

Surface Mount Multilayer Ceramic Chip Capacitor Solutions for Boardflex Sensitive Applications



FEATURES

- Surface mountable, precious metal technology, wet build process
- OMD-Cap (Open Mode Design) reduce the risk of short or low IR because of board flex cracks
- Efficient low-power consumption, ripple current capable to 1.2 A_{rms} at 100 kHz
- High Voltage breakdown compared to standard design
- Available with 100 % voltage condition, process code "5H" (Is available for 630 V and lower. Contact mlcc.specials@vishay.com for higher voltages.)
- Excellent reliability and thermal shock performance
- Available with polymer termination for increase resistance to board flex cracking
- Protective surface coating of high voltage capacitors maybe required to prevent surface arcing


RoHS
COMPLIANT

APPLICATIONS

- Ideal for Power Supplies
- Input filter capacitor

ELECTRICAL SPECIFICATIONS

Note: Electrical characteristics at + 25 °C unless otherwise stated
Protective surface coating of high voltage capacitors maybe required to prevent surface arcing. Input side filter.

Operating Temperature: - 55 °C to + 125 °C

Capacitance Range: 100 pF to 1.8 µF

Voltage Rating: 16 Vdc to 3000 Vdc

Temperature Coefficient of Capacitance (TCC):

X7R: ± 15 % from - 55 °C to + 125 °C, with 0 Vdc applied

Dissipation Factor:

6.3 V, 10 V ratings: 5 % max. at 1.0 V_{rms} and 1 kHz

16 V, 25 V ratings: 3.5 % max. at 1.0 V_{rms} and 1 kHz

50 V ratings: 2.5 % max. at 1.0 V_{rms} and 1 kHz

Aging Rate: 1 % maximum per decade

Insulation Resistance (IR):

At + 25 °C and rated voltage 100 000 MW minimum or 1000 WF, whichever is less

At + 125 °C and rated voltage 10 000 MW minimum or 100 WF, whichever is less

Dielectric Withstanding Voltage (DWV):

This is the maximum voltage the capacitors are tested for a 1 to 5 second period and the charge/discharge current does not exceed 50 mA

≤ 250 Vdc: DWV at 250 % of rated voltage

500 Vdc: DWV at 200 % of rated voltage

630 Vdc: DWV at 150 % of rated voltage

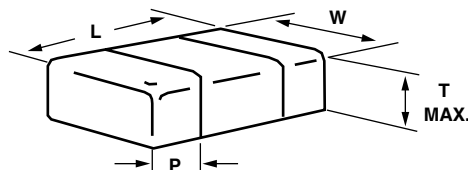
1000 Vdc: DWV at 150 % of rated voltage

1500 Vdc: DWV at 120 % of rated voltage

2000 Vdc: DWV at 120 % of rated voltage

3000 Vdc: DWV at 120 % of rated voltage

DIMENSIONS in inches [millimeters]



PART ORDERING NUMBER	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION PAD (P)	
				MINIMUM	MAXIMUM
VJ0805	0.126 ± 0.008 [2.00 ± 0.20]	0.049 ± 0.008 [1.25 ± 0.20]	0.057 [1.45]	0.010 [0.25]	0.028 [0.71]
VJ1206	0.126 ± 0.008 [3.20 ± 0.20]	0.063 ± 0.008 [1.60 ± 0.20]	0.067 [1.70]	0.010 [0.25]	0.028 [0.71]
VJ1210	0.126 ± 0.008 [3.20 ± 0.20]	0.098 ± 0.008 [2.50 ± 0.20]	0.067 [1.70]	0.010 [0.25]	0.028 [0.71]
VJ1808	0.180 ± 0.010 [4.57 ± 0.25]	0.080 ± 0.010 [2.03 ± 0.25]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]
VJ1812	0.177 ± 0.010 [4.50 ± 0.25]	0.126 ± 0.008 [3.20 ± 0.20]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]
VJ1825	0.177 ± 0.010 [4.50 ± 0.25]	0.252 ± 0.010 [6.40 ± 0.25]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]
VJ2220	0.220 ± 0.008 [5.59 ± 0.20]	0.200 ± 0.008 [5.08 ± 0.20]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]
VJ2225	0.220 ± 0.010 [5.59 ± 0.25]	0.250 ± 0.010 [6.35 ± 0.25]	0.086 [2.18]	0.010 [0.25]	0.030 [0.76]

ORDERING INFORMATION

VJ1210	Y	474	K	X	A	A	T	## (2)
CASE SIZE	DIELECTRIC	CAPACITANCE CODE	CAPACITANCE TOLERANCE	TERMINATION	DC VOLTAGE RATING (1)	MARKING	PACKAGING	PROCESS CODE
0805 1206 1210 1808 1812 1825 2220 2225	Y = X7R	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. Example: 474 = 470 000 pF	J = ± 5 % K = ± 10 % M = ± 20 %	X = Ni barrier 100 % tin plate matte finish F = AgPd B = Polymer 100 % tin plate matte finish	J = 16 X = 25 A = 50 V B = 100 V C = 200 V P = 250 V E = 500 V L = 630 V G = 1000 V R = 1500 V F = 2000 V H = 3000 V	A = Unmarked	T = 7" Reels R = 11 1/4" Reels B = Bulk W = Waffle tray	4X = OMD Cap 5H = OMD Cap 100 % voltage conditioning

Notes:

(1) DC voltage rating should not be exceeded in application

(2) Process code with 2 digits has to be added

Polymer plus termination "B" termination part number code length dimensions positive tolerances (including bandwidth) above are allowed to increase by the following amounts.

1206 and smaller case sizes: Length 0.002" (0.05 mm)

1210 and larger case sizes: Length 0.004" (0.1 mm)



OMD - X7R CAPACITANCE RANGE																		
EIA CODE		0805							1206									
VOLTAGE (Vdc)		16	25	50	100	200	500	630	16	25	50	100	200	500	630	1000	1500	2000
CAP. CODE	CAP.																	
101	100 pF																	
121	120 pF																	
151	150 pF																	
181	180 pF																	
221	220 pF																	
271	270 pF								•	•	•	•	•	•	•	•	•	•
331	330 pF								•	•	•	•	•	•	•	•	•	•
391	390 pF								•	•	•	•	•	•	•	•	•	•
471	470 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
561	560 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
681	680 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
821	820 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
102	1000 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
122	1200 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
152	1500 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
182	1800 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
222	2200 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
272	2700 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
332	3300 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
392	3900 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
472	4700 pF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
562	5600 pF	•	•	•	•	•			•	•	•	•	•	•	•			
682	6800 pF	•	•	•	•	•			•	•	•	•	•	•	•			
822	8200 pF	•	•	•	•	•			•	•	•	•	•	•	•			
103	0.010 μ F	•	•	•	•	•			•	•	•	•	•	•	•			
123	0.012 μ F	•	•	•	•	•			•	•	•	•	•	•	•			
153	0.015 μ F	•	•	•	•	•			•	•	•	•	•	•	•			
183	0.018 μ F	•	•	•	•	•			•	•	•	•	•	•	•			
223	0.022 μ F	•	•	•	•	•			•	•	•	•	•					
273	0.027 μ F	•	•	•	•				•	•	•	•	•					
333	0.033 μ F	•	•	•	•				•	•	•	•	•					
393	0.039 μ F	•	•	•	•				•	•	•	•	•					
473	0.047 μ F	•	•	•	•				•	•	•	•	•					
563	0.056 μ F	•	•	•					•	•	•	•	•					
683	0.068 μ F	•	•	•					•	•	•	•	•					
823	0.082 μ F	•	•	•					•	•	•	•	•					
104	0.10 μ F	•	•	•					•	•	•	•						
124	0.12 μ F	•	•						•	•	•	•						
154	0.15 μ F	•	•						•	•	•	•						
184	0.18 μ F	•							•	•	•	•						
224	0.22 μ F	•							•	•	•							
274	0.27 μ F								•	•	•							
334	0.33 μ F								•	•	•							
394	0.39 μ F								•	•								
474	0.47 μ F								•	•								
564	0.56 μ F								•									
684	0.68 μ F								•									
824	0.82 μ F																	
105	1.0 μ F																	
125	1.2 μ F																	
155	1.5 μ F																	
185	1.8 μ F																	
225	2.2 μ F																	

Note:(1) See soldering recommendations within this data book, or visit www.vishay.com/doc?45034

OMD - X7R CAPACITANCE RANGE																
EIA CODE		1210 ⁽¹⁾										1808 ⁽¹⁾				
VOLTAGE (Vdc)		16	25	50	100	200	500	630	1000	1500	2000	630	1000	1500	2000	3000
CAP. CODE	CAP.															
101	100 pF															
121	120 pF															
151	150 pF															
181	180 pF															
221	220 pF															•
271	270 pF															•
331	330 pF															•
391	390 pF								•	•	•					•
471	470 pF								•	•	•	•	•	•	•	•
561	560 pF								•	•	•	•	•	•	•	•
681	680 pF								•	•	•	•	•	•	•	•
821	820 pF								•	•	•	•	•	•	•	•
102	1000 pF								•	•	•	•	•	•	•	•
122	1200 pF								•	•	•	•	•	•	•	•
152	1500 pF								•	•	•	•	•	•	•	•
182	1800 pF								•	•	•	•	•	•	•	
222	2200 pF								•	•	•	•	•	•	•	
272	2700 pF								•	•	•	•	•	•	•	
332	3300 pF								•	•	•	•	•	•	•	
392	3900 pF								•	•		•	•	•		
472	4700 pF								•	•		•	•	•		
562	5600 pF								•			•	•	•		
682	6800 pF								•			•	•	•		
822	8200 pF								•			•	•			
103	0.010 µF	•	•	•	•	•	•	•	•			•	•			
123	0.012 µF	•	•	•	•	•	•	•	•			•	•			
153	0.015 µF	•	•	•	•	•	•	•	•			•	•			
183	0.018 µF	•	•	•	•	•	•	•	•			•	•			
223	0.022 µF	•	•	•	•	•	•	•	•							
273	0.027 µF	•	•	•	•	•	•	•	•							
333	0.033 µF	•	•	•	•	•	•	•	•							
393	0.039 µF	•	•	•	•	•	•	•	•							
473	0.047 µF	•	•	•	•	•	•	•	•							
563	0.056 µF	•	•	•	•	•										
683	0.068 µF	•	•	•	•	•										
823	0.082 µF	•	•	•	•	•										
104	0.10 µF	•	•	•	•	•										
124	0.12 µF	•	•	•	•	•										
154	0.15 µF	•	•	•	•	•										
184	0.18 µF	•	•	•	•											
224	0.22 µF	•	•	•	•											
274	0.27 µF	•	•	•	•											
334	0.33 µF	•	•	•	•											
394	0.39 µF	•	•	•	•											
474	0.47 µF	•	•	•	•											
564	0.56 µF	•	•	•												
684	0.68 µF	•	•	•												
824	0.82 µF	•	•													
105	1.0 µF	•														
125	1.2 µF															
155	1.5 µF															
185	1.8 µF															
225	2.2 µF															

Note:

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OMD - X7R CAPACITANCE RANGE																		
EIA CODE		1812 ⁽¹⁾										1825 ⁽¹⁾						
VOLTAGE (Vdc)		50	100	200	250	500	630	1000	1500	2000	3000	100	200	500	630	1000	1500	2000
CAP. CODE	CAP.																	
101	100 pF	•	•	•	•	•												
121	120 pF	•	•	•	•	•												
151	150 pF	•	•	•	•	•												
181	180 pF	•	•	•	•	•												
221	220 pF	•	•	•	•	•												
271	270 pF	•	•	•	•	•	•	•	•	•	•							
331	330 pF	•	•	•	•	•	•	•	•	•	•							
391	390 pF	•	•	•	•	•	•	•	•	•	•							
471	470 pF	•	•	•	•	•	•	•	•	•	•							
561	560 pF	•	•	•	•	•	•	•	•	•	•							
681	680 pF	•	•	•	•	•	•	•	•	•	•							
821	820 pF	•	•	•	•	•	•	•	•	•	•							
102	1000 pF	•	•	•	•	•	•	•	•	•	•							
122	1200 pF	•	•	•	•	•	•	•	•	•	•							
152	1500 pF	•	•	•	•	•	•	•	•	•	•							
182	1800 pF	•	•	•	•	•	•	•	•	•	•							
222	2200 pF	•	•	•	•	•	•	•	•	•	•							
272	2700 pF	•	•	•	•	•	•	•	•	•	•							
332	3300 pF	•	•	•	•	•	•	•	•	•	•							
392	3900 pF	•	•	•	•	•	•	•	•	•	•							
472	4700 pF	•	•	•	•	•	•	•	•	•	•							
562	5600 pF	•	•	•	•	•	•	•	•	•	•						•	•
682	6800 pF	•	•	•	•	•	•	•	•	•	•						•	•
822	8200 pF	•	•	•	•	•	•	•	•	•	•						•	•
103	0.010 μF	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•
123	0.012 μF	•	•	•	•	•	•	•				•	•	•	•	•	•	•
153	0.015 μF	•	•	•	•	•	•	•				•	•	•	•	•	•	•
183	0.018 μF	•	•	•	•	•	•	•				•	•	•	•	•	•	•
203	0.020 μF	•	•	•	•	•	•	•				•	•	•	•	•	•	•
223	0.022 μF	•	•	•	•	•	•	•				•	•	•	•	•	•	•
273	0.027 μF	•	•	•	•	•	•	•				•	•	•	•	•	•	•
333	0.033 μF	•	•	•	•	•	•					•	•	•	•	•		
393	0.039 μF	•	•	•	•	•	•					•	•	•	•	•		
473	0.047 μF	•	•	•	•	•	•					•	•	•	•	•		
563	0.056 μF	•	•	•	•	•	•					•	•	•	•	•		
683	0.068 μF	•	•	•	•	•	•					•	•	•	•	•		
823	0.082 μF	•	•	•	•	•	•					•	•	•	•	•		
104	0.10 μF	•	•	•	•	•	•					•	•	•				
124	0.12 μF	•	•	•	•	•						•	•	•				
154	0.15 μF	•	•	•	•	•						•	•	•				
184	0.18 μF	•	•	•	•							•	•	•				
224	0.22 μF	•	•	•	•							•	•	•				
274	0.27 μF	•	•	•	•							•	•					
334	0.33 μF	•	•	•	•							•	•					
394	0.39 μF	•	•	•								•	•					
474	0.47 μF	•	•									•	•					
564	0.56 μF	•	•									•	•					
684	0.68 μF	•	•									•	•					
824	0.82 μF	•	•									•						
105	1.0 μF	•	•									•						
125	1.2 μF	•										•						
155	1.5 μF											•						
185	1.8 μF																	
225	2.2 μF																	

Note:⁽¹⁾ See soldering recommendations within this data book, or visit www.vishay.com/doc?45034

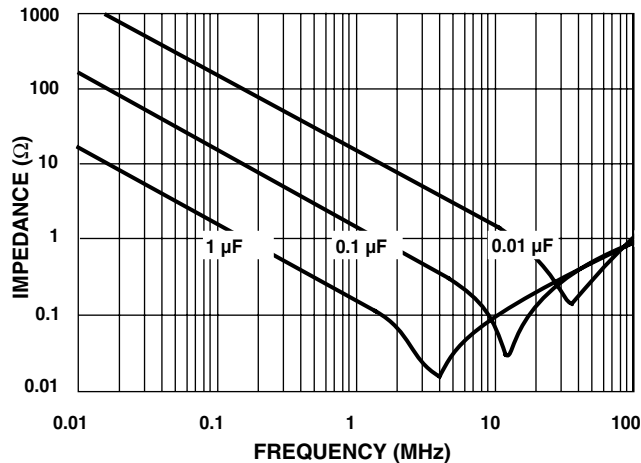
OMD - X7R CAPACITANCE RANGE																	
EIA CODE		2220 ⁽¹⁾									2225 ⁽¹⁾						
VOLTAGE (Vdc)		50	100	200	250	500	630	1000	2000	30000	100	200	500	630	1000	1500	2000
CAP. CODE	CAP.																
101	100 pF																
121	120 pF																
151	150 pF																
181	180 pF																
221	220 pF																
271	270 pF																
331	330 pF																
391	390 pF																
471	470 pF																
561	560 pF																
681	680 pF																
821	820 pF																
102	1000 pF									•							
122	1200 pF									•							
152	1500 pF									•							
182	1800 pF									•							
222	2200 pF									•							
272	2700 pF																
332	3300 pF																
392	3900 pF																
472	4700 pF																
562	5600 pF								•							•	•
682	6800 pF								•							•	•
822	8200 pF								•							•	•
103	0.010 μ F	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•
123	0.012 μ F	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•
153	0.015 μ F	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•
183	0.018 μ F	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•
203	0.020 μ F	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•
223	0.022 μ F	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•
273	0.027 μ F	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•
333	0.033 μ F	•	•	•	•	•	•	•			•	•	•	•	•	•	•
393	0.039 μ F	•	•	•	•	•	•	•			•	•	•	•	•	•	•
473	0.047 μ F	•	•	•	•	•	•	•			•	•	•	•	•	•	•
563	0.056 μ F	•	•	•	•	•	•	•			•	•	•	•	•		
683	0.068 μ F	•	•	•	•	•	•	•			•	•	•	•	•		
823	0.082 μ F	•	•	•	•	•	•	•			•	•	•	•	•		
104	0.10 μ F	•	•	•	•	•	•				•	•	•	•	•		
124	0.12 μ F	•	•	•	•	•	•				•	•	•				
154	0.15 μ F	•	•	•	•	•	•				•	•	•				
184	0.18 μ F	•	•	•	•	•	•				•	•	•				
224	0.22 μ F	•	•	•	•	•	•				•	•	•				
274	0.27 μ F	•	•	•	•						•	•	•				
334	0.33 μ F	•	•	•	•						•	•	•				
394	0.39 μ F	•	•	•	•						•	•					
474	0.47 μ F	•	•	•	•						•	•					
564	0.56 μ F	•	•	•	•						•	•					
684	0.68 μ F	•	•	•	•						•	•					
824	0.82 μ F	•	•								•	•					
105	1.0 μ F	•	•								•	•					
125	1.2 μ F	•	•								•	•					
155	1.5 μ F	•	•								•						
185	1.8 μ F	•									•						
225	2.2 μ F																

Note:
⁽¹⁾ See soldering recommendations within this data book, or visit www.vishay.com/doc?45034

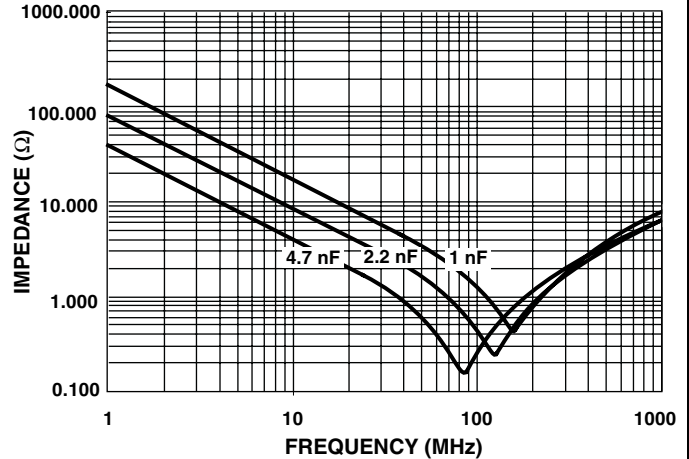


OMD - CAPACITORS - TYPICAL PARAMETERS

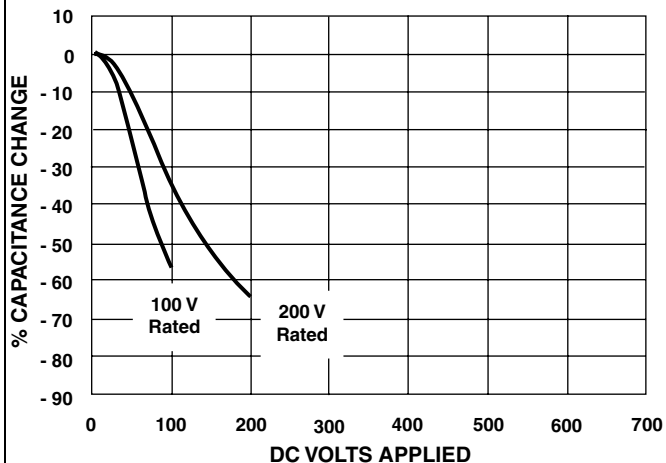
IMPEDANCE VS. FREQUENCY
X7R 500/630 V



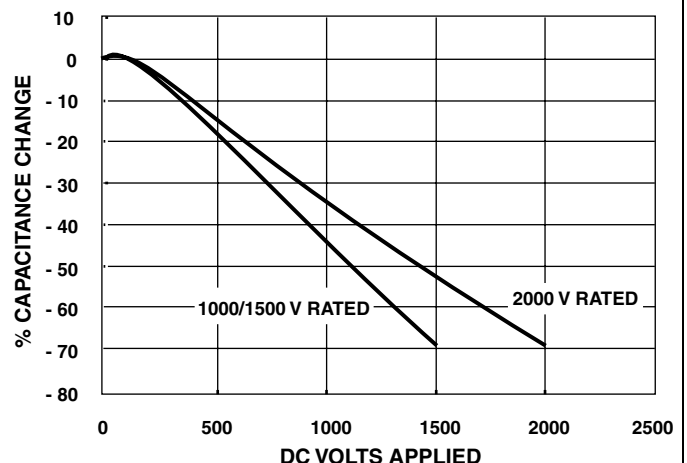
IMPEDANCE VS. FREQUENCY
X7R 2000 V



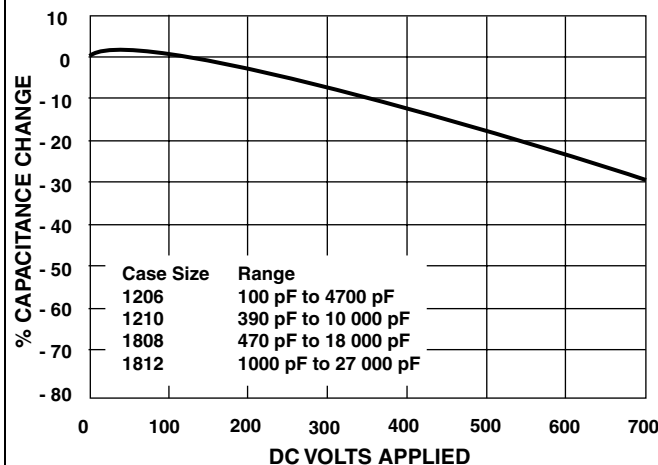
VOLTAGE COEFFICIENT OF CAPACITANCE
X7R OMD - CAP



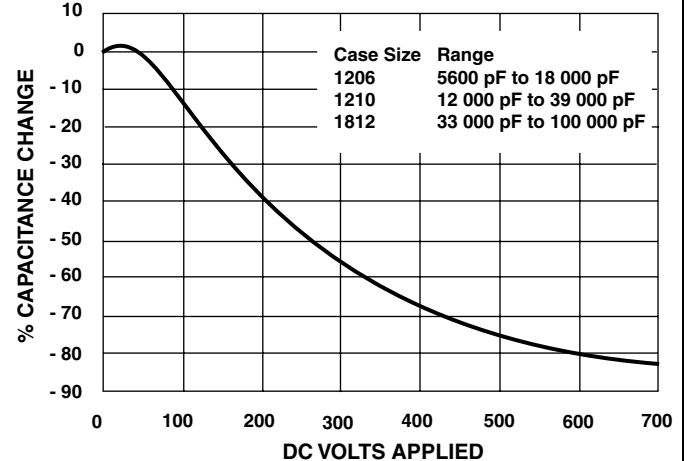
VOLTAGE COEFFICIENT OF CAPACITANCE X7R



VOLTAGE COEFFICIENT OF CAPACITANCE
X7R 500/630 V LOWER CAPACITANCE



VOLTAGE COEFFICIENT OF CAPACITANCE
X7R OMD - CAP - 500/630 V HIGHER CAPACITANCE



BOARDFLEX SENSITIVE APPLICATIONS - SOLUTION:

A predominant failure mode in multilayer ceramic chip capacitors is cracking caused by board flexure. Cracks can then create a path for current to pass from one electrode through the dielectric to an opposing electrode or from the terminations at one end of the MLCC through the dielectric to an opposing electrode. This may subsequently result in capacitance loss, leakage - low Insulation Resistance (IR) - and/or more seriously, high current shorts. A short circuit condition in the surface mounted capacitors can cause further failures of downstream components. Vishay's Open Mode Design Capacitors (VJ OMD - Cap series) reduce the risk of these destructive conditions through MLCC designs that prevent board flexure cracks reaching the opposing electrode.

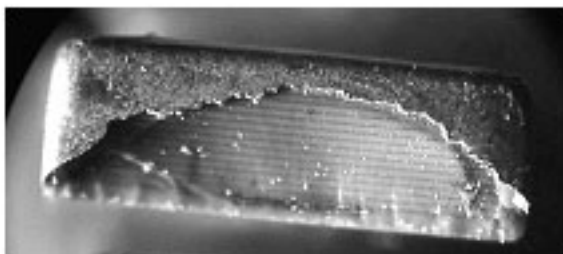
VJ OMD - Cap MLCCs reduce the risk of early field failures associated with board flex cracks. However, it is important to note that even in the open mode designs the presence of flexure related cracks can cause capacitance loss leading to localized stresses on the parts. eventually, depending on the application environment, including such factors and high voltage pulse frequency and thermal cycling this may lead to internal breakdown of the component.

POLYMER TERMINATION

Polymer termination provides additional protection against board flexure damage by absorbing greater mechanical and thermal stresses. Components can be packaged, transported, stored and handled the same standard terminated product. Wave and reflow soldering of MLCC does not require modification to equipment and/or process. Polymer termination greatly reduces the risk of mechanical cracking however it does not completely eliminate.

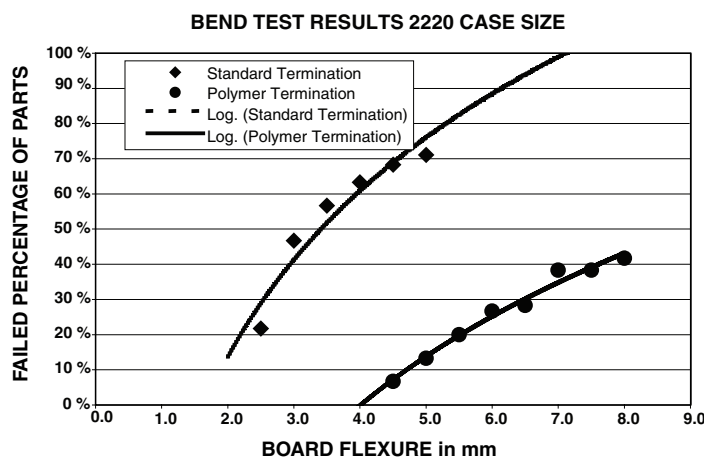
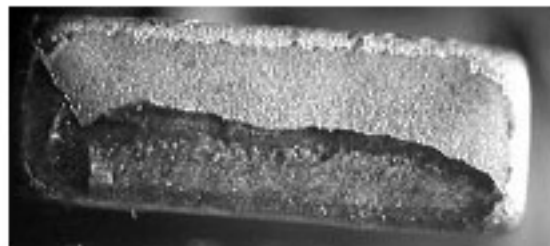
STANDARD TERMINATION

Exposed Electrodes = Electrical Short



OMD CAP PLUS POLYMER TERMINATION

No Exposed Electrodes = No Electrical Short



STANDARD PACKAGING QUANTITIES ⁽¹⁾ ⁽²⁾ ⁽³⁾							
		7" REEL QUANTITIES		11 1/4" AND 13" REEL QUANTITIES		BULK QUANTITIES	
BODY SIZE	TAPE SIZE	PAPER TAPE PACKAGING CODE "C"	PLASTIC TAPE PACKAGING CODE "T"	PAPER TAPE PACKAGING CODE "P"	PLASTIC TAPE PACKAGING CODE "R"	VIAL PACKAGING CODE "B"	WAFFLE PACKAGING CODE "W"
0805	8 mm	3000	3000	10 000	10 000	5000	N/a
1206	8 mm	N/a	2500	N/a	10 000	5000	5000
1210	8 mm	N/a	3000	N/a	10 000	5000	N/a
1808	12 mm	N/a	3000	N/a	10 000	1000	N/a
1812	12 mm	N/a	1000	N/a	5000	1000	N/a
1825	12 mm	N/a	1000	N/a	5000	1000	1000
2220	12 mm	N/a	1000	N/a	5000	N/a	1000
2225	12 mm	N/a	1000	N/a	5000	N/a	1000

Notes:

⁽¹⁾ Vishay Vitramon uses embossed plastic and punch paper carrier tapes. Paper tape is not available for case sizes > 1206 or for component thickness > 0.035" [0.89 mm]

⁽²⁾ REFERENCE: EIA Standard RS 481 - "Taping of Surface Mount Components for Automatic Placement"

⁽³⁾ N/a = Not available



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