



# SPECIFICATION

- · Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor
- · Samsung P/N :
- CL05A823KP5NNNC

(Reference sheet)

- Description :
- CAP, 82nF, 10V, ±10%, X5R, 0402

A. Samsung Part Number

		<u>C</u>		<u>▲</u> ③	<u>823</u> ④	<u>K</u> 5	<u>P</u> 6	<u>5</u> 7	<u>N</u> 8	<u>N</u> 9	<u>N</u> 10	<u>C</u> ⓓ
1	Series	Samsung Multi-layer Ceramic Capacitor										
2	Size	0402 (inc	h code)		L:	1.00	± 0.05	mm			W:	$0.50 \pm 0.05$ mm
3	Dielectric	X5R				8	Inner	elect	trode			Ni
4	Capacitance	82 nF					Term	inatio	on			Cu
(5)	Capacitance	±10 %					Platir	ng				Sn 100% (Pb Free)
	tolerance					9	Prod	uct				Normal
6	Rated Voltage	10 V				10	Spec	ial				Reserved for future use
$\bigcirc$	Thickness	0.50 ± 0.05	mm			1	Pack	aging	I			Cardboard Type, 7" reel

## B. Structure & Dimension



Samsung P/N	Dimension(mm)							
Samsung F/N	L	W	Т	BW				
CL05A823KP5NNNC	1.00 ± 0.05	0.50 ± 0.05	0.50 ± 0.05	0.25 ± 0.10				

#### C. Samsung Reliablility Test and Judgement Condition

Tan δ (DF)   0.05 max.   treated at 150°C+0/-10°C for 1 hour and maintained ambient air for 24±2 hours.     Insulation   10,000Mohm or 100Mohm×μ <sup>±</sup> Rated Voltage   60~120 sec.     Appearance   No abnormal exterior appearance   Microscope (×10)     Withstanding   No dielectric breakdown or   250% of the rated voltage     Voltage   mechanical breakdown   250%     Temperature   XSR   Characteristics     (From-55°C to 85°C, Capacitance change should be within ±15%)   Adhesive Strength     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 solder d newly   SAg3.0Cu0.5 solder     Soldering Heat   Tan δ, IR : initial spec.   Yibration Test   Capacitance change : within ±7.5%     Soldering Heat   Tan δ, IR : initial spec.   Amplitude : 1.5mm     Vibration Test   Capacitance change : within ±12.5%   Amplitude : 1.5mm     Resistance   Tan δ, IR : initial spec.   Yibrin trad voltage     Whichever is smaller   Moisture   Capacitance change : within ±12.5%  <		Judgement	Test condition				
Tan δ (DF)   0.05 max.   treated at 150°C+0/-10°C for 1 hour and maintained ambient air for 24±2 hours.     Insulation   10.000Mohm or 100Mohm×μ <sup>E</sup> Rated Voltage   60~120 sec.     Appearance   No abnormal exterior appearance   Microscope (×10)     Withstanding   No dielectric breakdown or   250% of the rated voltage     Voltage   mechanical breakdown   250%     Temperature   XSR   Characteristics     (From-55°C to 85°C, Capacitance change should be within ±15%)   Adhesive Strength     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 solder of newly   Solder pot : 270±5°C, 10±1sec.     Soldering Heat   Tan δ, IR : initial spec.   Yibration Test   Capacitance change : within ±17.5%     Soldering Heat   Tan δ , IR : initial spec.   Amplitude : 1.5mm   From 10Hz to 55Hz (return : 1min.) 20usrs × 30E/z (	Capacitance	Within specified tolerance	1 <sup>kHz</sup> ±10% / 1.0±0.2Vrms				
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   250% of the rated voltage     Characteristics   (From-55°C to 85°C, 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 5, 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 5 : 0.075 max   With rated voltage 40±2°C, 90-95%RH, 500+12/-0hrs     High Temperature   Capacitance change : within ±12.5% Whichever is smaller   With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs	Tan δ (DF)	0.05 max.	*A capacitor prior to measuring the capacitance is heat treated at $150^{\circ}$ +0/-10° 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 voltageYoltagemechanical breakdown250% of the rated voltageTemperatureX5R Characteristics(From-55°C to 85°C, Capacitance change should be within ±15%)Adhesive StrengthNo peeling shall be occur on the terminal electrode500g·f, for 10±1 sec.Bending StrengthCapacitance change : utim ±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 Vibration TestCapacitance change : Capacitance change : mital spec.Solder pot : 270±5°C, 10±1sec.Vibration Test ResistanceCapacitance change : mital spec.within ±12.5% Morithin ±12.5%Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : mital spec.With nated voltage 40±2°C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : mital spaleWith ±12.5% With ±12.5%With 200% of the rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature ResistanceCapacitance change : mital spalewithin ±12.5% Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrs	Insulation	10,000Mohm or 100Mohm× <i>μ</i> F	Rated Voltage 60~120 sec.				
Withstanding   No dielectric breakdown or mechanical breakdown   250% of the rated voltage     Temperature   X5R     Characteristics   (From-55 °C to 85 °C, 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)     Moisture   Capacitance change : within ±12.5% Tan ō : 0.075 max IR : 500Mohm or 25Mohm × μ <sup>c</sup> 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     High Temperature   Capacitance change : within ±12.5% Whichever is smaller   With 200% of the rated voltage	Resistance	Whichever is smaller					
Voltagemechanical breakdownTemperature CharacteristicsX5R (From-55 °C to 85 °C, Capacitance change should be within $\pm 15\%$ )Adhesive Strength of TerminationNo peeling shall be occur on the terminal electrode500g f, for 10±1 sec.Bending Strength 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±5°C, 3±0.3sec. (preheating : 80~120°C for 10~30sec.)Resistance to Vibration TestCapacitance change : capacitance change : within $\pm 7.5\%$ Solder pot : $270\pm5°C$ , $10\pm1sec$ .Vibration TestCapacitance change : capacitance change : within $\pm 5\%$ Tan $\delta$ , IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : tan $\delta$ : 0.075 max IR : Soldem or 25Mohm × $\mu^{c}$ With 200% of the rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature ResistanceCapacitance change : to : 0.075 max IR : 1,000Mohm or 50Mohm × $\mu^{c}$ With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs	Appearance	No abnormal exterior appearance	Microscope (×10)				
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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Solderability	More than 75% of terminal surface	SnAg3.0Cu0.5 solder				
Resistance to Soldering HeatCapacitance change : Tan $\delta$ , IR : initial spec.within $\pm 7.5\%$ Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Vibration TestCapacitance change : Tan $\delta$ , IR : initial spec.Within $\pm 5\%$ Tan $\delta$ , IR : initial spec.Amplitude : $1.5$ mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Tan $\delta$ : $0.075$ max IR : $500$ Mohm or 25Mohm × $\mu$ F Whichever is smallerWith rated voltage $40\pm2^{\circ}$ C, $90\sim95\%$ RH, $500+12/-0$ hrsHigh Temperature ResistanceCapacitance change : $10.075$ max IR : $1,000$ Mohm or 50Mohm × $\mu$ F Whichever is smallerWith $200\%$ of the rated voltage Max. operating temperature $1000+48/-0$ hrs		is to be soldered newly	245±5℃, 3±0.3sec.				
Soldering HeatTan $\delta$ , IR : initial spec.Vibration TestCapacitance change : Tan $\delta$ , IR : initial spec.within $\pm 5\%$ From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Tan $\delta$ : 0.075 maxwithin $\pm 12.5\%$ $\mu^{F}$ Whichever is smallerMuith rated voltage $40\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : within $\pm 12.5\%$ $IR : 500Mohm or 25Mohm × \mu^{F}Whichever is smallerWith 200\% of the rated voltageMax. operating temperature1000+48/-0hrs$			(preheating : 80~120℃ for 10~30sec.)				
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ResistanceTan $\delta$ :0.075 max $40\pm 2^{\circ}\mathbb{C}$ , 90~95%RH, 500+12/-0hrsIR:500Mohm or 25Mohm × $\mu^{F}$ Whichever is smaller $40\pm 2^{\circ}\mathbb{C}$ , 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change :within $\pm 12.5\%$ Tan $\delta$ :With $200\%$ of the rated voltage Max. operating temperature 1000+48/-0hrsIR:1,000Mohm or 50Mohm × $\mu^{F}$ Whichever is smaller $1000+48/-0hrs$	Moisture	Capacitance change : within ±12.5%					
Whichever is smaller     High Temperature     Resistance     IR :   1,000Mohm or 50Mohm × μF     Whichever is smaller	Resistance	Tan δ : 0.075 max	40±2℃, 90~95%RH, 500+12/-0hrs				
High Temperature ResistanceCapacitance change : 0.075 max IR : Whichever is smallerwithin $\pm 12.5\%$ Max. operating temperature 1000+48/-0hrsWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrs		IR : 500Mohm or 25Mohm × $\mu$ F					
Resistance   Tan δ : 0.075 max   Max. operating temperature     IR :   1,000Mohm or 50Mohm × μF   1000+48/-0hrs     Whichever is smaller   0.000 + 48/-0hrs   0.000 + 48/-0hrs		Whichever is smaller					
Resistance   Tan δ : 0.075 max   Max. operating temperature     IR : 1,000Mohm or 50Mohm × μF   1000+48/-0hrs     Whichever is smaller   1000+48/-0hrs	High Temperature	Capacitance change : within ±12.5%	With 200% of the rated voltage				
Whichever is smaller		Tan δ : 0.075 max	-				
		IR : 1,000Mohm or 50Mohm × μF	1000+48/-0hrs				
Temperature     Capacitance change :     within ±7.5%     1 cycle condition		Whichever is smaller					
	Temperature	Capacitance change : within ±7.5%	1 cycle condition				
CyclingTan $\delta$ , IR : initial spec.Min. operating temperature $\rightarrow$ 25°C	-	Tan δ, IR : initial spec.	-				
$\rightarrow$ Max. operating temperature $\rightarrow$ 25°C	-		$\rightarrow$ Max. operating temperature $\rightarrow$ 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 )

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.