



# **SPECIFICATION**

(Reference sheet)

- Supplier : Samsung electro-mechanics - Samsung P/N : CL31C100JGFNNWE

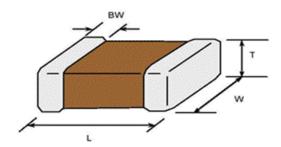
Product : Multi-layer Ceramic Capacitor
 Description : CAP, 10pF, 500V, ± 5%, C0G, 1206

### A. Samsung Part Number

<u>CL</u> <u>31</u> <u>C</u> <u>100</u> <u>J</u> <u>G</u> <u>F</u> <u>N</u> <u>N</u> <u>W</u> <u>E</u> ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

1	Series	Samsung Multi-layer Ceramic Capacitor		
2	Size	1206 (inch code)	L: 3.20 ± 0.15 mm	W: 1.60 ± 0.15 mm
3	Dielectric	C0G	8 Inner electrode	Ni
4	Capacitance	<b>10</b> pF	Termination	Cu
(5)	Capacitance	± 5%	Plating	Sn 100% (Pb Free)
	tolerance		Product	Normal
6	Rated Voltage	500 V	Special	Industrial (Network,etc)
7	Thickness	1.25 ± 0.15 mm	① Packaging	Embossed Type, 7" reel

#### B. Structure and dimension



Samsung P/N	Dimension(mm)				
(Lead Free)	L	W	Т	BW	
CL31C100JGFNNWE	3.20 ± 0.15	1.60 ± 0.15	1.25 ± 0.15	0.50 ± 0.30	

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

Rated Voltage   60~120 sec.		Performance	Test condition			
Rated Voltage   60~120 sec.	Capacitance	Within specified tolerance	1₩z±10% / 0.5~5Vrms			
Resistance       Whichever is smaller         Appearance       No abnormal exterior appearance       Microscop (X10)         Withstanding       No dielectric breakdown or mechanical breakdown       150% of the rated voltage         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       500g×F, for 10±1 sec.         Bending Strength       Capacitance change:       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         Solderability       More than 75% of terminal surface is to be soldered newly       SnAg3.0Cu0.5 solder       Solder pot : 270±5°C, 10±1sec.         Resistance to       Capacitance change:       Solder pot : 270±5°C, 10±1sec.         Wibration Test       Capacitance change:       Amplitude: 1.5mm       From 10Hz to 55Hz (return: 1min.)         Wibration Test       Capacitance change:       Amplitude: 1.5mm       From 10Hz to 55Hz (return: 1min.)         Moisture       Capacitance change:       With rated voltage       With rated voltage         Moisture       Capacitance change:       With rated voltage         Milliance in Internation       With rated voltage         With rated	Q	600 min				
No abnormal exterior appearance   Microscop (X10)	Insulation	10,000Mohm or 500Mohm× <i>μ</i> F	Rated Voltage 60~120 sec.			
Withstanding       No dielectric breakdown or mechanical breakdown       150% 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 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         Solderability       Soldered newly       245±5℃, 3±0.3sec. (preheating : 80~120℃ 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℃, 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 : 133.33 min IR : 500Mohm or 25Mohm × μF       With rated voltage	Resistance	Whichever is smaller				
Voltage         mechanical breakdown           Temperature         C0G           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 of Termination         Capacitance change : within ±5% or ±0.5 pF 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 ±0.25 pF whichever is larger 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 ±2.5% or ±0.25 pF whichever is larger Tan δ, IR : initial spec.         With rated voltage         With rated voltage           Moisture         Capacitance change : within ±7.5% or ±0.75 pF whichever is larger Q : 133.33 min IR : 500Mohm or 25Mohm × μF         With rated voltage         40±2 °C, 90~95%RH, 500+12/-0hrs	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 Of Termination  Bending Strength  Capacitance change : within ±5% or ±0.5pF whichever is larger With 1.0mm/sec.  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.  Vibration Test  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.  Within ±2.5% or ±0.25pF whichever is larger Tan δ, IR : initial spec.  Capacitance change : within ±7.5% or ±0.75pF whichever is larger Q : 133.33 min IR : 500Mohm or 25Mohm × μF	Withstanding	No dielectric breakdown or	150% of the rated voltage			
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Adhesive 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  Resistance to  Soldering heat  Vibration Test  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.  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     Tan δ, IR: initial spec.  Capacitance change:     within ±7.5% or ±0.75pF whichever is larger     Q: 133.33 min     IR: 500Mohm or 25Mohm × μF	Temperature	COG				
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.)         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         Moisture       Capacitance change : within ±7.5% or ±0.75pF whichever is larger Q : 133.33 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       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 : 133.33 min       With rated voltage         Resistance       With rated voltage         Q : 133.33 min       IR : 500Mohm or 25Mohm × μF	Adhesive Strength	No peeling shall be occur on the	500g×F, for 10±1 sec.			
within $\pm 5\%$ or $\pm 0.5 p$ F whichever is larger with 1.0mm/sec.  Solderability  More than 75% of terminal surface is to be soldered newly  Capacitance change:  Within $\pm 2.5\%$ or $\pm 0.25 p$ F whichever is larger Tan $\delta$ , IR: initial spec.  Vibration Test  Capacitance change:  within $\pm 2.5\%$ or $\pm 0.25 p$ F whichever is larger Tan $\delta$ , IR: initial spec.  Vibration Test  Capacitance change:  within $\pm 2.5\%$ or $\pm 0.25 p$ F whichever is larger Tan $\delta$ , IR: initial spec.  Capacitance change:  within $\pm 2.5\%$ or $\pm 0.25 p$ F whichever is larger Tan $\delta$ , IR: initial spec.  Capacitance change:  within $\pm 2.5\%$ or $\pm 0.25 p$ F whichever is larger Tan $\delta$ , IR: initial spec.  Capacitance change:  within $\pm 2.5\%$ or $\pm 0.25 p$ F whichever is larger Tan $\delta$ , IR: initial spec.  With rated voltage  With rated voltage  40±2°C, 90~95%RH, 500+12/-0hrs  Resistance  Q: 133.33 min  IR: 500Mohm or 25Mohm × $\mu$ F	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 : within ±2.5% or ±0.25 pF whichever is larger Tan δ, IR : initial spec.Solder pot : 270±5 °C, 10±1sec.Vibration TestCapacitance change : within ±2.5% or ±0.25 pF whichever is larger Tan δ, IR : initial spec.Amplitude : 1.5mmVibration TestFrom 10Hz to 55Hz (return : 1min.) 2hours ´3 direction (x, y, z)MoistureCapacitance change : within ±7.5% or ±0.75 pF whichever is larger Q : 133.33 min IR : 500Mohm or 25Mohm × $\mu$ FWith 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}\text{C},  3\pm0.3\text{sec.} \\  \text{(preheating: 80~120^{\circ}\text{C for }10~30\text{sec.})} $ $ \text{Resistance to} $ $ \text{Capacitance change:} \\  \text{within } \pm2.5\% \text{ or } \pm0.25^{\circ}\text{F} \text{ whichever is larger} \\  \text{Tan } \delta,  \text{IR: initial spec.} $ $ \text{Capacitance change:} \\  \text{within } \pm2.5\% \text{ or } \pm0.25^{\circ}\text{F} \text{ whichever is larger} \\  \text{Tan } \delta,  \text{IR: initial spec.} $ $ \text{Amplitude: 1.5mm} \\  \text{From } 10^{\circ}\text{Hz to } 55^{\circ}\text{Hz (return: 1min.)} \\  \text{Tan } \delta,  \text{IR: initial spec.} $ $ \text{Moisture} \\  \text{Resistance} $ $ \text{Capacitance change:} \\  \text{within } \pm7.5\% \text{ or } \pm0.75^{\circ}\text{F} \text{ whichever is larger} \\  \text{Q: } 133.33 \text{ min} \\  \text{IR: } 500\text{Mohm or } 25\text{Mohm} \times \mu\text{F} $ $ \text{With } \frac{1}{2}^{\circ}\text{C},  3\pm0.3\text{sec.} \\  \text{Moisture} \\  \text{Capacitance change:} \\  \text{With rated voltage} \\  40\pm2^{\circ}\text{C},  90~95\%^{\circ}\text{RH, } 500+12/-0\text{hrs} \\  \text{O} = 133.33 \text{ min} \\  \text{IR: } 500\text{Mohm or } 25\text{Mohm} \times \mu\text{F} $		within ±5% or ±0.5pF whichever is larger				
(preheating : $80\sim120^{\circ}\mathrm{C}$ for $10\sim30\mathrm{sec.}$ )  Resistance to Soldering heat Capacitance change : within $\pm2.5\%$ or $\pm0.25_{\mathrm{p}}\mathrm{F}$ whichever is larger Tan $\delta$ , IR : initial spec.  Vibration Test Capacitance change : within $\pm2.5\%$ or $\pm0.25_{\mathrm{p}}\mathrm{F}$ whichever is larger Tan $\delta$ , IR : initial spec.  Vibration Test Capacitance change : within $\pm2.5\%$ or $\pm0.25_{\mathrm{p}}\mathrm{F}$ whichever is larger Tan $\delta$ , IR : initial spec.  Moisture Capacitance change : With rated voltage Within $\pm7.5\%$ or $\pm0.75_{\mathrm{p}}\mathrm{F}$ whichever is larger Q: $\pm0.75_{\mathrm{p}}\mathrm{F}$ whichever is larger $\pm0.95_{\mathrm{m}}\mathrm{F}$ whichever $\pm0.95_$	Solderability	More than 75% of terminal surface				
Resistance to Soldering heat Capacitance change : Solder pot : $270\pm5^{\circ}$ C, $10\pm1^{\circ}$ sec.  Within $\pm2.5\%$ or $\pm0.25^{\circ}$ F whichever is larger Tan $\delta$ , IR : initial spec.  Vibration Test Capacitance change : within $\pm2.5\%$ or $\pm0.25^{\circ}$ F whichever is larger Within $\pm2.5\%$ or $\pm0.25^{\circ}$ F whichever is larger Tan $\delta$ , IR : initial spec.  Moisture Capacitance change : With rated voltage Within $\pm7.5\%$ or $\pm0.75^{\circ}$ F whichever is larger Q: $\pm0.75^{\circ}$ F whichever is larger $\pm0.25^{\circ}$ C, $\pm0.25^{\circ}$ F whichever is larger $\pm0.25^{\circ}$ C, $\pm0.25^{\circ}$ F whichever is larger $\pm0.25^{\circ}$ F whichever $\pm0.25^{\circ}$ F whichever is larger $\pm0.25^{\circ}$ F whichever $\pm0.25^{\circ}$ F		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: Amplitude: 1.5mm From $\pm 10\mathrm{Hz}$ to $\pm 55\mathrm{Hz}$ (return: 1min.) Tan $\pm 50\mathrm{mm}$ , IR: initial spec. 2hours $\pm 30\mathrm{mm}$ Within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\pm 50\mathrm{mm}$ Ta						
Soldering heat within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\delta$ , IR: initial spec.  Vibration Test Capacitance change: Amplitude: 1.5mm From $\pm 10\mathrm{Hz}$ to $\pm 55\mathrm{Hz}$ (return: 1min.) Tan $\pm 50\mathrm{mm}$ , IR: initial spec. 2hours $\pm 30\mathrm{mm}$ Within $\pm 2.5\%$ or $\pm 0.25\mathrm{pF}$ whichever is larger Tan $\pm 50\mathrm{mm}$ Ta						
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: $133.33$ min  IR: $500\mathrm{Mohm}$ or $25\mathrm{Mohm} \times \mu\mathrm{F}$	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 : I 33.33 min IR : S00Mohm or 25Mohm × $\mu\mathrm{F}$ With rated voltage 40 $\pm 2\mathrm{^{\circ}C}$ , 90~95%RH, 500+12/-0hrs	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: 133.33 min  IR: 500Mohm or 25Mohm × $\mu\mathrm{F}$		Tan δ, IR : initial spec.				
Tan $\delta$ , IR: initial spec. 2hours ´3 direction (x, y, z)  Moisture Capacitance change: Within ±7.5% or ±0.75 pF whichever is larger Q: 133.33 min IR: 500Mohm or 25Mohm × $\mu$ F	Vibration Test	Capacitance change :	Amplitude : 1.5mm			
MoistureCapacitance change :With rated voltageResistancewithin $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger Q : $\pm 40\pm2\mathrm{°C}$ , $\pm 90\mathrm{°}$ 95%RH, $\pm 500\mathrm{°}$ 12/-0hrsIR :500Mohm or 25Mohm × $\pm \mathrm{°E}$		within ±2.5% or ±0.25pF whichever is larger	From 10Hz to 55Hz (return : 1min.)			
<b>Resistance</b> within $\pm 7.5\%$ or $\pm 0.75\mathrm{pF}$ whichever is larger Q: 133.33 min IR: 500Mohm or 25Mohm × $\mu\mathrm{F}$ $40\pm2^{\circ}\mathrm{C}$ , 90~95%RH, 500+12/-0hrs		Tan δ, IR : initial spec.	2hours ´ 3 direction (x, y, z)			
Q: 133.33 min IR: 500Mohm or 25Mohm × $\mu$ F	Moisture	Capacitance change :	· · · ·			
IR : 500Mohm or 25Mohm × $\mu$ F	Resistance	within ±7.5% or ±0.75pF whichever is larger	_			
		Q: 133.33 min				
Whichever is smaller		IR: 500Mohm or 25Mohm × $\mu$ F				
		Whichever is smaller				
High Temperature Capacitance change : With 150% of the rated voltage	High Temperature	Capacitance change :	With 150% 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: 300 min 1000+48/-0hrs		Q: 300 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	-	· ·			
Tan $\delta$ , IR: initial spec. $\rightarrow$ Max. operating temperature $\rightarrow$ 25°C	- <del>-</del>	I -				
		·				
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.

## - 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.