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Tandem Capacitors

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 FlexiCap™ Termination, Syfer Tandem Capacitors provide an ultra robust and reliable component, for use in the most demanding applications.

Introduction

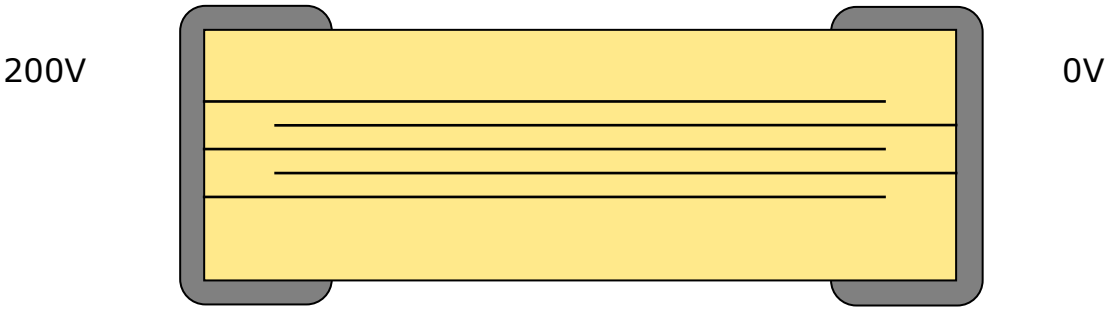
Tandem Capacitors have been designed as a fail safe range using a series section internal design, for use in any application where short circuits would be unacceptable. A single Tandem capacitor can also be used in applications where two capacitors placed in series are specified, reducing board space and assembly time. The series section design offers the additional benefit of improved ESD performance.

When combined with Syfer FlexiCap™ Termination, Syfer Tandem Capacitors provide an ultra robust and reliable component, for use in the most demanding applications.

Background

Standard capacitors normally use a single section internal design as shown below.

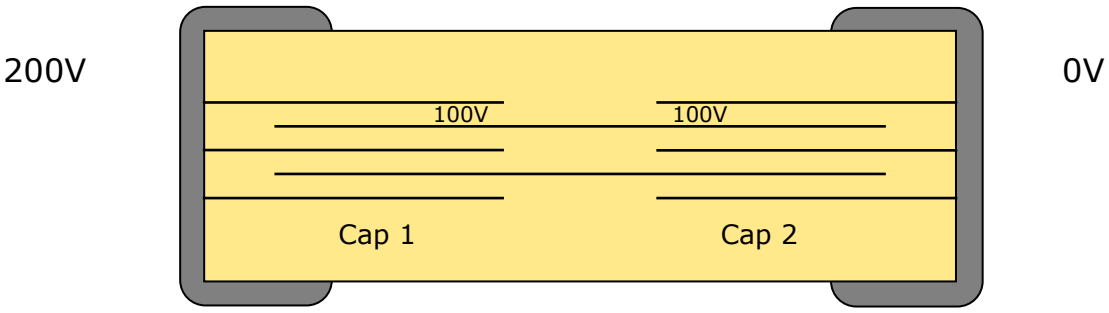
Example 1 - 200V rated capacitor, Standard Design



In the case of short circuit failure of this type of component, the capacitor would no longer function, and the circuit would be at risk.

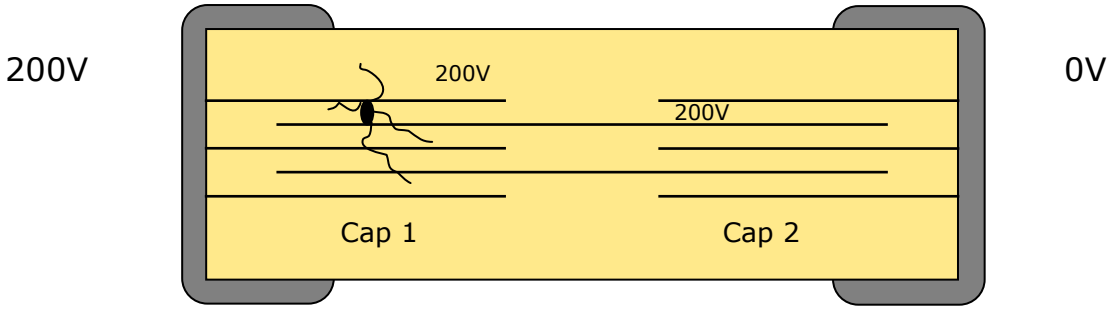
Syfer Tandem capacitors use a series section internal design, where each section is capable of withstanding the full rated voltage (DWV) of the component as shown below.

Example 2 – 200V rated Tandem capacitor design



NB - Each section of the tandem capacitor has only 50% of the rated voltage (DWV) applied during normal use, so the component is under a low stress condition.

In the event of a tandem capacitor failing due to short circuit, the second capacitor is capable of withstanding the resulting doubling in Voltage as shown in the example below.



The left hand capacitor failed due to short circuit, but the right hand capacitor would continue to function as a normal capacitor, although the component capacitance would change depending on failure mechanism**.**

Tandem Capacitors and FlexiCap™ - Product Qualification

Syfer have built an excellent reputation throughout the industry using FlexiCap™ termination. FlexiCap™ is proven to prevent failures due to mechanical cracking during the board assembly process. By combining Tandem Capacitors and FlexiCap™, an ultra-safe range of capacitors has been introduced, which offers all the benefits of FlexiCap™, plus the advantage of two capacitors in series.

Although it is extremely unlikely that a Syfer Capacitor with FlexiCap™ would suffer from mechanical cracking, under extreme handling conditions, a crack may be formed.

In order to simulate customer use of a cracked component, Tandem Capacitors were manufactured with Syfer FlexiCap™ termination. Samples were submitted for bend testing in accordance with AECQ-200 Rev C, in order to crack the components prior to Endurance and 8585 testing of the cracked parts.

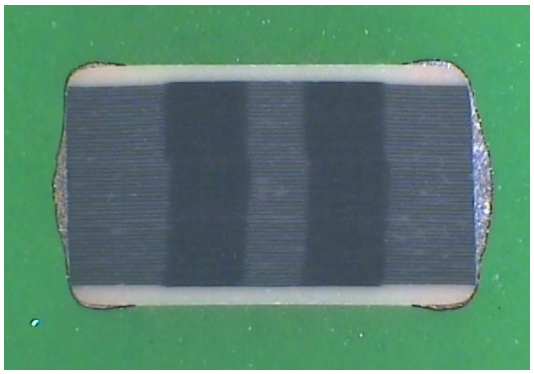
It should be noted that in most cases, the FlexiCap™ parts were found to be unbreakable using a single bend test (up to 10mm of bend), and it was necessary to undertake multiple bend tests, or to terminate parts using an alternative material in order to break the components.

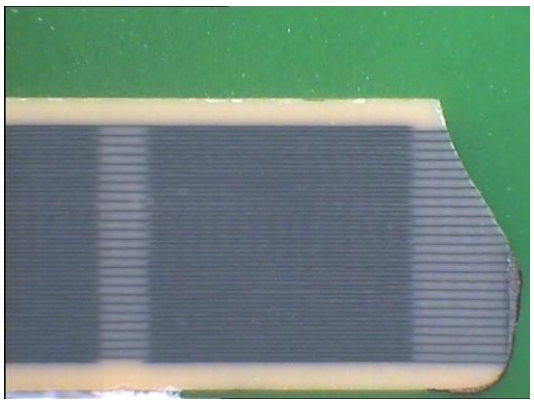
Following 1000 hour endurance and 8585 testing, the cracked components were electrically tested, and then removed from the test boards and microsectioned. Some of the components had lower capacitance post test, capacitance loss was between zero and 50%, depending on the position of the cracks (although higher capacitance would be possible for failed Tandem capacitors with failures on one side of the component).

There were no failures due to short circuit ***– i.e. during product qualification it has been demonstrated that cracked Syfer Tandem Capacitors can be used without risk of failure due to short circuit.***

Examples of Syfer Tandem Capacitors pre and post test

Tandem Capacitor
Untested





Tandem Capacitor post bend and life test. Capacitance loss approximately 50%.

NB - Capacitor still Functioning

Product Range

Tandem capacitor range is offered in low to mid range capacitance values in X7R dielectric with FlexiCap™ termination:

Max capacitance in nF (X7R only)

Chip Size	16V	25V	50/63V	100V	200/250V
0603	12	10	6.8	2.2	1.0
0805	47	39	33	10	4.7
1206	150	120	100	47	22
1210	270	220	180	82	47
1812	560	470	390	220	100
2220	1200	1000	680	470	220
2225	1500	1200	1000	680	330

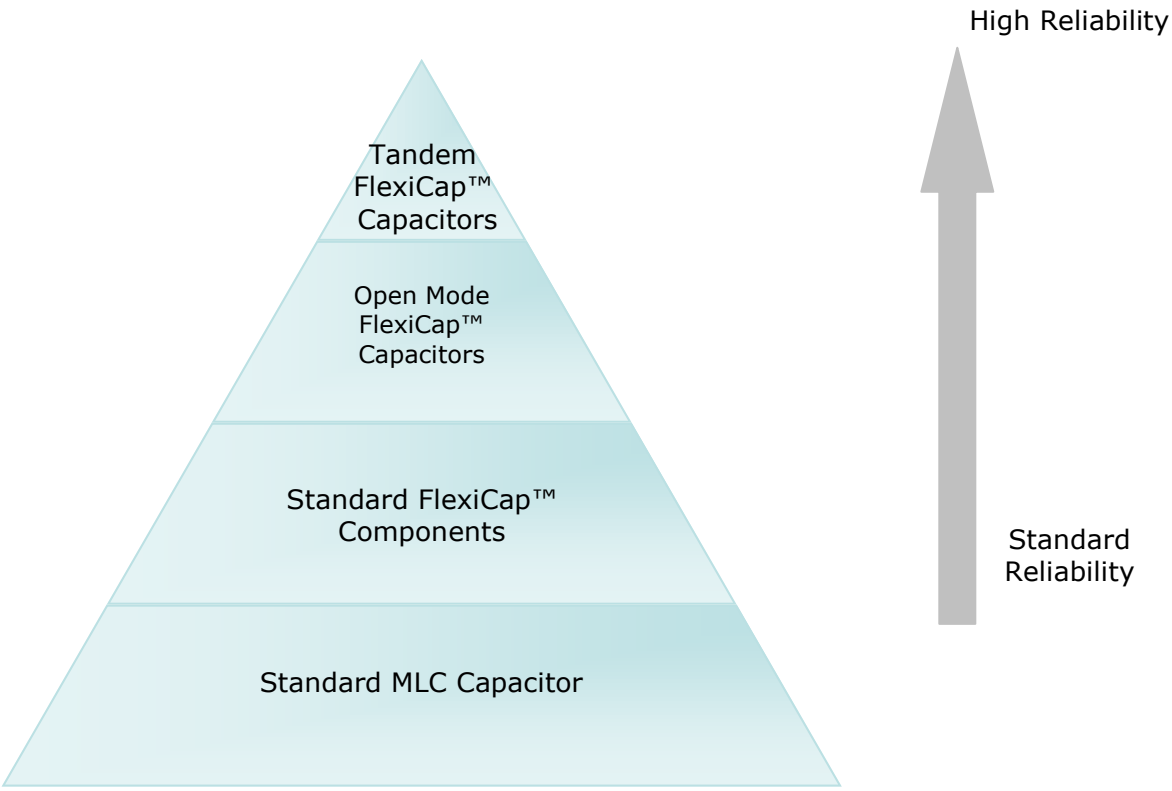
Benefits

- Series section internal design provides two capacitors, both capable of independently working at rated voltage (DWV).
- Fully functioning component works at 50% of the applied voltage, resulting in a lower stress condition.

- Syfer FlexiCap™ provides protection from mechanical cracking.
- Improved ESD performance.
- Where two series capacitors are specified, board space and assembly time can be reduced.
- In the event of short circuit failure, one of the two capacitors will continue to function (although capacitance may be affected).
- Available in a wide range of chip sizes and voltage ratings.

Mechanical Crack Prevention – Syfer Product Group

- The Tandem Capacitor range is offered to compliment the Syfer standard FlexiCap™ range and the new Open mode capacitor range, to offer the best possible protection against mechanical cracking:



Ordering Information

The Tandem Capacitors can be ordered by using a standard Syfer product code with the suffix code T01.

Examples: 1206Y0500104KXT**T01**

1206Y0500104KET**T01**

1206	Case Size
Y	Polymer Termination FlexiCap™
050	50V DC Rated
0104	100nF Capacitance Value
K	10% Capacitance Tolerance
X or E	X - X7R Dielectric (standard)
	E - X7R Dielectric (AEC-Q200 product)
T	Taped and Reeled
T01	**Syfer Tandem Capacitor**

All other specifications and properties are as Syfer standard product.

For further information or technical assistance please contact our Sales Department on +44 1603 723310 or by Email at sales@syfer.co.uk