

# Surface Mount Multilayer Ceramic Chip Capacitors

## DSCC Qualified Type 03028



### FEATURES

- US defense supply center approved
- Federal stock control number, CAGE CODE 2770A
- Small case size (0603)
- Stable BP, BR and BX dielectrics
- Excellent aging characteristics
- Lead (Pb)-free termination code "M"
- Tin / lead termination code "Z" and "U"
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Made with a combination of design, materials and tight process control to achieve very high field reliability
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



Available  
**RoHS\***  
Available  
**HALOGEN  
FREE**

### Note

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

### APPLICATIONS

- Broadband wireless communication
- Satellite communication
- WiFi (802.11) and WiMax (802.16)
- Subscriber based wireless devices
- Microwave systems

### ELECTRICAL SPECIFICATIONS

#### Note

- Electrical characteristics at +25 °C unless otherwise specified

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

#### Capacitance Range:

BP: 1.0 pF to 1.0 nF

BR: 100 pF to 100 nF

BX: 100 pF to 100 nF

**Voltage Range:** 6.3 V<sub>DC</sub> to 100 V<sub>DC</sub>

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

BP: 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C with zero (0) V<sub>DC</sub> applied

BP: 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C with 100 % rated V<sub>DC</sub> applied

BR: ± 15 % from -55 °C to +125 °C with zero (0) V<sub>DC</sub> applied

BR: +15 %, -40 % from -55 °C to +125 °C with 100 % rated V<sub>DC</sub> applied

BX: ± 15 % from -55 °C to +125 °C with zero (0) V<sub>DC</sub> applied

BX: +15 %, -25 % from -55 °C to +125 °C with 100 % rated V<sub>DC</sub> applied

#### Dissipation Factor (DF):

BP:

0.15 % max. at 1.0 V<sub>RMS</sub> and 1 MHz for values ≤ 1000 pF

0.15 % max. at 1.0 V<sub>RMS</sub> and 1 kHz for values > 1000 pF

BR, BX:

≤ 25 V: ± 3.5 % max. at 1.0 V<sub>RMS</sub> and 1 kHz

≥ 50 V: ± 2.5 % max. at 1.0 V<sub>RMS</sub> and 1 kHz

#### Aging Rate:

BP: 0 % maximum per decade

BR, BX: 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 voltages

≤ 200 V<sub>DC</sub>-rated: 250 % of rated voltage

**QUICK REFERENCE DATA**

| DIELECTRIC | CASE | MAXIMUM VOLTAGE<br>(V) | CAPACITANCE |         |
|------------|------|------------------------|-------------|---------|
|            |      |                        | MINIMUM     | MAXIMUM |
| BP         | 0603 | 100                    | 1.0 pF      | 1.0 nF  |
| BR         | 0603 | 100                    | 100 pF      | 100 nF  |
| BX         | 0603 | 100                    | 100 pF      | 100 nF  |

**Note**

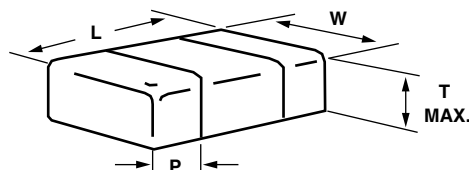
- Detail ratings see "Selection Chart"

**ORDERING INFORMATION**

| 03028-            | BX             | 102                                                                                                                                                                                                   | B                                                                      | J                                                                                                                                                                                                                      | Z                                                                                                                                                   | -                                                                                                                                                      | T                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DSCC<br>NUMBER    | DIELECTRIC     | CAPACITANCE<br>NOMINAL CODE                                                                                                                                                                           | DC VOLTAGE<br>RATING <sup>(1)</sup>                                    | CAPACITANCE<br>TOLERANCE                                                                                                                                                                                               | TERMINATION                                                                                                                                         | GROUP C<br>TESTING OPTION <sup>(2)</sup>                                                                                                               | PACKAGING                                                                                                                                                                                                                                                                                                                                                     |
| Case code<br>0603 | BP<br>BR<br>BX | Expressed in<br>picofarads (pF).<br>The first two<br>digits are<br>significant, the<br>third is a<br>multiplier. An "R"<br>indicates a<br>decimal point.<br>Examples:<br>1R8 = 1.8 pF<br>101 = 100 pF | W = 6.3 V<br>X = 10 V<br>Y = 16 V<br>Z = 25 V<br>A = 50 V<br>B = 100 V | C = $\pm 0.25$ pF<br>D = $\pm 0.5$ pF<br>F = $\pm 1$ %<br>G = $\pm 2$ %<br>J = $\pm 5$ %<br>K = $\pm 10$ %<br>M = $\pm 20$ %<br><b>Note:</b><br>C, D < 10 pF (BP)<br>F, G, J, K, M<br>≥ 10 pF (BP)<br>J, K, M (BR, BX) | M = silver<br>palladium<br>Z = Ni barrier<br>with tin / lead<br>plate min.<br>4 % lead<br>U = Ni barrier,<br>solder coated<br>(min. of 4 %<br>lead) | C = full group C<br>L = 2000 h life<br>test only<br>M = 1000 h life<br>test only<br>H = low voltage<br>humidity test only<br>- = no group C<br>testing | <p>T = 7" reel / plastic tape<br/>C = 7" reel / paper tape<br/>O = 7" reel / flamed paper tape<br/>J = 7" reel (low quantity)<br/>R = 11 1/4" / 13" reel / plastic tape<br/>P = 11 1/4" / 13" reel / paper tape<br/>I = 11 1/4" / 13" reel /<br/>flamed paper tape<br/>B = bulk</p> <p><b>Note:</b><br/>"I" and "O" are used for<br/>"M" termination code</p> |

**Notes**

- 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)
- To receive data package, add "P" to the end of the part number. For example, 03028-BX102BJZCTP. Group C will be completed and data included with shipment.

**DIMENSIONS** in inches (millimeters)


| PART ORDERING<br>NUMBER | LENGTH<br>(L)                          | WIDTH<br>(W)                           | MAXIMUM<br>THICKNESS<br>(T) | TERMINATION PAD<br>(P) |                 |
|-------------------------|----------------------------------------|----------------------------------------|-----------------------------|------------------------|-----------------|
|                         |                                        |                                        |                             | MINIMUM                | MAXIMUM         |
| 03028-                  | 0.063 $\pm$ 0.006<br>(1.60 $\pm$ 0.15) | 0.032 $\pm$ 0.006<br>(0.81 $\pm$ 0.15) | 0.036<br>(0.91)             | 0.008<br>(0.20)        | 0.020<br>(0.51) |

**Note**

- Metric equivalents are given for general information only



| SELECTION CHART            |        |       |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
|----------------------------|--------|-------|----|----|----|----|-----|-----|----|----|----|----|-----|-----|----|----|----|----|-----|
| DIELECTRIC                 |        | BP    |    |    |    |    |     | BR  |    |    |    |    |     | BX  |    |    |    |    |     |
| STYLE                      |        | 03028 |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| CASE CODE                  |        | 0603  |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| VOLTAGE (V <sub>DC</sub> ) |        | 6.3   | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 50 | 100 |
| VOLTAGE CODE               |        | W     | X  | Y  | Z  | A  | B   | W   | X  | Y  | Z  | A  | B   | W   | X  | Y  | Z  | A  | B   |
| CAP. CODE                  | CAP.   |       |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| 1R0                        | 1.0 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 1R2                        | 1.2 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 1R5                        | 1.5 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 1R8                        | 1.8 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 2R2                        | 2.2 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 2R4                        | 2.4 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 2R7                        | 2.7 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 3R0                        | 3.0 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 3R3                        | 3.3 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 3R6                        | 3.6 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 3R9                        | 3.9 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 4R7                        | 4.7 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 5R1                        | 5.1 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 5R6                        | 5.6 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 6R2                        | 6.2 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 6R8                        | 6.8 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 7R5                        | 7.5 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 8R2                        | 8.2 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 9R1                        | 9.1 pF | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 100                        | 10 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 110                        | 11 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 120                        | 12 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 130                        | 13 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 150                        | 15 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 160                        | 16 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 180                        | 18 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 200                        | 20 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 220                        | 22 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 240                        | 24 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 270                        | 27 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 300                        | 30 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 330                        | 33 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 360                        | 36 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 390                        | 39 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 430                        | 43 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 470                        | 47 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 510                        | 51 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 560                        | 56 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 620                        | 62 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 680                        | 68 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 750                        | 75 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 820                        | 82 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |
| 910                        | 91 pF  | •     | •  | •  | •  | •  | •   |     |    |    |    |    |     |     |    |    |    |    |     |

**Notes**

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

• Not RoHS-compliant



| SELECTION CHART            |        |       |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
|----------------------------|--------|-------|----|----|----|----|-----|-----|----|----|----|----|-----|-----|----|----|----|----|-----|
| DIELECTRIC                 |        | BP    |    |    |    |    |     | BR  |    |    |    |    |     | BX  |    |    |    |    |     |
| STYLE                      |        | 03028 |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| CASE CODE                  |        | 0603  |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| VOLTAGE (V <sub>DC</sub> ) |        | 6.3   | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 50 | 100 |
| VOLTAGE CODE               |        | W     | X  | Y  | Z  | A  | B   | W   | X  | Y  | Z  | A  | B   | W   | X  | Y  | Z  | A  | B   |
| CAP. CODE                  | CAP.   |       |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| 101                        | 100 pF | •     | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 121                        | 120 pF | •     | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 151                        | 150 pF | •     | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 181                        | 180 pF | •     | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 221                        | 220 pF | •     | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 271                        | 270 pF | •     | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 331                        | 330 pF | •     | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 391                        | 390 pF | •     | •  | •  | •  | •  |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 471                        | 470 pF | •     | •  | •  | •  | •  |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 561                        | 560 pF | •     | •  | •  | •  | •  |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 681                        | 680 pF | •     | •  | •  | •  | •  |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 821                        | 820 pF | •     | •  | •  | •  |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 102                        | 1.0 nF | •     | •  | •  | •  |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 122                        | 1.2 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 152                        | 1.5 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 182                        | 1.8 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 222                        | 2.2 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 272                        | 2.7 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  | •   |
| 332                        | 3.3 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  |     |
| 392                        | 3.9 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  |     |
| 472                        | 4.7 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  |     |
| 562                        | 5.6 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  |     |
| 682                        | 6.8 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  |     |
| 822                        | 8.2 nF |       |    |    |    |    |     | •   | •  | •  | •  | •  | •   | •   | •  | •  | •  | •  |     |
| 103                        | 10 nF  |       |    |    |    |    |     | •   | •  | •  | •  | •  |     | •   | •  | •  | •  | •  |     |
| 123                        | 12 nF  |       |    |    |    |    |     | •   | •  | •  | •  | •  |     | •   | •  | •  | •  |    |     |
| 153                        | 15 nF  |       |    |    |    |    |     | •   | •  | •  | •  | •  |     | •   | •  | •  | •  |    |     |
| 183                        | 18 nF  |       |    |    |    |    |     | •   | •  | •  | •  | •  |     | •   | •  | •  | •  |    |     |
| 223                        | 22 nF  |       |    |    |    |    |     | •   | •  | •  | •  | •  |     | •   | •  | •  | •  |    |     |
| 273                        | 27 nF  |       |    |    |    |    |     | •   | •  | •  | •  | •  |     | •   | •  | •  | •  |    |     |
| 333                        | 33 nF  |       |    |    |    |    |     | •   | •  | •  | •  |    |     | •   | •  | •  |    |    |     |
| 393                        | 39 nF  |       |    |    |    |    |     | •   | •  | •  | •  |    |     | •   | •  | •  |    |    |     |
| 473                        | 47 nF  |       |    |    |    |    |     | •   | •  | •  | •  |    |     | •   | •  | •  |    |    |     |
| 563                        | 56 nF  |       |    |    |    |    |     | •   | •  | •  | •  |    |     | •   | •  | •  |    |    |     |
| 683                        | 68 nF  |       |    |    |    |    |     | •   | •  | •  |    |    |     | •   |    |    |    |    |     |
| 823                        | 82 nF  |       |    |    |    |    |     | •   | •  | •  |    |    |     | •   |    |    |    |    |     |
| 104                        | 100 nF |       |    |    |    |    |     | •   | •  | •  |    |    |     | •   |    |    |    |    |     |
| 124                        | 120 nF |       |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| 154                        | 150 nF |       |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| 184                        | 180 nF |       |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |
| 224                        | 220 nF |       |    |    |    |    |     |     |    |    |    |    |     |     |    |    |    |    |     |

**Notes**

- RoHS-compliant except when supplied with lead (Pb)-containing termination, code "Z"
- Not RoHS-compliant

**DSCC PACKAGING QUANTITIES <sup>(1)</sup>**

| CASE CODE | TAPE SIZE | 7" REEL QUANTITIES |      | 11 1/4" AND 13" REEL QUANTITIES | BULK                |
|-----------|-----------|--------------------|------|---------------------------------|---------------------|
|           |           | PACKAGING CODE     |      | PACKAGING CODE                  | VIAL PACKAGING CODE |
|           |           | "C" / "O" / "T"    | "J"  | "P" / "I" / "R"                 | "B"                 |
| 0603      | 8 mm      | 4000               | 1000 | 10 000                          | 100                 |

**Note**

(1) Reference: EIA standard RS 481 - "Taping of Surface Mount Components for Automatic Placement"

**STORAGE AND HANDLING CONDITIONS**

(1) Store the components at 5 °C to +40 °C ambient temperature and ≤ 70 % relative humidity conditions.

(2) The product is recommended to be used within a time-frame of 2 years after shipment.

Check solderability in case extended shelf life beyond the expiry date is needed.

**Precautions:**

- Do not store products in an environment containing corrosive elements, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. This may cause corrosion or oxidization of the terminations, which can easily lead to poor soldering.
- Store products on the shelf and avoid exposure to moisture or dust.
- Do not expose products to excessive shock, vibration, direct sunlight and so on.



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