



SPECIFICATION

(Reference sheet)

· Supplier : Samsung electro-mechanics · Samsung P/N : CL10A226MQ8NRNC

· Product : Multi-layer Ceramic Capacitor · Description : CAP, 22uF, 6.3V, ±20%, X5R, 0603

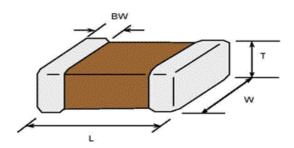
A. Samsung Part Number

 CL
 10
 A
 226
 M
 Q
 8
 N
 R
 N
 C

 1
 2
 3
 4
 5
 6
 7
 8
 9
 00
 10

| 1 | Series | Samsung Multi-layer Ceramic Capacitor | | | | | |
|-----|---------------|---------------------------------------|---------|-----------------|----|----------------------------|--|
| 2 | Size | 0603 (inch code) | L: 1.60 | ± 0.20 mm | W: | $0.80 \pm 0.20 \text{ mm}$ | |
| 3 | Dielectric | X5R | 8 | Inner electrode | | Ni | |
| 4 | Capacitance | 22 uF | | Termination | | Cu | |
| (5) | Capacitance | ±20 % | | Plating | | Sn 100% (Pb Free) | |
| | tolerance | | 9 | Product | | Size control code | |
| 6 | Rated Voltage | 6.3 V | 10 | Special | | Reserved for future use | |
| 7 | Thickness | $0.80 \pm 0.20 \text{ mm}$ | 11 | Packaging | | Cardboard Type, 7" reel | |

B. Structure & Dimension



| Samsung P/N | Dimension(mm) | | | | | |
|-----------------|---------------|-------------|-------------|-------------|--|--|
| Samsung F/N | L | W | Т | BW | | |
| CL10A226MQ8NRNC | 1.60 ± 0.20 | 0.80 ± 0.20 | 0.80 ± 0.20 | 0.30 ± 0.20 | | |

C. Samsung Reliablility Test and Judgement Condition

| Tan δ (DF) 0.1 max. treated at 150 ℃ +0/-10 ℃ for 1 hour and maintained ambient air for 24±2 hours. Insulation Resistance Whichever is smaller Appearance No abnormal exterior appearance Withstanding Voltage Temperature Characteristics (From-55 ℃ to 85 ℃, Capacitance change should be within ±15%) Adhesive Strength of Termination Bending Strength of Termination Bending Strength Oapacitance 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 Appearance to Capacitance change: within ±7.5% Soldering Heat Vibration Test Capacitance change: within ±5% Tan δ, IR: initial spec. Vibration Test Capacitance change: within ±12.5% Moisture Capacitance change: within ±12.5% Tan δ: 0.25 max IR: 500Mohm or 8.8Mohm × μF Whichever is smaller High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage | | Judgement | Test condition | | |
|---|-------------------|---|---|--|--|
| Tan δ (DF) 0.1 max. treated at 150 ℃ +0/-10 ℃ for 1 hour and maintained ambient air for 24±2 hours. Insulation 10,000Mohm or 50Mohm×μF Resistance Whichever is smaller Appearance No abnormal exterior appearance Withstanding Voltage No dielectric breakdown or mechanical breakdown Temperature Characteristics (From-55 ℃ to 85 ℃, 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 Resistance to Soldering Heat Vibration Test Capacitance change: within ±7.5% Solder pot: 270±5 ℃, 10±1sec. Amplitude: 1.5mm From 10Hz to 55Hz (return: 1min.) 2hours × 3 direction (x, y, z) With nated voltage High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage 40±2 ℃, 90~95%RH, 500+12/-0hrs With 150% of the rated voltage | Capacitance | Within specified tolerance | 120Hz ±20% / 0.5±0.1Vrms | | |
| Resistance Whichever is smaller Appearance No abnormal exterior appearance Microscope (×10) Withstanding No dielectric breakdown or mechanical breakdown 250% of the rated voltage Temperature X5R Characteristics (From-55℃ to 85℃, Capacitance change should be within ±15%) 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 ō, IR : initial spec. Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Wiosture Capacitance change : within ±12.5% With rated voltage Resistance Tan ō : 0.25 max IR : 500Mohm or 8.8Mohm × μF Whichever is smaller Whichever is smaller With 150% of the rated voltage High Temperature Capacitance change : within ±12.5% With 150% of the rated voltage | Tan δ (DF) | 0.1 max. | *A capacitor prior to measuring the capacitance is heat treated at $150^{\circ}\text{C}+0/-10^{\circ}\text{C}$ for 1 hour and maintained in ambient air for 24±2 hours. | | |
| Appearance No abnormal exterior appearance Microscope (×10) Withstanding No dielectric breakdown or mechanical breakdown 250% of the rated voltage Temperature X5R Characteristics (From-55℃ to 85℃, Capacitance change should be within ±15%) 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. 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. 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: 0.25 max Within ±12.5% With 150% of the rated voltage High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage | Insulation | 10,000Mohm or 50Mohm×μF | Rated Voltage 60~120 sec. | | |
| Withstanding No dielectric breakdown or mechanical breakdown 250% of the rated voltage Temperature Characteristics X5R Characteristics (From-55℃ to 85℃, Capacitance change should be within ±15%) 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 Resistance Tan δ: 0.25 max IR: 500Mohm or 8.8Mohm × μF Whichever is smaller With 150% of the rated voltage High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage | Resistance | Whichever is smaller | | | |
| Voltage mechanical breakdown Temperature X5R Characteristics (From-55 ℃ to 85 ℃, Capacitance change should be within ±15%) 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) Woisture Capacitance change : within ±12.5% With rated voltage Resistance Tan δ : 0.25 max IR : 500Mohm or 8.8Mohm × μF Whichever is smaller With 150% of the rated voltage High Temperature Capacitance change : within ±12.5% With 150% of the rated voltage | Appearance | No abnormal exterior appearance | Microscope (×10) | | |
| Temperature Characteristics (From-55℃ to 85℃, 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 Resistance to Capacitance change: within ±7.5% Solder pot: 270±5℃, 10±1sec. Soldering Heat Vibration Test Capacitance change: within ±5% Tan δ, IR: initial spec. Vibration Test Capacitance change: within ±5% Tan δ, IR: initial spec. Within ±12.5% Moisture Resistance Capacitance change: within ±12.5% With rated voltage 40±2℃, 90~95%RH, 500+12/-0hrs Whichever is smaller High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage | Withstanding | No dielectric breakdown or | 250% of the rated voltage | | |
| Characteristics (From-55 ℃ to 85 ℃, Capacitance change should be within ±15%) 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℃, 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 Resistance Capacitance change : within ±12.5% With rated voltage 40±2℃, 90~95%RH, 500+12/-0hrs IR : 500Mohm or 8.8Mohm × № Whichever is smaller With 150% of the rated voltage High Temperature Capacitance change : within ±12.5% With 150% of the rated voltage | Voltage | mechanical breakdown | | | |
| Adhesive Strength of TerminationNo peeling shall be occur on the terminal electrode500g·f, for 10±1 sec.Bending StrengthCapacitance change : within ±12.5%Bending to the limit (1mm) with 1.0mm/sec.SolderabilityMore than 75% of terminal surface is to be soldered newlySnAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (preheating : 80~120°C for 10~30sec.)Resistance toCapacitance change : within ±7.5%Solder pot : 270±5°C, 10±1sec.Soldering HeatTan δ, IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)WoistureCapacitance change : within ±12.5%With rated voltageResistanceTan δ : 0.25 max IR : 500Mohm or 8.8Mohm × μF Whichever is smallerWith 150% of the rated voltageHigh TemperatureCapacitance change : within ±12.5%With 150% of the rated voltage | Temperature | X5R | | | |
| of Terminationterminal electrodeBending StrengthCapacitance change : within $\pm 12.5\%$ Bending to the limit (1mm)SolderabilityMore than 75% of terminal surface is to be soldered newlySnAg3.0Cu0.5 solder $245\pm5^{\circ}$ C, 3 ± 0.3 sec. (preheating : $80\sim120^{\circ}$ C for $10\sim30$ sec.)Resistance toCapacitance change : within $\pm 7.5\%$ Solder pot : $270\pm5^{\circ}$ C, 10 ± 1 sec.Soldering HeatTan δ , IR : initial spec.Amplitude : 1.5 mmVibration TestCapacitance change : within $\pm 5\%$ Amplitude : 1.5 mmTan δ , IR : initial spec.From 10 Hz to 55 Hz (return : 1 min.) 2 hours $\times 3$ direction (x, y, z)MoistureCapacitance change : within $\pm 12.5\%$ With rated voltageResistanceTan δ : 0.25 max IR : 500 Mohm or 8.8 Mohm $\times \mu$ F Whichever is smallerWith 150% of the rated voltageHigh TemperatureCapacitance change : within $\pm 12.5\%$ With 150% of the rated voltage | Characteristics | (From-55 ℃ to 85 ℃, Capacitance change sh | nould 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 From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Woisture Capacitance change : within ±12.5% With rated voltage Resistance Tan δ : 0.25 max IR : 500Mohm or 8.8Mohm × μF With rated voltage High Temperature Capacitance change : within ±12.5% With 150% of the rated voltage | Adhesive Strength | No peeling shall be occur on the | 500g·f, for 10±1 sec. | | |
| 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 Soldering Heat Capacitance change : within ±7.5% Solder pot : 270±5°C, 10±1sec. Vibration Test Capacitance change : within ±5% 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% Tan δ : 0.25 max IR : 500Mohm or 8.8Mohm × μF Whichever is smaller With rated voltage 40±2°C, 90~95%RH, 500+12/-0hrs High Temperature Capacitance change : within ±12.5% With 150% of the rated voltage | of Termination | terminal electrode | | | |
| SolderabilityMore than 75% of terminal surface is to be soldered newlySnAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (preheating : 80~120°C for 10~30sec.)Resistance to Soldering HeatCapacitance change : Tan δ , IR : initial spec.Within $\pm 7.5\%$ Solder pot : 270 ± 5 °C, 10 ± 1 sec.Vibration TestCapacitance change : Tan δ , IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)MoistureCapacitance change : Tan δ : 0.25 max IR : 500Mohm or 8.8Mohm × μ F Whichever is smallerWith rated voltage 40 ± 2 °C, 90~95%RH, 500+12/-0hrsHigh TemperatureCapacitance change : Within $\pm 12.5\%$ With 150% of the rated voltage | 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. | | |
| | 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. Vibration Test Capacitance change : within $\pm 5\%$ Amplitude : 1.5 mm From 10 Hz to 55 Hz (return : 1 min.) 2hours × 3 direction (x, y, z) Moisture Capacitance change : within $\pm 12.5\%$ With rated voltage Resistance Tan δ : 0.25 max IR : 500 Mohm or 8.8 Mohm × μ F Whichever is smaller High Temperature Capacitance change : within $\pm 12.5\%$ With 150% of the rated voltage | | 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 \times 3 direction (x, y, z)MoistureCapacitance change : within \pm 12.5%With rated voltageResistanceTan δ : 0.25 max IR : 500Mohm or 8.8Mohm $\times \mu$ F Whichever is smallerWith 150% of the rated voltageHigh TemperatureCapacitance change : within \pm 12.5%With 150% of the rated voltage | | | (preheating : 80~120°C for 10~30sec.) | | |
| Vibration TestCapacitance change : Tan δ , IR : initial spec.within \pm 5% From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)MoistureCapacitance change : Tan δ : UR : Whichever is smallerWith rated voltage 40 \pm 2°C, 90~95%RH, 500+12/-0hrsHigh TemperatureCapacitance change : Within \pm 12.5%With \pm 150% With \pm 150% of the rated voltage | Resistance to | Capacitance change : within ±7.5% | Solder pot : 270±5℃, 10±1sec. | | |
| Tan δ , IR: initial spec. From 10Hz to 55Hz (return: 1min.) 2hours × 3 direction (x, y, z) Moisture Resistance Tan δ : 0.25 max IR: 500Mohm or 8.8Mohm × μ F Whichever is smaller High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage | Soldering Heat | Tan δ, IR : initial spec. | | | |
| Resistance Tan δ : 0.25 max 40±2°C, 90~95%RH, 500+12/-0hrs IR: 500Mohm or 8.8Mohm × μ F Whichever is smaller High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage | Vibration Test | , · · · · · · · · · · · · · · · · · · · | From 10Hz to 55Hz (return : 1min.) | | |
| IR: 500Mohm or 8.8Mohm × μ F Whichever is smaller High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage | Moisture | Capacitance change : within ±12.5% | With rated voltage | | |
| Whichever is smaller High Temperature Capacitance change: within ±12.5% With 150% of the rated voltage | Resistance | Tan δ : 0.25 max | 40±2°C, 90~95%RH, 500+12/-0hrs | | |
| ingi remperatare papasitanes shange . Walling 172.678 | | | | | |
| Resistance Tan δ : 0.25 max Max operating temperature | High Temperature | Capacitance change : within ±12.5% | With 150% of the rated voltage | | |
| 1 Tan 6 . 6.26 max max operating temperature | Resistance | Tan δ : 0.25 max | Max. operating temperature | | |
| IR: 1,000Mohm or 17.7Mohm × μ F 1,000+48/-0hrs Whichever is smaller | | | 1,000+48/-0hrs | | |
| Temperature Capacitance change: within ±10% 1 cycle condition | Temperature | Capacitance change : within ±10% | 1 cycle condition | | |
| Cycling Tan δ, IR : initial spec. Min. operating temperature \rightarrow 25°C | Cycling | Tan δ, IR : initial spec. | Min. operating temperature → 25°C | | |
| → Max. operating temperature → 25°C | | | → Max. operating temperature → 25°C | | |
| 5 cycle test | | | 5 cycle test | | |

^{**} The reliability test condition can be replaced by the corresponding accelerated test condition.

D. Recommended Soldering method:

Reflow (Reflow Peak Temperature : 260±5°C, 30sec.)



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
- 4 Military equipment
- ⑤ Disaster prevention/crime prevention equipment
- 6 Power plant control equipment
- Atomic energy-related equipment
- Undersea equipment
- Traffic signal equipment
- Data-processing equipment
- ## Electric heating apparatus, burning equipment
- Safety equipment
- ® Any other applications with the same as or similar complexity or reliability to the applications