



SPECIFICATION

- · Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor
- · Samsung P/N:
- CL05B822KO5NNNC

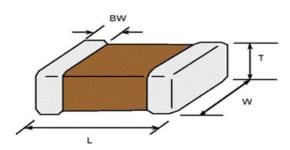
(Reference sheet)

- · Description :
- CAP, 8.2nF, 16V, ±10%, X7R, 0402

A. Samsung Part Number

		<u>CL</u> ①	<u>05</u> ②	<u>B</u> 3	<u>822</u> ④	<u>K</u> 5	<mark>0</mark> 6	<u>5</u> 7	<u>N</u> 8	<u>N</u> 9	<u>N</u> 10	<mark>C</mark> 1	
1	Series	Samsung Multi-layer Ceramic Capacitor											
2	Size	0402 (inch c	ode)		L:	1.00	± 0.05	mm			W:	0.50 ± 0.05 mm	
3	Dielectric	X7R				8	Inner	elect	rode			Ni	
4	Capacitance	8.2 nF					Term	inatio	on			Cu	
5	Capacitance	±10 %					Platir	ng				Sn 100% (Pb Free)	
	tolerance					9	Prod	uct				Normal	
6	Rated Voltage	16 V				10	Spec	ial				Reserved for future use	
\bigcirc	Thickness	0.50 ± 0.05 mr	n			1	Pack	aging	I			Cardboard Type, 7" reel	

B. Structure & Dimension



Samsung D/N	Dimension(mm)								
Samsung P/N	L	W	Т	BW					
CL05B822KO5NNNC	1.00 ± 0.05	0.50 ± 0.05	0.50 ± 0.05	0.25 ± 0.10					

C. Samsung Reliablility Test and Judgement Condition

Tan 5 (DF) 0.035 max. treated at 150° - 40/-10 $^{\circ}$ for 1 hour and maintained in ambient air for $24\pm 2 \text{ hours.}$ Insulation10,000Mohm or 100Mohm×/ p^{c} Rated Voltage $60 \sim 120 \text{ sec.}$ ResistanceWhichever is smallerMicroscope (×10)WithstandingNo dielectric breakdown or wohtage 250% of the rated voltageCharacteristics(From-55° to 125°C, Capacitance change should be within $\pm 15\%$)Adhesive Strength of TerminationNo peeling shall be occur on the of Termination $500gr, for 10\pm 1 \text{ sec.}$ of TerminationCapacitance change : within $\pm 12.5\%$ Bending to the limit (1mm) with 1.0mm/sec.SolderabilityMore than 75% of terminal surface is to be soldered newlySnAg3.0Cu0.5 solder $245\pm5°C, 30-3 \text{ sec.}$ (preheating : 80~120°C for 10~30 \text{ sec.})Resistance to Soldering Heat Tan 5, IR : initial spec.Solder pot : 270\pm5°C, 10\pm 1 \text{ sec.}Vibration TestCapacitance change : capacitance change : within $\pm 12.5\%$ Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture Resistance ResistanceCapacitance change : is 0.05 max IR : 0.006 mm or 25Mohm × μ^{f} Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature CyclingCapacitance change : is nitial spec.Vith $\pm 1.5\%$ Amplitude : 1 comm From 1004-48/-0hrsTemperature Whichever is smallerCapacitance change : Whichever is smallerVith $\pm 200\%$ of the rated voltage Max. operating temperature $\rightarrow 25^{\circ}$ C $\rightarrow Max. operating t$		Judgement	Test condition				
Tan 5 (DF) 0.035 max. treated at $150^{\circ}0+0/\cdot10^{\circ}$ for 1 hour and maintained in ambient air for 24 ± 2 hours.Insulation $10,000Mohm or 100Mohm \times \mu^{c}$ Rated Voltage $00-120 \text{ sec.}$ ResistanceWhichever is smallerMicroscope (×10)WithstandingNo deloctric breakdown or mechanical breakdown 250% of the rated voltageTemperatureX7R (From-55 to 125° , Capacitance change should be within $\pm 15\%$)Adhesive Strength of Terminal electrodeNo peeling shall be occur on the of Terminal electrode $500gr, for 10\pm 1 \text{ sec.}$ Bending Strength of TerminalCapacitance change : within $\pm 12.5\%$ arb is to be soldered newlyBending to the limit (1mm) with 1.0mm/sec.SolderabilityMore than 75% of terminal surface is to be soldered newlySolder pot : $270\pm5^{\circ}C$, $10\pm 1 \text{ sec.}$ Soldering Heat Tan $\delta_1 R$: initial spec.Solder pot : $270\pm5^{\circ}C$, $10\pm 1 \text{ sec.}$ Vibration Test ResistanceCapacitance change : within $\pm 7.5\%$ Tan $\delta_1 R$: initial spec.Solder pot : $270\pm5^{\circ}C$, $10\pm 1 \text{ sec.}$ Wibration Test ResistanceCapacitance change : within $\pm 7.5\%$ Tan $\delta_1 R$: initial spec.With $\pm 25\%$ Mointo $\pm 25\%$ Tan $\delta_1 R$: initial spec.High Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Tan $\delta_1 R$: ± 0.006 mm $\times \mu^{c}$ Whichever is smallerWith $\pm 200\%$ of the rated voltage Max. operating temperature $1000+48/-0hrs$ High Temperature CyclingCapacitance change : within $\pm 12.5\%$ Tan $\delta_1 R$: ± 0.006 hor π μ^{c} Whichever is smallerVith 200% of the rated voltage Max.	Capacitance	Within specified tolerance	1 ^{kHz} ±10% / 1.0±0.2Vrms				
ResistanceWhichever is smallerAppearanceNo abnormal exterior appearanceMicroscope (×10)WithstandingNo dielectric breakdown or mechanical breakdown 250% of the rated voltageTemperatureX7RCharacteristics(From-55°C to 125°C, Capacitance change should be within ±15%)Adhesive StrengthNo peeling shall be occur on the termination500g-f, for 10±1 sec.of TerminationCapacitance 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 to Soldering HeatCapacitance change : within ±7.5% Capacitance change : within ±12.5%Solder pot : 270±5°C, 10±1sec.Vibration TestCapacitance change : within ±15% Tan δ, IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : within ±12.5% Tan 5 : 0.05 max IR : 500Mohm or 25Mohm × $μ^{c}$ Whichever is smallerWith 200% of the rated voltage 40±2°C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : within ±12.5% Tan 5 : 0.05 max IR : 1,000Mohm or 50Mohm × $μ^{c}$ Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : within ±17.5% Tan δ, IR : initial spec.Vith 200% of the rated voltage Max. operating temperature $\rightarrow 25^{\circ}$ \rightarrow Max. operating temperature $\rightarrow 25^{\circ}$ \rightarrow Max. operating temperature $\rightarrow 25^{\circ}$	Tan δ (DF)	0.035 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.				
AppearanceNo abnormal exterior appearanceMicroscope (×10)WithstandingNo dielectric breakdown or mechanical breakdown250% of the rated voltageTemperatureX7RCharacteristics(From-55°C to 125°C, Capacitance change should be within ±15%)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. 	Insulation	10,000Mohm or 100Mohm× <i>µ</i> F	Rated Voltage 60~120 sec.				
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Resistance to Soldering HeatCapacitance change : within $\pm 7.5\%$ Solder pot : $270\pm5^{\circ}$ C, 10 ± 1 sec.Vibration TestCapacitance change : within $\pm 5\%$ Tan δ , IR : initial spec.Amplitude : $1.5mm$ From 10Hz to $55Hz$ (return : $1min.$) $2hours × 3 direction (x, y, z)$ Moisture ResistanceCapacitance change : within $\pm 12.5\%$ Tan δ : $0.05 max$ IR : $500Mohm or 25Mohm × \mu^{f}$ Whichever is smallerWith rated voltage $40\pm2^{\circ}$ C, $90\sim95\%$ RH, $500\pm12/-0hrs$ High Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Tan δ : $0.05 max$ IR : $500Mohm or 25Mohm × \mu^{f}$ Whichever is smallerWith 200% of the rated voltage Max. operating temperature $1000\pm48/-0hrs$ Temperature CyclingCapacitance change : within $\pm 7.5\%$ Tan δ , IR : initial spec.I cycle condition Min. operating temperature $\rightarrow 25^{\circ}C$ \rightarrow Max. operating temperature $\rightarrow 25^{\circ}C$	Solderability	More than 75% of terminal surface	SnAg3.0Cu0.5 solder				
Resistance to Soldering HeatCapacitance change : Tan δ , IR : initial spec.within $\pm 7.5\%$ Solder pot : $270\pm5^{\circ}$ C, 10 ± 1 sec.Vibration TestCapacitance change : Tan δ , IR : initial spec.within $\pm 5\%$ Tan δ , IR : initial spec.Amplitude : $1.5mm$ From $10Hz$ to $55Hz$ (return : $1min.$) $2hours × 3 direction (x, y, z)MoistureResistanceCapacitance change :Tan \delta : 0.05 maxIR : 500Mohm or 25Mohm × \mu^{c}Whichever is smallerWith rated voltage40\pm2^{\circ}C, 90\sim95\%RH, 500+12/-0hrsHigh TemperatureResistanceCapacitance change :within \pm 12.5\%Tan \delta : 0.05 maxIR : 1,000Mohm or 50Mohm × \mu^{c}Whichever is smallerWith 200\% of the rated voltageMax. operating temperature1000+48/-0hrsTemperatureCyclingCapacitance change :within \pm 7.5\%Tan \delta, IR : initial spec.I cycle conditionMin. operating temperature \rightarrow 25^{\circ}C\rightarrowMax. operating temperature \rightarrow 25^{\circ}C$	-	is to be soldered newly	245±5℃, 3±0.3sec.				
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Vibration TestCapacitance change : Tan δ , IR : initial spec.within $\pm 5\%$ Tan δ , IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Tan δ : 0.05 max IR : 500Mohm or 25Mohm × μ^{F} Whichever is smallerWith rated voltage 40±2°C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Tan δ : 0.05 max IR : 1,000Mohm or 25Mohm × μ^{F} Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : within $\pm 7.5\%$ With $\pm 7.5\%$ Tan δ , IR : initial spec.I cycle condition Min. operating temperature $\rightarrow 25^{\circ}C$ \rightarrow Max. operating temperature $\rightarrow 25^{\circ}C$	Resistance to	Capacitance change : within ±7.5%	Solder pot : 270±5°C, 10±1sec.				
Tan δ , IR : initial spec.From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : within ±12.5% Tan δ : 0.05 maxWith rated voltage 40±2°C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : within ±12.5% Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : within ±7.5% Tan δ , IR : initial spec.Vith 1 cycle condition Min. operating temperature Ax. operating temperature Ax. operating temperature Max. operating temperature Ax. operating temperature Ax. operating temperature25°C \rightarrow Max. operating temperature \rightarrow 25°C	Soldering Heat	Tan δ, IR : initial spec.					
Moisture ResistanceCapacitance change : within $\pm 12.5\%$ Tan δ : 0.05 maxWith rated voltage $40\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Whichever is smallerWith 200% of the rated voltage Max. operating temperature $1000+48/-0hrs$ Temperature CyclingCapacitance change : within $\pm 7.5\%$ Tan δ , IR : initial spec.Uith $\pm 7.5\%$ Max. operating temperature $1 cycle condition$	Vibration Test		From 10Hz to 55Hz (return : 1min.)				
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Whichever is smallerWith ever 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 Max. operating temperature Min. operating temperature Max. operating temperature	Resistance	Tan δ : 0.05 max	40±2℃, 90~95%RH, 500+12/-0hrs				
ResistanceTan δ : 0.05 max IR: 1,000Mohm or 50Mohm × μ F Whichever is smallerMax. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : within ±7.5% Tan δ , IR : initial spec.1 cycle condition Min. operating temperature Min. operating temperature Max. operating temperature Max. operating temperature							
IR:1,000Mohm or 50Mohm × μ F1000+48/-0hrsIR:1,000Mohm or 50Mohm × μ F1000+48/-0hrsTemperatureCapacitance change : within ±7.5%1 cycle conditionCyclingTan ō, IR : initial spec.1 cycle conditionMin. operating temperature \rightarrow 25°C \rightarrow Max. operating temperature \rightarrow 25°C	High Temperature	Capacitance change : within ±12.5%	With 200% of the rated voltage				
Whichever is smallerTemperature CyclingCapacitance change : within $\pm 7.5\%$ Tan δ , IR : initial spec.1 cycle condition Min. operating temperature $\rightarrow 25^{\circ}$ C \rightarrow Max. operating temperature $\rightarrow 25^{\circ}$ C	Resistance	Tan δ : 0.05 max	Max. operating temperature				
CyclingTan δ , IR : initial spec.Min. operating temperature \rightarrow 25° C \rightarrow Max. operating temperature \rightarrow 25° C			1000+48/-0hrs				
\rightarrow Max. operating temperature \rightarrow 25°C	Temperature	Capacitance change : within ±7.5%	1 cycle condition				
	Cycling	Tan δ, IR : initial spec.	Min. operating temperature \rightarrow 25°C				
			→ Max. operating temperature → 25° C				
I IS CVCIE IEST			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.

- 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.

- 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.