# **MLCC with FLEXITERM®**

## **General Specifications**





#### **GENERAL DESCRIPTION**

With increased requirements from the automotive industry for additional component robustness, KYOCERA 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, KYOCERA 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, KYOCERA AVX launched FLEXITERM<sup>®</sup>. FLEXITERM<sup>®</sup> 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<sup>®</sup>, KYOCERA 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<sup>®</sup> 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	ĸ	<b>A</b>	z	2	A
<b>Style</b> 0603 0805 1206 1210 1812	<b>Voltage</b> 6 = 6.3V Z = 10V Y = 16V 3 = 25V	<b>Dielectric</b> 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%	Failure Rate A=Commercial 4 = Automotive	Terminations Z=FLEXITERM® For FLEXITERM® with Tin/Lead termination see	<b>Packaging</b> 2 = 7" Reel 4 = 13" Reel	Special Code A = Std.Product
2220	5 = 50V 1 = 100V 2 = 200V			*≤1µF only		LD Series		RoHS

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

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# MLCC with FLEXITERM<sup>®</sup> Specifications and Test Methods

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#### **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 FLEXITERM® Bend Test





1210

X7R

X7R soft term



#### **TABLE SUMMARY**

Typical bend test results are shown below:

Style	Conventional Termination	FLEXITERM <sup>®</sup>
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.

Substrate Bend (mm)

12 10

8

6

4

2

0

NPO

- 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

Test Temperature Profile (1 cycle)													
+125º C													
+25° C													
-55° C													

#### **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)

BEND TESTPI ATE

2.4

 Board connected electrically to the test equipment (Figure 2)



Fig 1 - PCB layout with electrical connections

Fig 2 - Board Bend test equipment

#### 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

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# MLCC with FLEXITERM<sup>®</sup> Specifications and Test Methods

#### **BEYOND 1000 CYCLES: TEMPERATURE CYCLE TEST RESULTS**



# Soft Term - No Defects up to 3000 cycles

#### FLEXITERM<sup>®</sup> TEST SUMMARY

- Qualified to AEC-Q200 test/specification with the exception of using 3000 temperature cycles (up to +150°C bend test guaranteed greater than 5mm).
- FLEXITERM® provides improved performance compared to standard termination systems.

#### WITHOUT SOFT TERMINATION

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

KYOCERa

- · 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



Major fear is of latent board flex failures.

#### WITH SOFT TERMINATION



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# **MLCC with FLEXITERM®**

## **Capacitance Range X8R Dielectric**



	SIZE	06	03	08	05	12	206			
S	oldering									
	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	М			
184	0.18			N		М	М			
224	0.22			N		М	М			
274	0.27					M	M			
334	0.33					М	M			
394	0.39					М				
474	0.47									
684	0.68									
824	0.82									
105	1									
	SIZE	06	03	08	05	1206				
		00		00		12				

Letter	А	С	E	G	J	К	М	N	Р	Q	Х	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

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# **MLCC with FLEXITERM®**

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### **Capacitance Range X7R Dielectric**

	Size			0402	,	r –			06	2 0603						805			r	_		120	6			T	12	10		18	12	<u> </u>	2220	
	Solderi			0402	•																	120	•									<u> </u>		
	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	1100 V
221	Cap	220	C	С	С											С																		
271	(pF)	270	С	С	С						1																							
331		330	С	С	С																													
391		390	С	С	С									1	1					1		1	1			1		1						
471		470	С	С	C										1								1								1			
561		560	С	С	C		1																											
681		680	С	С	C																													
821		820	С	С	C																													
102		1000	С	С	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	С	С	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	С	С	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	С	С	С		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	К	K	K	K	N	N			
472		4700	С	С	С		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	Сар	0.01	С				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					G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
153		0.015	С				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
183		0.018	С				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
223		0.022	С				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
273		0.027	С				G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	N	N			
333		0.033	С				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	С				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			
224 334		0.22				G	J	J	J				M	N	N	N			J	M	M	Q				M	M P	M	P	N	N			$\vdash$
474		0.33				J	J						N	N	N N	N	<u> </u>		J	M	P	Q O				P	P	P P	Q 0	X	X X	$\left  - \right $		
684		0.47				J	J	J					N	N		N										P	P				X	$\vdash$		$\vdash$
105		0.68						-					N	N	N	N			M	Q	Q	Q				P	0	Q	X Z	X	X			<u> </u>
105		1.5											N	N	N	IN			0	0	Q	Q				P	0	Z	Z	X	X			┝──┤
225		2.2											N	N	<u> </u>				0	Q	Q					X	Z	Z	Z	Z	Z			$\vdash$
335		3.3							<u> </u>				IN	IN					0	Q	ų					X	Z	Z	Z	Z	<u> </u>			├
475		4.7				-													0	0						X	Z	Z	Z	Z		$\vdash$		7
106		4.7															-		ų	Q						Ż	Z	Z	2	2			7	7
226		22																								2	2	2				7	/	
220	WVDC		16V	25V	50V	101	16V	251/	501/	100 V	200V	2501/	16V	25V	501/	100 V	2001	2501/	16V	25V	501/	100 \	2001	2501	5001/	16V	25V	50V	100 V	50V	100 V	, 25V	501/	100 V
	Size		107	0402		100	100	1234			2000	2301	101	231		805	12001	2001	107	237	507	120		12300	1000	107	12		1100 0		12	2.57	2220	
	Size 0402 0603								005					_	120	•				12	10		10	12		2220								

Letter	А	С	E	G	J	K	М	Ν	Р	Q	Х	Y	Z	7		
Max.	0.33	0.56	0.71	0.90	0.94	1.02	1.27	1.40	1.52	1.78	2.29	2.54	2.79	3.30		
Thickness	(0.013)	(0.022)	(0.028)	(0.035)	(0.037)	(0.040)	(0.050)	(0.055)	(0.060)	(0.070)	(0.090)	(0.100)	(0.110)	(0.130)		
			PAPER			EMBOSSED										

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