



Product Test and Reliability Guide



Introduction

Syfer Technology Ltd manufactures quality multilayer ceramic components supplied to a worldwide customer base.

Customers utilise Syfer's components in all types of applications including telecoms, industrial, automotive, military, aerospace, space and medical.

Different applications require corresponding reliability grade components. The purpose of this document is to provide a guide to the different reliability grades of multilayer ceramic components offered by Syfer.

Syfer's state-of-the-art manufacturing and test equipment in the Norwich, England facility is supported by an integrated management system approved by BSI to ISO 9001, ISO 14001 and OHSAS 18001.



Customers are encouraged to visit Syfer and review / audit our facilities and systems.

syfer.com



Syfer - High-Rel Products

Surface mount capacitors

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Radial capacitors

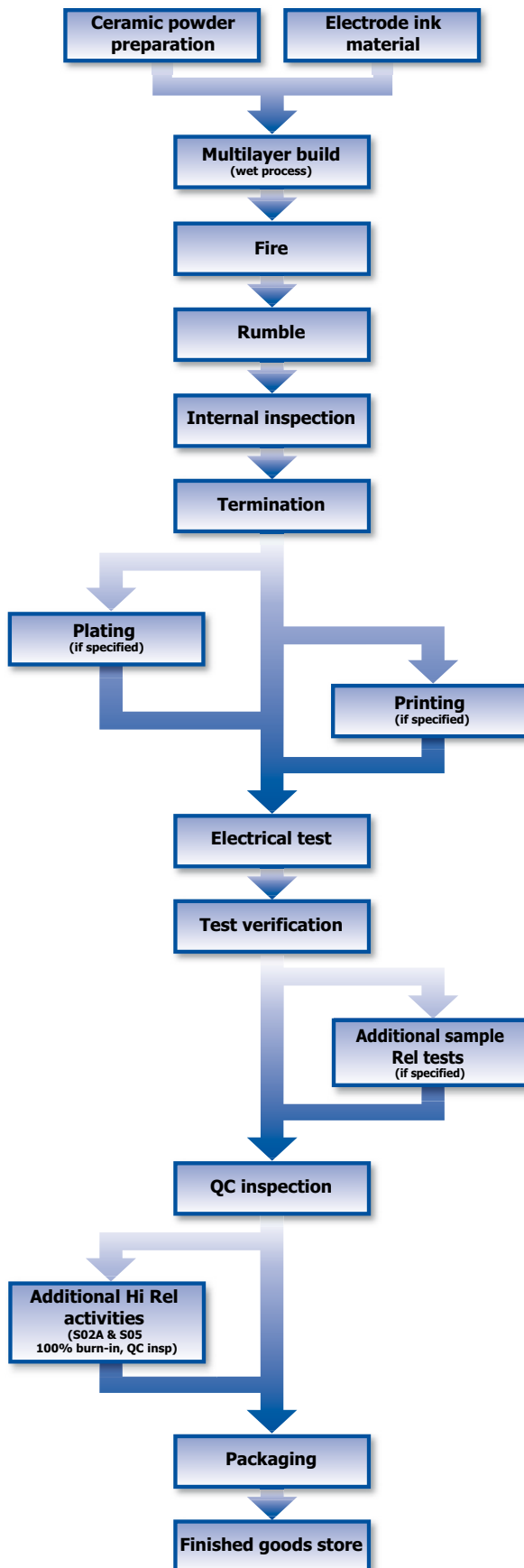
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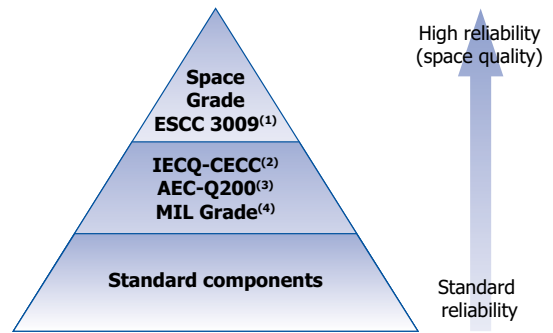
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1.1 - Production process flowchart



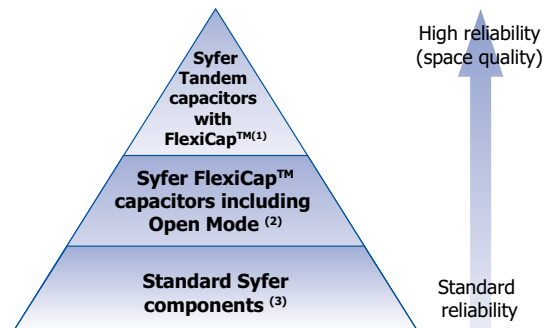
1.2 - Syfer reliability grades



Notes:

- (1) Space grade tested in accordance with ESCC 3009. Refer to Syfer specification S02A 0100.
- (2) IECQ-CECC. The International Electrotechnical Commission (IEC) Quality Assessment System for Electronic Components. This is an internationally recognised product quality certification which provides customers with assurance that the product supplied meets high quality standards.
View Syfer's IECQ-CECC approvals at <http://www.iecq.org/certificates> or at www.syfer.com
- (3) AEC-Q200. Automotive Electronics Council Stress Test Qualification For Passive Components. Refer to Syfer application note reference AN0009.
- (4) MIL Grade. Released in accordance with US standards available on request.

1.3 - Syfer reliability surface mount product groups



Notes:

- (1) "Tandem" construction capacitors, ie internally having the equivalent of 2 series capacitors. If one of these should fail short-circuit, there is still capacitance end to end and the chip will still function as a capacitor, although with increased capacitance, and reduced voltage withstand. See Application Note AN0021 on the Syfer web site.
- (2) Multilayer capacitors with Syfer FlexiCap™ termination. By using FlexiCap™ termination, there is a reduced possibility of the mechanical cracking occurring. Open Mode capacitors with FlexiCap™ termination further reduce the possibility of a short circuit by utilising inset electrode margins. See Application Note AN0022 on the Syfer web site.
- (3) "Standard" capacitors includes MLCCs with tin finish over nickel, but no FlexiCap™.

1.4 - Syfer FlexiCap™ termination

All ranges are available with FlexiCap™ termination material offering increased reliability and superior mechanical performance (board flex and temperature cycling) when compared with standard termination materials. Refer to Syfer application note reference AN0001. As can be seen from the table below (Summary of Bend Test Results), FlexiCap™ capacitors enable the board to be bent almost twice as much before mechanical cracking occurs.

An additional benefit of FlexiCap™ is that MLCCs can withstand temperature cycling -55°C to 125°C in excess of 1,000 times without cracking.

Polymer Termination FlexiCap™ - a lead free termination

MLCC's are widely used in electronic circuit design for a multitude of applications. Their small package size, technical performance and suitability for automated assembly makes them the component of choice for the specifier.

However, despite the technical benefits, ceramic components are brittle and need careful handling on the production floor. In some circumstances they may be prone to mechanical stress damage if not used in an appropriate manner. Board flexing, depanelisation, mounting through hole components, poor storage and automatic testing may all result in cracking.

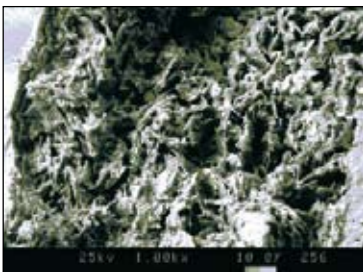
Careful process control is important at all stages of circuit board assembly and transportation - from component placement to test and packaging. Any significant board flexing may result in stress fractures in ceramic devices that may not always be evident during the board assembly process. Sometimes it may be the end customer who finds out - when equipment fails!

FlexiCap™ benefits

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.

FlexiCap™ may be soldered using your traditional wave or reflow solder techniques and needs no adjustment to equipment or current processes.

Syfer has delivered millions of FlexiCap™ components and during that time has collected substantial test and reliability data, working in partnership with customers world wide, to eliminate mechanical cracking.



● Picture taken at 1,000x magnification using a SEM to demonstrate the fibrous nature of the FlexiCap™ termination that absorbs increased levels of mechanical stress.

Available on the following ranges:

- Standard and high voltage chips
- Surge protection and safety capacitor chips
- 3 terminal EMI chips
- X2Y Integrated Passive Components
- X8R high temperature capacitors

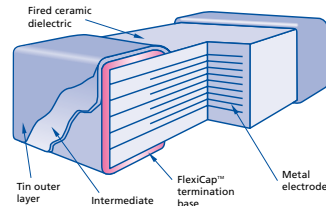


Fig 2. FlexiCap™ MLCC cross section

With traditional termination materials and assembly, the chain of materials from bare PCB to soldered termination, provides no flexibility. In circumstances where excessive stress is applied - the weakest link fails. This means the ceramic itself, which may fail short circuit.

Syfer has the solution - 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 production 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.

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.

Typical examples

| Product | Mean bend (mm) standard term. | Mean bend (mm) FlexiCap™ | Improvement with FlexiCap™ |
|-----------------|-------------------------------|--------------------------|----------------------------|
| 0603 X7R | 1.6 | 6.4 | + 400% |
| 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% |

Application Notes

FlexiCap™ may be handled, stored and transported in the same manner as standard terminated capacitors. The requirements for mounting and soldering FlexiCap™ are the same as for standard SMD capacitors.

For customers currently using standard terminated capacitors there should be no requirement to change the assembly process when converting to FlexiCap™.

Based upon board bend tests in accordance with IEC 60384-1 the amount of board bending required to mechanically crack a polymer terminated capacitor is significantly increased compared with standard terminated capacitors.

It must be stressed however, that capacitor users must not assume that the use of FlexiCap™ terminated capacitors will totally eliminate mechanical cracking. Good process controls are still required for this objective to be achieved.

1.5 - Tests conducted during batch manufacture

| | Syfer reliability SM product group | | | | |
|--|------------------------------------|-----------------------|----------|--------------------------|--------------------------|
| | Standard SM capacitors | IECQ-CECC / MIL grade | AEC-Q200 | S (space grade) High Rel | |
| | | | | S05 | S02A |
| Solderability | ● | ● | ● | ● | ● |
| Resistance to soldering heat | ● | ● | ● | ● | ● |
| Plating thickness verification (if plated) | ● | ● | ● | ● | ● |
| DPA (Destructive Physical Analysis) | ● | ● | ● | ● | ● |
| Voltage proof test (DWV / Flash) | ● | ● | ● | ● | ● |
| Insulation resistance | ● | ● | ● | ● | ● |
| Capacitance test | ● | ● | ● | ● | ● |
| Dissipation factor test | ● | ● | ● | ● | ● |
| 100% visual inspection | ○ | ○ | ● | ● | ● |
| 100% burn-in. (2xRV @125°C for 168 hours) | ○ | ○ | ○ | ● | ● |
| Load sample test @ 125°C | ○ | ○ | ○ | ○ | LAT1 & LAT2 (1000 hours) |
| Humidity sample test. 85°C/85%RH | ○ | ○ | ○ | ○ | 240 hours |
| Hot IR sample test | ○ | ○ | ○ | ○ | ○ |
| Axial pull sample test (MIL-STD-123) | ○ | ○ | ○ | ○ | ○ |
| Breakdown voltage sample test | ○ | ○ | ○ | ○ | ○ |
| Deflection (bend) sample test | ○ | ○ | ○ | ○ | ○ |
| SAM (Scanning Acoustic Microscopy) | ○ | ○ | ○ | ○ | ○ |
| 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) | - | - | - | - | ○ |

- Test conducted as standard.
- Optional test. Please discuss with Syfer Sales.

1.6 - Termination types available

| | Syfer reliability SM product group | | | | |
|---|------------------------------------|-----------------------|---------------------|--------------------------|------|
| | Standard SM capacitors | IECQ-CECC / MIL grade | AEC-Q200 | S (space grade) High Rel | |
| | | | | S05 | S02A |
| F: Silver Palladium | ● | ● | - | ● | ● |
| J: Silver base with nickel barrier (100% matte tin plating) | ● | ● | COG dielectric only | ○ | ○ |
| A: Silver base with nickel barrier (tin/lead plating with min 10% lead) | ● | ● | - | ● | ● |
| Y: FlexiCap™ with nickel barrier (100% matte tin plating) | ● | ● | ● | ○ | ○ |
| H: FlexiCap™ with nickel barrier (tin/lead plating with min 10% lead) | ● | ● | - | ○ | ○ |

- Termination available.
- Termination available but generally not requested for space grade components. Please discuss with Syfer Sales.

1.7 - Release documentation

| | Syfer reliability SM product group | | | | |
|---|------------------------------------|-----------|--------------------|--------------------------|-----------------------|
| | Standard SM capacitors | IECQ-CECC | AEC-Q200 MIL grade | S (space grade) High Rel | |
| | | | | S05 | S02A |
| Certificate of conformance | ● | - | ● | ● | ● |
| IECQ-CECC Release certificate of conformity | - | ● | - | - | - |
| Batch electrical test report | ○ | ○ | ○ | Included in data pack | Included in data pack |
| S (space grade) data documentation package | - | - | - | ● | ● |

- Release documentation supplied as standard.
- Original documentation.

1.8 - RoHS compliance

All Syfer surface mount capacitors (excluding Sn/Pb plated) are compliant with the Eu RoHS directive. Breakdown of materials content is available on request.

1.9 - Periodic tests conducted and reliability data availability

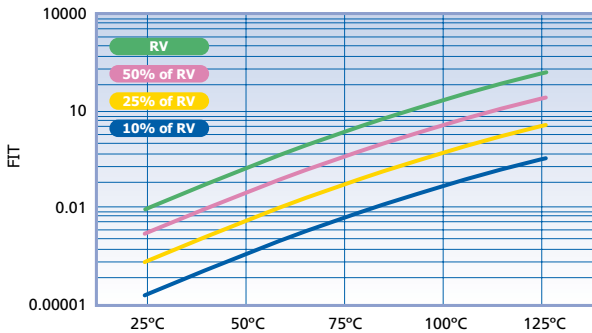
Standard Surface Mount Capacitors

Components are randomly selected on a sample basis and the following routine tests are conducted:

- Load Test. 1,000 hours @125°C. Applied voltage depends on components tested.
- Humidity Test. 168 hours @ 85 °C/85%RH.
- Board Deflection (bend test).

Test results are available on request.

Example of FIT (Failure In Time) data available:



Component type: 0805 (COG/NP0 and X7R).

Testing location: Syfer reliability test department.

Results based on: 14,942,000 component test hours.

Conversion factors:

| From | To | Operation |
|------|--------------|---------------------------------------|
| FITS | MTBF (hours) | $10^9 \div \text{FITS}$ |
| FITS | MTBF (years) | $10^9 \div (\text{FITS} \times 8760)$ |

FITS = Failures in 10⁹ hours.

MTBF = Mean time between failures.



1.9 - Periodic tests conducted for IECQ-CECC and AEC-Q200

| Test ref | Test | Termination type | D or ND | Additional requirements | Sample acceptance | | | Reference |
|----------|---|--------------------------------------|---------|--|-------------------|----|---|---------------------------------------|
| | | | | | P | n | c | |
| P1 | High temperature exposure (storage) | All Types | D | Un-powered. 1,000 hours @ T=150°C. Measurement at 24 ± 2 hours after test conclusion | 12 | 77 | 0 | MIL-STD-202 Method 108 |
| P2 | Temperature cycling | COG/NP0: All types X7R: Y & H only | D | 1,000 cycles -55°C to +125°C Measurement at 24 ± 2 hours after test conclusion | 12 | 77 | 0 | JESD22 Method JA-104 |
| P3 | Moisture resistance | All types | D | T = 24 hours/cycle. Note: Steps 7a and 7b not required. Un-powered. Measurement at 24 ± 2 hours after test conclusion | 12 | 77 | 0 | MIL-STD-202 Method 106 |
| P4 | Biased humidity | All types | D | 1,000 hours 85°C/85%RH. Rated voltage or 50V whichever is the greater and 1.5V. Measurement at 24 ± 2 hours after test conclusion | 12 | 77 | 0 | MIL-STD-202 Method 103 |
| P5 | Operational life | All Types | D | Condition D steady state TA=125°C at full rated. Measurement at 24 ± 2 hours after test conclusion | 12 | 77 | 0 | MIL-STD-202 Method 108 |
| P6 | Resistance to solvents | All Types | D | Note: Add aqueous wash chemical. Do not use banned solvents | 12 | 5 | 0 | MIL-STD-202 Method 215 |
| P7 | Mechanical shock | COG/NP0: All types X7R: Y & H only | D | Figure 1 of Method 213. Condition F | 12 | 30 | 0 | MIL-STD-202 Method 213 |
| P8 | Vibration | COG/NP0: All types X7R: Y and H only | D | 5g for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8" x 5" PCB 0.031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2,000Hz | 12 | 30 | 0 | MIL-STD-202 Method 204 |
| P9 | Resistance to soldering heat | All Types | D | Condition B, no pre-heat of samples: Single wave solder - Procedure 2 | 3 | 12 | 0 | MIL-STD-202 Method 210 |
| P10 | Thermal shock | COG/NP0: All types X7R: Y and H only | D | -55°C/+125°C. Number of cycles 300. Maximum transfer time - 20 seconds, Dwell time - 15 minutes. Air-Air | 12 | 30 | 0 | MIL-STD-202 Method 107 |
| P11 | Adhesion, rapid temp change and climatic sequence | X7R: A, F and J only | D | 5N force applied for 10s, -55°C/ +125°C for 5 cycles, damp heat cycles | 12 | 27 | 0 | BS EN132100 Clause 4.8, 4.12 and 4.13 |
| P12 | Board flex | COG/NP0: All types X7R: Y and H only | D | 3mm deflection Class I 2mm deflection Class II | 12 | 30 | 0 | AEC-Q200-005 |
| P13 | | X7R: A, F and J only | D | 1mm deflection. | 12 | 12 | 0 | BS EN132100 Clause 4.9 |
| P14 | Terminal strength | All types | D | Force of 1.8kg for 60 seconds | 12 | 30 | 0 | AEC-Q200-006 |
| P15 | Beam load test | All types | D | - | 12 | 30 | 0 | AEC-Q200-003 |

Test results are available on request.

1.10 - Product ranges - standard 16V to 6kV ranges

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

(* Indicates components that require conformal coating post soldering).



1.10 - IECQ-CECC and MIL grade ranges

Maximum capacitance values.

| | | 0603 | 0805 | 1206 | 1210 | 1812 |
|--------|---------|-------|-------|-------|-------|-------|
| 50/63V | COG/NP0 | 470pF | 2.7nF | 10nF | 18nF | 39nF |
| | X7R | 33nF | 150nF | 330nF | 680nF | 1.5µF |
| 100V | COG/NP0 | 330pF | 1.8nF | 6.8nF | 12nF | 27nF |
| | X7R | 10nF | 47nF | 150nF | 470nF | 1.0µF |
| 200V | COG/NP0 | 100pF | 680pF | 2.2nF | 4.7nF | 12nF |
| | X7R | 5.6nF | 27nF | 100nF | 220nF | 470nF |
| 500V | COG/NP0 | n/a | 330pF | 1.5nF | 3.9nF | 10nF |
| | X7R | n/a | 8.2nF | 33nF | 100nF | 270nF |
| 1kV | COG/NP0 | n/a | n/a | 470pF | 1.0nF | 3.3nF |
| | X7R | n/a | n/a | 4.7nF | 15nF | 56nF |
| | | 0603 | 0805 | 1206 | 1210 | 1812 |

1.10 - AEC-Q200 Rev C ranges

Maximum capacitance values.

| | | 0603 | 0805 | 1206 | 1210 | 1812 |
|----------|---------|-------|-------|-------|-------|-------|
| 50/63V | COG/NP0 | 330pF | 1.8nF | 5.6nF | 10nF | 22nF |
| | X7R | 22nF | 150nF | 220nF | 470nF | 1.0µF |
| 100V | COG/NP0 | 220pF | 1.0nF | 3.3nF | 6.8nF | 27nF |
| | X7R | 6.8nF | 33nF | 100nF | 220nF | 15nF |
| 200/250V | COG/NP0 | 68pF | 470pF | 2.2nF | 3.3nF | 6.8nF |
| | X7R | 3.9nF | 18nF | 1.5nF | 100nF | 270nF |
| 500V | COG/NP0 | n/a | 150pF | 560pF | 1.5nF | 3.3nF |
| | X7R | n/a | 5.6nF | 22nF | 68nF | 150nF |
| 1kV | COG/NP0 | n/a | n/a | 330pF | 680pF | 2.2nF |
| | X7R | n/a | n/a | 3.3nF | 10nF | 33nF |
| 2.0kV | COG/NP0 | n/a | n/a | 68pF | 150pF | 470pF |
| | X7R | n/a | n/a | 1.0nF | 2.2nF | 6.8nF |
| 3.0kV | COG/NP0 | n/a | n/a | n/a | n/a | 330pF |
| | X7R | n/a | n/a | n/a | n/a | 1.5nF |
| | | 0603 | 0805 | 1206 | 1210 | 1812 |

1.10 - S05 and S02A ranges

Maximum capacitance values.

| | | 0603 | 0805 | 1206 | 1210 | 1812 | 2220 | 2225 |
|----------|---------|-------|-------|-------|-------|-------|-------|-------|
| 16V | COG/NP0 | 1.2nF | 4.7nF | 12nF | 22nF | 47nF | 82nF | 100nF |
| | X7R | 100nF | 330nF | 1.0µF | 1.5µF | 3.3µF | 5.6µF | 6.8µF |
| 50/63V | COG/NP0 | 470pF | 2.7nF | 8.2nF | 12nF | 27nF | 56nF | 82nF |
| | X7R | 47nF | 180nF | 470nF | 680nF | 1.5µF | 2.2µF | 3.3µF |
| 100V | COG/NP0 | 330pF | 1.5nF | 4.7nF | 8.2nF | 18nF | 39nF | 56nF |
| | X7R | 10nF | 47nF | 150nF | 330nF | 680nF | 1.0µF | 1.5µF |
| 200/250V | COG/NP0 | 100pF | 680pF | 2.2nF | 3.9nF | 8.2nF | 18nF | 22nF |
| | X7R | 5.6nF | 27nF | 100nF | 180nF | 390nF | 680nF | 820nF |
| | | 0603 | 0805 | 1206 | 1210 | 1812 | 2220 | 2225 |

1.11 - Technical summary

| | COG/NP0 | X7R |
|--|--|---------------------|
| Dielectric characteristics | Ultra stable | Stable |
| IECQ-CECC | 1B/CG | 2C1, 2R1, 2X1 |
| EIA | COG/NP0 | X7R |
| MIL | CG(BP) | BZ, BX |
| Rated temperature range | -55°C to +125°C | -55°C to +125°C |
| Maximum capacitance change over temperature range | 0 ± 30 ppm/°C | ± 20%, ± 15%, ± 15% |
| No DC voltage applied | | |
| Rated DC voltage applied | | +20-30%, -, +15-25% |
| Syfer dielectric ordering code | C | R, X, B |
| Tangent of loss angle (tan δ) | Cr > 50pF ≤ 0.0015 Cr ≤ 50pF = 0.0015 (15/Cr + 0.7) | |

The table above highlights the difference in coding for IECQ-CECC, EIA and MIL standards when defining the temperature coefficient and the voltage coefficient.



1.12 - Ordering information

Standard product code construction

| 1210 | Y | 100 | 0103 | J | X | T | --- |
|-----------|---|---|---|---|---|---|--|
| Chip size | Termination | Voltage | Capacitance in picofarads (pF) | Capacitance tolerance | Dielectric Rel Release codes | Packaging | Suffix code |
| | <p>Y = FlexiCap™ termination base with Ni barrier (100% matte tin plating). RoHS compliant.</p> <p>H = FlexiCap™ termination base with Ni barrier (Tin/lead plating with min. 10% lead).</p> <p>F = Silver Palladium. RoHS compliant.</p> <p>J = Silver base with nickel barrier (100% matte tin plating). RoHS compliant.</p> <p>A = Silver base with nickel barrier (Tin/lead plating with min. 10% lead).</p> | <p>016 = 16 Volts 025 = 25 Volts 050 = 50 Volts 063 = 63 Volts 100 = 100 Volts 200 = 200 Volts 250 = 250 Volts 500 = 500 Volts 630 = 630 Volts</p> <p>1K0 = 1kV 1K2 = 1.2kV 1K5 = 1K5 2K0 = 2kV 2K5 = 2.5kV 3K0 = 3kV 4K0 = 4kV 5K0 = 5kV 6K0 = 6kV</p> | <p>First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following</p> <p>Example: 0103 = 10nF</p> | <p><10pF B = +/-0.1pF C = +/-0.25pF D = +/-0.5pF</p> <p>>= 10pF F = +/-1% G = +/-2% J = +/-5% K = +/-10% M = +/-20%</p> | <p>C = COG/NP0 (1B) X = X7R (2R1)</p> | <p>T = 178mm (7") reel R = 330mm (13") reel B = Bulk pack - tubs</p> | <p>Used for specific customer requirements</p> |

IECQ-CECC product code construction

| 1210 | Y | 100 | 0103 | J | D | T | --- |
|-----------|---|---|---|---|---|---|--|
| Chip size | Termination | Voltage | Capacitance in picofarads (pF) | Capacitance tolerance | Dielectric Release codes ⁽¹⁾ | Packaging | Suffix code |
| | <p>Y = FlexiCap™ termination base with Ni barrier (100% matte tin plating). RoHS compliant.</p> <p>H = FlexiCap™ termination base with Ni barrier (Tin/lead plating with min. 10% lead).</p> <p>F = Silver Palladium. RoHS compliant.</p> <p>J = Silver base with nickel barrier (100% matte tin plating). RoHS compliant.</p> <p>A = Silver base with nickel barrier (Tin/lead plating with min. 10% lead).</p> | <p>016 = 16 Volts 025 = 25 Volts 050 = 50 Volts 063 = 63 Volts 100 = 100 Volts 200 = 200 Volts 250 = 250 Volts 500 = 500 Volts 630 = 630 Volts</p> <p>1K0 = 1kV</p> | <p>First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following</p> <p>Example: 0103 = 10nF</p> | <p><10pF B = +/-0.1pF C = +/-0.25pF D = +/-0.5pF</p> <p>>= 10pF F = +/-1% G = +/-2% J = +/-5% K = +/-10% M = +/-20%</p> | <p>D = X7R (2R1) with IECQ-CECC release F = COG/NP0 (1B/NP0) with IECQ-CECC release B = 2X1/BX released in accordance with R = 2C1/BZ released in accordance with</p> | <p>T = 178mm (7") reel R = 330mm (13") reel B = Bulk pack - tubs</p> | <p>Used for specific customer requirements</p> |

1.12 - Ordering information

AEC-Q200 product code construction

| 1210 | Y | 100 | 0103 | J | E | T | --- |
|-----------|---|--|---|---|---|---|---|
| Chip size | Termination | Voltage | Capacitance in picofarads (pF) | Capacitance tolerance | Dielectric Rel Release codes | Packaging | Suffix code |
| | <p>Y = FlexiCap™ termination base with Ni barrier (100% matte tin plating). RoHS compliant.</p> <p>J = Silver base with nickel barrier (100% matte tin plating). RoHS compliant. (J termination not available with X7R products).</p> | <p>050 = 50 Volts 063 = 63 Volts 100 = 100 Volts 200 = 200 Volts 250 = 250 Volts 500 = 500 Volts 630 = 630 Volts 1K0 = 1kV</p> | <p>First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following</p> <p>Example: 0103 = 10nF</p> | <p><10pF B = +/-0.1pF C = +/-0.25pF D = +/-0.5pF</p> <p>>= 10pF F = +/-1% G = +/-2% J = +/-5% K = +/-10% M = +/-20%</p> | <p>A = COG/NPO (1B) E = X7R (2R1)</p> | <p>T = 178mm (7") reel R = 330mm (13") reel B = Bulk pack - tubs</p> | Used for specific customer requirements |

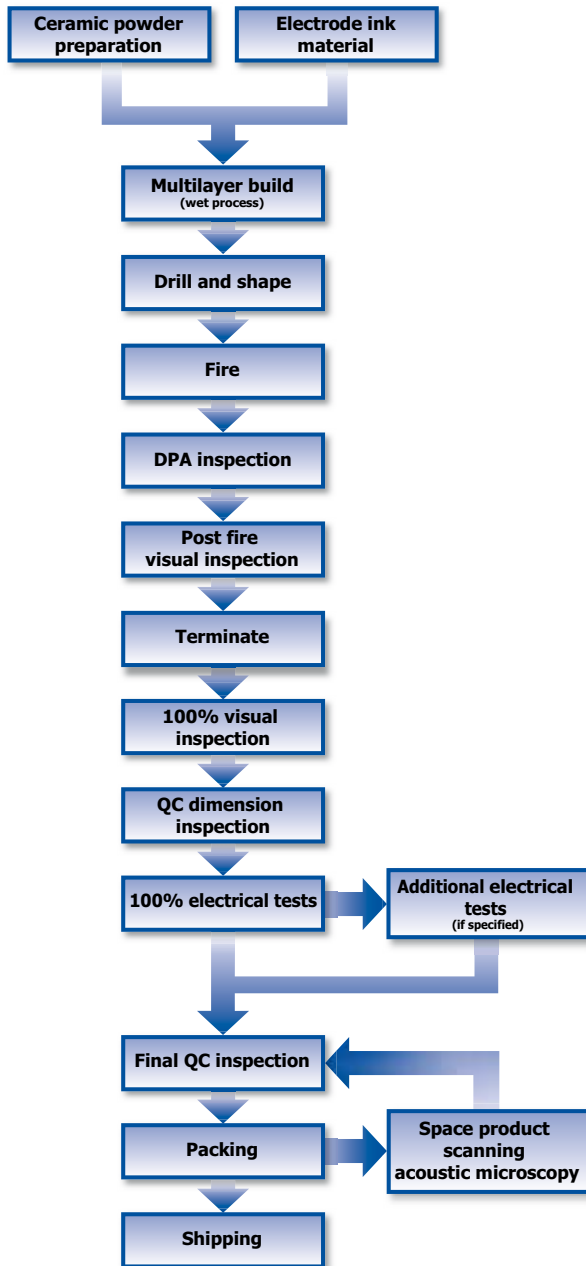
S05 and S02A product code construction

| 1210 | A | 100 | 0103 | J | X | T | --- |
|-----------|--|--|---|---|---|--|---|
| Chip size | Termination | Voltage | Capacitance in picofarads (pF) | Capacitance tolerance | Dielectric Rel Release codes | Packaging | Suffix code |
| | <p>A = Silver base with nickel barrier (Tin/lead plating with min. 10% lead).</p> <p>F = Silver Palladium. RoHS compliant.</p> | <p>016 = 16 Volts 025 = 25 Volts 050 = 50 Volts 063 = 63 Volts 100 = 100 Volts 200 = 200 Volts 250 = 250 Volts 500 = 500 Volts 630 = 630 Volts 1K0 = 1kV 1K2 = 1.2kV 1K5 = 1.5kV 2K0 = 2kV 2K5 = 2.5kV 3K0 = 3kV 4K0 = 4kV 5K0 = 5kV 6K0 = 6kV</p> | <p>First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following</p> <p>Example: 0103 = 10nF</p> | <p><10pF B = +/-0.1pF C = +/-0.25pF D = +/-0.5pF</p> <p>>= 10pF F = +/-1% G = +/-2% J = +/-5% K = +/-10% M = +/-20%</p> | <p>C = COG/NPO (1B) X = X7R (2R1)</p> | <p>T = 178mm (7") reel R = 330mm (13") reel B = Bulk pack - tubs Q = Waffle pack</p> | Used for specific customer requirements S05 = S (space grade) High Rel S02A = ⁽²⁾ S (space grade) High Rel |

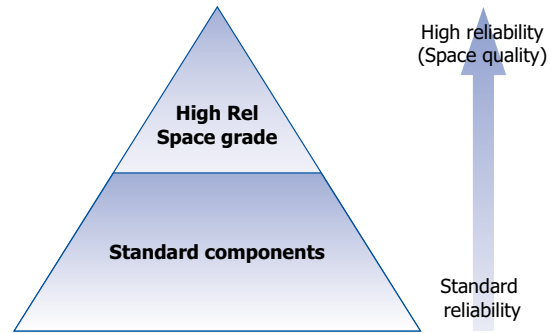
Notes:

- (1) A & F approved 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.

2.1 - Production process flowchart



2.2 - Syfer planar array and discoidal reliability product groups



2.3 - Tests conducted during batch manufacture

| | Standard Products | High Rel Space Grade |
|--|-------------------|----------------------|
| Solderability | ● | ● |
| Resistance to soldering heat | ● | ● |
| Plating thickness verification (if plated) | ● | ● |
| Plating adhesion (If plated) | ● | ● |
| DPA (Destructive Physical Analysis) | ● | ● |
| Voltage proof test (DWV / Flash) | ● | ● |
| Insulation resistance | ● | ● |
| Capacitance test | ● | ● |
| Dissipation factor test | ● | ● |
| 100% visual inspection | ● | ● |
| Crosstalk sample test (if applicable) | ● | ● |
| Groundplane resistance sample test (if applicable) | ● | ● |
| Additional production screening (QP14 Section 6) | ● | ● |
| SAM (Scanning Acoustic Microscopy) | N/A | ○ |
| Breakdown voltage sample test | N/A | ○ |
| Load sample test @ 125°C | ○ | ○ |
| Electrical impulse sample test | ○ | ○ |
| Humidity sample test 85°C/85%RH | ○ | ○ |

- Test conducted as standard.
- Optional test. Please discuss with Syfer Sales.

2.4 - Additional options available

| | Standard Products | High Rel Space Grade |
|---|-------------------|----------------------|
| Palladium silver termination | ○ | ○ |
| Platinum silver termination | ○ | ○ |
| Platinum silver | ○ | ○ |
| Gold flash over nickel termination | ○ | ○ |
| Lacquer (standard for components >750Vdc) | ○ | ○ |
| Matched pairs | ○ | ○ |
| Spring clips fitted | ○ | ○ |

2.5 - Release documentation

| | Standard Products | High Rel Space Grade |
|----------------------------|-------------------|----------------------|
| Certificate of Conformance | ● | ● |
| Batch Test Report | ● | ● |
| FAIRs (AS9102) | ○ | ○ |

- Release documentation supplied as standard.
- Optional documentation.

2.6 - RoHS compliance

All planar arrays and discoidal products are compliant with the Eu RoHS directive. Breakdown of materials content is available on request.

2.7 - Periodic tests conducted and reliability data availability

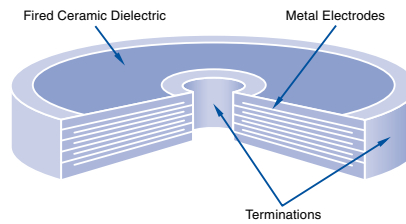
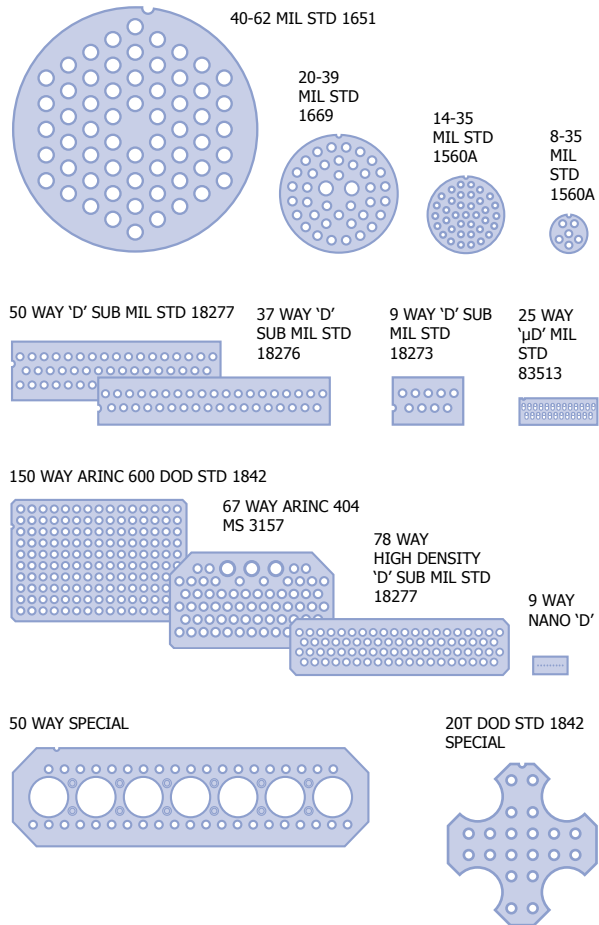
Components are randomly selected on a sample basis and the following routine tests are conducted:

- Load test. 1,000 hours @ 125°C. Applied voltage depends on components tested.

Test results are available on request.

2.8 - Planar array

Examples of outlines.

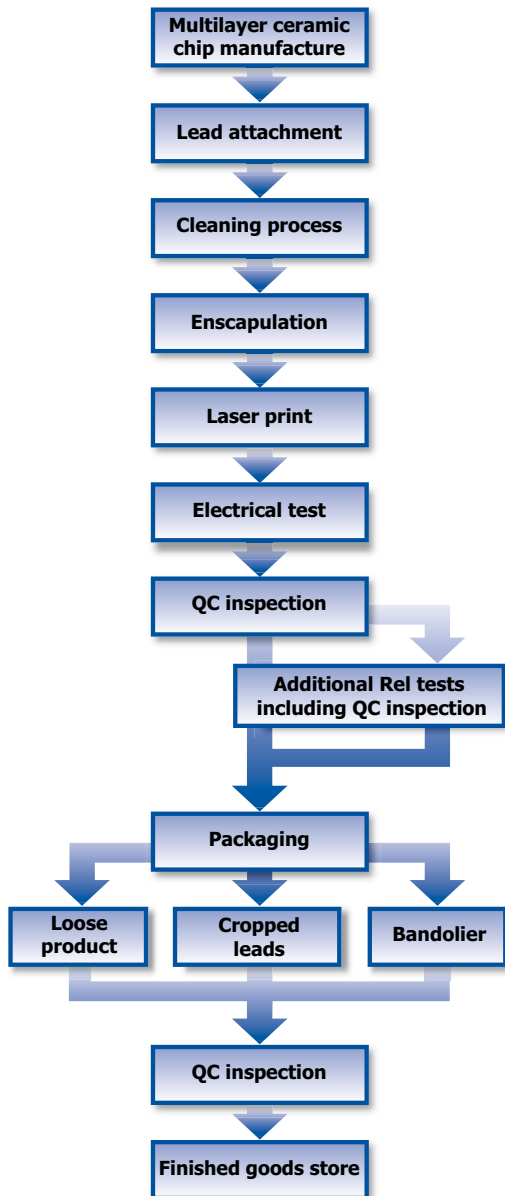


Typical discoidal capacitor construction

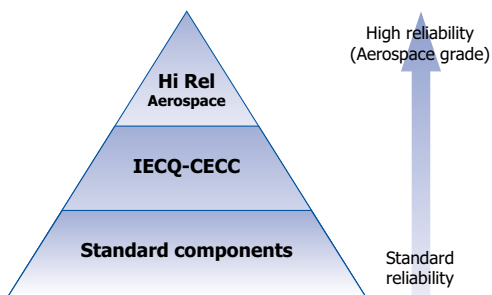
2.9 - Ordering information

For ordering information, and to discuss specific applications, please contact the Syfer sales department.

3.1 - Production process flowchart



3.2 - Syfer reliability radial product groups



IECQ-CECC - The International Electrotechnical Commission (IEC) Quality Assessment System for Electronic Components. This is an internationally recognised product quality certification which provides customers with assurance that the product supplied meets high quality standards.

View Syfer's IECQ-CECC approvals at <http://www.iecq.org/certificates>

3.3 - Tests conducted during batch manufacture

The following tests are in addition to the tests conducted as part of the multilayer ceramic chip manufacturing process:

| | Standard Products | IECQ-CECC | High Rel Aerospace Grade |
|--|-------------------|-----------|--------------------------|
| Solderability | ● | ● | ● |
| Voltage proof test (DWV / Flash) | ● | ● | ● |
| Insulation resistance | ● | ● | ● |
| Capacitance test | ● | ● | ● |
| Dissipation factor test | ● | ● | ● |
| 100% Burn-In 125°C, RV for 96 hours unless otherwise specified | ○ | ○ | ● |
| 100% visual inspection | ○ | ○ | ○ |
| Breakdown voltage sample test | ○ | ○ | ○ |
| Load sample test @ 125°C | ○ | ○ | ○ |
| Humidity sample test. 85°C/85%RH | ○ | ○ | ○ |

- Test conducted as standard.
- Optional test. Please discuss with Syfer Sales.

3.4 - Additional options available

The following tests are in addition to the tests conducted as part of the multilayer ceramic chip manufacturing process:

| | Standard Products | IECQ-CECC | High Rel Aerospace Grade |
|--|-------------------|-----------|--------------------------|
| Different lead length and lead forms available | ○ | ○ | ○ |
| Tin/Lead (Sn/Pb) coated (not RoHS compliant) | ○ | ○ | ○ |
| Different packaging methods (loose or bandolier) | ○ | ○ | ○ |

3.5 - Release documentation

| | Standard Products | IECQ-CECC | Hi Rel Aerospace Grade |
|---|-------------------|-----------|------------------------|
| Certificate of Conformance | ● | ○ | ● |
| IECQ-CECC Release Certificate of Conformity | ○ | ● | ○ |
| Batch Electrical Test Report | ○ | ○ | ○ |

- Release documentation supplied as standard.
- Original documentation.

3.6 - RoHS compliance

All Syfer radial capacitors (excluding Sn/Pb coated leads) are compliant with the Eu RoHS directive. Breakdown of materials content is available on request. All Syfer radial capacitors can be supplied with SnPb coated leads for RoHS exempt applications. Special suffix codes are applied for clear identification.

3.7 - Periodic tests conducted and reliability data availability

Components are randomly selected on a sample basis and the following routine tests are conducted:

- Load test. 1,000 hours @ 125°C. Applied voltage depends on components tested.
- Humidity test. 168 hours @ 85°C/85%RH.

Test results are available on request.

Periodic tests conducted for IECQ-CECC

Following tests detailed in the following CECC specifications:

- CECC 30 601 009. Dipped radial COG/NPO capacitors.
- CECC 30 701 013. Dipped radial X7R capacitors.

| CECC Specification Sub-Group | Test | Sample acceptance | | |
|------------------------------|---|-------------------|----|---|
| | | P | n | c |
| C1a | ROT (Robustness of Terminations) RTSH (Resistance to Soldering Heat) | 12 | 9 | 1 |
| C1b | RTC (Rapid Change of Temperature) Vibration Bump | 12 | 18 | 1 |
| C1 | Climatic sequence (conducted on sample from C1a and C1b tests) | 12 | 27 | 2 |
| C2 | Damp heat steady state (21 days) | 12 | 15 | 1 |
| C3 | Endurance test (1,000 hours) | 3 | 15 | 1 |
| C4 | Temperature characteristic of capacitance | 12 | 9 | 1 |

3.8 - Standard product ranges

Maximum capacitance values shown:

| | | 8111M | 8111N | 8121M | 8121N | 8121T | 8131M | 8131T | 8141M | 8151M | 8161M | 8171M |
|----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 50/63V | COG/NPO | 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/NPO | 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/NPO | 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/NPO | 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/NPO | 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/NPO | - | - | 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/NPO | - | - | - | - | - | 2.2nF | 820pF | 3.3nF | 5.6nF | 10nF | 18nF |
| | X7R | - | - | - | - | - | 33nF | 10nF | 47nF | 47nF | 82nF | 150nF |
| 3kV | COG/NPO | - | - | - | - | - | 1.5nF | 470pF | 1.0nF | 2.2nF | 4.7nF | 8.2nF |
| | X7R | - | - | - | - | - | 6.8nF | 2.7nF | 10nF | 18nF | 39nF | 68nF |
| 4kV | COG/NPO | - | - | - | - | - | 1.2nF | - | 680pF | 1.0nF | 2.2nF | 4.7nF |
| | X7R | - | - | - | - | - | 5.6nF | - | 5.6nF | 6.8nF | 15nF | 33nF |
| 5kV | COG/NPO | - | - | - | - | - | - | - | 470pF | 560pF | 1.5nF | 3.3nF |
| | X7R | - | - | - | - | - | - | - | 3.3nF | 3.9nF | 8.2nF | 18nF |



3.8 - IECQ-CECC approved product ranges

Dielectric CECC Specification

COG/NP0 CECC 30 601 008
X7R CECC 30 701 013

Maximum capacitance values shown:

| | | 8111M | 8111N | 8121M | 8121N | 8131M |
|----------|---------|-------|-------|-------|-------|-------|
| 50/63V | COG/NP0 | 4.7nF | 4.7nF | 18nF | 18nF | 27nF |
| | X7R | 220nF | 220nF | 1.0µF | 1.0µF | 1.0µF |
| 100V | COG/NP0 | 2.7nF | 2.7nF | 12nF | 12nF | 27µF |
| | X7R | 10nF | 10nF | 47nF | 47nF | 1.0µF |
| 200/250V | COG/NP0 | 1.0nF | 1.0nF | 4.7µF | 4.7µF | 27µF |
| | X7R | 56nF | 56nF | 220nF | 220nF | 1.0µF |

Minimum capacitance values for all IECQ-CECC approved ranges:

COG/NP0 3.9pF
X7R 100pF

3.9 - Ordering information

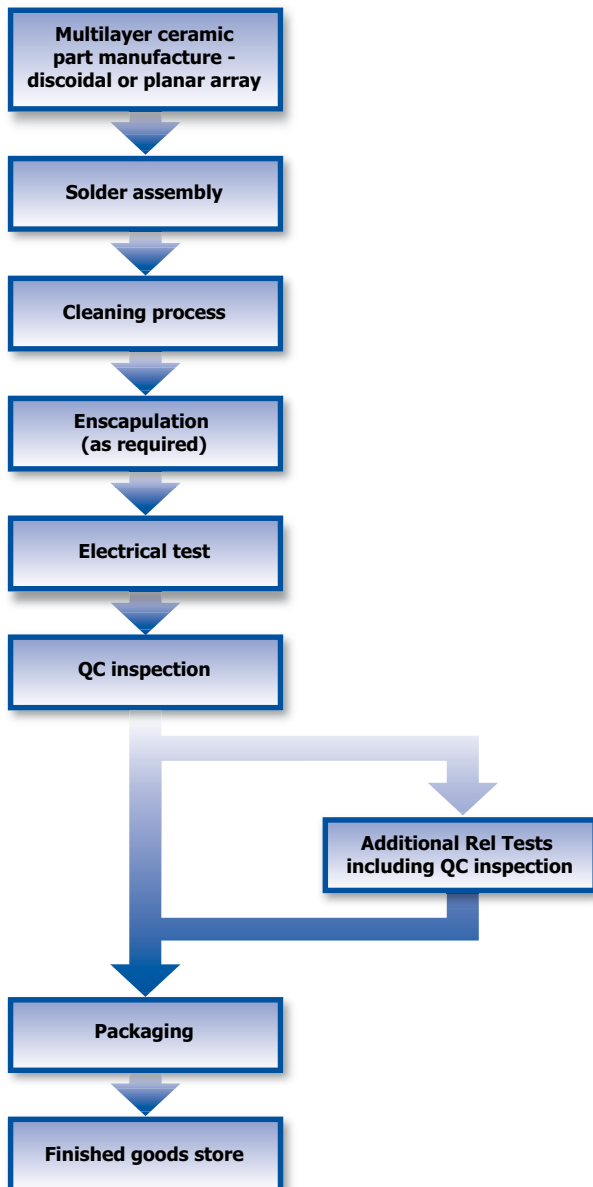
Radial leaded capacitors

| 8111M | 100 | 0102 | J | C | --- | --- |
|----------------------|--|---|---|--|---|--|
| Type No/ size ref | Voltage dc | Capacitance (pF) | Capacitance tolerance code | Dielectric code/ Classes | Suffix code | RoHS compliant/ RoHS exempt |
| | 050 = 50 Volts 063 = 63 Volts 100 = 100 Volts 200 = 200 Volts 500 = 500 Volts 1K0 = 1KV 2K0 = 2KV 3K0 = 3KV 4K0 = 4KV 5K0 = 5KV | First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following Example: 0102 = 1000pF. For values below 10pF insert a P for the decimal point. Example: 8P20 = 8.2pF. | Ultra Stable class D = Cr < 47pF ± 0.47pF F = Cr ≥ 47pF ± 1% G = Cr ≥ 27pF ± 2% J = Cr ≥ 10pF ± 5% K = Cr ≥ 10pF ± 10% Stable class J ± 5% K ± 10% M ± 20% | C = Ultra Stable CECC = 18/CG EIA = COG/NP0 MIL = CG/(BP) X = Stable CECC = 2R1 EIA = X7R (Special order) B = Stable CECC = 2X1 MIL = BX R = Stable CECC = 2C1 MIL = BZ | The remaining alpha/numeric digits are used to denote variation from the standard products of customer special requirements (electrical, packing, mechanical, environmental, coding etc.) | C42 : RoHS compliant A31 : RoHS exempt tin-lead finish, 8151 and larger A97 : RoHS exempt tin-lead finish, up to and incl. 8141 |

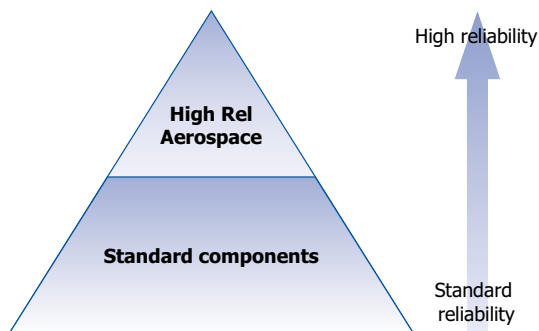
Note:

If IECQ-CECC release required then please ensure clearly stated on purchase orders.

4.1 - Production process flowchart



4.2 - Syfer filter reliability product groups



4.3 - Tests conducted during batch manufacture

| | Standard products | High Rel aerospace grade |
|--|-------------------|--------------------------|
| Solderability | ● | ● |
| Voltage proof test (DWW / Flash) | ● | ● |
| Insulation resistance | ● | ● |
| Capacitance test | ● | ● |
| Dissipation factor test | ● | ● |
| 100% visual inspection | ● | ● |
| Sample inductance presence | ● | ● |
| Sample insertion loss (depends on product) | ● | ● |
| 100% Burn-in 125°C, RV for 96 hours unless otherwise specified | - | ○ |
| Breakdown voltage sample test | - | ○ |
| Load sample test @ 125°C | - | ○ |
| Humidity sample test. 85°C/85%RH | - | ○ |

- Test conducted as standard.
- Optional test, depending on product. Please discuss with Syfer Sales.

4.4 - Additional options available

| | Custom specific |
|--|-----------------|
| Special testing in accordance with the general requirements of MIL-PRF-28861 & MIL-PRF-15733 | ○ |
| Cropped axial Leads | ○ |
| Special plating finishes | ○ |
| Special electrical testing (e.g. 500Vac) | ○ |
| Lacquer / conformal coat | ○ |
| Matched pairs (balanced line products) | ○ |
| Unique custom designs | ○ |

4.5 - Release documentation

| | Standard products | Custom specific |
|------------------------------|-------------------|-----------------|
| Certificate of Conformance | ● | ● |
| Batch Electrical Test Report | ○ | ○ |
| FAIRS (AS9102) | ○ | ○ |

- Test conducted as standard.
- Optional test. Please discuss with Syfer Sales.

4.6 - RoHS compliance

All standard Syfer filters are compliant with the Eu RoHS directive. Breakdown of materials content is available on request.

4.7 - Periodic tests conducted and reliability data availability

Components are randomly selected on a sample basis and the following routine tests are conducted:

- Sample Insertion Loss.
- Load Test. 168/1,000 hours @125°C. Applied voltage/test duration depends on component type.

Test results are available on request.

4.8 - Product ranges and ordering information

Refer to Syfer website or specific filter catalogue for further details.





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



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