



SPECIFICATION

(Reference sheet)

· Supplier : Samsung electro-mechanics · Samsung P/N : CL21B563KBCNNNC

· Product : Multi-layer Ceramic Capacitor · Description : CAP, 56nF, 50V, ±10%, X7R, 0805

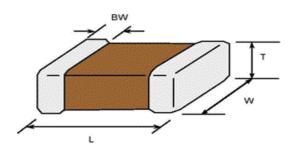
A. Samsung Part Number

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| 1 | Series | Samsung Multi-layer Ceramic Capacitor | | |
|-----|---------------|---------------------------------------|-------------------------------|-------------------------|
| 2 | Size | 0805 (inch code) | L: $2.00 \pm 0.10 \text{ mm}$ | W: 1.25 ± 0.10 mm |
| (3) | Dielectric | X7R | Inner electrode | Ni |
| 🎱 | Dielectric | A/K | 8 Inner electrode | INI |
| 4 | Capacitance | 56 nF | Termination | Cu |
| (5) | Capacitance | ±10 % | Plating | Sn 100% (Pb Free) |
| | tolerance | | Product | Normal |
| 6 | Rated Voltage | 50 V | Special | Reserved for future use |
| 7 | Thickness | $0.85 \pm 0.10 \text{ mm}$ | 11) Packaging | Cardboard Type, 7" reel |

B. Structure & Dimension



| Samsung P/N | Dimension(mm) | | | | |
|-----------------|---------------|-------------|-------------|------------------|--|
| Samsung F/N | L | W | T | BW | |
| CL21B563KBCNNNC | 2.00 ± 0.10 | 1.25 ± 0.10 | 0.85 ± 0.10 | 0.50 +0.20/-0.30 | |

C. Samsung Reliablility Test and Judgement Condition

| Tan δ (DF) 0.025 max. *A capacitor prior to measuring the capacitance is heat treated at 150°C+0/-10°C for 1 hour and maintained in ambient air for 24±2 hours. Rated Voltage 60~120 sec. Whichever is smaller Appearance No abnormal exterior appearance Microscope (×10) Withstanding No dielectric breakdown or mechanical breakdown Temperature Characteristics Adhesive Strength of Terminal electrode Bending Strength Capacitance change: within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly Soldering Heat Tan δ, IR: initial spec. Within ±12.5% Amplitude: 1.5mm From 10liz to 56liz (return: 1min.) Zhours × 3 direction (x, y, z) Moisture Resistance Capacitance change: within ±12.5% Resistance Tan δ : 0.05 max IR: 500Mohm or 25Mohm × μF Whichever is smaller Temperature Resistance Resistance Capacitance change: within ±12.5% With 720% of the rated voltage Max. operating temperature Max. operating temperature Resistance Tan δ : 0.05 max IR: 1,000Mohm or 50Mohm × μF Whichever is smaller Temperature Capacitance change: within ±7.5% Toyloc condition | | Judgement | Test condition | |
|---|-------------------|---|---|--|
| Tan δ (DF) 0.025 max. treated at 150℃+0/-10℃ for 1 hour and maintained in ambient air for 24±2 hours. Insulation 10.000Mohm or 500Mohm×μF Rated Voltage 60~120 sec. Resistance Whichever is smaller Appearance Mo abnormal exterior appearance Microscope (×10) Withstanding No dielectric breakdown or wechanical breakdown 250% of the rated voltage Voltage mechanical breakdown Temperature X7R Characteristics (From-55℃ to 125℃, Capacitance change should be within ±15%) Adhesive Strength No peeling shall be occur on the of Termination terminal electrode Bending Strength Capacitance change : within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly SnAg3.0Cu0.5 solder 245±5℃, 32-0.3sec. (preheating : 80~120℃ for 10~30sec.) Resistance to Capacitance change : within ±7.5% Solder pot : 270±5℃, 10±1sec. Soldering Heat Tan δ, IR : initial spec. Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Wibration Test Capacitance change : within ±12.5% With rated voltage 40±2℃, 90~95%RH, 500+12/-0hrs Resistance Tan δ : 0.05 max IR : initial spec. Within ±12.5% | Capacitance | Within specified tolerance | 1 kHz ±10% / 1.0±0.2Vrms | |
| Resistance Whichever is smaller Appearance No abnormal exterior appearance Microscope (×10) | Tan δ (DF) | 0.025 max. | treated at 150 ℃+0/-10 ℃ for 1 hour and maintained in | |
| Appearance No abnormal exterior appearance Microscope (×10) Withstanding No dielectric breakdown or mechanical breakdown 250% of the rated voltage Temperature X7R Characteristics (From-55℃ to 125℃, Capacitance change should be within ±15%) Adhesive Strength No peeling shall be occur on the terminal electrode 500g·f, for 10±1 sec. Bending Strength Capacitance change: within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly SnAg3.0cu0.5 solder 245±5℃, 3±0.3sec. (preheating: 80~120℃ for 10~30sec.) Resistance to Capacitance change: within ±7.5% Solder pot: 270±5℃, 10±1sec. Soldering Heat Tan δ, IR: initial spec. Amplitude: 1.5mm From 10Hz to 55Hz (return: 1min.) 2hours × 3 direction (x, y, z) Wibration Test Capacitance change: within ±12.5% With rated voltage 40±2℃, 90~95%RH, 500+12/-0hrs Resistance Tan δ: 0.05 max IR: 500Mohm × μF Whichever is smaller With 200% of the rated voltage Max. operating temperature High Temperature Capacitance change: within ±12.5% With 200% of the rated voltage Max. operating temperature Max. operating temperature Temperature Capacitance change: within ±7.5% 1 cycle c | Insulation | 10,000Mohm or 500Mohm× <i>μ</i> F | Rated Voltage 60~120 sec. | |
| Withstanding No dielectric breakdown or mechanical breakdown 250% of the rated voltage Temperature X7R Characteristics (From-55 ℃ to 125 ℃, Capacitance change should be within ±15%) Adhesive Strength No peeling shall be occur on the terminal electrode 500g·f, for 10±1 sec. Bending Strength Capacitance change : within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly SnAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (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 From 10½ to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Wibration Test Capacitance change : within ±12.5% Amplitude : 1.5mm From 10½ to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Moisture Capacitance change : within ±12.5% With rated voltage Resistance Tan δ : 0.05 max Within ±12.5% Within ±12.5% With 200% of the rated voltage Max. operating temperature Max. operating temperature Max. operating temperature Temperature Capacitance change : within ±7.5% 1 cycle conditio | Resistance | Whichever is smaller | | |
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| Temperature Characteristics (From-55°C to 125°C, Capacitance change should be within ±15%) Adhesive Strength of Termination Bending Strength Capacitance change: within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly Capacitance change: within ±7.5% Solder pot: 270±5°C, 10±1 sec. From 10±1 sec. SnAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (preheating: 80~120°C for 10~30sec.) Resistance to Capacitance change: within ±7.5% Solder pot: 270±5°C, 10±1 sec. Solder pot: 270±5°C, 10±1 sec. Capacitance change: within ±5% Tan δ, IR: initial spec. Within ±5% Tan δ, IR: initial spec. Capacitance change: within ±12.5% Tan δ i 0.05 max IR: 500Mohm or 25Mohm × Whichever is smaller High Temperature Resistance Tan δ: 0.05 max IR: 1,000Mohm or 50Mohm × Whichever is smaller Tan δ i 0.05 max IR: 1,000Mohm or 50Mohm × Whichever is smaller Temperature Capacitance change: within ±7.5% With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs Max. operating temperature 1000+48/-0hrs Whichever is smaller Temperature Capacitance change: within ±7.5% Capacitance change: within ±7.5% With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs Whichever is smaller Temperature Capacitance change: within ±7.5% Tan δ, IR: initial spec. | Withstanding | No dielectric breakdown or | 250% of the rated voltage | |
| Temperature Characteristics (From-55°C to 125°C, Capacitance change should be within ±15%) Adhesive Strength of Termination Bending Strength Capacitance change: within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly Capacitance change: within ±7.5% Solder pot: 270±5°C, 10±1 sec. (preheating: 80~120°C for 10~30sec.) Resistance to Soldering Heat Tan δ, IR: initial spec. Vibration Test Capacitance change: within ±5% Tan δ, IR: initial spec. Capacitance change: within ±12.5% Tan δ: 0.05 max IR: 500Mohm or 25Mohm × Whichever is smaller High Temperature Resistance Tan δ: 0.05 max IR: 1,000Mohm or 50Mohm × Whichever is smaller Temperature Capacitance change: within ±7.5% With 200% of the rated voltage Max. operating temperature Max. operating temperature 1000+48/-0hrs Whichever is smaller Temperature Capacitance change: within ±7.5% With 1 cycle condition Min. operating temperature → 25°C | Voltage | mechanical breakdown | | |
| Adhesive Strength of Termination Bending Strength Capacitance change: within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly Capacitance change: within ±7.5% Soldering Heat Vibration Test Capacitance change: within ±12.5% Moisture Resistance Tan δ : 0.05 max IR : 500Mohm or 25Mohm × μF Whichever is smaller High Temperature Capacitance change: within ±7.5% Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μF Whichever is smaller Temperature Capacitance change: within ±7.5% Capacitance change: within ±12.5% Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μF Whichever is smaller Temperature Capacitance change: within ±7.5% Capacitance change: within ±12.5% Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μF Whichever is smaller Temperature Capacitance change: within ±7.5% Capacitance change: within ±12.5% Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μF Whichever is smaller Temperature Capacitance change: within ±7.5% Capacitance change: within ±7.5% Capacitance change: within ±7.5% Mith 200% of the rated voltage Max. operating temperature 1000+48/-0hrs Min. operating temperature → 25°C | = | | | |
| Adhesive Strength of Termination No peeling shall be occur on the terminal electrode 500g·f, for 10±1 sec. Bending Strength Capacitance change: within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly SnAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (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 From 10Hz to 55Hz (return: 1min.) 2hours × 3 direction (x, y, z) Wibration Test Capacitance change: within ±12.5% With rated voltage 40±2°C, 90~95%RH, 500+12/-0hrs Resistance Tan δ: 0.05 max IR: 500Mohm or 25Mohm × μF Whichever is smaller With 200% of the rated voltage Max. operating temperature High Temperature Capacitance change: within ±12.5% Whichever is smaller Max. operating temperature Max. operating temperature Temperature Capacitance change: within ±7.5% Whichever is smaller 1 cycle condition Min. operating temperature → 25°C | Characteristics | (From-55℃ to 125℃, Capacitance change s | should be within ±15%) | |
| Bending Strength Capacitance change : within ±12.5% Bending to the limit (1mm) with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly SnAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (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, y, z) Moisture Capacitance change : within ±12.5% With rated voltage Resistance Tan δ : 0.05 max IR : 500Mohm or 25Mohm × μF Whichever is smaller With 200% of the rated voltage High Temperature Capacitance change : within ±12.5% Whichever is smaller With 200% of the rated voltage Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μF Whichever is smaller 1000+48/-0hrs Temperature Capacitance change : within ±7.5% Whichever is smaller 1 cycle condition Temperature Capacitance change : within ±7.5% Min. operating temperature → 25°C | Adhesive Strength | | | |
| with 1.0mm/sec. Solderability More than 75% of terminal surface is to be soldered newly SnAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (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 From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Moisture Capacitance change : within ±12.5% With rated voltage 40±2°C, 90~95%RH, 500+12/-0hrs Resistance Tan δ : 0.05 max IR : 500Mohm or 25Mohm × /μ² Whichever is smaller With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs High Temperature Capacitance change : within ±12.5% Whichever is smaller With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs Temperature Capacitance change : within ±7.5% Whichever is smaller To cycle condition Min. operating temperature → 25°C | of Termination | terminal electrode | | |
| Solderability More than 75% of terminal surface is to be soldered newly SnAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (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 From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Moisture Capacitance change : within ±12.5% With rated voltage Resistance Tan δ : 0.05 max IR : 500Mohm or 25Mohm × μF With rated voltage Whichever is smaller With 200% of the rated voltage High Temperature Capacitance change : within ±12.5% With 200% of the rated voltage Resistance Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μF With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs Whichever is smaller 1 cycle condition Temperature Capacitance change : within ±7.5% 1 cycle condition Cycling Tan δ, IR : initial spec. 1 cycle condition Min. operating temperature → 25°C | Bending Strength | Capacitance change: within ±12.5% | Bending to the limit (1mm) | |
| is to be soldered newly 245±5°C, 3±0.3sec. (preheating: 80~120°C for 10~30sec.) | | | with 1.0mm/sec. | |
| is to be soldered newly 245±5°C, 3±0.3sec. (preheating: 80~120°C for 10~30sec.) | Solderability | More than 75% of terminal surface | SnAg3.0Cu0.5 solder | |
| Resistance to Capacitance change : within $\pm 7.5\%$ Solder pot : $270\pm 5^{\circ}$ C, 10 ± 1 sec. Soldering Heat Tan δ , IR : initial spec. Vibration Test Capacitance change : within $\pm 5\%$ Amplitude : 1.5 mm From 10 Hz to 55 Hz (return : 1 min.) 2hours $\times 3$ direction (x, y, z) Moisture Capacitance change : within $\pm 12.5\%$ With rated voltage ± 1.5 With rated volta | | is to be soldered newly | 245±5°C, 3±0.3sec. | |
| Soldering HeatTan δ, IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)MoistureCapacitance change : Tan δ : 0.05 maxwithin ±12.5% 40±2°C, 90~95%RH, 500+12/-0hrsHigh TemperatureCapacitance change : Whichever is smallerwithin ±12.5% 40±2°C, 90~95%RH, 500+12/-0hrsHigh TemperatureCapacitance change : With ±12.5%With 200% of the rated voltage Max. operating temperatureResistanceTan δ : Uncompared to 0.05 max IR : Whichever is smallerMax. operating temperature 1000+48/-0hrsTemperatureCapacitance change : Whichever is smaller1 cycle condition Min. operating temperatureTemperatureCapacitance change : Whithial spec.1 cycle condition Min. operating temperature | | | (preheating : 80~120°C for 10~30sec.) | |
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| Tan δ , IR: initial spec. From 10Hz to 55Hz (return: 1min.) 2hours × 3 direction (x, y, z) Moisture Resistance Tan δ : 0.05 max IR: 500Mohm or 25Mohm × μ F Whichever is smaller High Temperature Resistance Tan δ : 0.05 max IR: 500Mohm or 25Mohm × μ F Whichever is smaller High Temperature Resistance Tan δ : 0.05 max IR: 1,000Mohm or 50Mohm × μ F Whichever is smaller Temperature Capacitance change: within $\pm 12.5\%$ With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs Temperature Capacitance change: within $\pm 7.5\%$ Temperature Capacitance change: within $\pm 7.5\%$ Toycle condition Min. operating temperature \rightarrow 25°C | Soldering Heat | | | |
| Resistance Tan δ : 0.05 max $40\pm2^{\circ}$ C, $90\sim95\%$ RH, $500\pm12/-0$ hrs IR : 500Mohm or 25Mohm × μF Whichever is smaller High Temperature Capacitance change : within ±12.5% With 200% of the rated voltage Resistance Tan δ : 0.05 max Max. operating temperature IR : 1,000Mohm or 50Mohm × μF 1000+48/-0hrs Whichever is smaller 1 cycle condition Temperature Capacitance change : within ±7.5% 1 cycle condition Cycling Tan δ, IR : initial spec. Min. operating temperature → 25°C | Vibration Test | , , | From 10Hz to 55Hz (return : 1min.) | |
| IR: 500Mohm or 25Mohm × μ F Whichever is smaller High Temperature Resistance Tan δ: 0.05 max IR: 1,000Mohm or 50Mohm × μ F Whichever is smaller Temperature Capacitance change: within ±7.5% With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs Temperature Capacitance change: within ±7.5% Tan δ, IR: initial spec. 1 cycle condition Min. operating temperature \rightarrow 25°C | Moisture | Capacitance change: within ±12.5% | With rated voltage | |
| Whichever is smallerHigh Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μ F Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : within $\pm 7.5\%$ Tan δ , IR : initial spec.1 cycle condition Min. operating temperature | Resistance | Tan δ: 0.05 max | 40±2°C, 90~95%RH, 500+12/-0hrs | |
| High Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μ F Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : within $\pm 7.5\%$ Tan δ , IR : initial spec.1 cycle condition Min. operating temperature | | IR: 500Mohm or 25Mohm × μ F | | |
| Resistance Tan δ : 0.05 max Max. operating temperature IR : 1,000Mohm or 50Mohm × μ F 1000+48/-0hrs Whichever is smaller 1 cycle condition Cycling Tan δ, IR : initial spec. Min. operating temperature Max. operating temperature 1000+48/-0hrs 1 cycle condition 1 cycle condition Min. operating temperature → 25°C | | Whichever is smaller | | |
| IR: 1,000Mohm or 50Mohm × μ F Whichever is smaller Temperature Capacitance change: within ±7.5% 1 cycle condition Tan δ, IR: initial spec. 1 cycle condition Min. operating temperature \rightarrow 25°C | High Temperature | Capacitance change: within ±12.5% | With 200% of the rated voltage | |
| | Resistance | Tan δ: 0.05 max | Max. operating temperature | |
| Temperature Capacitance change : within $\pm 7.5\%$ 1 cycle condition Cycling Tan δ, IR : initial spec. Min. operating temperature \rightarrow 25°C | | IR: 1,000Mohm or 50Mohm × μ F | 1000+48/-0hrs | |
| Cycling Tan δ, IR : initial spec. Min. operating temperature → 25°C | | Whichever is smaller | | |
| | Temperature | Capacitance change : within ±7.5% | 1 cycle condition | |
| → Max. operating temperature → 25°C | Cycling | Tan δ, IR : initial spec. | Min. operating temperature → 25°C | |
| | | | → Max. operating temperature → 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)



A 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.

- Disclaimer & Limitation of Use and Application -

The products listed in this Specification sheet are **NOT** designed and manufactured for any use and applications set forth below.

Please note that any misuse of the products deviating from products specifications or information provided in this Spec sheet may cause serious property damages or personal injury.

We will **NOT** be liable for any damages resulting from any misuse of the products, specifically including using the products for high reliability applications as listed below.

If you have any questions regarding this 'Limitation of Use and Application', you should first contact our sales personnel or application engineers.

- ① Aerospace/Aviation equipment
- ② Automotive or Transportation equipment (vehicles, trains, ships, etc)
- 3 Medical equipment
- 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.