Syfer Technology Limited
Old Stoke Road
Arminghall, Norwich, Norfolk
NR14 8SQ England

Tel: +44 (0)1603 723310
Fax: +44 (0)1603 723301
Email: sales@syfer.co.uk
Web: www.syfer.com

AC250 Range: Non-Safety AC MLCC for use at Mains Voltages

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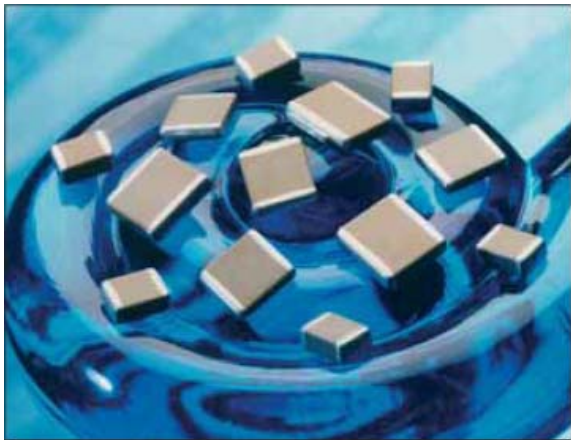
Introduction



Industry wide standard multilayer ceramic capacitors are supplied with a DC rating only. For AC use Surge and Safety capacitors with an AC rating of 250Vac have been available but the capacitance range is limited as a result of the strict impulse and VP requirements in the international standards. Syfer Technology Ltd has developed a range which provides a solution for use at up to 250Vac 60Hz continuous use and provides for non-safety critical applications where extended capacitance ranges are required.

Background

Behaviour of dielectrics is well defined for DC bias:

C0G or Ultra Stable Class 1 dielectric types have little or no variation with applied voltage.

X7R or Stable Class 2 dielectrics are not quite as straightforward but still have subcategories into which they can be classified:-

EIA dielectric type X7R (CECC 2R1) has no voltage coefficient requirement,

CECC 2C1/MIL BZ are +20%-30%

CECC 2X1/MIL BX are +15-25% with rated DC voltage applied.

For all of the above dielectrics there is no dielectric classification to define capacitance change under AC voltage conditions.

DC rated capacitors have always been used in AC environments but by de-rating a DC capacitor one merely gains the required reliability and not the knowledge of how the capacitance will change under operational conditions. The aim of the Syfer 250Vac range is to provide parts which are reliable and consistent in their AC behaviour.

Another consideration which has to be made is that of self heating effects; this is dependant on case size capacitance and dissipation factor along with frequency and amplitude of the applied voltage.

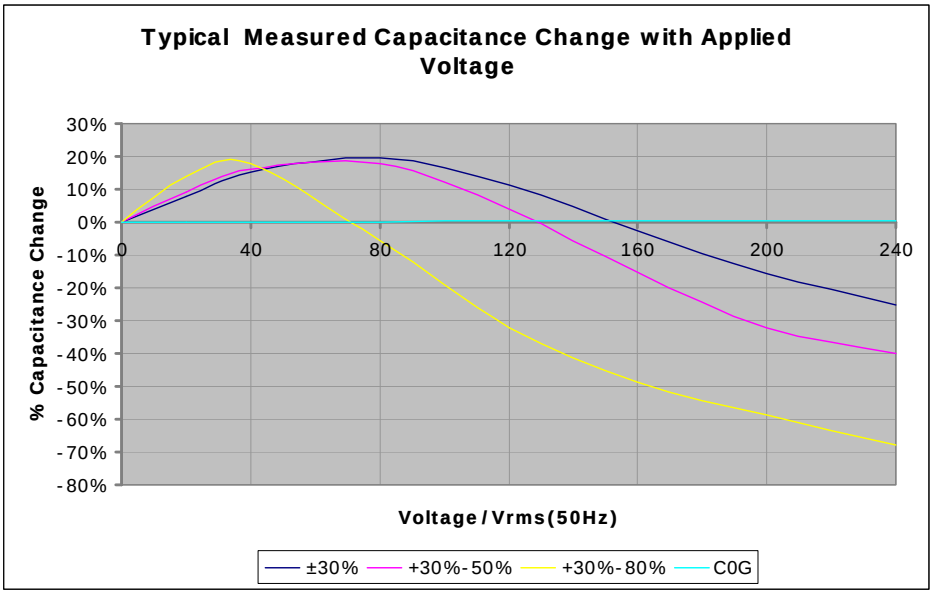
Testing

We have carried out Extensive testing to define the behaviour of MLCC under AC conditions. Current flow, capacitance change and temperature rise have all been measured in order to provide the circuit designer with the data required to simulate the behaviour of the component under operating conditions. Temperature rise at room temperature is restricted to a maximum of 25°C, given appropriate mounting to a PCB which provides no heating to the system under operational conditions.

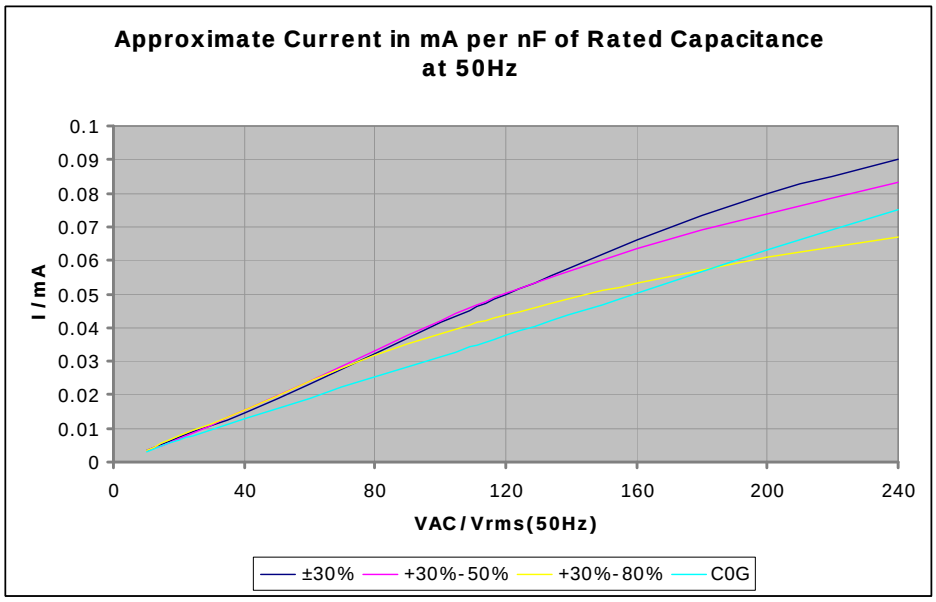
Accelerated life testing has also been carried out at maximum rated voltage and frequency at elevated temperatures to ensure that the parts supplied meet Syfer's high quality standards.

Test Data

Below: Capacitance change with applied rms voltage at 50Hz. Capacitance was measured using an ART AC Bias module connected to an HP4284A Precision LCR Meter. AC was supplied from 240V mains source via a Claude Lyons LUC500 line voltage conditioner and an isolated variable transformer. Values are typical and may vary with design and tolerance.



Below: In circuit current with applied rms voltage at 50Hz. Current was measure using a TTi 1705 True RMS programmable multimeter; AC was supplied from 240V mains source via a Claude Lyons LUC500 line voltage conditioner and an isolated variable transformer. Values are typical and may vary with design and tolerance.



Specific information regarding individual values may be available upon request, contact Syfer for more details.

Ranges

Case sizes 0805 to 2220 are available in both X7R and C0G dielectrics with capacitances of up to 120nF. The capacitance ranges are divided into four groups, C0G which has negligible capacitance shift with applied voltage and three subgroups of X7R, with ±30%, +30%-50% and +30-80% maximum capacitance shift between 0V-240V 50Hz.

Capacitance Shift 0-240VAC 50Hz	Capacitance Values					
	Case Size					
	0805	1206	1210	1808	1812	2220
C0G s negligible shift	1.0pF – 470pF	1.0pF – 1.2nF	4.7pF – 2.2nF	4.7pF – 2.2nF	10pF – 5.6nF	10pF – 10nF
X7R ±30% max shift	560pF - 1.5nF	1.5nF – 10nF	2.7nF – 22nF	2.7nF – 22nF	6.8nF – 56nF	12nF – 120nF
X7R +30%-50% max shift	1.8nF – 3.3nF	12nF	27nF	27nF	68nF – 82nF	-
X7R +30%-80% max shift	3.9nF – 10nF	15nF – 47nF	33nF – 100nF	33nF – 100nF	100nF – 120nF	-

Ordering Information

The 250Vac Capacitors can be ordered by using a standard Syfer product code with the voltage code A25.

Examples: 1206YA250473KXT or 2220JA250102JCT

1206	Case Size
Y	Polymer Termination FlexiCap™
A25	250V AC Rated up to 60Hz
0473	47nF Capacitance Value
K	10% Capacitance Tolerance
X	X - X7R Dielectric
T	Taped and Reeled

2220	Case Size
J	Nickel Barrier with Matte Tin Finish
A25	250V AC Rated up to 60Hz
0102	1nF Capacitance Value
J	5% Capacitance Tolerance
C	C – C0G/NP0 Dielectric
T	Taped and Reeled

This Range is complementary to Syfer's range of Surge and Safety Certified capacitors, Y2/X1, Y3/X2 and X2 rated components are available in case sizes 1808, 1812, 2211, 2215 and 2220 with certifications from TÜV and UL for standard terminations and our FlexiCap™ flexible polymer termination.

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