# Multilayer Ceramic Chip Capacitors

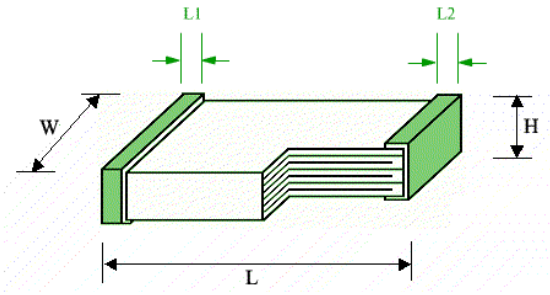
## Multilayer Ceramic Chip Capacitors

Middle & high voltage MLCC is a kind of special design 、special technology MLCC that bases on the technology of general MLCC. This kind of MLCC has stable high voltage reliability and suitable to SMT. Middle & high MLCC is widely applicable for many direct high voltage circuits in which it can improve the performance of the circuit.

## Features

- Series size from 0603～2225
- Working Voltage from 100V～5000V
- Surface mount suited for wave and reflow soldering
- Wide Operating temperature range from -55℃-125℃
- Good Temperature Coefficient
- High reliability

## Dimension




## How To Order

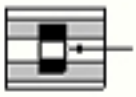
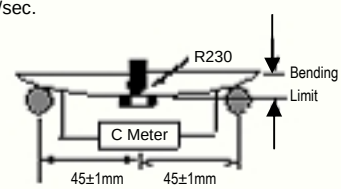
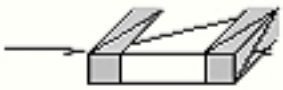
| HC | 1206 | X7R | 105 | K | 500 | P |
|---|---|---|---|---|---|---|
| Product Code<br><br>HV=High Voltage Capacitance<br>HA=Safety Capacitors<br>HC=High Capacitance | Size<br>Ex.:<br>0603<br>0805<br>1206<br>1210<br>1808<br>1812<br>2220<br>2225 | Dielectric<br>Ex.:<br>C0G=NP0<br>X7R<br>X5R<br>Y5V<br>Z5U | Capacitance<br>Unit : pF<br>Ex.:<br>0R5=0.5pF<br>2R5=2.5pF<br>105=10×10$^5$ | Tolerance<br>Ex.:<br>A=±0.1pF<br>B=±0.2pF<br>C=±0.25pF<br>D=±0.5pF<br>F=±1%<br>G=±2%<br>J=±5%<br>K=±10%<br>M=±20%<br>Z=+80%/-20% | Rated Voltage<br>Ex.:<br>6R3=6.6V<br>500=50V<br>102=1000V<br>202=2000V<br>502=5000V | Termination<br>P:Ag/Ni/Sn<br>S:Ag/Pd/Pt |

## Capacitance Range

| Size Inch(mm) | Rated Voltage | Capacitance Range | | | |
|---|---|---|---|---|---|
| | | C0G(nF) | X5R(nF) | X7R(nF) | Y5V(nF) |
| 0402 (1005) | 6.3V | | 1,000～2,200(225) | 1,000(105) | 1,000(105) |
| | 10V | | 1,000(105) | 100(104) | 1,000(105) |
| | 16V | | 1,000(105) | 100(104) | |
| 0603 (1608) | 6.3V | 1～22(223) | 1,000～10,000(106) | 1,000～2,200(225) | 1,000～4,700(475) |
| | 10V | 1～10(103) | 1,000～4,700(475) | 1,000～2,200(225) | 1,000～4,700(475) |
| | 16V | 1～3.3(332) | 1,000～2,200(225) | 1,000(105) | 1,000～2,200(225) |
| | 25V | 1～3.3(332) | 1,000(105) | | 1,000(105) |
| 0805 (2012) | 6.3V | | 1,000～47,000(476) | 1,000～10,000(106) | 1,000～22,000(226) |
| | 10V | 1～100(104) | 1,000～22,000(226) | 1,000～10,000(106) | 1,000～10,000(106) |
| | 16V | 1～33(333) | 1,000～10,000(106) | 1,000～4,700(475) | 1,000～10,000(106) |
| | 25V | 1～22(223) | 1,000～4,700(475) | 1,000(105) | 1,000～4,700(475) |
| | 50V | 1～10(103) | 1,000(105) | 1,000(105) | 1,000～2,200(225) |
| 1206 (3216) | 6.3V | | 1,000～10,000(107) | | 1,000～100,000(107) |
| | 10V | | 1,000～47,000(476) | 1,000～22,000(226) | 1,000～47,000(476) |
| | 16V | 10～100(104) | 1,000～22,000(226) | 1,000～10,000(106) | 1,000～22,000(226) |
| | 25V | 10～47(473) | 1,000～10,000(106) | 1,000～10,000(106) | 1,000～10,000(106) |
| | 35V | | 1,000～4,700(475) | 1,000～4,700(475) | 1,000～10,000(106) |
| | 50V | 1～33(333) | 1,000～4,700(475) | 1,000～4,700(475) | 1,000～10,000(106) |
| 1210 (3225) | 6.3V | | 1,000～100,000(107) | | 1,000～100,000(107) |
| | 10V | | 1,000～47,000(476) | 1,000～47,000(476) | 1,000～47,000(476) |
| | 16V | | 1,000～47,000(476) | 1,000～22,000(226) | 1,000～47,000(476) |
| | 25V | 10～100(104) | 1,000～22,000(226) | 1,000～10,000(106) | 1,000～22,000(226) |
| | 35V | | 1000～10,000(106) | 1,000～10,000(106) | 1,000～10,000(106) |
| | 50V | 10～47(473) | 1,000～10,000(106) | 1,000～10,000(106) | 1,000～10,000(106) |
| 1812 (4532) | 6.3V | | 1,000～100,000(107) | | 1,000～100,000(107) |
| | 10V | | 1,000～100,000(107) | 1,000～47,000(476) | 1,000～100,000(107) |
| | 16V | 10～220(224) | 1,000～47,000(476) | 1,000～47,000(476) | 1,000～47,000(476) |
| | 25V | 10～120(124) | 1,000～22,000(226) | 1,000～22,000(226) | 1,000～22,000(226) |
| | 50V | 10～100(104) | 1,000～10,000(106) | 1,000～10,000(106) | 1,000～10,000(106) |
| 2220 (5750) | 6.3V | | 1,000～100,000(107) | | |
| | 10V | | 1,000～100,000(107) | | |
| | 16V | | 1,000～47,000(476) | 1,000～47,000(476) | 1,000～100,000(107) |
| | 25V | | 1,000～22,000(226) | 1,000～22,000(226) | 1,000～47,000(476) |
| | 50V | | 1,000～10,000(106) | 1,000～10,000(106) | 1,000～22,000(226) |

※ We can design according to customer special requirements。

## HV Series Specification & Test Condition

| Item | Specification | Test Condition |
|---|---|---|
| **Operation Temperature** | -55 to +125℃ | |
| **Visual** | No abnormal exterior appearance | Visual Inspection |
| **Capacitance** | Within The Specified Tolerance | |
| **Quality Factor** | Class Ⅰ(NPO):<br>More Than 30pF : Q ≧1000<br>30pF & Below: Q≧400+20C (C:Cap., pF) | |
| **Dissipation Factor** | Class Ⅱ(X7R):<br>Maximum 0.025 | |
| **Insulation Resistance** | 10,000MΩ or 500/C Ω whichever is smaller.<br>(C in Farad) | V≦500V, Rated Voltage<br>V> 500V, Applied 500Vdc<br>Charge Time : 60sec.<br>Is applied less than 50mA current. |
| **Withstanding Voltage** | No dielectric breakdown or mechanical breakdown | 200V≦V＜500V : 200% Rated Voltage<br>500V≦V＜1000V: 150% Rated Voltage<br>1000≦V :120% Rated Voltage<br>for 1~5 sec. Current is limited to less than 50mA.<br>Withstanding voltage testing requires immersion of the element in a isolation fluid prevent arcing on the chip surface, at voltage over 1000Vdc. |
| **Temperature Capacitance Coefficient** | Char. / Temp. Range / Cap. Change<br>NPO(N) / -55℃~ +125℃ / ± 30ppm/℃<br>X7R (X) / -55℃~ +125℃ / ± 15% | ClassⅠ:<br>[C2-C1/C1(T2-T1)] × 100%<br>Class Ⅱ:<br>(C2-C1)/C1 × 100%<br>T1:Standard Temperature(25℃)<br>T2:Test Temperature<br>C1:Capacitance At Standard Temperature<br>C2:Capacitance At Test Temperature |
| **Adhesive Strength of Termination** | No indication of peeling shall occur on the terminal electrode. |  5N· f<br>A 5N· f(≈0.5Kg· f) pull force shall be applied for 10±1 sec. |
| **Resistance to Flexure of Substrate** | No mechanical damage or capacitance change more than the following table.<br>Char. / Capacitance Change<br>NPO(N) / ≦ ± 5.0% of initial value<br>X7R (X) / ≦ ± 12.5% of initial value | The board shall be bend 1.0mm with a rate of 1.0 mm/sec.<br>  |
| **Solderability** | More than 90% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve .<br>  | Solder Temperature : 245±5℃<br>Dip Time : 5 ± 0.5 sec.<br>Immersing Speed : 25±10% mm/s<br>Solder : H63A<br>Flux :Rosin<br>Preheat : At 80~120 ℃ For 10~30sec. |

## HV Series Specification & Test Condition

| Item | | Specification | Test Condition |
|---|---|---|---|
| **Resistance to Soldering Heat** | Appearance | No mechanical damage shall occur | Class Ⅱ capacitor shall be set for 48± 4 hours at room temperature after one hour heat treatment at 150 +0/-10℃ before initial measure.<br><br>Preheat : at 150±10°C for 60~120sec.<br>Dip : solder temperature of 260±5℃<br>Dip Time : 10 ± 1sec.<br>Immersing Speed : 25±10% mm/s<br>Solder : H63A<br>Flux : Rosin<br><br>Measure at room temperature after cooling for<br>Class Ⅰ: 24 ± 2 Hours<br>Class Ⅱ: 48 ± 4 Hours |
| | Capacitance | Class Ⅰ(NPO):<br>Within 2.5% or ±0.25pF whichever is larger of initial value<br>Class Ⅱ(X7R):<br>Within ±10% of initial value | |
| | Q / Tanδ | To satisfy the specified initial value | |
| | Insulation Resistance | To satisfy the specified initial value | |
| **Temperature Cycle** | Appearance | No mechanical damage shall occur | Class Ⅱ capacitor shall be set for 48±4 hours at room temperature after one hour heat treatment at 150 +0/-10 ℃ before initial measure.<br>Capacitor shall be subjected to five cycles of the temperature cycle as following:<br><br>Step / Temp.(℃) / Time(min)<br>1 / Min Rated Temp.+0/-3 (-55) / 30<br>2 / 25 / 3<br>3 / Max Rated Temp.+3/-0 (125) / 30<br>4 / 25 / 3<br><br>Measure at room temperature after cooling for<br>Class Ⅰ: 24 ± 2 Hours<br>Class Ⅱ: 48 ± 4 Hours |
| | Capacitance | Class Ⅰ(NPO):<br>Within 2.5% or ±0.25pF whichever is larger of initial value<br>Class Ⅱ(X7R):<br>Within ±7.5% of initial value | |
| | Q / Tanδ | To satisfy the specified initial value | |
| | Insulation Resistance | To satisfy the specified initial value | |
| **Humidity** | Appearance | No mechanical damage shall occur | Class Ⅱ capacitor shall be set for 48±4 hours at room temperature after one hour heat treatment at 150 +0/-10 ℃before initial measure.<br><br>Temperature : 40± 2 ℃<br>Relative Humidity : 90 ~95%RH<br>Test Time : 500 +12/-0 hr<br><br>Measure at room temperature after cooling for<br>Class Ⅰ: 24 ± 2 Hours<br>Class Ⅱ: 48 ± 4 Hours |
| | Capacitance | Class Ⅰ(NPO):<br>Within 5% or ±0.5pF whichever is larger of initial value<br>Class Ⅱ(X7R):<br>Within ±15% of initial value | |
| | Q / Tanδ | Class Ⅰ(NPO):<br>More Than 30pF : Q ≧350<br>30pF & Below: Q≧275＋2.5C<br>Class Ⅱ(X7R):<br>Maximum ±5.0% | |
| | Insulation Resistance | 1,000MΩ or 50/C Ω whichever is smaller. (C in Farad) | |

## HV Series Specification & Test Condition

<table>
<tr><th>Item</th><th colspan="2">Specification</th><th>Test Condition</th></tr>
<tr><td rowspan="4">High Temperature Load<br>(Life Test)</td><td>Appearance</td><td>No mechanica damage shall occur</td><td rowspan="4">Class Ⅱ capacitors applied DC voltage (following table) is applied for one hour at maximum operation temperature ±3℃ then shall be set for 48±4 hours at room temperature and the initial measurement shall be conducted.<br>Applied Voltage :<br><br><table><tr><th>Rated Voltage</th><th>Applied Voltage</th></tr><tr><td>≤250Vdc</td><td>150%Rated Voltage</td></tr><tr><td>>250Vdc < 1KVdc</td><td>120%Rated Voltage</td></tr><tr><td>≥1KVdc</td><td>100%Rated Voltage</td></tr></table><br>Temperature : max. operation temperature<br>Test Time : 1000 +12/-0Hr<br>Current Applied : 50 mA Max.<br>Measure at room temperature after cooling for<br>Class Ⅰ: 24 ± 2 Hours<br>Class Ⅱ: 48 ± 4 Hours</td></tr>
<tr><td>Capacitance</td><td>Class Ⅰ (NPO):<br>Within 3% or ±0.3pF whichever is larger of initial value<br>Class Ⅱ (X7R):<br>Within ±15% of initial value</td></tr>
<tr><td>Q / Tanδ</td><td>Class Ⅰ (NPO):<br>More Than 30pF : Q ≥350<br>30pF & Below: Q≥275＋2.5C<br>Class Ⅱ (X7R):<br>Maximum ±5%</td></tr>
<tr><td>Insulation Resistance</td><td>1,000MΩ or 50/C Ω whichever is smaller. (C in Farad)</td></tr>
<tr><td>Vibration</td><td>Appearance</td><td>No mechanical damage shall occur</td><td>Solder the capacitor on P.C. board.<br>Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1 min.<br>Repeat this for 2 hours each in 3 perpendicular directions.</td></tr>
<tr><td></td><td>Capacitance</td><td>Within the specified tolerance</td><td></td></tr>
<tr><td></td><td>Q / Tanδ</td><td>To satisfy the specified initial value</td><td></td></tr>
</table>