# imall

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## **SPECIFICATION**

- · Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor
- · Samsung P/N :
- CL21A106KOQNNNE

(Reference sheet)

A. Samsung Part Number

| -               |  |
|-----------------|--|
| · Description : |  |

- CAP, 10uF, 16V, ±10%, X5R, 0805

|     |               |             |          | 21<br>2) | <u>▲</u><br>③ | <u>106</u><br>④ | <u>K</u><br>5 | <mark>0</mark><br>6 | <mark>Q</mark><br>⑦ | <u>N</u><br>8 | <u>N</u><br>9 | <u>N</u><br>10 | <u>Е</u><br>11 |              |  |
|-----|---------------|-------------|----------|----------|---------------|-----------------|---------------|---------------------|---------------------|---------------|---------------|----------------|----------------|--------------|--|
| 1   | Series        | Samsung M   | ulti-lay | er C     | Cerar         | nic Ca          | pacito        | or                  |                     |               |               |                |                |              |  |
| 2   | Size          | 0805 (inc   | ch cod   | e)       |               | L:              | 2.00          | ± 0.15              | mm                  |               |               | W:             | 1.25 ± 0.15 m  | m            |  |
| 3   | Dielectric    | X5R         |          |          |               |                 | 8             | Inner               | elect               | rode          |               |                | Ni             |              |  |
| 4   | Capacitance   | 10 uF       |          |          |               |                 | -             | Term                | inatio              | n             |               |                | Cu             |              |  |
| (5) | Capacitance   | ±10 %       |          |          |               |                 |               | Platin              | g                   |               |               |                | Sn 100%        | (Pb Free)    |  |
|     | tolerance     |             |          |          |               |                 | 9             | Produ               | ıct                 |               |               |                | Normal         |              |  |
| 6   | Rated Voltage | 16 V        |          |          |               |                 | 10            | Speci               | al                  |               |               |                | Reserved for   | future use   |  |
| 7   | Thickness     | 1.25 ± 0.15 | mm       |          |               |                 | 1             | Packa               | aging               |               |               |                | Embossed Ty    | /pe, 7" reel |  |

#### **B. Structure & Dimension**



| Samsung P/N     |             |             |             |                  |
|-----------------|-------------|-------------|-------------|------------------|
| Samsung F/N     | L           | W           | Т           | BW               |
| CL21A106KOQNNNE | 2.00 ± 0.15 | 1.25 ± 0.15 | 1.25 ± 0.15 | 0.50 +0.20/-0.30 |

#### C. Samsung Reliablility Test and Judgement Condition

|  | <br>Test condition   | Judgement                               |                   |
|--|--|---|-------------------|
| Tan δ (DF) 0.1 max. treated at 150°C+0/-10°C for 1 hour and maintaine ambient air for 24±2 hours.   Insulation 10,000Mohm or 100Mohm×μ <sup>F</sup> Rated Voltage 60~120 sec.   Resistance Whichever is smaller Rated Voltage 60~120 sec.   Appearance No abnormal exterior appearance Microscope (×10)   Withstanding No dielectric breakdown or 250% of the rated voltage   Voltage mechanical breakdown 250%   Temperature X5R   Characteristics (From-55°C to 85°C, Capacitance change should be within ±15%)   Adhesive Strength No peeling shall be occur on the terminal electrode   Bending Strength Capacitance change : within ±12.5%   Bending Strength Capacitance change : within ±12.5%   Solderability More than 75% of terminal surface is to be soldered newly   Solder pot : 270±5°C, 10±1sec. (preheating : 80~120°C for 10~30sec.)   Resistance to Capacitance change : within ±7.5% Solder pot : 270±5°C, 10±1sec.   Soldering Heat Tan δ, IR : initial spec. Amplitude : 1.5mm   Vibration Test Capacitance change : within ±5% Amplitude : 1.5mm   From 10Hz to 55Hz (return : 1min.) 2hours < 3 direction (x   | 1 <sup>kHz</sup> ±10% / 1.0±0.2Vrms  | Within specified tolerance              | Capacitance       |
| Resistance Whichever is smaller   Appearance No abnormal exterior appearance Microscope (×10)   Withstanding No dielectric breakdown or<br>mechanical breakdown 250% of the rated voltage   Voltage mechanical breakdown 250% of the rated voltage   Temperature X5R 250% of the rated voltage   Characteristics (From-55°C to 85°C, Capacitance change should be within ±15%)   Adhesive Strength No peeling shall be occur on the<br>of Termination 500g·f, for 10±1 sec.   Gending Strength Capacitance change : within ±12.5% Bending to the limit (1mm)<br>with 1.0mm/sec.   Solderability More than 75% of terminal surface<br>is to be soldered newly Solder pot : 270±5°C, 3±0.3sec.<br>(preheating : 80~120°C for 10~30sec.)   Resistance to Capacitance change : within ±7.5% Solder pot : 270±5°C, 10±1sec.   Soldering Heat Tan δ, IR : initial spec. Amplitude : 1.5mm   Vibration Test Capacitance change : within ±5%<br>Tan δ, IR : initial spec. Amplitude : 1.5mm   Moisture Capacitance change : within ±12.5% With rated voltage   Resistance Tan δ : 0.2 max With in ±2.5% With rated voltage   Tan δ : 0.2 max Within ±2.5% With rated voltage   | *A capacitor prior to measuring the capacitance is he<br>treated at 150°C+0/-10°C for 1 hour and maintained i<br>ambient air for 24±2 hours. | 0.1 max.                                | Tan δ (DF)        |
| AppearanceNo abnormal exterior appearanceMicroscope (×10)WithstandingNo dielectric breakdown or<br>mechanical breakdown $250\%$ of the rated voltageTemperatureX5RCharacteristics(From-55 °C to 85 °C, Capacitance change should be within ±15%)Adhesive Strength<br>of TerminationNo peeling shall be occur on the<br>terminal electrode $500g \cdot f$ , for $10\pm 1$ sec.Bending StrengthCapacitance change :<br>within ±12.5%within ±12.5%Bending to the limit (1mm)<br>with 1.0mm/sec.SolderabilityMore than 75% of terminal surface<br>is to be soldered newlySolder pot : $270\pm 5^\circ$ C, $10\pm 3$ sec.<br>(preheating : $80-120^\circ$ C for $10-30$ sec.)Resistance to<br>Soldering HeatCapacitance change :<br>Tan $\delta_1$ IR : initial spec.within $\pm 7.5\%$ Solder pot : $270\pm 5^\circ$ C, $10\pm 1$ sec.Vibration TestCapacitance change :<br>macitance change :<br>Tan $\delta_1$ IR : initial spec.within $\pm 5\%$<br>Tan $\delta_1$ IR : initial spec.Amplitude : $1.5mm$<br>From $10Hz$ to $55Hz$ (return : 1min.)<br>$2hours × 3$ direction (x, y, z)Moisture<br>ResistanceCapacitance change :<br>Tan $\delta_1$ IR : initial spec.Within $\pm 12.5\%$<br>With rated voltage<br>$40\pm 2^\circ$ C, $90-95\%$ RH, $500+12/-0hrs$ | <br>Rated Voltage 60~120 sec.  | 10,000Mohm or 100Mohm× <i>μ</i> F       | Insulation        |
| Withstanding<br>VoltageNo dielectric breakdown or<br>mechanical breakdown $250\%$ of the rated voltageTemperature<br>CharacteristicsX5R<br>  |  | Whichever is smaller                    | Resistance        |
| Voltagemechanical breakdownTemperatureX5RCharacteristics(From-55°C to 85°C, Capacitance change should be within ±15%)Adhesive StrengthNo peeling shall be occur on the<br>terminal electrode500g f, for 10±1 sec.Bending StrengthCapacitance change :<br>terminal electrodewithin ±12.5%Bending to the limit (1mm)<br>with 1.0mm/sec.SolderabilityMore than 75% of terminal surface<br>is to be soldered newlySnAg3.0Cu0.5 solder<br>245±5°C, 3±0.3sec.<br>(preheating : 80~120°C for 10~30sec.)Resistance to<br>Soldering HeatCapacitance change :<br>tan ō, IR : initial spec.within ±7.5%<br>thin ±5%<br>Tan ō, IR : initial spec.Solder pot : 270±5°C, 10±1sec.Vibration TestCapacitance change :<br>tan ō, IR : initial spec.within ±12.5%<br>thin ±12.5%Amplitude : 1.5mm<br>From 10Hz to 55Hz (return : 1min.)<br>2hours × 3 direction (x, y, z)Moisture<br>ResistanceCapacitance change :<br>tan ō :<br>IR :<br>S00Mohm or 12.5Mohm × $\mu^{F}$<br>Whichever is smallerWith rated voltage<br>40±2°C, 90~95%RH, 500+12/-0hrs  | <br>Microscope (×10)   | No abnormal exterior appearance         | Appearance        |
| Temperature<br>CharacteristicsX5R<br>(From-55 °C to 85 °C, Capacitance change should be within $\pm 15\%$ )Adhesive Strength<br>of TerminationNo peeling shall be occur on the<br>   | 250% of the rated voltage  | No dielectric breakdown or              | Withstanding      |
| $\begin{array}{c c} \textbf{Characteristics} & (From-55 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $  |  | mechanical breakdown                    | Voltage           |
| Adhesive Strength<br>of TerminationNo peeling shall be occur on the<br>terminal electrode500g·f, for 10±1 sec.Bending StrengthCapacitance change : within ±12.5%Bending to the limit (1mm)<br>with 1.0mm/sec.SolderabilityMore than 75% of terminal surface<br>is to be soldered newlySnAg3.0Cu0.5 solder<br>245±5°C, 3±0.3sec.<br>(preheating : 80~120°C for 10~30sec.)Resistance to<br>Soldering HeatCapacitance change : within ±7.5%<br>Tan $\delta$ , IR : initial spec.Solder pot : 270±5°C, 10±1sec.Vibration TestCapacitance change : within ±5%<br>Tan $\delta$ , IR : initial spec.Amplitude : 1.5mm<br>From 10Hz to 55Hz (return : 1min.)<br>2hours × 3 direction (x, y, z)Moisture<br>ResistanceCapacitance change : within ±12.5%<br>Tan $\delta$ : 0.2 max<br>IR : 500Mohm or 12.5Mohm × $\mu$ F<br>Whichever is smallerWith rated voltage<br>40±2°C, 90~95%RH, 500+12/-0hrs   |  | X5R                                     | Temperature       |
| of Terminationterminal electrodeBending StrengthCapacitance change :within $\pm 12.5\%$ Bending to the limit (1mm)<br>with 1.0mm/sec.SolderabilityMore than 75% of terminal surface<br>is to be soldered newlySnAg3.0Cu0.5 solder<br>245 $\pm 5^{\circ}$ C, $3\pm 0.3$ sec.<br>(preheating : $80 \sim 120^{\circ}$ C for $10 \sim 30$ sec.)Resistance toCapacitance change :within $\pm 7.5\%$ Solder pot : $270\pm 5^{\circ}$ C, $10\pm 1$ sec.Soldering HeatTan $\delta$ , IR : initial spec.Amplitude : $1.5$ mm<br>From 10Hz to $55$ Hz (return : 1min.)<br>2hours × 3 direction (x, y, z)MoistureCapacitance change :within $\pm 12.5\%$<br>Tan $\delta$ :Output<br>$12.5$ Mohm × $\mu^{F}$<br>Whichever is smaller   | should be within ±15%)   | (From-55℃ to 85℃, Capacitance change sh | Characteristics   |
| Bending StrengthCapacitance change :within $\pm 12.5\%$ Bending to the limit (1mm)<br>with 1.0mm/sec.SolderabilityMore than 75% of terminal surface<br>is to be soldered newlySnAg3.0Cu0.5 solder<br>$245\pm5^{\circ}$ C, $3\pm0.3$ sec.<br>(preheating : $80^{-}120^{\circ}$ C for 10~30sec.)Resistance toCapacitance change :within $\pm 7.5\%$ Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Soldering HeatTan $\delta$ , IR : initial spec.Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Vibration TestCapacitance change :within $\pm 5\%$<br>Tan $\delta$ , IR : initial spec.Amplitude : $1.5mm$<br>From 10Hz to 55Hz (return : $1min.$ )<br>$2hours × 3 direction (x, y, z)$ Moisture<br>ResistanceCapacitance change :within $\pm 12.5\%$<br>Tan $\delta$ :Output<br>$12.5Mohm × \mu^{F}$<br>Whichever is smaller   | 500g·f, for 10±1 sec.  | No peeling shall be occur on the        | Adhesive Strength |
| with 1.0mm/sec.SolderabilityMore than 75% of terminal surface<br>is to be soldered newlySinAg3.0Cu0.5 solder<br>$245\pm5^{\circ}$ C, $3\pm0.3$ sec.<br>(preheating : $80\sim120^{\circ}$ C for $10\sim30$ sec.)Resistance to<br>Soldering HeatCapacitance change :<br>Tan $\delta$ , IR : initial spec.within $\pm7.5\%$<br>Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Vibration TestCapacitance change :<br>Moisture<br>Resistancewithin $\pm5\%$<br>Tan $\delta$ : IR : initial spec.Amplitude : $1.5$ mm<br>From $10$ Hz to $55$ Hz (return : $1$ min.)<br>$2hours × 3$ direction (x, y, z)Moisture<br>ResistanceCapacitance change :<br>N :<br>Moisture<br>IR :<br>$500$ Mohm or $12.5$ Mohm × $\mu$ F<br>Whichever is smallerWith rated voltage<br>$40\pm2^{\circ}$ C, $90\sim95\%$ RH, $500\pm12/-0$ hrs   |  | terminal electrode                      | of Termination    |
| SolderabilityMore than 75% of terminal surface<br>is to be soldered newlySnAg3.0Cu0.5 solder<br>$245\pm5^{\circ}$ C, $3\pm0.3$ sec.<br>(preheating : $80\sim120^{\circ}$ C for $10\sim30$ sec.)Resistance toCapacitance change :<br>Tan $\delta$ , IR : initial spec.Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Vibration TestCapacitance change :<br>Capacitance change :<br>Tan $\delta$ , IR : initial spec.Amplitude : $1.5$ mm<br>From $10$ Hz to $55$ Hz (return : $1$ min.)<br>$2hours \times 3$ direction (x, y, z)Moisture<br>ResistanceCapacitance change :<br>Tan $\delta$ :<br>$0.2$ max<br>IR :<br>$500$ Mohm or $12.5$ Mohm × $\mu$ F<br>Whichever is smallerWith rated voltage<br>$40\pm2^{\circ}$ C, $90\sim95\%$ RH, $500+12/-0$ hrs  | <br>Bending to the limit (1mm)   | Capacitance change : within ±12.5%      | Bending Strength  |
| is to be soldered newly $245\pm5^{\circ}$ C, $3\pm0.3$ sec.<br>(preheating : $80\sim120^{\circ}$ C for $10\sim30$ sec.)Resistance toCapacitance change :<br>Tan $\delta$ , IR : initial spec.Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Vibration TestCapacitance change :<br>Tan $\delta$ , IR : initial spec.Amplitude : $1.5$ mm<br>  | with 1.0mm/sec.  |   |                   |
| Resistance to<br>Soldering HeatCapacitance change :<br>Tan $\delta$ , IR : initial spec.within $\pm 7.5\%$<br>Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Vibration TestCapacitance change :<br>Capacitance change :<br>Tan $\delta$ , IR : initial spec.within $\pm 5\%$<br>From 10Hz to 55Hz (return : 1min.)<br>2hours × 3 direction (x, y, z)Moisture<br>ResistanceCapacitance change :<br>0.2 max<br>IR :<br>S00Mohm or 12.5Mohm × $\mu$ F<br>Whichever is smallerWithin $\pm 12.5\%$<br>With rated voltage<br>40 $\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrs  | <br>SnAg3.0Cu0.5 solder  | More than 75% of terminal surface       | Solderability     |
| Resistance toCapacitance change :<br>Tan $\delta$ , IR : initial spec.within $\pm 7.5\%$ Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Vibration TestCapacitance change :<br>Tan $\delta$ , IR : initial spec.within $\pm 5\%$ Amplitude : $1.5$ mm<br>From 10Hz to 55Hz (return : 1min.)<br>   | 245±5℃, 3±0.3sec.  | is to be soldered newly                 |                   |
| Soldering HeatTan $\delta$ , IR : initial spec.Amplitude : 1.5mmVibration TestCapacitance change : within $\pm 5\%$<br>Tan $\delta$ , IR : initial spec.Amplitude : 1.5mm<br>From 10Hz to 55Hz (return : 1min.)<br>2hours × 3 direction (x, y, z)Moisture<br>ResistanceCapacitance change : within $\pm 12.5\%$<br>Tan $\delta$ : 0.2 max<br>IR : 500Mohm or 12.5Mohm × $\mu$ F<br>Whichever is smallerWith rated voltage<br>40 $\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrs  | (preheating : 80~120℃ for 10~30sec.)   |   |                   |
| Vibration TestCapacitance change :<br>Tan $\delta$ , IR : initial spec.within $\pm 5\%$<br>From 10Hz to 55Hz (return : 1min.)<br>2hours × 3 direction (x, y, z)Moisture<br>ResistanceCapacitance change :<br>0.2 max<br>IR :<br>$500$ Mohm or 12.5Mohm × $\mu$ F<br>Whichever is smallerWith in $\pm 12.5\%$<br>$40\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrs  | <br>Solder pot : 270±5°C, 10±1sec.   | Capacitance change : within ±7.5%       | Resistance to     |
| Tan $\delta$ , IR : initial spec.From 10Hz to 55Hz (return : 1min.)<br>2hours × 3 direction (x, y, z)Moisture<br>ResistanceCapacitance change : within ±12.5%<br>Tan $\delta$ : 0.2 max<br>  |  |   | Soldering Heat    |
| ResistanceTan $\delta$ :0.2 max40±2°C, 90~95%RH, 500+12/-0hrsIR:500Mohm or 12.5Mohm × $\mu$ FWhichever is smaller  | From 10Hz to 55Hz (return : 1min.)   | i e                                     | Vibration Test    |
| IR : 500Mohm or 12.5Mohm × $\mu$ F<br>Whichever is smaller   | <br>With rated voltage   | Capacitance change : within ±12.5%      | Moisture          |
| Whichever is smaller   | 40±2℃, 90~95%RH, 500+12/-0hrs  | Tan δ : 0.2 max                         | Resistance        |
|  |  | IR : 500Mohm or 12.5Mohm × $\mu$ F      |                   |
| High Temperature Capacitance change : within ±12.5% With <sup>100%</sup> of the rated voltage  |  | Whichever is smaller                    |                   |
|  | With 100% of the rated voltage   | Capacitance change : within ±12.5%      | High Temperature  |
| Resistance   Tan δ :   0.2 max   Max. operating temperature  | _  |   |                   |
| IR : 1,000Mohm or 25Mohm × <i>μ</i> F 1000+48/-0hrs  | 1000+48/-0hrs  | IR : 1,000Mohm or 25Mohm × <i>μ</i> F   |                   |
| Whichever is smaller   |  | Whichever is smaller                    |                   |
| Temperature   Capacitance change :   within ±7.5%   1 cycle condition  | 1 cycle condition  | Capacitance change : within ±7.5%       | Temperature       |
| <b>Cycling</b> Tan $\delta$ , IR : initial spec. Min. operating temperature $\rightarrow 25^{\circ}$ C   | -  | Tan δ, IR : initial spec.               |                   |
| $\rightarrow$ Max. operating temperature $\rightarrow$ 25°C  |  |   | _                 |
|  |  |   |                   |
| 5 cycle test   | 5 cycle test   |   |                   |

X The reliability test condition can be replaced by the corresponding accelerated test condition.

#### D. Recommended Soldering method :

Reflow ( Reflow Peak Temperature : 260+0/-5°C, 10sec. Max )

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.

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- Aerospace/Aviation equipment
- 2 Automotive or Transportation equipment (vehicles, trains, ships, etc)
- 3 Medical equipment
- ④ Military equipment
- *⑤* Disaster prevention/crime prevention equipment
- *ⓐ* Any other applications with the same as or similar complexity or reliability to the applications set forth above.