

# IECQ-CECC range - Specialty High Rel. and approved parts

A range of specialist, high reliability, multilayer ceramic capacitors 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 Knowles FlexiCap™.

Ranges include:

1. Range tested and approved in accordance with IECQ-CECC QC32100.
2. Range qualified to the requirements of Knowles detail specification S02A-0100 (based on ESCC 3009).



## IECQ-CECC - maximum capacitance values

		0603	0805	1206	1210	1808	1812	2220	2225
16V	COG/NP0	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/NP0	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/NP0	470pF	2.7nF	10nF	18nF	18nF	33nF	68nF	100nF
	X7R	47nF	220nF	470nF	1.0µF	680nF	1.5µF	2.2µF	3.3µF
100V	COG/NP0	330pF	1.8nF	6.8nF	12nF	12nF	27nF	47nF	68nF
	X7R	10nF	47nF	150nF	470nF	330nF	1.0µF	1.5µF	1.5µF
200/250V	COG/NP0	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/NP0	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/NP0	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 range

1210	Y	100	0103	J	D	T	---
Chip size	Termination	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric Release codes	Packaging	Suffix code
<b>0603</b> <b>0805</b> <b>1206</b> <b>1210</b> <b>1808</b> <b>1812</b> <b>2220</b> <b>2225</b>	<b>Y</b> = FlexiCap™ termination base with Ni barrier (100% matte tin plating). RoHS compliant. <b>H</b> = FlexiCap™ termination base with Ni barrier (Tin/lead plating with min. 10% lead). Not RoHS compliant. <b>F</b> = Silver Palladium. RoHS compliant. <b>J</b> = Nickel barrier (100% matte tin plating). RoHS compliant. <b>A</b> = Nickel barrier (Tin/lead plating with min. 10% lead). Not RoHS compliant.	<b>016</b> = 16V <b>025</b> = 25V <b>050</b> = 50V <b>063</b> = 63V <b>100</b> = 100V <b>200</b> = 200V <b>250</b> = 250V <b>500</b> = 500V <b>630</b> = 630V <b>1K0</b> = 1kV	First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following Example: <b>0103</b> = 10nF	<b>F</b> = ±1% <b>G</b> = ±2% <b>J</b> = ±5% <b>K</b> = ±10% <b>M</b> = ±20%	<b>D</b> = X7R (2R1) with IECQ-CECC release <b>F</b> = COG/NP0 (1B/NP0) with IECQ-CECC release <b>B</b> = 2X1/BX released in accordance with IECQ-CECC <b>R</b> = 2C1/BZ released in accordance with IECQ-CECC For <b>B</b> and <b>R</b> codes please refer to TCC/VCC range for full capacitance values	<b>T</b> = 178mm (7") reel <b>R</b> = 330mm (13") reel <b>B</b> = Bulk pack - tubs or trays	Used for specific customer requirements

# High Reliability Chip - COG/NPO - 16Vdc to 10kVdc

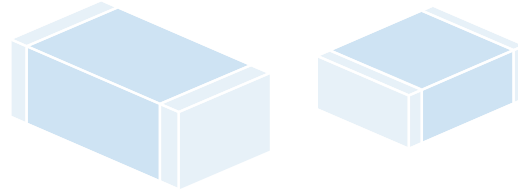
A range of MLC chip capacitors in Ultra stable EIA Class I COG/NPO, dielectric with special testing for long term reliability. They are designed for optimum reliability; burned in at elevated voltage and temperature, and 100% physically and electrically inspected to ascertain conformance to strict performance criteria. Units may be tested in accordance with MIL-PRF-55681, MIL-PRF-123, MIL-PRF-49467 or customer SCD.

Designed for surface mount application with nickel barrier terminations making them suitable for solder wave and reflow solder board attachment as well as vapor phase attachment for part sizes 2225 or smaller. Silver-palladium terminations are also available for hybrid use with conductive epoxy.

COG/NPO chips are used in precision circuitry requiring Class I stability and exhibit linear temperature coefficient, low loss and stable electrical properties with time, voltage and frequency.

They find application for High Reliability use such as medical implanted devices, aerospace, airborne and military use as well as consumer uses requiring safety margins not attainable with commercial products.

Standard EIA case sizes and available C/V values are listed below - special sizes, thicknesses and other voltage ratings are available; please contact the Sales Office for information.



## Capacitance and voltage selection for popular chip sizes

Size	0402	0504	0603	0805	1206	1206	1210	1515	1808	1812	1825	1825		
<b>Min cap.</b>	0R3	0R5	0R3	0R5	0R5	3R0	5R0	3R0	5R0	5R0	100	100	150	150
<b>Tmax</b> inches: mm:	0.024 0.61	0.044 1.12	0.035 0.89	0.054 1.37	0.054 1.37	0.064 1.63	0.065 1.63	0.130 3.02	0.065 1.63	0.080* 2.03	0.065 1.63	0.100* 2.54	0.080 2.03	0.140* 3.56
<b>16V</b>	81	152	102	392	562	103	223	393	223	273	473	473	104	104
<b>25V</b>	181	152	102	392	562	123	223	393	223	273	473	473	104	104
<b>50V</b>	181	152	102	392	562	123	223	333	183	223	393	393	104	104
<b>100V</b>	101	821	561	222	332	682	123	273	123	183	273	273	683	823
<b>200V</b>	101	561	331	152	222	392	822	223	822	103	153	273	473	683
<b>250V</b>	390	391	271	102	152	272	562	183	562	682	123	183	273	473
<b>300V</b>	•	•	•	681	681	182	392	123	392	472	822	123	223	273
<b>400V</b>	•	•	•	681	561	152	392	822	392	472	822	103	183	183
<b>500V</b>	•	•	•	681	561	152	392	682	392	392	822	103	183	183
<b>600V</b>	•	•	•	•	•	122	392	682	392	392	822	103	183	183
<b>800V<sup>†</sup></b>	•	•	•	•	•	102	222	472	222	222	472	682	123	153
<b>1kV<sup>†</sup></b>	•	•	•	•	•	681	152	392	152	152	332	562	822	123
<b>1.5kV<sup>†</sup></b>	•	•	•	•	•	271	681	222	681	102	152	222	392	682
<b>2kV<sup>†</sup></b>	•	•	•	•	•	151	391	122	391	391	821	122	222	392
<b>3kV<sup>†</sup></b>	•	•	•	•	•	•	•	561	181	181	391	561	102	182
<b>4kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	391	681
<b>5kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	221	471
<b>6kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>7kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>8kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>9kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>10kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Note: <sup>†</sup> Units rated above 800V may require conformal coating to preclude arcing over chip surface.  
Maximum voltage for MIL-PRF-123 tested parts is 1kV.

# High Reliability Chip - COG/NPO - 16Vdc to 10kVdc

- For dielectric characteristics see pages 4 & 5.
- For dimensions see page 16.
- For termination options see pages 6.
- For capacitance tolerances available see page 21.
- For ordering information see page 21.

**Note:** Maximum capacitance values are shown below as 3 digit code: 2 significant figures followed by the no. of zeros e.g. 183 = 18,000pF.



## Capacitance and voltage selection for popular chip sizes

Size	2020	2221	2225		2520	3333	3530	4040	4540	5440	5550	6560	7565
<b>Min cap.</b>	270	270	270	270	390	390	390	390	390	390	390	560	101
<b>Tmax</b> inches: mm:	0.180 4.57	0.080 2.03	0.080 2.03	0.150* 3.81	0.180 4.57	0.250 6.35	0.250 6.35	0.300 7.62	0.300 7.62	0.300 7.62	0.300 7.62	0.300 7.62	0.300 7.62
<b>16V</b>	683	104	124	124	104	184	184	334	334	334	394	684	824
<b>25V</b>	683	104	124	124	104	184	184	334	334	334	394	684	824
<b>50V</b>	683	104	124	124	104	154	184	274	334	274	394	564	824
<b>100V</b>	563	683	823	104	823	124	154	224	274	224	274	474	564
<b>200V</b>	473	393	473	823	683	104	104	184	184	184	224	394	474
<b>250V</b>	393	223	273	563	563	823	104	154	184	184	224	394	474
<b>300V</b>	333	183	273	473	473	823	823	154	154	154	184	334	394
<b>400V</b>	223	183	273	273	333	563	563	124	124	124	154	274	334
<b>500V</b>	153	183	273	273	183	473	473	823	104	104	124	224	274
<b>600V</b>	153	183	273	273	183	393	393	683	823	823	124	184	274
<b>800V†</b>	103	103	153	223	123	333	333	563	683	683	104	154	184
<b>1kV†</b>	103	822	123	183	123	273	273	473	563	563	823	124	184
<b>1.5kV†</b>	682	392	562	103	822	183	183	333	393	393	563	823	124
<b>2kV†</b>	392	182	272	562	472	153	153	223	273	333	473	683	823
<b>3kV†</b>	182	821	122	272	222	682	682	153	183	183	273	393	473
<b>4kV†</b>	681	331	471	102	102	272	272	562	682	822	103	153	223
<b>5kV†</b>	391	221	331	681	561	182	182	392	472	472	682	103	123
<b>6kV†</b>	•	•	•	•	•	152	152	272	332	332	472	822	822
<b>7kV†</b>	•	•	•	•	•	•	821	152	182	182	272	392	472
<b>8kV†</b>	•	•	•	•	•	•	•	102	122	122	182	272	392
<b>9kV†</b>	•	•	•	•	•	•	•	•	821	102	122	222	272
<b>10kV†</b>	•	•	•	•	•	•	•	•	681	821	122	182	222

Note: † Units rated above 800V may require conformal coating to preclude arcing over chip surface. Maximum voltage for MIL-PRF-123 tested parts is 1kV.

# High Reliability Chip - X7R - 16Vdc to 10kVdc

A range of MLC chip capacitors in Stable EIA Class II dielectric with special testing for long term reliability. They are designed for optimum reliability; burned in at elevated voltage and temperature, and 100% physically and electrically inspected to ascertain conformance to strict performance criteria. Units may be tested in accordance with MIL-PRF-55681, MIL-PRF-123, MIL-PRF-49467 or customer SCD.

Designed for surface mount application with nickel barrier terminations making them suitable for solder wave and reflow solder board attachment as well as vapor phase attachment for part sizes 2225 or smaller. Silver-palladium terminations are also available for hybrid use with conductive epoxy.

Class II X7R chips are used as decoupling, by-pass, filtering and transient voltage suppression elements and exhibit +/-15%

temperature coefficient and predictable variation of electrical properties with time, temperature and voltage.

They find application for High Reliability use such as medical implanted devices, aerospace, airborne and military use as well as consumer uses requiring safety margins not attainable with commercial products.

Standard EIA case sizes and available C/V values are listed below - special sizes, thicknesses and other voltage ratings are available; please contact the Sales Office for information.



## Capacitance and voltage selection for popular chip sizes

Size	0402	0504	0603	0805	1005	1206	1210	1515	1808		1812		1825	
Min cap.	121	121	121	121	121	121	121	151	151	151	151	151	471	471
<b>Tmax</b> inches: mm:	0.024 0.61	0.044 1.12	0.035 0.89	0.054 1.37	0.054 1.37	0.064 1.63	0.065 1.63	0.130 3.02	0.065 1.63	0.080* 2.03	0.065 1.63	0.100* 2.54	0.080 2.03	0.140* 3.56
<b>16V</b>	472	333	223	104	124	274	474	105	394	684	824	824	155	225
<b>25V</b>	472	333	223	104	124	274	474	824	394	564	824	824	155	225
<b>50V</b>	472	333	223	823	104	224	394	824	334	474	684	684	125	185
<b>100V</b>	392	273	183	563	683	154	274	684	224	334	474	474	105	185
<b>200V</b>	182	123	822	223	333	823	124	394	124	154	224	394	564	105
<b>250V</b>	102	822	562	183	273	393	823	224	683	104	124	124	394	684
<b>300V</b>	•	•	•	103	123	273	563	184	563	683	104	154	274	474
<b>400V</b>	•	•	•	682	682	183	333	104	333	393	563	124	184	334
<b>500V</b>	•	•	•	472	472	123	273	823	273	333	473	683	124	274
<b>600V</b>	•	•	•	332	272	682	153	563	183	223	273	473	823	184
<b>800V<sup>†</sup></b>	•	•	•	222	182	472	103	333	103	123	183	273	563	104
<b>1kV<sup>†</sup></b>	•	•	•	122	821	222	562	183	562	822	103	183	333	563
<b>1.5kV<sup>†</sup></b>	•	•	•	•	•	102	222	822	272	332	392	822	123	273
<b>2kV<sup>†</sup></b>	•	•	•	•	•	471	102	392	122	152	182	332	682	123
<b>3kV<sup>†</sup></b>	•	•	•	•	•	•	•	102	391	471	821	152	152	332
<b>4kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	181	271	391	681	821	182
<b>5kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	561	102
<b>6kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>7kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>8kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>9kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<b>10kV<sup>†</sup></b>	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Note: † Units rated above 800V may require conformal coating to preclude arcing over chip surface. Maximum voltage for MIL-PRF-123 tested parts is 1kV.

# High Reliability Chip - X7R - 16Vdc to 10kVdc

- For dielectric characteristics see pages 4 & 5.
- For dimensions see page 16.
- For termination options see pages 6.
- For capacitance tolerances available see page 21.
- For ordering information see page 21.

**Note:** Maximum capacitance values are shown below as 3 digit code: 2 significant figures followed by the no. of zeros e.g. 183 = 18,000pF.



## Capacitance and voltage selection for popular chip sizes

Size	2020	2221	2225		2520	3333	3530	4040	4540	5440	5550	6560	7565
Min cap.	102	471	471	471	102	102	102	102	102	102	102	222	222
<b>Tmax</b> inches: mm:	0.180 4.57	0.080 2.03	0.080 2.03	0.150* 3.81	0.180 4.57	0.250 6.35	0.250 6.35	0.300 7.62	0.300 7.62	0.300 7.62	0.300 7.62	0.300 7.62	0.300 7.62
<b>16V</b>	185	125	185	275	225	475	475	825	825	106	126	186	226
<b>25V</b>	155	125	185	225	225	475	475	685	825	106	126	186	206
<b>50V</b>	155	125	155	225	155	395	395	685	685	825	106	156	186
<b>100V</b>	125	824	125	185	125	335	335	565	685	685	825	106	156
<b>200V</b>	105	474	564	125	125	275	275	475	475	565	685	825	106
<b>250V</b>	684	394	394	684	804	225	225	475	475	565	685	825	106
<b>300V</b>	564	224	334	684	684	185	185	335	335	395	475	685	825
<b>400V</b>	334	154	184	394	394	105	105	185	225	225	275	335	565
<b>500V</b>	224	154	154	334	274	684	684	125	155	155	185	275	395
<b>600V</b>	154	823	104	224	184	474	474	824	824	105	155	225	275
<b>800V†</b>	104	563	683	124	124	334	334	564	684	824	125	185	225
<b>1kV†</b>	563	273	393	823	683	184	184	394	474	474	684	105	125
<b>1.5kV†</b>	123	123	153	333	333	823	823	184	184	224	274	474	564
<b>2kV†</b>	123	562	822	153	153	473	473	104	104	124	184	224	334
<b>3kV†</b>	272	182	222	392	562	223	223	333	473	473	683	104	154
<b>4kV†</b>	182	821	102	222	272	123	123	183	223	273	393	563	823
<b>5kV†</b>	102	561	561	122	182	682	822	103	153	183	273	393	473
<b>6kV†</b>	•	•	•	•	•	472	562	682	103	123	183	273	333
<b>7kV†</b>	•	•	•	•	•	•	392	472	682	822	123	183	273
<b>8kV†</b>	•	•	•	•	•	•	272	392	562	682	103	153	183
<b>9kV†</b>	•	•	•	•	•	•	222	272	392	472	682	123	153
<b>10kV†</b>	•	•	•	•	•	•	152	222	332	392	562	822	123

Note: † Units rated above 800V may require conformal coating to preclude arcing over chip surface.  
Maximum voltage for MIL-PRF-123 tested parts is 1kV.