

Capacitors & Filters





Syfer Technology is a leader in specialist multilayer ceramic chip capacitors and EMI filters

First in the market with flexible polymer terminations - the revolutionary FlexiCap™ capacitors - our capacitor range also includes X8R high temperature types, Tip & Ring/Ring Detect and other application specific types. Our renowned high voltage MLCC expertise has led to the development of an impressive range with working voltage capability up to 10kV. This includes surface mount Class 'X' and 'Y' approved surge and safety capacitors, 0603 chips with working voltages up to 500V, and 0805 types up to 1kV.

Our class-leading SMD EMI filters include high capacitance, high voltage, high current Pi filters, 3 terminal EMI chips and the ultra low inductance X2Y Integrated Passive Component. Complementing our SMD offerings are an extensive selection of solder-in and threaded panel mount EMI filters, all utilising our multilayer discoidal capacitor technology. Our planar capacitor technology is world leading, with our quality and reliability being recognised by NASA approval for the International Space Station.

As part of the Dover Ceramic Products Group (CPG), we are able to offer unrivalled product quality with short lead-times, backed up by excellent sales and technical support.

With a commitment to product innovation, new ranges are continually being developed. Our experienced applications engineers are also available to provide custom solutions for specific applications. Flexibility is key, not only in design but in all aspects of customer service and support. Our quality management systems meet international requirements, with approval to ISO 9001, environmental approval to ISO 14001 and Occupational Health and Safety approval to OHSAS 18001. Product approvals include AEC Q200, IECQ CECC, UL and TÜV. SPC is used extensively, supported by Continuous Improvement Programmes, 6 sigma projects and Lean Manufacturing initiatives.

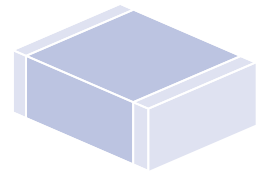


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16V to 6kV - SM chip - Quick Reference Guide



The following table shows the minimum and maximum capacitance values available for any given case size and voltage. Continuing developments in processes and materials technology mean we are often able to extend our product ranges. Please see our website for the most up-to-date information on the ranges available.

		0603	0805	1206	1210	1808	1812	1825	2220	2225	3640	5550	8060
16V	COG/NPO	0.47p-1.5n	1.0p-6.8n	1.0p-22n	3.9p-33n	4.7p-33n	10p-100n	10p-150n	10p-150n	10p-220n	n/a	n/a	n/a
	X7R	100p-100n	100p-330n	100p-1.0μ	1.0n-1.5μ	15p-1.5μ	3.9n-3.3μ	10n-4.7μ	10n-5.6μ	18n-6.8μ	n/a	n/a	n/a
25V	COG/NPO	0.47p-1.0n	1.0p-4.7n	1.0p-15n	3.9p-22n	4.7p-27n	10p-68n	10p-100n	10p-100n	10p-150n	n/a	n/a	n/a
	X7R	100p-56n	100p-220n	100p-820n	1.0n-1.2μ	15p-1.2μ	3.9n-2.2μ	10n-3.9μ	10n-4.7μ	18n-5.6μ	n/a	n/a	n/a
50/63V	COG/NPO	0.47p-470p	1.0p-2.7n	1.0p-10n	3.9p-18n	4.7p-18n	10p-39n	10p-68n	10p-68n	10p-100n	10p-220n	390p-390n	680p-680n
	X7R	100p-47n	100p-220n	100p-470n	1.0n-1.0μ	15p-680n	3.9n-2.2μ	10n-1.8μ	10n-3.3μ	18n-3.3μ	390p-4.7μ	560p-8.2μ	10n-15μ
100V	COG/NPO	0.47p-330p	1.0p-1.8n	1.0p-6.8n	3.9p-12n	4.7p-12n	10p-27n	10p-47n	10p-47n	10p-68n	10p-180n	390p-330n	680p-560n
	X7R	100p-10n	100p-47n	100p-150n	1.0n-470n	15p-330n	3.9n-1.0μ	10n-1.2μ	10n-1.5μ	18n-1.5μ	390p-3.3μ	560p-6.8μ	10n-10μ
200/250V	COG/NPO	0.47p-100p	1.0p-680p	1.0p-2.2n	3.9p-4.7n	4.7p-4.7n	10p-12n	10p-22n	10p-22n	10p-27n	10p-82n	390p-120n	680p-270n
	X7R	100p-5.6n	100p-27n	100p-100n	1.0n-220n	15p-180n	3.9n-470n	10n-1.0μ	10n-1.0μ	18n-1.0μ	390p-1.5μ	560p-3.9μ	10n-8.2μ
500V	COG/NPO	0.47p-68p	1.0p-330p	1.0p-1.5n	3.9p-3.9n	4.7p-3.3n	10p-10n	10p-15n	10p-15n	10p-22n	10p-56n	390p-100n	680p-180n
	X7R	100p-1.5n	10p-8.2n	10p-33n	15p-100n	15p-100n	22p-270n	180p-560n	180p-560n	180p-820n	390p-1.0μ	560p-1.8μ	10n-3.3μ
630V	COG/NPO	n/a	1.0p-180p	1.0p-1.0n	3.9p-1.8n	4.7p-2.2n	10p-5.6n	10p-8.2n	10p-10n	10p-15n	10p-39n	390p-68n	680p-150n
	X7R	n/a	10p-4.7n	10p-10n	15p-27n	15p-33n	22p-150n	180p-180n	180p-330n	180p-390n	390p-680n	560p-1.2μ	10n-2.2μ
1kV	COG/NPO	n/a	1.0p-100p	1.0p-470p	3.9p-1.0n	4.7p-1.2n	10p-3.3n	10p-4.7n	10p-8.2n	10p-10n	10p-22n	390p-39n	680p-68n
	X7R	n/a	10p-3.3n	10p-4.7n	15p-15n	15p-18n	22p-56n	180p-120n	180p-120n	180p-150n	390p-180n	560p-390n	10n-1.0μ
1.2kV	COG/NPO	n/a	n/a	1.0p-220p	3.9p-680p	4.7p-1.0n	10p-2.2n	10p-3.9n	10p-4.7n	10p-6.8n	10p-18n	390p-33n	680p-47n
	X7R	n/a	n/a	10p-3.3n	15p-10n	15p-10n	22p-33n	180p-68n	180p-82n	180p-100n	390p-150n	560p-220n	10n-470n
1.5kV	COG/NPO	n/a	n/a	1.0p-150p	3.9p-470p	4.7p-680p	10p-1.5n	10p-2.7n	10p-3.3n	10p-4.7n	10p-12n	390p-22n	680p-33n
	X7R	n/a	n/a	10p-2.7n	15p-6.8n	15p-6.8n	22p-22n	180p-47n	180p-47n	180p-68n	390p-100n	560p-150n	10n-330n
2kV	COG/NPO	n/a	n/a	1.0p-100p	3.9p-220p	4.7p-270p	10p-820p	10p-1.2n	10p-1.8n	10p-2.2n	10p-5.6n	390p-10n	680p-18n
	X7R	n/a	n/a	10p-2.2n	15p-4.7n	15p-4.7n	22p-10n	180p-10n	180p-27n	180p-33n	390p-47n	560p-82n	10n-150n
2.5kV	COG/NPO	n/a	n/a	n/a	n/a	4.7p-220p	10p-680p	10p-1.0n	10p-1.5n	10p-1.8n	10p-4.7n	390p-6.8n	680p-12n
	X7R	n/a	n/a	n/a	n/a	15p-1.5n	22p-3.3n	180p-6.8n	180p-8.2n	180p-12n	390p-33n	560p-68n	10n-100n
3kV	COG/NPO	n/a	n/a	n/a	n/a	4.7p-180p	10p-470p	10p-820p	10p-1.2n	10p-1.5n	10p-2.2n	390p-4.7n	680p-8.2n
	X7R	n/a	n/a	n/a	n/a	15p-1.2n	22p-2.7n	180p-3.3n	180p-5.6n	180p-6.8n	390p-18n	560p-39n	10n-68n
4kV	COG/NPO	n/a	n/a	n/a	n/a	1.0p-150p*	2.2p-390p*	10p-680p*	10p-1.0n*	10p-1.2n*	10p-1.0n	390p-2.2n	680p-4.7n
	X7R	n/a	n/a	n/a	n/a	100p-1.0n*	100p-2.2n*	100p-2.2n*	100p-4.7n*	100p-5.6n*	390p-6.8n	560p-15n	10n-33n
5kV	COG/NPO	n/a	n/a	n/a	n/a	1.0p-82p*	2.2p-270p*	10p-470p*	10p-680p*	10p-820p*	10p-560p	390p-1.5n	680p-3.3n
	X7R	n/a	n/a	n/a	n/a	100p-680p*	100p-1.2n*	100p-1.8n*	100p-3.9n*	100p-4.7n*	n/a	560p-8.2n	10n-18n
6kV	COG/NPO	n/a	n/a	n/a	n/a	1.0p-56p*	2.2p-220p*	10p-330p*	10p-470p*	10p-560p*	n/a	n/a	n/a
	X7R	n/a	n/a	n/a	n/a	68p-390p*	100p-1.0n*	100p-1.5n*	100p-2.2n*	100p-2.7n*	n/a	n/a	n/a
		0603	0805	1206	1210	1808	1812	1825	2220	2225	3640	5550	8060

New ranges

N.B. Capacitance in F. * These parts may require conformal coating post soldering.

FlexiCap™

FlexiCap™ has been developed as a result of listening to customers' experiences of stress damage to MLCC's from many manufacturers, often caused by variations in customer assembly processes. Our answer is a proprietary flexible epoxy polymer termination material, that is applied to the device under the usual nickel barrier finish. FlexiCap™ will accommodate a greater degree of board bending than conventional capacitors.

The benefit to the user is to facilitate a wider process window giving a greater safety margin and substantially reducing the typical root causes of mechanical stress cracking.



- No degradation in electrical performance
- The polymer allows greater degrees of PCB deflection during de-panelisation, typically twice that of standard capacitors
- Solves cracking problems caused by excessive mechanical stress
- Allows designers to select larger case sizes. Larger case sizes with standard termination are often excluded from designs, FlexiCap™ versions can dramatically reduce the risks
- Permits more stress to be placed on components when using large through hole parts, eg transformers, connectors, heatsinks
- More resistant to cracking due to temperature cycling
- Capacitors with tin-lead termination can also utilise the FlexiCap™ technology
- Applications include: aerospace, automotive, power supplies, industrial, lighting ballasts

Summary of PCB bend test results

The bend tests conducted have proved that the FlexiCap™ termination withstands a greater level of mechanical stress before mechanical cracking occurs.

	Mean bend (mm) Standard Term.	Mean bend (mm) FlexiCap™	Improvement with FlexiCap™
0805 X7R	3.6	6.3	+ 75%
1206 X7R	3.4	6.4	+ 88%
1812 X7R	3.2	6.0	+ 88%
2220 X7R	3.2	6.1	+ 91%

The FlexiCap™ termination can be applied to many of the Syfer product ranges, including:

- Standard MLCC capacitors
- Surge and Safety capacitors
- 3 terminal EMI chip capacitors
- X2Y chips
- Applied to X8R high temperature chips and 1206 size SBSP Pi-filters as standard

FlexiCap™

Additional technical information is available including details of our Bend Test Programme, mechanical cracking data and other technical articles. Please see the website for further details.

Open Mode capacitors and Tandem capacitors

For additional reliability, capacitors are available with FlexiCap™ termination and with inset electrode margins (Open Mode), to reduce the chance of short circuit in the event of a crack. See application note AN0022 on the Syfer website. Alternatively, FlexiCap™ capacitors with 2 internal series capacitors (Tandem capacitors) ensure that even if a crack does occur, the possibility of a short-circuit is minimised. See application note AN0021.

Application Specific Capacitors

High Dielectric Withstand Voltage Capacitors (DWV range)

The Syfer DWV range is specifically designed for use in applications where a high Dielectric Withstand Voltage (DWV) is required.

These parts have a continuous rated voltage of 500Vdc/250Vac, and are 100% DWV tested at the specified voltages to ensure Flashover (arcing) across the surface does not occur.

- High dielectric withstand voltages (DWV) of 1.5kV and 2.5kV
- These ratings are based on an application of the DWV voltage for a period of up to 60 seconds (where the charging current is limited to 50mA)
- Case sizes 1206 to 2225
- COG and X7R dielectrics
- Capacitance values from 4.7pF to 120nF

X8R High Temperature Capacitors

X8R dielectric chip capacitors suitable for operation in extreme temperatures
X8R operating temperature range is from -55°C to 150°C.

- Capacitance change maximum of $\pm 15\%$ over the full temperature range
- From 0805 to 2225, with capacitance values up to 1.8 μ F
- Termination material is FlexiCap™ as standard

Tip & Ring/Ring Detect Capacitors

Syfer's range of 250V d.c. chip capacitors is ideal for telephone line filtering (Tip & Ring/Ring Detect) applications.

- Small surface mount package compared to traditional through hole capacitors
- Suitable as replacements for high voltage leaded film capacitors, thereby saving pcb board space and weight
- Low ESR
- Improved temperature performance compared to film capacitors
- FlexiCap™ option available

Low Profile Capacitors

Available in three maximum thicknesses of 0.50mm, 0.60mm and 0.65mm
They are ideal for use in smart cards, sensors or for mounting underneath components where space is restricted.

- All types are available with either silver/palladium or nickel barrier terminations
- Allows higher packaging densities to be achieved



Surge Protection and Safety Capacitors



Syfer Technology's Surge Protection and Safety Capacitors comply with international UL and TÜV specifications to offer designers the option of using a surface mount ceramic multilayer capacitor to replace leaded film types. Offering the benefits of simple pick-and-place assembly, reduced board space required and lower profile, they are also available in a FlexiCap™ version to reduce the risk of mechanical cracking.

Syfer's high voltage capacitor expertise means the range offers among the highest range available capacitance values in certain case sizes. Applications include: modems, AC-DC power supplies and where lightning strike or other voltage transients represent a threat to electronic equipment.

Surge Protection Capacitors

Meet Class X2/X1 and Y3/Y2 requirements

Approved for mains ac voltages, up to 250Vac

Approved by UL, TÜV

Sizes 1808, 1812, 2211, 2215 and 2220

- 1808 Y2 type available up to 1nF
- Suitable for use in equipment certified to EN 60950
- Surface mount package
- Reduces board area, including height restrictions
- Reduces assembly costs over conventional through-hole components
- FlexiCap™ option available (TÜV approved versions)



Safety Capacitors

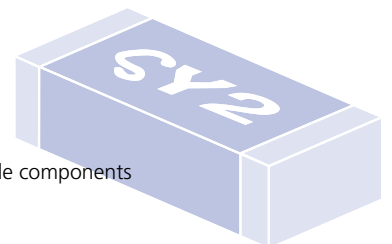
Class Y2/X1 and X2 surface mount multilayer ceramic safety capacitors

Approved for mains ac voltages, up to 250Vac

Approved by UL, TÜV

Sizes 2211, 2215 and 2220

- 2220 Y2 type available up to 4.7nF
- Surface mount package
- Reduces assembly costs over conventional through-hole components
- Also reduces board area and height
- FlexiCap™ option available (TÜV approved versions)



Surge Protection and Safety Capacitors classification and approval specification.

	SAFETY CLASSIFICATION	SYFER PRODUCT			APPROVAL SPECIFICATION	APPROVAL BODY	CERTIFICATE NUMBER	FlexiCap™ OPTION (TÜV only)
		CHIP SIZE	DIELECTRIC	CAP RANGE				
SURGE PROTECTION	Y2/X1** <i>SY2</i>	1808	C0G/NP0	4.7pF to 220pF	IEC60384-14:1993 EN132400:1994	TÜV	R60007460	✓
	Y2/X1** <i>SY2</i>	1808	X7R	150pF to 1nF	IEC60384-14:1993 EN132400:1994	TÜV	R60007460	✓
	Y3/X2* <i>SP</i>	1808	C0G/NP0	4.7pF to 1.0nF	IEC60384-14:1993 EN132400:1994 } UL60950***	TÜV UL	R2110618 E235189	✓
	Y3/X2* <i>SP</i>	1808	X7R	150pF to 1nF 150pF to 2.2nF	IEC60384-14:1993 EN132400:1994 } UL60950***	TÜV UL	R60003323 E235189	✓
	Y2/X1** <i>SY2</i>	1812	C0G/NP0	4.7pF to 470pF	IEC60384-14:1993 EN132400:1994	TÜV	R60010910	✓
	Y2/X1** <i>SY2</i>	1812	X7R	150pF to 1.0nF	IEC60384-14:1993 EN132400:1994	TÜV	R60010910	✓
	Y2/X1** <i>SP</i>	2211	C0G/NP0	4.7pF to 680pF	IEC60384-14:1993 EN132400:1994 } UL60950***	TÜV UL	R60001955 E235189	✓
	Y2/X1** <i>SP</i>	2211	X7R	100pF to 1.0nF	IEC60384-14:1993 EN132400:1994 } UL60950***	TÜV UL	R60003753 E235189	✓
	Y2/X1** <i>SP</i>	2215	C0G/NP0	820pF to 1.0nF	IEC60384-14:1993 EN132400:1994 } UL60950***	TÜV UL	R60001955 E235189	✓
	Y2/X1 <i>B16</i>	2220	X7R	150pF to 4.7nF	IEC60384-14:1993 EN132400:1994 } UL1414: 6th Edition	TÜV UL	R60006629 E228790	✓
	X2 <i>B17</i>	2220	X7R	150pF to 10.0nF	IEC60384-14:1993 EN132400:1994	TÜV	R60006629	✓

* Only approved for use in equipment certified to IEC60950:1992 edition

** Approved for use in equipment certified to IEC60950:2000 edition

*** Formerly UL1950



Radial Leaded Capacitors

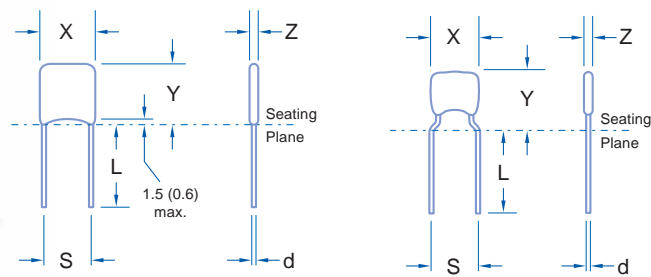
Syfer Technology produces a wide range of dipped radial leaded capacitors. These are available in rated voltages of 50V up to 5kV. Although our catalogue range extends to 5kV, we are able to offer a capability for specials up to 10kV. Our larger case sizes and high voltage versions are particularly in demand, especially for mil/aero and medical power supply applications. Please contact our Sales Office to discuss any special requirements. IECQ CECC approved parts are also included within the ranges.

- High working voltage - up to 10kVdc
- Large case sizes
- RoHS compliant versions
- Tin-lead plated wire option to reduce tin whiskers



Radial Leaded Capacitors - Quick Reference Guide

		8111M	8111N	8121M	8121N	8121T	8131M	8131T	8141M	8151M	8161M	8171M
50/63V	COG/NP0	4.7nF	4.7nF	18nF	18nF	18nF	100nF	33nF	150nF	220nF	390nF	680nF
	X7R	220nF	220nF	1.0µF	1.0µF	1.0µF	3.3µF	1.5µF	4.7µF	4.7µF	8.2µF	15µF
100V	COG/NP0	2.7nF	2.7nF	12nF	12nF	12nF	68nF	27nF	100nF	180nF	330nF	560nF
	X7R	100nF	100nF	470nF	470nF	470nF	1.5µF	1.0µF	2.2µF	3.3µF	6.8µF	10µF
200/250V	COG/NP0	1.0nF	1.0nF	4.7nF	4.7nF	4.7nF	27nF	12nF	47nF	82nF	120nF	270nF
	X7R	56nF	56nF	220nF	220nF	220nF	1.0µF	470nF	1.0µF	1.5µF	3.9µF	8.2µF
500V	COG/NP0	470pF	470pF	3.3nF	3.3nF	3.3nF	22nF	10nF	33nF	56nF	100nF	180nF
	X7R	8.2nF	8.2nF	100nF	100nF	100nF	820nF	270nF	680nF	1.0µF	1.8µF	3.3µF
630V	COG/NP0	270pF	270pF	1.8nF	1.8nF	1.8nF	15nF	5.6nF	22nF	39nF	68nF	150nF
	X7R	-	-	27nF	27nF	27nF	390nF	150nF	470nF	680nF	1.2µF	2.2µF
1kV	COG/NP0	-	-	1.0nF	1.0nF	1.0nF	10nF	3.3nF	15nF	22nF	39nF	68nF
	X7R	-	-	15nF	15nF	15nF	150nF	56nF	150nF	180nF	390nF	1.0µF
2kV	COG/NP0	-	-	-	-	-	2.2nF	820pF	3.3nF	5.6nF	10nF	18nF
	X7R	-	-	-	-	-	33nF	10nF	47nF	47nF	82nF	150nF
3kV	COG/NP0	-	-	-	-	-	1.5nF	470pF	1.0nF	2.2nF	4.7nF	8.2nF
	X7R	-	-	-	-	-	6.8nF	2.7nF	10nF	18nF	39nF	68nF
4kV	COG/NP0	-	-	-	-	-	1.2nF	-	680pF	1.0nF	2.2nF	4.7nF
	X7R	-	-	-	-	-	5.6nF	-	5.6nF	6.8nF	15nF	33nF
5kV	COG/NP0	-	-	-	-	-	-	-	470pF	560pF	1.5nF	3.3nF
	X7R	-	-	-	-	-	-	-	3.3nF	3.9nF	8.2nF	18nF



	FILTER RANGE	DESCRIPTION	CIRCUIT	CAPACITANCE RANGE
SURFACE MOUNT	E01 EMI CHIP	3 TERMINAL CHIP, SIZES 0805, 1206 & 1806	C	22pF - 200nF
	E07 EMI CHIP	HIGH CURRENT EMI CHIP, SIZES 0805, 1206 & 1806	C	1nF - 200nF
	E03 X2Y CHIP	INTEGRATED PASSIVE COMPONENT, 0603 to 2220	C	10pF - 1.2μF
	SBSF	1A RATED PI-FILTER	Pi	22pF - 150nF
	SBSG	5A RATED PI-FILTER, 10A C FILTER	C & Pi	1nF - 220nF
	SBSM	10A RATED PI-FILTER, 20A C FILTER	C & Pi	1nF - 470nF
	DESIGN KIT	EMI FILTER DESIGN KIT	VARIOUS	VARIOUS
SOLDER-IN	SFSS	DISCOIDAL CAPACITORS WITH LEADS	C	10pF - 3.3μF
	SFSR	2.8mm BODY DIAMETER	C	10pF - 47nF
	SFST	3.25mm BODY DIAMETER	C	10pF - 100nF
	SFSU	5.6mm BODY DIAMETER	C	10pF - 680nF
THREADED	SFNO	M2.5, ROUND HEAD	C	10pF - 47nF
	SFAA	4-40 UNC, HEX HEAD	C	10pF - 150nF
	SFAJ	M3, HEX HEAD	C & L-C	10pF - 150nF
	SFAB/SFKB	6-32 UNC, HEX HEAD/ROUND HEAD	C & L-C	10pF - 150nF
	SFAK/SFKK	M3.5, HEX HEAD/ROUND HEAD	C, L-C & T	10pF - 150nF
	SFBC	8-32 UNC, HEX HEAD	C, L-C & Pi	10pF - 150nF
	SFBL	M4, HEX HEAD	C, L-C & Pi	10pF - 150nF
	SFBD/SFCD	12-32 UNEF, HEX HEAD	C, L-C, T & Pi	10pF - 680nF
	SFCI	2BA, HEX HEAD	C & L-C	10pF - 680nF
	SFBM/SFCM/SFLM SFTM/SFUM	M5, HEX HEAD/ROUND HEAD	C, L-C, T & Pi	10pF - 680nF
	SFJE/SFJN	¼-28 UNF/M6, HEX HEAD (ALSO HIGH VOLTAGE)	C, L-C	330pF - 3.3μF
	SFCMV	VARISTOR FILTER	CVARISTOR	1nF - 10nF
	SFJEB	BALANCED LINE FILTER	C	4.7nF - 100nF

Surface mount EMI filters

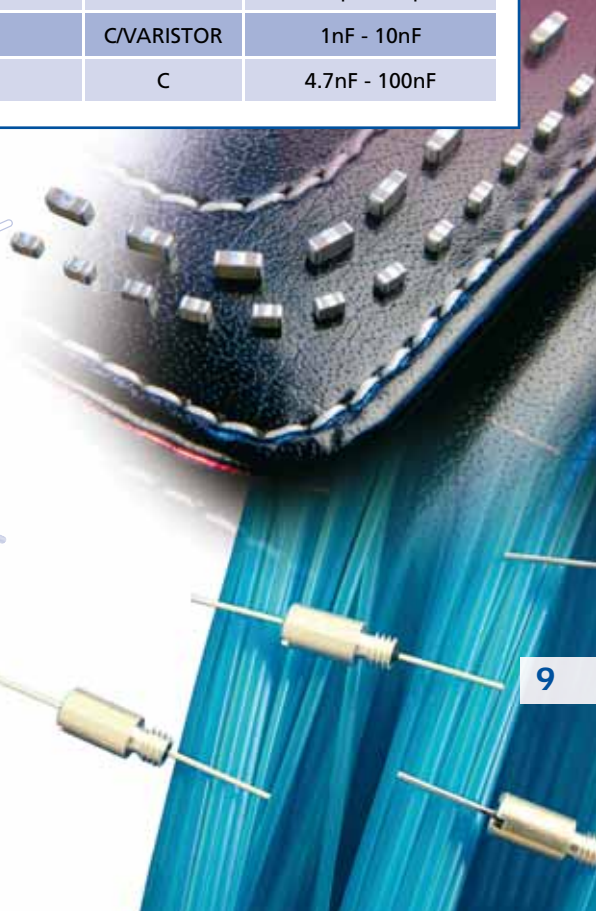
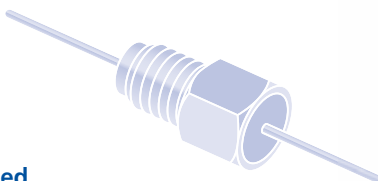
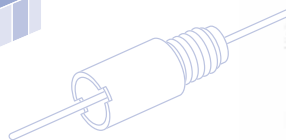
- EMI chips 0805, 1206, 1806
- High current C filters up to 20A
- SMD Pi filters 1206, 1812, 2220
- X2Y Integrated Passive Components

Panel mount EMI filters

- Solder-in versions in 4 sizes
- Threaded filters C, L-C, T and Pi
- Varistors filters and Balanced Line Filters

Filter assemblies – multiway custom designed

Planar capacitor arrays – world leading manufacturer for filter connectors

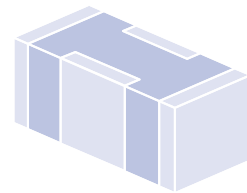


Surface Mount Filters

Syfer has developed an ever-expanding range of surface mount EMI filters. Utilising our multilayer ceramic capacitor expertise, we are able to offer a range of EMI filter components suitable for a wide range of applications. The pi-filter range in particular leads the market in terms of capacitance, voltage and current ratings.

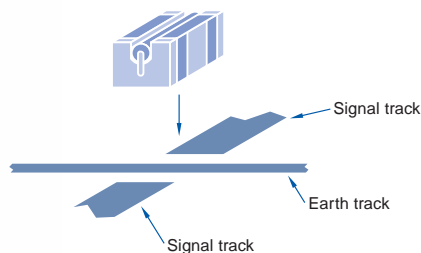


- EMI chips 0805, 1206, 1806
- High current C filters up to 20A
- Highest capacitance Pi filters available - in 1206, 1812 and 2220 sizes
- X2Y Integrated Passive Components in sizes 0603 to 2220



SURFACE MOUNT

FILTER RANGE	DESCRIPTION	CIRCUIT	CAPACITANCE RANGE
E01 EMI CHIP	3 TERMINAL CHIP - SIZES 0805, 1206 & 1806	C	22pF - 200nF
E07 EMI CHIP	HIGH CURRENT EMI CHIP - SIZES 0805, 1206 & 1806	C	1nF to 200nF
E03 X2Y CHIP	INTEGRATED PASSIVE COMPONENT - 0603 to 2220	C	10pF - 1.2μF
SBSGC	5A RATED PI-FILTER, 10A C FILTER	C	1nF - 220nF
SBSMC	10A RATED PI-FILTER, 20A C FILTER	C	1nF - 470nF
SBSPP	1A RATED PI FILTER	Pi	22pF - 150nF
SBSGP	1A RATED PI FILTER - SIZE 1812	Pi	1nF - 150nF
SBSMP	1A RATED PI FILTER - SIZE 2220	Pi	1nF - 330nF
DESIGN KIT	EMI FILTER DESIGN KIT	VARIOUS	VARIOUS



SM Pi or C filter mounted to board and soldered in identical manner to chip capacitor.

Solder connections made to each end (signal lines) and each side band (earth track).

X2Y Filters

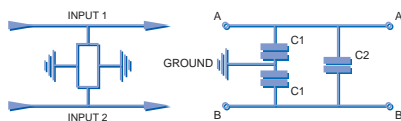
The Syfer X2Y Integrated Passive Component is a 3 terminal EMI chip device. When used in balanced line applications, the revolutionary design provides simultaneous line-to-line and line-to-ground filtering, using a single ceramic chip. In this way, differential and common mode filtering are provided in one device.

For unbalanced applications, it provides ultra low ESL (equivalent series inductance). Capable of replacing 2 or more conventional devices, it is ideal for balanced and unbalanced lines, twisted pairs and dc motors, in automotive, audio, sensor and other applications.

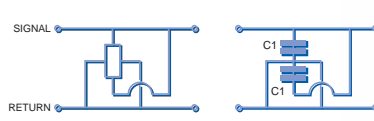
Available in sizes from 0603 to 2220, these filters can prove invaluable in meeting stringent EMC demands.

Manufactured in the UK by Syfer Technology Limited under license from X2Y Attenuators LLC.

Filtering application



Decoupling application

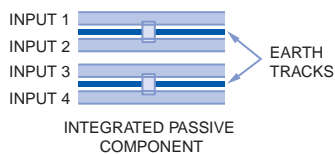
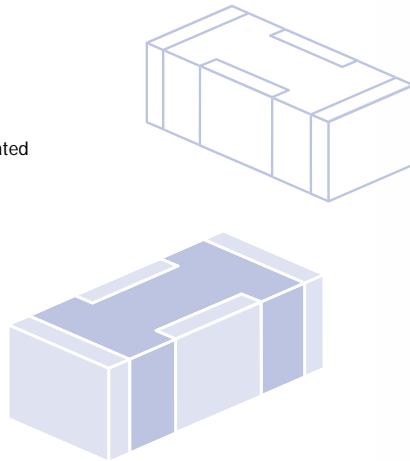


Advantages

- Replaces 2 or 3 capacitors with one device
- Ultra low inductance due to cancellation effect
- For balanced lines: Matched capacitance line to ground on both lines
- Differential and common mode attenuation
- Effects of temperature and voltage variation eliminated
- Effect of ageing equal on both lines
- High current capability

Applications

- Single ended/unbalanced lines
- Balanced lines and twisted pairs
- EMI Suppression on dc motors
- Sensor/transducer applications
- Wireless communications
- Audio amplifiers
- CANBUS systems



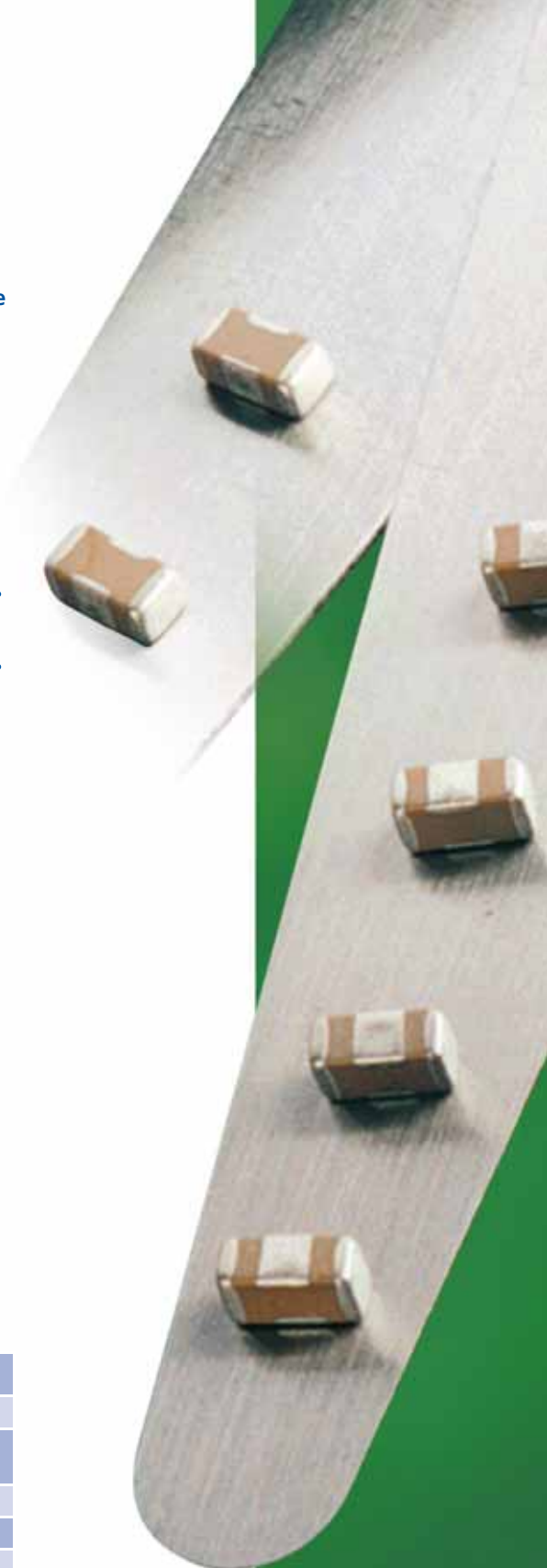
A single X2Y chip is used across 2 lines, providing simultaneous differential and common mode filtering.

Type		E03					
Chip size		0603	0805	1206	1410	1812	2220
Rated voltage	Dielectric	Minimum and maximum capacitance values					
	16Vdc	COG/NP0	150pF	-	-	-	-
X7R		15nF	-	-	-	-	-
25Vdc	COG/NP0	120pF	560pF-820pF	1.8nF-3.3nF	6.8nF-8.2nF	12nF-15nF	22nF-33nF
	X7R	12nF	56nF-68nF	-	470nF	820nF	1.2µF
50Vdc	COG/NP0	10pF-100pF	390pF-470pF	1.2nF-1.5nF	4.7nF-5.6nF	8.2nF-10nF	18nF
	X7R	150pF-10nF	18nF-47nF	56nF-220nF	180nF-400nF	390nF-680nF	560nF-1.0µF
100Vdc	COG/NP0	-	10pF-330pF	22pF-1.0nF	100pF-3.9nF	820pF-6.8nF	1.0nF-15nF
	X7R	-	470pF-15nF	1.5nF-47nF	4.7nF-150nF	8.2nF-330nF	10nF-470nF

Note: For some lower capacitance parts, higher voltage rated parts may be supplied.

Cap value C1 (±20%)

For additional technical information, please visit either the Syfer website (www.syfer.com) or the X2Y Attenuators website (www.X2Y.com).



Panel Mount EMI Filters

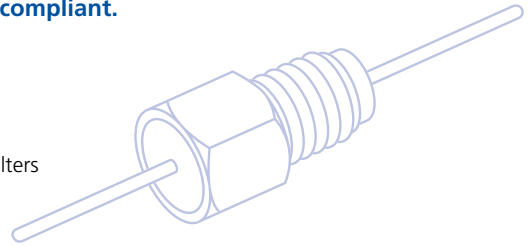
The Syfer range of EMI filters is extensive, covering both threaded and solder-in panel mounting versions. Threaded types are available in both metric and non-metric threads and include varistor filters and X2Y filters.

Benefits

At the heart of every Syfer filter is a multilayer ceramic element manufactured using our unique 'Wet Process'. Dielectric materials used include the ultra stable COG and stable X7R types - Z5U/Y5V is not used. This ensures excellent insertion loss performance is provided up to full rated voltage and to the extremes of rated temperature.

Capacitance values up to 3.3 μ F are offered, with working voltages up to 3kVdc. All types are fully RoHS compliant.

- Solder-in versions in 4 sizes
- Threaded filters C, L-C, T and Pi
- Varistor filters and Balanced Line Filters

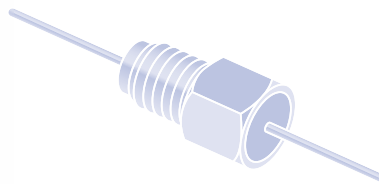


Solder-in

FILTER RANGE	DESCRIPTION	CIRCUIT	CAPACITANCE RANGE
SFSS	DISCOIDAL CAPACITORS WITH LEADS	C	10pF - 3.3 μ F
SFSR	2.8mm BODY DIAMETER	C	10pF - 47nF
SFST	3.25mm BODY DIAMETER	C	10pF - 100nF
SFSU	5.6mm BODY DIAMETER	C	10pF - 680nF

Threaded

FILTER RANGE	DESCRIPTION	CIRCUIT	CAPACITANCE RANGE
SFNO	M2.5, ROUND HEAD	C	10pF - 47nF
SFAA	4-40 UNC, HEX HEAD	C	10pF - 150nF
SFAJ	M3, HEX HEAD	C & L-C	10pF - 150nF
SFAB/SFKB	6-32 UNC, HEX HEAD/ROUND HEAD	C & L-C	10pF - 150nF
SFAK/SFKK	M3.5, HEX HEAD/ROUND HEAD	C, L-C & T	10pF - 150nF
SFBC	8-32 UNC, HEX HEAD	C, L-C & Pi	10pF - 150nF
SFBL	M4, HEX HEAD	C, L-C & Pi	10pF - 150nF
SFBD/SFCD	12-32 UNEF, HEX HEAD	C, L-C, T & Pi	10pF - 680nF
SFCI	2BA, HEX HEAD	C & L-C	10pF - 680nF
SFBM/SFCM/SFLM SFTM/SFUM	M5, HEX HEAD/ROUND HEAD	C, L-C, T & Pi	10pF - 680nF
SFJE/SFJN	1/4-28 UNF/M6, HEX HEAD (ALSO HIGH VOLTAGE)	C, L-C	330pF - 3.3 μ F
SFCMV	VARISTOR FILTER	C/VARISTOR	1nF - 10nF
SFJEB	BALANCED LINE FILTER	C	4.7nF - 100nF



For information on assembly and soldering, insertion loss performance and other technical information, please see our website.

Special Filters and Assemblies

Syfer's design and manufacturing capabilities are well suited to providing special products. We are always pleased to consider modifications to standard devices, or fully custom products.

Special filters can be offered to suit specific applications - meeting a wide range of mechanical and electrical requirements.

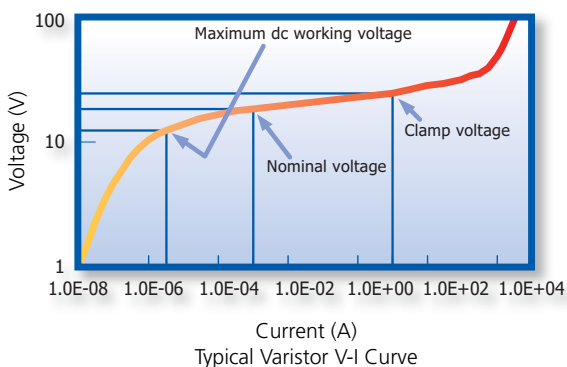
Multiway assemblies can be offered using any of the filters in the Syfer range, either solder-in or screw-in. Our planar capacitor arrays can also be utilised, which allows closer pin pitching. Specially manufactured chassis or plates can be provided, or alternatively filters can be assembled to customers free-issue plates. We would be pleased to discuss specific applications and propose designs.

- Flexible design - plates to suit the application
- Faster assembly for the customer - reduced risk of damage to the filters through soldering
- Reliability - 100% tested
- Filtering options - wide range of values
- Ground lines and unfiltered lines
- Planar arrays can be supplied with compliant spring clips for solderless assembly
- Lead lengths to suit
- Modified bodies
- Fully custom - either to customer drawings, or designed by Syfer
- Higher test voltages than standard
- d.c. or a.c.
- alternative capacitance values or tolerances

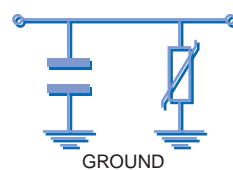
Varistor Filters

The Syfer range of varistor filters provides both transient voltage protection and EMI filtering in one device. The heart of this unique device is a multilayer varistor discoidal, which provides a dual function. The use of metal oxide based ceramic (MOV) provides the voltage protection, with bi-directional clamping, while the inherent capacitance, due to the multilayer construction, ensures effective lowpass EMI filtering up to at least 1GHz.

Varistor V-I Characteristics



Circuit Configuration



Maximum continuous dc working voltage

This is the maximum continuous dc working voltage which may be applied up to the maximum operating temperature of the Varistor.

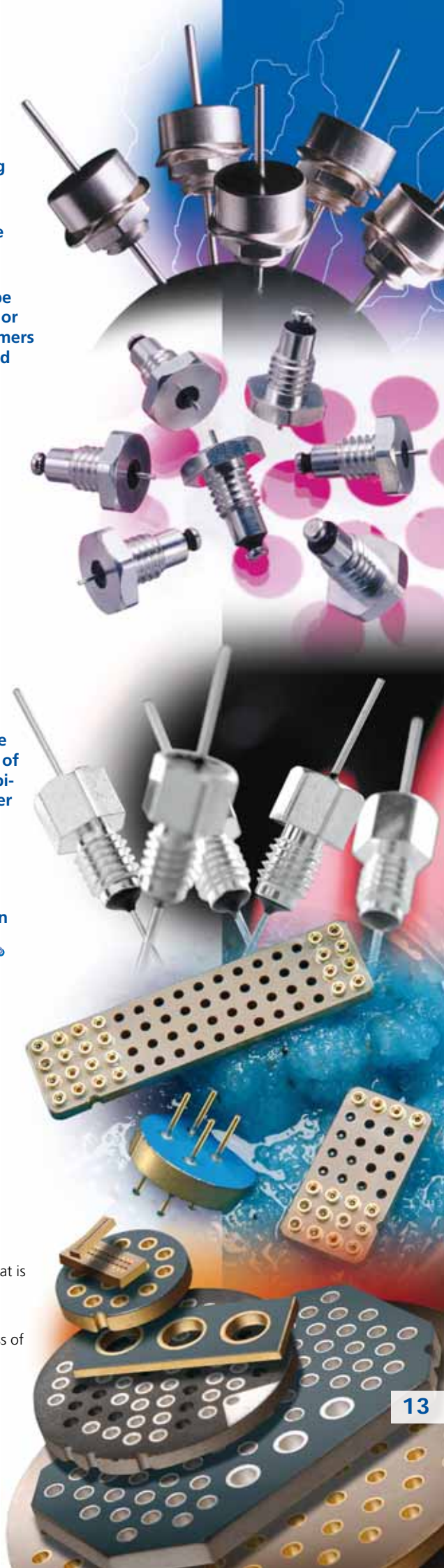
Nominal voltage

This is the voltage across the varistor when drawing a dc current of 1 mA. It is this point that is notionally the start of the region of normal varistor operation.

Maximum clamping voltage

As a varistor is designed for handling transient voltages, all tests requiring currents in excess of 1 mA are conducted as pulse tests.

The clamping voltage of a varistor is the peak voltage appearing across the device when measured under the conditions of a specified pulse current and a specified waveform.



Planar Arrays

The multilayer Planar Array is an application specific component designed for use in multi-line EMI filter circuits, typically found in filtered connectors. Planar Array technology affords the user weight and volumetric efficiency as well as performance and reliability advantages compared to other capacitor technologies.

The quality and reliability of Syfer's planars has been recognised by the approval of NASA for their use in the International Space Station. Syfer's position as the world's leading supplier has been achieved through utilisation of the advantages inherent in our "Wet-Stack" process. A stress-free component is produced with mechanical precision, enabling a filter assembly to withstand the most rigorous of electrical specifications.

Syfer's Planar Arrays are also available in varistor format, thus providing both voltage transient protection and EMI filtering.

Mechanical

Working with customers in the EMC field has enabled Syfer to develop a comprehensive range of planforms. These include the following, up to 155 hole:

- Circular (MIL-C-38999 and similar)
- ARINC 404 and 600
- "D" SUB (Rectangular and Trapezoidal)
- High Density "D" SUB
- Micro-D (MIL - C - 83513)

Special custom shapes are also available. Component thicknesses are produced from a minimum of 1.40 mm (0.055 inches) to a maximum of 3.18mm (0.125 inches).

Electrical

The holes within the planar array are required to perform differing electrical functions. This could embrace the following:-

- Multiple capacitance values (to a wide ratio)
- Hole to hole insertion loss specification
- Hole grounding to a specified maximum resistance
- Functionless holes (Feedthru's)

Typical capacitance ranges for COG and X7R dielectric are 47pF to 4nF and 250pF to 600nF respectively.

Compliant spring clips

An option for the planar arrays is to supply them with compliant spring clips. The clips are soldered to each hole in the array, allowing the user to push the connector contact through the clip without soldering.

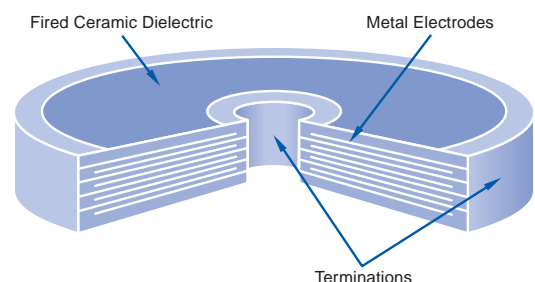
Discoidal Multilayer Capacitors

Discoidal capacitors are at the heart of many EMI filters. More robust and reliable than tubular capacitors, they offer higher capacitance options, with values up to 4.7µF. In addition to standard configurations, Syfer is able to meet customers' specific drawings in terms of electrical performance and mechanical design.

Discoidal Multilayer Ceramic Capacitors are of a configuration suitable for direct mounting into filters, onto bulkheads and hybrid circuits. Due to their geometry, they have excellent RF performance characteristics as well as very high Self Resonant Frequencies. They are offered with a choice of COG or X7R ceramic.

General Specification

Dielectrics:
COG, X7R
Capacitance Range:
10pF to 4.7µF
Capacitance Tolerance:
±5%, ±10%, ±20%, -0%+100%
Voltage:
50V to 3kV
Operating Temperature Range:
COG/X7R, -55°C to +125°C
Termination Options:
Silver-Palladium, Silver-Platinum, Gold over Nickel



The above parameters are indicative, please contact our Sales Office with your specific enquiry.

Syfer Sample Kits

A variety of sample kits is available from Syfer to help designers and EMC engineers to select the most suitable component for any particular application. Please see our website for further details, or contact our Sales Office directly.

X2Y Sample Kit

A selection of X2Y chips in various case sizes and capacitance values.

Surge Protection and Safety Capacitors Sample Kit

Class X and Class Y surface mount surge and safety capacitor samples.

Multilayer Ceramic Chip Capacitors Sample Kit

MLC chip capacitor samples.



FACTORY APPROVALS

Approval	Certificate Number	
ISO 9001:2000	ISO 9001:2000 FM 21663	
ISO 14001:2004	ISO 14001:2004 EMS 68436	
OHSAS 18001:1999	OHSAS 18001:1999 OHS 75225	

IECQ CECC PRODUCT APPROVALS

Approval	Certificate Number	Syfer Product Range
EN 60384-1	M1043 IECQ-CECC	Manufacturer's Approval
CECC 32 101-801 Issue1	E0480/N	Surface Mount Capacitors
QC 32101	E1281/F	Surface Mount Capacitors
BS CECC 30 601-008	E0487/N	Radial Leaded Capacitors

AEC QUALIFICATION

Specification	Qualification Tests	Syfer Product Range
AEC-Q200	Stress test qualification for passive components	Surface Mount Capacitors
AEC-Q200	Stress test qualification for passive components	X2Y Integrated Passive Components
AEC-Q200	Stress test qualification for passive components	3 terminal EMI chips (E01)

SURGE PROTECTION & SAFETY CAPACITOR PRODUCT APPROVALS

Approval	Certificate Number	Syfer Product Range
UL 1414:6th Edition	UL E228790	2220 Y2/X1, X7R
UL 60950 (Formerly UL 1950)	UL E235189	1808 Y3/X2, 2211 Y2/X1, 2215 Y2/X1
EN 13240:1994 +A2+A3+A4 IEC 60384-14 2nd Edition:1993 +A1	TÜV R2110618	1808 Y3/X2
EN 13240:1994 +A2+A3+A4 IEC 60384-14 2nd Edition:1993 +A1	TÜV R60001955	2211 Y2/X1, 2215 Y2/X1
EN 13240:1994 +A2+A3+A4 IEC 60384-14 2nd Edition:1993 +A1	TÜV R60003323	1808 Y3/X2, X7R
IEC 60384-14 2nd Edition:1993 +A1 EN 13240:1994 +A2+A3+A4 EN 130000:1993 +A8+A9+A10	TÜV R60003753	2211 Y2/X1, X7R
IEC 60384-14 2nd Edition:1993 +A1 EN 13240:1994 +A2+A3+A4 EN 130000:1993 +A8+A9+A10	TÜV R60006629	2220 Y2/X1, 2220 X2
EN 13240:1994 +A2+A3+A4 IEC 60384-14 2nd Edition:1993 +A1	TÜV R60007460	1808 Y2/X1
EN 13240:1994 +A2+A3+A4 IEC 60384-14 2nd Edition:1993 +A1	TÜV R60010910	1812 Y2/X1



syfer.com





Worldwide field sales of Syfer products are handled by the CPG global sales team.



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Other companies in CPG (Ceramic Products Group) include:

