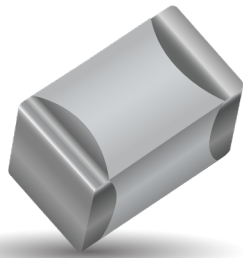


Automotive MLCC with FLEXITERM®, KAF Series

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®. FLEXITERM® is designed to enhance the mechanical flexure and temperature cycling performance of a standard ceramic capacitor. The industry standard for flexure is 2mm minimum. Using FLEXITERM®, 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® 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

KAF	31	G	R7	1H	475	K	U
Series AEC-Q200 FLEXITERM® SERIES	Size 15 = 0603 21 = 0805 31 = 1206 32 = 1210 42 = 1808 43 = 1812 55 = 2220	Thickness See Cap Chart	Dielectric CG = COG R7 = X7R R8 = X8R L8 = X8L G8 = X8G	0J = 6.3V 2H = 500V 1A = 10V 2J = 630V 1C = 16V 3A = 1000V 1E = 25V 3N = 1500V 1H = 50V 3D = 2000V 2A = 100V 3E = 2500V 2D = 200V 3U = 3000V 2E = 250V	Capacitance Code (in pF) 2 Significant Digits +Number of zeros eg 10uF = 106 10nF = 103 47pF = 470	Capacitance Tolerance B = ± 0.1pF (<10pF)* C = ± 0.25pF (<10pF)* D = ± 0.5pF (<10pF)* F = ± 1%* G = ± 2%* J = ± 5% K = ± 10% M = ± 20%	Packaging See Table Below

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

PACKAGING CODES

Code	EIA (inch)	IEC (mm)	7" Paper	7" Embossed	13" Paper	13" Embossed
15	0603	1608	T	U	M	L
21	0805	2012	T	U	M	L
31	1206	3216	T	U	M	L
32	1210	3225	T	U	M	L
42	1808	4520		Y		K
43	1812	4532		V		S
55	2220	5750		V		S

*thickness determines paper or plastic embossed packaging

*COG only

Automotive MLCC with FLEXITERM®, KAF Series

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 RESULTS

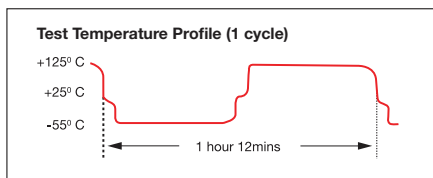
Style	Conventional Termination	FLEXITERM®
0603	>2mm	>5mm
0805	>2mm	>5mm
1206	>2mm	>5mm

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)

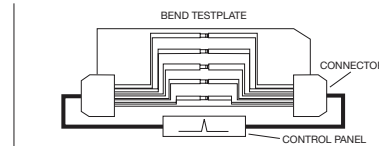


Fig 1 - PCB layout with electrical connections

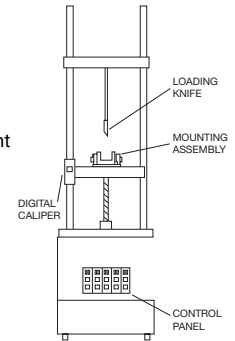
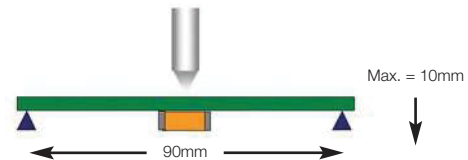


Fig 2 - Board Bend test equipment

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

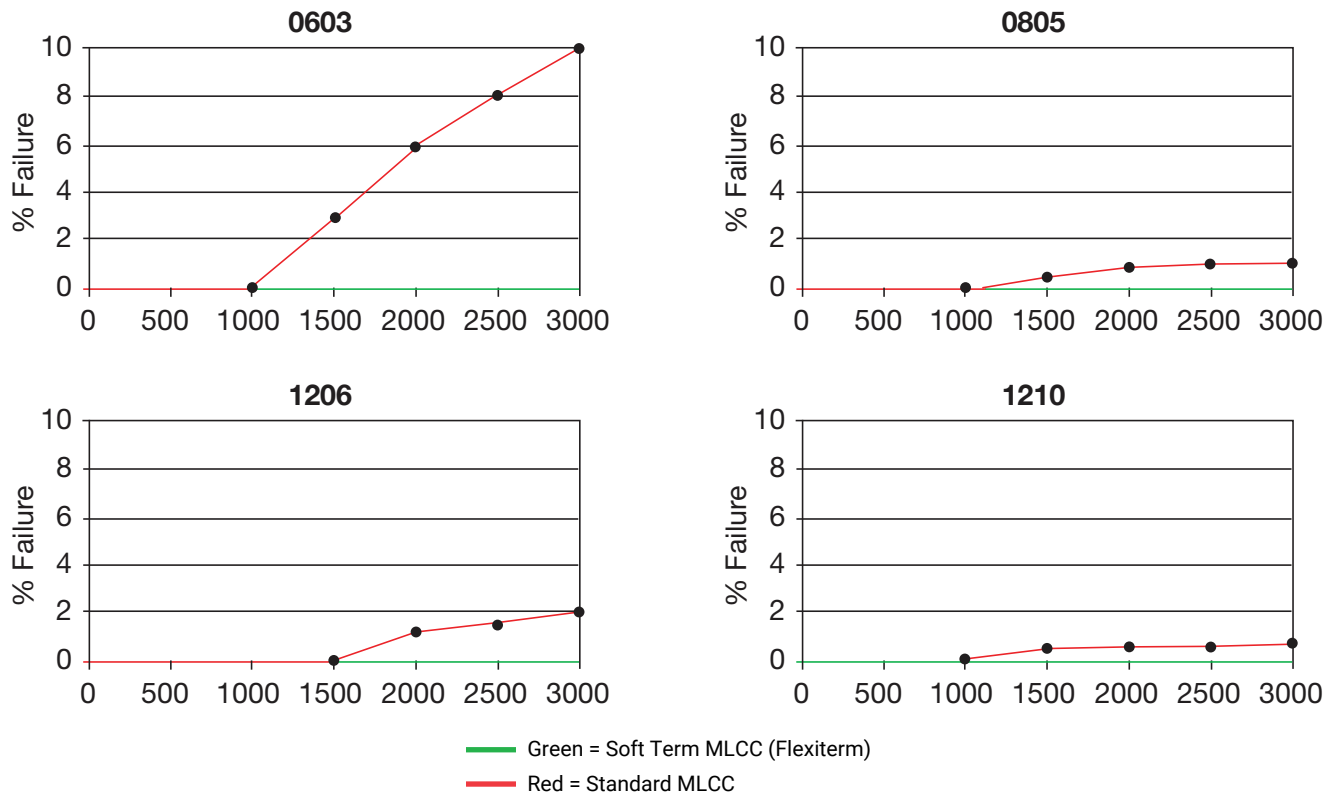


- The load is applied and the deflection where the part starts to crack is recorded (Note: Equipment detects the start of the crack using a highly sensitive current detection circuit)
- The maximum deflection capability is 10mm

Automotive MLCC with FLEXITERM[®], KAF Series

Specifications and Test Methods

BEYOND 1000 CYCLES: TEMPERATURE CYCLE TEST RESULTS



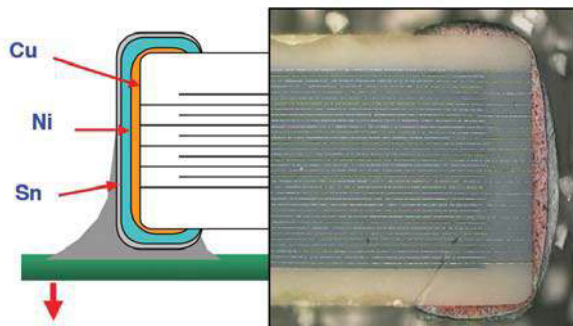
Soft Term - No Defects up to 3000 cycles

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

FLEXITERM[®] TEST SUMMARY

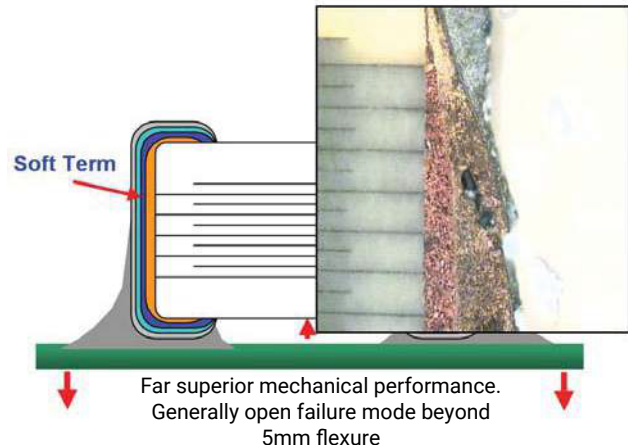
- Qualified to AEC-Q200 test/specification with the exception of using 3000 temperature cycles (up to +150°C bend test guaranteed greater than 5mm).
- FLEXITERM[®] provides improved performance compared to standard termination systems.
- Board bend test improvement by a factor of 2 to 4 times.
- Temperature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



Automotive MLCC with FLEXITERM® - NP0

Capacitance Range

SIZE		0603								0805								1206								1210							
Soldering		Reflow/Wave								Reflow/Wave								Reflow/Wave								Reflow/Wave							
(L) Length	mm (in.)	1.6 ± 0.15 (0.063 ± 0.006)								2.01 ± 0.2 (0.079 ± 0.008)								3.2 ± 0.2 (0.126 ± 0.008)								3.2 ± 0.2 (0.126 ± 0.008)							
(W) Width	mm (in.)	0.81 ± 0.15 (0.032 ± 0.006)								1.25 ± 0.2 (0.049 ± 0.008)								1.6 ± 0.2 (0.063 ± 0.008)								2.5 ± 0.2 (0.098 ± 0.008)							
(t) Terminal	mm (in.)	0.35 ± 0.15 (0.014 ± 0.006)								0.5 ± 0.25 (0.02 ± 0.01)								0.5 ± 0.25 (0.02 ± 0.01)								0.5 ± 0.25 (0.02 ± 0.01)							
WVDC		25V	50V	100V	200V	250V	630V	1000V	25V	50V	100V	200V	250V	630V	1000V	25V	50V	100V	200V	250V	500V	630V	1000V	50V	100V	200V	250V	500V	630V	1000V			
0R5	0.5	A	A	A	A				B	B	B	B																					
1R0	1.0	A	A	A	A				B	B	B	B																					
100	10	A	A	A	A				B	B	B	B																					
120	12	A	A	A	A				B	B	B	B																					
150	15	A	A	A	A				B	B	B	B																					
180	18	A	A	A	A				B	B	B	B																					
220	22	A	A	A	A				B	B	B	B																					
270	27	A	A	A	A				B	B	B	B																					
330	33	A	A	A	A		B	B	B	B	B	B																					
390	39	A	A	A	A		B	B	B	B	B	B																					
470	47	A	A	A	A		B	B	B	B	B	B		A	A																		
560	56	A	A	A	A	A*	B	B	B	B	B	B		A	A																		
680	68	A	A	A	A	A*	B	B	B	B	B	B		A	A																		
820	82	A	A	A	A	A*	B	B	B	B	B	B		A	A																		
101	100	A	A	A		A*	B	B	B	B	B	B		A	A																		
121	120				A*	A*	B	B	B	B	B	B		A	A																		
151	150				A*	A*	B	B	B	B	B	B		A	A																		
181	180				A*	A*	B	B	B	B	B	B		A	A																		
221	220				A*	A*	B	B	B	B	B	B		A	A																		
271	270				A*	A*	B*		B	B	B	B		A	A								N										
331	330				A*	A*	B*				B			A	A							N											
391	390				A*	A*	B*				B			A	A							N											
471	470			A*	A*	A*	B*				B			A	A							N											
561	560			A*	A*	A*	B*				B			A	A							N											
681	680			A*	A*	A*	B*				B			A	A							N											
821	820	A*	A*	A*	A*	A*	B*				B			A	A							N											
102	1000	A*	A*	A*	A*	A*	B*				B			A	A							N								K*			
122	1200	A*	A*	A*	A*	A*								A	A							N								C*			
152	1500	A*	A*	A*	A*	A*																N								G*			
182	1800	A*	A*	A*							B	B	B									N								G*			
222	2200	A*	A*	A*							B	B	B									N								G*			
272	2700	A*	A*								A	A	A	A								B	B	B	B	B	B	B	B	G*			
332	3300	A*	A*								A	A	A	A								G	G	G	G	G	G	G	G	G*			
392	3900	A*	A*								A	A	A	A								G	G	G	G	G	G	G	G	G*			
472	4700	A*	A*								A	A	A	A								G	G	G	G	G	G	G	G	G*			
562	5600	A*	A*								A	A										G	G	G	G	G	G	G	G	G*			
682	6800	A*	A*								A	A										G	G	G	G	G	G	G	G	K*			
822	8200	A*									A	A										G	G	G	G	G	G	G	G	K*			
103	10000	A*									A	A										G	G	G	G	G	G	G	G	K*			
123	12000																					G	G	G	G	G				K*			
153	15000																					G	G	G	G	G				L*			
183	18000																					G	G	G	G	G				L*			
223	22000																					G	G	G						L*			
273	27000																					G	G	G						L*			
333	33000																					G	G	G						L*			
393	39000																					G	G							L*			
473	47000																					G	G							L*			
563	56000																					G	G										
683	68000																																
823	82000																																
104	100000																																
WVDC		25V	50V	100V	200V	250V	630V	1000V	25V	50V	100V	200V	250V	630V	1000V	25V	50V	100V	200V	250V	500V	630V	1000V	50V	100V	200V	250V	500V	630V	1000V			
Size		0603								0805								1206								1210							

* These dimensions differ from the standard in table above and are:

0603 L= 1.6 ± 0.2 mm, W = 0.8 ± 0.2 mm

1206 L= 3.2 ± 0.4 mm, W = 1.6 ± 0.3 mm

1210 L= 3.2 ± 0.4 mm, W = 2.5 ± 0.3 mm

Case Size	0603 (KAF15)		0805 (KAF21)		1206 (KAF31)			1210 (KAF32)			
Thickness Letter	A	B	B	A	B	N	G	C	G	K	L
Max Thickness (mm)	0.90	0.95	0.94	1.45	0.94	1.27	1.78	1.27	1.78	2.29	2.80
Carrier Tape	PAPER	PAPER	PAPER	EMB	PAPER	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7" reel	T	T	T	U	T	U	U	U	U	U	U
Packaging Code 13" reel	M	M	M	L	M	L	L	L	L	L	L
	PAPER						EMBOSSED				

Automotive MLCC with FLEXITERM® - X8R / X8L

Capacitance Range

KYOCERA AVX has developed a range of multilayer ceramic capacitors designed for use in applications up to 150°C. These capacitors are manufactured with an X8R and an X8L dielectric material. X8R material has capacitance variation of $\pm 15\%$ between -55°C and +150°C. The X8L material has capacitance variation of $\pm 15\%$ between -55°C to 125°C to 125°C and +15/40% from +125°C to +150°C.

The need for X8R and X8L performance has been driven by customer requirements for parts that operate at elevated temperatures. They provide a highly reliable capacitor with low loss and stable capacitance over temperature.

They are ideal for automotive under the hood sensors, and various industrial applications. Typical industrial application would be drilling monitoring system. They can also be used as bulk capacitors for high temperature camera modules.

X8R

SIZE		0603			0805			1206		
Soldering		Reflow/Wave			Reflow/Wave			Reflow/Wave		
(L) Length	mm (in.)	1.6 ± 0.15 (0.063 ± 0.006)			2.01 ± 0.2 (0.079 ± 0.008)			3.2 ± 0.2 (0.126 ± 0.008)		
(W) Width	mm (in.)	0.81 ± 0.15 (0.032 ± 0.006)			1.25 ± 0.2 (0.049 ± 0.008)			1.6 ± 0.2 (0.063 ± 0.008)		
(t) Terminal	mm (in.)	0.35 ± 0.15 (0.014 ± 0.006)			0.5 ± 0.25 (0.02 ± 0.01)			0.5 ± 0.25 (0.02 ± 0.01)		
WVDC		25V	50V	100V	25V	50V	100V	25V	50V	100V
271	Cap 270	A	A	A						
331	(pF) 330	A	A	A	B	B	B			
471	470	A	A	A	B	B	B			
681	680	A	A	A	B	B	B			
102	1000	A	A	A	B	B	B	B	B	
152	1500	A	A	A	B	B	B	B	B	
182	1800	A	A	A	B	B	B	B	B	
222	2200	A	A	A	B	B	B	B	B	
272	2700	A	A	A	B	B	B	B	B	
332	3300	A	A	A	B	B	B	B	B	
392	3900	A	A	A	B	B	B	B	B	
472	4700	A	A	A	B	B	B	B	B	
562	5600	A	A	A	B	B	B	B	B	
682	6800	A	A	A	B	B	B	B	B	
822	8200	A	A	A	B	B	B	B	B	
103	Cap 0.01	A	A	A	B	B	B	B	B	
123	(uF) 0.012	A	A		B	B	B	B	B	
153	0.015	A	A		B	B	A	B	B	
183	0.018	A	A		B	B	A	B	B	
223	0.022	A	A		B	B	A	B	B	
273	0.027	A	A		B	B		B	B	
333	0.033	A	A		B	B		B	B	
393	0.039	A	A		B	B		B	B	
473	0.047	A	A		B	B		B	B	
563	0.056	A			A	A		N	N	
683	0.068	A			A	A		N	N	
823	0.082				A	A		N	N	
104	0.1				A	A		N	N	
124	0.12				A	A		N	N	
154	0.15				A	A		N	N	
184	0.18				A			N	N	
224	0.22				A			N	N	
274	0.27							N	N	
334	0.33							N	N	
394	0.39							E	G	
474	0.47							E	G	
684	0.68							G	G	
824	0.82							G	G	
105	1							G	G	
WVDC		25V	50V	100V	25V	50V	100V	25V	50V	100V
SIZE		0603			0805			1206		

Case Size	0603(KAF15)		0805(KAF21)		1206(KAF31)				1210(KAF32)	2220(KAF55)
Thickness Letter	A	B	B	A	B	N	E	G	L	C
Max Thickness	0.90	0.95	0.94	1.45	0.94	1.27	1.52	1.78	2.79	2.80
Carrier Tape	PAPER	PAPER	PAPER	EMB	PAPER	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	T	T	T	U	T	U	U	U	U	V
Packaging Code 13"reel	M	M	M	L	M	L	L	L	L	S
PAPER				EMBOSSED (EMB)						

X8L

SIZE			0603			0805			1206				1210				2220		
Soldering			Reflow/Wave			Reflow/Wave			Reflow/Wave				Reflow/Wave				Reflow Only		
(L) Length	mm		1.6 ± 0.15 (0.063 ± 0.006)			2.01 ± 0.2 (0.079 ± 0.008)			3.2 ± 0.2 (0.126 ± 0.008)				3.2 ± 0.2 (0.126 ± 0.008)				5.7 ± 0.5 (0.224 ± 0.02)		
	(in.)		0.81 ± 0.15 (0.032 ± 0.006)			1.25 ± 0.2 (0.049 ± 0.008)			1.6 ± 0.2 (0.063 ± 0.008)				2.5 ± 0.2 (0.098 ± 0.008)				5 ± 0.4 (0.197 ± 0.016)		
(W) Width	mm		0.35 ± 0.15 (0.014 ± 0.006)			0.5 ± 0.25 (0.02 ± 0.01)			0.5 ± 0.25 (0.02 ± 0.01)				0.5 ± 0.25 (0.02 ± 0.01)				0.64 ± 0.39 (0.025 ± 0.015)		
	(in.)		0.035 ± 0.015 (0.014 ± 0.006)			0.05 ± 0.025 (0.02 ± 0.01)			0.05 ± 0.025 (0.02 ± 0.01)				0.05 ± 0.025 (0.02 ± 0.01)				0.064 ± 0.039 (0.025 ± 0.015)		
WVDC			25V	50V	100V	25V	50V	100V	16V	25V	50V	100V	10V	25V	50V	100V	25V	50V	
271	Cap	270	A	A															
331	(pF)	330	A	A	A	B	B	B											
471		470	A	A	A	B	B	B											
681		680	A	A	A	B	B	B											
102		1000	A	A	A	B	B	B		B	B	B							
152		1500	A	A	A	B	B	B		B	B	B							
182		1800	A	A	A	B	B	B		B	B	B							
222		2200	A	A	A	B	B	B		B	B	B							
272		2700	A	A	A	B	B	B		B	B	B							
332		3300	A	A	A	B	B	B		B	B	B							
392		3900	A	A	A	B	B	B		B	B	B							
472		4700	A	A	A	B	B	B		B	B	B							
562		5600	A	A	A	B	B	B		B	B	B							
682		6800	A	A	A	B	B	B		B	B	B							
822		8200	A	A	A	B	B	B		B	B	B							
103	Cap	0.01	A	A	A	B	B	B		B	B	B							
123	(uF)	0.012	A	A		B	B	B		B	B	B							
153		0.015	A	A		B	B	B		B	B	B							
183		0.018	A	A		B	B	B		B	B	B							
223		0.022	A	A		B	B	B		B	B	B							
273		0.027	A	A		B	B	B		B	B	B							
333		0.033	A	A		B	B	A		B	B	B							
393		0.039	A	A		B	B	A		B	B	B							
473		0.047	A	A		B	B	A		B	B	B							
563		0.056	A	A		B	B	A		B	B	B							
683		0.068	A	A		B	B	A		B	B	B							
823		0.082	A	A		B	B	A		B	B	N							
104		0.1	A	A		B	B	A		B	B	N							
124		0.12				B	A			B	B	N							
154		0.15				B	A			B	B	N							
184		0.18				A	A			B	B	B	G						
224		0.22				A	A			B	B	B	G						
274		0.27				A	A			B	N	N							
334		0.33				A	A			B	N	E							
394		0.39				A	A			N	N	E							
474		0.47				A	A			N	N	E							
684		0.68				A	A			N	G	G							
824		0.82				A	A			N	G	G							
105		1				A	A			N	G	G							
155		1.5								G	G	G							
225		2.2								G	G	G			L	L	C	C	
475		4.7								G	G				L				
106		10											L	L	L				
WVDC			25V	50V	100V	25V	50V	100V	16V	25V	50V	100V	10V	25V	50V	100V	200V	250V	
SIZE			0603			0805			1206				1210				2220		

Automotive MLCC with FLEXITERM® - X8R / X8L

General Specifications

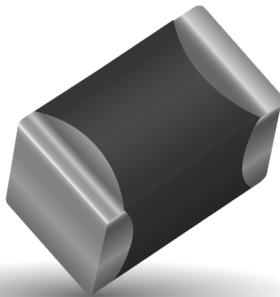
APPLICATIONS FOR X8R AND X8L CAPACITORS

- All market sectors with a 150°C requirement
- Automotive on engine applications
- Oil exploration applications
- Hybrid automotive applications
 - Battery control
 - Inverter / converter circuits
 - Motor control applications
 - Water pump
- Hybrid commercial applications
 - Emergency circuits
 - Sensors
 - Temperature regulation



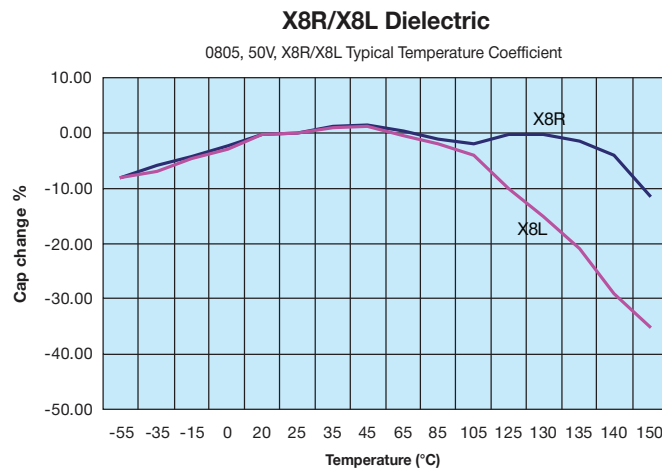
ADVANTAGES OF X8R AND X8L MLC CAPACITORS

- Both ranges are qualified to the highest automotive AEC-Q200 standards
- Excellent reliability compared to other capacitor technologies
- RoHS compliant
- Low ESR / ESL compared to other technologies
- Tin solder finish
- FLEXITERM® available
- 100V range available



ENGINEERING TOOLS FOR HIGH VOLTAGE MLC CAPACITORS

- Samples
- Technical Articles
- Application Engineering
- Application Support



Automotive MLCC with FLEXITERM® - X7R , 4V to 500V
Capacitance Range



SIZE		0402				0603				0805				1206				1210				1812		2220											
Soldering		Reflow/Wave				Reflow/Wave				Reflow/Wave				Reflow/Wave				Reflow Only				Reflow Only		Reflow Only											
(L) Length	mm (in.)	1.0 ± 0.2 (0.039±0.008)				1.6 ± 0.15 (0.063 ± 0.006)				2.01 ± 0.2 (0.079 ± 0.008)				3.2 ± 0.2 (0.126 ± 0.008)				3.2 ± 0.2 (0.126 ± 0.008)				4.5 ± 0.3 (0.177 ± 0.012)		5.7 ± 0.5 (0.224 ± 0.02)											
(W) Width	mm (in.)	0.5± 0.2 (0.02±0.008)				0.81 ± 0.15 (0.032 ± 0.006)				1.25 ± 0.2 (0.049 ± 0.008)				1.6 ± 0.2 (0.063 ± 0.008)				2.5 ± 0.2 (0.098 ± 0.008)				3.2 ± 0.2 (0.126 ± 0.008)		5 ± 0.4 (0.197 ± 0.016)											
(t) Terminal	mm (in.)	0.25 ± 0.15 (0.010±0.006)				0.35 ± 0.15 (0.014 ± 0.006)				0.5 ± 0.25 (0.02 ± 0.01)				0.5 ± 0.25 (0.02 ± 0.01)				0.5 ± 0.25 (0.02 ± 0.01)				0.61 ± 0.36 (0.024 ± 0.014)		0.64 ± 0.39 (0.025 ± 0.015)											
WVDC		10V	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	200V	250V	6.3V	10V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	500V	16V	25V	50V	100V	200V	250V	500V
101	100																																		
221	220	A	A	A	A																														
271	270	A	A	A	A																														
331	330	A	A	A	A																														
391	390	A	A	A	A																														
471	470	A	A	A	A																														
561	560	A	A	A	A																														
681	680	A	A	A	A																														
821	820	A	A	A	A																														
102	1000	A	A	A	A		A	A	A	A	A	A	A																						
122	1220	A	A	A	A		A	A	A	A	A	A	A																						
152	1500	A	A	A	A		A	A	A	A	A	A	A																						
182	1800	A	A	A	A		A	A	A	A	A	A	A																						
222	2200	A	A	A	A		A	A	A	A	A	A	A																						
272	2700	A	A	A	A		A	A	A	A	A	A	A																						
332	3300	A	A	A	A		A	A	A	A	A	A	A																						
392	3900	A	A	A	A		A	A	A	A	A	A	A																						
472	4700	A	A	A	A		A	A	A	A	A	A	A																						
562	5600	A	A	A	A		A	A	A	A	A	A	A																						
682	6800	A	A	A	A		A	A	A	A	A	A	A																						
822	8200	A	A	A	A		A	A	A	A	A	A	A																						
103	Cap 0.01	A	A	A	A		A	A	A	A	A	A	A																						
123	(F) 0.012	A	A				A	A	A	A	A																								
153	0.015	A	A				A	A	A	A	A																								
183	0.018	A	A				A	A	A	A	A																								
223	0.022	A	A				A	A	A	A	A																								
273	0.027	A	A				A	A	A	A	B																								
333	0.033	A	A				A	A	A	A	B																								
393	0.039						A	A	A	A	B																								
473	0.047						A	A	A	A	B																								
563	0.056						A	A	A	A	B																								
683	0.068						A	A	A	A	B																								
823	0.082						A	A	A	A	B																								
104	0.1						A	A	A	A	B																								
124	0.12						A	B	B	B																									
154	0.15						A	B	B	B																									
224	0.22						A	B	B	B	B																								
334	0.33						B	B	B	B																									
474	0.47						B	B	B	B																									
684	0.68																																		
105	1.0																																		
155	1.5																																		
225	2.2																																		
335	3.3																																		
475	4.7																																		
106	10																																		
226	22																																		
WVDC		10v	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	200V	250V	6.3V	10V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	50V	100V	25V	50V	100V	200V	250V	500V
Size		0402				0603				0805				1206				1210				1812				2220									

*The dimensions are:
Length (mm) 3.2 ± 0.4
Width (mm) 1.6 ± 0.3

Case Size	0402 (KAF05)	0603(KAF15)		0805(KAF21)		1206(KAF31)		1210(KAF32)		1812(KAF43)		2220(KAF55)	
Thickness Letter	A	A	B	B	K	A	B	N	E	G	H	Q	C
Max Thickness(mm)	0.56	0.90	0.95	0.94	1.40	1.45	0.94	1.27	1.52	1.78	1.9	0.94	1.27
Carrier Tape	PAPER	PAPER	PAPER	PAPER	EMB	EMB	PAPER	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	H	T	T	T	U	U	T	U	U	U	U	U	U
Packaging Code 13"reel	N	M	M	M	L	L	M	L	L	L	L	L	S
PAPER							EMBOSS (EMB)						



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

Automotive MLCC with FLEXITERM® - X7R, 630V to 3000V

Capacitance Range



Case Size		1206					1210				1808						1812						2220				
Soldering		Reflow/Wave					Reflow/Wave				Reflow Only						Reflow Only						Reflow Only				
(L) Length	mm (in.)	3.2 ± 0.2 (0.126 ± 0.008)					3.2 ± 0.2 (0.126 ± 0.008)				4.57 ± 0.25 (0.18 ± 0.01)						4.5 ± 0.3 (0.177 ± 0.012)						5.7 ± 0.5 (0.224 ± 0.02)				
(W) Width	mm (in.)	1.6 ± 0.2 (0.063 ± 0.008)					2.5 ± 0.2 (0.098 ± 0.008)				2.03 ± 0.25 (0.08 ± 0.01)						3.2 ± 0.2 (0.126 ± 0.008)						5 ± 0.4 (0.197 ± 0.016)				
(t) Terminal	mm max	0.5 ± 0.25 (0.02 ± 0.01)					0.5 ± 0.25 (0.02 ± 0.01)				0.61 ± 0.36 (0.024 ± 0.014)						0.61 ± 0.36 (0.024 ± 0.014)						0.64 ± 0.39 (0.025 ± 0.015)				
Voltage (V)		630	1000	1500	2000	2500	630	1000	1500	2000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	3000
Cap (pF)	101 100	B	B	B	B	B																					
	121 120	B	B	B	B	B																					
	151 150	B	B	B	B	B																					
	181 180	B	B	B	B	B																					
	221 220	B	B	B	B	B					B	B	B	B	B	B											
	271 270	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B											
	331 330	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E										
	391 390	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E										
	471 470	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E	E	E	E	E	E					
	561 560	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E	E	E	E	E	E					
	681 680	B	B	B	B	B	H	H	H	H	B	B	B	B	B	B	E	E	E	E	E	E					
	821 820	B	B	B	B	B	H	H	H	H	B	B	C	C	C	C	E	E	E	E	E	E					
	102 1000	B	B	B	B	B	H	H	H	H	B	B	C	C	C	C	E	E	E	E	E	E	Z	Z	Z	Z	C
	122 1220	D	A	A	A		H	H	H	H							F	F	F	F	F		Z	Z	Z	Z	C
	152 1500	D	A	A	A		H	H	H	H							F	F	F	F	F		Z	Z	Z	Z	C
	182 1800	D	A	A			H	H	H	H							F	F	F	F	F		Z	Z	Z	Z	C
	222 2200	D	A	A			H	H	H	H							F	F	F	F	F		Z	Z	Z	Z	C
	272 2700	D	A	A			H	H	H	H							F	F	F	F			Z	Z	Z	Z	
	332 3300	D	A				H	H	H	H							F	F	F	F			Z	Z	Z	Z	
	392 3900	D	A				H	H	H								F	F	F	F			Z	Z	Z	Z	
	472 4700	D	A				H	H	H								F	F	J	J			Z	Z	Z	Z	
	562 5600	D	A				H	H	H								F	F	J	J			Z	Z	Z	Z	
	682 6800	A	A				H	H									F	F	J	J			Z	Z	Z	Z	
	822 8200	A					H	H									F	F	J	J			Z	Z	C	C	
	103 0.01	A					H	H									F	F	J				C	C	C	C	
	123 0.012						H	H									F	F	J				C	C	C	C	
	153 0.015						H	H									F	F	J				C	C	C	C	
	183 0.018						H										F	F					C	C	C	C	
	223 0.022						H										F	F					C	C	C	C	
	273 0.027						H										F	F					C	C	C		
	333 0.033																F						C	C			
	393 0.039																F						C	C			
	473 0.047																F						C	C			
	563 0.056																						C	C			
	683 0.068																						C	C			
	823 0.082																						C	C			
	104 0.1																						C	C			
	124 0.12																						C				
	154 0.15																						C				
	224 0.22																										
	334 0.33																										
	474 0.47																										
	684 0.68																										
	105 1																										
WVDC		630	1000	1500	2000	2500	630	1000	1500	2000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	3000
Size		1206					1210				1808						1812						2220				

NOTE: Contact factory for non-specified capacitance values

Case Size	1206(KAF31)			1210(KAF32)		1808(KAF42)		1812(KAF43)			2220(KAF55)	
Thickness Letter	B	D	A	H	B	C	E	F	J	Z	C	
Max Thickness	0.94	1.45	1.80	1.80	1.80	2.21	1.80	2.21	2.80	2.21	2.80	
Carrier Tape	PAPER	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	
Packaging Code 7" reel	T	U	U	U	Y	Y	V	V	V	V	V	
Packaging Code 13" reel	M	L	L	L	K	K	S	S	S	S	S	
PAPER						EMBOSSED (EMB)						

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

KYOCERA AVX:

KAF15AR72A102KT	KAF15AR72A103JM	KAF15AR72A103KT	KAF15AR81H102KM	KAF15AR81H102KT
KAF21BR71H473KT	KAF21BR72A103KM	KAF21BR72D102KT	KAF21KR71E225KU	KAF21KR71H105KU
KAF21KR71H224KU	KAF21KR71H474MU	KAF21KR72A473KU	KAF21KR72A474KU	KAF31BR71H224KT
KAF31GR71E225KU	KAF31GR72A105KL	KAF31GR72A225KU	KAF31NR72A104KU	KAF32GR71H105KU
KAF32LR71E106KU	KAF32LR71H475KL	KAF55CR71H106KV	KAF55CR72A475KV	KAF15BR71E224KT
KAF21KR71H225KU	KAF31GR71C106KU	KAF32LL81E106KU	KAF32LL81H475KU	KAF05AR71C333KH
KAF05AR71E103KH	KAF05AR71H102KH	KAF05AR71H331KH	KAF05AR71H332KH	KAF05AR71H472KH
KAF15AL81H104KT	KAF15AR71C104JT	KAF15AR71C104KM	KAF15AR71C104KT	KAF15AR71E104KM
KAF15AR71E104KT	KAF15AR71E473KM	KAF15AR71E473KT	KAF15AR71H104JM	KAF15AR71H104JT
KAF15AR71H104KM	KAF15AR71H104KT	KAF15AR71H104MT	KAF15AR71H153KT	KAF15AR71H183KT
KAF15AR71H223JT	KAF15AR71H223KM	KAF15AR71H223KT	KAF15AR71H273JM	KAF15AR71H273JT
KAF15AR71H332JT	KAF15AR71H332KT	KAF15AR71H333JT	KAF15AR71H333KT	KAF15AR71H472KM
KAF15AR71H472KT	KAF15AR71H472MT	KAF15AR71H473JT	KAF15AR71H473KM	KAF15AR71H473KT
KAF15AR71H562KT	KAF15AR71H683KM	KAF15AR71H683KT	KAF15AR71H823KT	KAF15AR72A102JT
KAF15AR72A102KM	KAF15AR72A102MT	KAF15AR72A103JT	KAF15AR72A103KM	KAF15AR72A103MT
KAF15AR72A152KT	KAF15AR72A182KT	KAF15AR72A182MT	KAF15AR72A222JT	KAF15AR72A222KM
KAF15AR72A222KT	KAF15AR72A222MT	KAF15AR72A223KT	KAF15AR72A332JT	KAF15AR72A332KT
KAF15AR72A392KT	KAF15AR72A472KM	KAF15AR72A472KT	KAF15AR72A562KT	KAF15AR72A682KT
KAF15AR72D102KT	KAF15AR81E683JT	KAF15AR81H103KM	KAF15AR81H103KT	KAF15AR81H152KT
KAF15AR81H331KM	KAF15AR81H331KT	KAF15AR81H472JT	KAF15AR81H473JT	KAF15AR81H473KT