

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



### FEATURES

- Approved IEC 60384-14
- Specialty: safety certified capacitors
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### APPLICATIONS

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

### 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>:** 10 pF to 1.0 nF

**Capacitance Range X2 <sup>(1)</sup>:** 10 pF to 470 pF

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

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

0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C

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

0.1 % maximum for values ≤ 1000 pF at 1.0 V<sub>RMS</sub> at 1 MHz  
or per IEC 60384-14 at 1.0 V<sub>RMS</sub> at 10 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:** 0 % maximum per decade

**Voltage Proof Test:**

X1 / Y2: 1500 V<sub>AC</sub> (RMS), 60 s ± 1 s

X2: 1075 V<sub>DC</sub>, 60 s ± 1 s

**Peak Impulse Voltage:**

X1 / Y2: 5000 V

X2: 2500 V

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

55/125/21

#### Note

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

Voltage: 1.0 V<sub>RMS</sub>

Capacitance: C ≤ 100 pF at 1 MHz and C > 100 pF at 1 kHz



## QUICK REFERENCE DATA

| DIELECTRIC          | CASE | MAXIMUM VOLTAGE<br>(V <sub>AC</sub> ) | CAPACITANCE |         |
|---------------------|------|---------------------------------------|-------------|---------|
|                     |      |                                       | MINIMUM     | MAXIMUM |
| C0G (NP0) (X1 / Y2) | 2008 | 250                                   | 10 pF       | 220 pF  |
|                     | 2012 | 250                                   | 18 pF       | 470 pF  |
|                     | 2220 | 250                                   | 47 pF       | 1.0 nF  |
| C0G (NP0) (X2)      | 2008 | 250                                   | 10 pF       | 390 pF  |
|                     | 2012 | 250                                   | 18 pF       | 470 pF  |

## Notes

- Detail ratings see "Selection Chart"
- Size 2008 and 2012 are compatible with 1808 and 1812 solderlands and full conform with the IEC-60384-14 requirements for creepage distance

## ORDERING INFORMATION

| VJ2008               | A             | 101                                                                                                                                   | 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<br>2012<br>2220 | A = C0G (NP0) | Expressed in picofarads (pF).<br>The first two digits are significant, the third is a multiplier.<br><b>Examples:</b><br>101 = 100 pF | J = $\pm 5\%$<br>K = $\pm 10\%$ | X = Ni barrier<br>100 % tin plated | U = 250 V <sub>AC</sub> | S = marked<br>(see Part Marking table below) | T = 7" reel/plastic tape<br>R = 11 1/4"/13" reel/plastic tape | X1 = X1 /<br>Y2<br>X2 = X2 |

## Notes

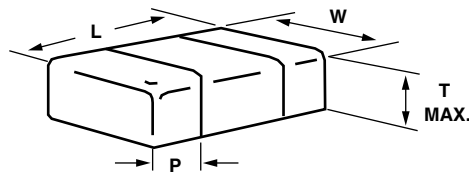
<sup>(1)</sup> Process code must be added to control products and requirements

- Detail ratings see "Selection Chart"

## PART MARKING

| MARKING | 1 <sup>ST</sup> DIGIT<br>MANUFACTURER | 2 <sup>ND</sup> DIGIT<br>DIELECTRIC AND RATING |
|---------|---------------------------------------|------------------------------------------------|
| VC      | V = Vishay                            | C = C0G/NP0, X1/Y2                             |
| VT      |                                       | T = C0G/NP0, X2                                |

## DIMENSIONS in inches (millimeters)



| CASE CODE | PART ORDERING NUMBER | LENGTH (L)                             | WIDTH (W)                              | MAXIMUM THICKNESS (T) | TERMINATION (P) |                 |
|-----------|----------------------|----------------------------------------|----------------------------------------|-----------------------|-----------------|-----------------|
|           |                      |                                        |                                        |                       | MINIMUM         | MAXIMUM         |
| 2008      | VJ2008               | 0.200 $\pm$ 0.010<br>(5.08 $\pm$ 0.25) | 0.080 $\pm$ 0.010<br>(2.03 $\pm$ 0.25) | 0.086<br>(2.18)       | 0.010<br>(0.25) | 0.030<br>(0.76) |
| 2012      | VJ2012               | 0.200 $\pm$ 0.010<br>(5.08 $\pm$ 0.25) | 0.126 $\pm$ 0.008<br>(3.20 $\pm$ 0.20) | 0.086<br>(2.18)       | 0.010<br>(0.25) | 0.030<br>(0.76) |
| 2220      | VJ2220               | 0.220 $\pm$ 0.008<br>(5.59 $\pm$ 0.20) | 0.200 $\pm$ 0.010<br>(5.08 $\pm$ 0.25) | 0.086<br>(2.18)       | 0.010<br>(0.25) | 0.030<br>(0.76) |



| SELECTION CHART            |        |                       |                       |                       |                       |                       |
|----------------------------|--------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| DIELECTRIC                 |        | C0G (NP0) (X1/Y2)     |                       |                       | C0G (NP0) (X2)        |                       |
| STYLE                      |        | VJ2008 <sup>(1)</sup> | VJ2012 <sup>(1)</sup> | VJ2220 <sup>(1)</sup> | VJ2008 <sup>(1)</sup> | VJ2012 <sup>(1)</sup> |
| CASE CODE                  |        | 2008                  | 2012                  | 2220                  | 2008                  | 2012                  |
| VOLTAGE (V <sub>AC</sub> ) |        | 250                   | 250                   | 250                   | 250                   | 250                   |
| VOLTAGE CODE               |        | U                     | U                     | 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 |                       |                       |                       |                       |                       |

**Notes**

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

• RoHS-compliant

| PACKAGING QUANTITIES <sup>(1)</sup> |           |                       |                                 |
|-------------------------------------|-----------|-----------------------|---------------------------------|
| CASE CODE                           | TAPE SIZE | 7" REEL QUANTITIES    | 11 1/4" AND 13" REEL QUANTITIES |
|                                     |           | PACKAGING CODE<br>"T" | PACKAGING CODE<br>"R"           |
| 2008                                | 12 mm     | 2000                  | 10 000                          |
| 2012                                | 12 mm     | 1000                  | 4000                            |
| 2220                                | 12 mm     | 1000                  | 4000                            |

**Note**

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



## APPROVALS

IEC 60384-14 - Safety tests  
CB test certificates:

X1/Y2-capacitor: DE1-51726 10 pF to 1000 pF 250 V<sub>AC</sub>

X2-capacitor: DE1-51726 10 pF to 470 pF 250 V<sub>AC</sub>

DIN EN 60384-14 (VDE 0565 Teil 1-1):2006-04; EN 60384-14:2005-08; IEC 60384-14 (ed.3)



X1/Y2-capacitor: 70001064 10 pF to 1000 pF 250 V~

X2-capacitor: 70001064 10 pF to 470 pF 250 V~

CAN/CSA-E60384-14:09 and ANSI/UL 60384-14-2009



## 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:

- 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.
- Store products on the shelf and avoid exposure to moisture or dust.
- Do not expose products to excessive shock, vibration, direct sunlight and so on.



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