

## Surface Mount Multilayer Ceramic Chip Capacitors for High Temperature Applications



### FEATURES

- Specialty: high temperature applications
- High operating temperature dielectric, up to +150 °C
- Maintains capacitance at high temperature for frequency stability
- 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)  
Available

### APPLICATIONS

- High temperature modules

### ELECTRICAL SPECIFICATIONS

#### Note

- Electrical characteristics at +25 °C unless otherwise specified.

**Operating Temperature:** -55 °C to +150 °C

**Capacitance Range:** 330 pF to 220 nF

**Voltage Range:** 25 V<sub>DC</sub> to 100 V<sub>DC</sub>

**Temperature Coefficient of Capacitance (TCC):**  
± 15 % from -55 °C to +150 °C

#### Dissipation Factor (DF):

25 V ratings: 3.5 % maximum at 1.0 V<sub>RMS</sub> and 1 kHz  
> 25 V ratings: 2.5 % maximum at 1.0 V<sub>RMS</sub> and 1 kHz

**Aging Rate:** 1 % maximum per decade

#### Insulation Resistance (IR):

at +25 °C and rated voltage 100 000 MΩ minimum or 1000 ΩF, whichever is less  
at +125 °C and rated voltage 10 000 MΩ minimum or 100 ΩF, whichever is less

#### Dielectric Strength Test:

performed per method 103 of EIA-198-2-E  
Applied test voltage:  
≤ 100 V<sub>DC</sub>-rated: 250 % of rated voltage

**QUICK REFERENCE DATA**

| DIELECTRIC | CASE | MAXIMUM VOLTAGE<br>(V) | CAPACITANCE |         |
|------------|------|------------------------|-------------|---------|
|            |      |                        | MINIMUM     | MAXIMUM |
| X8R        | 0402 | 100                    | 330 pF      | 6.8 nF  |
|            | 0603 | 100                    | 470 pF      | 33 nF   |
|            | 0805 | 100                    | 470 pF      | 100 nF  |
|            | 1206 | 50                     | 1.0 nF      | 220 nF  |
|            | 1210 | 50                     | 10 nF       | 220 nF  |

**Note**

- Detail ratings see "Selection Chart"

**ORDERING INFORMATION**

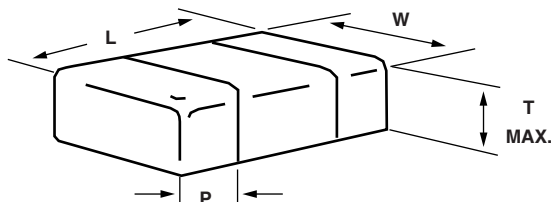
| VJ0805                                                                                                                                                                                                                                                                                                                                                | H          | 102                                                                                                                                    | K                                                 | X                                                                   | A                                 | A                                                                                                                  | C         | ### <sup>(2)</sup> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------|--------------------|
| CASE CODE                                                                                                                                                                                                                                                                                                                                             | DIELECTRIC | CAPACITANCE NOMINAL CODE                                                                                                               | CAPACITANCE TOLERANCE                             | TERMINATION                                                         | DC VOLTAGE RATING <sup>(1)</sup>  | MARKING <sup>(4)</sup>                                                                                             | PACKAGING | PROCESS CODE       |
| 0402<br>0603<br>0805<br>1206<br>1210                                                                                                                                                                                                                                                                                                                  | H = X8R    | Expressed in picofarads (pF).<br>The first two digits are significant, the third is a multiplier.<br><b>Examples:</b><br>102 = 1000 pF | J = $\pm 5\%$<br>K = $\pm 10\%$<br>M = $\pm 20\%$ | X = Ni barrier<br>100 % tin plated<br>F, E = AgPd <sup>(3)(5)</sup> | X = 25 V<br>A = 50 V<br>B = 100 V | A = unmarked<br>M = marked<br><b>Note</b><br>Marking is only available for 0805 and 1206 with termination code "X" |           |                    |
| T = 7" reel / plastic tape<br>C = 7" reel / paper tape<br>R = 11 1/4" / 13" reel / plastic tape<br>P = 11 1/4" / 13" reel / paper tape<br>O = 7" reel / flamed paper tape<br>I = 11 1/4" / 13" reel / flamed paper tape<br><b>Note</b><br>"I" and "O" are used for<br>"F" termination size 0603 / 0805 and<br>"E" termination size 0402 / 0603 / 0805 |            |                                                                                                                                        |                                                   |                                                                     |                                   |                                                                                                                    |           |                    |

**Notes**

- <sup>(1)</sup> DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance. Consult for questions: [mlcc@vishay.com](mailto:mlcc@vishay.com)
- <sup>(2)</sup> Process code may be added with up to three digits, used to control non-standard products and requirements.
- <sup>(3)</sup> Termination code "E" for conductive epoxy assembly.
- <sup>(4)</sup> Marking in reference to EIA198, see [www.vishay.com/doc?45028](http://www.vishay.com/doc?45028)
- <sup>(5)</sup> Termination code "F" not available for 0402, 0603 - 100 V, 0805 - 100 V.

**ENVIRONMENTAL STATUS**

| TERMINATION CODE | TERMINATION DESCRIPTION                  | RoHS COMPLIANT | VISHAY GREEN |
|------------------|------------------------------------------|----------------|--------------|
| X                | Ni barrier 100 % tin plated matte finish | Yes            | Yes          |
| E                | AgPd                                     | Yes            | Yes          |
| 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<br>(1.00 + 0.10/- 0.05) | 0.020 + 0.004/- 0.002<br>(0.50 + 0.10/- 0.05) | 0.024<br>(0.60)       | 0.004<br>(0.10) | 0.016<br>(0.41) |
| 0603      | VJ0603 | 0.063 ± 0.006<br>(1.60 ± 0.15)                | 0.031 ± 0.006<br>(0.80 ± 0.15)                | 0.036<br>(0.92)       | 0.012<br>(0.30) | 0.018<br>(0.46) |
| 0805      | VJ0805 | 0.079 ± 0.008<br>(2.00 ± 0.20)                | 0.049 ± 0.008<br>(1.25 ± 0.20)                | 0.057<br>(1.45)       | 0.010<br>(0.25) | 0.028<br>(0.71) |
| 1206      | VJ1206 | 0.126 ± 0.010<br>(3.20 ± 0.25)                | 0.063 ± 0.010<br>(1.60 ± 0.25)                | 0.067<br>(1.70)       | 0.010<br>(0.25) | 0.028<br>(0.71) |
| 1210      | VJ1210 | 0.126 ± 0.010<br>(3.20 ± 0.25)                | 0.098 ± 0.010<br>(2.50 ± 0.25)                | 0.067<br>(1.70)       | 0.010<br>(0.25) | 0.028<br>(0.71) |



| SELECTION CHART            |        |        |    |     |        |    |     |        |    |     |                       |    |                       |    |
|----------------------------|--------|--------|----|-----|--------|----|-----|--------|----|-----|-----------------------|----|-----------------------|----|
| DIELECTRIC                 |        | X8R    |    |     |        |    |     |        |    |     |                       |    |                       |    |
| STYLE                      |        | VJ0402 |    |     | VJ0603 |    |     | VJ0805 |    |     | VJ1206 <sup>(1)</sup> |    | VJ1210 <sup>(1)</sup> |    |
| CASE CODE                  |        | 0402   |    |     | 0603   |    |     | 0805   |    |     | 1206                  |    | 1210                  |    |
| VOLTAGE (V <sub>DC</sub> ) |        | 25     | 50 | 100 | 25     | 50 | 100 | 25     | 50 | 100 | 25                    | 50 | 25                    | 50 |
| VOLTAGE CODE               |        | X      | A  | B   | X      | A  | B   | X      | A  | B   | X                     | A  | X                     | A  |
| CAP. CODE                  | CAP.   |        |    |     |        |    |     |        |    |     |                       |    |                       |    |
| 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 |        |    |     |        |    |     |        |    |     |                       |    |                       |    |

**Notes**

<sup>(1)</sup> See soldering recommendations within this data book, or visit [www.vishay.com/doc245034](http://www.vishay.com/doc245034)

• Plastic tape, •• Paper tape

RoHS-compliant

| X8R PACKAGING QUANTITIES <sup>(1)</sup> |           |                    |                    |                                 |               |
|-----------------------------------------|-----------|--------------------|--------------------|---------------------------------|---------------|
| CASE CODE                               | TAPE SIZE | 7" REEL QUANTITIES |                    | 11 1/4" AND 13" REEL QUANTITIES |               |
|                                         |           | PACKAGING CODE     |                    | PACKAGING CODE                  |               |
|                                         |           | "C" / "O"          | "T"                | "P" / "I"                       | "R"           |
| 0402                                    | 8 mm      | 5000               | n/a                | 10 000                          | n/a           |
| 0603                                    | 8 mm      | 4000               | n/a                | 10 000                          | n/a           |
| 0805 <sup>(2)</sup>                     | 8 mm      | 3000               | 3000               | 10 000                          | 10 000        |
| 1206 <sup>(2)</sup>                     | 8 mm      | n/a                | 2500 / 3000        | 10 000                          | 9000 / 10 000 |
| 1210 <sup>(2)</sup>                     | 8 mm      | n/a                | 2000 / 2500 / 3000 | 10 000                          | 9000 / 10 000 |

**Notes**

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

<sup>(2)</sup> Packaging "C" / "P" / "O" / "I" and "T" / "R" or lower quantities can depend from product thickness



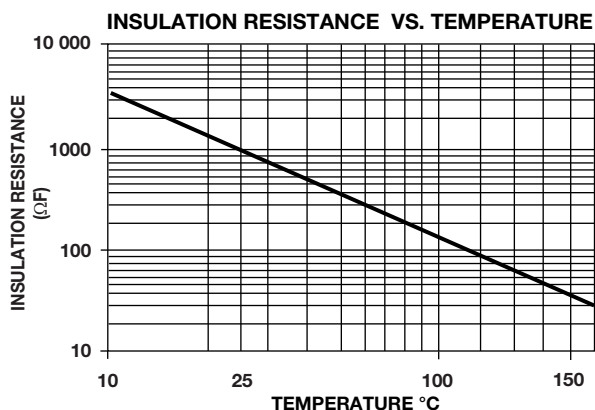
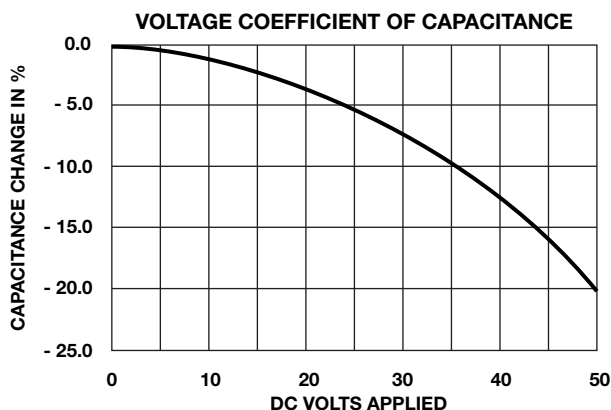
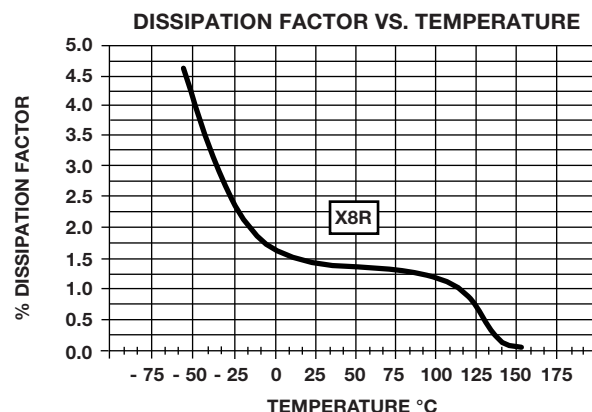
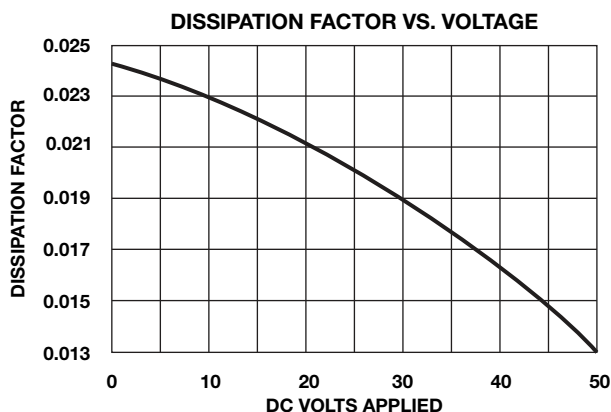
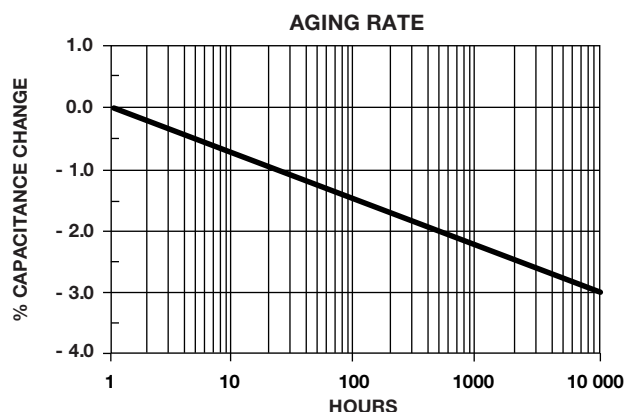
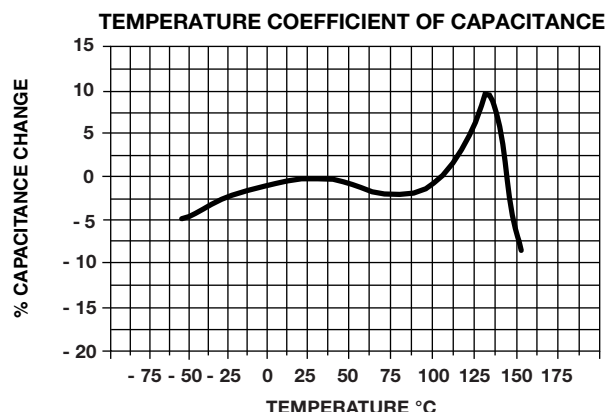
## STORAGE AND HANDLING CONDITIONS

- (1) Store the components at 5 °C to 40 °C ambient temperature and  $\leq 70$  % 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 oxidation 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.

## X8R DIELECTRIC - TYPICAL PARAMETERS





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