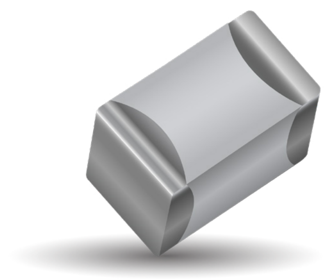
MLCC with FLEXITERM®

General Specifications



GENERAL DESCRIPTION

With increased requirements from the automotive industry for additional component robustness, AVX recognized the need to produce a MLCC with enhanced mechanical strength. It was noted that many components may be subject to severe flexing and vibration when used in various under the hood automotive and other harsh environment applications.

To satisfy the requirement for enhanced mechanical strength, AVX had to find a way of ensuring electrical integrity is maintained whilst external forces are being applied to the component. It was found that the structure of the termination needed to be flexible and after much research and development, AVX launched FLEXITERM®. FLEXITERM® is designed to enhance the mechanical flexure and temperature cycling performance of a standard ceramic capacitor with an X7R dielectric. The industry standard for flexure is 2mm minimum. Using FLEXITERM®, AVX provides up to 5mm of flexure without internal cracks. Beyond 5mm, the capacitor will generally fail "open".

As well as for automotive applications FLEXITERM® will provide Design Engineers with a satisfactory solution when designing PCB's which may be subject to high levels of board flexure.

PRODUCT ADVANTAGES

- High mechanical performance able to withstand, 5mm bend test guaranteed
- Increased temperature cycling performance, 3000 cycles and beyond
- Flexible termination system
- Reduction in circuit board flex failures
- Base metal electrode system
- Automotive or commercial grade products available
- AECQ200 Qualified
- Approved to VW 80808 Specification

APPLICATIONS

High Flexure Stress Circuit Boards

- e.g. Depanelization: Components near edges of board.

Variable Temperature Applications

- Soft termination offers improved reliability performance in applications where there is temperature variation.
- e.g. All kind of engine sensors: Direct connection to battery rail.

Automotive Applications

- Improved reliability.
- Excellent mechanical performance and thermo mechanical performance.

HOW TO ORDER

0805	5	C	104	K	A	Z	2	A
Style 0603 0805 1206 1210 1812 2220	**Voltage** 6 = 6.3V Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V 2 = 200V	**Dielectric** C = X7R F = X8R	**Capacitance Code (In pF)** 2 Sig Digits + Number of Zeros e.g., 104 = 100nF	**Capacitance Tolerance** J = ±5%* K = ±10% M = ±20% *≤1µF only	**Failure Rate** A=Commercial 4 = Automotive	**Terminations** Z = FLEXITERM® For FLEXITERM® with Tin/Lead termination see AVX LD Series	**Packaging** 2 = 7" Reel 4 = 13" Reel	**Special Code** A = Std.Product

RoHS COMPLIANT

NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.

MLCC with FLEXITERM®

Specifications and Test Methods

PERFORMANCE TESTING

AEC-Q200 Qualification:

- Created by the Automotive Electronics Council
- Specification defining stress test qualification for passive components

Testing:

Key tests used to compare soft termination to AEC-Q200 qualification:

- Bend Test
- Temperature Cycle Test

BOARD BEND TEST PROCEDURE

According to AEC-Q200

Test Procedure as per AEC-Q200:
Sample size: 20 components
Span: 90mm Minimum deflection spec: 2 mm

- Components soldered onto FR4 PCB (Figure 1)
- Board connected electrically to the test equipment (Figure 2)

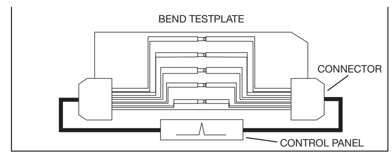


Fig 1 - PCB layout with electrical connections

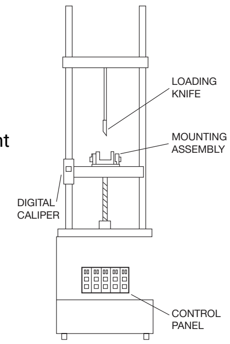
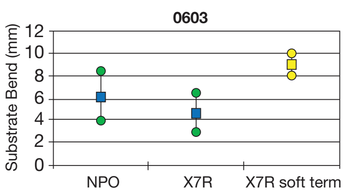
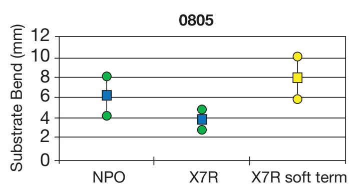


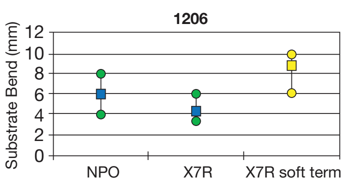
Fig 2 - Board Bend test equipment

BOARD BEND TEST RESULTS

AEC-Q200 Vrs AVX FLEXITERM® Bend Test







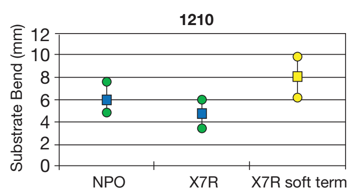


TABLE SUMMARY

Typical bend test results are shown below:

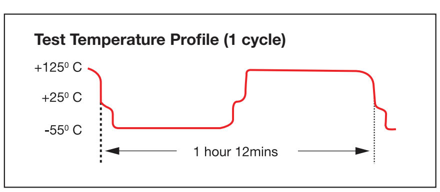
Style	Conventional Termination	FLEXITERM®
0603	>2mm	>5mm
0805	>2mm	>5mm
1206	>2mm	>5mm

TEMPERATURE CYCLE TEST PROCEDURE

Test Procedure as per AEC-Q200:

The test is conducted to determine the resistance of the component when it is exposed to extremes of alternating high and low temperatures.

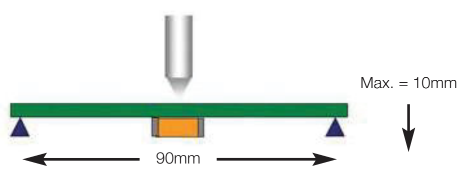
- Sample lot size quantity 77 pieces
- TC chamber cycle from -55°C to +125°C for 1000 cycles
- Interim electrical measurements at 250, 500, 1000 cycles
- Measure parameter capacitance dissipation factor, insulation resistance



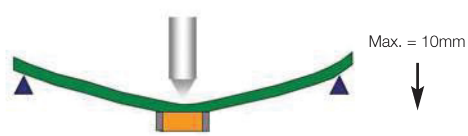
AVX ENHANCED SOFT TERMINATION BEND TEST PROCEDURE

Bend Test

The capacitor is soldered to the printed circuit board as shown and is bent up to 10mm at 1mm per second:

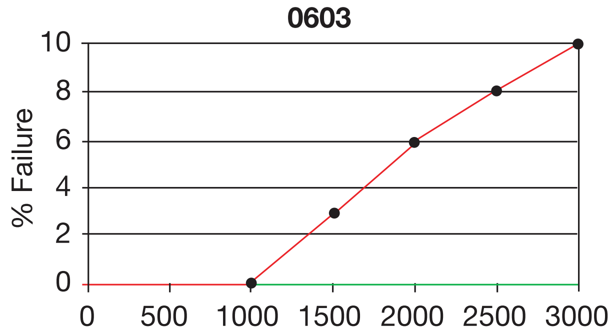


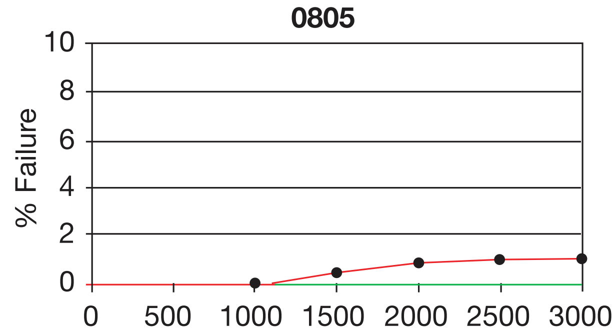
- The board is placed on 2 supports 90mm apart (capacitor side down)
- The row of capacitors is aligned with the load stressing knife

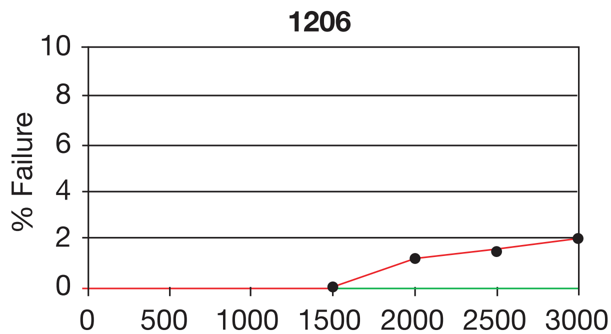


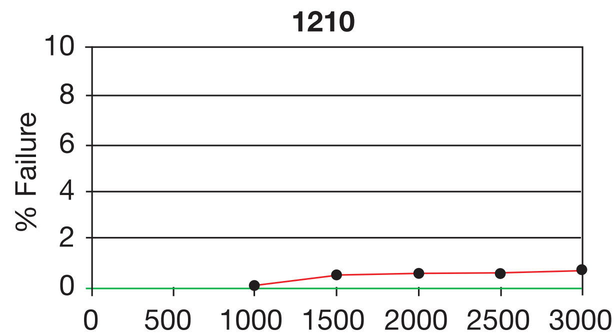
- The load is applied and the deflection where the part starts to crack is recorded (Note: Equipment detects the start of the crack using a highly sensitive current detection circuit)
- The maximum deflection capability is 10mm

BEYOND 1000 CYCLES: TEMPERATURE CYCLE TEST RESULTS









Green = Soft Term MLCC (Flexiterm)
Red = Standard MLCC

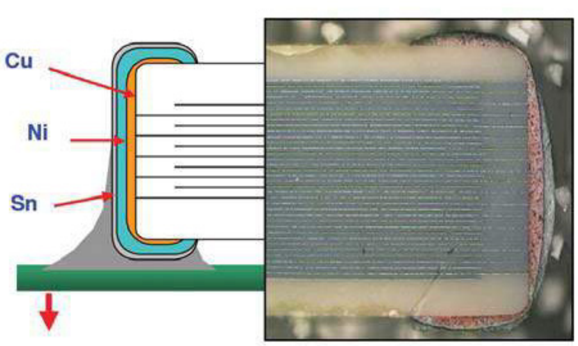
Soft Term - No Defects up to 3000 cycles

AEC-Q200 specification states 1000 cycles compared to AVX 3000 temperature cycles.

FLEXITERM® TEST SUMMARY

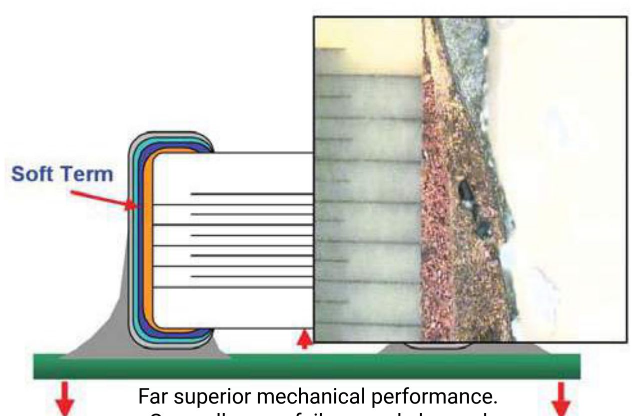
- Qualified to AEC-Q200 test/specification with the exception of using AVX 3000 temperature cycles (up to +150°C bend test guaranteed greater than 5mm).
- FLEXITERM® provides improved performance compared to standard termination systems.
- Board bend test improvement by a factor of 2 to 4 times.
- Temperature Cycling:
  - 0% Failure up to 3000 cycles
  - No ESR change up to 3000 cycle

WITHOUT SOFT TERMINATION



Major fear is of latent board flex failures.

WITH SOFT TERMINATION



Far superior mechanical performance. Generally open failure mode beyond 5mm flexure

MLCC with FLEXITERM®

Capacitance Range X8R Dielectric

SIZE			0603		0805		1206	
Soldering			Reflow/Wave		Reflow/Wave		Reflow/Wave	
WVDC			25V	50V	25V	50V	25V	50V
271	Cap	270	G	G				
331	(pF)	330	G	G	J	J		
471		470	G	G	J	J		
681		680	G	G	J	J		
102		1000	G	G	J	J	J	J
152		1500	G	G	J	J	J	J
182		1800	G	G	J	J	J	J
222		2200	G	G	J	J	J	J
272		2700	G	G	J	J	J	J
332		3300	G	G	J	J	J	J
392		3900	G	G	J	J	J	J
472		4700	G	G	J	J	J	J
562		5600	G	G	J	J	J	J
682		6800	G	G	J	J	J	J
822		8200	G	G	J	J	J	J
103	Cap	0.01	G	G	J	J	J	J
123	(μF)	0.012	G	G	J	J	J	J
153		0.015	G	G	J	J	J	J
183		0.018	G	G	J	J	J	J
223		0.022	G	G	J	J	J	J
273		0.027	G	G	J	J	J	J
333		0.033	G	G	J	J	J	J
393		0.039	G	G	J	J	J	J
473		0.047	G	G	J	J	J	J
563		0.056	G		N	N	M	M
683		0.068	G		N	N	M	M
823		0.082			N	N	M	M
104		0.1			N	N	M	M
124		0.12			N	N	M	M
154		0.15			N	N	M	M
184		0.18			N		M	M
224		0.22			N		M	M
274		0.27					M	M
334		0.33					M	M
394		0.39					**M**	
474		0.47					M	
684		0.68						
824		0.82						
105		1						
WVDC			25V	50V	25V	50V	25V	50V
SIZE			0603		0805		1206	

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
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TS 16949, ISO 9001Certified

MLCC with FLEXITERM®

Capacitance Range X7R Dielectric

AVX
A KYOCERA GROUP COMPANY

Size			0402			0603							0805						1206							1210				1812		2220		
Soldering			Reflow/ Wave			Reflow/Wave							Reflow/Wave						Reflow/Wave							Reflow Only				Reflow Only		Reflow Only		
WVDC			16V	25V	50V	10V	16V	25V	50V	100 V	200V	250V	16V	25V	50V	100 V	200V	250V	16V	25V	50V	100 V	200V	250V	500V	16V	25V	50V	100V	50V	100 V	25V	50V	100 V
221	Cap	220	C	C	C											C																		
271	(pF)	270	C	C	C																													
331		330	C	C	C																													
391		390	C	C	C																													
471		470	C	C	C																													
561		560	C	C	C																													
681		680	C	C	C																													
821		820	C	C	C																													
102		1000	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	N	N			
182		1800	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	N	N			
222		2200	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	N	N			
332		3300	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	N	N			
472		4700	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	N	N			
103	Cap	0.01	C				G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	N	N			
123	(μF)	0.012	C				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
153		0.015	C				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
183		0.018	C				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
223		0.022	C				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
273		0.027	C				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
333		0.033	C				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
473		0.047					G	G	G				J	J	J	N	N	N	J	J	J	M	J	J		K	K	K	K	N	N			
563		0.056					G	G	G				J	J	J	N			J	J	J	M	J	J		K	K	K	M	N	N			
683		0.068					G	G	G				J	J	J	N			J	J	J	M	J	J		K	K	K	M	N	N			
823		0.082					G	G	G				J	J	J	N			J	J	J	M	J	J		K	K	K	M	N	N			
104		0.1	C				G	G	G				J	J	J	N			J	J	J	M	J	J		K	K	K	M	N	N			
124		0.12											J	J	N	N			J	J	M	M				K	K	K	P	N	N			
154		0.15											M	N	N	N			J	J	M	M				K	K	K	P	N	N			
224		0.22				G	J	J	J				M	N	N	N			J	M	M	Q				M	M	M	P	N	N			
334		0.33											N	N	N	N			J	M	P	Q				P	P	P	Q	X	X			
474		0.47				J	J	J					N	N	N	N			M	M	P	Q				P	P	P	Q	X	X			
684		0.68											N	N	N	N			M	Q	Q	Q				P	P	Q	X	X	X			
105		1											N	N	N	N			M	Q	Q	Q				P	Q	Q	Z	X	X			
155		1.5											N	N					Q	Q	Q					P	Q	Z	Z	X	X			
225		2.2											N	N					Q	Q	Q					X	Z	Z	Z	Z	Z			
335		3.3																	Q	Q						X	Z	Z	Z	Z				
475		4.7																	Q	Q						X	Z	Z	Z	Z				Z
106		10																								Z	Z	Z					Z	Z
226		22																														Z		
WVDC			16V	25V	50V	10V	16V	25V	50V	100 V	200V	250V	16V	25V	50V	100 V	200V	250V	16V	25V	50V	100 V	200V	250V	500V	16V	25V	50V	100 V	50V	100 V	25V	50V	100 V
Size			0402			0603							0805						1206							1210				1812		2220		

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
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