Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

0505C/P (0.055” x 0.055”)

Product Features
- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 0.1pF to 1000pF
- Working Voltage: 150V
- Extended Voltage: 300V

Product Applications
Typical Functional Applications:
- Tuning • Bypass • Coupling
- Feedback • D.C. Blocking
- Impedance Matching

Typical Circuit Applications:
- UHF/Microwave RF Power Amplifiers
- Mixers • Oscillators • Filter Networks
- Low Noise Amplifiers • Timing Circuits and Delay Lines

Part Numbering

<table>
<thead>
<tr>
<th>0505</th>
<th>C</th>
<th>100</th>
<th>J</th>
<th>W</th>
<th>151</th>
<th>X</th>
<th>TV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case Size (0.055” x 0.055”)</td>
<td>C =NP0</td>
<td>Capacitor Code</td>
<td>Rated Voltage</td>
<td>Add TV for Vertical Orientation (Only available below 430pF)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P = P90</td>
<td>100=10x10^6=10pF</td>
<td>See Table</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Laser Marking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitance Tolerance</td>
<td>Termination Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Table</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Capacitor Dimensions

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Thickness</th>
<th>Overlap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lc</td>
<td>Wc</td>
<td>Tc</td>
<td>B</td>
</tr>
<tr>
<td>0.055 + 0.015 to -0.010 (1.40 +0.38 to -0.25)</td>
<td>0.055 ± .010 (1.40 ±0.25)</td>
<td>0.057 (1.45 max)</td>
<td>0.020 (0.51max)</td>
</tr>
</tbody>
</table>

Temperature Coefficient

C: -55° to 125°C 0± 30ppm/°C;
>125°C to 200°C 0± 60ppm/°C
P: ±90 ±20ppm/°C

www.passiveplus.com +1 (631) 425-0938 sales@passiveplus.com
PPI0505CPData051921RevA
## 0505C/P Capacitance Values

- **NP0=C; P90=P**
- **Maximum Capacitance:** 0505P=100pF; 0505C=1000pF
- * - Available in NP0 only.

Special capacitances, tolerances and WVDC are available. Please contact PPI.

![Image](image-url)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 OR1</td>
<td>0.2 OR2</td>
<td>0.3 OR3</td>
<td>0.4 OR4</td>
<td>0.5 OR5</td>
<td>0.6 OR6</td>
<td>0.7 OR7</td>
<td>0.8 OR8</td>
</tr>
<tr>
<td>0.9 OR9</td>
<td>1.0 1R0</td>
<td>1.1 1R1</td>
<td>1.2 1R2</td>
<td>1.3 1R3</td>
<td>1.4 1R4</td>
<td>1.5 1R5</td>
<td>1.6 1R6</td>
</tr>
<tr>
<td>1.7 1R7</td>
<td>1.8 1R8</td>
<td>1.9 1R9</td>
<td>2.0 2R0</td>
<td>2.1 2R1</td>
<td>2.2 2R2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A,B,C,D</td>
<td></td>
<td></td>
<td>A,B,C,D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4 2R4</td>
<td>2.7 2R7</td>
<td>3.0 3R0</td>
<td>3.3 3R3</td>
<td>3.6 3R6</td>
<td>3.9 3R9</td>
<td>4.3 4R3</td>
<td>4.7 4R7</td>
</tr>
<tr>
<td>5.1 5R1</td>
<td>5.6 5R6</td>
<td>6.2 6R2</td>
<td>6.8 6R8</td>
<td>7.5 7R5</td>
<td>8.2 8R2</td>
<td>9.1 9R1</td>
<td>10 100</td>
</tr>
<tr>
<td>11 110</td>
<td>12 120</td>
<td>13 130</td>
<td>15 150</td>
<td>16 160</td>
<td>18 180</td>
<td></td>
<td>20 200</td>
</tr>
<tr>
<td>22 220</td>
<td>24 240</td>
<td>27 270</td>
<td>30 300</td>
<td>33 330</td>
<td>36 360</td>
<td>39 390</td>
<td>43 430</td>
</tr>
<tr>
<td>47 470</td>
<td></td>
<td></td>
<td>51 510</td>
<td>56 560</td>
<td>62 620</td>
<td>68 680</td>
<td>75 750</td>
</tr>
<tr>
<td>82 820</td>
<td>91 910</td>
<td>100 101</td>
<td>110 111*</td>
<td>120 121*</td>
<td>130 131*</td>
<td>150 151*</td>
<td>160 161*</td>
</tr>
<tr>
<td>180 180*</td>
<td>200 201*</td>
<td>220 221*</td>
<td>240 241*</td>
<td>270 271*</td>
<td>300 301*</td>
<td></td>
<td>330 331*</td>
</tr>
<tr>
<td>360 361*</td>
<td>390 391*</td>
<td>430 431*</td>
<td>470 471*</td>
<td>510 511*</td>
<td>560 561*</td>
<td>620 621*</td>
<td>680 681*</td>
</tr>
<tr>
<td>750 751*</td>
<td>820 821*</td>
<td>910 911*</td>
<td>1000 102*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* - Available in NP0 only.
Traditional High Q (>10,000) Low ESR
Multi-Layer Ceramic Capacitors

0505C/P (0.055” x 0.055”)

Capacitance Tolerance Codes

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>G</th>
<th>J</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tol.</td>
<td>±0.05pF</td>
<td>±0.1pF</td>
<td>±0.25pF</td>
<td>±0.5pF</td>
<td>±1%</td>
<td>±2%</td>
<td>±5%</td>
<td>±10%</td>
</tr>
</tbody>
</table>

Termination Types

<table>
<thead>
<tr>
<th>Termination Code</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>100% Sn Solder over Nickel Plating</td>
</tr>
<tr>
<td>L</td>
<td>90% Sn10%Pb Tin/Lead Solder over Nickel Plating</td>
</tr>
<tr>
<td>P (Non-Magnetic)</td>
<td>100%Sn Solder of Copper Plating</td>
</tr>
</tbody>
</table>

Note: “Non-Magnetic” means no magnetic materials.

Voltage Codes

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>50V</td>
<td>500</td>
</tr>
<tr>
<td>100V</td>
<td>101</td>
</tr>
<tr>
<td>150V</td>
<td>151</td>
</tr>
<tr>
<td>200V</td>
<td>201</td>
</tr>
<tr>
<td>250V</td>
<td>251</td>
</tr>
<tr>
<td>300V</td>
<td>301</td>
</tr>
</tbody>
</table>
### Electrical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Test Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Factor (Q)</td>
<td>Greater than 10,000 at 1 MHz</td>
</tr>
<tr>
<td>Insulation Resistance (IR)</td>
<td>10⁸ MegaOhms min. @ +25°C rated WVDC 10⁴ MegaOhms min. @ +125°C rated WVDC</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>See Rated Voltage Table</td>
</tr>
<tr>
<td>Dielectric Withstanding Voltage (WVDC)</td>
<td>250% of Rated Voltage of 5 seconds</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-55°C to 200°C</td>
</tr>
<tr>
<td>Temperature Coefficient (TC)</td>
<td>C: -55°C to 125°C 0±30ppm/°C; &gt;125°C to 200°C 0±60ppm/°C P: +90±20ppm/°C</td>
</tr>
<tr>
<td>Capacitance Drift</td>
<td>±0.02% or ±0.02pF, whichever is greater</td>
</tr>
<tr>
<td>Piezoelectric Effects</td>
<td>None</td>
</tr>
<tr>
<td>Termination Type</td>
<td>See Termination Type Table</td>
</tr>
</tbody>
</table>

Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

### Environmental Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Test Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Shock Hz2</td>
<td>DWV: The initial value IR: Shall not be less than 30% of the initial value. Capacitance Change: No more than 0.5% or 0.5pF, whichever is greater. MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.</td>
</tr>
<tr>
<td>Moisture Resistance P25</td>
<td>DWV: The initial value IR: The initial value. Capacitance Change: No more than 0.5% or 0.5pF, whichever is greater. MIL-STD-202, Method 106</td>
</tr>
<tr>
<td>Humidity (Steady State) Hz2</td>
<td>IR: Shall not be less than 30% of the initial value. Capacitance Change: No more than 2.0% or 0.5pF, whichever is greater. MIL-STD-202, Method 103, Condition A With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum.</td>
</tr>
<tr>
<td>Life Hz2</td>
<td>IR: Shall not be less than 30% of the initial value. Capacitance Change: No more than 2.0% or 0.5pF, whichever is greater. MIL-STD-202, Method 108. For 2000 hours, at 200°C. Rated Voltage DC applies.</td>
</tr>
</tbody>
</table>
÷ FPR -- First Parallel Resonance (FPRs)

÷ Definitions and Measurement Conditions

The First Parallel Resonance, FPR, is defined as the lowest frequency at which a suckout or notch appears in |S21|. It is generally independent of substrate thickness or dielectric constant, but does depend on capacitor orientation. A horizontal orientation means the capacitor electrode planes are parallel to the plane of the substrate; a vertical orientation means the electrode planes are perpendicular to the substrate.

÷ FSR -- First Series Resonance (FSRs)

÷ Definitions and Measurement Conditions

The First Series Resonance, FSR, is defined as the lowest frequency at which the imaginary part of the input impedance, Im[Zin], equals zero. Should Im[Zin] or the real part of the input impedance, Re[Zin], not be monotonic with frequency at frequencies lower than those at which Im[Zin] =0, the FSR shall be considered as undefined (represented as a gap in the plot). FSR is dependent on internal capacitor structure; substrate thickness and dielectric constant; capacitor orientation, as defined alongside the FPR plot; and mounting pad dimensions.

The measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.66; horizontal mount substrate thickness (mils) =25; gap in microstrip trace (mils) = 15; horizontal mount microstrip trace width (mils) = 55. Reference planes at sample edges.

All data has been derived from electrical models created by Modelithics, Inc., a specialty vendor contracted by PPI. The models are derived from measurements on a large number of parts disposed on several different substrates.

www.passiveplus.com +1 (631) 425-0938 sales@passiveplus.com
Traditional High Q (>10,000) Low ESR
Multi-Layer Ceramic Capacitors

**0505C/P (0.055” x 0.055”)**

---

**ESR vs. Frequency**

**0505C/P ESR vs Frequency**

---

**0505C ESR vs Frequency**

---

http://www.passiveplus.com  +1 (631) 425-0938  sales@passiveplus.com

PPI0505CPData051921RevA
Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

**Q vs. Frequency**

**0505C/P Q vs Frequency**

<table>
<thead>
<tr>
<th>Capacitance (pF)</th>
<th>Frequency (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.9 pF</td>
<td>100</td>
</tr>
<tr>
<td>6.8 pF</td>
<td>1000</td>
</tr>
<tr>
<td>10 pF</td>
<td>1000</td>
</tr>
<tr>
<td>33 pF</td>
<td>100</td>
</tr>
<tr>
<td>68 pF</td>
<td>1000</td>
</tr>
<tr>
<td>100 pF</td>
<td>1000</td>
</tr>
</tbody>
</table>

**0505C Q vs Frequency**

<table>
<thead>
<tr>
<th>Capacitance (pF)</th>
<th>Frequency (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 pF</td>
<td>100</td>
</tr>
<tr>
<td>180 pF</td>
<td>1000</td>
</tr>
<tr>
<td>330 pF</td>
<td>100</td>
</tr>
<tr>
<td>470 pF</td>
<td>1000</td>
</tr>
<tr>
<td>680 pF</td>
<td>1000</td>
</tr>
<tr>
<td>820 pF</td>
<td>1000</td>
</tr>
</tbody>
</table>

**Current Rating vs. Capacitance**

**0505C/P Current Rating vs Capacitance**

**0505C Current Rating vs Capacitance**

![Graph](image)

Note: If the thermal resistance of mounting surface is 40°C/W, then a power dissipation of 1.5 W will result in the current limited. We can calculate the current limited:

\[ I = \sqrt{\frac{P_{\text{max}}}{ESR}} \]

www.passiveplus.com +1 (631) 425-0938 sales@passiveplus.com
Capacitor Application Program

Passive Plus, Inc.’s brand new **online Capacitor Application Program** (C.A.P.) helps Engineers and Designers select capacitors according to parameters such as cap value and frequency. C.A.P. allows engineers to insert capacitors requirements (Cap value, Frequency), producing Scattering Matrices (S2P) Charts while providing options (Case Size, Terminations, Mounting), and parameters (ESR, Q, Impedance) along with Datasheets. Once engineers have determined their capacitor requirements, C.A.P. also includes online Requests For Quotes (RFQs) and/or sample requests.

Modelithics Vendor Program

PPI offers design engineers a Free 90-Day Trial license for the Modelithics PPI Component Library. This program provides engineers access to extremely accurate scalable simulation models for Passive Plus capacitors with advanced features that enable a more precise and rapid design process.

Microwave Global Models include every part value in a series and permit users to input substrate thickness, dielectric constant, and loss tangent, as well as mounting pad layout dimensions. Selected models also include capacitor orientation – vertical or horizontal – as an input. Engineers can request FREE use of the models, by either visiting the [Passive Plus Resources page](http://passiveplus.com/addldocs_resources.php).
**Recommended Land Pattern Dimensions**

When mounting the capacitor to substrate, it's important to carefully consider that the amount of solder (size of fillet) used has a direct effect upon the capacitor once it's mounted.

1) The greater the amount of solder, the greater the stress to the elements. This may cause the substrate to break or crack.

2) In the situation where two or more devices are mounted onto a common land, be sure to separate the device into exclusive pads by using soldering resist.

**Horizontal Mounting (mm)**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5-0.7</td>
<td>0.7-0.9</td>
<td>1.2-1.4</td>
</tr>
</tbody>
</table>

**Vertical Mounting* (mm)**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5-0.7</td>
<td>0.7-0.9</td>
<td>1.0-1.2</td>
</tr>
</tbody>
</table>

*Only available below 430pF

**Tape & Reel Specifications (mm)**

**Horizontal Orientation**

<table>
<thead>
<tr>
<th>Orientation</th>
<th>W</th>
<th>P0</th>
<th>P1</th>
<th>T</th>
<th>F</th>
<th>Qty Min</th>
<th>Qty/reel</th>
<th>Tape</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>8.00</td>
<td>4.00</td>
<td>4.00</td>
<td>0.22</td>
<td>3.50</td>
<td>500</td>
<td>3000</td>
<td>Plastic</td>
<td></td>
</tr>
<tr>
<td>Vertical</td>
<td>12.00</td>
<td>4.00</td>
<td>4.00</td>
<td>0.30</td>
<td>5.50</td>
<td>300</td>
<td>2000</td>
<td>Plastic</td>
<td></td>
</tr>
</tbody>
</table>

*A_0 B_0 K_0*

- Determined by component size. Typical clearance between the cavity and the component is:
  - .05 (.002) min to .50 (.020) max for 8mm tape and .50 (.002) min to .65 (.006) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.
Engineering Design Kits

PPI offers Design Kits for engineers who are building and testing prototypes. Each kit contains 16 values; 10 pieces per value.

Kits are offered in Magnetic or Non-Magnetic Terminations. Kits are 100% RoHS compliant.

<table>
<thead>
<tr>
<th>Kit Number</th>
<th>Value Range</th>
<th>Capacitance (pF)</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>DKD0505C01</td>
<td>0.1pF - 2.0pF</td>
<td>0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5, 1.6, 1.8, 2.0</td>
<td>±.1pF</td>
</tr>
<tr>
<td>DKD0505P01</td>
<td>1.0pF - 10pF</td>
<td>1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2</td>
<td>±1pF ±5%</td>
</tr>
<tr>
<td>DKD0505C06</td>
<td>10pF - 100pF</td>
<td>10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100</td>
<td>±5%</td>
</tr>
<tr>
<td>DKD0505P02</td>
<td>100pF - 1000pF</td>
<td>100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000</td>
<td>±5%</td>
</tr>
</tbody>
</table>