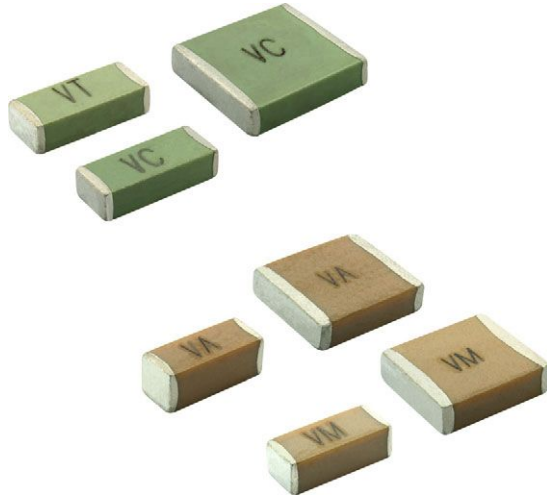


## Surface Mount Multilayer Ceramic Chip Capacitors for Safety Certified Applications



### FEATURES

- Approved IEC 60384-14
- Specialty: safety certified capacitors
- AEC-Q200 qualified available with PPAP
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Flexible termination “W” for improved bending capability performance available for selected values
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

AUTOMOTIVE  
GRADE  
Available



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### APPLICATIONS

- Power supplies
- EMI and AC line filtering
- EV charging systems
- AC equipment and appliances
- Lighting strike and voltage surge protection
- Isolators
- Facsimile and telephone

### ELECTRICAL SPECIFICATIONS

#### Note

- Electrical characteristics at +25 °C unless otherwise specified

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

**Capacitance Range X1 / Y2 <sup>(1)</sup>:**

C0G (NP0): 10 pF to 1.0 nF

X7R: 100 pF to 4.7 nF

**Capacitance Range X2 <sup>(1)</sup>:**

C0G (NP0): 10 pF to 390 pF

X7R: 100 pF to 12 nF

**Voltage Range:** 250 V<sub>AC</sub>

**Temperature Coefficient of Capacitance (TCC):**

C0G (NP0): 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C

X7R: ± 15 % from -55 °C to +125 °C, with 0 V<sub>DC</sub> applied

**Dissipation Factor (DF) <sup>(1)</sup>:**

C0G (NP0): 0.1 % maximum

X7R: 2.5 % maximum

**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

#### Note

<sup>(1)</sup> Test conditions per IEC 60384-14:

C0G (NP0): 1.0 V<sub>RMS</sub> at 1 MHz

X7R: 1.0 V<sub>RMS</sub> at 1 kHz

#### Aging Rate:

C0G (NP0): 0 % maximum per decade

X7R: 1 % maximum per decade

#### Voltage Proof Test:

X1 / Y2: min. 1500 V<sub>AC</sub>

X2: min. 1075 V<sub>DC</sub>

#### Peak Impulse Voltage:

X1 / Y2: 5000 V

X2: 2500 V

#### Voltage Rating DC:

X1 / Y2: 2000 V<sub>DC</sub>

X2: 1500 V<sub>DC</sub>

#### Climatic Category According to EN 60068-1:

55/125/21



QUICK REFERENCE DATA				
DIELECTRIC	CASE	MAXIMUM VOLTAGE (V <sub>AC</sub> )	CAPACITANCE	
			MINIMUM	MAXIMUM
C0G (NP0) (X1 / Y2)	2008	250	10 pF	220 pF
	2220	250	47 pF	1.0 nF
C0G (NP0) (X2)	2008	250	10 pF	390 pF
X7R (X1 / Y2)	2008	250	100 pF	1.0 nF
	2220	250	270 pF	4.7 nF
X7R (X2)	2008	250	100 pF	2.7 nF
	2220	250	270 pF	12 nF

**Notes**

- Detail ratings see “Selection Chart”
- Size 2008 is compatible with 1808 solderlands and full conform with the IEC-60384-14 requirements for creepage distance

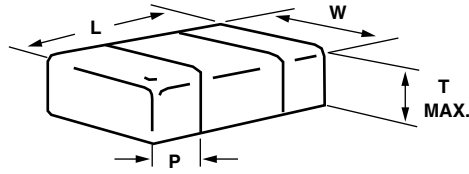
ORDERING INFORMATION								
VJ2008	Y	102	K	X	U	S	T	### <sup>(1)</sup>
CASE CODE	DIELECTRIC	CAPACITANCE NOMINAL CODE	CAPACITANCE TOLERANCE	TERMINATION	AC VOLTAGE RATING	MARKING	PACKAGING	PROCESS CODE
2008 2220	A = C0G (NP0) Y = X7R	Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. <b>Examples:</b> 101 = 100 pF 102 = 1000 pF 103 = 10 000 pF	C0G (NP0): J = ± 5 % K = ± 10 %  X7R: K = ± 10 % M = ± 20 %	X = Ni barrier 100 % matte tin plate finish W = Ni barrier with flexible layer, 100 % matte tin plate finish	U = 250 V <sub>AC</sub>	S = marked (see Part Marking table below)	T = 7" reel / plastic tape	X1 = X1 / Y2 X2 = X2 Vishay automotive grade per customer request, add "A": X1A = X1 / Y2 X2A = X2

**Notes**

- Detail ratings see “Selection Chart”
- (1) Process code must be added to control products and requirements

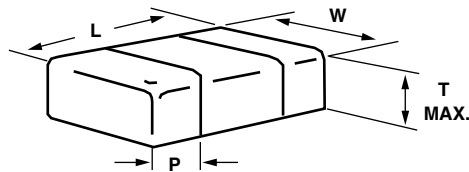
PART MARKING		
MARKING	1 <sup>ST</sup> DIGIT MANUFACTURER	2 <sup>ND</sup> DIGIT DIELECTRIC AND RATING
VC	V = Vishay	C = C0G (NP0), X1 / Y2 - “X” termination option
VT		T = C0G (NP0), X2 - “X” termination option
VD		D = C0G (NP0), X1 / Y2 - “W” termination option
VU		U = C0G (NP0), X2 - “W” termination option
VA		A = X7R, X1 / Y2 - “X” termination option
VM		M = X7R, X2 - “X” termination option
VB		B = X7R, X1 / Y2 - “W” termination option
VN		N = X7R, X2 - “W” termination option

## DIMENSIONS FOR "X" TERMINATION OPTION in inches (millimeters)



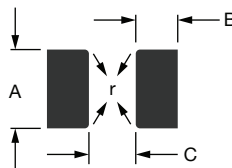
CASE CODE	PART ORDERING NUMBER	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION (P)	
					MINIMUM	MAXIMUM
2008	VJ2008	0.200 ± 0.010 (5.08 ± 0.25)	0.080 ± 0.010 (2.03 ± 0.25)	0.086 (2.18)	0.010 (0.25)	0.030 (0.76)
2220	VJ2220	0.220 ± 0.008 (5.59 ± 0.20)	0.200 ± 0.010 (5.08 ± 0.25)	0.086 (2.18)	0.010 (0.25)	0.030 (0.76)

## DIMENSIONS FOR "W" TERMINATION OPTION in inches (millimeters)



CASE CODE	PART ORDERING NUMBER	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION (P)	
					MINIMUM	MAXIMUM
2008	VJ2008	0.200 - 0.010 / + 0.020 (5.08 - 0.25 / + 0.50)	0.080 ± 0.010 (2.03 ± 0.25)	0.086 (2.18)	0.010 (0.25)	0.030 (0.76)
2220 COG (NP0)	VJ2220A	0.220 - 0.008 / + 0.018 (5.59 - 0.20 / + 0.45)	0.200 ± 0.010 (5.08 ± 0.25)	0.086 (2.18)	0.010 (0.25)	0.030 (0.76)
2220 X7R	VJ2220Y	0.220 - 0.008 / + 0.018 (5.59 - 0.20 / + 0.45)	0.200 ± 0.010 (5.08 ± 0.25)	0.105 (2.65)	0.010 (0.25)	0.030 (0.76)

## RECOMMENDED SOLDERING PAD DIMENSIONS in millimeters



CASE CODE	A	B	C	r <sup>(1)</sup>
2008	2.70	1.50	4.00	0.5
2220	5.80	1.50	4.20	0.5

**Note**
<sup>(1)</sup> Radius optional



SELECTION CHART				
DIELECTRIC		C0G (NP0) (X1 / Y2)		C0G (NP0) (X2)
STYLE		VJ2008 <sup>(1)</sup>	VJ2220 <sup>(1)</sup>	VJ2008 <sup>(1)</sup>
CASE CODE		2008	2220	2008
VOLTAGE (V <sub>AC</sub> )		250	250	250
VOLTAGE CODE		U	U	U
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			

**Note**

<sup>(1)</sup> See soldering recommendations within this data book, or visit [www.vishay.com/doc?45034](http://www.vishay.com/doc?45034)



SELECTION CHART					
DIELECTRIC		X7R (X1 / Y2)		X7R (X2)	
STYLE		VJ2008 <sup>(1)</sup>	VJ2220 <sup>(1)</sup>	VJ2008 <sup>(1)</sup>	VJ2220 <sup>(1)</sup>
CASE CODE		2008	2220	2008	2220
VOLTAGE (V <sub>AC</sub> )		250	250	250	250
VOLTAGE CODE		U	U	U	U
CAP. CODE	CAP.				
100	10 pF				
220	22 pF				
330	33 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				

**Notes**

■ Values available with “W” termination

<sup>(1)</sup> See soldering recommendations within this data book, or visit [www.vishay.com/doc?45034](http://www.vishay.com/doc?45034)



PACKAGING QUANTITIES (1)		
CASE CODE	TAPE SIZE	7" REEL QUANTITIES
		PACKAGING CODE "T"
2008	12 mm	2000
2220	12 mm	1000

**Note**

(1) Reference: EIA standard RS481 - "Taping of Surface Mount Components for Automatic Placement"

APPROVALS FOR COG (NPO)				
VDE approval mark (update 2020-02-20):				
X1 / Y2-capacitor:	40036706	10 pF to 1000 pF	250 V <sub>AC</sub>	
X2-capacitor:	40036706	10 pF to 470 pF	250 V <sub>AC</sub>	
DIN EN 60384-14 (VDE 0565-1-1):2014-04; EN 60384-14:2013-08; IEC 60384-14 (ed.4)				
CAN / cCSAus approval mark (update 2020-05-05):				
X1 / Y2-capacitor:	70001064	10 pF to 1000 pF	250 V~	
X2-capacitor:	70001064	10 pF to 470 pF	250 V~	
CAN / CSA-E60384-14:14 and ANSI / UL 60384-14-2017				

APPROVALS FOR X7R					
VDE approval mark (*update 2020-02-20), ** update 2021-01-14:					
X1 / Y2-capacitor:	X termination	40037440*	82 pF to 4700 pF	250 V <sub>AC</sub>	
	W termination	40052169**	100 pF to 4700 pF		
X2-capacitor:	X termination	40037440*	82 pF to 12 000 pF	250 V <sub>AC</sub>	
	W termination	40052169**	100 pF to 12 000 pF		
DIN EN 60384-14 (VDE 0565-1-1):2014-04; EN 60384-14:2013-08; IEC 60384-14 (ed.4)					
CSA / cCSAus approval mark (update 2020-05-05):					
X1 / Y2-capacitor:	70001064	82 pF to 4700 pF	250 V~		
X2-capacitor:	70001064	82 pF to 12 000 pF	250 V~		
CAN / CSA-E60384-14:14 and ANSI / UL 60384-14-2017					

GENERAL CERTIFICATES	
# Quality management system according to ISO/IATF 16949	Yes
# Quality management system according to ISO 9001	Yes
# Environmental certification according to ISO 14001	Yes
# Health and safety system according to ISO 45001	Yes

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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