

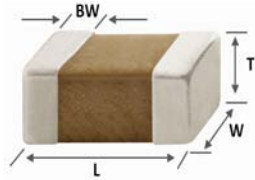
# Specification of Automotive MLCC (Reference sheet)

- Supplier : Samsung Electro-Mechanics
- Product : Multi-layer Ceramic Capacitor

- Samsung P/N : **CL10B224KA8VPNC**
- Description : **CAP, 220nF, 25V, ± 10%, X7R, 0603**
- AEC-Q200 Qualified

## A. Dimension

### ● Dimension



| Size | 0603 inch    |
|------|--------------|
| L    | 1.60±0.10 mm |
| W    | 0.80±0.10 mm |
| T    | 0.80±0.10 mm |
| BW   | 0.30±0.20 mm |

## B. Samsung Part Number

|           |           |          |            |          |          |          |          |          |          |          |
|-----------|-----------|----------|------------|----------|----------|----------|----------|----------|----------|----------|
| <b>CL</b> | <b>10</b> | <b>B</b> | <b>224</b> | <b>K</b> | <b>A</b> | <b>8</b> | <b>V</b> | <b>P</b> | <b>N</b> | <b>C</b> |
| ①         | ②         | ③        | ④          | ⑤        | ⑥        | ⑦        | ⑧        | ⑨        | ⑩        | ⑪        |

|                         |                                       |             |                   |                         |  |
|-------------------------|---------------------------------------|-------------|-------------------|-------------------------|--|
| ① Series                | Samsung Multi-layer Ceramic Capacitor |             |                   |                         |  |
| ② Size                  | 0603                                  | (inch code) | L : 1.60±0.10 mm  | W : 0.80±0.10 mm        |  |
| ③ Dielectric            | X7R                                   |             | ⑧ Inner electrode | Ni                      |  |
| ④ Capacitance           | 220                                   | nF          | Termination       | Metal-Epoxy             |  |
| ⑤ Capacitance tolerance | ± 10%                                 |             | Plating           | Sn 100% (Pb Free)       |  |
| ⑥ Rated Voltage         | 25                                    | V           | ⑨ Product         | Automotive              |  |
| ⑦ Thickness             | 0.80±0.10 mm                          |             | ⑩ Special code    | Normal                  |  |
|                         |                                       |             | ⑪ Packaging       | Cardboard Type, 7" Reel |  |

## C. Reliability Test and Judgement condition

| Test items                      | Performance                                                                                                                                                              | Test condition                                                                                                                                                                                                               |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High Temperature Exposure       | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±10 %<br>Tan δ : 0.075 max.<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<br><br>Initial Measurement 2*<br>Final Measurement 3*                                                                                 |
| Temperature Cycling             | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±10 %<br>Tan δ : 0.075 max.<br>IR : More than 10,000 MΩ or 500 MΩ × μF<br>Whichever is smaller | 1,000Cycles<br>Initial Measurement 2*<br>Final Measurement 3*<br>Measurement at 24±2hrs after test conclusion<br>1 cycle condition : -55+0/-3℃(30±3min) → Room Temp. (1min)<br>→ 125+3/-0℃(30±3min) → Room Temp. (1min)      |
| Destructive Physical Analysis   | No Defects or abnormalities                                                                                                                                              | Per EIA 469                                                                                                                                                                                                                  |
| Humidity Bias                   | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±12.5 %<br>Tan δ : 0.075 max.<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>Initial Measurement 2*<br>Final Measurement 4*<br>Measurement at 24±2hrs after test conclusion<br>The charge/discharge current is less than 50mA. |
| High Temperature Operating Life | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±12.5 %<br>Tan δ : 0.075 max.<br>IR : More than 1,000 MΩ or 50 MΩ × μF<br>Whichever is smaller | 1,000hrs @ 125℃, 200% Rated Voltage,<br>Initial Measurement 2*<br>Final Measurement 4*<br>Measurement at 24±2hrs after test conclusion<br>The charge/discharge current is less than 50mA.                                    |

|                             | Performance                                                                                                                                                                                                                         | Test condition                                                                                                                                                                                                                                                                                                                                                                                                         |            |          |      |          |        |       |           |          |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|------|----------|--------|-------|-----------|----------|
| External Visual             | No abnormal exterior appearance                                                                                                                                                                                                     | Microscope (ˆ10)                                                                                                                                                                                                                                                                                                                                                                                                       |            |          |      |          |        |       |           |          |
| Physical Dimension          | Within the specified dimensions                                                                                                                                                                                                     | Using The calipers                                                                                                                                                                                                                                                                                                                                                                                                     |            |          |      |          |        |       |           |          |
| Mechanical Shock            | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±10 %<br>Tan δ, IR : Initial spec.                                                                                                                        | Three shocks in each direction should be applied along<br>3 mutually perpendicular axes of the test specimen (18 shocks) <table><tr><td>Peak value</td><td>Duration</td><td>Wave</td><td>Velocity</td></tr><tr><td>1,500G</td><td>0.5ms</td><td>Half sine</td><td>4.7m/sec</td></tr></table> Initial Measurement 2*<br>Final Measurement 5*                                                                            | 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   |          |      |          |        |       |           |          |
| Vibration                   | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±10 %<br>Tan δ, 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<br>and 2 secure points at corners of opposite sides. Parts mounted<br>within 2" from any secure point. Test from 10~2,000Hz.<br>Initial Measurement 2*<br>Final Measurement 5*                                                                                                                        |            |          |      |          |        |       |           |          |
| Resistance to Solder Heat   | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±10 %<br>Tan δ, IR : Initial spec.                                                                                                                        | preheating : 150°C for 60~120 sec.<br>Solder pot : 260±5°C, 10±1sec.<br>Initial Measurement 2*<br>Final Measurement 3*                                                                                                                                                                                                                                                                                                 |            |          |      |          |        |       |           |          |
| ESD                         | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±10 %<br>Tan δ, IR : Initial spec.                                                                                                                        | AEC-Q200-002 or ISO/DIS10605<br>Initial Measurement 2*<br>Final Measurement 4*                                                                                                                                                                                                                                                                                                                                         |            |          |      |          |        |       |           |          |
| Solderability               | 95% of the terminations is to be soldered<br>evenly and continuously                                                                                                                                                                | a) Preheat at 155°C for 4 hours, Immerse in solder for 5s at 245±5°C<br>b) Steam aging for 8 hours, Immerse in solder for 5s at 245±5°C<br>c) Steam aging for 8 hours, Immerse in solder for 120s at 260±5°C<br>solder : a solution ethanol and rosin                                                                                                                                                                  |            |          |      |          |        |       |           |          |
| Electrical Characterization | Capacitance : Within specified tolerance<br>Tan δ :0.035 max.<br>IR(25°C) : More than 10,000 MΩ or 500 MΩ×μF<br>Whichever is smaller<br>IR(125°C) More than 1,000 MΩ or 10 MΩ×μF<br>Whichever is smaller<br><br>Dielectric Strength | *A capacitor prior to measuring the capacitance is heat treated at<br>150 +0/-10°C for 1hour and maintained in ambient air for 24±2 hours<br>The Capacitance / D.F. should be measured at 25°C,<br>1 kHz ± 10%,          1 ± 0.2 Vrms<br>I.R. should be measured with a DC voltage not exceeding<br>Rated Voltage @25°C, @125°C for 60~120 sec.<br><br>Dielectric Strength : 250% of the rated voltage for 1~5 seconds |            |          |      |          |        |       |           |          |
| Board Flex                  | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±10 %                                                                                                                                                     | Bending to the limit, 3 mm for 60 seconds 1*<br>Initial Measurement 2*<br>Final Measurement 5*                                                                                                                                                                                                                                                                                                                         |            |          |      |          |        |       |           |          |
| Terminal Strength(SMD)      | Appearance : No abnormal exterior appearance<br>Capacitance Change Within ±10 %                                                                                                                                                     | 10 N, for 60 sec.<br>Initial Measurement 2*<br>Final Measurement 5*                                                                                                                                                                                                                                                                                                                                                    |            |          |      |          |        |       |           |          |
| Beam Load                   | Destruction value should be exceed 20 N                                                                                                                                                                                             | Beam speed : 0.5±0.05 mm/sec                                                                                                                                                                                                                                                                                                                                                                                           |            |          |      |          |        |       |           |          |
| Temperature Characteristics | X7R<br>From -55 °C to 125 °C, Capacitance change should be within ±15%                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                        |            |          |      |          |        |       |           |          |

#### D. Recommended Soldering method :

Reflow ( Reflow Peak Temperature : 260 +0/-5 °C, 30sec. ), Meet IPC/JEDEC J-STD-020 D Standard

\*1 : The figure indicates typical specification. Please refer to individual specifications.

\*2 : Initial measurement : Perform a heat treatment at 150 +0/-10°C for one hour after soldering process.  
and then let sit for 24 $\pm$ 2 hours at room temperature. Perform the initial measurement.

\*3 : Final measurement : Let sit for 24 $\pm$ 2 hours at room temperature after test conclusion, then measure.

\*4 : Final measurement : Perform a heat treatment at 150 +0/-10°C for one hour after soldering process.  
and then let sit for 24 $\pm$ 2 hours at room temperature. Perform the initial measurement.

\*5 : Final measurement : Let measure within 24 hours at room temperature after test conclusion.

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

Please be advised that they are standard product specifications for reference only.

We may change, modify or discontinue the product specifications without notice at any time.

So, you need to approve the product specifications before placing an order.

Should you have any question regarding the product specifications, please contact our sales personnel or application engineers.