

## Surface Mount Multilayer Ceramic Chip Capacitors for Commodity Applications



### FEATURES

- Available from 0402 to 1210 body sizes
- Ultra stable C0G (NP0) dielectric
- High capacitance in X5R, X7R
- Ni-barrier with 100 % tin terminations
- Dry sheet technology process
- Base Metal Electrode system (BME)
- 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

- Consumer electronics
- Telecommunications
- Data processing
- Mobile applications

### ELECTRICAL SPECIFICATIONS

#### Operating Temperature:

C0G (NP0): -55 °C to +125 °C

X5R: -55 °C to +85 °C

X7R: -55 °C to +125 °C

#### Capacitance Range:

C0G (NP0): 0.5 pF to 39 nF

X5R: 47 nF to 100 µF

X7R: 100 pF to 10 µF

#### Voltage Range:

C0G (NP0): 10 V<sub>DC</sub> to 100 V<sub>DC</sub>

X5R: 6.3 V<sub>DC</sub> to 50 V<sub>DC</sub>

X7R: 10 V<sub>DC</sub> to 100 V<sub>DC</sub>

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

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

X5R: ± 15 % from -55 °C to +85 °C without voltage applied

X7R: ± 15 % from -55 °C to +125 °C without voltage applied

#### Insulation Resistance (IR) at U<sub>R</sub>:

≥ 10 GΩ or R x C ≥ 500 Ω x F whichever is less

#### Test Conditions for Capacitance Tolerance:

preconditioning for X5R, X7R MLCC: perform a heat treatment at +150 °C ± 10 °C for 1 h, then leave in ambient condition for 24 h ± 2 h before measurement

#### Test Conditions for Capacitance and DF Measurement:

measured at conditions of 30 % to 70 % related humidity.

C0G (NP0): Apply 1.0 V<sub>RMS</sub> ± 0.2 V<sub>RMS</sub>, 1.0 MHz ± 10 % for caps ≤ 1000 pF, at +25 °C ambient temperature  
Apply 1.0 V<sub>RMS</sub> ± 0.2 V<sub>RMS</sub>, 1.0 kHz ± 10 % for caps > 1000 pF, at +25 °C ambient temperature

X5R / X7R: Caps ≤ 10 µF apply 1.0 V<sub>RMS</sub> ± 0.2 V<sub>RMS</sub>, 1.0 kHz ± 10 %, at +25 °C ambient temperature <sup>(1)</sup>  
Caps > 10 µF apply 0.5 V<sub>RMS</sub> ± 0.2 V<sub>RMS</sub>, 120 Hz ± 20 %, at +25 °C ambient temperature

#### Note

<sup>(1)</sup> Test conditions: 0.5 V<sub>RMS</sub> ± 0.2 V<sub>RMS</sub>, 1 kHz ± 10 %

X7R: 0603: ≥ 2.2 µF / 10 V

0805: 10 µF (6.3 V and 10 V)

X5R: 0402: ≥ 4.7 µF / 6.3 V and ≥ 2.2 µF / 10 V

0603: 10 µF (6.3 V and 10 V)

#### Aging Rate:

C0G (NP0): 0 % per decade

X5R: 6.3 V<sub>DC</sub> / 10 V<sub>DC</sub>: 3 % maximum per decade  
16 V<sub>DC</sub> / 25 V<sub>DC</sub>: 2 % maximum per decade

X7R: ≤ 10 V<sub>DC</sub>: 1.5 % maximum per decade  
≥ 16 V<sub>DC</sub>: 1 % maximum per decade

#### Dielectric Strength Test:

this is the maximum voltage the capacitors are tested 1 s to 5 s period and the charge / discharge current does not exceed 50 mA.

≤ 100 V<sub>DC</sub>: 250 % of rated voltage

**Dissipation Factor (DF):**

C0G (NP0): Cap. < 30 pF: Q ≥ 400 + 20C  
 Cap. ≥ 30 pF: Q ≥ 1000

X5R, X7R:

| RATED VOLTAGE | D.F. ≤ | EXCEPTION OF D.F. ≤ |                                                                                                     |
|---------------|--------|---------------------|-----------------------------------------------------------------------------------------------------|
| ≥ 100 V       | 2.5 %  | 3 %                 | 1206 ≥ 0.47 μF                                                                                      |
|               |        | 5 %                 | 0603 ≥ 0.068 μF; 0805 ≥ 0.1 μF;<br>1206 ≥ 1 μF                                                      |
|               |        | 10 %                | 1210 ≥ 4.7 μF                                                                                       |
| ≥ 50 V        | 2.5 %  | 3 %                 | 0603 ≥ 0.047 μF; 0805 ≥ 0.18 μF;<br>1206 ≥ 0.47 μF                                                  |
|               |        | 5 %                 | 1210 ≥ 4.7 μF                                                                                       |
|               |        | 10 %                | 0402 ≥ 0.1 μF; 0603 ≥ 1 μF; 0805 ≥ 1 μF; 1206 ≥ 2.2 μF; 1210 ≥ 10 μF                                |
| 25 V          | 3.5 %  | 5 %                 | 0805 ≥ 1 μF; 1210 ≥ 10 μF                                                                           |
|               |        | 7 %                 | 0603 ≥ 0.33 μF; 1206 ≥ 4.7 μF                                                                       |
|               |        | 10 %                | 0402 ≥ 0.10 μF; 0603 ≥ 0.47 μF;<br>0805 ≥ 2.2 μF; 1206 ≥ 6.8 μF;<br>1210 ≥ 22 μF                    |
| 16 V          | 3.5 %  | 5 %                 | 0402 ≥ 0.033 μF; 0603 ≥ 0.15 μF;<br>0805 ≥ 0.68 μF; 1206 ≥ 2.2 μF;<br>1210 ≥ 4.7 μF                 |
|               |        | 10 %                | 0402 ≥ 0.22 μF; 0603 ≥ 0.68 μF;<br>0805 ≥ 2.2 μF; 1206 ≥ 4.7 μF;<br>1210 ≥ 22 μF                    |
| 10 V          | 5 %    | 10 %                | 0402 ≥ 0.33 μF; 0402/X7R ≥ 0.22 μF<br>0603 ≥ 0.33 μF; 0805 ≥ 2.2 μF;<br>1206 ≥ 2.2 μF; 1210 ≥ 22 μF |
|               |        | 15 %                | 0402 ≥ 1 μF                                                                                         |
| 6.3 V         | 10 %   | 15 %                | 0402 ≥ 1 μF; 0603 ≥ 10 μF;<br>0805 ≥ 4.7 μF; 1206 ≥ 47 μF;<br>1210 ≥ 100 μF                         |
|               |        | 20 %                | 0402 ≥ 2.2 μF                                                                                       |
| 4 V           | 15 %   | -                   | -                                                                                                   |

**QUICK REFERENCE DATA**

| DIELECTRIC | CASE | MAXIMUM VOLTAGE<br>(V) | CAPACITANCE |         |
|------------|------|------------------------|-------------|---------|
|            |      |                        | MINIMUM     | MAXIMUM |
| C0G (NP0)  | 0402 | 100                    | 0.5 pF      | 1.0 nF  |
|            | 0603 | 100                    | 0.5 pF      | 10 nF   |
|            | 0805 | 100                    | 0.5 pF      | 18 nF   |
|            | 1206 | 100                    | 1.5 pF      | 39 nF   |
| X5R        | 0402 | 50                     | 47 nF       | 4.7 μF  |
|            | 0603 | 50                     | 220 nF      | 22 μF   |
|            | 0805 | 50                     | 1.5 μF      | 10 μF   |
|            | 1206 | 50                     | 1.5 μF      | 47 μF   |
|            | 1210 | 50                     | 1.5 μF      | 100 μF  |
| X7R        | 0402 | 50                     | 100 pF      | 1.0 μF  |
|            | 0603 | 100                    | 100 pF      | 2.2 μF  |
|            | 0805 | 100                    | 100 pF      | 10 μF   |
|            | 1206 | 100                    | 150 pF      | 10 μF   |
|            | 1210 | 100                    | 1.0 nF      | 10 μF   |

**Note**

- Detail ratings see "Selection Chart"



| ORDERING INFORMATION                 |                                     |                                                                                                                                                                  |                                                                                                                                                                                                                                                                  |                                   |                                                                                   |                                                                                                                    |                                  |
|--------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------|
| VJ0402                               | Y                                   | 101                                                                                                                                                              | J                                                                                                                                                                                                                                                                | X                                 | Q                                                                                 | C                                                                                                                  | W1BC                             |
| SIZE CODE                            | DIELECTRIC                          | CAPACITANCE                                                                                                                                                      | TOLERANCE                                                                                                                                                                                                                                                        | TERMINATION                       | VOLTAGE <sup>(1)</sup>                                                            | PACKAGING                                                                                                          | PROCESS CODE FOR BASIC COMMODITY |
| 0402<br>0603<br>0805<br>1206<br>1210 | A = C0G (NP0)<br>G = X5R<br>Y = X7R | Two significant digits followed by the number of zeros:<br>1R0 = 1.0 pF<br>101 = 100 pF<br>102 = 1000 pF<br>152 = 1500 pF<br>103 = 10 000 pF<br>104 = 100 000 pF | <b>C0G (NP0) <sup>(2)</sup></b><br>Cap. < 10 pF:<br>B = ± 0.10 pF<br>C = ± 0.25 pF<br>D = ± 0.50 pF<br><br>Cap. ≥ 10 pF:<br>F = ± 1 %<br>G = ± 2 %<br>J = ± 5 %<br>K = ± 10 %<br><br><b>X5R / X7R <sup>(2)(3)</sup></b><br>J = ± 5 %<br>K = ± 10 %<br>M = ± 20 % | X = Ni barrier<br>100 % matte tin | S = 4 V<br>Y = 6.3 V<br>Q = 10 V<br>J = 16 V<br>X = 25 V<br>A = 50 V<br>B = 100 V | C = 7" reel / paper tape<br>P = 13" reel / paper tape<br>T = 7" reel / plastic tape<br>R = 13" reel / plastic tape |                                  |

## Notes

- Detail rating see "Selection Chart"

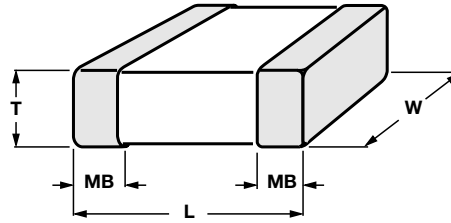
<sup>(1)</sup> DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance.

Consult for questions: [mlcc@vishay.com](mailto:mlcc@vishay.com)

<sup>(2)</sup> Not all values, see "Selection Chart"

<sup>(3)</sup> No 5 % tolerance for X5R

## DIMENSIONS in inches (millimeters)



| SIZE CODE      | THICKNESS SYMBOL | SOLDERING METHOD (1) | L                                                 | W                                                 | T                                                 | MB                                                |
|----------------|------------------|----------------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|
| 0402<br>(1005) | N                | R                    | 0.040 ± 0.002<br>(1.00 ± 0.05)                    | 0.020 ± 0.002<br>(0.50 ± 0.05)                    | 0.020 ± 0.002<br>(0.50 ± 0.05)                    | 0.010 + 0.002 / - 0.004<br>(0.25 + 0.05 / - 0.10) |
|                | E                | R                    | 0.040 ± 0.008<br>(1.00 ± 0.20)                    | 0.020 ± 0.008<br>(0.50 ± 0.20)                    | 0.020 ± 0.008<br>(0.50 ± 0.20)                    |                                                   |
| 0603<br>(1608) | S                | R / W                | 0.063 ± 0.004<br>(1.60 ± 0.10)                    | 0.030 ± 0.004<br>(0.80 ± 0.10)                    | 0.030 ± 0.0028<br>(0.80 ± 0.07)                   | 0.016 ± 0.006<br>(0.40 ± 0.15)                    |
|                | X                | R / W                | 0.063 + 0.006 / - 0.004<br>(1.60 + 0.15 / - 0.10) | 0.030 + 0.006 / - 0.004<br>(0.80 + 0.15 / - 0.10) | 0.030 + 0.006 / - 0.004<br>(0.80 + 0.15 / - 0.10) |                                                   |
|                | X'               | R / W                | 0.063 ± 0.008<br>(1.60 ± 0.20)                    | 0.030 ± 0.008<br>(0.80 ± 0.20)                    | 0.030 ± 0.008<br>(0.80 ± 0.20)                    |                                                   |
| 0805<br>(2012) | A                | R / W                | 0.080 ± 0.006<br>(2.00 ± 0.15)                    | 0.050 ± 0.004<br>(1.25 ± 0.10)                    | 0.024 ± 0.004<br>(0.60 ± 0.10)                    | 0.020 ± 0.008<br>(0.50 ± 0.20)                    |
|                | B                | R / W                |                                                   |                                                   | 0.030 ± 0.004<br>(0.80 ± 0.10)                    |                                                   |
|                | D                | R                    |                                                   |                                                   | 0.049 ± 0.004<br>(1.25 ± 0.10)                    |                                                   |
|                | T                | R / W                | 0.080 ± 0.008<br>(2.00 ± 0.20)                    | 0.050 ± 0.008<br>(1.25 ± 0.20)                    | 0.033 ± 0.004<br>(0.85 ± 0.10)                    |                                                   |
|                | I                | R                    |                                                   |                                                   | 0.049 ± 0.008<br>(1.25 ± 0.20)                    |                                                   |
| 1206<br>(3216) | B                | R / W                | 0.126 ± 0.006<br>(3.20 ± 0.15)                    | 0.063 ± 0.006<br>(1.60 ± 0.15)                    | 0.030 ± 0.004<br>(0.80 ± 0.10)                    | 0.024 ± 0.008<br>(0.60 ± 0.20)                    |
|                | C                | R                    |                                                   |                                                   | 0.037 ± 0.004<br>(0.95 ± 0.10)                    |                                                   |
|                | D                | R                    |                                                   |                                                   | 0.049 ± 0.004<br>(1.25 ± 0.10)                    |                                                   |
|                | J                | R                    | 0.126 ± 0.008<br>(3.20 ± 0.20)                    | 0.063 ± 0.008<br>(1.60 ± 0.20)                    | 0.045 ± 0.006<br>(1.15 ± 0.15)                    |                                                   |
|                | G                | R                    |                                                   |                                                   | 0.063 ± 0.008<br>(1.60 ± 0.20)                    |                                                   |
|                | P                | R                    |                                                   |                                                   | 0.063 + 0.012 / - 0.004<br>(1.60 + 0.30 / - 0.10) |                                                   |
| 1210<br>(3225) | C                | R                    | 0.126 ± 0.012<br>(3.20 ± 0.30)                    | 0.098 ± 0.008<br>(2.50 ± 0.20)                    | 0.037 ± 0.004<br>(0.95 ± 0.10)                    | 0.030 ± 0.010<br>(0.75 ± 0.25)                    |
|                | D                | R                    |                                                   |                                                   | 0.049 ± 0.004<br>(1.25 ± 0.10)                    |                                                   |
|                | G                | R                    | 0.126 ± 0.016<br>(3.20 ± 0.40)                    | 0.098 ± 0.012<br>(2.50 ± 0.30)                    | 0.063 ± 0.008<br>(1.60 ± 0.20)                    |                                                   |
|                | K                | R                    |                                                   |                                                   | 0.078 ± 0.008<br>(2.00 ± 0.20)                    |                                                   |
|                | M                | R                    |                                                   |                                                   | 0.098 ± 0.012<br>(2.50 ± 0.30)                    |                                                   |

### Note

(1) "R" = Reflow soldering process; "W" = Wave soldering process



| SELECTION CHART            |        |           |    |    |    |     |        |    |    |    |     |        |    |    |    |     |        |    |    |    |     |
|----------------------------|--------|-----------|----|----|----|-----|--------|----|----|----|-----|--------|----|----|----|-----|--------|----|----|----|-----|
| DIELECTRIC                 |        | C0G (NP0) |    |    |    |     |        |    |    |    |     |        |    |    |    |     |        |    |    |    |     |
| STYLE                      |        | VJ0402    |    |    |    |     | VJ0603 |    |    |    |     | VJ0805 |    |    |    |     | VJ1206 |    |    |    |     |
| SIZE CODE                  |        | 0402      |    |    |    |     | 0603   |    |    |    |     | 0805   |    |    |    |     | 1206   |    |    |    |     |
| VOLTAGE (V <sub>DC</sub> ) |        | 10        | 16 | 25 | 50 | 100 | 10     | 16 | 25 | 50 | 100 | 10     | 16 | 25 | 50 | 100 | 10     | 16 | 25 | 50 | 100 |
| VOLTAGE CODE               |        | Q         | J  | X  | A  | B   | Q      | J  | X  | A  | B   | Q      | J  | X  | A  | B   | Q      | J  | X  | A  | B   |
| CAP. CODE                  | CAP.   |           |    |    |    |     |        |    |    |    |     |        |    |    |    |     |        |    |    |    |     |
| 0R5                        | 0.5 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   |        |    |    |    |     |
| 1R0                        | 1.0 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   |        |    |    |    |     |
| 1R2                        | 1.2 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   |        |    |    |    |     |
| 1R5                        | 1.5 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 1R8                        | 1.8 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 2R2                        | 2.2 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 2R7                        | 2.7 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 3R3                        | 3.3 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 3R9                        | 3.9 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 4R7                        | 4.7 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 5R6                        | 5.6 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 6R8                        | 6.8 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 8R2                        | 8.2 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 100                        | 10 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 120                        | 12 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 150                        | 15 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 180                        | 18 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 220                        | 22 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 270                        | 27 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 330                        | 33 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 390                        | 39 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 470                        | 47 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 560                        | 56 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 680                        | 68 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 820                        | 82 pF  | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 101                        | 100 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 121                        | 120 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 151                        | 150 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 181                        | 180 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 221                        | 220 pF | N         | N  | N  | N  | N   | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 271                        | 270 pF | N         | N  | N  | N  |     | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 331                        | 330 pF | N         | N  | N  | N  |     | S      | S  | S  | S  | S   | A      | A  | A  | A  | A   | B      | B  | B  | B  | B   |
| 391                        | 390 pF | N         | N  | N  | N  |     | S      | S  | S  | S  | S   | B      | B  | B  | B  | B   | B      | B  | B  | B  | B   |
| 471                        | 470 pF | N         | N  | N  | N  |     | S      | S  | S  | S  | S   | B      | B  | B  | B  | B   | B      | B  | B  | B  | B   |
| 561                        | 560 pF | N         | N  | N  | N  |     | S      | S  | S  | S  | S   | B      | B  | B  | B  | B   | B      | B  | B  | B  | B   |
| 681                        | 680 pF | N         | N  | N  | N  |     | S      | S  | S  | S  | S   | B      | B  | B  | B  | B   | B      | B  | B  | B  | B   |
| 821                        | 820 pF | N         | N  | N  | N  |     | S      | S  | S  | S  | S   | B      | B  | B  | B  | B   | B      | B  | B  | B  | B   |

**Note**

- Letters indicate product thickness, see packaging quantities



| SELECTION CHART            |        |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     |        |    |                  |                  |     |
|----------------------------|--------|-----------|----|----|----|-----|--------|----|----|------------------|-----|------------------|------------------|------------------|------------------|-----|--------|----|------------------|------------------|-----|
| DIELECTRIC                 |        | C0G (NP0) |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     |        |    |                  |                  |     |
| STYLE                      |        | VJ0402    |    |    |    |     | VJ0603 |    |    |                  |     | VJ0805           |                  |                  |                  |     | VJ1206 |    |                  |                  |     |
| SIZE CODE                  |        | 0402      |    |    |    |     | 0603   |    |    |                  |     | 0805             |                  |                  |                  |     | 1206   |    |                  |                  |     |
| VOLTAGE (V <sub>DC</sub> ) |        | 10        | 16 | 25 | 50 | 100 | 10     | 16 | 25 | 50               | 100 | 10               | 16               | 25               | 50               | 100 | 10     | 16 | 25               | 50               | 100 |
| VOLTAGE CODE               |        | Q         | J  | X  | A  | B   | Q      | J  | X  | A                | B   | Q                | J                | X                | A                | B   | Q      | J  | X                | A                | B   |
| CAP. CODE                  | CAP.   |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     |        |    |                  |                  |     |
| 102                        | 1.0 nF | N         | N  | N  | N  |     | S      | S  | S  | S                | S   | B                | B                | B                | B                | B   | B      | B  | B                | B                | B   |
| 122                        | 1.2 nF |           |    |    |    |     | X      | X  | X  | X                | X   | B                | B                | B                | B                | B   | B      | B  | B                | B                | B   |
| 152                        | 1.5 nF |           |    |    |    |     | X      | X  | X  | X                | X   | B                | B                | B                | B                | B   | B      | B  | B                | B                | B   |
| 182                        | 1.8 nF |           |    |    |    |     | X      | X  | X  | X                |     | B                | B                | B                | B                | B   | B      | B  | B                | B                | B   |
| 222                        | 2.2 nF |           |    |    |    |     | X      | X  | X  | X                |     | B                | B                | B                | B                | B   | B      | B  | B                | B                | B   |
| 272                        | 2.7 nF |           |    |    |    |     | X      | X  | X  | X                |     | D                | D                | D                | D                | D   | B      | B  | B                | B                | B   |
| 332                        | 3.3 nF |           |    |    |    |     | X      | X  | X  | X                |     | D                | D                | D                | D                | D   | B      | B  | B                | B                | B   |
| 392                        | 3.9 nF |           |    |    |    |     |        |    |    |                  |     | D                | D                | D                | D                | D   | B      | B  | B                | B                | B   |
| 472                        | 4.7 nF |           |    |    |    |     |        |    |    |                  |     | D                | D                | D                | D                | D   | B      | B  | B                | B                | B   |
| 562                        | 5.6 nF |           |    |    |    |     |        |    |    |                  |     | D                | D                | D                | D                |     | B      | B  | B                | B                | B   |
| 682                        | 6.8 nF |           |    |    |    |     |        |    |    |                  |     | D                | D                | D                | D                |     | C      | C  | C                | C                | C   |
| 822                        | 8.2 nF |           |    |    |    |     |        |    |    |                  |     | D                | D                | D                | D                |     | D      | D  | D                | D                | D   |
| 103                        | 10 nF  |           |    |    |    |     |        |    |    | X <sup>(1)</sup> |     | D                | D                | D                | D                |     | D      | D  | D                | D                | D   |
| 123                        | 12 nF  |           |    |    |    |     |        |    |    |                  |     | T <sup>(1)</sup> | T <sup>(1)</sup> | T <sup>(1)</sup> | T <sup>(1)</sup> |     | P      | P  | P <sup>(1)</sup> | P <sup>(1)</sup> |     |
| 153                        | 15 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  | T <sup>(1)</sup> | T <sup>(1)</sup> |     | P      | P  | P <sup>(1)</sup> | P <sup>(1)</sup> |     |
| 183                        | 18 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  | T <sup>(1)</sup> | T <sup>(1)</sup> |     | P      | P  | P <sup>(1)</sup> | P <sup>(1)</sup> |     |
| 223                        | 22 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     | P      | P  | P <sup>(1)</sup> | P <sup>(1)</sup> |     |
| 273                        | 27 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     | P      | P  | P <sup>(1)</sup> | P <sup>(1)</sup> |     |
| 333                        | 33 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     | P      | P  | P <sup>(1)</sup> | P <sup>(1)</sup> |     |
| 393                        | 39 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     | P      | P  | P <sup>(1)</sup> | P <sup>(1)</sup> |     |
| 473                        | 47 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     |        |    |                  |                  |     |
| 563                        | 56 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     |        |    |                  |                  |     |
| 683                        | 68 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     |        |    |                  |                  |     |
| 823                        | 82 nF  |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     |        |    |                  |                  |     |
| 104                        | 100 nF |           |    |    |    |     |        |    |    |                  |     |                  |                  |                  |                  |     |        |    |                  |                  |     |

**Notes**

- Letters indicate product thickness, see packaging quantities
- <sup>(1)</sup> Only in 5 % (code "J") tolerance



## SELECTION CHART

| DIELECTRIC                 |        | X5R              |      |      |      |      |                   |                   |      |      |                  |        |      |      |      |      |
|----------------------------|--------|------------------|------|------|------|------|-------------------|-------------------|------|------|------------------|--------|------|------|------|------|
| STYLE                      |        | VJ0402           |      |      |      |      | VJ0603            |                   |      |      |                  | VJ0805 |      |      |      |      |
| SIZE CODE                  |        | 0402             |      |      |      |      | 0603              |                   |      |      |                  | 0805   |      |      |      |      |
| VOLTAGE (V <sub>DC</sub> ) |        | 6.3 V            | 10 V | 16 V | 25 V | 50 V | 6.3 V             | 10 V              | 16 V | 25 V | 50 V             | 6.3 V  | 10 V | 16 V | 25 V | 50 V |
| VOLTAGE CODE               |        | Y                | Q    | J    | X    | A    | Y                 | Q                 | J    | X    | A                | Y      | Q    | J    | X    | A    |
| CAP. CODE                  | CAP.   |                  |      |      |      |      |                   |                   |      |      |                  |        |      |      |      |      |
| 473                        | 47 nF  |                  |      | N    |      |      |                   |                   |      |      |                  |        |      |      |      |      |
| 563                        | 56 nF  |                  | N    |      |      |      |                   |                   |      |      |                  |        |      |      |      |      |
| 683                        | 68 nF  |                  | N    | N    |      |      |                   |                   |      |      |                  |        |      |      |      |      |
| 823                        | 82 nF  | N                | N    | N    |      |      |                   |                   |      |      |                  |        |      |      |      |      |
| 104                        | 100 nF | N                | N    | N    | N    | N    |                   |                   |      |      |                  |        |      |      |      |      |
| 124                        | 120 nF |                  |      |      |      |      |                   |                   |      |      |                  |        |      |      |      |      |
| 154                        | 150 nF |                  | N    |      | N    |      |                   |                   |      |      |                  |        |      |      |      |      |
| 184                        | 180 nF |                  |      |      |      |      |                   |                   |      |      |                  |        |      |      |      |      |
| 224                        | 220 nF | N                | N    | N    | N    | N    |                   |                   | X    | X    |                  |        |      |      |      |      |
| 274                        | 270 nF |                  |      |      |      |      |                   | X                 | X    |      |                  |        |      |      |      |      |
| 334                        | 330 nF | N                | N    |      |      |      |                   | X                 | X    | X    |                  |        |      |      |      |      |
| 394                        | 390 nF |                  |      |      |      |      |                   | X                 | X    |      |                  |        |      |      |      |      |
| 474                        | 470 nF | N                | N    | E    | E    |      |                   | X                 | X    | X    | X <sup>(2)</sup> |        |      |      |      |      |
| 564                        | 560 nF |                  |      |      |      |      |                   |                   |      |      |                  |        |      |      |      |      |
| 684                        | 680 nF | N                | N    |      |      |      |                   | X                 | X    | X    |                  |        |      |      |      |      |
| 824                        | 820 nF |                  |      |      |      |      | X                 | X                 | X    |      |                  |        |      |      |      |      |
| 105                        | 1.0 µF | N                | N    | N    | N    |      | X                 | X                 | X    | X    | X                |        |      |      |      |      |
| 155                        | 1.5 µF |                  |      |      |      |      | X                 |                   |      |      |                  | I      | I    | I    | I    |      |
| 225                        | 2.2 µF | N                |      |      |      |      | X                 | X                 | X'   | X'   |                  | I      | I    | I    | I    |      |
| 335                        | 3.3 µF |                  |      |      |      |      |                   |                   |      |      |                  | I      | I    | I    | I    |      |
| 475                        | 4.7 µF | E <sup>(1)</sup> |      |      |      |      | X                 | X                 | X'   |      |                  | I      | I    | I    | I    |      |
| 106                        | 10 µF  |                  |      |      |      |      | X'                | X' <sup>(1)</sup> |      |      |                  | I      | I    | I    | I    |      |
| 226                        | 22 µF  |                  |      |      |      |      | X' <sup>(1)</sup> |                   |      |      |                  |        |      |      |      |      |

## Notes

- Letters indicate product thickness, see packaging quantities

(1) Only in 20 % (code "M") tolerance

(2) Only in 10 % (code "K") tolerance

## SELECTION CHART

| DIELECTRIC                 |        | X5R              |      |      |      |                  |                  |      |      |      |      |
|----------------------------|--------|------------------|------|------|------|------------------|------------------|------|------|------|------|
| STYLE                      |        | VJ1206           |      |      |      |                  | VJ1210           |      |      |      |      |
| SIZE CODE                  |        | 1206             |      |      |      |                  | 1210             |      |      |      |      |
| VOLTAGE (V <sub>DC</sub> ) |        | 6.3 V            | 10 V | 16 V | 25 V | 50 V             | 6.3 V            | 10 V | 16 V | 25 V | 50 V |
| VOLTAGE CODE               |        | Y                | Q    | J    | X    | A                | Y                | Q    | J    | X    | A    |
| CAP. CODE                  | CAP.   |                  |      |      |      |                  |                  |      |      |      |      |
| 105                        | 1.0 µF |                  |      |      |      |                  |                  |      |      |      |      |
| 155                        | 1.5 µF |                  | J    | J    |      |                  |                  | K    | K    |      |      |
| 225                        | 2.2 µF |                  | J    | J    | P    | P <sup>(2)</sup> |                  | K    | K    |      |      |
| 335                        | 3.3 µF |                  | P    | P    | P    |                  |                  |      |      |      |      |
| 475                        | 4.7 µF | P                | P    | P    | P    | P                |                  | K    | K    | K    |      |
| 685                        | 6.8 µF | P                | P    |      |      |                  |                  |      |      |      |      |
| 106                        | 10 µF  | P                | P    | P    | P    | P                |                  | K    | K    | K    | M    |
| 226                        | 22 µF  | P                | P    | P    |      |                  | M                | M    | M    | M    |      |
| 476                        | 47 µF  | P <sup>(1)</sup> |      |      |      |                  | M                | M    | M    |      |      |
| 107                        | 100 µF |                  |      |      |      |                  | M <sup>(1)</sup> |      |      |      |      |

## Notes

- Letters indicate product thickness, see packaging quantities

(1) Only in 20 % (code "M") tolerance

(2) Only in 10 % (code "K") tolerance



| SELECTION CHART            |        |                  |                  |                  |      |                  |       |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |
|----------------------------|--------|------------------|------------------|------------------|------|------------------|-------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| DIELECTRIC                 |        | X7R              |                  |                  |      |                  |       |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |
| STYLE                      |        | VJ0402           |                  |                  |      |                  |       | VJ0603           |                  |                  |                  |                  | VJ0805           |                  |                  |                  |                  |
| SIZE CODE                  |        | 0402             |                  |                  |      |                  |       | 0603             |                  |                  |                  |                  | 0805             |                  |                  |                  |                  |
| VOLTAGE (V <sub>DC</sub> ) |        | 6.3 V            | 10 V             | 16 V             | 25 V | 50 V             | 100 V | 10 V             | 16 V             | 25 V             | 50 V             | 100 V            | 10 V             | 16 V             | 25 V             | 50 V             | 100 V            |
| VOLTAGE CODE               |        | Y                | Q                | J                | X    | A                | B     | Q                | J                | X                | A                | B                | Q                | J                | X                | A                | B                |
| CAP. CODE                  | CAP.   |                  |                  |                  |      |                  |       |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |
| 101                        | 100 pF |                  | N                | N                | N    | N                |       | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |
| 121                        | 120 pF |                  | N                | N                | N    | N                |       | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |
| 151                        | 150 pF |                  | N                | N                | N    | N                |       | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |
| 181                        | 180 pF |                  | N                | N                | N    | N                |       | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |
| 221                        | 220 pF |                  | N                | N                | N    | N                |       | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |
| 271                        | 270 pF |                  | N                | N                | N    | N                |       | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |
| 331                        | 330 pF |                  | N                | N                | N    | N                |       | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |
| 391                        | 390 pF |                  | N                | N                | N    | N                |       | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | S <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |
| 471                        | 470 pF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 561                        | 560 pF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 681                        | 680 pF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 821                        | 820 pF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 102                        | 1.0 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 122                        | 1.2 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 152                        | 1.5 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 182                        | 1.8 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 222                        | 2.2 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 272                        | 2.7 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 332                        | 3.3 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 392                        | 3.9 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 472                        | 4.7 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 562                        | 5.6 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 682                        | 6.8 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 822                        | 8.2 nF |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 103                        | 10 nF  |                  | N                | N                | N    | N                |       | S                | S                | S                | S                | S                | B                | B                | B                | B                | B                |
| 123                        | 12 nF  |                  | N                | N                | N    |                  |       | S                | S                | S                | S                |                  | B                | B                | B                | B                | B                |
| 153                        | 15 nF  |                  | N                | N                | N    |                  |       | S                | S                | S                | S                |                  | B                | B                | B                | B                | B                |
| 183                        | 18 nF  |                  | N                | N                | N    |                  |       | S                | S                | S                | S                |                  | B                | B                | B                | B                | B                |
| 223                        | 22 nF  |                  | N                | N                | N    | N <sup>(2)</sup> |       | S                | S                | S                | S                | X <sup>(2)</sup> | B                | B                | B                | B                | B                |
| 273                        | 27 nF  |                  | N                | N                | N    |                  |       | S                | S                | S                | S                |                  | B                | B                | B                | B                | D                |
| 333                        | 33 nF  |                  | N                | N                | N    | N <sup>(1)</sup> |       | S                | S                | S                | X                |                  | B                | B                | B                | B                | D                |
| 393                        | 39 nF  |                  | N                | N                | N    |                  |       | S                | S                | S                | X                |                  | B                | B                | B                | B                | D                |
| 473                        | 47 nF  |                  | N                | N                | N    | N <sup>(2)</sup> |       | S                | S                | S                | X                | X <sup>(2)</sup> | B                | B                | B                | B                | D                |
| 563                        | 56 nF  |                  | N                | N                |      |                  |       | S                | S                | S                | X                |                  | B                | B                | B                | B                | D                |
| 683                        | 68 nF  |                  | N                | N                |      |                  |       | S                | S                | S                | X                |                  | B                | B                | B                | B                | D                |
| 823                        | 82 nF  |                  | N                | N                |      |                  |       | S                | S                | S                | X                |                  | B                | B                | B                | B                | D                |
| 104                        | 100 nF |                  | N                | N                | N    | E <sup>(2)</sup> |       | S                | S                | S                | X                | X <sup>(2)</sup> | B                | B                | B                | B / D            | D                |
| 124                        | 120 nF |                  |                  |                  |      |                  |       | S                | S                | X                |                  |                  | B                | B                | B                | D                |                  |
| 154                        | 150 nF |                  |                  |                  |      |                  |       | S                | S                | X                |                  |                  | D                | D                | D                | D                |                  |
| 184                        | 180 nF |                  |                  |                  |      |                  |       | S                | S                | X                |                  |                  | D                | D                | D                | D                |                  |
| 224                        | 220 nF |                  |                  | N <sup>(1)</sup> |      |                  |       | S                | S                | X                | X <sup>(2)</sup> |                  | D                | D                | D                | D                | I <sup>(2)</sup> |
| 274                        | 270 nF |                  |                  |                  |      |                  |       | X                | X                | X                |                  |                  | D                | D                | D                |                  |                  |
| 334                        | 330 nF |                  |                  |                  |      |                  |       | X                | X                | X                |                  |                  | D                | D                | D                | I                |                  |
| 394                        | 390 nF |                  |                  |                  |      |                  |       | X                | X                | X                |                  |                  | D                | D                | D                |                  |                  |
| 474                        | 470 nF |                  | N <sup>(2)</sup> |                  |      |                  |       | X                | X                | X                | X <sup>(2)</sup> |                  | D                | D                | D                | I                | I <sup>(2)</sup> |
| 564                        | 560 nF |                  |                  |                  |      |                  |       | X                | X                |                  |                  |                  | D                | D                | D                |                  |                  |
| 684                        | 680 nF |                  |                  |                  |      |                  |       | X                | X                |                  |                  |                  | D                | D                | D                |                  |                  |
| 824                        | 820 nF |                  |                  |                  |      |                  |       | X                | X                |                  |                  |                  | D                | D                | D                |                  |                  |
| 105                        | 1.0 μF | N <sup>(1)</sup> |                  |                  |      |                  |       | X                | X                | X <sup>(1)</sup> |                  |                  | D                | D                | D                | I <sup>(1)</sup> |                  |
| 155                        | 1.5 μF |                  |                  |                  |      |                  |       |                  |                  |                  |                  |                  | I                | I <sup>(1)</sup> | I <sup>(1)</sup> |                  |                  |
| 225                        | 2.2 μF |                  |                  |                  |      |                  |       | X <sup>(1)</sup> | X <sup>(1)</sup> |                  |                  |                  | I                | I                | I                |                  |                  |
| 335                        | 3.3 μF |                  |                  |                  |      |                  |       |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |
| 475                        | 4.7 μF |                  |                  |                  |      |                  |       |                  |                  |                  |                  |                  | I <sup>(1)</sup> | I <sup>(1)</sup> | I <sup>(1)</sup> |                  |                  |
| 685                        | 6.8 μF |                  |                  |                  |      |                  |       |                  |                  |                  |                  |                  |                  |                  |                  |                  |                  |
| 106                        | 10 μF  |                  |                  |                  |      |                  |       |                  |                  |                  |                  |                  | I <sup>(1)</sup> |                  |                  |                  |                  |

## Notes

- Letters indicate product thickness, see packaging quantities

<sup>(1)</sup> Not in 5 % (code "J") tolerance

<sup>(2)</sup> Only in 10 % (code "K") tolerance



| SELECTION CHART            |        |                  |                  |                  |                  |                  |        |      |                  |                  |                  |
|----------------------------|--------|------------------|------------------|------------------|------------------|------------------|--------|------|------------------|------------------|------------------|
| DIELECTRIC                 |        | X7R              |                  |                  |                  |                  |        |      |                  |                  |                  |
| STYLE                      |        | VJ1206           |                  |                  |                  |                  | VJ1210 |      |                  |                  |                  |
| SIZE CODE                  |        | 1206             |                  |                  |                  |                  | 1210   |      |                  |                  |                  |
| VOLTAGE (V <sub>DC</sub> ) |        | 10 V             | 16 V             | 25 V             | 50 V             | 100 V            | 6.3 V  | 10 V | 16 V             | 25 V             | 50 V             |
| VOLTAGE CODE               |        | Q                | J                | X                | A                | B                | Y      | Q    | J                | X                | A                |
| CAP. CODE                  | CAP.   |                  |                  |                  |                  |                  |        |      |                  |                  |                  |
| 101                        | 100 pF |                  |                  |                  |                  |                  |        |      |                  |                  |                  |
| 121                        | 120 pF |                  |                  |                  |                  |                  |        |      |                  |                  |                  |
| 151                        | 150 pF | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |        |      |                  |                  |                  |
| 181                        | 180 pF | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |        |      |                  |                  |                  |
| 221                        | 220 pF | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |        |      |                  |                  |                  |
| 271                        | 270 pF | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |        |      |                  |                  |                  |
| 331                        | 330 pF | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |        |      |                  |                  |                  |
| 391                        | 390 pF | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> | B <sup>(1)</sup> |        |      |                  |                  |                  |
| 471                        | 470 pF | B                | B                | B                | B                | B                |        |      |                  |                  |                  |
| 561                        | 560 pF | B                | B                | B                | B                | B                |        |      |                  |                  |                  |
| 681                        | 680 pF | B                | B                | B                | B                | B                |        |      |                  |                  |                  |
| 821                        | 820 pF | B                | B                | B                | B                | B                |        |      |                  |                  |                  |
| 102                        | 1.0 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 122                        | 1.2 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 152                        | 1.5 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 182                        | 1.8 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 222                        | 2.2 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 272                        | 2.7 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 332                        | 3.3 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 392                        | 3.9 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 472                        | 4.7 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 562                        | 5.6 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 682                        | 6.8 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 822                        | 8.2 nF | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 103                        | 10 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 123                        | 12 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 153                        | 15 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 183                        | 18 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 223                        | 22 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 273                        | 27 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 333                        | 33 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 393                        | 39 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 473                        | 47 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 563                        | 56 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 683                        | 68 nF  | B                | B                | B                | B                | B                |        | C    | C                | C                | C                |
| 823                        | 82 nF  | B                | B                | B                | B                | D                |        | C    | C                | C                | C                |
| 104                        | 100 nF | B                | B                | B                | B                | D                |        | C    | C                | C                | C                |
| 124                        | 120 nF | B                | B                | B                | B                | D                |        | C    | C                | C                | C                |
| 154                        | 150 nF | C                | C                | C                | C                | G                |        | C    | C                | C                | D                |
| 184                        | 180 nF | C                | C                | C                | C                | G                |        | C    | C                | C                | D                |
| 224                        | 220 nF | C                | C                | C                | C                | G                |        | C    | C                | C                | D                |
| 274                        | 270 nF | C                | C                | C                | D                | G                |        | C    | C                | C                | G                |
| 334                        | 330 nF | C                | C                | C                | D                | G                |        | C    | C                | C                | G                |
| 394                        | 390 nF | C                | C                | J                | P                | G                |        | C    | C                | C                | M                |
| 474                        | 470 nF | J                | J                | J                | P                | G                |        | C    | C                | C                | M                |
| 564                        | 560 nF | J                | J                | J                | P                | P                |        | D    | D                | D                | M                |
| 684                        | 680 nF | J                | J                | J                | P                | P                |        | D    | D                | D                | K                |
| 824                        | 820 nF | J                | J                | J                | P                | P                |        | D    | D                | D                | K                |
| 105                        | 1.0 μF | J                | J                | J                | P                | P                |        | D    | D                | D                | K                |
| 155                        | 1.5 μF | J                | J                | P                |                  |                  |        |      |                  |                  | M                |
| 225                        | 2.2 μF | J                | J                | P                | P <sup>(1)</sup> | P <sup>(1)</sup> |        |      | K                | G <sup>(1)</sup> | M <sup>(1)</sup> |
| 335                        | 3.3 μF | P                | P                | P                |                  |                  |        |      | K <sup>(2)</sup> | G <sup>(1)</sup> |                  |
| 475                        | 4.7 μF | P                | P                | P                | P <sup>(1)</sup> |                  |        | K    | K                | K <sup>(1)</sup> | M <sup>(1)</sup> |
| 685                        | 6.8 μF |                  |                  |                  |                  |                  |        |      |                  |                  |                  |
| 106                        | 10 μF  | P                | P <sup>(1)</sup> | P <sup>(1)</sup> |                  |                  |        | K    | K                | K <sup>(1)</sup> | M <sup>(1)</sup> |

**Notes**

- Letters indicate product thickness, see packaging quantities

(1) Not in 5 % (code "J") tolerance

(2) Only in 10 % (code "K") tolerance

**PACKAGING QUANTITIES**

| SIZE CODE<br>(inch / mm) | MAX. THICKNESS<br>(mm) | THICKNESS<br>SYMBOL | PAPER TAPE  |              | PLASTIC TAPE |              |
|--------------------------|------------------------|---------------------|-------------|--------------|--------------|--------------|
|                          |                        |                     | 7" REEL (C) | 13" REEL (P) | 7" REEL (T)  | 13" REEL (R) |
| 0402 (1002)              | 0.55                   | N                   | 10K         | 50K          |              |              |
|                          | 0.70                   | E                   | 10K         |              |              |              |
| 0603 (1608)              | 0.87                   | S                   | 4K          | 15K          |              |              |
|                          | 0.95                   | X                   | 4K          | 15K          |              |              |
|                          | 1.00                   | X'                  | 4K          | 15K          |              |              |
| 0805 (2012)              | 0.75                   | A                   | 4K          | 15K          |              |              |
|                          | 0.95                   | B, T                | 4K          | 15K          |              |              |
|                          | 1.40                   | D                   |             |              | 3K           | 10K          |
|                          | 1.45                   | I                   |             |              | 3K           | 10K          |
| 1206 (3216)              | 0.95                   | B                   | 4K          | 15K          |              |              |
|                          | 1.05                   | C                   |             |              | 3K           | 10K          |
|                          | 1.30                   | J                   |             |              | 3K           | 10K          |
|                          | 1.35                   | D                   |             |              | 3K           | 10K          |
|                          | 1.80                   | G                   |             |              | 2K           |              |
|                          | 1.90                   | P                   |             |              | 2K           |              |
| 1210 (3225)              | 1.05                   | C                   |             |              | 3K           | 10K          |
|                          | 1.35                   | D                   |             |              | 3K           | 10K          |
|                          | 1.80                   | G                   |             |              | 2K           |              |
|                          | 2.20                   | K                   |             |              | 1K           |              |
|                          | 2.80                   | M                   |             |              | 1K           |              |

**TAPE AND REEL SPECIFICATION**


Dimensions of paper tape



Dimensions of plastic tape

**DIMENSIONS PAPER TAPE in millimeters**

| SIZE CODE           | 0402        |             | 0603        | 0805        |             | 1206        |
|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| THICKNESS           | N           | E           | S, X, X'    | A           | B, T        | B           |
| A <sub>0</sub>      | 0.62 ± 0.05 | 0.70 ± 0.10 | 1.02 ± 0.05 | 1.50 ± 0.10 | 1.50 ± 0.10 | 2.00 ± 0.10 |
| B <sub>0</sub>      | 1.12 ± 0.05 | 1.20 ± 0.10 | 1.80 ± 0.05 | 2.30 ± 0.10 | 2.30 ± 0.10 | 3.50 ± 0.10 |
| T                   | 0.60 ± 0.05 | 0.70 ± 0.10 | 0.95 ± 0.05 | 0.75 ± 0.05 | 0.95 ± 0.05 | 0.95 ± 0.05 |
| K <sub>0</sub>      | -           | -           | -           | -           | -           | -           |
| W                   | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 |
| P <sub>0</sub>      | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 |
| 10 x P <sub>0</sub> | 40.0 ± 0.10 | 40.0 ± 0.10 | 40.0 ± 0.10 | 40.0 ± 0.10 | 40.0 ± 0.10 | 40.0 ± 0.10 |
| P <sub>1</sub>      | 2.00 ± 0.05 | 2.00 ± 0.05 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 |
| P <sub>2</sub>      | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 |
| D <sub>0</sub>      | 1.55 ± 0.05 | 1.55 ± 0.05 | 1.55 ± 0.05 | 1.55 ± 0.05 | 1.55 ± 0.05 | 1.50 ± 0.05 |
| D <sub>1</sub>      | -           | -           | -           | -           | -           | -           |
| E                   | 1.75 ± 0.05 | 1.75 ± 0.05 | 1.75 ± 0.05 | 1.75 ± 0.05 | 1.75 ± 0.05 | 1.75 ± 0.10 |
| F                   | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 |

**DIMENSIONS PLASTIC TAPE in millimeters**

| SIZE CODE           | 0805        | 1206        |             | 1210        |             |             |
|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| THICKNESS           | D, I        | C, J, D     | G, P        | C, D        | G, K        | M           |
| A <sub>0</sub>      | < 1.57      | < 1.85      | < 1.95      | < 2.97      | < 2.97      | < 2.97      |
| B <sub>0</sub>      | < 2.40      | < 3.46      | < 3.67      | < 3.73      | < 3.73      | < 3.73      |
| T                   | 0.23 ± 0.05 | 0.23 ± 0.05 | 0.23 ± 0.05 | 0.23 ± 0.05 | 0.23 ± 0.05 | 0.23 ± 0.05 |
| K <sub>0</sub>      | < 2.50      | < 2.50      | < 2.50      | < 2.50      | < 2.50      | < 3.00      |
| W                   | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 |
| P <sub>0</sub>      | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 |
| 10 x P <sub>0</sub> | 40.0 ± 0.10 | 40.0 ± 0.10 | 40.0 ± 0.10 | 40.0 ± 0.10 | 40.0 ± 0.10 | 40.0 ± 0.10 |
| P <sub>1</sub>      | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 |
| P <sub>2</sub>      | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 |
| D <sub>0</sub>      | 1.50 ± 0.05 | 1.50 ± 0.05 | 1.50 ± 0.05 | 1.50 ± 0.05 | 1.50 ± 0.05 | 1.50 ± 0.05 |
| D <sub>1</sub>      | 1.00 ± 0.10 | 1.00 ± 0.10 | 1.00 ± 0.10 | 1.00 ± 0.10 | 1.00 ± 0.10 | 1.00 ± 0.10 |
| E                   | 1.75 ± 0.10 | 1.75 ± 0.10 | 1.75 ± 0.10 | 1.75 ± 0.10 | 1.75 ± 0.10 | 1.75 ± 0.10 |
| F                   | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 |

## REEL SPECIFICATION



### REEL DIMENSIONS in millimeters

| SYMBOL | 7" REEL     | 13" REEL    |
|--------|-------------|-------------|
| A      | 13.0 ± 0.5  | 13.0 ± 0.5  |
| B      | 9.0 ± 1.0   | 9.0 ± 1.0   |
| C      | 178.0 ± 1.0 | 330.0 ± 1.0 |
| D      | 60.0 ± 1.0  | 100.0 ± 1.0 |

## CONSTRUCTION

| NO. | NAME             | C0G (NP0)                | X5R / X7R                |
|-----|------------------|--------------------------|--------------------------|
| 1   | Ceramic material | CaZrO <sub>3</sub> based | BaTiO <sub>3</sub> based |
| 2   | Inner electrode  | Ni                       |                          |
| 3   | Termination      | Inner layer              | Cu                       |
| 4   |                  | Middle layer             | Ni                       |
| 5   |                  | Outer layer              | Sn (matt)                |



## STORAGE AND HANDLING CONDITIONS

- (1) To store products at 5 °C to 40 °C ambient temperature and 20 % to 70 % relative humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

### Cautions:

- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability.  
Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.



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