**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


*Marking shown for illustration purposes only. Actual marking may differ.*

## Part Numbering

**0505 C 100 J W 151 X TV***

- 0505: Case Size (0.055” x 0.055”)
- C: C =NP0, P = P90
- 100: Capacitor Code, 100=10x10⁰=10pF, 1R0=1.0pF
- J: Capacitance Tolerance *See Table*
- W: Termination Type *See Table*
- 151: Rated Voltage *See Table*
- X: Laser Marking
- TV*: Add TV for Vertical Orientation ***Contact PPI for availability***

## Capacitance Tolerance Codes

| Code | A | B | C | D | F | G | J | K |
|---|---|---|---|---|---|---|---|---|
| **Tol.** | ±0.05pF | ±0.1pF | ±0.25pF | ±0.5pF | ±1% | ±2% | ±5% | ±10% |

## Voltage Codes

| Voltage | Code | Voltage | Code |
|---|---|---|---|
| 50V | 500 | 200V | 201 |
| 100V | 101 | 250V | 251 |
| 150V | 151 | 300V | 301 |

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## 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.

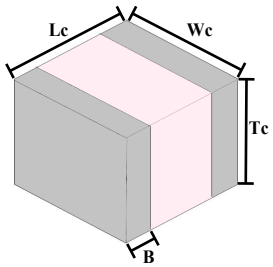
| Cap. pF | Cap Code | Tol. | Rated WVDC Std. | Rated WVDC Ext. | Cap. pF | Cap Code | Tol. | Rated WVDC Std. | Rated WVDC Ext. | Cap. pF | Cap Code | Tol. | Rated WVDC Std. | Rated WVDC Ext. | Cap. pF | Cap Code | Tol. | Rated WVDC Std. | Rated WVDC Ext. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.1** | 0R1 | A,B, C,D | 150V | 250V or 300V | **2.4** | 2R4 | A,B, C,D | 150V | 250V or 300V | **20** | 200 | F,G, J,K | 150V | 250V or 300V | **160** | 161* | F,G, J,K | 150V | 200V |
| **0.2** | 0R2 | | | | **2.7** | 2R7 | | | | **22** | 220 | | | | **180** | 181* | | | |
| **0.3** | 0R3 | | | | **3.0** | 3R0 | | | | **24** | 240 | | | | **200** | 201* | | | |
| **0.4** | 0R4 | | | | **3.3** | 3R3 | | | | **27** | 270 | | | | **220** | 221* | | | |
| **0.5** | 0R5 | | | | **3.6** | 3R6 | | | | **30** | 300 | | | | **240** | 241* | | | |
| **0.6** | 0R6 | | | | **3.9** | 3R9 | | | | **33** | 330 | | | | **270** | 271* | | | |
| **0.7** | 0R7 | | | | **4.3** | 4R3 | | | | **36** | 360 | | | | **300** | 301* | | | |
| **0.8** | 0R8 | | | | **4.7** | 4R7 | | | | **39** | 390 | | | | **330** | 331* | F,G, J,K | 150V | N/A |
| **0.9** | 0R9 | | | | **5.1** | 5R1 | | | | **43** | 430 | | | | **360** | 361* | | | |
| **1.0** | 1R0 | | | | **5.6** | 5R6 | | | | **47** | 470 | | | | **390** | 391* | | | |
| **1.1** | 1R1 | | | | **6.2** | 6R2 | | | | **51** | 510 | F,G, J,K | 150V | 200V | **430** | 431* | | | |
| **1.2** | 1R2 | | | | **6.8** | 6R8 | | | | **56** | 560 | | | | **470** | 471* | | | |
| **1.3** | 1R3 | | | | **7.5** | 7R5 | | | | **62** | 620 | | | | **510** | 511* | | | |
| **1.4** | 1R4 | | | | **8.2** | 8R2 | | | | **68** | 680 | | | | **560** | 561* | | | |
| **1.5** | 1R5 | | | | **9.1** | 9R1 | | | | **75** | 750 | | | | **620** | 621* | | | |
| **1.6** | 1R6 | | | | **10** | 100 | F,G, J,K | 150V | 250V or 300V | **82** | 820 | | | | **680** | 681* | F,G, J,K | 50V | 100V |
| **1.7** | 1R7 | | | | **11** | 110 | | | | **91** | 910 | | | | **750** | 751* | | | |
| **1.8** | 1R8 | | | | **12** | 120 | | | | **100** | 101 | | | | **820** | 821* | | | |
| **1.9** | 1R9 | | | | **13** | 130 | | | | **110** | 111* | | | | **910** | 911* | | | |
| **2.0** | 2R0 | | | | **15** | 150 | | | | **120** | 121* | | | | **1000** | 102* | | | |
| **2.1** | 2R1 | | | | **16** | 160 | | | | **130** | 131* | | | | | | | | |
| **2.2** | 2R2 | | | | **18** | 180 | | | | **150** | 151* | | | | | | | | |

*Available in NP0 only

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

# 0505C/P (0.055” x 0.055”)

## Termination Types and Codes




Chip Termination:
Codes: **W, L, P**

| Magnetic Terminations | |
|---|---|
| **Termination Code** | **Termination** |
| **W** (RoHS) | 100% Tin<br>Solder over Nickel Barrier |
| **L** | 90%Tin/10%Lead<br>Solder over Nickel Barrier |

| Non-Magnetic Terminations | |
|---|---|
| **Termination Code** | **Termination** |
| **P** (RoHS) | 100% Tin<br>Solder over Copper Barrier |

## Dimensions

Unit: inch (millimeter)

| Magnetic Termination | | | | | |
|---|---|---|---|---|---|
| **Code** | | **Length** | **Width** | **Thickness** | **Overlap** |
| | | Lc | Wc | Tc | B |
| W/L | Chip | 0.055 +0.015 -0.010 | 0.055 ± 0.010 | 0.057 max | 0.014 ± 0.006 |
| | | (1.40 +0.38 -0.25) | (1.40 ± 0.25) | (1.45 max) | (0.356 ± 0.152) |

| Non-Magnetic Termination | | | | | |
|---|---|---|---|---|---|
| **Code** | | **Length** | **Width** | **Thickness** | **Overlap** |
| | | Lc | Wc | Tc | B |
| P | Chip | 0.055 +0.015 -0.010 | 0.055 ± 0.010 | 0.057 max | 0.014 ± 0.006 |
| | | (1.40 +0.38 -0.25) | (1.40 ± 0.25) | (1.45 max) | (0.356 ± 0.152) |

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

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

# 0505C/P (0.055" x 0.055")

## Electrical Specifications

| | |
|---|---|
| Quality Factor (Q) | No less than 1000pF, Q value more than 10,000, Test Frequency 1MHz<br>More than 1000pF, Q value more than 10,000, Test Frequency 1kHz |
| Insulation Resistance (IR) | $10^5$ MegaOhms min. @ +25°C rated WVDC<br>$10^4$ MegaOhms min. @ +125°C rated WVDC |
| Rated Voltage | See Rated Voltage in Capacitance Table |
| Dielectric Withstanding Voltage (DWV) | 250% of Rated Voltage of 5 seconds |
| Operating Temperature Range | -55°C to 200°C |
| Temperature Coefficient (TC) | **C:** -55°C to 125°C 0±30ppm/°C;<br>>125°C to 200°C 0±60ppm/°C<br>**P:** -55°C to 200°C +90±20ppm/°C |
| Capacitance Drift | ±0.02% or ±0.02pF, whichever is greater |
| Piezoelectric Effects | None |
| Termination Type | See Termination Type Table |

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

## Environmental Specifications

| | Specification | Test Parameters |
|---|---|---|
| Thermal Shock | **DWV:** The initial Value<br>**IR:** Shall not be less than 30% of the initial value.<br>**Capacitance Change:**<br>No more than 0.5% or 0.5pF, whichever is greater. | MIL-STD-202, Method 107, Condition A.<br>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. |
| Moisture Resistance | | MIL-STD-202, Method 106 |
| Humidity (Steady State) | **DWV:** The initial Value<br>**IR:** The initial value.<br>**Capacitance Change:**<br>No more than 0.5% or 0.5pF, whichever is greater. | MIL-STD-202, Method 103, Condition A<br>With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum. |
| Life | **IR:** Shall not be less than 30% of the initial value.<br>**Capacitance Change:**<br>No more than 2.0% or 0.5pF, whichever is greater. | MIL-STD-202, Method 108. For 2000 hours, at 200°C.<br>Rated Voltage DC applies. |
| Terminal Strength | **Force:** 10lbs typical, 5lbs. Minimum.<br>**Duration Time:** 5 to 10 seconds | MIL-STD-202, Method 211A, Test Condition A.<br>Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations. |

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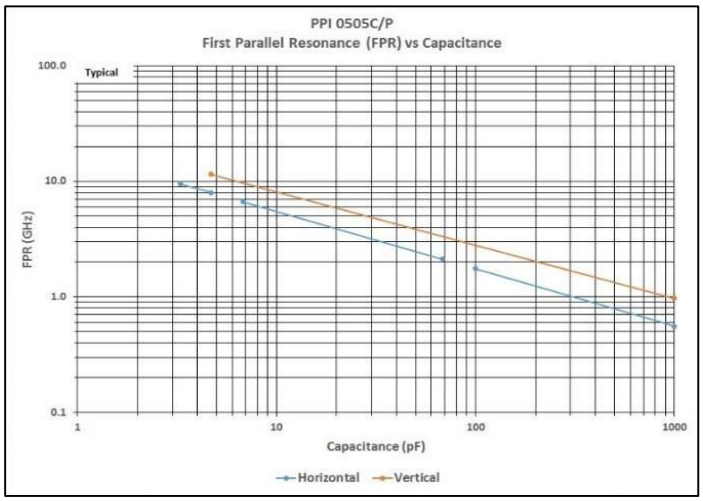
## FPR -- First Parallel Resonance (FPRs)

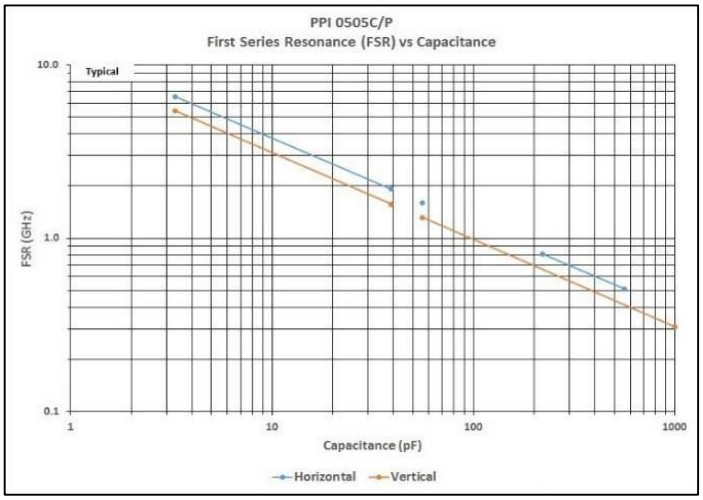



## Definitions and Measurement Conditions

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

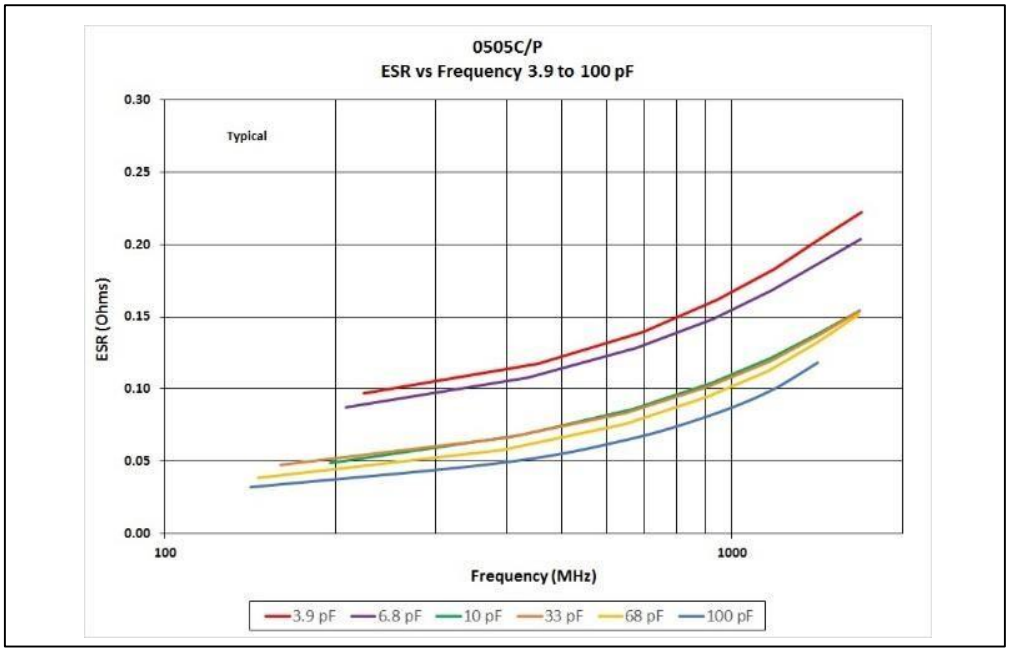
The **First Series Resonance, FSR,** is defined as the lowest frequency at which the imaginary part of the input impedance, Im[Zin], equals zero. Should Im[Zin] or the real part of the input impedance, Re[Zin], not be monotonic with frequency at frequencies lower than those at which Im[Zin] =0, the FSR 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.

## ESR vs. Frequency

0505C/P ESR vs Frequency



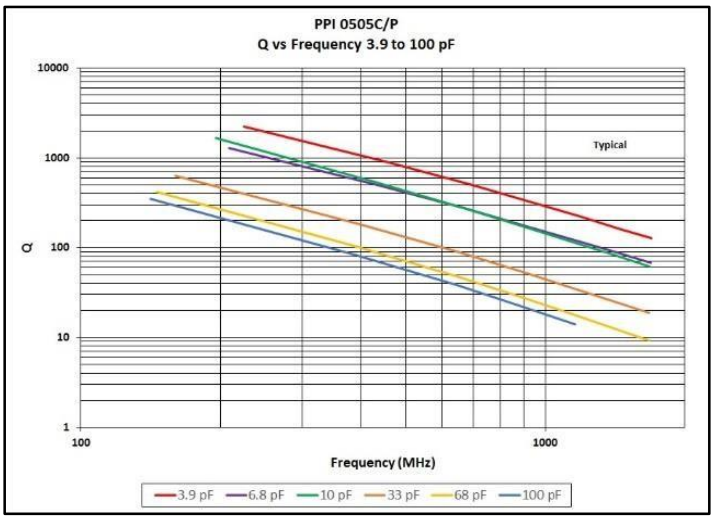

0505C ESR vs Frequency

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

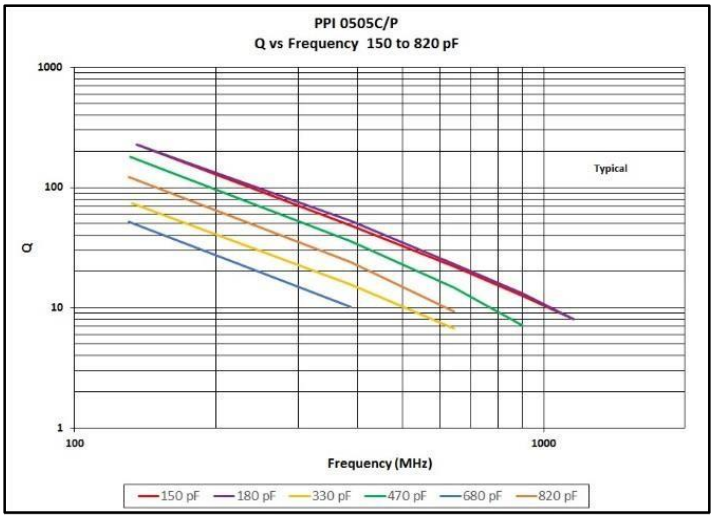
# 0505C/P (0.055” x 0.055”)

## Q vs. Frequency

0505C/P Q vs Frequency

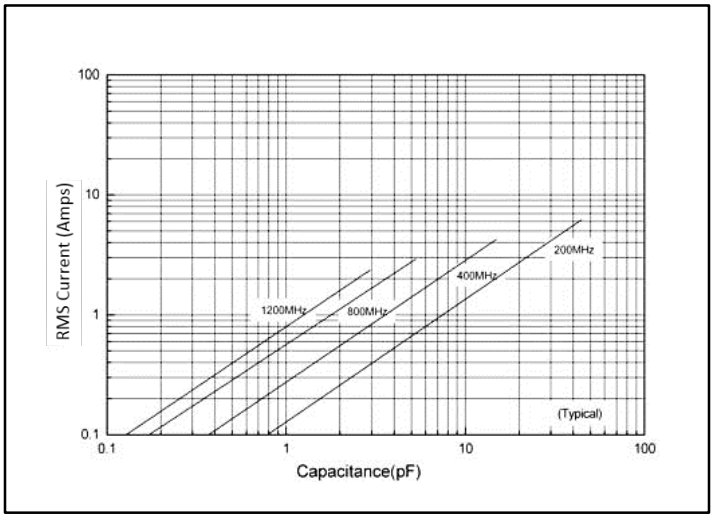



0505C Q vs Frequency

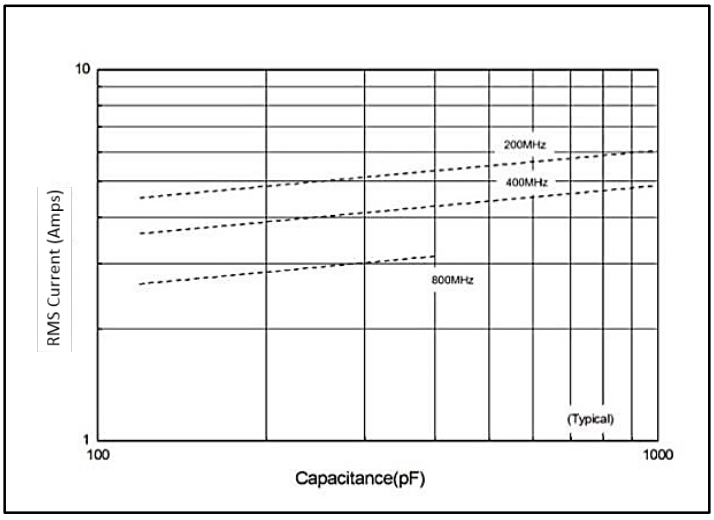



## Current Rating vs. Capacitance

0505C/P Current Rating vs Capacitance




0505C Current Rating vs Capacitance



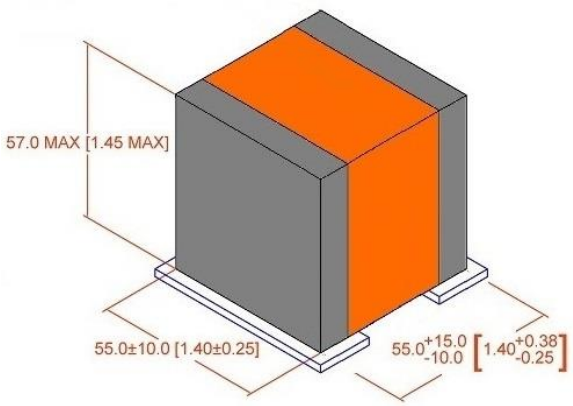

Current limits can depend on two different criteria. The first Voltage Limited Current ($I_{volt\ lim}$, represented by the solid line), the second is Power Dissipation Limited Current ($I_{pow\ diss}$).

$$I_{volt\ lim} = \frac{\sqrt{2}}{2} I_{peak} = \frac{\sqrt{2}}{2} \times \frac{V_{rated}}{X_C} = \sqrt{2}\pi FCV_{rated}$$

$I_{pow\ diss} = \sqrt{\frac{P_{dissipation}}{ESR}}$ (If the thermal resistance of the mounting surface is 40°C/W, then you will reach the power dissipated limit of 1.5W)

## Capacitor Application Program

PPI’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 visiting the https://www.modelithics.com/MVP/PPI.

## Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

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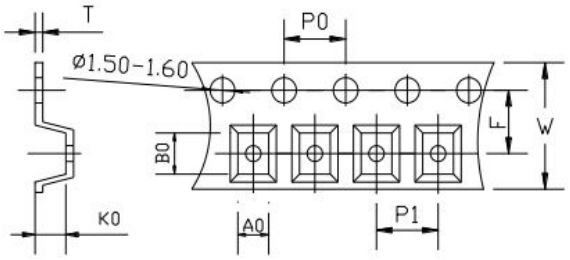
## Tape & Reel Specifications

| Orientation | Measurement Unit | W | P0 | P1 | T | F | Minimum Qty per Reel | Std Qty per Reel | Tape Material |
|---|---|---|---|---|---|---|---|---|---|
| H | in. | 0.315 | 0.157 | 0.157 | 0.009 | 0.138 | 500 | 3000 | Plastic |
| | mm | 8.00 | 4.00 | 4.00 | 0.22 | 3.50 | | | |
| V | in. | 0.472 | 0.157 | 0.157 | 0.012 | 0.217 | 500 | 2000 | |
| | mm | 12.00 | 4.00 | 4.00 | 0.30 | 5.50 | | | |




$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) 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.

| Kit Number MAGNETIC | Kit Number NON-MAGNETIC | Value Range | Values |
|---|---|---|---|
| DKD0505C01<br>DKD0505P01 | DKD0505C05<br>DKD0505P05 | **0.1 - 2.0pF** | 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.2, 1.5, 1.6, 1.8, 2.0pF |
| DKD0505C02<br>DKD0505P02 | DKD0505C06<br>DKD0505P06 | **1 - 10pF** | 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, 10pF |
| DKD0505C03<br>DKD0505P03 | DKD0505C07<br>DKD0505P07 | **10 - 100pF** | 10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF |
| DKD0505C04 | DKD0505C08 | **100 - 1000pF** | 100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF |