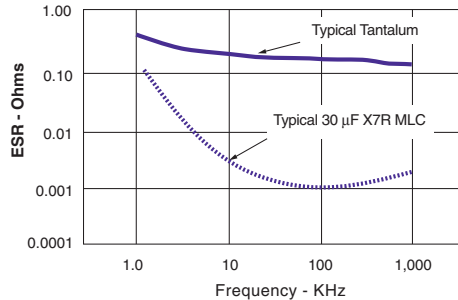
KEY: SMP-3 SMP-4 SMP-5

SMPS Capacitor Electrical Testing

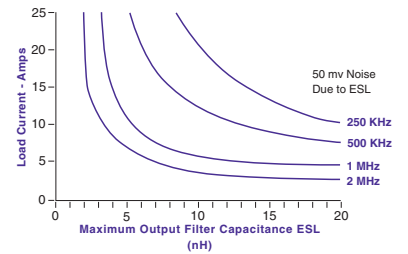
Absolute Maximum Output Capacitance
Assuming no ESL and no ESR



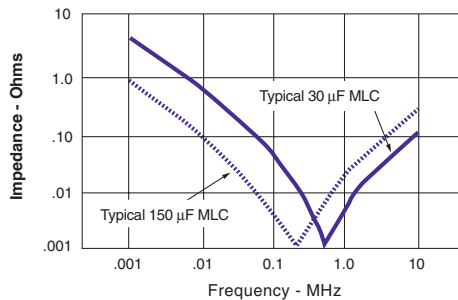
ESR vs. Frequency



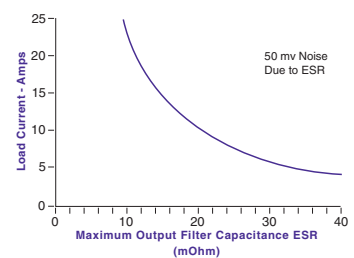
Absolute Maximum Capacitance ESL
Assuming no ESR - Capacitive Induced Ripple



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 | | Solderability Group A | | | |
| | | Thermal Shock and Voltage Conditioning | | | |



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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