# NP0 Dielectric Non-Magnetic Multilayer Ceramic Capacitors

## ◆ Product Features

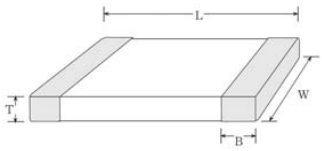
Non-Magnetism, Suitable for MRI

## ◆ Part Numbering

| C | 0603 | CG | 101 | J | 500 | P | T |
|---|---|---|---|---|---|---|---|
| ❶ Chip Capacitor | ❷ Dimensions | ❸ Temperature Coefficient | ❹ Rated Capacitance | ❺ Tolerance | ❻ Rated Voltage | ❼ Termination Type | ❽ Packing Type |

### ① Chip Capacitor

### ② Dimensions




| Type | Dimensions (Unit: mm) | | | | |
|---|---|---|---|---|---|
| | L | W | T（max） | B(min) | B(max) |
| 0603 | 1.6±0.1 | 0.8±0.1 | 0.8±0.1 | 0.20 | 0.50 |
| 0805 | 2.0±0.2 | 1.2±0.2 | 1.40 | 0.25 | 0.70 |
| 1206 | 3.2±0.2 | 1.6±0.2 | 1.40 | 0.25 | 0.76 |
| 1210 | 3.2±0.2 | 2.5±0.2 | 2.00 | 0.25 | 0.76 |

### ③ Temperature Coefficient

| Code(EIA) | Temperature Coefficients | Operating Temperature Range |
|---|---|---|
| CG (C0G) | 0±30ppm/℃ | -55℃~ +125℃ |

### ④ Rated Capacitance

| Code | Capacitance |
|---|---|
| 1R5 | 1.5pF |
| 101 | 100pF |

### ⑤ Tolerance

| Code | Tolerance | Capacitance Range |
|---|---|---|
| B | ±0.1pF | <10pF |
| C | ±025pF | |
| D | ±0.5pF | |
| F | ±1% | ≥10pF |
| G | ±2% | |
| J | ±5% | |

### ⑥ Rated Voltage

| Code | Rated Voltage (DC) | Code | Rated Voltage (DC) |
|---|---|---|---|
| 25 | 25V | 251 | 250V |
| 50 | 50V | 501 | 500V |
| 101 | 100V | 102 | 1000V |
| 201 | 200V | 202 | 2000V |

### ⑦ Termination Type

| Code | Termination Type |
|---|---|
| P | Non-magnetic Copper Plated 100% Sn (RoHS) |

### ⑧ Packing Type

| Code | Packing Type |
|---|---|
| T | Tape carrier packing |

## ◆ Rated Capacitance Range Table (Unit:pF)

| | Size | 0603 | | | | | 0805 | | | | 1206 | | | | | | | 1210 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cap.pF | code | 25V | 50V | 100V | 200V | 250V | 50V | 100V | 200V | 250V | 50V | 100V | 200V | 250V | 500V | 1000V | 2000V | 50V | 100V | 200V | 250V | 500V | 1000V | 2000V |
| 10 | 100 | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | 150 | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | 220 | | | | | | | | | | | | | | | | | | | | | | | |
| 33 | 330 | | | | | | | | | | | | | | | | | | | | | | | |
| 47 | 470 | | | | | | | | | | | | | | | | | | | | | | | |
| 68 | 680 | | | | | | | | | | | | | | | | | | | | | | | |
| 100 | 101 | | | | | | | | | | | | | | | | | | | | | | | |
| 150 | 151 | | | | | | | | | | | | | | | | | | | | | | | |
| 220 | 221 | | | | | | | | | | | | | | | | | | | | | | | |
| 330 | 331 | | | | | | | | | | | | | | | | | | | | | | | |
| 470 | 471 | | | | | | | | | | | | | | | | | | | | | | | |
| 680 | 681 | | | | | | | | | | | | | | | | | | | | | | | |
| 1000 | 102 | | | | | | | | | | | | | | | | | | | | | | | |
| 1500 | 152 | | | | | | | | | | | | | | | | | | | | | | | |
| 2200 | 222 | | | | | | | | | | | | | | | | | | | | | | | |
| 3300 | 332 | | | | | | | | | | | | | | | | | | | | | | | |
| 4700 | 472 | | | | | | | | | | | | | | | | | | | | | | | |
| 6800 | 682 | | | | | | | | | | | | | | | | | | | | | | | |
| 10000 | 103 | | | | | | | | | | | | | | | | | | | | | | | |
| 15000 | 153 | | | | | | | | | | | | | | | | | | | | | | | |

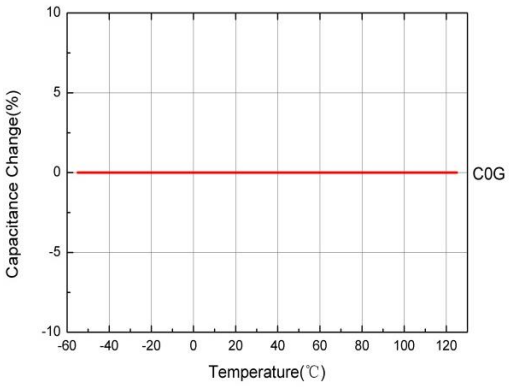
Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

## ◆ Tape & Reel Specifications

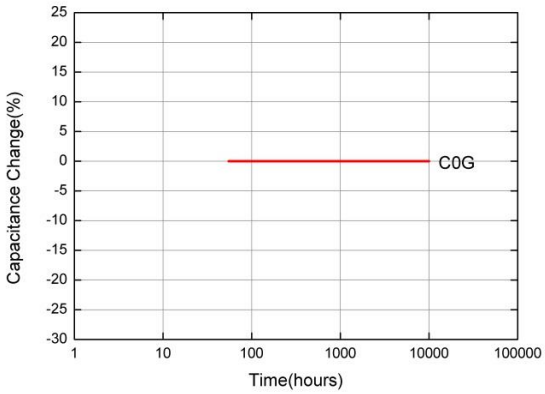
| Orientation | EIA | A0 | B0 | K0 | W | P0 | P1 | T | F | MIN /REEL | QTY/ REEL | TAPE MATERIAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Horizontal | 0603 | 1.05 | 1.80 | 0.90 | 8.00 | 4.00 | 4.00 | 0.90 | 3.50 | 1000 | 4000 | Paper |
| Horizontal | 0805 | 1.40 | 2.20 | 1.20 | 8.00 | 4.00 | 4.00 | 0.22 | 3.50 | 1000 | 3000 | Plastic |
| Horizontal | 1206 | 1.91 | 3.51 | 1.30 | 8.00 | 4.00 | 4.00 | 0.25 | 3.50 | 1000 | 3000 | Plastic |
| Horizontal | 1210 | 2.85 | 3.50 | 1.95 | 8.00 | 4.00 | 4.00 | 0.25 | 3.50 | 1000 | 3000 | Plastic |

## ◆ Characteristics Curve

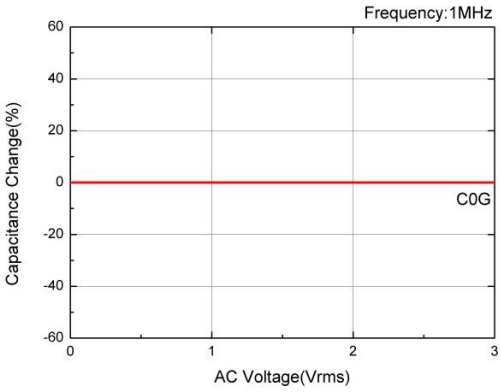
Capacitance vs Temperature



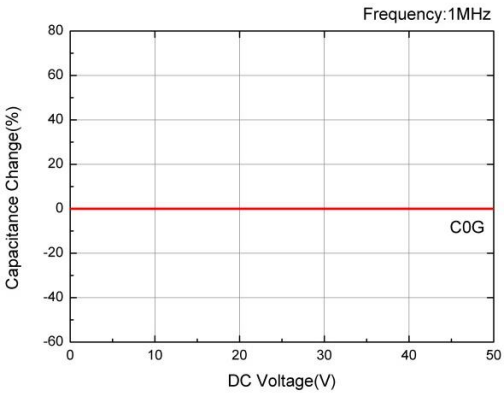

Capacitance Change vs Aging



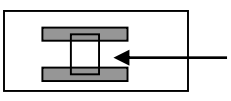

Capacitance Change vs AC Voltage



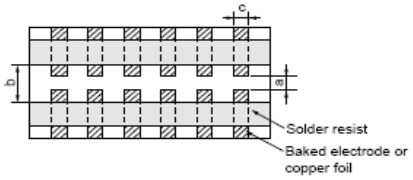
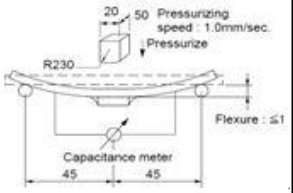
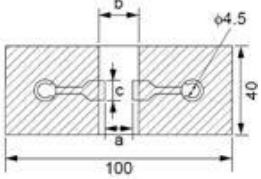

Capacitance Change vs DC Voltage



## ◆ Specifications and Test Methods

<table>
<tr><th>NO.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>1</td><td>Operating Temperature Range</td><td>-55 ℃ ~ +125 ℃</td><td></td></tr>
<tr><td>2</td><td>Rated Voltage</td><td>See pages 68</td><td>The rated voltage means the maximum direct voltage or peak value of pulse voltage which may be applied continuously to a capacitor</td></tr>
<tr><td>3</td><td>Appearance</td><td>No defects or abnormality</td><td>Visual inspection</td></tr>
<tr><td>4</td><td>Dimensions</td><td>See the previous pages</td><td>Callipers inspection</td></tr>
<tr><td>5</td><td>Dielectric Strength</td><td>No defects or abnormality</td><td>2.5 RV for 5 seconds, RV ≦500VDC;<br>1.5 RV for 5 seconds, 500VDC < RV ≦1250V DC;<br>1.2 RV for 5 seconds, RV >1250VDC;<br>RV-Rated Voltage,</td></tr>
<tr><td>6</td><td>Insulation Resistance</td><td>More than 10GΩ</td><td>The insulation resistance shall be measured with the rated voltage at 25° C, 75%oRH and within 1 minute of charging.</td></tr>
<tr><td>7</td><td>Capacitance</td><td>Within the specified tolerance</td><td rowspan="2">The capacitance/Q shall be measured at 25 ℃ with the frequency and voltage shown in the table.<br><table><tr><th>Frequency</th><th>Voltage</th></tr><tr><td>1±0.1MHz</td><td>1±0.2Vrms</td></tr></table></td></tr>
<tr><td>8</td><td>Q</td><td>Q is not less than 1000</td></tr>
<tr><td>9</td><td>Temperature Coefficient</td><td>0±30ppm/℃<br>Capacitance drift:<br>Within 0.3% or 0.05pF<br>(whichever is greater)</td><td>The temperature cycling sequential is from the step 1 through 5. The temperature coefficient shall be within the specified tolerance for the temperature coefficient. The temperature coefficient equals [(Ci-C3)/C3]/(Ti-T3). The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the Step 1, 3 and 5 by the capacitance value in Step 3.<br><table><tr><th>Step</th><th>Temperature</th></tr><tr><td>1</td><td>25±2 ℃</td></tr><tr><td>2</td><td>55±3 ℃</td></tr><tr><td>3</td><td>25±2 ℃</td></tr><tr><td>4</td><td>125±3 ℃</td></tr><tr><td>5</td><td>25±2 ℃</td></tr></table></td></tr>
<tr><td>10</td><td>Adhesive strength of termination</td><td>No removal of the terminations or other defect shall occur</td><td>Solder a capacitor to test jig (glass epoxy board) shown in fig below using a eutectic solder, then apply 10N force in the direction of the arrow.<br>The soldering should be done either by hand iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.<br>  <br>10Newton<br>Glass Epoxy Resin Board</td></tr>
</table>

## ◆ Specifications and Test Methods

| NO. | Item | | Specification | Test Method |
|---|---|---|---|---|
| 11 | Vibration Resistance | Appearance | No defect or abnormality | Solder the capacitor to test jig (glass epoxy board) shown in fig below. Soldering should be done either by hand iron of using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5 mm. The frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total 6 hours).   |
| | | Capacitance | Within the specified tolerance | |
| | | Q | Q≥1000 | |
| 12 | Deflection | | No cracking or marking defects shall occur, Δ C/C<5%   | Solder the capacitor to the glass epoxy boards shown in below fig. Then apply a force in the direction and measured the capacitance.   |
| 13 | Solderability of Termination | | More than 75% of the terminations is to be soldered evenly and continuously. | Immerse the capacitor first in an ethanol solution of rosin. Preheat at 80 ℃ to 120 ℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 250±5 ℃. |
| 14 | Resistance to Soldering Heat | Appearance | No marking defects | Preheat capacitor at 120 ℃ to 200 ℃ for 1 minute. Then immerse the capacitor in a eutectic solder at 260 ℃ to 265 ℃ for 10±1 second, the immersed depth is 10mm. Set it for 24±2 hours at room. |
| | | Capacitance Range | Less than ±2.5% or ±0.25pF (Whichever is larger) | |
| | | Q | Q≥1000 | |
| | | Insulation Resistance | More than 10GΩ | |

| Size | a | b | C |
|---|---|---|---|
| 0603 | 1.0 | 3.0 | 1.2 |
| 0805 | 1.2 | 4.0 | 1.65 |
| 1206 | 2.2 | 5.0 | 2.0 |

## ◆ Specifications and Test Methods

<table>
<tr><th>NO.</th><th colspan="2">Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td rowspan="4">15</td><td rowspan="4">Temperature Cycle</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11).<br>Perform the five cycles according to the four heat treatments listed in the following table.<br>Set it for 24±2 hours at room temperature.<br><table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(minutes)</th></tr><tr><td>1</td><td>Min.operating temp. -3 to 0</td><td>30±3</td></tr><tr><td>2</td><td>Room temperature</td><td>2to3</td></tr><tr><td>3</td><td>Max.operating temp. -3 to 0</td><td>30±3</td></tr><tr><td>4</td><td>Room temperature</td><td>2to3</td></tr></table></td></tr>
<tr><td>Capacitance Range</td><td>Less than ±2.5% or ±0.25pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 10GΩ</td></tr>
<tr><td rowspan="4">16</td><td rowspan="4">Humidity Steady State</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Set the capacitor at 40±2 ℃ and 90% to 95% humidity for 500 ±12 hours.<br>Remove and let sit for 24 ±2 hours at room temperature, then measure.</td></tr>
<tr><td>Capacitance Range</td><td>Less than ±5% or ±0.5pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 1GΩ</td></tr>
<tr><td rowspan="4">17</td><td rowspan="4">Humidity Load</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Apply the rated voltage(500Vmax) at 40±2 ℃ and 90% to 95% humidity for 500±12 hours.<br>Remove and let sit for 24±2 hours at room temperature, then measure.<br>The charge/discharge current is less than 50mA.</td></tr>
<tr><td>Capacitance Range</td><td>Less than ±7.5% or ±0.75pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 1GΩ</td></tr>
<tr><td rowspan="4">18</td><td rowspan="4">High Temperature Load</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Apply a voltage for 1000±12 hours at 125±3 ℃, and set it for 24±2 hours at room temperature, then easure.<br>The charge/discharge current is less than 50mA.<br>Apply voltage:<br>＜500V, apply 200% rated voltage;<br>500V, apply 150% rated voltage;<br>＞500V, apply 120% rated voltage;</td></tr>
<tr><td>Capacitance Range</td><td>Less than ±3% or ±0.3pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 1GΩ</td></tr>
</table>