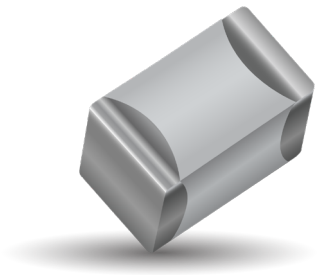
General Purpose MLCC with FLEXITERM®, KGF Series

General Specifications



GENERAL DESCRIPTION

With increased Industry requirements 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 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".

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

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.

HOW TO ORDER

KGF	15	A	R7	1H	103	K	T
Series	**Size**	**Thickness**	**Dielectric**	**Voltage**	**Capacitance Code Code (in pF)**	**Capacitance Tolerance**	**Packaging**
General Purpose FLEXITERM®	05 = 0402 15 = 0603 21 = 0805 31 = 1206 32 = 1210 42 = 1808 43 = 1812 44 = 1825 55 = 2220 56 = 2225 91 = 3640	See Cap Chart	C0G=CG X7R= R7 X8R=R8 X8L=L8	1C = 16V 1E = 25V 1H = 50V 2A = 100V 2D = 200V 2E = 250V 2H = 500V 2J = 630V 3A = 1000V 3N = 1500V 3D = 2000V 3E = 2500V 3U = 3000V 3G = 4000V 3H = 5000V	2 Significant Digits +Number of zeros eg. 10µF = 106 10nF = 103 47pF = 470	B = ± 0.1pF(<10pF)* C = ± 0.25pF(<10pF)* D = ± 0.5pF(<10pF)* G = ±2%* F = ±1%* J = ±5% K = ±10% M = ±20% * COG ONLY	See Table Below

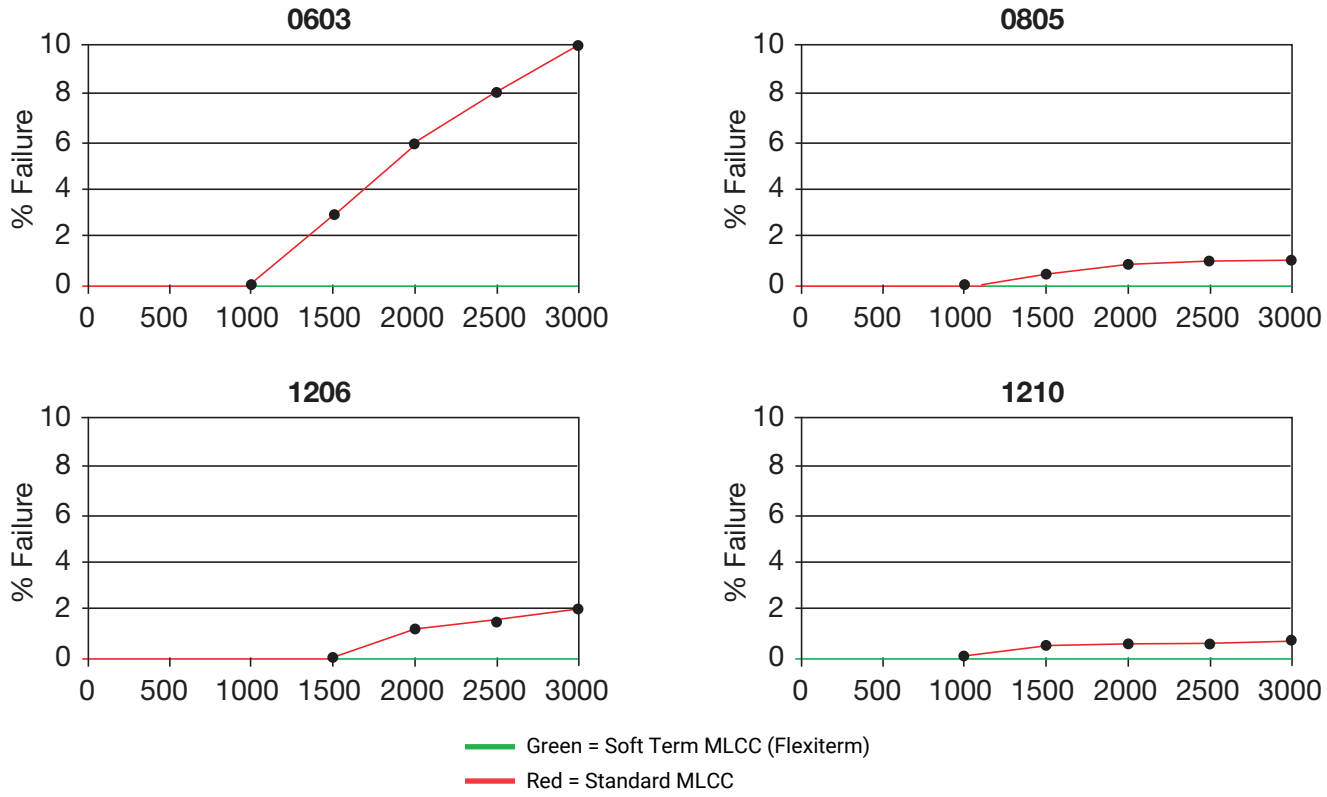
RoHS COMPLIANT

PACKAGING CODES

Code	EIA (inch)	IEC(mm)	7" Paper	7" Embossed	13" Paper	13"Embossed
05	0402	1005	H		N	
15	0603	1608	T		M	
21	0805	2012	T	U	M	L
31	1206	3216	T	U	M	L
32	1210	3225		U		L
42	1808	4520		Y		K
43	1812	4532		V		S
44	1825	4564		V		S
55	2220	5750		V		S
56	2225	5763		V		S

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BEYOND 1000 CYCLES: TEMPERATURE CYCLE TEST RESULTS

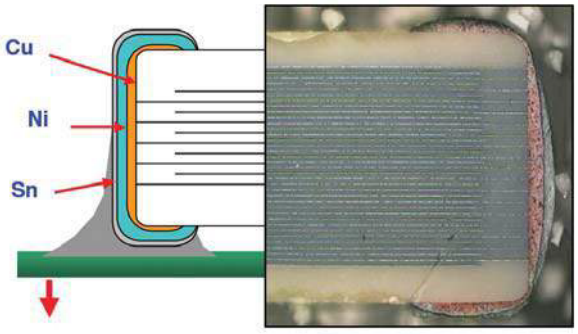


Soft Term - No Defects up to 3000 cycles

FLEXITERM® TEST SUMMARY

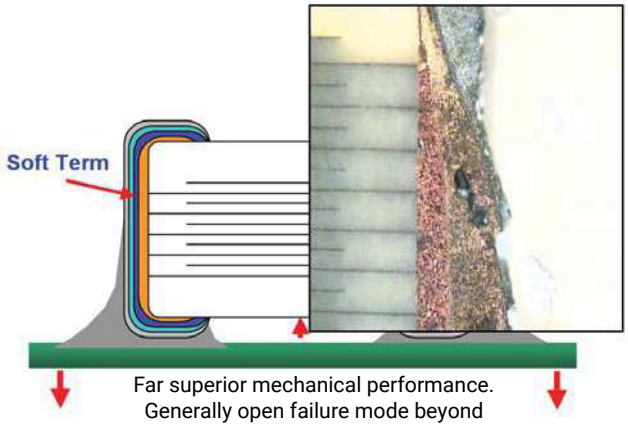
- FLEXITERM® provides improved performance compared to standard termination systems.
- Board bend test improvement by a factor of 2 to 4 times.
- Temperature Cycling:

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

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General Purpose MLCC with FLEXITERM® - NP0, 25V to 500V

Capacitance Range

NP0

C0G (NP0) ceramics offer one of the most stable capacitor dielectrics available. Capacitance change with temperature is 0 ±30ppm/°C which is less than ±0.3% C from -55°C to +125°C.

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

Case Size	0603(KGF15)		0805(KGF21)	1206(KGF31)	1210(KGF32)		
Thickness Letter	A	B	B	G	G	K	L
Max Thickness (mm)	0.90	0.95	0.94	1.78	1.78	2.29	2.80
Carrier Tape	PAPER	PAPER	PAPER	EMB	EMB	EMB	EMB
Packaging Code 7"reel	H	T	T	U	U	U	U
Packaging Code 13"reel	N	M	M	L	L	L	L
	PAPER			EMBOSSED(EMB)			

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General Purpose MLCC with FLEXITERM® - NP0, 630V to 5000V

Capacitance Range

SIZE		0805		1206				1210				1808							1812						
Soldering		Reflow/Wave		Reflow/Wave				Reflow Only				Reflow Only							Reflow Only						
(L) Length	mm	2.10 ± 0.20		3.30 ± 0.30				3.30 ± 0.40				4.60 ± 0.50							4.60 ± 0.50						
	(in.)	(0.083 ± 0.008)		(0.130 ± 0.012)				(0.130 ± 0.016)				(0.181 ± 0.020)							(0.181 ± 0.020)						
(W) Width	mm	1.25 ± 0.20		1.60 ± 0.30/-0.10				2.50 ± 0.30				2.00 ± 0.20							3.20 ± 0.30						
	(in.)	(0.049 ± 0.008)		(0.063 ± 0.012/-0.004)				(0.098 ± 0.012)				(0.079 ± 0.008)							(0.126 ± 0.012)						
(t) Terminal	mm	0.50 ± 0.20		0.60 ± 0.20				0.75 ± 0.35				0.75 ± 0.35							0.75 ± 0.35						
	(in.)	(0.020 ± 0.008)		(0.024 ± 0.008)				(0.030 ± 0.014)				(0.030 ± 0.014)							(0.030 ± 0.014)						
WVDC		630	1000	630	1000	1500	2000	630	1000	1500	2000	630	1000	1500	2000	2500	3000	4000	630	1000	1500	2000	2500	3000	4000
Cap (pF) 1.5	1R5	Z		B	B	B	B																		
1.8	1R8	Z		B	B	B	B																		
2.2	2R2	Z		B	B	B	B																		
2.7	2R7	Z		B	B	B	B						A	A	A	A	A								
3.3	3R3	Z		B	B	B	B						A	A	A	A	A								
3.9	3R9	Z		B	B	B	B						A	A	A	A	A								
4.7	4R7	Z		B	B	B	B						A	A	A	A	A								
5.6	5R6	Z		B	B	B	B						A	A	A	A	A								
6.8	6R8	Z		B	B	B	B						A	A	A	A	A								
8.2	8R2	Z		B	B	B	B						A	A	A	A	A								
10	100	Z	A	B	B	B	B	E	E	E	E	A	A	A	A	A	A	A	B	B	B	B	B	B	E
12	120	Z	A	B	B	B	B	E	E	E	E	A	A	A	A	A	A	A	B	B	B	B	B	B	E
15	150	Z	A	B	B	B	B	E	E	E	E	A	A	A	A	A	A	A	B	B	B	B	B	B	E
18	180	Z	A	B	B	B	B	E	E	E	E	A	A	A	A	A	A	A	B	B	B	B	B	B	E
22	220	Z	A	B	B	B	B	E	E	E	E	A	A	A	A	A	A	B	B	B	B	B	B	B	E
27	270	Z	A	B	B	B	B	E	E	E	E	A	A	A	A	A	A	B	B	B	B	B	B	B	E
33	330	Z	A	B	B	D	D	E	E	E	E	A	A	A	A	A	A	C	B	B	B	B	B	B	E
39	390	Z	A	B	B	D	D	E	E	E	E	A	A	A	A	A	A	C	B	B	B	B	B	B	E
47	470	Z	A	B	D	D	D	E	E	E	E	A	A	A	A	A	A	C	B	B	B	B	B	B	E
56	560	Z	A	B	D	D	D	E	E	E	E	A	A	A	A	A	A		B	B	B	B	B	B	F
68	680	Z	A	B	D	D	D	E	E	E	E	A	A	A	A	A	A		B	B	B	B	B	B	F
82	820	B	A	B	D	D	D	E	E	E	E	A	A	A	A	A	A		B	B	B	B	B	B	F
100	101	B	A	B	D	D	D	E	E	E	E	A	A	A	A	C	C		B	B	B	B	B	B	J
120	121	A	A	B	D	A	A	E	E	E	E	A	A	A	A	C	C		B	B	B	B	B	B	J
150	151	A	A	B	D	A	A	E	E	H	H	A	A	C	C	C	C		B	B	B	B	B	B	J
180	181	A	A	B	A	A	A	E	H	H	H	A	A	C	C	C	C		B	B	B	B	F	F	
220	221	A		B	A	A	A	E	H	H	H	A	A	C	C	C	C		B	B	B	B	F	F	
270	271	A		D	A	A	A	E	H	H	H	A	A	C	C	C	C		B	B	B	B	F	F	
330	331	A		D	A	A	A	E	H	H	H	A	C	C	C	C	C		B	B	F	F	F	F	
390	391	A		D	A	A	A	E	H	H	H	A	C	C	C	C	C		B	B	F	F	F	F	
470	471	A		D	A	A	A	E	H	H	H	A	C	C	C	C	C		B	F	F	F	F	F	
560	561	A		D	A			E	H	H	H	A	C	C	C				B	F	F	F	F	F	
680	681	A		D	A			E	H	H	H	A	C	C	C				B	F	F	F	J	J	
750	751	A		A	A			E	H	H	H	A	C	C	C				B	F	F	F	J	J	
820	821	A		A	A			E	H	H	H	A	C	C	C				B	F	F	F	J	J	
1000	102			A	A			E	H	J	J	A	C	C	C				B	F	F	F	J	J	
1200	122			A				E	H	J	J	B	C	C	C				B	F	F	F			
1500	152			A				E	J	L	L	B	C						B	F	F	F			
1800	182			A				E	L	L	L	B	C						B	F	F	F			
2200	222			A				E	L			B							B	F	J	J			
2700	272			A				E	L			B							B	F	J	J			
3300	332			A				E	L			B							B	F					
3900	392			G				E	L			B							B	F					
4700	472			G				E	G			B							B	J					
5600	562			G				H	G			B							B						
6800	682			G				H	G			C							B						
8200	822			G				J	G										F						
Cap (µF) 0.01	103			G				J	L										F						
0.012	123							J											F						
0.015	153							L											J						
0.018	183							L											J						
0.022	223							L																	
0.033	333							L																	
0.047	473																								
0.056	563																								
0.068	683																								
0.1	104																								
WVDC		630	1000	630	1000	1500	2000	630	1000	1500	2000	630	1000	1500	2000	2500	3000	4000	630	1000	1500	2000	2500	3000	4000
SIZE		0805		1206				1210				1808							1812						

Case Size	0805(KGF21)			1206(KGF31)				1210(KGF32)					1808(KGF42)			1812(KGF43)			
Thickness Letter	Z	B	A	B	D	G	A	E	G	H	J	L	A	B	C	B	E	F	J
Max Thickness (mm)	0.85	0.94	1.45	0.94	1.45	1.78	1.80	1.45	1.78	1.80	2.21	2.80	1.45	1.80	2.21	1.45	1.80	2.21	2.80
Carrier Tape	PAPER	PAPER	EMB	PAPER	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	T	T	U	T	U	U	U	U	U	U	U	U	Y	Y	Y	V	V	V	V
Packaging Code 13"reel	M	M	L	M	L	L	L	L	L	L	L	L	K	K	K	S	S	S	S
	PAPER			EMBOSSED(EMB)															

General Purpose MLCC with FLEXITERM® - NP0, 630V to 5000V

Capacitance Range

SIZE		1825							2220								2225							
Soldering		Reflow Only							Reflow Only								Reflow Only							
(L) Length	mm	4.60 ± 0.50							5.70 ± 0.50								5.70 ± 0.50							
	(in.)	(0.181 ± 0.020)							(0.224 ± 0.020)								(0.224 ± 0.020)							
(W) Width	mm	6.30 ± 0.40							5.00 ± 0.40								6.30 ± 0.40							
	(in.)	(0.248 ± 0.016)							(0.197 ± 0.016)								(0.248 ± 0.016)							
(t) Terminal	mm	0.75 ± 0.35							0.85 ± 0.35								0.85 ± 0.35							
	(in.)	(0.030 ± 0.014)							(0.033 ± 0.014)															
WVDC		630	1000	1500	2000	2500	3000	4000	630	1000	1500	2000	2500	3000	4000	5000	630	1000	1500	2000	2500	3000	4000	5000
Cap (pF) 1.5	1R5																							
1.8	1R8																							
2.2	2R2																							
2.7	2R7																							
3.3	3R3																							
3.9	3R9																							
4.7	4R7																							
5.6	5R6																							
6.8	6R8																							
8.2	8R2																							
10	100	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D
12	120	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D
15	150	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D
18	180	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D
22	220	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D
27	270	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D
33	330	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D
39	390	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	D
47	470	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	G
56	560	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	G
68	680	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	G
82	820	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	D	G
100	101	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	G	G
120	121	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	G	G
150	151	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	G	G
180	181	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	G	G
220	221	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	D	D	G	G
270	271	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z			D	D	D	D	D	D	G	G
330	331	C	C	C	C	C	C	C	Z	Z	Z	Z	Z	Z			D	D	D	D	D	D	G	
390	391	C	C	C	C	C	C		Z	Z	Z	Z	Z	Z			D	D	D	D	D	D	G	
470	471	C	C	C	C	C	C		Z	Z	Z	Z	Z	Z			D	D	D	D	D	D	G	
560	561	C	C	C	C	C	C		Z	Z	Z	Z	Z	Z			D	D	D	D	D	D	G	
680	681	C	C	C	C	C	C		Z	Z	Z	Z	Z	Z			D	D	D	D	D	D		
750	751	C	C	C	C	C	C		Z	Z	Z	Z	Z	Z			D	D	D	D	D	D		
820	821	C	C	C	C	C	C		Z	Z	Z	Z	Z	Z			D	D	D	D	D	D		
1000	102	C	C	C	C	C	C		Z	Z	Z	Z	Z	Z			D	D	D	D	D	D		
1200	122	C	C	C	C	F	F		Z	Z	Z	Z	C	C			D	D	D	D	D	D		
1500	152	C	C	C	C	F	F		Z	Z	Z	Z	C	C			D	D	D	D	D	D		
1800	182	C	C	C	C	F	F		Z	Z	Z	Z	C	C			D	D	D	D	G	G		
2200	222	C	C	F	F				Z	Z	C	C					D	D	D	D				
2700	272	C	C	F	F				Z	Z	C	C					D	D	D	D				
3300	332	C	C	F	F				Z	Z	C	C					D	D	D	D				
3900	392	C	C	F	F				Z	Z	C	C					D	D	G	G				
4700	472	C	C	F	F				Z	C	C	C					D	D	G	G				
5600	562	C	C	F	F				Z	C							D	D	G	G				
6800	682	C	C						Z	C							D	D	G	G				
8200	822	F	F						C	C							G	G						
Cap (µF) 0.01	103																G	G						
0.012	123																G							
0.015	153																G							
0.018	183																G							
0.022	223																G							
0.033	333																G							
0.047	473																G							
0.056	563																G							
0.068	683																G							
0.1	104																							
WVDC		630	1000	1500	2000	2500	3000	4000	630	1000	1500	2000	2500	3000	4000	5000	630	1000	1500	2000	2500	3000	4000	5000
SIZE		1825							2220								2225							

Case Size	1825(KGF44)		2220(KGF55)		2225(KGF56)	
Thickness Letter	C	F	Z	C	D	G
Max Thickness (mm)	2.21	2.80	2.21	2.80	2.21	2.80
Carrier Tape	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	V	V	V	V	V	V
Packaging Code 13"reel	S	S	S	S	S	S
	EMBOSSED(EMB)					

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General Purpose MLCC with FLEXITERM® - X8R/X8L

Capacitance Range

X8R

X8R material has capacitance variation of ± 15% between -55°C and +150°C. The X8L material has capacitance variation of ±15% between -55°C to 125°C to 125°C and +15/40% from +125°C to +150°C.

SIZE		0402	0603			0805			1206		
Soldering		Reflow/Wave	Reflow/Wave			Reflow/Wave			Reflow/Wave		
(L) Length	mm	1.0 ± 0.2	1.6 ± 0.15			2.01 ± 0.2			3.2 ± 0.2		
	(in.)	(0.04 ± 0.008)	(0.063 ± 0.006)			(0.079 ± 0.008)			(0.126 ± 0.008)		
(W) Width	mm	0.5 ± 0.2	0.81 ± 0.15			1.25 ± 0.2			1.6 ± 0.2		
	(in.)	(0.02 ± 0.008)	(0.032 ± 0.006)			(0.049 ± 0.008)			(0.063 ± 0.008)		
(t) Terminal	mm	0.25 ± 0.15	0.35 ± 0.15			0.5 ± 0.25			0.5 ± 0.25		
	(in.)	(0.01 ± 0.006)	(0.014 ± 0.006)			(0.02 ± 0.01)			(0.02 ± 0.01)		
WVDC		**50V**	**25V**	50V	100V	**25V**	50V	100V	**25V**	50V	100V
271	Cap 270	A	A	A	A						
331	(pF) 330	A	A	A	A	B	B	B			
471	470	A	A	A	A	B	B	B			
681	680	A	A	A	A	B	B	B			
102	1000	A	A	A	A	B	B	B	B	B	B
152	1500	A	A	A	A	B	B	B	B	B	B
182	1800	A	A	A	A	B	B	B	B	B	B
222	2200	A	A	A	A	B	B	B	B	B	B
272	2700	A	A	A	A	B	B	B	B	B	B
332	3300	A	A	A	A	B	B	B	B	B	B
392	3900	A	A	A	A	B	B	B	B	B	B
472	4700	A	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	A	B	B	B
183	0.018		A	A		B	B	A	B	B	B
223	0.022		A	A		B	B	A	B	B	B
273	0.027		A	A		B	B		B	B	B
333	0.033		A	A		B	B		B	B	B
393	0.039		A	A		B	B		B	B	B
473	0.047		A	A		B	B		B	B	B
563	0.056		A			A	A		N	N	N
683	0.068		A			A	A		N	N	N
823	0.082					A	A		N	N	N
104	0.1					A	A		N	N	N
124	0.12					A	A		N	N	N
154	0.15					A	A		N	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		50V	25V	50V	100V	25V	50V	100V	25V	50V	100V
SIZE		0402	0603			0805			1206		

Case Size	0402(KGF05)	0603(KGF15)		0805(KGF21)		1206(KGF31)				1210(KGF32)	2220(KGF55)
Thickness Letter	A	A	B	B	A	B	N	E	G	L	C
Max Thickness	0.56	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	PAPER	EMB	PAPER	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	H	T	T	T	U	T	U	U	U	U	V
Packaging Code 13"reel	N	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			2.01 ± 0.2			3.2 ± 0.2				3.2 ± 0.2				5.7 ± 0.5	
	(in.)	(0.063 ± 0.006)			(0.079 ± 0.008)			(0.126 ± 0.008)				(0.126 ± 0.008)				(0.224 ± 0.02)	
(W) Width	mm	0.81 ± 0.15			1.25 ± 0.2			1.6 ± 0.2				2.5 ± 0.2				5 ± 0.4	
	(in.)	(0.032 ± 0.006)			(0.049 ± 0.008)			(0.063 ± 0.008)				(0.098 ± 0.008)				(0.197 ± 0.016)	
(t) Terminal	mm	0.35 ± 0.15			0.5 ± 0.25			0.5 ± 0.25				0.5 ± 0.25				0.64 ± 0.39	
	(in.)	(0.014 ± 0.006)			(0.02 ± 0.01)			(0.02 ± 0.01)				(0.02 ± 0.01)				(0.025 ± 0.015)	
WVDC		**25V**	**50V**	100V	25V	**50V**	100V	16V	**25V**	50V	100V	10V	25V	50V	100V	200V	250V
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							
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	A	B	B	B		B	B	B						
153	0.015	A	A	A	B	B	B		B	B	B						
183	0.018	A	A	A	B	B	B		B	B	B						
223	0.022	A	A	A	B	B	B		B	B	B						
273	0.027	A	A	A	B	B	B		B	B	B						
333	0.033	A	A	B	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	B	N						
184	0.18				A	A		B	B	B	G						
224	0.22				A	A		B	B	B	G						
274	0.27				A			B	N	N							
334	0.33				A			B	N	E							
394	0.39				A			N	N	E							
474	0.47				A			N	N	E							
684	0.68				A			N	G	G							
824	0.82				A			N	G	G							
105	**1**				**A**			**N**	**G**	**G**							
155	1.5				A			G	G	G							
225	2.2				A			G	G	G				L	L	C	C
475	4.7							G	G					L			
106	10											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**	

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General Purpose MLCC with FLEXITERM® - X7R , 4V to 500V

Capacitance Range

X7R

The **X7R** dielectric is the most popular of the intermediate EIA class II materials due to its relative temperature stability. While the capacitance change is non-linear, temperature variation is within ±15% from - 55°C to + 125°C.

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	1 ± 0.1					1.6 ± 0.15								2.01 ± 0.2								3.2 ± 0.2							3.2 ± 0.2						4.5 ± 0.3		5.7 ± 0.5					
	(in.)	(0.04 ± 0.004)					(0.063 ± 0.006)								(0.079 ± 0.008)								(0.126 ± 0.008)							(0.126 ± 0.008)						(0.177 ± 0.012)		(0.224 ± 0.02)					
(W) Width	mm	0.5 ± 0.1					0.81 ± 0.15								1.25 ± 0.2								1.6 ± 0.2							2.5 ± 0.2						3.2 ± 0.2		5 ± 0.4					
	(in.)	(0.02 ± 0.004)					(0.032 ± 0.006)								(0.049 ± 0.008)								(0.063 ± 0.008)							(0.098 ± 0.008)						(0.126 ± 0.008)		(0.197 ± 0.016)					
(t) Terminal	mm	0.25 ± 0.15					0.35 ± 0.15								0.5 ± 0.25								0.5 ± 0.25							0.5 ± 0.25						0.61 ± 0.36		0.64 ± 0.39					
	(in.)	(0.01 ± 0.006)					(0.014 ± 0.006)								(0.02 ± 0.01)								(0.02 ± 0.01)							(0.02 ± 0.01)						(0.024 ± 0.014)		(0.025 ± 0.015)					
WVDC		4V	6.3V	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	50V	100V	25V	50V	100V	200V	250V	500V
101	100																																C	G									
221	220			A	A	A																											C	G									
271	270			A	A	A																											C	G									
331	330			A	A	A																											C	G									
391	390			A	A	A																											C	G									
471	470			A	A	A																											C	G									
561	560			A	A	A																											C	G									
681	680			A	A	A																											C	G									
821	820			A	A	A																											C	G									
102	1000			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
122	1200			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
152	1500			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
182	1800			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
222	2200			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
272	2700			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
332	3300			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
392	3900			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
472	4700			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
562	5600			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
682	6800			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
822	8200			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	B	Q	Q	Q	Q	C	G	Y	Y						
103	Cap 0.01			A	A	A		A	A	A	A	A	A	A			B	B	B	B	B	B	B	B	B	B	B	B	G	Q	Q	Q	Q	C	G	Y	Y						
123	(F) 0.012			A				A	A	A	A	A					B	B	B	B	B	K	B	B	B	B	B	B		Q	Q	Q	Q	C	G	Y	Y						
153	0.015			A				A	A	A	A	A					B	B	B	B	B	K	B	B	B	B	B	B		Q	Q	Q	Q	C	G	Y	Y						
183	0.018			A				A	A	A	A	A					B	B	B	B	K	K	B	B	B	B	B	B		Q	Q	Q	Q	C	G	Y	Y						
223	0.022			A				A	A	A	A	A					B	B	B	B	K	K	B	B	B	B	G	G		Q	Q	Q	Q	C	G	Y	Y						
273	0.027			A				A	A	A	A	B					B	B	B	B	K	K	B	B	B	B	G	G		Q	Q	Q	Q	C	G	Y	Y						
333	0.033			A				A	A	A	A	B					B	B	B	K	K	K	B	B	B	B	G	G		Q	Q	Q	Q	C	G	Y	Y						
393	0.039							A	A	A	A	B					B	B	B	K	K	K	B	B	B	B	G	G		Q	Q	Q	Q	C	G	Y	Y						
473	0.047							A	A	A	A	B					B	B	B	K	K	K	B	B	B	N	G	G		Q	Q	Q	Q	C	G	Y	Y						
563	0.056							A	A	A	A	B					B	B	B	K			B	B	B	N	G	G		Q	Q	Q	Q	C	G	Y	Y						
683	0.068							A	A	A	A	B					B	B	B	K			B	B	B	N	G	G		Q	Q	Q	Q	C	G	Y	Y						
823	0.082							A	A	A	A	B					B	B	B	K			B	B	B	N	G	G		Q	Q	Q	Q	G	G	Y	Y						
104	0.1							A	A	A	A	B					B	B	B	K			B	B	B	N	G	G		Q	Q	Q	Q	G	G	Y	Y						A
124	0.12							A	B	B							B	B	K	K			B	B	B	N	G	G		Q	Q	Q	F	G	G	Y	Y						
154	0.15							A	B	B							B	B	K	K			B	B	B	N	G	G		Q	Q	Q	F	G	G	Y	Y						
224	0.22							A	B	B							J	K	K	K			B	B	B	G	G	G		Q	Q	Q	F	G	G	Z	Z						
334	0.33																K	K	K	K			B	N	E	G	G	G		Q	Q	Q	G	L	L	G	G						
474	0.47																K	K	K	K			N	N	E	G				F	F	F	G			G	G						
684	0.68																K	K	K	K			N	G	G	G				F	F	G	K			G	G						
105	1.0																K	K	K	K			N	G	G	G				F	G	G	L			G	G		C	C	A	A	
155	1.5																K	K	K				G	G	G	G				F	G	L	L			G	G		C	C	C	C	
225	2.2																K	K	K				G	G	G	G				L	L	L	L			J	J		C	C	C	C	
335	3.3																						G	G	G					K	L	L	L			J			C	C				
475	4.7																						G	G	G					K	L	L	L			J			C	C				
106	10																						H	H*						L	L	L				J		C	C	C				
226	22																																					C						
WVDC		4V	6.3V	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	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(KGF05)		0603(KGF15)			0805(KGF21)				1206(KGF31)					1210(KGF32)							1812(KGF43)				2220(KGF55)		
Thickness Letter	A	C	A	B	C	B	J	K	A	B	N	E	G	H	Q	B	C	F	G	K	L	Y	Z	G	J	A	C	G
Max Thickness(mm)	0.56	0.70	0.90	0.95	1.00	0.94	1.27	1.40	1.45	0.94	1.27	1.52	1.78	1.9	0.94	1.02	1.27	1.52	1.78	2.29	2.80	1.02	1.27	2.29	2.80	2.29	2.80	3.1
Carrier Tape	PAPER	PAPER	PAPER	PAPER	PAPER	PAPER	EMB	EMB	EMB	PAPER	EMB	EMB	EMB	EMB	PAPER	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	H	H	T	T	T	T	U	U	U	T	U	U	U	U	T	U	U	U	U	U	U	V	V	V	V	V	V	V
Packaging Code 13"reel	N	N	M	M	M	M	L	L	L	M	L	L	L	L	M	L	L	L	L	L	L	S	S	S	S	S	S	S
	PAPER														EMBOSSED (EMB)													

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General Purpose MLCC with FLEXITERM® - X7R, 630V to 5000V

Capacitance Range

SIZE		0805		1206					1210				1808						1812					
Soldering		Reflow/Wave		Reflow/Wave					Reflow Only				Reflow Only						Reflow Only					
(L) Length	mm	2.10 ± 0.20		3.30 ± 0.30					3.30 ± 0.40				4.60 ± 0.50						4.60 ± 0.50					
	(in.)	(0.083 ± 0.008)		(0.130 ± 0.012)					(0.130 ± 0.016)				(0.181 ± 0.020)						(0.181 ± 0.020)					
(W) Width	mm	1.25 ± 0.20		1.60 +0.30/-0.10					2.50 ± 0.30				2.00 ± 0.20						3.20 ± 0.30					
	(in.)	(0.049 ± 0.008)		(0.063 +0.012/-0.004)					(0.098 ± 0.012)				(0.079 ± 0.008)						(0.126 ± 0.012)					
(t) Terminal	mm	0.50 ± 0.20		0.60 ± 0.20					0.75 ± 0.35				0.75 ± 0.35						0.75 ± 0.35					
	(in.)	(0.020 ± 0.008)		(0.024 ± 0.008)					(0.030 ± 0.014)				(0.030 ± 0.014)						(0.030 ± 0.014)					
WVDC		630	1000	630	1000	1500	2000	2500	630	1000	1500	2000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000
Cap (pF) 100	101	B	A	D	A	A	A	A	H	H	H	H												
120	121	B	A	D	A	A	A	A	H	H	H	H												
150	151	B	A	D	A	A	A	A	H	H	H	H												
180	181	B	A	D	A	A	A	A	H	H	H	H												
220	221	B	A	D	A	A	A	A	H	H	H	H	B	B	B	B	B	B						
270	271	B	A	D	A	A	A	A	H	H	H	H	B	B	B	B	B	B	E	E	E	E		
330	331	B	A	D	A	A	A	A	H	H	H	H	B	B	B	B	B	C	E	E	E	E		
390	391	B	A	D	A	A	A	A	H	H	H	H	B	B	B	C	C	C	E	E	E	E		
470	471	B	A	D	A	A	A	A	H	H	H	H	B	B	B	C	C	C	E	E	E	E	E	E
560	561	B	A	D	A	A	A	A	H	H	H	H	B	B	B	C	C	C	E	E	E	E	E	E
680	681	B	A	D	A	A	A	A	H	H	H	H	B	B	B	C	C	C	E	E	E	E	F	F
750	751	B	A	D	A	A	A	A	H	H	H	H	B	B	B	C	C	C	E	E	E	E	F	F
820	821	B	A	D	A	A	A	A	H	H	H	H	B	B	B	C	C	C	E	E	E	E	F	F
1000	102	B	A	D	A	A	A	A	H	H	H	H	B	B	B	C	C	C	E	E	E	E	F	F
1200	122	B	A	D	A	A	A		H	H	H	H	B	B	B	C	C	C	F	F	F	F	F	F
1500	152	B	A	D	A	A	A		H	H	H	H	B	B	B	C	C	C	F	F	F	F	J	J
1800	182	B		D	A	A	A		H	H	H	H	B	B	B	C	C	C	F	F	F	F	J	J
2200	222	B		D	A	A	A		H	H	J	J	B	B	C	C	C		F	F	F	F	J	J
2700	272	B		D	A	A			H	H	J	L	B	B	C	C			F	F	F	F	J	J
3300	332	B		D	A				H	H	J	L	B	B	C	C			F	F	F	J	J	G
3900	392	B		D	A				H	H	L		B	B	C				F	F	F	J	J	G
4700	472	A		D	A				H	H	L		B	B	C				F	F	F	J	J	G
5600	562	A		D	A				H	H	L		B	B	C				F	F	J	J		
6800	682	A		D	A				H	H			B	B	C				F	F	J	J		
8200	822	A		D	A				H	H			B	B	C				F	F	J	J		
Cap(µF) 0.01	103	A		D	A				H	H			B	C	C				F	F	J	J		
0.015	153	A		A	A				H	H			C	C	C				F	F	J		G	
0.018	183	A		A					H	H			C	C	C				F	J	J			
0.022	223	A		A					H	H			C	C					F	J				
0.027	273			A					H				C	C					F	J				
0.033	333			A					H				C						F	J				
0.039	393								H				C						F	J				
0.047	473								H				C						F	J				
0.056	563								J				C						F					
0.068	683								J				C						F					
0.082	823								J										F					
0.1	104								J										F					
0.15	154																		J					
0.22	224																		J					
0.27	274																							
0.33	334																							
0.39	394																							
0.47	474																							
0.56	564																							
0.68	684																							
0.82	824																							
1	105																							
0.1	104																							
WVDC		630	1000	630	1000	1500	2000	2500	630	1000	1500	2000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000
SIZE		0805		1206					1210				1808						1812					

Case Size	0805(KGF21)		1206(KGF31)		1210(KGF32)			1808(KGF42)		1812(KGF43)		
Thickness Letter	B	A	D	A	H	J	L	B	C	E	F	J
Max Thickness (mm)	0.94	1.45	1.45	1.80	1.80	2.21	2.80	1.80	2.21	1.80	2.21	2.80
Carrier Tape	PAPER	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	U	U	U	U	U	U	U	Y	Y	V	V	V
Packaging Code 13"reel	L	L	L	L	L	L	L	K	K	S	S	S
	PAPER	EMBOSSED(EMB)										

General Purpose MLCC with FLEXITERM® - X7R, 630V to 5000V

Capacitance Range

SIZE		1825						2220						2225						3640							
Soldering		Reflow Only						Reflow Only						Reflow Only						Reflow Only							
(L) Length	mm	4.60 ± 0.50						5.70 0.50						5.70 ± 0.50						9.14 ± 0.25							
	(in.)	(0.181 0.020)						(0.224 0.020)						(0.224 ± 0.020)						(0.360 ± 0.010)							
(W) Width	mm	6.30 ± 0.40						5.00 0.40						6.30 ± 0.40						5.72 ± 0.25							
	(in.)	(0.248 ± 0.016)						(0.197 0.016)						(0.248 ± 0.016)						(0.225 ± 0.010)							
(t) Terminal	mm	0.75 ± 0.35						0.85 0.35						0.85 ± 0.35						0.76 (0.030)							
	(in.)	(0.030 ± 0.014)						(0.033 ± 0.014)						(0.033 ± 0.014)						1.52 (0.062)							
WVDC		630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	4000	5000
Cap (pF) 100	101																										
120	121																										
150	151																										
180	181																										
220	221																										
270	271																										
330	331																										
390	391																										
470	471																										
560	561																										
680	681																										
750	751																										
820	821																										
1000	102	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	D	D	A	A	A	A	A	A	A	A
1200	122	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	D	D	A	A	A	A	A	A	A	A
1500	152	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	D	D	A	A	A	A	A	A	A	A
1800	182	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	D	D	A	A	A	A	A	A	A	A
2200	222	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	D	D	A	A	A	A	A	A	A	A
2700	272	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	D	D	A	A	A	A	A	A	A	A
3300	332	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	D	D	A	A	A	A	A	A	A	A
3900	392	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	D	D	A	A	A	A	A	A	A	
4700	472	C	C	C	C	C	C	Z	Z	Z	Z	Z	C	D	D	D	D	G	G	A	A	A	A	A	A	A	
5600	562	C	C	C	C	F	F	Z	Z	Z	Z	Z	C	D	D	D	D	G	G	A	A	A	A	A	A	A	
6800	682	C	C	F	F	F	F	Z	Z	Z	Z	C	C	D	D	D	D	G	G	A	A	A	A	A	A	A	
8200	822	C	C	F	F	F	F	Z	Z	C	C	C	C	D	D	D	D	G	G	A	A	A	A	A	A		
Cap(µF) 0.01	103	C	C	F	F	F	F	Z	Z	C	C	C	C	D	D	D	D	G	G	A	A	A	A	A	A		
0.015	153	C	C	F	F	G		Z	Z	C	C	C		D	D	G	G	G	G	A	A	A	A	A	A		
0.018	183	C	C	F	F			Z	Z	D	D	C		D	D	G	G	G		A	A	A	A	A	A		
0.022	223	C	C	F	F			Z	Z	D	D			D	D	G	G	G		A	A	A	A	A			
0.027	273	C	C	G				Z	Z	D	D			D	D	G	G			A	A	A	A				
0.033	333	C	C	G				Z	Z	D				D	D	G	G			A	A	A					
0.039	393	C	C	G				Z	C	D				D	D	G				A	A	A					
0.047	473	C	C	G				Z	C	D				D	D	G				A	A	A					
0.056	563	C	C	G				Z	C	D				D	D	G				A	A	A					
0.068	683	C	F					Z	C					D	D	G				A	A	A					
0.082	823	C	F					Z	C					D	G					A							
0.1	104	C	F					Z	C					D	G					A							
0.15	154	C						Z	D					D	G					A							
0.22	224	C						Z	D					D						A							
0.27	274	C						Z	D					D						A							
0.33	334	C						Z	D					D						A							
0.39	394	C						Z	D					D						A							
0.47	474	C						Z	D					D						A							
0.56	564	F						C						D						A							
0.68	684							C						G													
0.82	824							D						G													
1	105							D						G													
0.1	104																										
WVDC		630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	4000	5000
SIZE		1825						2220						2225						3640							

Case Size	1825(KGF44)			2220(KGF55)			2225(KGF56)		3640(KGF91)
Thickness Letter	C	F	G	Z	C	D	D	G	A
Max Thickness (mm)	2.21	2.80	3.30	2.21	2.80	3.30	2.21	2.80	2.80
Carrier Tape	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	V	V	V	V	V	V	V	V	N/A
Packaging Code 13"reel	S	S	S	S	S	S	S	S	N/A
	EMBOSSED(EMB)								

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