Surface Mount Multilayer Ceramic Chip Capacitor for High Voltage Applications

FEATURES

- High voltage breakdown compared to standard design
- High reliability serial electrode design
- Polymer termination available for intensive, board flex requirements
- Protective surface coating may be required to prevent surface arcing
- Excellent reliability and thermal shock performance
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

LINKS TO ADDITIONAL RESOURCES

Packages | Technical Notes | Related Documents

APPLICATIONS

- Input filter capacitors
- Output filter capacitors
- Snubber capacitors reduce MOSFET voltage spikes
- Filtering for switching power supplies
- For lighting and other AC applications please contact: mlcc@vishay.com

ELECTRICAL SPECIFICATIONS

C0G (NP0)

GENERAL SPECIFICATION

Note
Electrical characteristics at +25 °C unless otherwise specified

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

Capacitance Range: 10 pF to 3.3 nF

Voltage Range: 500 V_{DC} to 5000 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 value ≤ 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:
applied test voltages
120 % of rated voltage

X7R

GENERAL SPECIFICATION

Note
Electrical characteristics at +25 °C unless otherwise specified

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

Capacitance Range: 47 pF to 560 nF

Voltage Range: 500 V_{DC} to 8000 V_{DC}

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

Dissipation Factor (DF):
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:
applied test voltages
min. 120 % of rated voltage

QUICK REFERENCE DATA

DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
C0G (NP0)	1206	1500	10 pF	120 pF
	1210	2000	10 pF	120 pF
	1808	3000	27 pF	220 pF
	1812	5000	15 pF	1.8 nF
	1825	5000	15 pF	2.2 nF
	2220	5000	33 pF	2.2 nF
	2225	5000	47 pF	3.3 nF
X7R	1206	2000	270 pF	4.7 nF
	1210	2000	390 pF	10 nF
	1808	6000	47 pF	18 nF
	1812	6000	150 pF	27 nF
	1825	4000	330 pF	56 nF
	2220	6000	330 pF	82 nF
	2225	6000	470 pF	100 nF
	3040	1500	33 nF	220 nF
	3640	8000	470 pF	390 nF
	4044	1500	100 nF	560 nF

Notes

- Detail ratings see “Selection Chart”
- For special high voltage applications including Open Mode Design and ArcGuard please consult series datasheet
- High voltage capacitors may require a conformal coating to deter arc-over during operation

ORDERING INFORMATION

HV2220	Y	152	K	X	M	A	T	HV [2]
CASE CODE	DIELECTRIC	CAPACITANCE NOMINAL CODE	CAPACITANCE TOLERANCE	TERMINATION	DC VOLTAGE RATING [1]	MARKING	PACKAGING	PROCESS CODE
1206 1210 1808 1812 1825 2220 2225 3040 3640 4044	Y = X7R A = C0G (NP0)	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. **Examples** 152 = 1500 pF	C0G (NP0): F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % X7R: J = ± 5 % K = ± 10 % M = ± 20 %	X = Ni barrier 100 % tin plated matte finish B = polymer 100 % tin plated matte finish	E = 500 V L = 630 V G = 1000 V R = 1500 V F = 2000 V H = 3000 V V = 4000 V M = 5000 V 6 = 6000 V 8 = 8000 V	A = unmarked	T = 7" reel / plastic tape R = 11 1/4" / 13" reel / plastic tape	HV = high voltage

Notes

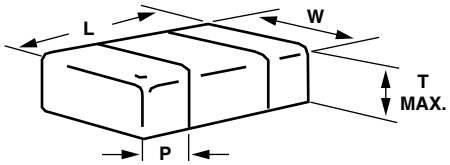
(1) DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance. Consult for questions: mlcc@vishay.com

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

ENVIRONMENTAL STATUS

TERMINATION CODE	TERMINATION DESCRIPTION	RoHS COMPLIANT	VISHAY GREEN
X	Ni barrier 100 % tin plated matte finish	Yes	Yes
B	Polymer layer, 100 % tin plated matte finish	Yes	Yes

DIMENSIONS in inches (millimeters)



CASE CODE	STYLE	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION PAD (P)	
					MINIMUM	MAXIMUM
1206	HV1206	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	HV1210	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	HV1808	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	HV1812	0.177 ± 0.012 (4.50 ± 0.30)	0.126 ± 0.008 (3.20 ± 0.20)	0.106 (2.70)	0.010 (0.25)	0.035 (0.90)
1825	HV1825	0.177 ± 0.012 (4.50 ± 0.30)	0.252 ± 0.010 (6.40 ± 0.25)	0.106 (2.70)	0.010 (0.25)	0.035 (0.90)
2220	HV2220	0.220 ± 0.010 (5.59 ± 0.25)	0.200 ± 0.010 (5.08 ± 0.25)	0.106 (2.70)	0.010 (0.25)	0.037 (0.95)
2225	HV2225	0.220 ± 0.010 (5.59 ± 0.25)	0.250 ± 0.010 (6.35 ± 0.25)	0.106 (2.70)	0.010 (0.25)	0.037 (0.95)
3040	HV3040	0.300 ± 0.015 (7.62 ± 0.38)	0.400 ± 0.015 (10.20 ± 0.38)	0.100 (2.54)	0.010 (0.25)	0.039 (1.00)
3640	HV3640	0.360 ± 0.015 (9.14 ± 0.38)	0.400 ± 0.015 (10.20 ± 0.38)	0.130 (3.30)	0.010 (0.25)	0.037 (0.95)
4044	HV4044	0.400 ± 0.015 (10.16 ± 0.38)	0.440 ± 0.015 (11.17 ± 0.38)	0.120 (3.05)	0.020 (0.50)	0.040 (1.00)

Note

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

SELECTION CHART

DIELECTRIC		C0G (NP0)													
STYLE		HV1206 (1)				HV1210 (1)					HV1808 (1)				
EIA CODE		1206				1210					1808				
VOLTAGE (V_{DC})		500	630	1000	1500	500	630	1000	1500	2000	500	630	1000	2000	3000
VOLTAGE CODE		E	L	G	R	E	L	G	R	F	E	L	G	F	H
CAP. CODE	CAP.														
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														

Notes

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

(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

SELECTION CHART

DIELECTRIC		C0G (NP0)																		
STYLE		HV1812 (1)							HV1825 (1)						HV2220 (1)			HV2225 (1)		
EIA CODE		1812							1825						2220			2225		
VOLTAGE (V_{DC})		500	630	1000	2000	3000	4000	5000	500	630	1000	3000	4000	5000	3000	4000	5000	3000	4000	5000
VOLTAGE CODE		E	L	G	F	H	V	M	E	L	G	H	V	M	H	V	M	H	V	M
CAP. CODE	CAP.																			
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																			

Notes

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

(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

SELECTION CHART

DIELECTRIC		X7R																
STYLE		HV1206 (1)					HV1210 (1)					HV1808 (1)						
EIA CODE		1206					1210					1808						
VOLTAGE (V_{DC})		500	630	1000	1500	2000	500	630	1000	1500	2000	500	630	1000	1500	2000	3000	6000
VOLTAGE CODE		E	L	G	R	F	E	L	G	R	F	E	L	G	R	F	H	6
CAP. CODE	CAP.																	
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	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
751	750 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											•	•	•				

Notes

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

(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

SELECTION CHART

DIELECTRIC		X7R																
STYLE		HV1812 (1)									HV1825 (1)							
EIA CODE		1812									1825							
VOLTAGE (V_{DC})		500	630	1000	1500	2000	3000	4000	5000	6000	500	630	1000	1500	2000	3000	4000
VOLTAGE CODE		E	L	G	R	F	H	V	M	6	E	L	G	R	F	H	V
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	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
751	750 pF	•	•	•	•	•	•	•	•	•								
821	820 pF	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	
102	1.0 nF	•	•	•	•	•	•	•			•	•	•	•	•	•	•	
122	1.2 nF	•	•	•	•	•	•	•			•	•	•	•	•	•	•	
152	1.5 nF	•	•	•	•	•	•	• (2)			•	•	•	•	•	•	•	
182	1.8 nF	•	•	•	•	•	•				•	•	•	•	•	•	•	
222	2.2 nF	•	•	•	•	•	•				•	•	•	•	•	•	•	
272	2.7 nF	•	•	•	•	•	• (2)				•	•	•	•	•	•	•	
332	3.3 nF	•	•	•	•	•	• (2)				•	•	•	•	•	•	•	
392	3.9 nF	•	•	•	•	•	• (2)				•	•	•	•	•	•		
472	4.7 nF	•	•	•	•	•					•	•	•	•	•	•		
562	5.6 nF	•	•	•	•	•					•	•	•	•	•	• (2)		
682	6.8 nF	•	•	•	•	•					•	•	•	•	•	• (2)		
822	8.2 nF	•	•	•	•						•	•	•	•	•	• (2)		
103	10 nF	•	•	•	•						•	•	•	•	•	• (2)		
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																	

Notes

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

(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

SELECTION CHART

DIELECTRIC		X7R																	
STYLE		HV2220 (1)									HV2225 (1)								
EIA CODE		2220									2225								
VOLTAGE (V_{DC})		500	630	1000	1500	2000	3000	4000	5000	6000	500	630	1000	1500	2000	3000	4000	5000	6000
VOLTAGE CODE		E	L	G	R	F	H	V	M	6	E	L	G	R	F	H	V	M	6
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	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
751	750 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	•	•	•	•	•	• (2)				•	•	•	•	•	•	•		
682	6.8 nF	•	•	•	•	•	• (2)				•	•	•	•	•	•			
822	8.2 nF	•	•	•	•	•	• (2)				•	•	•	•	•	•			
103	10 nF	•	•	•	•	•	• (2)				•	•	•	•	•	•			
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										•	•	•						

Notes

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

(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

SELECTION CHART

DIELECTRIC		X7R													
STYLE		HV3040 (1)				HV3640 (1)						HV4044 (1)			
EIA CODE		3040				3640						4044			
VOLTAGE (V_{DC})		500	630	1000	1500	500	630	1000	1500	6000	8000	500	630	1000	1500
VOLTAGE CODE		E	L	G	R	E	L	G	R	6	8	E	L	G	R
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					•	•	•	•	•	•				
751	750 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											•	•	•	

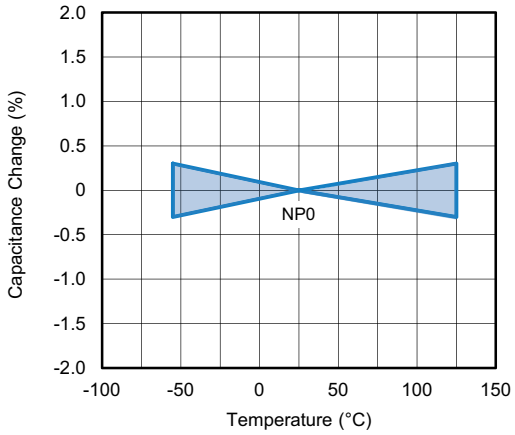
Notes

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

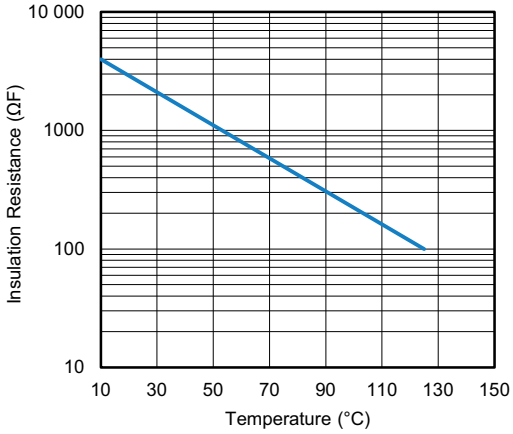
(2) Rating use lower packaging quantity, see “Standard Packaging Quantities” chart

C0G (NP0) DIELECTRIC - TYPICAL PARAMETERS

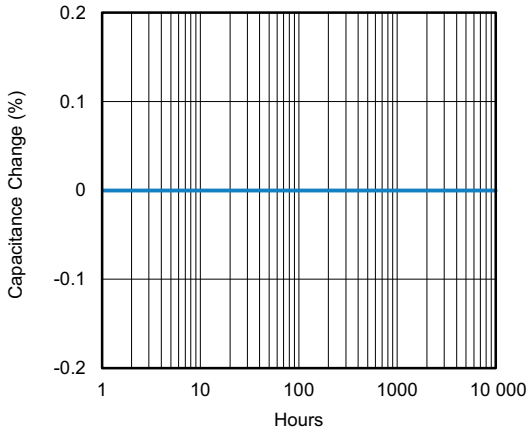
Temperature Coefficient of Capacitance



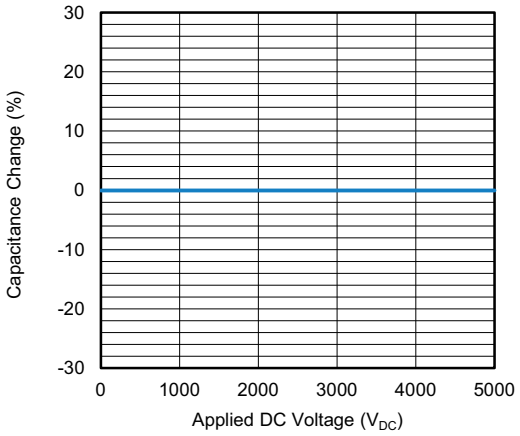
Minimum Insulation Resistance vs. Temperature



Aging Rate

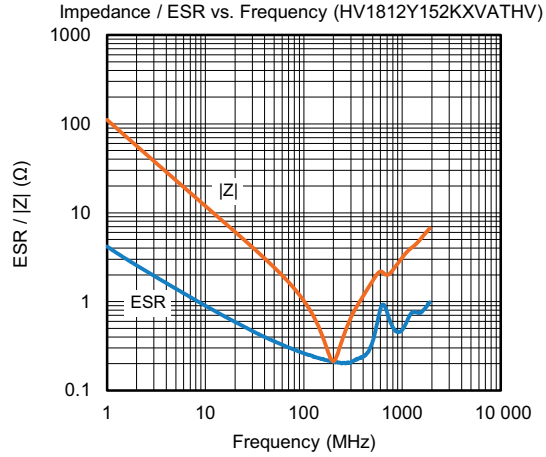


Voltage Coefficient of Capacitance

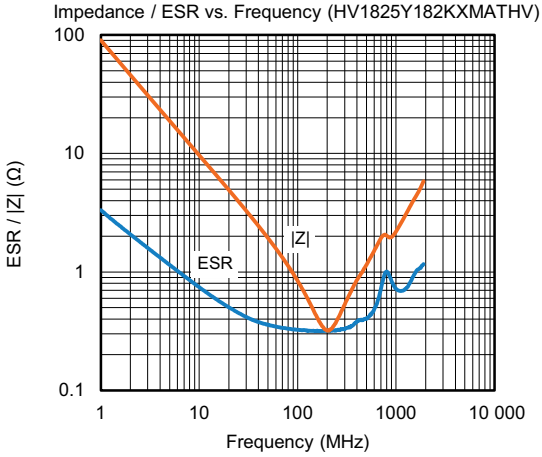


X7R DIELECTRIC - TYPICAL PARAMETERS

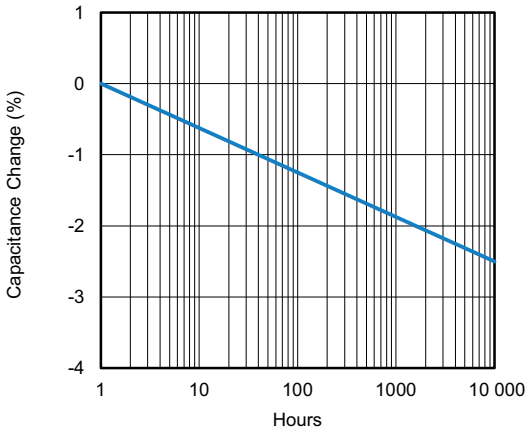
Impedance / ESR vs. Frequency (HV1812Y152KXVATHV)



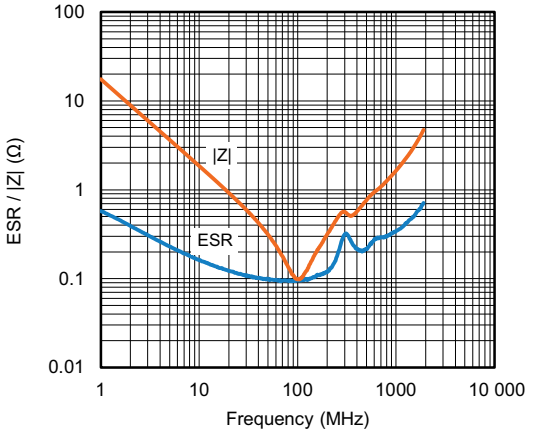
Impedance / ESR vs. Frequency (HV1825Y182KXMATHV)



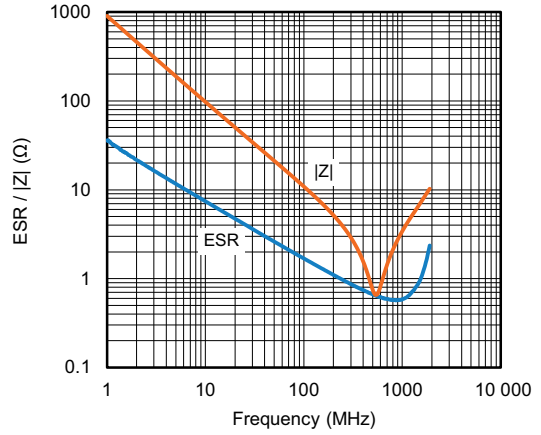
Aging Rate



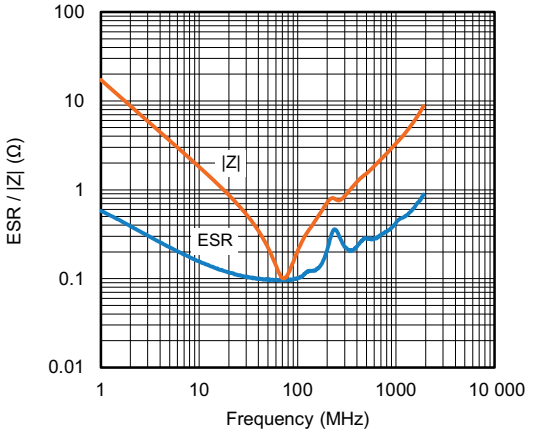
Impedance / ESR vs. Frequency (HV1825Y103KXHATHV)



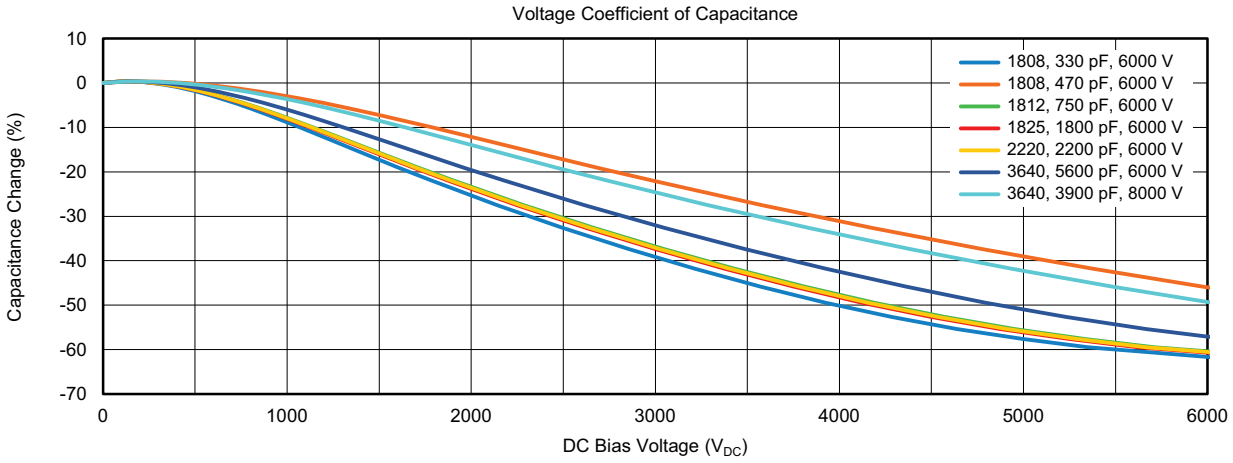
Impedance / ESR vs. Frequency (HV1812Y181KXMATHV)



Impedance / ESR vs. Frequency (HV2220Y103KXHATHV)



X7R DIELECTRIC - TYPICAL PARAMETERS

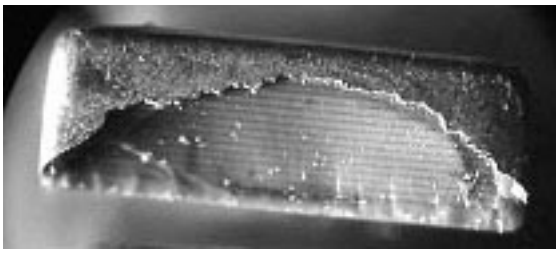


POLYMER TERMINATION

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. 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.

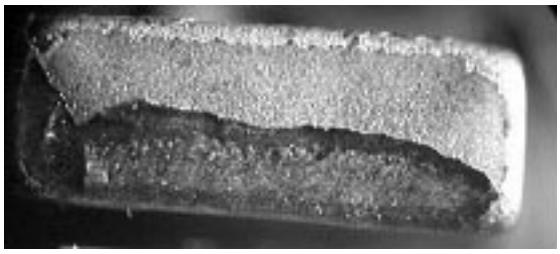
STANDARD TERMINATION

Exposed Electrodes = Electrical Short



OMD CAP PLUS POLYMER TERMINATION

No Exposed Electrodes = No Electrical Short



STANDARD PACKAGING QUANTITIES (1)

CASE CODE	TAPE SIZE	7" REEL QUANTITIES PACKAGING CODE "T"	11 1/4" AND 13" REEL QUANTITIES PACKAGING CODE "R"
1206	8 mm	2500 / 3000	9000 / 10 000
1210	8 mm	2000 / 2500 / 3000	9000 / 10 000
1808	12 mm	2000	10 000
1812	12 mm	500 (2) / 1000	4000
1825	12 mm	500 (2) / 1000	4000
2220	12 mm	500 (2) / 1000	n/a
2225	12 mm	500	n/a
3040	16 mm	500	n/a
3640	16 mm	500	n/a
4044	24 mm	300	n/a

Notes

(1) Reference: EIA standard RS 481 - "Taping of Surface Mount Components for Automatic Placement"

(2) Lower quantity for certain ratings, see "Selection Chart"

STORAGE AND HANDLING CONDITIONS

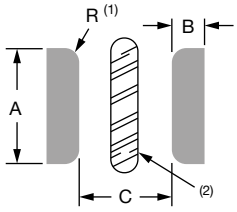
(1) Store the components at 5 °C to 40 °C ambient temperature and ≤ 70 % relative humidity conditions.
(2) The product is recommended to be used within a time-frame of 2 years after shipment.
Check solderability in case extended shelf life beyond the expiry date is needed.

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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