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IECQ-CECC Specification Update – Surface Mount Capacitors

Syfer has introduced a considerable expansion in the surface mount capacitor ranges now available with IECQ-CECC approval. Importantly, the new approval will not require customers to change any part numbers or specification number.

Syfer's IECQ-CECC original surface mount capacitor qualification was approved to CECC 32101-801 dated 1988 which defines, for example, rated capacitance ranges, rated voltage ranges and maximum component thicknesses. However, as technology progressed the ranges defined in CECC 32101-801 are no longer appropriate and actually impose restrictions when compared with standard surface mount capacitor ranges.

To extend IECQ-CECC surface mount qualified ranges beyond the limitations defined in CECC 32101-801, BSI and IECQ have been actively working with Syfer in qualifying a new IECQ-CECC Assessment Specification and a new IECQ-CECC Component Specification. The new approval specification reference is QC32100. *[Please see page 4 for a copy of the specification.]*

QC32100 extensions include:

- 0603 components now available with IECQ-CECC approval.
- 16Vdc, 25Vdc, 500Vdc and 1kVdc rated components now available with IECQ-CECC approval (previously limited from 50Vdc to 250Vdc).
- C0G and X7R (2R1) capacitance ranges increased.
- All Syfer surface mount capacitor termination types including Tin/Lead plating now available with IECQ-CECC approval.

Note: There are no changes to Syfer's IECQ-CECC approved radial capacitor ranges.

Information for customers currently specifying CECC 32101-801 approval on purchase orders:

- QC32100 does not introduce any change to the components (design, manufacturing, test or inspection processes).
- CECC 32101-801 approval will be maintained up to 31st March 2008. After this date, all products will be released against the QC32100 approval.
- Until 31st March 2008, release documentation will include the wording "CECC 32 101-801 Issue 1. QC 32100-C001." After 31st March 2008, release documentation will include the wording "QC32100 incorporating CECC 32101-801".
- QC32100 approval applies to classification 1B (C0G) and 2R1 (X7R). Classifications 2C1 and 2X1 will be available in accordance with QC32100. Note: There are no changes to components.
- New Syfer part number dielectric codes have been allocated so that parts released to QC32100 are uniquely identified. The dielectric release codes are:

  D: X7R (2R1) with IECQ-CECC release.
  F: C0G (1B/NP0) with IECQ-CECC release.

  Product can still be ordered using the C or X Syfer part number dielectric codes if required for customers not wishing to change existing part numbers. However, orders must clearly state IECQ-CECC release required

  For customers requiring specific voltage characteristics, the following dielectric release codes are still available but, from 31st March 2008, released "in accordance with" QC32100:
  B: 2X1 (BX) released "in accordance with".
  R: 2C1 (BZ) released "in accordance with".

Syfer Surface Mount IECQ-CECC Ranges

	Max Cap	16V	25V	50V	63V	100V	200V	250V	500V	1.0KV
0603	C0G/NP0	1.5nF	1.0nF	470pF	470pF	330pF	100pF	100pF	n/a	n/a
	X7R	100nF	56nF	47nF	47nF	10nF	5.6nF	5.6nF	n/a	n/a
0805	C0G/NP0	6.8nF	4.7nF	2.7nF	2.7nF	1.8nF	680pF	680pF	330pF	n/a
	X7R	330nF	220nF	220nF	220nF	47nF	27nF	27nF	8.2nF	n/a
1206	C0G/NP0	22nF	15nF	10nF	10nF	6.8nF	2.2nF	2.2nF	1.5nF	470pF
	X7R	1.0µF	820nF	470nF	470nF	150nF	100nF	100nF	33nF	4.7nF
1210	C0G/NP0	33nF	22nF	18nF	18nF	12nF	4.7nF	4.7nF	3.3nF	1.0nF
	X7R	1.5µF	1.2µF	1.0µF	1.0µF	470nF	220nF	220nF	100nF	15nF
1808	C0G/NP0	33nF	27nF	18nF	18nF	12nF	4.7nF	4.7nF	3.3nF	1.2nF
	X7R	1.5µF	1.2µF	680nF	680nF	330nF	180nF	180nF	100nF	18nF
1812	C0G/NP0	100nF	68nF	33nF	33nF	27nF	12nF	12nF	10nF	3.3nF
	X7R	3.3µF	2.2µF	1.5µF	1.5µF	1.0µF	470nF	470nF	270nF	56nF
2220	C0G/NP0	150nF	100nF	68nF	68nF	47nF	22nF	22nF	15nF	8.2nF
	X7R	5.6µF	4.7µF	2.2µF	2.2µF	1.5µF	1.0µF	1.0µF	560nF	120nF
2225	C0G/NP0	220nF	150nF	100nF	100nF	68nF	27nF	27nF	22nF	10nF
	X7R	6.8µF	5.6µF	3.3µF	3.3µF	1.5µF	1.0µF	1.0µF	820nF	150nF

Ordering information:

Example: …….. 1210 Y 100 0103 J D T _ _ _

Type No/Size ref

Termination
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)

Voltage Rating d.c.

Capacitance Value

Capacitance Tolerance code

Dielectric/ Release codes(1)
D: X7R (2R1) with IECQ-CECC release.
F: C0G (1B/NP0) with IECQ-CECC release.
B: 2X1 released(2) in accordance with.
R: 2C1 released(2) in accordance with.

Packaging
T: 178mm (7") reel
R: 330mm (13") reel
B: Bulk pack - tubs

Suffix code. Used for specific customer requirements.

Notes:
1. C: C0G (1B/NP0) dielectric code also available. If IECQ-CECC formal release is required using C dielectric/ release code then IECQ-CECC must be clearly stated on purchase order.
   X: X7R (2R1) dielectric code also available. If IECQ-CECC formal release is required using X dielectric/ release code then IECQ-CECC must be clearly stated on purchase order.
2. 2X1 & 2C1 available for IECQ-CECC formal release against CECC 32101-801 until 31st March 2008. After this date, release will be "in accordance with QC32100".

For further information, please contact Syfer Sales department.

IECQ-CECC

COMPONENT

SPECIFICATION

QC 32100-C001

Issue 1

June 2007

Component Specification
for
Multilayer Ceramic Capacitors

Up-to-date lists and bibliographical references of IECQ-CECC publications may be downloaded from www.iecq.org

Further copies of this document may be obtained from:

IEC

International Electrotechnical Commission
Commission Elextrtechnique Internationale

Box 131, rue de Varembé, CH 1211 Geneva 20, Switzerland

FOREWORD

The IECQ Quality Assessment System for Electronic Components (IECQ) is composed of those member countries of the International Electotechnical Commission (IEC) who wish to take part in a harmonised system for electronic components of assessed quality. IECQ is also known in some member countries as IECQ-CECC.

The object of the System is to facilitate international trade by the harmonisation of the specifications and quality assessment procedures for electronic components and by the grant of an internationally recognised Mark, or Certificate of Conformity. The components produced or services provided under the system are thereby acceptable in all member countries without further testing.

This Component Specification is based upon the requirements of IEC Publication QC 001002-2, CECC 32100 and CECC 32101-801 and has been prepared by:

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Amendment Record

No previous issue.

Purpose

This IECQ-CECC component specification (CS) has been prepared to enable the certification of surface mountable multilayer ceramic capacitors against the general requirements based on CECC 32100 and CECC 32101-801 as modified and enhanced by this CS and an associated AS (eg: QC32100-A001).

Requirements

The requirements for IECQ-CECC Component Specifications as detailed in QC 001002-2 Amendment 1 clause 5.4 are satisfied by the following data sheet.

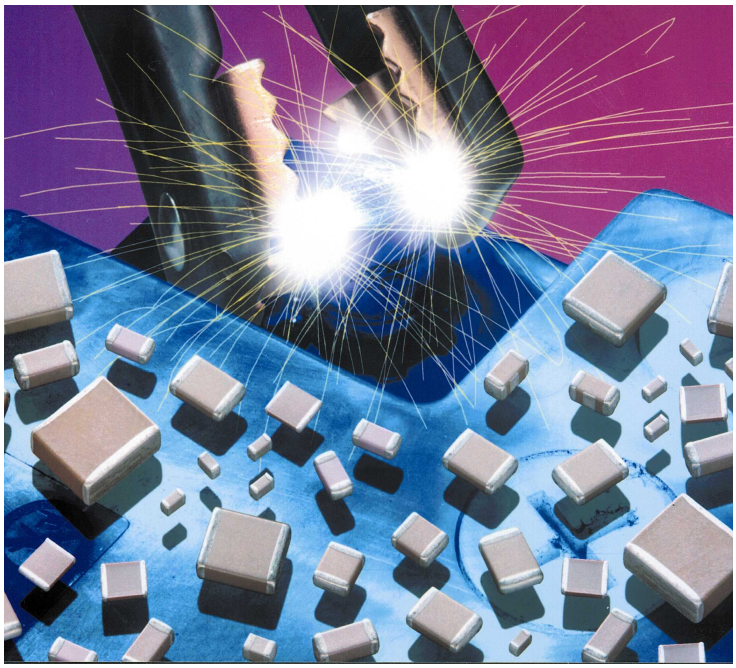
It should be noted that IECQ-CECC are not responsible for manufacturers declarations made in data sheets which fall outside the limits of approval detailed in IECQ-CECC certificates.

This Component Specification is intended for use with applicable IECQ-CECC Assessment Specifications. Eg: QC 32100-A001.

Surface Mount Products

Multilayer Ceramic Capacitors are generally divided into classes, which are defined by the capacitance temperature characteristics over specified temperature ranges.

C0G – Ultra Stable Class I



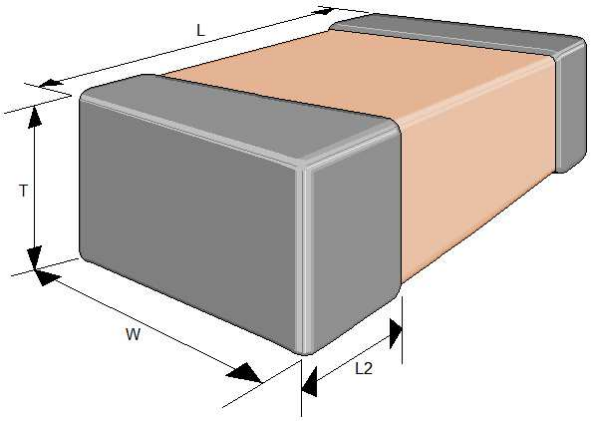
Capacitors within this class have a dielectric constant range from 10 to 100. They are used in applications, which require ultra stable dielectric characteristics with negligible dependence of capacitance and dissipation factor with time, voltage and frequency.

X7R – Stable Class II

Capacitors of this type have a dielectric constant range of 1000-4000, and also have a non-linear temperature characteristic, which exhibits a dielectric constant of less than ± 15% from its room temperature value, over the specified temperature range. Generally used for by-passing (decoupling), coupling, filtering, frequency discrimination, DC blocking and voltage transient suppression with greater volumetric efficiency than Class I units, whilst maintaining stability within defined limits.

Applications:

Typical applications include telecoms, power supplies, industrial, automotive, space, aerospace, inverters and military systems.

Detailed Specification	QC 32100-C001 Issue 1
	Rectangular construction with metallised solderable terminations suitable for Surface Mounting

Quick Reference Data:

Rated capacitance range:	0.47pF to 220nF (Class I) 100pF to 6.8µF (Class II)
Capacitance Tolerances:	± 0.1pF, ± 0.25pF, ± 0.5pF (Class I C_r < 10pF) ± 1%, ± 2%, ± 5%, ± 10% (Class I C_r≥ 10pF) ± 5%, ± 10%, ± 20% (Class II)
Rated Voltages:	16V, 25V, 50/63V, 100V, 200/250V, 500V, 1kV
Climatic Category:	55/125/56

1.0 General Data

1.1 Methods of Mounting

For normal use capacitors may be mounted by either reflow or wave soldering process. The use of soldering irons is not recommended.
For approval and periodic tests requiring parts to be mounted the mounting shall be in accordance with clause 4.4 of CECC 32 100 using glass-epoxy FR4 PCB 1.6mm thick. The method of CECC 32 100 clause 4.4.2 shall be used.

1.2 Dimensions

Table 1: Dimensions (mm)

Case Size	L	W	T (max)	L_2 (min	L_2 (max)
0603	1.6 ± 0.2	0.8 ± 0.2	0.8	0.1	0.4
0805	2.0 ± 0.3	1.25 ± 0.2	1.3	0.13	0.75
1206	3.2 ± 0.3	1.6 ± 0.2	1.6	0.25	0.75
1210	3.2 ± 0.3	2.5 ± 0.3	2.0	0.25	0.75
1808	4.5 ± 0.35	2.0± 0.3	2.0	0.25	1.0
1812	4.5 ± 0.35	3.2 ± 0.3	2.5	0.25	1.0
2220	5.70 ± 0.4	5.0 ± 0.4	2.5	0.25	1.0
2225	5.70 ± 0.4	6.3 ± 0.4	2.5	0.25	1.0

1.3 Ratings and Characteristics

Capacitance Range: See Tables 2A & 2B for minimum and maximum values

Tolerance on rated capacitance with letter codes from IEC 62

Class I

C_R < 10pF	C_R ≥ 10pF
± 0.25pF (C)	± 1% (F)
± 0.5pF (D)	± 2% (G)
± 1.0pF (F)	± 5% (J)
	± 10% (K)

Class II
± 5% (J)
± 10% (K)
± 20% (M)

Voltage Range: See Tables 2A & 2B

Climatic Category: 55/125/56

Rated Temperature: 125°C

Dissipation Factor (DF): Class I ≤ 0.1%
Class II ≤ 2.5%

Insulation Resistance (IR): 100GΩ or 1000s, whichever is less

Temperature Coefficient:

Sub-Class	Nominal TC and Tolerance $10^{-6}/^{o}C$	Limits of Capacitance Change (parts per thousand)			Cyclic Drift
		-55°C	85°C	125°C	
1B CG	0 ± 30	-2.25 +4.05	-1.95 +1.95	-3.15 +3.23	0.3% or 0.05pF whichever is greater

Multiplying factor for TC tolerance (see CECC 32 100 clause 2.2.5)

Capacitance pF	C ≥ 50	50 > C ≥ 40	40> C ≥ 25	25 > C ≥ 10	10> C ≥ 1
Multiplying Factor	1	1.25	2	5	50

Temperature Characteristic of Capacitance: No voltage-applied ± 15%

Termination Material:

Material	Code Letter
Silver Termination base with Ni Barrier (Tin/Lead plating finish with minimum 10% Lead)	A
Silver Termination base with Ni Barrier (100% matte Tin plating finish)	J
Flexicap™ Termination base with Ni Barrier (Tin/Lead plating finish with minimum 10% Lead)	H
Flexicap™ Termination base with Ni Barrier (100% matte Tin plating finish)	Y
Silver/Palladium termination	F

Table 2A Maximum Capacitance by Case Size – Class I

Case Size	Rated Voltage						
	16V	25V	50/63V	100V	200/250V	500V	1kV
0603	1.5nF	1.0nF	470pF	330pF	100pF	N/a	N/a
0805	6.8nF	4.7nF	2.7nF	1.8nF	680pF	330pF	N/a
1206	22nF	15nF	10nF	6.8nF	2.2nF	1.5nF	470pF
1210	33nF	22nF	18nF	12nF	4.7nF	3.3nF	1.0nF
1808	33nF	27nF	18nF	12nF	4.7nF	3.3nF	1.2nF
1812	100nF	68nF	33nF	27nF	12nF	10nF	3.3nF
2220	150nF	100nF	68nF	47nF	22nF	15nF	8.2nF
2225	220nF	150nF	100nF	68nF	27nF	22nF	10nF

Table 2B Maximum Capacitance by Case Size – Class II

Case Size	Rated Voltage						
	16V	25V	50/63V	100V	200/250V	500V	1kV
0603	100nF	56nF	47nF	10nF	5.6nF	N/a	N/a
0805	330nF	220nF	220nF	47nF	27nF	8.2nF	N/a
1206	1.0µF	820nF	470nF	150nF	100nF	33nF	4.7nF
1210	1.5µF	1.2µF	1.0µF	470nF	220nF	100nF	15nF
1808	1.5µF	1.2µF	680nF	330nF	180nF	100nF	18nF
1812	3.3µF	2.2µF	1.5µF	1.0µF	470nF	270nF	56nF
2220	5.6µF	4.7µF	2.2µF	1.5µF	1.0µF	560nF	120nF
2225	6.8µF	5.6µF	3.3µF	1.5µF	1.0µF	820nF	150nF

1.4 Related Documents

Generic specification: CECC 30 000 Issue 3

Sectional specification: CECC 32 100 Issue 1

1.5 Marking

The capacitors are not marked. The following information shall however be marked on the package containing the capacitors and on one side of any tape packaging reel:

(a) Rated capacitance and tolerance. If a code is used it shall be in accordance with IEC 60062.
(b) Rated voltage.
(c) Dielectric.
(d) Date code and lot identification.
(e) Manufacturer's name or trademark.
(f) Case size followed by termination material code.
(g) The number and issue of this specification.

1.6 Ordering Information

Orders for capacitors covered by this specification shall contain, in clear or coded form, the following information:

(a) Capacitance value and tolerance.
(b) Rated voltage.
(c) Dielectric code. C or F: C0G (class 1B) and D or X: X7R (class 2R1)
(d) Case size followed by termination code.
(e) The number and issue of this specification.
(f) The type of packaging (bulk or taped and reeled). Note: When tape packaging is required it should be in accordance with IEC60286-3.

1.7 Certified Test Records

Not required.

1.8 Additional Information

Capacitors approved to this specification are suitable for soldering or conductive adhesive (Termination Code F only) attachment and, with the exception of Tin/Lead plated components fully comply with the RoHS (Restriction of Hazardous Substances) Directive.