Surface Mount Multilayer Ceramic Chip Capacitors for Commercial Applications

FEATURES

- C0G (NP0) and X7R dielectrics offered
- C0G (NP0) is an ultra-stable dielectric offering a very low Temperature Coefficient of Capacitance (TCC)
- C0G (NP0) offers low dissipation
- Excellent aging characteristics
- Ideal for decoupling and filtering (X7R)
- Ideal for surge suppression and high voltage applications
- Wide range of case sizes, voltage ratings and capacitance values
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008) Available

APPLICATIONS

- Timing and tuning circuits
- Sensor and scanner applications
- Decoupling and filtering
- Surge suppression

ELECTRICAL SPECIFICATIONS

C0G (NP0) DIELECTRIC

GENERAL SPECIFICATION

Note
Electrical characteristics at +25 °C unless otherwise specified

Operating Temperature: -55 °C to +150 °C
(above +125 °C changed characteristics)

Capacitance Range: 1 pF to 56 nF

Voltage Range: 25 V_{DC} to 1000 V_{DC}

Temperature Coefficient of Capacitance (TCC):
0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C

Dissipation Factor (DF):
0.1 % maximum at 1.0 V_{RMS} and
1 MHz for values ≤ 1000 pF
0.1 % maximum at 1.0 V_{RMS} and
1 kHz for values > 1000 pF

Insulating Resistance:
at +25 °C 100 000 MΩ min. or 1000 ΩF whichever is less
at +125 °C 10 000 MΩ min. or 100 ΩF whichever is less

Aging Rate: 0 % maximum per decade

Dielectric Strength Test:
performed per method 103 of EIA 198-2-E.
Applied test voltages

≤ 200 V_{DC}-rated:	250 % of rated voltage
500 V_{DC}-rated:	200 % of rated voltage
630 V_{DC},1000 V_{DC}-rated:	150 % of rated voltage

X7R DIELECTRIC

GENERAL SPECIFICATION

Note
Electrical characteristics at +25 °C unless otherwise specified

Operating Temperature: -55 °C to +150 °C
(above +125 °C changed characteristics)

Capacitance Range: 120 pF to 6.8 µF

Voltage Range: 16 V_{DC} to 1000 V_{DC}

Temperature Coefficient of Capacitance (TCC):
± 15 % from -55 °C to +125 °C, with 0 V_{DC} applied

Dissipation Factor (DF):
16 V / 25 V ratings: 3.5 % maximum at 1.0 V_{RMS} and 1 kHz
> 25 V ratings: 2.5 % maximum at 1.0 V_{RMS} and 1 kHz

Insulating Resistance:
at +25 °C 100 000 MΩ min. or 1000 ΩF whichever is less
at +125 °C 10 000 MΩ min. or 100 ΩF whichever is less

Aging Rate: 1 % maximum per decade

Dielectric Strength Test:
performed per method 103 of EIA 198-2-E.
Applied test voltages

≤ 250 V_{DC}-rated:	250 % of rated voltage
500 V_{DC}-rated:	min. 150 % of rated voltage
630 V_{DC}, 1000 V_{DC}-rated:	min. 120 % of rated voltage

QUICK REFERENCE DATA				
DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
C0G (NP0)	0402	100	1.0 pF	220 pF
	0603	250	1.0 pF	1.0 nF
	0805	500	1.0 pF	4.7 nF
	1206	630	1.0 pF	10 nF
	1210	630	56 pF	12 nF
	1808	1000	27 pF	10 nF
	1812	1000	27 pF	22 nF
	1825	500	100 pF	39 nF
	2220	1000	270 pF	47 nF
	2225	1000	270 pF	56 nF
X7R	0402	100	120 pF	47 nF
	0603	200	330 pF	150 nF
	0805	250	330 pF	470 nF
	1206	630	330 pF	1.0 µF
	1210	630	390 pF	1.0 µF
	1808	1000	470 pF	270 nF
	1812	1000	1.0 nF	1.0 µF
	1825	1000	10 nF	2.7 µF
	2220	500	15 nF	2.2 µF
	2225	1000	33 nF	4.7 µF
	3640	500	27 nF	6.8 µF

Note

- Detail ratings see “Selection Chart”

ORDERING INFORMATION

VJ0805 (1)	Y	102	K	X	A	A	T	### (3)(6)
CASE CODE	DIELECTRIC	CAPACITANCE NOMINAL CODE	CAPACITANCE TOLERANCE	TERMINATION	DC VOLTAGE RATING (2)	MARKING	PACKAGING	PROCESS CODE
0402 0603 0805 1206 1210 1808 1812 1825 2220 2225 3640	A = C0G (NP0) Y = X7R	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. **Examples**: 1R8 = 1.8 pF 102 = 1000 pF	B = ± 0.10 pF C = ± 0.25 pF D = ± 0.5 pF F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % M = ± 20 % **Note** C0G (NP0): B, C, D < 10 pF F, G, J, K ≥ 10 pF X7R: J, K, M	X = Ni barrier 100 % tin plated matte finish F, E = AgPd (4) B = polymer 100 % tin plated matte finish (5)	J = 16 V X = 25 V A = 50 V B = 100 V C = 200 V P = 250 V E = 500 V L = 630 V G = 1000 V	A = unmarked M = marked **Note** Marking is only available for 0805 and 1206 with termination code “X” / “B”	C = 7" reel / paper tape T = 7" reel / plastic tape P = 11 1/4" / 13" reel / paper tape R = 11 1/4" / 13" reel / plastic tape O = 7" reel / flamed paper tape I = 11 1/4" / 13"reel / flamed paper tape **Note** “I” and “O” are used for “F”, “E” termination size 0402 / 0603 / 0805	

Notes

(1) Case size designator may be replaced by four digit drawing number used to control non-standard products and / or special requirements

(2) DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance. Consult for questions: mlcc@vishay.com

(3) Process code may be added with up to three digits, used to control non-standard products and / or special requirements

(4) Termination code “E” is for conductive epoxy assembly

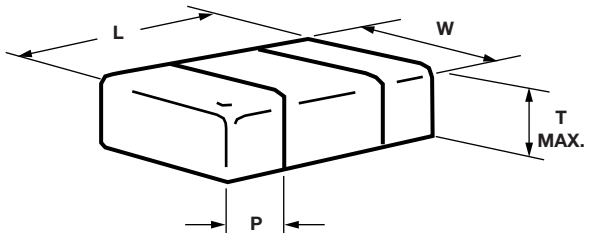
(5) Polymer termination for size 0603 and larger. Packaging only in plastic tape “T” / “R”

(6) Variable plastic / paper tape, see ratings in “Selection Charts”

ENVIRONMENTAL STATUS

TERMINATION CODE	TERMINATION DESCRIPTION	RoHS COMPLIANT	VISHAY GREEN
X	Ni barrier 100 % tin plated matte finish	Yes	Yes
E	AgPd	Yes	Yes
B	Polymer layer, 100 % tin plated matte finish	Yes	No
F	AgPd	Yes	No

DIMENSIONS in inches (millimeters)



CASE CODE	STYLE	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION (P)	
					MINIMUM	MAXIMUM
0402	VJ0402	0.040 + 0.004 / - 0.002 (1.00 + 0.10 / - 0.05)	0.020 + 0.004 / - 0.002 (0.50 + 0.10 / - 0.05)	0.024 (0.60)	0.004 (0.10)	0.016 (0.41)
0603	VJ0603	0.063 ± 0.006 (1.60 ± 0.15)	0.031 ± 0.006 (0.80 ± 0.15)	0.038 (0.97)	0.012 (0.30)	0.022 (0.55)
0805	VJ0805	0.079 ± 0.008 (2.00 ± 0.20)	0.049 ± 0.008 (1.25 ± 0.20)	0.057 (1.45)	0.010 (0.25)	0.030 (0.76)
1206	VJ1206	0.126 ± 0.010 (3.20 ± 0.25)	0.063 ± 0.010 (1.60 ± 0.25)	0.067 (1.70)	0.010 (0.25)	0.030 (0.76)
1210	VJ1210	0.126 ± 0.010 (3.20 ± 0.25)	0.098 ± 0.010 (2.50 ± 0.25)	0.067 (1.70)	0.010 (0.25)	0.030 (0.76)
1808	VJ1808	0.180 ± 0.012 (4.57 ± 0.30)	0.080 ± 0.010 (2.03 ± 0.25)	0.086 (2.18)	0.010 (0.25)	0.035 (0.90)
1812	VJ1812	0.177 ± 0.012 (4.50 ± 0.30)	0.126 ± 0.008 (3.20 ± 0.20)	0.086 (2.18)	0.010 (0.25)	0.035 (0.90)
1825	VJ1825	0.177 ± 0.012 (4.50 ± 0.30)	0.252 ± 0.010 (6.40 ± 0.25)	0.086 (2.18)	0.010 (0.25)	0.035 (0.90)
2220	VJ2220	0.220 ± 0.010 (5.59 ± 0.25)	0.200 ± 0.010 (5.08 ± 0.25)	0.086 (2.18)	0.010 (0.25)	0.037 (0.95)
2225	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)	0.037 (0.95)
3640	VJ3640	0.360 ± 0.015 (9.14 ± 0.38)	0.400 ± 0.015 (10.20 ± 0.38)	0.086 (2.18)	0.010 (0.25)	0.039 (1.00)

Note

- Polymer (B-termination) have increased dimensions:
  length 0.006"(0.15 mm)

SELECTION CHART

DIELECTRIC		C0G (NP0)																				
STYLE		VJ0402			VJ0603				VJ0805				VJ1206 (1)					VJ1210 (1)				
CASE CODE		0402			0603				0805				1206					1210				
VOLTAGE (V_{DC})		25	50	100	50	100	200	250	50	100	200	500	50	100	200	500	630	50	100	200	500	630
VOLTAGE CODE		X	A	B	A	B	C	P	A	B	C	E	A	B	C	E	L	A	B	C	E	L
CAP. CODE	CAP.																					
1R0	1.0 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
1R2	1.2 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
1R5	1.5 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
1R8	1.8 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
2R2	2.2 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
2R7	2.7 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
3R3	3.3 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
3R9	3.9 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
4R7	4.7 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
5R6	5.6 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
6R8	6.8 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
8R2	8.2 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
100	10 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
120	12 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
150	15 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
180	18 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
220	22 pF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••					
270	27 pF	••	••	••	••	••	••		••	••	••	••	••	••	••	••	••					
330	33 pF	••	••	••	••	••	••		••	••	••	••	••	••	••	••	••					
390	39 pF	••	••	••	••	••	••		••	••	••	••	••	••	••	••	••					
470	47 pF	••	••	••	••	••	••		••	••	••	••	••	••	••	••	••					
560	56 pF	••	••	••	••	••	••		••	••	••	••	••	••	••	••	••				•	•
680	68 pF	••	••	••	••	••	••		••	••	••	••	••	••	••	••	••				•	•
820	82 pF	••	••	••	••	••	••		••	••	••	••	••	••	••	••	••				•	•
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	1.0 nF				••				••	••	•		•	•	•	•	•	•	•	•	•	•
122	1.2 nF								••	•			•	•	•			•	•	•	•	•
152	1.5 nF								••	•			•	•	•			•	•	•	•	•
182	1.8 nF								•				•	•	•			•	•	•	•	•
222	2.2 nF								•				•	•	•			•	•	•		
272	2.7 nF								•				•	•	•			•	•	•		
332	3.3 nF								•				•	•	•			•	•	•		
392	3.9 nF								•				•	•				•	•	•		
472	4.7 nF								•				•	•				•	•	•		
562	5.6 nF												•	•				•	•	•		
682	6.8 nF												•	•				•	•	•		
822	8.2 nF												•	•				•	•	•		
103	10 nF												•	•				•	•			
123	12 nF																	•	•			
153	15 nF																					
183	18 nF																					
223	22 nF																					
273	27 nF																					
333	33 nF																					
393	39 nF																					
473	47 nF																					
563	56 nF																					

Notes

RoHS-compliant

•• Paper tape • Plastic tape

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

SELECTION CHART

DIELECTRIC		C0G (NP0)													
STYLE		VJ1808 (1)					VJ1812 (1)					VJ1825 (1)			
CASE CODE		1808					1812					1825			
VOLTAGE (V_{DC})		50	100	200	500	1000	50	100	200	500	1000	50	100	200	500
VOLTAGE CODE		A	B	C	E	G	A	B	C	E	G	A	B	C	E
CAP. CODE	CAP.														
1R0	1.0 pF														
1R2	1.2 pF														
1R5	1.5 pF														
1R8	1.8 pF														
2R2	2.2 pF														
2R7	2.7 pF														
3R3	3.3 pF														
3R9	3.9 pF														
4R7	4.7 pF														
5R6	5.6 pF														
6R8	6.8 pF														
8R2	8.2 pF														
100	10 pF														
120	12 pF														
150	15 pF														
180	18 pF														
220	22 pF														
270	27 pF			•		•					•				
330	33 pF			•		•									
390	39 pF			•		•	•	•	•	•	•				
470	47 pF			•		•	•	•	•	•	•				
560	56 pF			•		•	•	•	•	•	•				
680	68 pF			•		•	•	•	•	•	•				
820	82 pF			•		•	•	•	•	•	•				
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	1.0 nF	•	•	•	•	•	•	•	•	•	•	•	•	•	•
122	1.2 nF	•	•	•	•		•	•	•	•	•	•	•	•	•
152	1.5 nF	•	•	•	•		•	•	•	•	•	•	•	•	•
182	1.8 nF	•	•	•	•		•	•	•	•	•	•	•	•	•
222	2.2 nF	•	•	•			•	•	•	•	•	•	•	•	•
272	2.7 nF	•	•	•			•	•	•	•		•	•	•	•
332	3.3 nF	•	•	•			•	•	•	•		•	•	•	•
392	3.9 nF	•	•	•			•	•	•	•		•	•	•	•
472	4.7 nF	•	•	•			•	•	•	•		•	•	•	•
562	5.6 nF	•	•	•			•	•	•	•		•	•	•	•
682	6.8 nF	•	•	•			•	•	•	•		•	•	•	•
822	8.2 nF	•	•				•	•	•	•		•	•	•	•
103	10 nF	•					•	•	•	•		•	•	•	•
123	12 nF						•	•	•			•	•	•	
153	15 nF						•	•				•	•	•	
183	18 nF						•					•	•	•	
223	22 nF						•					•	•	•	
273	27 nF											•	•	•	
333	33 nF											•	•		
393	39 nF											•			
473	47 nF														
563	56 nF														

Notes

RoHS-compliant

• Plastic tape

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

SELECTION CHART

DIELECTRIC		C0G (NP0)										
STYLE		VJ2220 (1)						VJ2225 (1)				
CASE CODE		2220						2225				
VOLTAGE (V_{DC})		50	100	200	500	630	1000	50	100	200	500	1000
VOLTAGE CODE		A	B	C	E	L	G	A	B	C	E	G
CAP. CODE	CAP.											
1R0	1.0 pF											
1R2	1.2 pF											
1R5	1.5 pF											
1R8	1.8 pF											
2R2	2.2 pF											
2R7	2.7 pF											
3R3	3.3 pF											
3R9	3.9 pF											
4R7	4.7 pF											
5R6	5.6 pF											
6R8	6.8 pF											
8R2	8.2 pF											
100	10 pF											
120	12 pF											
150	15 pF											
180	18 pF											
220	22 pF											
270	27 pF											
330	33 pF											
390	39 pF											
470	47 pF											
560	56 pF											
680	68 pF											
820	82 pF											
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	1.0 nF	•	•	•	•	•	•			•	•	•
122	1.2 nF	•	•	•	•	•	•	•	•	•	•	•
152	1.5 nF	•	•	•	•	•	•	•	•	•	•	•
182	1.8 nF	•	•	•	•	•	•	•	•	•	•	•
222	2.2 nF	•	•	•	•	•	•	•	•	•	•	•
272	2.7 nF	•	•	•	•	•	•	•	•	•	•	•
332	3.3 nF	•	•	•	•	•	•	•	•	•	•	•
392	3.9 nF	•	•	•	•	•	•	•	•	•	•	•
472	4.7 nF	•	•	•	•	•	•	•	•	•	•	
562	5.6 nF	•	•	•	•	•		•	•	•	•	
682	6.8 nF	•	•	•				•	•	•	•	
822	8.2 nF	•	•	•				•	•	•	•	
103	10 nF	•	•	•				•	•	•	•	
123	12 nF	•	•	•				•	•	•	•	
153	15 nF	•	•	•				•	•	•		
183	18 nF	•	•					•	•	•		
223	22 nF	•	•					•	•	•		
273	27 nF	•	•					•	•	•		
333	33 nF	•	•					•	•	•		
393	39 nF	•						•	•	•		
473	47 nF	•						•	•			
563	56 nF							•				

Notes

RoHS-compliant

• Plastic tape

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

SELECTION CHART

DIELECTRIC		X7R															
STYLE		VJ0402				VJ0603					VJ0805						
CASE CODE		0402				0603					0805						
VOLTAGE (V_{DC})		16	25	50	100	16	25	50	100	200	16	25	50	100	200	250
VOLTAGE CODE		J	X	A	B	J	X	A	B	C	J	X	A	B	C	P
CAP. CODE	CAP.																
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	1.0 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
122	1.2 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
152	1.5 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
182	1.8 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
222	2.2 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
272	2.7 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
332	3.3 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
392	3.9 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
472	4.7 nF	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
562	5.6 nF	••	••	••		••	••	••	••		••	••	••	••	••	••	••
682	6.8 nF	••	••	••		••	••	••	••		••	••	••	••	••	••	••
822	8.2 nF	••	••	••		••	••	••	••		••	••	••	••	••	••	••
103	10 nF	••	••	••		••	••	••	••		••	••	••	••	••	••	•
123	12 nF	••	••			••	••	••	••		••	••	••	••	••	••	•
153	15 nF	••	••			••	••	••	••		••	••	••	••	•	••	•
183	18 nF	••	••			••	••	••	••		••	••	••	••	•	••	•
223	22 nF	••				••	••	••	••		••	••	••	••	•	••	•
273	27 nF	••				••	••	••	••		••	••	••	••	•		
333	33 nF	••				••	••	••	••		••	••	••	•			
393	39 nF	••				••	••	••	••		••	••	••	•			
473	47 nF	••				••	••	••			••	••	••	•			
563	56 nF					••	••	••			••	••	••	•			
683	68 nF					••	••	••			••	••	•	•			
823	82 nF					••	••	••			•	•	•	•			
104	100 nF					••	••	••			•	•	•	•			
124	120 nF					••					•	•	•				
154	150 nF					••					•	•	•				
184	180 nF										•	•					
224	220 nF										•	•					
274	270 nF										•	•					
334	330 nF										•	•					
394	390 nF										•						
474	470 nF										•						
564	560 nF																
684	680 nF																
824	820 nF																
105	1.0 µF																
125	1.2 µF																
155	1.5 µF																
185	1.8 µF																
225	2.2 µF																
275	2.7 µF																
335	3.3 µF																
395	3.9 µF																
475	4.7 µF																
565	5.6 µF																
685	6.8 µF																

Notes

RoHS-compliant

•• Paper tape • Plastic tape ••• Variable plastic / paper tape

SELECTION CHART

DIELECTRIC		X7R															
STYLE		VJ1206 (1)								VJ1210 (1)							
CASE CODE		1206								1210							
VOLTAGE (V_{DC})		16	25	50	100	200	250	500	630	16	25	50	100	200	250	500	630
VOLTAGE CODE		J	X	A	B	C	P	E	L	J	X	A	B	C	P	E	L
CAP. CODE	CAP.																
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	1.0 nF	••	••	••	••	••		••	••							•	•
122	1.2 nF	••	••	••	••	••		••	••							•	•
152	1.5 nF	••	••	••	••	••		••	••							•	•
182	1.8 nF	••	••	••	••	••		••	••							•	•
222	2.2 nF	••	••	••	••	••		••	••							•	•
272	2.7 nF	••	••	••	••	••		••	••							•	•
332	3.3 nF	••	••	••	••	••		••	••					•		•	•
392	3.9 nF	••	••	••	••	••		••	••					•		•	•
472	4.7 nF	••	••	••	••	••		••	••					•		•	•
562	5.6 nF	••	••	••	••	••		•	•					•		•	•
682	6.8 nF	••	••	••	••	••		•	•					•		•	•
822	8.2 nF	••	••	••	••	••		•	•					•		•	•
103	10 nF	••	••	••	••	••	•	•	•	•	•	•	•	•		•	•
123	12 nF	••	••	••	••	••	•	•	•	•	•	•	•	•		•	•
153	15 nF	••	••	••	••	••	•	•	•	•	•	•	•	•		•	•
183	18 nF	••	••	••	••	••	•	•	•	•	•	•	•	•		•	•
223	22 nF	••	••	••	••	••	•			•	•	•	•	•		•	•
273	27 nF	••	••	••	••	••	•			•	•	•	•	•		•	•
333	33 nF	••	••	••	••	••	•			•	•	•	•	•	•	•	•
393	39 nF	••	••	••	••	•	•			•	•	•	•	•	•	•	•
473	47 nF	••	••	••	••	•	•			•	•	•	•	•	•	•	•
563	56 nF	••	••	••	••	•	•			•	•	•	•	•	•		
683	68 nF	••	••	••	••	•	•			•	•	•	•	•	•		
823	82 nF	••	••	•	•	•	•			•	•	•	•	•	•		
104	100 nF	•	•	•	•	•	•			•	•	•	•	•	•		
124	120 nF	•	•	•	•					•	•	•	•	•			
154	150 nF	•	•	•	•					•	•	•	•	•			
184	180 nF	•	•	•	•					•	•	•	•	•			
224	220 nF	•	•	•	•					•	•	•	•				
274	270 nF	•	•	•	•					•	•	•	•				
334	330 nF	•	•	•						•	•	•	•				
394	390 nF	•	•	•						•	•	•	•				
474	470 nF	•	•	•						•	•	•	•				
564	560 nF	•	•							•	•	•					
684	680 nF	•	•							•	•	•					
824	820 nF	•	•							•	•	•					
105	1.0 µF	•	•							•	•	•					
125	1.2 µF																
155	1.5 µF																
185	1.8 µF																
225	2.2 µF																
275	2.7 µF																
335	3.3 µF																
395	3.9 µF																
475	4.7 µF																
565	5.6 µF																
685	6.8 µF																

Notes

RoHS-compliant

•• Paper tape • Plastic tape

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

SELECTION CHART

DIELECTRIC		X7R																			
STYLE		VJ1808 (1)					VJ1812 (1)								VJ1825 (1)						
CASE CODE		1808					1812								1825						
VOLTAGE (V_{DC})		50	100	200	500	1000	25	50	100	200	250	500	630	1000	25	50	100	200	250	500	1000
VOLTAGE CODE		A	B	C	E	G	X	A	B	C	P	E	L	G	X	A	B	C	P	E	G
CAP. CODE	CAP.																				
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	1.0 nF				•	•						•	•	•							
122	1.2 nF				•	•						•	•	•							
152	1.5 nF				•	•						•	•	•							
182	1.8 nF				•	•						•	•	•							
222	2.2 nF				•	•						•	•	•							
272	2.7 nF				•	•						•	•	•							
332	3.3 nF				•	•						•	•	•							
392	3.9 nF				•	•						•	•	•							
472	4.7 nF			•	•	•						•	•	•							
562	5.6 nF			•	•	•						•	•	•							
682	6.8 nF			•	•	•						•	•	•							
822	8.2 nF			•	•	•						•	•	•							
103	10 nF	•	•	•	•	•				•		•	•	•	•	•	•	•	•	•	•
123	12 nF	•	•	•	•					•		•	•	•	•	•	•	•	•	•	•
153	15 nF	•	•	•	•					•		•	•	•	•	•	•	•	•	•	•
183	18 nF	•	•	•	•					•		•	•	•	•	•	•	•	•	•	•
223	22 nF	•	•	•	•		•	•	•	•		•	•	•	•	•	•	•	•	•	•
273	27 nF	•	•	•	•		•	•	•	•		•	•	•	•	•	•	•	•	•	•
333	33 nF	•	•	•			•	•	•	•		•	•		•	•	•	•	•	•	•
393	39 nF	•	•	•			•	•	•	•		•	•		•	•	•	•	•	•	•
473	47 nF	•	•	•			•	•	•	•		•	•		•	•	•	•	•	•	•
563	56 nF	•	•	•			•	•	•	•		•	•		•	•	•	•	•	•	•
683	68 nF	•	•	•			•	•	•	•		•	•		•	•	•	•	•	•	
823	82 nF	•	•	•			•	•	•	•		•	•		•	•	•	•	•	•	
104	100 nF	•	•	•			•	•	•	•	•	•	•		•	•	•	•	•	•	
124	120 nF	•	•				•	•	•	•	•				•	•	•	•	•	•	
154	150 nF	•	•				•	•	•	•	•				•	•	•	•	•	•	
184	180 nF	•	•				•	•	•	•	•				•	•	•	•	•	•	
224	220 nF	•					•	•	•	•	•				•	•	•	•	•		
274	270 nF	•					•	•	•	•	•				•	•	•	•	•		
334	330 nF						•	•	•	•	•				•	•	•	•	•		
394	390 nF						•	•	•	•					•	•	•	•	•		
474	470 nF						•	•	•	•					•	•	•	•	•		
564	560 nF						•	•	•						•	•	•	•	•		
684	680 nF						•	•	•						•	•	•	•	•		
824	820 nF						•	•	•						•	•	•	•	•		
105	1.0 µF						•	•							•	•	•	•	•		
125	1.2 µF														•	•	•				
155	1.5 µF														•	•	•				
185	1.8 µF														•	•					
225	2.2 µF														•						
275	2.7 µF														•						
335	3.3 µF																				
395	3.9 µF																				
475	4.7 µF																				
565	5.6 µF																				
685	6.8 µF																				

Notes

RoHS-compliant

• Plastic tape

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

SELECTION CHART

DIELECTRIC		X7R														
STYLE		VJ2220 (1)				VJ2225 (1)						VJ3640 (1)				
CASE CODE		2220				2225						3640				
VOLTAGE (V_{DC})		50	100	200	500	25	50	100	200	500	1000	25	50	100	200	500
VOLTAGE CODE		A	B	C	E	X	A	B	C	E	G	X	A	B	C	E
CAP. CODE	CAP.															
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	1.0 nF															
122	1.2 nF															
152	1.5 nF															
182	1.8 nF															
222	2.2 nF															
272	2.7 nF															
332	3.3 nF															
392	3.9 nF															
472	4.7 nF															
562	5.6 nF															
682	6.8 nF															
822	8.2 nF															
103	10 nF															
123	12 nF															
153	15 nF				•											
183	18 nF				•											
223	22 nF				•											
273	27 nF				•										•	•
333	33 nF				•	•	•	•	•	•	•				•	•
393	39 nF				•	•	•	•	•	•	•				•	•
473	47 nF				•	•	•	•	•	•	•				•	•
563	56 nF				•	•	•	•	•	•	•				•	•
683	68 nF				•	•	•	•	•	•	•				•	•
823	82 nF				•	•	•	•	•	•	•				•	•
104	100 nF			•	•	•	•	•	•	•	•				•	•
124	120 nF			•	•	•	•	•	•	•					•	•
154	150 nF			•	•	•	•	•	•	•					•	•
184	180 nF			•	•	•	•	•	•	•		•	•	•	•	•
224	220 nF		•	•	•	•	•	•	•	•		•	•	•	•	•
274	270 nF	•	•	•		•	•	•	•	•		•	•	•	•	•
334	330 nF	•	•	•		•	•	•	•	•		•	•	•	•	•
394	390 nF	•	•	•		•	•	•	•			•	•	•	•	•
474	470 nF	•	•	•		•	•	•	•			•	•	•	•	•
564	560 nF	•	•	•		•	•	•	•			•	•	•	•	•
684	680 nF	•	•	•		•	•	•	•			•	•	•	•	•
824	820 nF	•	•	•		•	•	•	•			•	•	•	•	
105	1.0 µF	•	•	•		•	•	•	•			•	•	•	•	
125	1.2 µF	•	•			•	•	•	•			•	•	•	•	
155	1.5 µF	•				•	•	•				•	•	•	•	
185	1.8 µF	•				•	•	•				•	•	•	•	
225	2.2 µF	•				•	•					•	•	•		
275	2.7 µF					•	•					•	•	•		
335	3.3 µF					•						•	•	•		
395	3.9 µF					•						•	•	•		
475	4.7 µF					•						•	•			
565	5.6 µF											•				
685	6.8 µF											•				

Notes

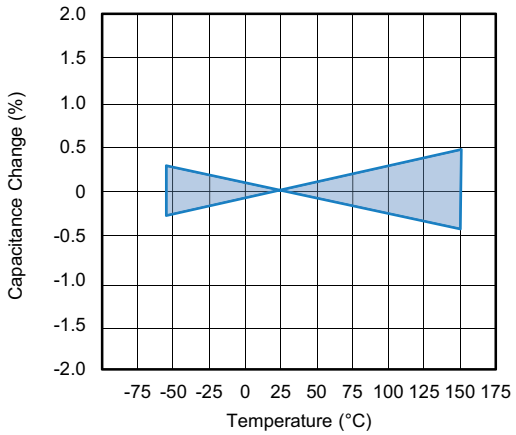
RoHS-compliant

• Plastic tape

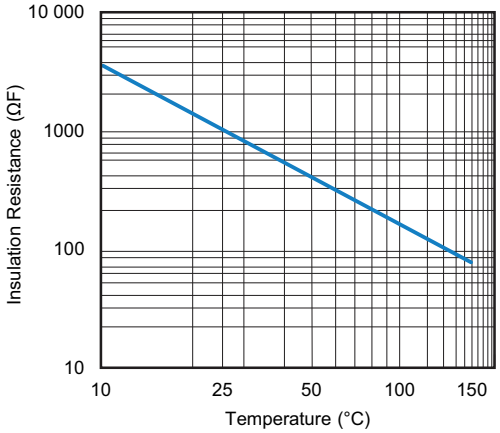
(1) See soldering recommendations within this data book, or visit www.vishay.com/doc?45034

C0G (NP0) DIELECTRIC - TYPICAL PARAMETERS

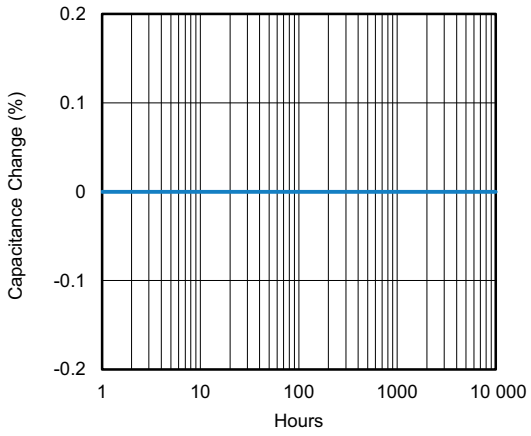
Temperature Coefficient of Capacitance



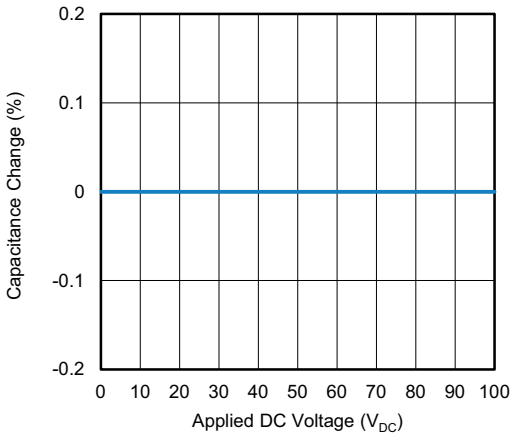
Insulation Resistance vs. Temperature



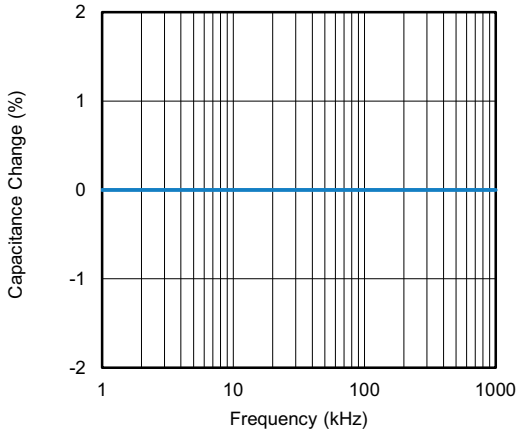
Aging Rate



Voltage Coefficient of Capacitance

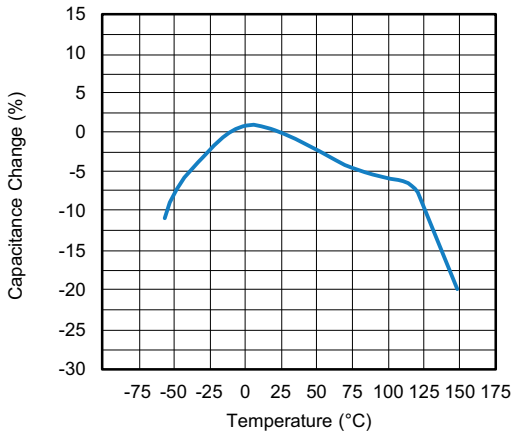


Change of Capacitance with Frequency

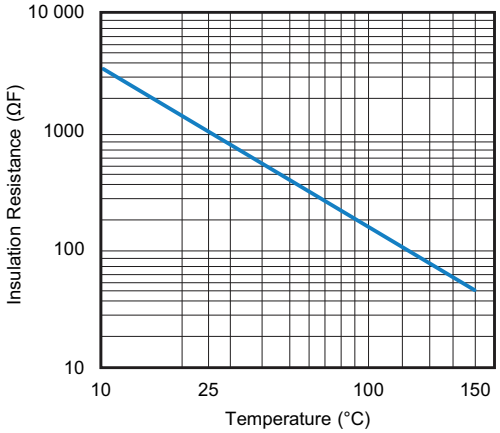


X7R DIELECTRIC - TYPICAL PARAMETERS

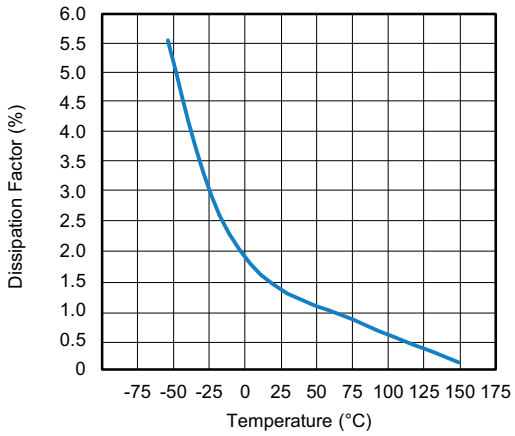
Temperature Coefficient of Capacitance



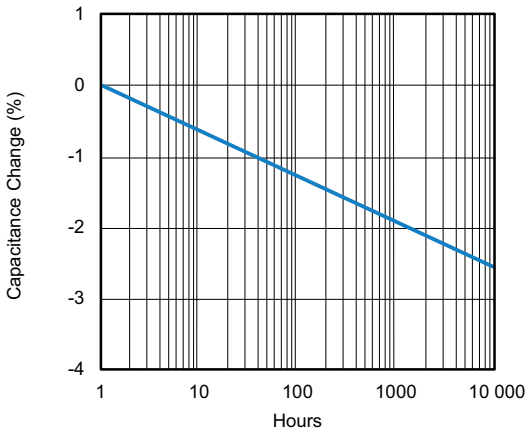
Insulation Resistance vs. Temperature



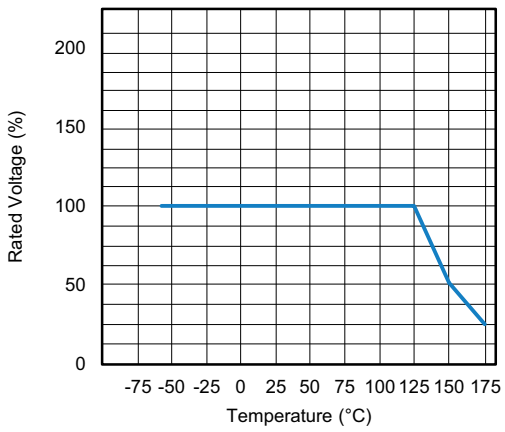
Dissipation Factor vs. Temperature



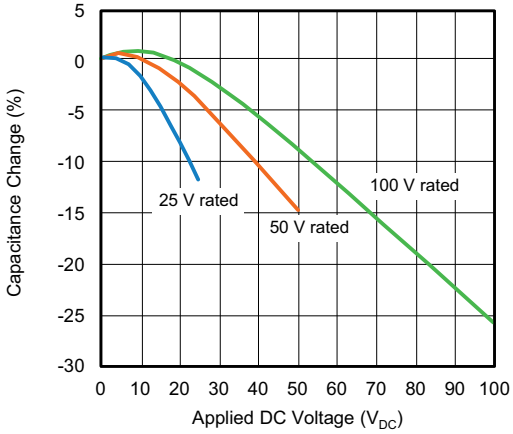
Aging Rate



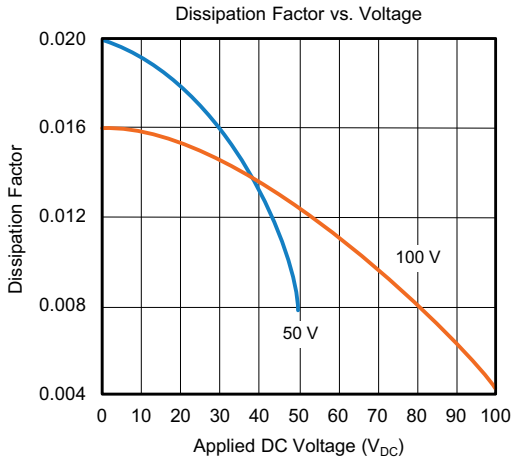
Rated Voltage vs. Temperature

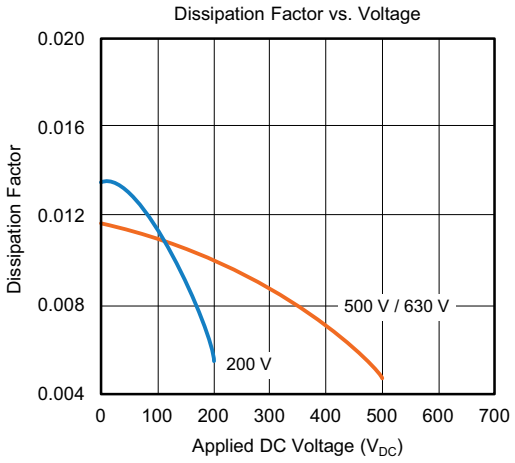


Voltage Coefficient of Capacitance



X7R DIELECTRIC - TYPICAL PARAMETERS





STANDARD PACKAGING QUANTITIES (1)(2)(3)

CASE CODE	TAPE SIZE	7" REEL QUANTITIES		11 1/4" AND 13" REEL QUANTITIES	
		PAPER TAPE PACKAGING CODE "C" / "O"	PLASTIC TAPE PACKAGING CODE "T"	PAPER TAPE PACKAGING CODE "P" / "I"	PLASTIC TAPE PACKAGING CODE "R"
0402	8 mm	5000	n/a	10 000	n/a
0603 (4)(5)(6)	8 mm	4000	4000	10 000	10 000
0805 (4)(5)	8 mm	3000	3000	10 000	10 000
1206 (4)(5)	8 mm	3000	2500 / 3000	10 000	9000 / 10 000
1210 (4)	8 mm	n/a	2000 / 2500 / 3000	n/a	9000 / 10 000
1808	12 mm	n/a	2000	n/a	10 000
1812	12 mm	n/a	1000	n/a	4000
1825	12 mm	n/a	500	n/a	4000
2220	12 mm	n/a	1000	n/a	n/a
2225	12 mm	n/a	500	n/a	n/a
3640	16 mm	n/a	500	n/a	n/a

Notes

(1) Vishay Vitramon uses embossed plastic carrier tape
(2) REFERENCE: EIA standard RS 481 - "Taping of Surface Mount Components for Automatic Placement"
(3) n/a = not available
(4) Packaging "C" / "P" / "O" / "I" and "T" / "R" or lower quantities can depend from product thickness
(5) Polymer termination, code "B", only available in plastic tape "T" / "R"
(6) Variable packaging codes, see ratings in "Selection Charts"

STORAGE AND HANDLING CONDITIONS

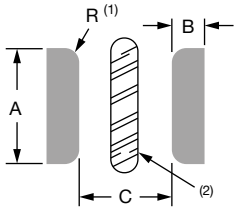
(1) Store the components at 5 °C to 40 °C ambient temperature and ≤ 70 % relative humidity conditions.
(2) The product is recommended to be used within a time-frame of 2 years after shipment.
Check solderability in case extended shelf life beyond the expiry date is needed.

Precautions:

a. Do not store products in an environment containing corrosive elements, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. This may cause corrosion or oxidization of the terminations, which can easily lead to poor soldering.
b. Store products on the shelf and avoid exposure to moisture or dust.
c. Do not expose products to excessive shock, vibration, direct sunlight and so on.

Solder Pad Dimensions for Vishay Surface-Mount Multilayer Ceramic Chip Capacitors

DIMENSIONS in millimeters



CASE CODE	A	B	C
0402	0.50	0.50	0.40
0505	1.35	1.00	0.60
0603	0.90	1.00	1.00 (3)
0805	1.30	1.20	1.00
1111	2.90	1.30	1.75
1206	1.80	1.20	2.10
1210	2.80	1.30	1.90
1808	2.40	1.50	3.00
1812	3.60	1.50	3.00
1825	6.50	1.50	3.00
2008	2.70	1.50	4.08
2220	5.50 (4)	1.50	4.20
2225	6.50	1.50	4.20
2525	6.60	1.50	4.50
3040	10.80	2.00	5.50
3640	10.80	2.00	7.00
3838	10.20	2.00	7.50
4044	12.30	2.00	8.00

Notes

(1) For safety capacitors and voltages above 3000 V, corner rounding (R) of 0.5 mm is recommended to suppress arcing
(2) Add a 1 mm slot in PCB between pads to allow cleaning and coating under MLCC
(3) For VJ HiFREQ Series, this dimension is 0.6 mm
(4) For safety capacitors, the A dimension should be 5.80 mm

PRINTED CIRCUIT BOARD PCB DESIGN CONSIDERATIONS FOR HIGH VOLTAGE SURFACE-MOUNT MLCCS

Special assembly process and design considerations should be employed for today's high voltage rating MLCCs. As case sizes remain the same and voltage ratings increase, MLCC manufacturers must design, evaluate, and qualify their capacitors using methods that reduce the occurrence of corona discharge and arcover events. To meet similar capability in high voltage applications, users should employ similar cautionary design and assembly methods.

MLCC PAD LAYOUT

A capacitor's arcover inception point can degrade due to factors such as the MLCC termination, PCB pad design, PCB cleanliness, solder flux residue, surface contamination / deposits and environmental conditions. PCB pads and their design affect the air gap distance between the opposing polarities of the MLCC termination. For voltage rating greater than 1500 V_{DC} add a corner radius to the inward facing edge of the MLCC pads and as large a gap as possible between the pads. Too small of a pad gap distance will reduce the capacitor's own arcover inception voltage level. Refer to the Figure and Table Figure 1.0, MLCC Pad Layout and Table 1.0, Vishay MLCC Solder Pad Dimensions for the recommended MLCC solder pad dimensions.

SLOT OR TRENCH BETWEEN PADS

PCB assembly can deposit dust, trap solder balls, or flux residue underneath the capacitors. These contaminants will reduce conductive clearances and the arcover inception level. Assembly methods must include a final PCB cleaning process. A slot or trench can be cut into the PCB in between the pads to allow cleaners to penetrate underneath the MLCC. The slot will also allow conformal or epoxy coatings to flow underneath the MLCC and build an insulative barrier between pads. Refer to Figure 1.0 MLCC Pad Layout for slot reference location.

COATING PRINTED CIRCUIT BOARD

Coating a printed circuit board with materials such as acrylic, silicone and urethane resins provide a protective dielectric barrier that is non-conductive and will enhance the resistance to arcing. Various processes exist which include dipping, brushing, and spaying. Optimal performance will come from coating the MLCC on all sides, top and bottom. The PCB slot in between the pads should extend slightly beyond the width of the MLCC. Refer to Figure 1.0 MLCC Pad Layout for slot reference location.

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