

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 RESULTS

AEC-Q200 Vrs AVX FLEXITERM® Bend Test

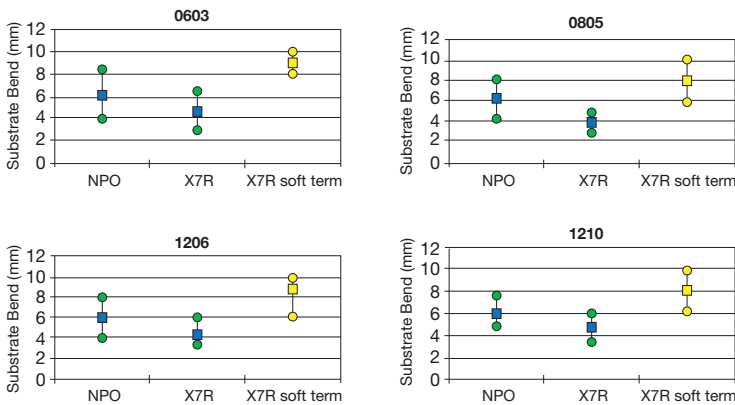


TABLE SUMMARY

Typical bend test results are shown below:

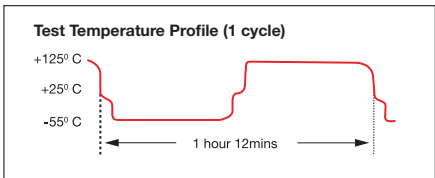
Style	Conventional Termination	FLEXITERM®
0603	>2mm	>5mm
0805	>2mm	>5mm
1206	>2mm	>5mm

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



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)

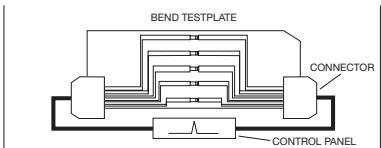


Fig 1 - PCB layout with electrical connections

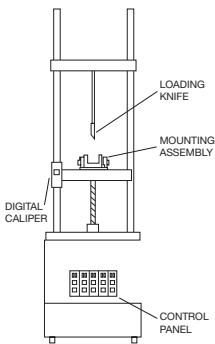
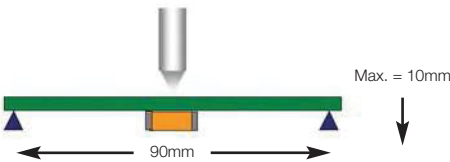


Fig 2 - Board Bend test equipment

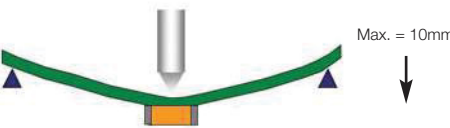
AVX ENHANCED SOFT TERMINATION BEND TEST PROCEDURE

Bend Test

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

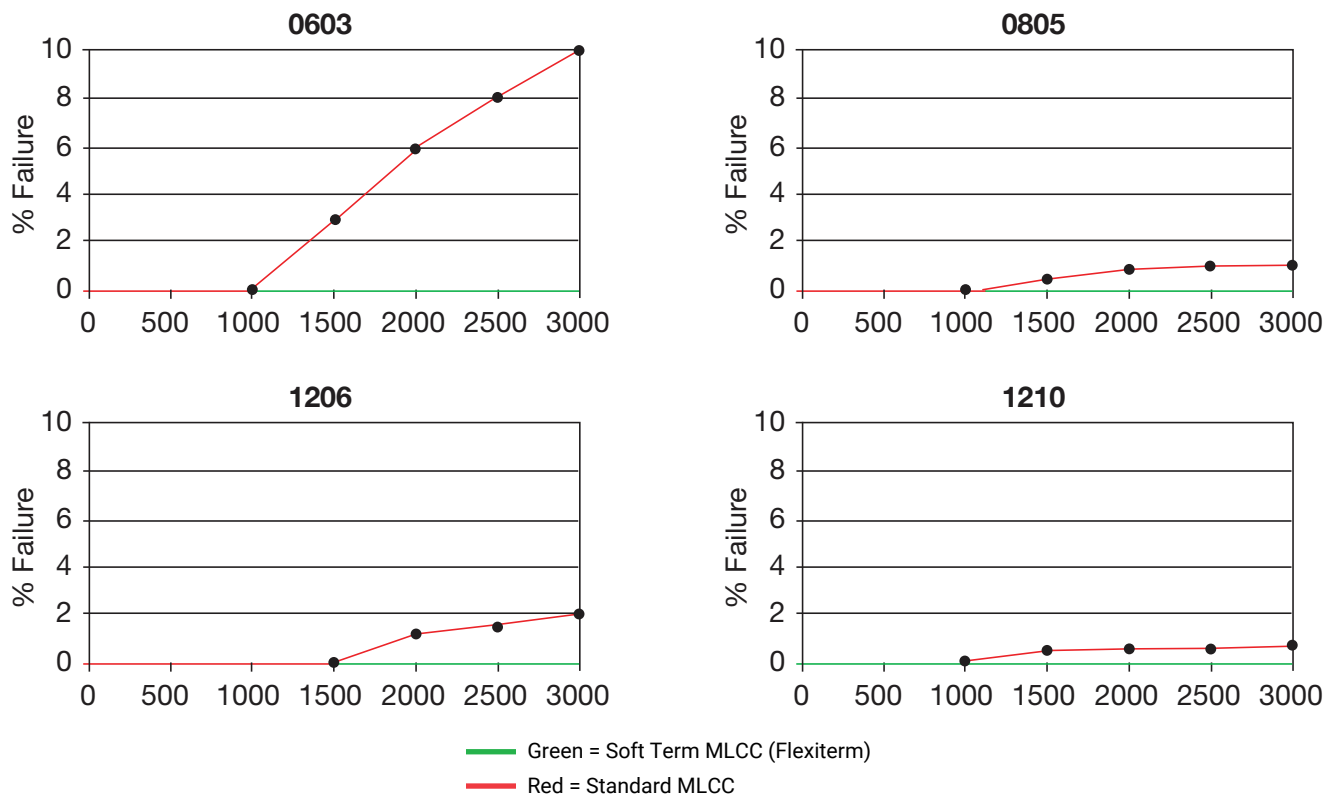


- The board is placed on 2 supports 90mm apart (capacitor side down)
- The row of capacitors is aligned with the load stressing knife



- 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



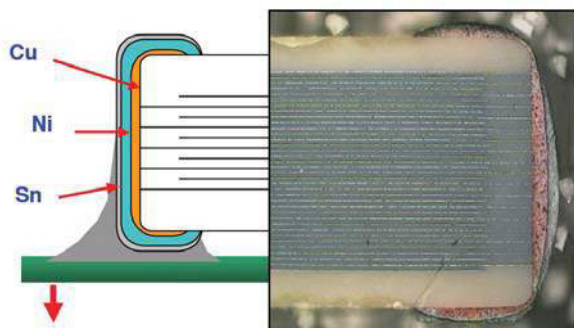
Soft Term - No Defects up to 3000 cycles

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

FLEXITERM® TEST SUMMARY

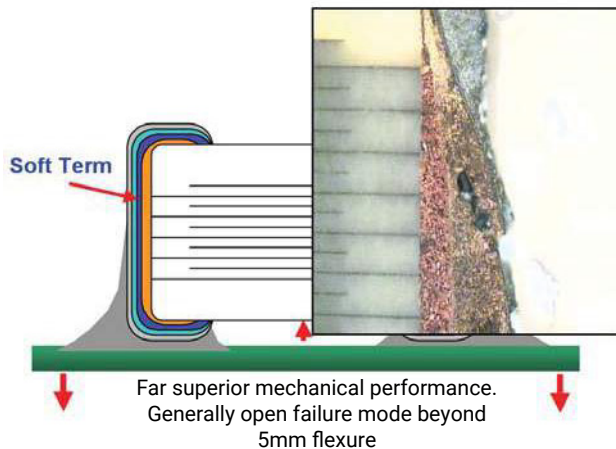
- Qualified to AEC-Q200 test/specification with the exception of using AVX 3000 temperature cycles (up to +150°C bend test guaranteed greater than 5mm).
- FLEXITERM® provides improved performance compared to standard termination systems.
- Board bend test improvement by a factor of 2 to 4 times.
- Temperature 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



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)
PAPER						EMBOSSED							

TS 16949, ISO 9001Certified



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MLCC with FLEXITERM®

Capacitance Range X7R Dielectric



Size			0402			0603						0805						1206							1210				1812			2220			
Soldering WVDC			Reflow/ Wave			Reflow/Wave						Reflow/Wave						Reflow/Wave							Reflow Only				Reflow Only			Reflow Only			
			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	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	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	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	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	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	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						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										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		
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)
PAPER					EMBOSSED								