

Surface Mount Multilayer Ceramic Chip Capacitors

DSCC Qualified Type 05006



FEATURES

- US defense supply center approved
- Federal stock control number, CAGE CODE 2770A
- Case size 0805
- 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



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

- Avionic application
- Sonar applications
- Satellite systems
- Missiles applications
- Geographical information systems
- Global positioning 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 3.3 nF

BR: 100 pF to 220 nF

BX: 100 pF to 180 nF

Voltage Range: 10 V_{DC} to 200 V_{DC}

Temperature Coefficient of Capacitance (TCC):

BP: 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C with zero (0) V_{DC} applied

BP: 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C with 100 % rated V_{DC} applied

BR: ± 15 % from -55 °C to +125 °C with zero (0) V_{DC} applied

BR: +15 %, -40 % from -55 °C to +125 °C with 100 % rated V_{DC} applied

BX: ± 15 % from -55 °C to +125 °C with zero (0) V_{DC} applied

BX: +15 %, -25 % from -55 °C to +125 °C with 100 % rated V_{DC} applied

Dissipation Factor (DF):

BP:

0.15 % max. at 1.0 V_{RMS} and 1 MHz for values ≤ 1000 pF

0.15 % max. at 1.0 V_{RMS} and 1 kHz for values > 1000 pF

BR and BX:

≤ 25 V: 3.5 % max. at 1.0 V_{RMS} and 1 kHz

≥ 50 V: 2.5 % max. at 1.0 V_{RMS} 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_{DC}-rated: 250 % of rated voltage

QUICK REFERENCE DATA

| DIELECTRIC | CASE | MAXIMUM VOLTAGE (V) | CAPACITANCE | |
|------------|------|------------------------|-------------|---------|
| | | | MINIMUM | MAXIMUM |
| BP | 0805 | 200 | 1.0 pF | 3.3 nF |
| BR | 0805 | 100 | 100 pF | 220 nF |
| BX | 0805 | 100 | 100 pF | 180 nF |

Note

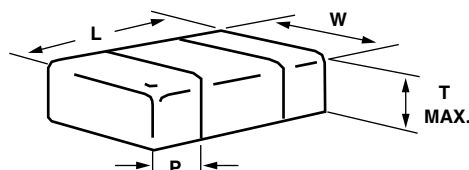
- Detail ratings see "Selection Chart"

ORDERING INFORMATION

| 05006- | BP | 101 | B | J | Z | - | T |
|-------------------|----------------|--|--|--|--|---|---|
| DSCC NUMBER | DIELECTRIC | CAPACITANCE NOMINAL CODE | DC VOLTAGE RATING ⁽¹⁾ | CAPACITANCE TOLERANCE | TERMINATION | GROUP C TESTING OPTION ⁽²⁾ | PACKAGING |
| Case code 0805 | BP BR BX | Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. An "R" indicates a decimal point. Examples: 1R8 = 1.8 pF 101 = 100 pF | X = 10 V Y = 16 V Z = 25 V A = 50 V B = 100 V C = 200 V | C = ± 0.25 pF D = ± 0.5 pF F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 % M = ± 20 % Note: C, D < 10 pF (BP) F, G, J, K, M ≥ 10 pF (BP) J, K, M (BR, BX) | M = silver palladium Z = Ni barrier with tin / lead plate min. 4 % lead U = Ni barrier solder coated (min. of 4 % lead) | C = full group C L = 2000 h life test only M = 1000 h life test only H = low voltage humidity test only - = no group C testing | T = 7" reel / plastic tape C = 7" reel / paper tape O = 7" reel / flamed paper tape J = 7" reel (low quantity) R = 11 1/4" / 13" reel / plastic tape P = 11 1/4" / 13" reel / paper tape I = 11 1/4" / 13" reel / flamed paper tape B = bulk Note: "I" and "O" are used for "M" termination code |

Notes

- DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance.
Consult for questions: mlcc@vishay.com
- To receive data package, add "P" to the end of the part number. For example, 05006-BP101BJZCTP.
Group C will be completed and data included with shipment.

DIMENSIONS in inches (millimeters)


| PART ORDERING NUMBER | LENGTH (L) | WIDTH (W) | MAXIMUM THICKNESS (T) | TERMINATION PAD (P) | |
|----------------------|--|--|-----------------------|---------------------|-----------------|
| | | | | MINIMUM | MAXIMUM |
| 05006- | 0.080 \pm 0.008 (2.03 \pm 0.20) | 0.050 \pm 0.008 (1.27 \pm 0.20) | 0.055 (1.40) | 0.012 (0.30) | 0.028 (0.71) |

Note

- Metric equivalents are given for general information only



| SELECTION CHART | | | | | | | | | | | | | | | | | |
|----------------------------|--------|-------|----|----|----|-----|-----|----|----|----|----|-----|----|----|----|----|-----|
| DIELECTRIC | | BP | | | | | | BR | | | | | BX | | | | |
| STYLE | | 05006 | | | | | | | | | | | | | | | |
| CASE CODE | | 0805 | | | | | | | | | | | | | | | |
| VOLTAGE (V _{DC}) | | 10 | 16 | 25 | 50 | 100 | 200 | 10 | 16 | 25 | 50 | 100 | 10 | 16 | 25 | 50 | 100 |
| VOLTAGE CODE | | X | Y | Z | A | B | C | X | Y | Z | A | B | 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 | • | • | • | • | + | • | | | | | | | | | | |
| 2R7 | 2.7 pF | • | • | • | • | + | • | | | | | | | | | | |
| 3R3 | 3.3 pF | • | • | • | • | + | • | | | | | | | | | | |
| 3R9 | 3.9 pF | • | • | • | • | + | • | | | | | | | | | | |
| 4R7 | 4.7 pF | • | • | • | • | + | • | | | | | | | | | | |
| 5R6 | 5.6 pF | • | • | • | • | + | • | | | | | | | | | | |
| 6R8 | 6.8 pF | • | • | • | • | + | • | | | | | | | | | | |
| 8R2 | 8.2 pF | • | • | • | • | + | • | | | | | | | | | | |
| 100 | 10 pF | • | • | • | • | + | • | | | | | | | | | | |
| 120 | 12 pF | • | • | • | • | + | • | | | | | | | | | | |
| 150 | 15 pF | • | • | • | • | + | • | | | | | | | | | | |
| 180 | 18 pF | • | • | • | • | + | • | | | | | | | | | | |
| 220 | 22 pF | • | • | • | • | + | • | | | | | | | | | | |
| 270 | 27 pF | • | • | • | • | + | • | | | | | | | | | | |
| 330 | 33 pF | • | • | • | • | + | • | | | | | | | | | | |
| 390 | 39 pF | • | • | • | • | + | • | | | | | | | | | | |
| 470 | 47 pF | • | • | • | • | + | • | | | | | | | | | | |
| 560 | 56 pF | • | • | • | • | + | • | | | | | | | | | | |
| 680 | 68 pF | • | • | • | • | + | • | | | | | | | | | | |
| 820 | 82 pF | • | • | • | • | + | • | | | | | | | | | | |
| 101 | 100 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | • |
| 121 | 120 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | + |
| 151 | 150 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | + |
| 181 | 180 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | + |
| 221 | 220 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | + |
| 271 | 270 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | + |
| 331 | 330 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | + |
| 391 | 390 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | + |
| 471 | 470 pF | • | • | • | • | + | • | • | • | • | • | • | • | • | • | • | + |
| 561 | 560 pF | • | • | • | + | • | • | • | • | • | • | • | • | • | • | • | + |
| 681 | 680 pF | • | • | • | + | • | • | • | • | • | • | • | • | • | • | • | + |
| 821 | 820 pF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | + |
| 102 | 1.0 nF | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | + |
| 122 | 1.2 nF | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | + |
| 152 | 1.5 nF | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | + |
| 182 | 1.8 nF | • | • | • | • | | | • | • | • | • | • | • | • | • | • | + |
| 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 | | | | | | | • | • | • | • | • | • | • | • | + | • |

Notes

• RoHS-compliant except when supplied with lead (Pb)-containing terminations, codes "Z" and "U"

• Not RoHS-compliant

+ Use MIL-PRF-55681 (CDR) instead, part numbers removed from DSCC listing



| SELECTION CHART | | | | | | | | | | | | | | | | | |
|----------------------------|--------|-------|----|----|----|-----|-----|----|----|----|----|-----|----|----|----|----|-----|
| DIELECTRIC | | BP | | | | | | BR | | | | | BX | | | | |
| STYLE | | 05006 | | | | | | | | | | | | | | | |
| CASE CODE | | 0805 | | | | | | | | | | | | | | | |
| VOLTAGE (V _{DC}) | | 10 | 16 | 25 | 50 | 100 | 200 | 10 | 16 | 25 | 50 | 100 | 10 | 16 | 25 | 50 | 100 |
| VOLTAGE CODE | | X | Y | Z | A | B | C | X | Y | Z | A | B | X | Y | Z | A | B |
| CAP. CODE | CAP. | | | | | | | | | | | | | | | | |
| 103 | 10 nF | | | | | | | • | • | • | • | • | • | • | • | + | • |
| 123 | 12 nF | | | | | | | • | • | • | • | • | • | • | • | + | |
| 153 | 15 nF | | | | | | | • | • | • | • | • | • | • | • | + | |
| 183 | 18 nF | | | | | | | • | • | • | • | • | • | • | • | + | |
| 223 | 22 nF | | | | | | | • | • | • | • | • | • | • | • | • | |
| 273 | 27 nF | | | | | | | • | • | • | • | • | • | • | • | • | |
| 333 | 33 nF | | | | | | | • | • | • | • | | • | • | • | • | |
| 393 | 39 nF | | | | | | | • | • | • | • | | • | • | • | | |
| 473 | 47 nF | | | | | | | • | • | • | • | | • | • | • | | |
| 563 | 56 nF | | | | | | | • | • | • | • | | • | • | • | | |
| 683 | 68 nF | | | | | | | • | • | • | • | | • | • | • | | |
| 823 | 82 nF | | | | | | | • | • | • | • | | • | • | • | | |
| 104 | 100 nF | | | | | | | • | • | • | • | | • | • | • | | |
| 124 | 120 nF | | | | | | | • | • | • | | | | | | | |
| 154 | 150 nF | | | | | | | • | • | • | | | | | | | |
| 184 | 180 nF | | | | | | | • | • | | | | | | | | |
| 224 | 220 nF | | | | | | | • | • | | | | | | | | |
| 274 | 270 nF | | | | | | | | | | | | | | | | |
| 334 | 330 nF | | | | | | | | | | | | | | | | |
| 394 | 390 nF | | | | | | | | | | | | | | | | |
| 474 | 470 nF | | | | | | | | | | | | | | | | |
| 564 | 560 nF | | | | | | | | | | | | | | | | |
| 684 | 680 nF | | | | | | | | | | | | | | | | |
| 824 | 820 nF | | | | | | | | | | | | | | | | |
| 105 | 1.0 μF | | | | | | | | | | | | | | | | |

Notes

RoHS-compliant except when supplied with lead (Pb)-containing terminations, codes "Z" and "U"

Not RoHS-compliant

+ Use MIL-PRF-55681 (CDR) instead, part numbers removed from DSCC listing

| DSCC PACKAGING QUANTITIES ⁽¹⁾⁽²⁾ | | | | | |
|---|-----------|--------------------|------|---------------------------------|-----------------------------|
| CASE CODE | TAPE SIZE | 7" REEL QUANTITIES | | 11 1/4" AND 13" REEL QUANTITIES | |
| | | PACKAGING CODE | | PACKAGING CODE | |
| | | "C" / "O" / "T" | "J" | "P" / "I" / "R" | BULK VIAL PACKAGING CODE |
| 0805 | 8 mm | 3000 | 1000 | 10 000 | 100 |

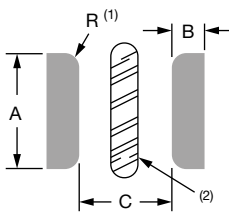
Notes

⁽¹⁾ Vishay Vitramon uses embossed plastic carrier tape and punch paper carrier tape

⁽²⁾ Reference: EIA standard RS 481 - "Taping of Surface Mount Components for Automatic Placement"

| STORAGE AND HANDLING CONDITIONS |
|--|
| <p>(1) Store the components at 5 °C to +40 °C ambient temperature and \leq 70 % relative humidity conditions.</p> <p>(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.</p> <p>Precautions:</p> <ol style="list-style-type: none"> 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. |

Solder Pad Dimensions for Vishay Surface-Mount Multilayer Ceramic Chip Capacitors

| DIMENSIONS in millimeters | | | |
|---|---------------------|------|---------------------|
|  | | | |
| CASE CODE | A | B | C |
| 0402 | 0.50 | 0.50 | 0.40 |
| 0505 | 1.35 | 1.00 | 0.60 |
| 0603 | 0.90 | 1.00 | 1.00 ⁽³⁾ |
| 0805 | 1.30 | 1.20 | 1.00 |
| 1111 | 2.90 | 1.30 | 1.75 |
| 1206 | 1.80 | 1.20 | 2.10 |
| 1210 | 2.80 | 1.30 | 1.90 |
| 1808 | 2.40 | 1.50 | 3.00 |
| 1812 | 3.60 | 1.50 | 3.00 |
| 1825 | 6.50 | 1.50 | 3.00 |
| 2008 | 2.70 | 1.50 | 4.08 |
| 2220 | 5.50 ⁽⁴⁾ | 1.50 | 4.20 |
| 2225 | 6.50 | 1.50 | 4.20 |
| 2525 | 6.60 | 1.50 | 4.50 |
| 3040 | 10.80 | 2.00 | 5.50 |
| 3640 | 10.80 | 2.00 | 7.00 |
| 3838 | 10.20 | 2.00 | 7.50 |
| 4044 | 12.30 | 2.00 | 8.00 |

Notes

- ⁽¹⁾ For safety capacitors and voltages above 3000 V, corner rounding (R) of 0.5 mm is recommended to suppress arcing
- ⁽²⁾ Add a 1 mm slot in PCB between pads to allow cleaning and coating under MLCC
- ⁽³⁾ For VJ HiFREQ Series, this dimension is 0.6 mm
- ⁽⁴⁾ For safety capacitors, the A dimension should be 5.80 mm



PRINTED CIRCUIT BOARD PCB DESIGN CONSIDERATIONS FOR HIGH VOLTAGE SURFACE-MOUNT MLCCS

Special assembly process and design considerations should be employed for today's high voltage rating MLCCs. As case sizes remain the same and voltage ratings increase, MLCC manufacturers must design, evaluate, and qualify their capacitors using methods that reduce the occurrence of corona discharge and arcover events. To meet similar capability in high voltage applications, users should employ similar cautionary design and assembly methods.

MLCC PAD LAYOUT

A capacitor's arcover inception point can degrade due to factors such as the MLCC termination, PCB pad design, PCB cleanliness, solder flux residue, surface contamination / deposits and environmental conditions. PCB pads and their design affect the air gap distance between the opposing polarities of the MLCC termination. For voltage rating greater than 1500 V_{DC} add a corner radius to the inward facing edge of the MLCC pads and as large a gap as possible between the pads. Too small of a pad gap distance will reduce the capacitor's own arcover inception voltage level. Refer to the Figure and Table Figure 1.0, MLCC Pad Layout and Table 1.0, Vishay MLCC Solder Pad Dimensions for the recommended MLCC solder pad dimensions.

SLOT OR TRENCH BETWEEN PADS

PCB assembly can deposit dust, trap solder balls, or flux residue underneath the capacitors. These contaminants will reduce conductive clearances and the arcover inception level. Assembly methods must include a final PCB cleaning process. A slot or trench can be cut into the PCB in between the pads to allow cleaners to penetrate underneath the MLCC. The slot will also allow conformal or epoxy coatings to flow underneath the MLCC and build an insulative barrier between pads. Refer to Figure 1.0 MLCC Pad Layout for slot reference location.

COATING PRINTED CIRCUIT BOARD

Coating a printed circuit board with materials such as acrylic, silicone and urethane resins provide a protective dielectric barrier that is non-conductive and will enhance the resistance to arcing. Various processes exist which include dipping, brushing, and spraying. Optimal performance will come from coating the MLCC on all sides, top and bottom. The PCB slot in between the pads should extend slightly beyond the width of the MLCC. Refer to Figure 1.0 MLCC Pad Layout for slot reference location.



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