Surface Mount Multilayer Ceramic Chip Capacitors for High Reliability Applications



FEATURES

- Manufactured with a combination of design, materials and tight process control to achieve very high field reliability
- C0G (NP0) and X7R / X5R dielectrics offered
- MIL-PRF-55681 qualified production line (1)
- Reliability maintenance testing to verify consistent quality
  (X5R max. test temperature: +85 °C)
- Available with group A and C screening
- Group C data can be reported
- Available with only group A screening
- Available with only voltage conditioning
- Customized certification available on request to meet your quality requirements
- Available with tin-lead barrier terminations order code “L”
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb Available

RoHS* Available

HALOGEN FREE

Notes

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

(1) External visual inspection per EIA-595 standard

APPLICATIONS

- System critical medical applications
- Mission critical military and aerospace applications

ELECTRICAL SPECIFICATIONS

C0G (NP0)

GENERAL SPECIFICATION

Note
Electrical characteristics at +25 °C unless otherwise specified

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

Capacitance Range: 1.0 pF to 39 nF

Voltage Range: 10 V_{DC} to 600 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}-rated:	150 % of rated voltage

X7R / X5R

GENERAL SPECIFICATION

Note
Electrical characteristics at +25 °C unless otherwise specified

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

Capacitance Range: 100 pF to 6.8 µF

Voltage Range: 6.3 V_{DC} to 500 V_{DC}

Temperature Coefficient of Capacitance (TCC):
X5R: ± 15 % from -55 °C to +85 °C, with 0 V_{DC} applied
X7R: ± 15 % from -55 °C to +125 °C, with 0 V_{DC} applied

Dissipation Factor (DF):
≤ 6.3 V, 10 V ratings: 5 % maximum at 1.0 V_{RMS} and 1 kHz
16 V, 25 V ratings: 3.5 % maximum at 1.0 V_{RMS} and 1 kHz
≥ 50 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:	150 % of rated voltage
1500 V_{DC}, 3000 V_{DC}-rated:	120 % of rated voltage

For technical questions, contact: mlcc@vishay.com

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QUICK REFERENCE DATA

DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
C0G (NP0)	0402	100	1.0 pF	180 pF
	0603	200	1.0 pF	1.5 nF
	0805	500	1.0 pF	3.3 nF
	1206	600	1.0 pF	10 nF
	1210	500	100 pF	10 nF
	1808	500	100 pF	10 nF
	1812	500	39 pF	22 nF
	1825	500	100 pF	33 nF
	2220	500	100 pF	33 nF
	2225	500	120 pF	39 nF
X5R	0402	16	27 nF	47 nF
	0603	6.3	120 nF	150 nF
X7R	0402	100	100 pF	22 nF
	0603	100	270 pF	100 nF
	0805	200	150 pF	390 nF
	1206	500	680 pF	1.0 µF
	1210	500	1.0 nF	1.0 µF
	1808	500	1.0 nF	270 nF
	1812	500	3.3 nF	1.0 µF
	1825	500	10 nF	2.7 µF
	2220	500	10 nF	2.2 µF
	2225	500	10 nF	4.7 µF
	3640	500	15 nF	6.8 µF

ORDERING INFORMATION

VJ1206	Y	104	J	L	A	A	T	### (2)
CASE CODE	DIELECTRIC	CAPACITANCE NOMINAL	CAPACITANCE TOLERANCE	TERMINATION	DC VOLTAGE RATING (1)	MARKING	PACKAGING	PROCESS CODE
0402 0603 0805 1206 1210 1808 1812 1825 2220 2225 3640	A = C0G (NP0) G = X5R Y = X7R	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. **Examples:** 1R0 = 1.0 pF 103 = 10 000 pF 104 = 100 000 pF	C = ± 0.25 pF D = ± 0.50 pF F = ± 1 % G = ± 2 % H = ± 3 % J = ± 5 % K = ± 10 % M = ± 20 % **Note:** C0G (NP0): C, D < 10 pF F, G, H, J, K ≥ 10 pF X7R, X5R: J, K, M	X = Ni barrier 100 % tin plated L = Ni barrier with tin lead plated finish min. 4 % lead F, E = AgPd (3)	Y = 6.3 V Q = 10 V J = 16 V X = 25 V A = 50 V B = 100 V C = 200 V P = 250 V E = 500 V N = 600 V	A = unmarked	C = 7" reel / paper tape T = 7" reel / plastic tape J = 7" reel (low quantity) 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 "E" and "F" terminations, sizes 0402 / 0603 / 0805	68, 5G, 2L, 2M, 2MP, CLH

Notes

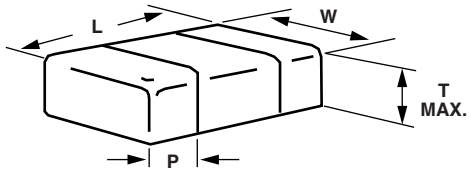
(1) DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance. Consult for questions: mlcc@vishay.com

(2) **68:** MIL-PRF-55681 Group A C of I, subgroups 1, 2, 4 attribute data provided with shipment. ***No Group C testing performed***
5G: Voltage conditioning only. Generic CoC (no data)
2L: MIL-PRF-55681 Group A C of I, provided with shipment.
Group C testing is performed based on MIL-PRF-55681 periodic maintenance schedule. ***No Group C data provided***
2M: MIL-PRF-55681 Group A, subgroups 1, 2, 4. Group A subgroups 1, 2, 4 attribute data provided with shipment.
MIL-PRF-55681 Group C, testing subgroups 1, 2, 3, 5 is performed on each lot. Shipment held until tests are complete.
No Group C data provided
2MP: MIL-PRF-55681 Group A, subgroups 1, 2, 4. Group A subgroups 1, 2, 4 attribute data provided with shipment.
MIL-PRF-55681 Group C, testing subgroups 1, 2, 3, 5 performed on each lot. Shipment held until tests are complete.
Group C test summary data is included with shipment (fee applies)
CLH: 100 % voltage condition. Tested and inspected in accordance with MIL-PRF-38534, Table C-III-1 Class H

(3) Termination code "F" is for conductive epoxy / reflow assembly.
Termination code "E" is for conductive epoxy assembly only

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DIMENSIONS in inches (millimeters)



CASE CODE	STYLE	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION PAD (P)	
					MINIMUM	MAXIMUM
0402	VJ0402	0.040 ± 0.004 (1.00 ± 0.10)	0.020 ± 0.004 (0.50 ± 0.10)	0.024 (0.61)	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)	0.036 (0.92)	0.012 (0.30)	0.018 (0.46)
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)	0.028 (0.71)
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)	0.028 (0.71)
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)	0.028 (0.71)
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)	0.030 (0.76)
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)	0.030 (0.76)
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)	0.030 (0.76)
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)	0.030 (0.76)
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)	0.030 (0.76)
3640	VJ3640	0.360 ± 0.015 (9.14 ± 0.38)	0.400 ± 0.015 (10.2 ± 0.38)	0.086 (2.18)	0.010 (0.25)	0.030 (0.76)

Note

- Termination code “F” has increased dimension tolerance:
  0402: length + 0.006" (+ 0.15 mm)
  0603: length + 0.008" (+ 0.20 mm)
  ≥ 0805: length + 0.011" (+ 0.28 mm)

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SELECTION CHART

DIELECTRIC		C0G (NP0)																	
STYLE		VJ0402					VJ0603						VJ0805						
CASE CODE		0402					0603						0805						
VOLTAGE (V_{DC})		10	16	25	50	100	10	16	25	50	100	200	10	16	25	50	100	200	500
VOLTAGE CODE		Q	J	X	A	B	Q	J	X	A	B	C	Q	J	X	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												•	•	•				
282	2.8 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																		

Notes

RoHS-compliant except when supplied with lead (Pb)-containing termination, code “L”

Not RoHS-compliant

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SELECTION CHART

DIELECTRIC		C0G (NP0)											
STYLE		VJ1206							VJ1210 [1]				
CASE CODE		1206							1210 [1]				
VOLTAGE (V_{DC})		16	25	50	100	200	500	600	25	50	100	200	500
VOLTAGE CODE		J	X	A	B	C	E	N	X	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	•	•	•	•	•			•	•	•	•	
282	2.8 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												

Notes

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

RoHS-compliant except when supplied with lead (Pb)-containing termination, code “L”

Not RoHS-compliant

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SELECTION CHART

DIELECTRIC		C0G (NP0)														
STYLE		VJ1808 (1)					VJ1812 (1)					VJ1825 (1)				
CASE CODE		1808 (1)					1812 (1)					1825 (1)				
VOLTAGE (V_{DC})		25	50	100	200	500	25	50	100	200	500	25	50	100	200	500
VOLTAGE CODE		X	A	B	C	E	X	A	B	C	E	X	A	B	C	E
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	•	•	•	•		•	•	•	•	•	•	•	•	•	•
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															

Notes

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

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SELECTION CHART

DIELECTRIC		C0G (NP0)									
STYLE		VJ2220 (1)					VJ2225 (1)				
CASE CODE		2220 (1)					2225 (1)				
VOLTAGE (V_{DC})		25	50	100	200	500	25	50	100	200	500
VOLTAGE CODE		X	A	B	C	E	X	A	B	C	E
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	•	•	•	•	•	•	•	•	•	•
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										

Notes

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SELECTION CHART

DIELECTRIC		X7R / X5R [1]																	
STYLE		VJ0402						VJ0603						VJ0805					
CASE CODE		0402						0603						0805					
VOLTAGE (V_{DC})		6.3	10	16	25	50	100	6.3	10	16	25	50	100	10	16	25	50	100	200
VOLTAGE CODE		Y	Q	J	X	A	B	Y	Q	J	X	A	B	Q	J	X	A	B	C
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	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	X5R	X5R	X5R				•	•	•	•	•		•	•	•	•	•	•
333	33 nF	X5R	X5R	X5R				•	•	•	•	•		•	•	•	•	•	
393	39 nF	X5R						•	•	•	•	•		•	•	•	•	•	
473	47 nF	X5R						•	•	•	•	•		•	•	•	•	•	
563	56 nF							•	•	•	•			•	•	•	•	•	
683	68 nF							•	•	•	•			•	•	•	•	•	
823	82 nF							•	•	•	•			•	•	•	•	•	
104	100 nF							•	•	•	•			•	•	•	•		
124	120 nF							X5R						•	•	•	•		
154	150 nF							X5R						•	•	•	•		
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																		

Notes

[1] See “Selection Chart” for values only available as X5R. All other values X7R.

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SELECTION CHART

DIELECTRIC		X7R											
STYLE		VJ1206						VJ1210 [1]					
CASE CODE		1206						1210					
VOLTAGE (V_{DC})		16	25	50	100	200	500	16	25	50	100	200	500
VOLTAGE CODE		J	X	A	B	C	E	J	X	A	B	C	E
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	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												

Notes

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

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SELECTION CHART

DIELECTRIC		X7R															
STYLE		VJ1808 (1)					VJ1812 (1)						VJ1825 (1)				
CASE CODE		1808 (1)					1812 (1)						1825 (1)				
VOLTAGE (V_{DC})		25	50	100	200	500	25	50	100	200	250	500	25	50	100	200	500
VOLTAGE CODE		X	A	B	C	E	X	A	B	C	P	E	X	A	B	C	E
CAP. CODE	CAP.																
102	1.0 nF	•	•	•	•	•											
222	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																
825	8.2 µF																

Notes

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SELECTION CHART

DIELECTRIC		X7R														
STYLE		VJ2220 (1)					VJ2225 (1)					VJ3640 (1)				
CASE CODE		2220 (1)					2225 (1)					3640 (1)				
VOLTAGE (V_{DC})		25	50	100	200	500	25	50	100	200	500	25	50	100	200	500
VOLTAGE CODE		X	A	B	C	E	X	A	B	C	E	X	A	B	C	E
CAP. CODE	CAP.															
102	1.0 nF															
222	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											•				
825	8.2 µF															

Notes

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

RoHS-compliant except when supplied with lead (Pb)-containing termination, code "L"

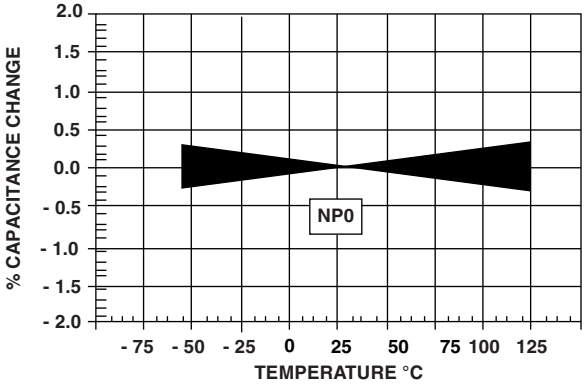
Not RoHS-compliant

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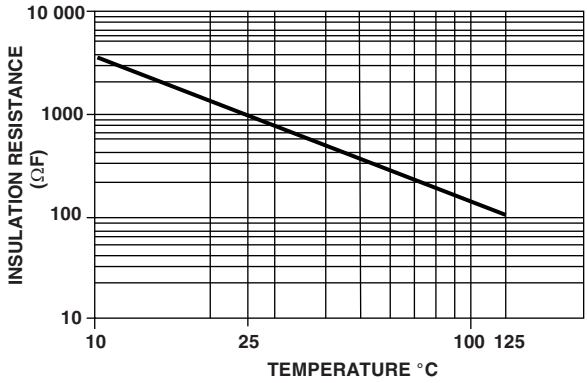
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HI-REL C0G (NP0) DIELECTRIC - TYPICAL PARAMETERS

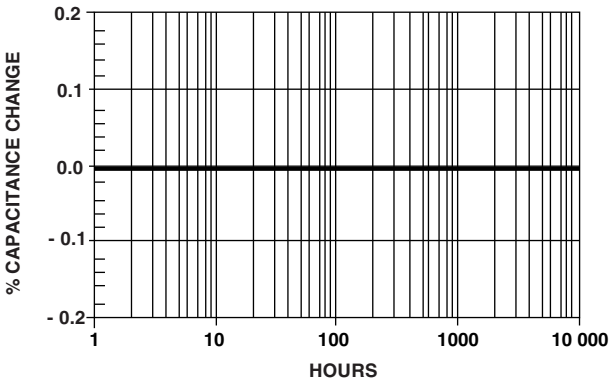
TEMPERATURE COEFFICIENT OF CAPACITANCE



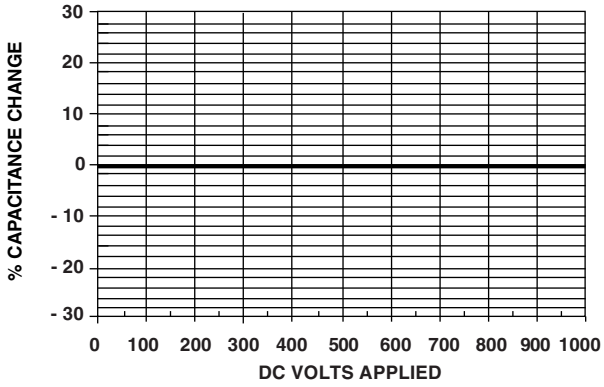
MINIMUM INSULATION RESISTANCE VS. TEMPERATURE



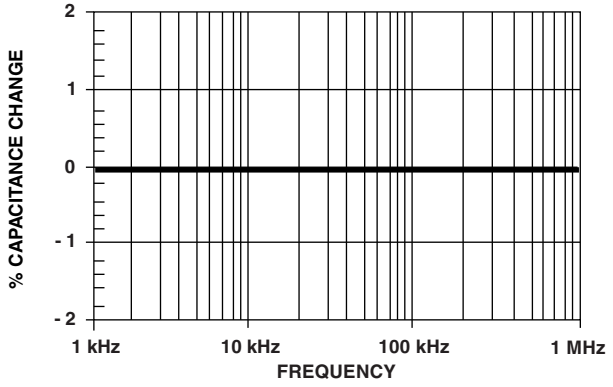
AGING RATE



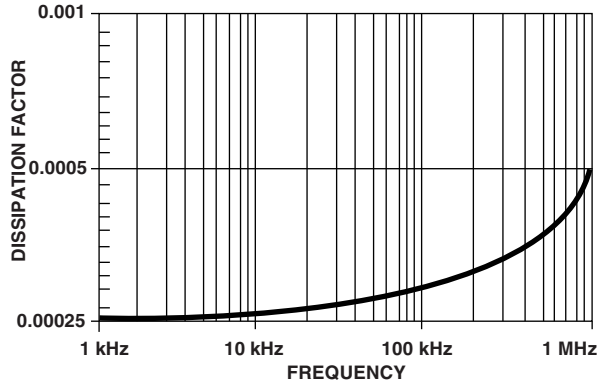
VOLTAGE COEFICIENT OF CAPACITANCE



CHANGE OF CAPACITANCE WITH FREQUENCY



DISSIPATION FACTOR VS. FREQUENCY

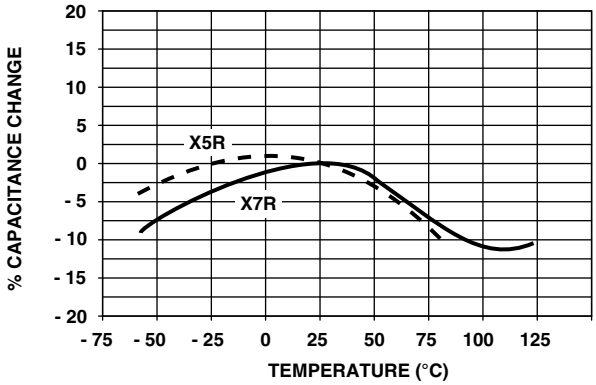


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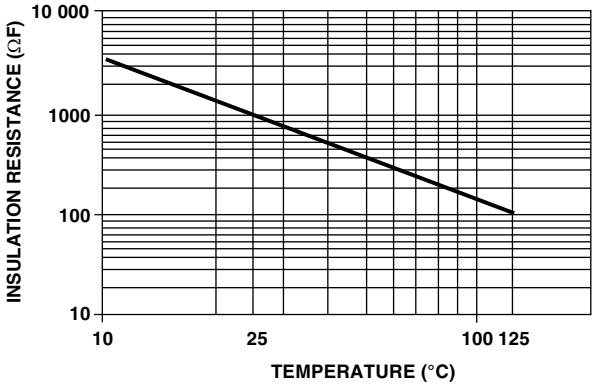
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HI-REL X7R / X5R DIELECTRIC - TYPICAL PARAMETERS

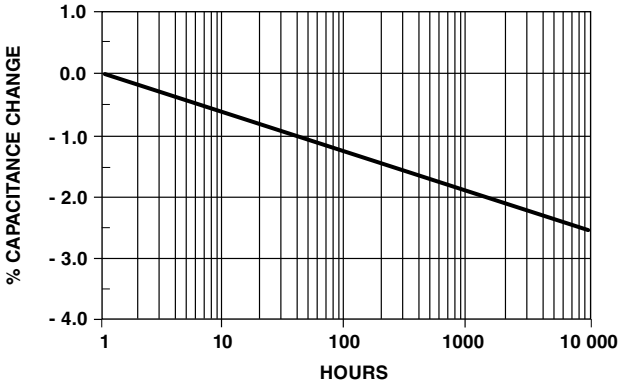
TEMPERATURE COEFFICIENT OF CAPACITANCE



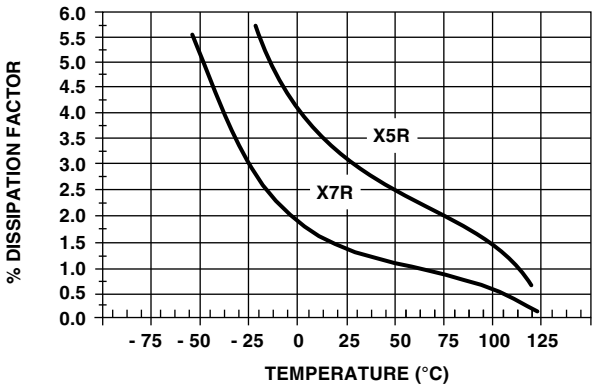
MIN. INSULATION RESISTANCE VS. TEMPERATURE



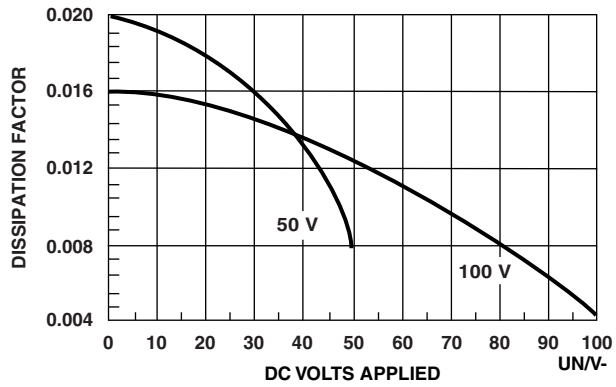
AGING RATE



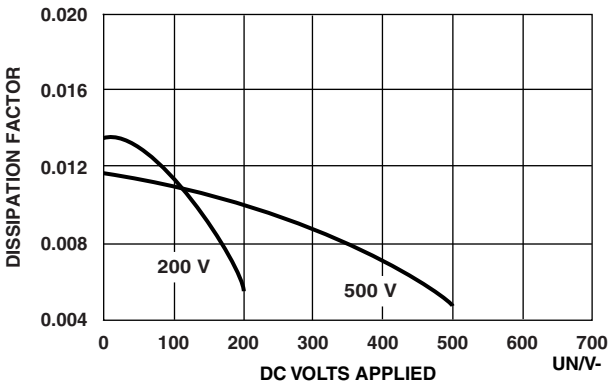
DISSIPATION FACTOR VS. TEMPERATURE



DISSIPATION FACTOR VS. VOLTAGE



DISSIPATION FACTOR VS. VOLTAGE



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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"	LOW QUANTITY PACKAGING CODE "J"	PAPER TAPE PACKAGING CODE "P" / "I"	PLASTIC TAPE PACKAGING CODE "R"
0402	8 mm	5000	n/a	1000	10 000	n/a
0603 (4)	8 mm	4000	4000	1000	10 000	10 000
0805 (4)	8 mm	3000	3000	1000	10 000	10 000
1206 (4)	8 mm	3000	3000 / 2500	1000	10 000	10 000 / 9000
1210 (4)	8 mm	n/a	3000 / 2500 / 2000	1000	n/a	10 000 / 9000
1808	12 mm	n/a	2000	500	n/a	10 000
1812	12 mm	n/a	1000	500	n/a	4000
1825	12 mm	n/a	500	250	n/a	4000
2220	12 mm	n/a	1000	500	n/a	4000
2225	12 mm	n/a	500	250	n/a	4000
3640	16 mm	n/a	500	n/a	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

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.

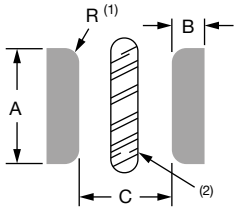
c. Do not expose products to excessive shock, vibration, direct sunlight and so on.

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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

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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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