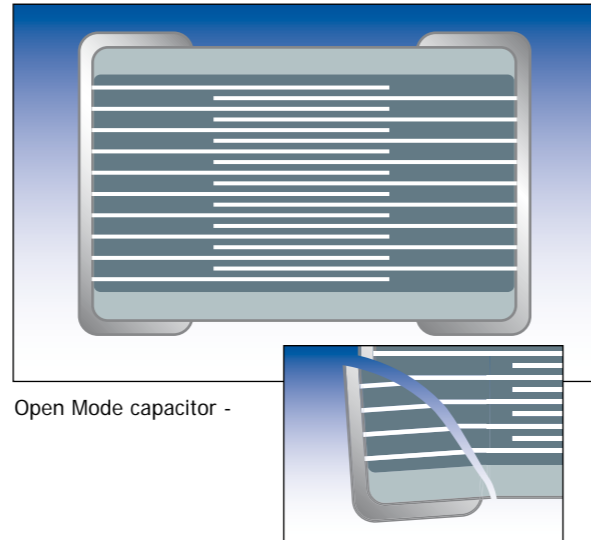


Open Mode capacitors have been designed specifically for use in applications where mechanical cracking is a severe problem and short circuits due to cracking are unacceptable.

Open Mode capacitors use inset electrode margins, which prevent any mechanical cracks which may form during board assembly from connecting to the internal electrodes.

When combined with Syfer's FlexiCap™ termination, Syfer Open Mode capacitors provide a robust component with the assurance that if a part becomes cracked, the crack will be unlikely to result in short circuit failure.



Open Mode capacitor -

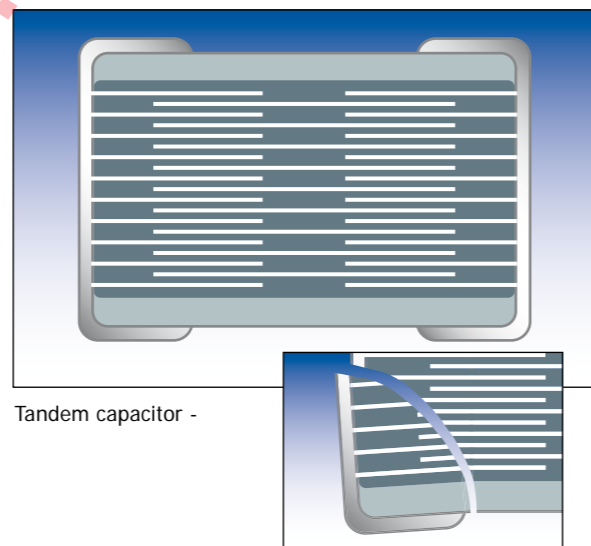
Open Mode max capacitance (X7R only)

	0603	0805	1206	1210	1812	2220	2225
16V	39nF	150nF	470nF	680nF	1.5µF	3.3µF	4.7µF
25V	33nF	120nF	330nF	560nF	1.2µF	2.2µF	3.9µF
50/63V	22nF	100nF	220nF	470nF	1.0µF	1.5µF	2.7µF
100V	6.8nF	27nF	100nF	220nF	680nF	1.0µF	1.8µF
200/250V	2.7nF	15nF	68nF	100nF	330nF	680nF	1.0µF

Qualification included cracking the components by severe bend tests. Following the bend tests cracked components were subjected to endurance / humidity tests, with no failures evident due to short circuits. Note: Depending on the severity of the crack, capacitance loss was between 0% and 70%.

Tandem Capacitors have been designed as a fail safe range using a series section internal design, for use in any application where short circuits would be unacceptable.

When combined with Syfer's FlexiCap™ termination, Syfer Tandem capacitors provide an ultra robust and reliable component, for use in the most demanding applications.



Tandem capacitor -

Tandem max capacitance (X7R only)

	0603	0805	1206	1210	1812	2220	2225
16V	12nF	47nF	150nF	270nF	560nF	1.2µF	1.5µF
25V	10nF	39nF	120nF	220nF	470nF	1.0µF	1.2µF
50/63V	6.8nF	33nF	100nF	180nF	390nF	680nF	1.0µF
100V	2.2nF	10nF	47nF	82nF	220nF	470nF	680nF
200/250V	1.0nF	4.7nF	22nF	47nF	100nF	220nF	330nF

Qualification included cracking the components by severe bend tests. Following the bend tests cracked components were subjected to endurance / humidity tests, with no failures evident due to short circuits. Note: Depending on the severity of the crack, capacitance loss was between 0% and 50%.

Ordering information - Open Mode and Tandem capacitors

1206	Y	050	0224	K	X	T	---
Chip size	Termination	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric codes	Packaging	Suffix
0603 0805 1206 1210 1812 2220 2225	Y = Polymer Termination FlexiCap™	016 = 16V 025 = 25V 050 = 50V 063 = 63V 100 = 100V 200 = 200V 250 = 250V	First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following. Example: 0224 = 22000pF	K = ±10%	X = X7R E = X7R (AEC-Q200 product)	T = 178mm (7") reel R = 330mm (13") reel	M01 = Syfer Open Mode capacitor T01 = Syfer Tandem capacitor

A range of specialist high reliability MLCC's for use in critical or high reliability environments. All fully tested / approved and available with a range of suitable termination options, including tin/lead plating and Syfer Flexicap™.

Ranges include :-

1. Range tested and approved in accordance with IECQ-CECC QC32100.
2. Range qualified to the requirements of AEC-Q200.
3. Range qualified to the requirements of ESCC 3009 European Space Specification.



IECQ-CECC - maximum capacitance values

		0603	0805	1206	1210	1808	1812	2220	2225
16V	COG/NPO	1.5nF	6.8nF	22nF	33nF	33nF	100nF	150nF	220nF
	X7R	100nF	330nF	1.0µF	1.5µF	1.5µF	3.3µF	5.6µF	6.8µF
25V	COG/NPO	1.0nF	4.7nF	15nF	22nF	27nF	68nF	100nF	150nF
	X7R	56nF	220nF	820nF	1.2µF	1.2µF	2.2µF	4.7µF	5.6µF
50/63V	COG/NPO	470pF	2.7nF	10nF	18nF	18nF	33nF	68nF	100nF
	X7R	47nF	220nF	470nF	1.0µF	680nF	1.5µF	2.2µF	3.3µF
100V	COG/NPO	330pF	1.8nF	6.8nF	12nF	12nF	27nF	47nF	68nF
	X7R	10nF	47nF	150nF	470nF	330nF	1.0µF	1.5µF	1.5µF
200V	COG/NPO	100pF	680pF	2.2nF	4.7nF	4.7nF	12nF	22nF	27nF
	X7R	5.6nF	27nF	100nF	220nF	180nF	470nF	1.0µF	1.0µF
500V	COG/NPO	n/a	330pF	1.5nF	3.3nF	3.3nF	10nF	15nF	22nF
	X7R	n/a	8.2nF	33nF	100nF	100nF	270nF	560nF	820nF
1kV	COG/NPO	n/a	n/a	470pF	1.0nF	1.2nF	3.3nF	8.2nF	10nF
	X7R	n/a	n/a	4.7nF	15nF	18nF	56nF	120nF	150nF

Ordering information - IECQ-CECC ranges

1210	Y	100	0103	J	D	T	---
Chip size	Termination	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric Release codes	Packaging	Suffix code
	Y = FlexiCap™ termination base with Ni barrier (100% matte tin plating). RoHS compliant. H = FlexiCap™ termination base with Ni barrier (Tin/lead plating with min. 10% lead). F = Silver Palladium. RoHS compliant. J = Silver base with nickel barrier (100% matte tin plating). RoHS compliant. A = Silver base with nickel barrier (Tin/lead plating with min. 10% lead).	016 = 16V 025 = 25V 050 = 50V 063 = 63V 100 = 100V 200 = 200V 250 = 250V 500 = 500V 630 = 630V 1K0 = 1kV	First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following Example: 0103 = 10nF	<10pF B = ±0.1pF C = ±0.25pF D = ±0.5pF  ≥ 10pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	D = X7R (2R1) with IECQ-CECC release F = COG/NPO (1B/NPO) with IECQ-CECC release B = 2X1/ BX released in accordance with IECQ-CECC R = 2C1/ BZ released in accordance with IECQ-CECC	T = 178mm (7") reel R = 330mm (13") reel B = Bulk pack - tubs	Used for specific customer requirements

AEC-Q200 ranges

Maximum capacitance values

		0603	0805	1206	1210	1812
50/63V	COG/NPO	470pF	2.7nF	10nF	18nF	39nF
	X7R	33nF	150nF	330nF	680nF	1.5µF
100V	COG/NPO	330pF	1.8nF	6.8nF	12nF	27nF
	X7R	10nF	47nF	150nF	470nF	1µF
200V	COG/NPO	100pF	680pF	2.2nF	4.7nF	12nF
	X7R	5.6nF	27nF	100nF	220nF	470nF
500V	COG/NPO	n/a	330pF	1.5nF	3.9nF	10nF
	X7R	n/a	8.2nF	33nF	100nF	270nF
630V	COG/NPO	n/a	n/a	1.0nF	1.8nF	5.6nF
	X7R	n/a	n/a	10nF	27nF	150nF
1kV	COG/NPO	n/a	n/a	470pF	1nF	3.3nF
	X7R	n/a	n/a	4.7nF	15nF	56nF

Ordering information - AEC-Q200

1210	Y	100	0103	J	E	T	---
Chip size	Termination	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric Release codes	Packaging	Suffix code
	<p><b>Y</b> = FlexiCap™ termination base with Ni barrier (100% matte tin plating). RoHS compliant.</p> <p><b>H</b> = FlexiCap™ termination base with Ni barrier (Tin/lead plating with min. 10% lead).</p> <p><b>F</b> = Silver Palladium. RoHS compliant.</p> <p><b>J</b> = Silver base with nickel barrier (100% matte tin plating). RoHS compliant.</p> <p><b>A</b> = Silver base with nickel barrier (Tin/lead plating with min. 10% lead).</p>	<p>016 = 16V</p> <p>025 = 25V</p> <p>050 = 50V</p> <p>063 = 63V</p> <p>100 = 100V</p> <p>200 = 200V</p> <p>250 = 250V</p> <p>500 = 500V</p> <p>630 = 630V</p> <p>1K0 = 1kV</p>	<p>First digit is 0.</p> <p>Second and third digits are significant figures of capacitance code.</p> <p>The fourth digit is number of zeros following</p> <p>Example: 0103 = 10nF</p>	<p>&lt;10pF</p> <p>B = ±0.1pF</p> <p>C = ±0.25pF</p> <p>D = ±0.5pF</p> <p>≥ 10pF</p> <p>F = ±1%</p> <p>G = ±2%</p> <p>J = ±5%</p> <p>K = ±10%</p> <p>M = ±20%</p>	<p><b>E</b> = X7R (2R1) AEC-Q200</p> <p><b>A</b> = COG/NPO (1B/NPO) AEC-Q200</p>	<p><b>T</b> = 178mm (7") reel</p> <p><b>R</b> = 330mm (13") reel</p> <p><b>B</b> = Bulk pack - tubs</p>	<p>Used for specific customer requirements</p>

3 Terminal EMI Components (E01) - AEC-Q200 ranges

Maximum capacitance values

		0805	1206	1806
50V	COG/NPO	820pF	1.0nF	2.2nF
	X7R	47nF	100nF	200nF
100V	COG/NPO	560pF	1.0nF	2.2nF
	X7R	15nF	15nF	68nF

Note: For some lower capacitance parts, higher voltage rated parts may be supplied. Refer to page 36.

X2Y Integrated Passive Components (E03) - AEC-Q200 ranges

Maximum capacitance values

		0805	1206	1410	1812
50V	COG/NPO	470pF	1.5nF	5.6nF	10nF
	X7R	33nF	150nF	330nF	560nF
100V	COG/NPO	330pF	1.0nF	3.9nF	6.8nF
	X7R	15nF	47nF	150nF	330nF

Note: For some lower capacitance parts, higher voltage rated parts may be supplied. Refer to page 38.

S02A Space ranges

Maximum capacitance values

		0603	0805	1206	1210	1812	2220	2225
16V	COG/NPO	390pF - 1.5nF	1pF - 6.8nF	1pF - 22nF	10pF - 33nF	220pF - 100nF	470pF - 150nF	560pF - 220nF
	X7R	330pF - 100nF	100pF - 330nF	680pF - 1.0µF	1.0nF - 1.5µF	3.9nF - 3.3µF	10nF - 5.6µF	18nF - 6.8µF
25V	COG/NPO	390pF - 1.0nF	1pF - 4.7nF	1pF - 15nF	10pF - 22nF	220pF - 68nF	470pF - 100nF	560pF - 150nF
	X7R	330pF - 56nF	100pF - 220nF	680pF - 820nF	1.0nF - 1.2µF	3.9nF - 2.2µF	10nF - 4.7µF	18nF - 5.6µF
50/63V	COG/NPO	0.5pF - 470pF	1pF - 2.7nF	1pF - 10nF	10pF - 18nF	220pF - 39nF	470pF - 68nF	560pF - 100nF
	X7R	330pF - 47nF	100pF - 220nF	680pF - 470nF	1.0nF - 1.0µF	3.9nF - 2.2µF	10nF - 3.3µF	18nF - 3.3µF
100V	COG/NPO	1pF - 330pF	1pF - 1.8nF	1pF - 6.8nF	10pF - 12nF	220pF - 27nF	470pF - 47nF	560pF - 68nF
	X7R	100pF - 10nF	100pF - 47nF	100pF - 150nF	1.0nF - 470nF	3.9nF - 1.0µF	10nF - 1.5µF	18nF - 1.5µF
200V	COG/NPO	1pF - 100pF	1pF - 680pF	1pF - 2.2nF	10pF - 4.7nF	220pF - 12nF	470pF - 22nF	560pF - 27nF
	X7R	100pF - 5.6nF	100pF - 27nF	100pF - 100nF	1.0nF - 220nF	3.9nF - 470nF	10nF - 1.0µF	18nF - 1.0µF
500V	COG/NPO	-	1pF - 270pF	1pF - 1.2nF	10pF - 2.7nF	180pF - 6.8nF	390pF - 15nF	4.7nF - 18nF
	X7R	-	10pF - 8.2nF	180pF - 33nF	390pF - 100nF	390pF - 270nF	1nF - 560nF	15nF - 820nF

Note: In accordance with ESCC 3009.

Ordering information - S02A Space ranges product code construction

1210	A	100	0103	J	X	T	---
Chip size	Termination <sup>(1)</sup>	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric Rel Release codes	Packaging	Suffix code
	<p><b>A</b> = Silver base with nickel barrier (Tin/lead plating with min. 10% lead).</p> <p><b>F</b> = Silver Palladium. RoHS compliant.</p> <p><b>H</b> = FlexiCap™ termination base with Ni barrier (Tin/lead plating with min. 10% lead).</p>	<p>016 = 16V</p> <p>025 = 25V</p> <p>050 = 50V</p> <p>063 = 63V</p> <p>100 = 100V</p> <p>200 = 200V</p> <p>500 = 500V</p>	<p>First digit is 0.</p> <p>Second and third digits are significant figures of capacitance code.</p> <p>The fourth digit is number of zeros following</p> <p>Example: 0103 = 10nF</p>	<p>&lt;10pF</p> <p>B = ±0.1pF</p> <p>C = ±0.25pF</p> <p>D = ±0.5pF</p> <p>≥ 10pF</p> <p>F = ±1%</p> <p>G = ±2%</p> <p>J = ±5%</p> <p>K = ±10%</p> <p>M = ±20%</p>	<p><b>C</b> = COG/NPO (1B)</p> <p><b>X</b> = X7R (2R1)</p>	<p><b>T</b> = 178mm (7") reel</p> <p><b>R</b> = 330mm (13") reel</p> <p><b>B</b> = Bulk pack - tubs</p> <p><b>Q</b> = Waffle pack</p>	<p>Used for specific customer requirements</p> <p><b>S02A</b> = S (Space Grade) High Rel</p>

Notes:

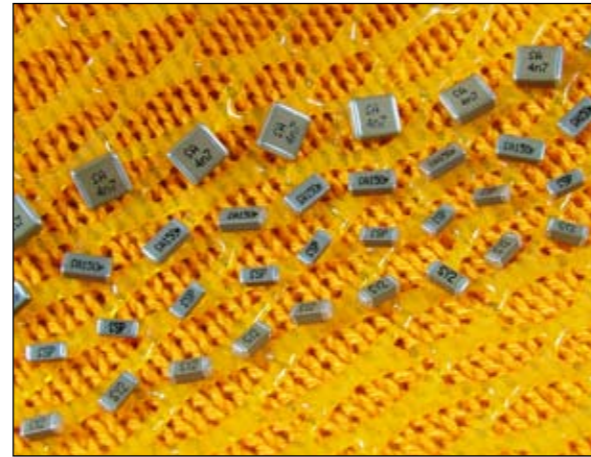
- (1) Termination **A**, **H** & **F** available for Space applications. If another termination type is required then contact Syfer Sales.
- (2) Please include Lot Acceptance Test requirement (LAT1, LAT2 or LAT3) on purchase order against each line item. Tests conducted after 100% Burn-In (2xRV @125°C for 168 hours):
  - LAT1: 4 x adhesion, 8 x rapid temp change + LAT2 and LAT3.
  - LAT2: 20 x 1000 hour life test + LAT3.
  - LAT3: 6 x TC and 4 x solderability.

## Safety Certified capacitors

Syfer Technology's Safety Certified 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.

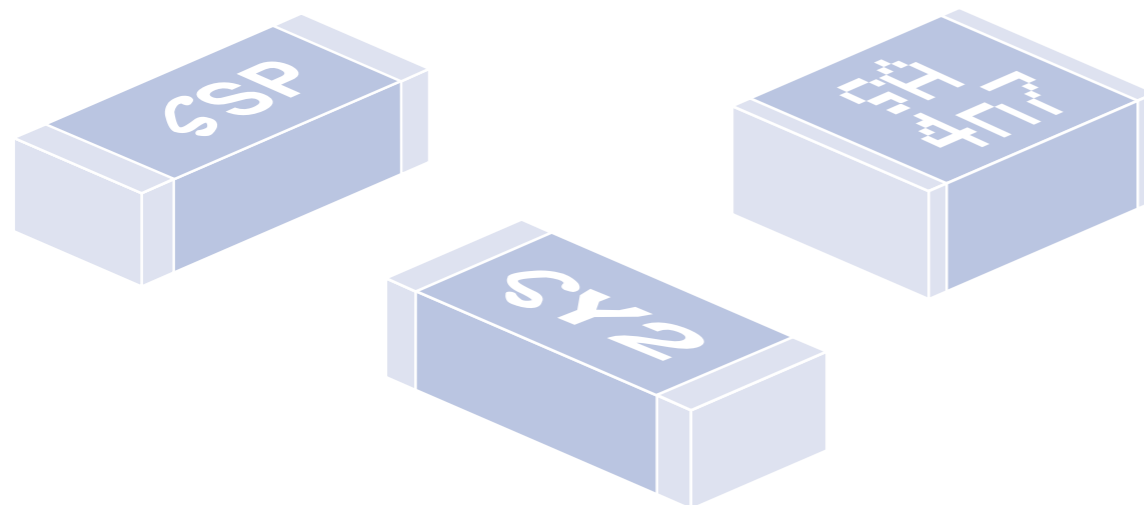
Syfer's high voltage capacitor expertise means the range offers among the highest range available of capacitance values in certain case sizes. Applications include: modems, AC-DC power supplies and where lightning strike or other voltage transients represent a threat to electronic equipment.

- Surface mount multilayer ceramic capacitors
- Meet Class Y2/X1, Y3/X2 and X2 requirements
- Approved for mains ac voltages, up to 250Vac
- Approved by UL and TÜV
- Sizes 1808, 1812, 2211, 2215 and 2220
- Smaller sizes suitable for use in equipment certified to EN60950
- Certification specifications for larger sizes include IEC/EN60384, UL/CSA60950 and UL1414
- Surface mount package
- Reduces board area and height restrictions
- Reduced assembly costs over conventional through hole components
- FlexiCap™ option available on all sizes.



Class	Rated voltage	Impulse voltage	Insulation bridging	May be used in primary circuit
Y1	250Vac	8000V	Double or reinforced	Line to protective earth
Y2	250Vac	5000V	Basic or supplementary*	Line to protective earth
Y3	250Vac	None	Basic or supplementary	-
Y4	150Vac	2500V	Basic or supplementary*	Line to protective earth
X1	250Vac	4000V	-	Line to line
X2	250Vac	2500V	-	Line to line
X3	250Vac	None	-	Line to line

\* 2 x Y2 or Y4 rated may bridge double or reinforced insulation when used in series.



### Safety Certified capacitors classification and approval specification.

CHIP SIZE	DIELECTRIC	CAP RANGE	SYFER FAMILY CODE	CLASSIFICATION	APPROVAL SPECIFICATION	APPROVAL BODY
1808	COG/NPO	4.7pF to 1.5nF	SP <sup>(1)</sup>	Y3/X2 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
1808	X7R	150pF to 2.2nF	SP <sup>(1)</sup>	Y3/X2 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
1808	COG/NPO	4.7pF to 390pF	PY2 <sup>(1)</sup>	Y2/X1 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
1808	X7R	150pF to 1nF	PY2 <sup>(1)</sup>	Y2/X1 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
1812	COG/NPO	4.7pF to 390pF	PY2 <sup>(1)</sup>	Y2/X1 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
1812	X7R	150pF to 1.0nF	PY2 <sup>(1)</sup>	Y2/X1 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
2211	COG/NPO	4.7pF to 1nF	SP <sup>(2)</sup>	Y2/X1 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
2211	X7R	100pF to 2.2nF	SP <sup>(2)</sup>	Y2/X1 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
2215	COG/NPO	820pF to 1.0nF	SP <sup>(2)</sup>	Y2/X1 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
2215	X7R	2.7nF to 3.3nF	SP <sup>(2)</sup>	Y2/X1 NWGQ2, NWGQ8	IEC60384-14:2005 EN60384-14:2005 UL-60950-1, 2nd Ed CSA 60950-1-07 2nd Ed	TÜV UL
2220	X7R	150pF to 4.7nF	B16	Y2/X1 <sup>(2)</sup> Y2/X1, <sup>(1)</sup> FOWX2	IEC60384-14:2005 EN60384-14:2005 UL1414: 6th Edition	TÜV UL
2220	X7R	150pF to 10nF	B17 <sup>(2)</sup>	X2	IEC60384-14:2005 EN60384:2005	TÜV

- Notes**
- (1), (2) J: Silver base with Nickel Barrier (100% Matte Tin Plating). RoHS compliant.
- (1), (2) Y: FlexiCap™ termination base with Nickel Barrier (100% Tin Plating). RoHS compliant.
- (2) H: FlexiCap™ termination base with Nickel Barrier (Tin/ Lead plating with min 10% Lead).
- (2) A: Silver base with Nickel Barrier (Tin/ Lead Plating with min 10% Lead).
- PY2 Unmarked capacitors also available as released in accordance with approval specifications. Family code SY2 applies.
- SP Unmarked capacitors also available as released in accordance with approval specifications. Family code SPU applies.

