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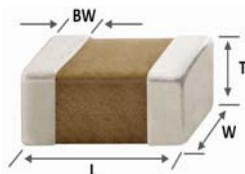
# Specification of Automotive MLCC (Reference sheet)

- Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor

- Samsung P/N : **CL05C120JB51PNC**
- Description : **CAP, 12pF, 50V, ± 5%, C0G, 0402**
- AEC-Q200 Qualified

## A. Dimension

### ● Dimension



| Size | 0402 inch    |
|------|--------------|
| L    | 1.00±0.05 mm |
| W    | 0.50±0.05 mm |
| T    | 0.50±0.05 mm |
| BW   | 0.25±0.10 mm |

## B. Samsung Part Number

**CL**   **05**   **C**   **120**   **J**   **B**   **5**   **1**   **P**   **N**   **C**  
 ①   ②   ③   ④   ⑤   ⑥   ⑦   ⑧   ⑨   ⑩   ⑪

|                         |                                       |                   |                         |
|-------------------------|---------------------------------------|-------------------|-------------------------|
| ① Series                | Samsung Multi-layer Ceramic Capacitor |                   |                         |
| ② Size                  | 0402 (inch code)                      | L: 1.00±0.05 mm   | W: 0.50±0.05 mm         |
| ③ Dielectric            | C0G                                   | ⑧ Inner electrode | Ni                      |
| ④ Capacitance           | 12 pF                                 | Termination       | Cu                      |
| ⑤ Capacitance tolerance | ± 5%                                  | Plating           | Sn 100% (Pb Free)       |
| ⑥ Rated Voltage         | 50 V                                  | ⑨ Product         | Automotive              |
| ⑦ Thickness             | 0.50±0.05 mm                          | ⑩ Special code    | Normal                  |
|                         |                                       | ⑪ Packaging       | Cardboard Type, 7" Reel |

## C. Reliability Test and Judgement condition

|  | Performance  | Test condition  |
|--|--|---|
| <b>High Temperature Exposure</b>       | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within ±2.5% or 0.25pF whichever is larger<br>Q : 640 min.<br>IR : More than 10,000 MΩ or 500 MΩ×μF<br>Whichever is smaller | Unpowered, 1,000hrs @ Max. temperature<br>Measurement at 24±2hrs after test conclusion  |
| <b>Temperature Cycling</b>             | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within ±2.5% or 0.25pF whichever is larger<br>Q : 640 min.<br>IR : More than 10,000 MΩ or 500 MΩ×μF<br>Whichever is smaller | 1,000Cycles<br>Measurement at 24±2hrs after test conclusion<br><br>1 cycle condition : -55+0/-3℃(30±3min) → Room Temp. (1min)<br>→ 125+3/-0℃(30±3min) → Room Temp. (1min) |
| <b>Destructive Physical Analysis</b>   | No Defects or abnormalities  | Per EIA 469   |
| <b>Humidity Bias</b>                   | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within ±2.5% or 0.25pF whichever is larger<br>Q : 139.96 min.<br>IR : More than 500 MΩ or 25 MΩ×μF<br>Whichever is smaller  | 1,000hrs 85℃/85%RH, Rated Voltage and 1.3~1.5V,<br>Add 100kohm resistor<br><br>The charge/discharge current is less than 50mA.  |
| <b>High Temperature Operating Life</b> | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within ±3% or 0.3pF whichever is larger<br>Q : 305 min.<br>IR : More than 1,000 MΩ or 50 MΩ×μF<br>Whichever is smaller      | 1,000hrs @ 125℃, 200% Rated Voltage,<br>Measurement at 24±2hrs after test conclusion<br>The charge/discharge current is less than 50mA.                                   |

|                                    | Performance   | Test condition   |            |          |      |          |        |       |           |          |
|------------------------------------|---|--|------------|----------|------|----------|--------|-------|-----------|----------|
| <b>External Visual</b>             | No abnormal exterior appearance   | Microscope (10)  |            |          |      |          |        |       |           |          |
| <b>Physical Dimensions</b>         | Within the specified dimensions   | Using The calipers   |            |          |      |          |        |       |           |          |
| <b>Mechanical Shock</b>            | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within $\pm 2.5\%$ or $0.25\mu\text{F}$ whichever is larger<br><br>Q, IR : Initial spec.   | Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks)<br><table border="1"> <thead> <tr> <th>Peak value</th> <th>Duration</th> <th>Wave</th> <th>Velocity</th> </tr> </thead> <tbody> <tr> <td>1,500G</td> <td>0.5ms</td> <td>Half sine</td> <td>4.7m/sec</td> </tr> </tbody> </table> | Peak value | Duration | Wave | Velocity | 1,500G | 0.5ms | Half sine | 4.7m/sec |
| Peak value                         | Duration  | Wave   | Velocity   |          |      |          |        |       |           |          |
| 1,500G                             | 0.5ms   | Half sine  | 4.7m/sec   |          |      |          |        |       |           |          |
| <b>Vibration</b>                   | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within $\pm 2.5\%$ or $0.25\mu\text{F}$ whichever is larger<br><br>Q, IR : Initial spec.   | 5g's for 20min., 12cycles each of 3 orientations,<br>Use 8"x5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2,000Hz.  |            |          |      |          |        |       |           |          |
| <b>Resistance to Solder Heat</b>   | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within $\pm 2.5\%$ or $0.25\mu\text{F}$ whichever is larger<br><br>Q, IR : Initial spec.   | preheating : $150^{\circ}\text{C}$ for 60~120 sec.<br>Solder pot : $260\pm 5^{\circ}\text{C}$ , $10\pm 1\text{sec}$ .  |            |          |      |          |        |       |           |          |
| <b>ESD</b>                         | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within $\pm 2.5\%$ or $0.25\mu\text{F}$ whichever is larger<br><br>Q, IR : Initial spec.   | AEC-Q200-002 or ISO/DIS10605   |            |          |      |          |        |       |           |          |
| <b>Solderability</b>               | 95% of the terminations is to be soldered evenly and continuously   | a) Preheat at $155^{\circ}\text{C}$ for 4 hours, Immerse in solder for 5s at $245\pm 5^{\circ}\text{C}$<br>b) Steam aging for 8 hours, Immerse in solder for 5s at $245\pm 5^{\circ}\text{C}$<br>c) Steam aging for 8 hours, Immerse in solder for 120s at $260\pm 5^{\circ}\text{C}$<br>solder : a solution ethanol and rosin                         |            |          |      |          |        |       |           |          |
| <b>Electrical Characterization</b> | Capacitance : Within specified tolerance<br>Q : 640 min.<br>IR( $25^{\circ}\text{C}$ ) : More than 100,000 $\text{M}\Omega$ or 1,000 $\text{M}\Omega \times \mu\text{F}$ Whichever is smaller<br>IR( $125^{\circ}\text{C}$ ) : More than 10,000 $\text{M}\Omega$ or 100 $\text{M}\Omega \times \mu\text{F}$ Whichever is smaller<br><br>Dielectric Strength | The Capacitance / D.F. should be measured at $25^{\circ}\text{C}$ , $1\text{MHz} \pm 10\%$ , $0.5\sim 5\text{Vrms}$<br>I.R. should be measured with a DC voltage not exceeding Rated Voltage @ $25^{\circ}\text{C}$ , @ $125^{\circ}\text{C}$ for 60~120 sec.<br><br>Dielectric Strength : 300% of the rated voltage for 1~5 seconds                   |            |          |      |          |        |       |           |          |
| <b>Board Flex</b>                  | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within $\pm 5\%$ or $0.5\mu\text{F}$ whichever is larger   | Bending to the limit, 3 mm for 60 seconds  |            |          |      |          |        |       |           |          |
| <b>Terminal Strength(SMD)</b>      | Appearance : No abnormal exterior appearance<br>Capacitance Change : Within $\pm 2.5\%$ or $0.25\mu\text{F}$ whichever is larger  | 2 N, for 60 sec.   |            |          |      |          |        |       |           |          |
| <b>Beam Load</b>                   | Destruction value should be exceed 8 N  | Beam speed : $0.5\pm 0.05\text{ mm/sec}$   |            |          |      |          |        |       |           |          |
| <b>Temperature Characteristics</b> | C0G<br>From $-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$ , Capacitance change should be within $0\pm 30\text{ppm}/^{\circ}\text{C}$   |  |            |          |      |          |        |       |           |          |

#### D. Recommended Soldering method :

Reflow ( Reflow Peak Temperature :  $260 \pm 0/-5^{\circ}\text{C}$ , 30sec. ), Meet IPC/JEDEC J-STD-020 D Standard



Product specifications included in the specifications are effective as of March 1, 2013.

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- ⑥ Atomic energy-related equipment
- ⑦ Undersea equipment
- ⑧ Traffic signal equipment
- ⑨ Data-processing equipment
- ⑩ Electric heating apparatus, burning equipment
- ⑪ Safety equipment
- ⑫ Any other applications with the same as or similar complexity or reliability to the applications