



# **SPECIFICATION**

(Reference sheet)

- Supplier : Samsung electro-mechanics - Samsung P/N : CL10C3R6BB8NNNC

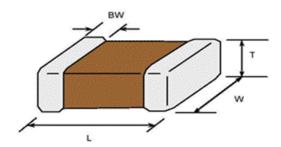
Product : Multi-layer Ceramic Capacitor
 Description : CAP, 3.6pF, 50V, ± 0.1pF, C0G, 0603

### A. Samsung Part Number

<u>CL</u> <u>10</u> <u>C</u> <u>3R6</u> <u>B</u> <u>B</u> <u>8</u> <u>N</u> <u>N</u> <u>N</u> <u>C</u> 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	C0G	8 Inner electrode	Ni
4	Capacitance	<b>3.6</b> pF	Termination	Cu
(5)	Capacitance	± 0.1pF	Plating	Sn 100% (Pb Free)
	tolerance		9 Product	Normal
6	Rated Voltage	50 V	Special	Reserved for future use
7	Thickness	0.80 ± 0.10 mm	① Packaging	Cardboard Type, 7" reel

#### B. Structure and dimension



Samsung P/N	Dimension(mm)				
(Lead Free)	L	W	Т	BW	
CL10C3R6BB8NNNC	1.60 ± 0.10	0.80 ± 0.10	0.80 ± 0.10	0.30 ± 0.20	

#### C. Samsung Reliability Test and Judgement condition

A72 min   10,000Mohm or 500Mohm×, pF   Rated Voltage   60~120 sec.   Microscop (X10)   Microscop (X1		Performance	Test condition			
A72 min   10,000Mohm or 500Mohm×, pF   Rated Voltage   60~120 sec.   Microscop (X10)   Microscop (X1	Capacitance	Within specified tolerance	15 ± 10% / 0.5~5 Vrms			
Resistance Whichever is smaller  Appearance No abnormal exterior appearance Withstanding No dielectric breakdown or Woltage mechanical breakdown  Temperature COG Characteristics (From -55°C to 125°C, Capacitance change should be within ±30PPM/°C) Adhesive Strength No peeling shall be occur on the terminal electrode Bending Strength Within ±5% or ±0.5pF whichever is larger Solderability More than 75% of terminal surface is to be soldered newly Within ±2.5% or ±0.25pF whichever is larger Tan δ, IR: initial spec.  Wibration Test Capacitance change: Within ±2.5% or ±0.25pF whichever is larger Tan δ, IR: initial spec.  Wibration Test Capacitance change: Within ±2.5% or ±0.25pF whichever is larger Tan δ, IR: initial spec.  Wibration Test Capacitance change: Within ±2.5% or ±0.25pF whichever is larger Tan δ, IR: initial spec.  Wibration Test Capacitance change: Within ±2.5% or ±0.25pF whichever is larger Tan δ, IR: initial spec.  With rated voltage With rated voltage With rated voltage  With rated voltage  With rated voltage  With rated voltage  With rated voltage  With rated voltage  With rated voltage  With rated voltage  With rated voltage  With rated voltage  With rated voltage  With rated voltage	Q	472 min				
Appearance No abnormal exterior appearance Withstanding No dielectric breakdown or mechanical breakdown  Temperature COG Characteristics (From -55°C to 125°C, Capacitance change should be within ±30PPM/°C) Adhesive Strength No peeling shall be occur on the terminal electrode Bending Strength Capacitance change: within ±5% or ±0.5pF whichever is larger Within ±5% or ±0.5pF whichever is larger Solderability More than 75% of terminal surface is to be soldered newly  Resistance to Capacitance change: within ±2.5% or ±0.25pF whichever is larger Tan δ, IR: initial spec.  Vibration Test Capacitance change: within ±2.5% or ±0.25pF whichever is larger Tan δ, IR: initial spec.  Amplitude: 1.5mm From 10Hz to 55Hz (return: 1min.) 2hours '3 direction (x, y, z) With rated voltage With rated voltage Within ±7.5% or ±0.75pF whichever is larger Q: 112 min IR: 500Mohm or 25Mohm × μF Whichever is smaller	Insulation	10,000Mohm or 500Mohm× <i>μ</i> F	Rated Voltage 60~120 sec.			
Withstanding       No dielectric breakdown or mechanical breakdown       300% of the rated voltage         Temperature       C0G         Characteristics       (From -55℃ to 125℃, Capacitance change should be within ±30PPM/℃)         Adhesive Strength of Termination       No peeling shall be occur on the terminal electrode       500g×F, for 10±1 sec.         Bending Strength       Capacitance change : within ±5% or ±0.5pF whichever is larger within ±5% or ±0.5pF whichever is larger is to be soldered newly       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         45±5℃, 3±0.3sec. (preheating : 80~120℃ for 10~30sec.)       (preheating : 80~120℃ for 10~30sec.)         Resistance to       Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.       Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.)         Vibration Test       Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.       Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.)         With rated voltage       With rated voltage         Woisture       Capacitance change : within ±7.5% or ±0.75pF whichever is larger Q : 112 min       With rated voltage         Resistance       With rated voltage       40±2℃, 90~95%RH, 500+12/-0hrs         With rated voltage       40±2℃, 90~95%RH, 500+12/-0hrs	Resistance	Whichever is smaller				
Temperature   C0G	Appearance	No abnormal exterior appearance	Microscop (X10)			
Temperature COG Characteristics (From -55°C to 125°C, Capacitance change should be within ±30PPM/°C)  Adhesive Strength of Termination Bending Strength Of Termination Bending Strength  Capacitance change : within ±5% or ±0.5pF whichever is larger Solderability  More than 75% of terminal surface is to be soldered newly  Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.  Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.  Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.  Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.  Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.  Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.  Capacitance change : within ±2.5% or ±0.75pF whichever is larger Q : 112 min IR : 500Mohm or 25Mohm × μF Whichever is smaller	Withstanding	No dielectric breakdown or	300% of the rated voltage			
Characteristics         (From -55°C to 125°C, Capacitance change should be within ±30PPM/°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 ±5% or ±0.5pF whichever is larger         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 ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.         Solder pot : 270±5°C, 10±1sec.           Vibration Test         Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.         Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours '3 direction (x, y, z)           Moisture         Capacitance change : within ±7.5% or ±0.75pF whichever is larger Q : 112 min IR : 500Mohm or 25Mohm × μF Whichever is smaller         With rated voltage 40±2°C, 90~95%RH, 500+12/-0hrs	Voltage	mechanical breakdown				
Adhesive Strength of Termination       No peeling shall be occur on the terminal electrode       500g×F, for 10±1 sec.         Bending Strength       Capacitance change : within ±5% or ±0.5pF whichever is larger       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.)       (preheating : 80~120°C for 10~30sec.)         Resistance to Soldering heat       Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.       Solder pot : 270±5°C, 10±1sec.         Vibration Test       Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.       Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours ′ 3 direction (x, y, z)         Moisture       Capacitance change : within ±7.5% or ±0.75pF whichever is larger Q : 112 min IR : 500Mohm or 25Mohm × μF Whichever is smaller       With rated voltage 40±2°C, 90~95%RH, 500+12/-0hrs			•			
of Termination       terminal electrode         Bending Strength       Capacitance change : within ±5% or ±0.5pF whichever is larger       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.)       Solder pot : 270±5°C, 10±1sec.         Resistance to       Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.       Amplitude : 1.5mm         Vibration Test       Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.       Amplitude : 1.5mm         Moisture       Capacitance change : within ±7.5% or ±0.75pF whichever is larger Q : 112 min IR : 500Mohm or 25Mohm × μF       With rated voltage         Resistance       Within ±7.5% or ±0.75pF whichever is larger Q : 112 min IR : 500Mohm or 25Mohm × μF       With rated voltage	Characteristics	(From -55 ℃ to 125 ℃, Capacitance change should be within ±30PPM/ ℃)				
Bending Strength   Capacitance change : within ±5% or ±0.5pF whichever is larger   Solderability   With 1.0mm/sec.   SnAg3.0Cu0.5 solder   245±5°C, 3±0.3sec.   (preheating : 80~120°C for 10~30sec.)	Adhesive Strength	No peeling shall be occur on the	500g×F, for 10±1 sec.			
within ±5% or ±0.5pF whichever is larger  More than 75% of terminal surface is to be soldered newly  Capacitance change:  With 1.0mm/sec.  SnAg3.0Cu0.5 solder  245±5°C, 3±0.3sec. (preheating: 80~120°C for 10~30sec.)  Solder pot: 270±5°C, 10±1sec.  Solder pot: 270±5°C, 10±1sec.  Solder pot: 270±5°C, 10±1sec.  Within ±2.5% or ±0.25pF whichever is larger  Tan δ, IR: initial spec.  Capacitance change:  within ±2.5% or ±0.25pF whichever is larger  Tan δ, IR: initial spec.  Capacitance change:  with 1.0mm/sec.  SnAg3.0Cu0.5 solder  245±5°C, 3±0.3sec. (preheating: 80~120°C for 10~30sec.)  Solder pot: 270±5°C, 10±1sec.  Amplitude: 1.5mm  From 10Hz to 55Hz (return: 1min.)  2hours ′ 3 direction (x, y, z)  With rated voltage  With rated voltage  40±2°C, 90~95%RH, 500+12/-0hrs  With rated voltage  40±2°C, 90~95%RH, 500+12/-0hrs	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 Soldering heat       Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.       Solder pot : 270±5 °C, 10±1sec.         Vibration Test       Capacitance change : within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.       Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours ′3 direction (x, y, z)         Moisture Resistance       Capacitance change : within ±7.5% or ±0.75pF whichever is larger Q : 112 min IR : 500Mohm or 25Mohm × μF Whichever is smaller       With rated voltage 40±2°C, 90~95%RH, 500+12/-0hrs	Bending Strength	Capacitance change :	Bending to the limit (1mm)			
is to be soldered newly $ 245\pm5^\circ C,  3\pm0.3 \text{sec.} \\  \text{(preheating: } 80\sim120^\circ C \text{ for } 10\sim30 \text{sec.}) $ $ \text{Resistance to} $ $ \text{Capacitance change:} \\  \text{within } \pm2.5\% \text{ or } \pm0.25^\circ F \text{ whichever is larger} \\  \text{Tan } \delta,  \text{IR: initial spec.} $ $ \text{Capacitance change:} \\  \text{within } \pm2.5\% \text{ or } \pm0.25^\circ F \text{ whichever is larger} \\  \text{Tan } \delta,  \text{IR: initial spec.} $ $ \text{Amplitude: } 1.5 \text{mm} \\  \text{From } 10\text{Hz to } 55\text{Hz (return: 1min.)} \\  \text{2hours } \text{`3 direction (x, y, z)} $ $ \text{Moisture} \\  \text{Resistance} $ $ \text{Within } \pm7.5\% \text{ or } \pm0.75^\circ F \text{ whichever is larger} \\  Q:   \text{112 min} \\  \text{IR: } 500\text{Mohm or } 25\text{Mohm} \times \mu F \\   \text{Whichever is smaller} $ $ \text{Whichever is smaller} $		within ±5% or ±0.5pF whichever is larger	1			
(preheating : 80~120 °C for 10~30sec.)  Resistance to Soldering heat  Capacitance change : within ±2.5% or ±0.25 pF whichever is larger Tan δ, IR : initial spec.  Vibration Test  Capacitance change : within ±2.5% or ±0.25 pF whichever is larger Tan δ, IR : initial spec.  Capacitance change : within ±2.5% or ±0.25 pF whichever is larger Tan δ, IR : initial spec.  Moisture  Resistance  Capacitance change : within ±7.5% or ±0.75 pF whichever is larger Q: 112 min IR : 500Mohm or 25Mohm × μF Whichever is smaller	Solderability	More than 75% of terminal surface				
Resistance to Soldering heat Capacitance change : within $\pm 2.5\%$ or $\pm 0.25p\text{F}$ whichever is larger Tan $\delta$ , IR: initial spec. Capacitance change : within $\pm 2.5\%$ or $\pm 0.25p\text{F}$ whichever is larger within $\pm 2.5\%$ or $\pm 0.25p\text{F}$ whichever is larger Tan $\delta$ , IR: initial spec. Amplitude: 1.5mm From $\pm 10\text{Hz}$ to $\pm 10\text{Hz}$ to $\pm 10\text{Hz}$ to $\pm 10\text{Hz}$ (return: 1min.) 2hours '3 direction (x, y, z) 2hours '3 direction (x, y, z) 3 direction (x, y, z) 40 direction		is to be soldered newly	245±5℃, 3±0.3sec.			
Soldering heat within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\delta$ , IR: initial spec.  Vibration Test Capacitance change: within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\delta$ , IR: initial spec. Amplitude: 1.5mm From $\pm 10\mathrm{Hz}$ to $\pm 10\mathrm{Hz}$ to $\pm 10\mathrm{Hz}$ (return: 1min.) 2hours $\pm 10\mathrm{Hz}$ direction (x, y, z)  Moisture Capacitance change: With rated voltage Within $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger Q: $\pm 112\mathrm{min}$ IR: $\pm 500\mathrm{Mohm}$ or $\pm 25\mathrm{Mohm}$ x		·				
Soldering heat within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\delta$ , IR: initial spec.  Vibration Test Capacitance change: within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\delta$ , IR: initial spec. Amplitude: 1.5mm From $\pm 10\mathrm{Hz}$ to $\pm 10\mathrm{Hz}$ to $\pm 10\mathrm{Hz}$ (return: 1min.) 2hours $\pm 10\mathrm{Hz}$ direction (x, y, z)  Moisture Capacitance change: With rated voltage Within $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger Q: $\pm 112\mathrm{min}$ IR: $\pm 500\mathrm{Mohm}$ or $\pm 25\mathrm{Mohm}$ x						
Tan $\delta$ , IR: initial spec.  Capacitance change:  within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger  Tan $\delta$ , IR: initial spec.  Amplitude: 1.5mm  From $10\mathrm{Hz}$ to $55\mathrm{Hz}$ (return: 1min.)  2hours ´ 3 direction (x, y, z)  Moisture  Capacitance change:  within $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger  Q: 112 min  IR: 500Mohm or 25Mohm × $\mu\mathrm{F}$ Whichever is smaller	Resistance to	Capacitance change :	Solder pot : 270±5℃, 10±1sec.			
Vibration TestCapacitance change : within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\delta$ , IR : initial spec.Amplitude : 1.5mmMoistureCapacitance change : within $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger Q : Nondommer Capacitance of the control of the contr	Soldering heat	within ±2.5% or ±0.25pF whichever is larger				
within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\delta$ , IR: initial spec.  From $10\mathrm{Hz}$ to $55\mathrm{Hz}$ (return: 1min.)  2hours ´3 direction (x, y, z)  Moisture  Resistance  within $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger Q: 112 min  IR: 500Mohm or 25Mohm × $\mu\mathrm{F}$ Whichever is smaller	_	Tan δ, IR : initial spec.				
Tan $\delta$ , IR: initial spec. 2hours ´3 direction (x, y, z)  Moisture Capacitance change: With rated voltage within $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger Q: 112 min IR: 500Mohm or 25Mohm × $\mu\mathrm{F}$ Whichever is smaller	Vibration Test	Capacitance change :	Amplitude : 1.5mm			
MoistureCapacitance change :With rated voltageResistancewithin $\pm 7.5\%$ or $\pm 0.75$ pF whichever is larger $40\pm 2$ °C, $90\sim 95\%$ RH, $500+12/-0$ hrsQ :112 minIR : $500$ Mohm or $25$ Mohm × $\mu$ FWhichever is smaller		within ±2.5% or ±0.25pF whichever is larger	From 10Hz to 55Hz (return : 1min.)			
Resistance within $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger Q: 112 min IR: 500Mohm or 25Mohm × $\mu\mathrm{F}$ Whichever is smaller		Tan δ, IR : initial spec.	2hours ´ 3 direction (x, y, z)			
Q: 112 min IR: 500Mohm or 25Mohm × $\mu$ F Whichever is smaller	Moisture	Capacitance change :	· · · ·			
Q: 112 min IR: 500Mohm or 25Mohm × $\mu$ F Whichever is smaller	Resistance	within ±7.5% or ±0.75pF whichever is larger	_			
Whichever is smaller		Q: 112 min				
		IR : 500Mohm or 25Mohm × $\mu$ F				
High Temperature Capacitance change : With 200% of the rated voltage		Whichever is smaller				
	High Temperature	Capacitance change :	With 200% of the rated voltage			
Resistance within ±3% or ±0.3pF whichever is larger Max. operating temperature	Resistance	within ±3% or ±0.3pF whichever is larger				
Q: 236 min 1000+48/-0hrs		Q: 236 min	1000+48/-0hrs			
IR: 1,000Mohm or 50Mohm × $\mu$ F		IR: 1,000Mohm or 50Mohm × $\mu$ F				
Whichever is smaller		Whichever is smaller				
Temperature Capacitance change : 1 cycle condition	Temperature	Capacitance change :	1 cycle condition			
	Cycling		<u> </u>			
Tan $\delta$ , IR: initial spec. $\rightarrow$ Max. operating temperature $\rightarrow$ 25°C	-	-	1			
			. , ,			
5 cycle test			5 cycle test			

<sup>\*</sup> 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.

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

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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.

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- 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.