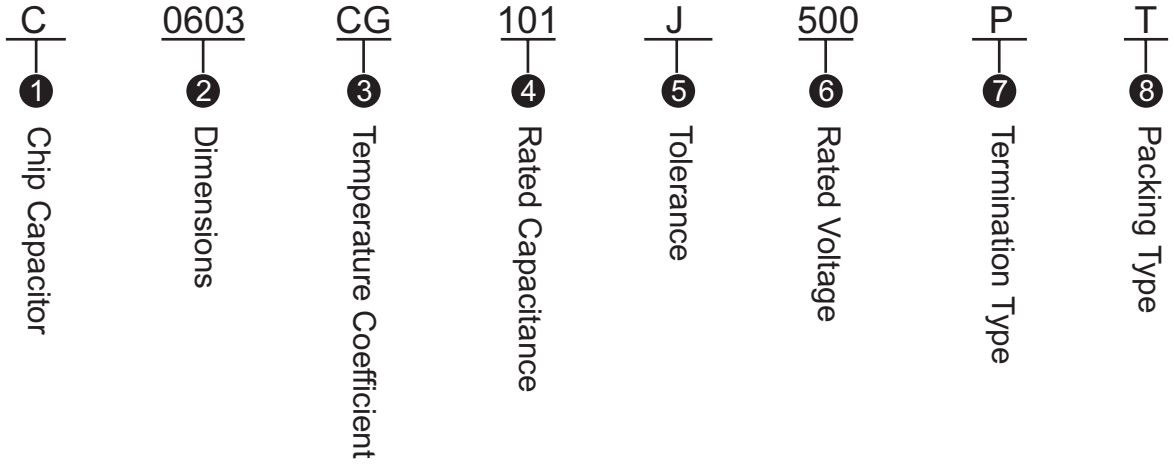
# General Purpose Non-Magnetic Multilayer Ceramic Capacitors

## ◆Product Features

Non-Magnetic, Suitable for MRI

## ◆Part Numbering




①**C:** General Purpose Non-Magnetic Multilayer Ceramic Capacitors

## ②Dimensions

| Series | L | W | T | B(Min) | B(Max) |
|---|---|---|---|---|---|
| 0603 | 1.60±0.10 | 0.80±0.10 | 0.80±0.10 | 0.20 | 0.50 |
| 0805 | 2.00±.020 | 1.20±.020 | 1.40 | 0.25 | 0.60 |
| 1206 | 3.20±.020 | 1.60±.020 | 1.40 | 0.25 | 0.60 |
| 1210 | 3.20±.020 | 2.50±.020 | 2.00 | 0.25 | 0.70 |

## ③Temperature Coefficient

CG: 0±30ppm/℃
X: ±15%

## ④Rated Capacitance

Capacitance is less than 10pF; for example: 1R0=1.0pF, R denote decimal point.

Capacitance greater than 10pF; for example: 101=100pF, the third number is the power of 10.

## ⑤Tolerance

| Code | B | C | D | G | J | K |
|---|---|---|---|---|---|---|
| Tolerance | ±0.1pF | ±0.25pF | ±0.5pF | ±2% | ±5% | ±10% |

## ⑥ Rated Voltage

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

## ⑦ Laser Marking

P: 100% Sn Solder over Copper Plating (RoHS Compliant)

## ⑧ Packaging Type

T: Tape carrier packing

| | A0 (mm) | B0 (mm) | K0 (mm) | W (mm) | P0 (mm) | P1 (mm) | T (mm) | F (mm) | Qty/min | Qty/reel | Tape Material |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0603 | 1.05 | 1.80 | 0.90 | 8.00 | 4.00 | 4.00 | 0.90 | 3.50 | 1000 | 4000 | Paper |
| 0805 | 1.40 | 2.20 | 1.20 | 8.00 | 4.00 | 4.00 | 0.22 | 3.50 | 1000 | 3000 | Plastic |
| 1206 | 1.91 | 3.51 | 1.30 | 8.00 | 4.00 | 4.00 | 0.25 | 3.50 | 1000 | 3000 | Plastic |
| 1210 | 2.85 | 3.50 | 1.95 | 8.00 | 4.00 | 4.00 | 0.25 | 3.50 | 1000 | 3000 | Plastic |

## ◆Capacitance & Rated Voltage Table

unit: V

| CG | 0603 | | | | | 0805 | | | | 1206 | | | | | 1210 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code. | 25 | 50 | 100 | 200 | 250 | 50 | 100 | 200 | 250 | 50 | 100 | 200 | 250 | 500 | 50 | 100 | 200 | 250 | 500 | 1000 |
| 1R0 | | | | | | | | | | | | | | | | | | | | |
| 1R2 | | | | | | | | | | | | | | | | | | | | |
| 1R5 | | | | | | | | | | | | | | | | | | | | |
| 1R8 | | | | | | | | | | | | | | | | | | | | |
| 2R2 | | | | | | | | | | | | | | | | | | | | |
| 2R7 | | | | | | | | | | | | | | | | | | | | |
| 3R3 | | | | | | | | | | | | | | | | | | | | |
| 3R9 | | | | | | | | | | | | | | | | | | | | |
| 4R7 | | | | | | | | | | | | | | | | | | | | |
| 5R6 | | | | | | | | | | | | | | | | | | | | |
| 6R8 | | | | | | | | | | | | | | | | | | | | |
| 8R2 | | | | | | | | | | | | | | | | | | | | |
| 100 | | | | | | | | | | | | | | | | | | | | |
| 120 | | | | | | | | | | | | | | | | | | | | |
| 150 | | | | | | | | | | | | | | | | | | | | |
| 180 | | | | | | | | | | | | | | | | | | | | |
| 220 | | | | | | | | | | | | | | | | | | | | |
| 270 | | | | | | | | | | | | | | | | | | | | |
| 330 | | | | | | | | | | | | | | | | | | | | |
| 390 | | | | | | | | | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | | | | | | | | | |
| 560 | | | | | | | | | | | | | | | | | | | | |
| 680 | | | | | | | | | | | | | | | | | | | | |
| 820 | | | | | | | | | | | | | | | | | | | | |
| 101 | | | | | | | | | | | | | | | | | | | | |
| 121 | | | | | | | | | | | | | | | | | | | | |
| 151 | | | | | | | | | | | | | | | | | | | | |
| 181 | | | | | | | | | | | | | | | | | | | | |
| 221 | | | | | | | | | | | | | | | | | | | | |
| 271 | | | | | | | | | | | | | | | | | | | | |
| 331 | | | | | | | | | | | | | | | | | | | | |
| 391 | | | | | | | | | | | | | | | | | | | | |
| 471 | | | | | | | | | | | | | | | | | | | | |
| 561 | | | | | | | | | | | | | | | | | | | | |
| 681 | | | | | | | | | | | | | | | | | | | | |
| 821 | | | | | | | | | | | | | | | | | | | | |
| 102 | | | | | | | | | | | | | | | | | | | | |
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## ◆Capacitance & Rated Voltage Table

unit: V

| X7R | 0603 | | | | | 0805 | | | | 1206 | | | | | 1210 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code. | 25 | 50 | 100 | 200 | 250 | 50 | 100 | 200 | 250 | 50 | 100 | 200 | 250 | 500 | 50 | 100 | 200 | 250 | 500 | 1000 |
| 331 | | | | | | | | | | | | | | | | | | | | |
| 471 | | | | | | | | | | | | | | | | | | | | |
| 681 | | | | | | | | | | | | | | | | | | | | |
| 821 | | | | | | | | | | | | | | | | | | | | |
| 102 | | | | | | | | | | | | | | | | | | | | |
| 152 | | | | | | | | | | | | | | | | | | | | |
| 222 | | | | | | | | | | | | | | | | | | | | |
| 332 | | | | | | | | | | | | | | | | | | | | |
| 472 | | | | | | | | | | | | | | | | | | | | |
| 682 | | | | | | | | | | | | | | | | | | | | |
| 103 | | | | | | | | | | | | | | | | | | | | |
| 153 | | | | | | | | | | | | | | | | | | | | |
| 223 | | | | | | | | | | | | | | | | | | | | |
| 333 | | | | | | | | | | | | | | | | | | | | |
| 473 | | | | | | | | | | | | | | | | | | | | |
| 683 | | | | | | | | | | | | | | | | | | | | |
| 104 | | | | | | | | | | | | | | | | | | | | |
| 154 | | | | | | | | | | | | | | | | | | | | |
| 224 | | | | | | | | | | | | | | | | | | | | |
| 334 | | | | | | | | | | | | | | | | | | | | |
| 474 | | | | | | | | | | | | | | | | | | | | |
| 684 | | | | | | | | | | | | | | | | | | | | |
| 105 | | | | | | | | | | | | | | | | | | | | |
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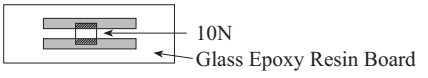
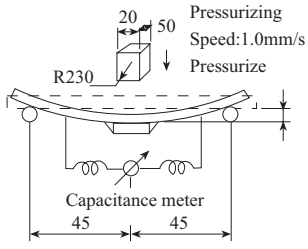
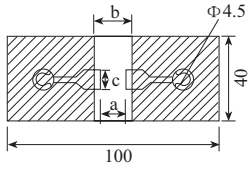
## ◆Specifications and Test Methods

<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>Appearance</td><td>No defects or abnormality</td><td>Visual inspection</td></tr>
<tr><td>3</td><td>Dimensions</td><td>See the previous pages</td><td>Callipers inspection</td></tr>
<tr><td>4</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>5</td><td>Insulation Resistance</td><td>More than 10GΩ or 100MΩ・μF, Whichever is less.</td><td>The insulation resistance shall be measured with the rated voltage at 25℃, 75%RH and within 1 minute of charging.</td></tr>
<tr><td>6</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.
<table>
<tr><th></th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>NP0</td><td>1±0.1MHz</td><td>1±0.2Vrms</td></tr>
<tr><td>X7R</td><td>1±0.1KHz</td><td>1±0.2Vrms</td></tr>
</table></td></tr>
<tr><td>7</td><td>Dissipation Factor /Q</td><td>NP0:<br>Cap⩾30pF, Q⩾1000;<br>Cap＜30pF, Q⩾400+20C<br>X7R:<br>D.F⩽ 5%</td></tr>
<tr><td>8</td><td>Temperature Coefficient</td><td>NP0: 0±30ppm/℃<br>X7R: ±15%</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.
<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>9</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> 
</td></tr>
</table>

## ◆Specifications and Test Methods

| No. | Item | | Specification | Test Method |
|---|---|---|---|---|
| 10 | Deflection | | No cracking or marking defects shall occur, △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.   t :1.6mm |
| 11 | 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℃. |
| 12 | 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 | NP0:<br>Less than ±2.5% or ±0.25pF (Whichever is larger)<br>X7R:<br>Less than ±7.5% . | |
| | | D.F./Q | NP0:<br>Cap≥30pF, Q≥1000;<br>Cap<30pF, Q≥400+20C<br>X7R:<br>D.F≤ 5% | |
| | | Insulation Resistance | More than 10GΩ or 100MΩ · μF, Whichever is less. | |

| 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

| No. | Item | | Specification | Test Method |
|---|---|---|---|---|
| 13 | Temperature Cycle | Appearance | No marking defects. | Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11). Perform the five cycles according to the four heat treatments listed in the following table. Set it for 24±2 hours at room temperature. |
| | | Capacitance Range | NP0: Less than ±2.5% or ±0.25pF (Whichever is larger) X7R: Less than ±7.5% . | |
| | | D.F./Q | NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R: D.F≤ 5% | |
| | | Insulation Resistance | More than 10GΩ or 100MΩ · μF, Whichever is less. | |
| 14 | Humidity Steady State | Appearance | No marking defects. | Set the capacitor at 40±2℃ and 90% to 95% humidity for 500 ±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. |
| | | Capacitance Range | NP0: Less than ±5% or ±0.5pF (Whichever is larger) X7R: Less than ±12.5% . | |
| | | D.F./Q | NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R: D.F≤ 5% | |
| | | Insulation Resistance | More than 1GΩ or 10MΩ · μF, Whichever is less. | |
| 15 | High Temperature Load | Appearance | No marking defects. | Apply a voltage for 1000±12 hours at 125±3℃, and set it for 24±2 hours at room temperature, then easure. The charge/discharge current is less than 50mA. Apply voltage: <500V, apply 200% rated voltage; 500V, apply 150% rated voltage; >500V, apply 120% rated voltage; |
| | | Capacitance Range | NP0: Less than ±5% or ±0.5pF (Whichever is larger) X7R: Less than ±12.5% . | |
| | | D.F./Q | NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R: D.F≤ 5% | |
| | | Insulation Resistance | More than 1GΩ or 10MΩ · μF, Whichever is less. | |

| Step | Temperature(℃) | Time(minutes) |
|---|---|---|
| 1 | Min.operating temp. -3 to 0 | 30±3 |
| 2 | Room temperature | 2 to 3 |
| 3 | Max.operating temp. -3 to 0 | 30±3 |
| 4 | Room temperature | 2 to 3 |