



SPECIFICATION

- · Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor
- · Samsung P/N :
- CL10A475KQ8NNNC

(Reference sheet)

- Description :
- CAP, 4.7uF, 6.3V, ±10%, X5R, 0603

A. Samsung Part Number

		<u>CL</u> ①	<u>10</u> ②	<u>А</u> З	<u>475</u> ④	<u>K</u> 5	<mark>Q</mark> 6	<u>8</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	0603 (inch co	ode)		L: ′	1.60	± 0.10	mm			W:	0.80 ± 0.10 mm
3	Dielectric	X5R				8	Inner	elect	rode			Ni
4	Capacitance	4.7 uF					Term	inatio	n			Cu
5	Capacitance	±10 %					Platir	g				Sn 100% (Pb Free)
	tolerance					9	Produ	uct				Normal
6	Rated Voltage	6.3 V				10	Speci	al				Reserved for future use
1	Thickness	0.80 ± 0.10 mm				1	Packa	aging				Cardboard Type, 7" reel

B. Structure & Dimension



Samsung P/N	Dimension(mm)							
Samsung F/N	L	W	Т	BW				
CL10A475KQ8NNNC	1.60 ± 0.10	0.80 ± 0.10	0.80 ± 0.10	0.30 ± 0.20				

C. Samsung Reliablility Test and Judgement Condition

		Judgement	Test condition			
Tan δ (DF)0.1 max.treated at 150°C+0/-10°C for 1 hour and maintained ambient air for 24±2 hours.Insulation10,000Mohm or 100Mohm×µ ^E Rated Voltage60~120 sec.ResistanceWhichever is smallerAppearanceMicroscope (×10)WithstandingNo abnormal exterior appearanceMicroscope (×10)WithstandingNo dielectric breakdown or mechanical breakdown250% of the rated voltageTemperatureX5RCharacteristics(From-55°C to 85°C, Capacitance change should be within ±15%)Adhesive Strength Bending StrengthNo peeling shall be occur on the terminal electrodeSolog f, for 10±1 sec.Bending StrengthCapacitance change : is to be soldered newlySinAg3.0Cu0.5 solder 245±5°C, 3±0.3sec. (preheating : 80~120°C for 10~30sec.)Resistance to Vibration TestCapacitance change : Capacitance change : mithin ±12.5%Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : mithin ±12.5MWith rated voltage Mith rated voltageHigh Temperature ResistanceCapacitance change : mithin ±12.5MWith 150% of the rated voltage fran δ : 0.125 max ir δ : 0.125 max<	Capacitance	Within specified tolerance	1 ^{kHz} ±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 K5R 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 Solder pot : 270±5°C, 10±1sec. Soldering Heat Tan δ, IR : initial spec. Solder pot : 270±5°C, 10±1sec. Vibration Test Capacitance change : within ±12.5% Tan δ : 0.125 max Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Moisture Resistance Capacitance change : within ±12.5% Tan δ : 0.125 max With nated voltage 40±2°C, 90~95%RH, 500+12/-0hrs High Temperature Resistance Capacitance change : within ±12.5% Tan δ : 0.125 max With 150% of the rated voltage Max. operating temperature IR : 1,000Mohm or 25Mohm × μ ^E	Tan δ (DF)	0.1 max.	*A capacitor prior to measuring the capacitance is heat treated at $150^{\circ}C+0/-10^{\circ}C$ 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 Yoltage 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 õ, 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 õ : 0.125 max IR : 500Mohm or 12.5Mohm × μ ^c Whichever is smaller With rated voltage High Temperature Capacitance change : within ±12.5% With nated voltage With 150% of the rated voltage Resistance Tan õ : 0.125 max IR : 1,000Mohm or 25Mohm × μ ^c IAn õ : 0.125 max With 150% of the rated voltage	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 Voltage 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 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% Resistance Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z) Mith rated voltage Tan δ : 0.125 max IR : 500Mohm or 12.5Mohm × μE Whichever is smaller With 150% of the rated voltage Max. operating temperature High Temperature Resistance Capacitance change : within ±12.5% Tan δ : 0.125 max IR : 1,000Mohm or 25Mohm × μE With 150% of the rated voltage	Resistance	Whichever is smaller				
Voltagemechanical breakdownTemperature CharacteristicsX5R (From-55°C to 85°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 Strength 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 : mot, IR : initial spec.within ±7.5% Solder pot : 270±5°C, 10±1sec.Vibration Test ResistanceCapacitance change : mot, IR : initial spec.within ±12.5% Mithin ±12.5% Tan 5, IR : initial spec.More than 2.5Mohm × μ^{c} With Temperature ResistanceCapacitance change : mothin ± 12.5% Tan 5 : 0.125 max IR : 500Mohm or 12.5Mohm × μ^{c} With 150% of the rated voltage Max. operating temperature IR : 1,000Mohm or 25Mohm × μ^{c}	Appearance	No abnormal exterior appearance	Microscope (×10)			
Temperature CharacteristicsX5R (From-55 °C to 85 °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. (preheating : 80~120°C for 10~30sec.)Resistance to Soldering HeatCapacitance change : tan δ_i IR : initial spec.Within ±7.5% Solder pot : 270±5°C, 10±1sec.Vibration TestCapacitance change : capacitance change : tan δ_i IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : tan δ_i : 0.125 max IR : Soldohm or 12.5Mohm × $\mu^{f'}$ Whichever is smallerWith 150% of the rated voltage Max. operating temperature IR : 1,000Mohm or 25Mohm × $\mu^{f'}$	Withstanding	No dielectric breakdown or	250% of the rated voltage			
$\begin{array}{l c c c c c c c c c c c c c c c c c c c$	Voltage	mechanical breakdown				
Adhesive Strength of TerminationNo peeling shall be occur on the terminal electrode $500g.f, for 10\pm1 sec.$ Bending StrengthCapacitance change : within ±12.5%Bending to the limit (1mm) 	Temperature	X5R				
of Termination terminal electrode 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 : 0.125 max IR : 500Mohm or 12.5Mohm × μ ^F Whichever is smaller With rated voltage 40±2°C, 90~95%RH, 500+12/-0hrs High Temperature Resistance Capacitance change : within ±12.5% Tan ō : 0.125 max IR : 1,000Mohm or 25Mohm × μ ^F With 150% of the rated voltage Max. operating temperature 1000+48/-0hrs	Characteristics	(From-55℃ to 85℃, Capacitance change s	hould be within ±15%)			
Bending StrengthCapacitance 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 \pm 5°C, 3 \pm 0.3sec. (preheating : 80~120°C for 10~30sec.)Resistance to Soldering HeatCapacitance change :within \pm 7.5%Solder pot : 270 \pm 5°C, 10 \pm 1sec.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% Whichever is smallerWith rated voltage 40 \pm 2°C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change :within \pm 12.5% Whichever is smallerWith 150% of the rated voltage Max. operating temperature 1000+48/-0hrs	Adhesive Strength	No peeling shall be occur on the	500g⋅f, for 10±1 sec.			
with 1.0mm/sec.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 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 : within $\pm 5\%$ Tan δ , IR : initial spec.Amplitude : 1.5 mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Tan δ : 0.125 max IR : 500 Mohm or 12.5 Mohm × / d^{c} Whichever is smallerWith 150% of the rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature ResistanceCapacitance change : 13.00 within or 25 Mohm × / d^{c} With 150% of the rated voltage Max. operating temperature $1000+48/-0hrs$	of Termination	terminal electrode				
SolderabilityMore than 75% of terminal surface is to be soldered newlySnAg3.0Cu0.5 solder $245\pm5^{\circ}C$, $3\pm0.3sec$. (preheating : $80\sim120^{\circ}C$ for $10\sim30sec$.)Resistance toCapacitance change : Tan δ , IR : initial spec.Solder pot : $270\pm5^{\circ}C$, $10\pm1sec$.Vibration TestCapacitance change : Capacitance change : Tan δ , IR : initial spec.Momentum terminal surface (preheating : $80\sim120^{\circ}C$ for $10\sim30sec$.)MoistureCapacitance change : Capacitance change : Tan δ , IR : initial spec.Mithin $\pm 5\%$ From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)MoistureCapacitance change : Tan δ : 0.125 max IR : Whichever is smallerWith rated voltage $40\pm2^{\circ}C$, $90\sim95\%$ RH, $500+12/-0hrs$ High Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Tan δ : 0.125 max IR : IR : 1,000Mohm or 25Mohm × / μ^{F} With 150% Max. operating temperature 1000+48/-0hrs	Bending Strength	Capacitance change : within ±12.5%	Bending to the limit (1mm)			
is to be soldered newly $245\pm5^{\circ}$ C, 3 ± 0.3 sec. (preheating : $80\sim120^{\circ}$ C for $10\sim30$ sec.)Resistance to Soldering HeatCapacitance change : Tan δ , IR : initial spec.within $\pm7.5\%$ Solder pot : $270\pm5^{\circ}$ C, 10 ± 1 sec.Vibration TestCapacitance change : Dapacitance change : Tan δ , IR : initial spec.within $\pm 5\%$ From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Tan δ : 0.125 max IR : 500 Mohm or 12.5Mohm × μ F Whichever is smallerWith 150% of the rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature ResistanceCapacitance change : $12, 000$ Mohm or 25Mohm × μ FWith 150% of the rated voltage Max. operating temperature $1000+48/-0hrs$			with 1.0mm/sec.			
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 : Moisture Resistancewithin $\pm 5\%$ Tan δ , IR : initial spec.Amplitude : $1.5mm$ From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Michever is smallerwithin $\pm 12.5\%$ Whichever is smallerAmplitude : $1.5mm$ From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)High Temperature ResistanceCapacitance change : Michever is smallerwithin $\pm 12.5\%$ With $\pm 12.5\%$ Tan δ : 0.125 max IR : 500 Mohm or 12.5 Mohm × μ F Whichever is smallerWith 150% of the rated voltage Max. operating temperature $1000+48/-0hrs$	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 $\pm 5\%$ From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Tan δ : 0.125 max IR : 500Mohm or 12.5Mohm × μ F Whichever is smallerWith rated voltage 40±2°C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : 0.125 max IR : 500Mohm or 25Mohm × μ FWith 150% of the rated voltage Max. operating temperature 1000+48/-0hrs		is to be soldered newly	245±5℃, 3±0.3sec.			
Soldering HeatTan δ , IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Woisture ResistanceCapacitance change : within ±12.5% Tan δ : 0.125 max IR : 500Mohm or 12.5Mohm × μ F Whichever is smallerWith rated voltage 40±2°C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : within ±12.5% Uhichever is smallerWith 150% of the rated voltage Max. operating temperature 1000+48/-0hrs			(preheating : 80~120℃ for 10~30sec.)			
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 : 0.125 maxwithin $\pm 12.5\%$ 40 $\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsMigh Temperature ResistanceCapacitance change : Whichever is smallerWith $\pm 12.5\%$ With $\pm 12.5\%$ With 150% of the rated voltage Max. operating temperature 1000+48/-0hrs	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 : 0.125 max IR : 500Mohm or 12.5Mohm × μ F Whichever is smallerWith rated voltage 40±2°C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : within ±12.5% Whichever is smallerWith 150% of the rated voltage Max. operating temperature 1000+48/-0hrs	Soldering Heat					
ResistanceTan δ :0.125 max $40\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsIR:500Mohm or 12.5Mohm × μ F $40\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsHigh TemperatureCapacitance change : within $\pm 12.5\%$ With 150% of the rated voltageResistanceTan δ :0.125 maxMax. operating temperatureIR:1,000Mohm or 25Mohm × μ F1000+48/-0hrs	Vibration Test		From 10Hz to 55Hz (return : 1min.)			
IR :500Mohm or 12.5Mohm × μ F Whichever is smallerHigh Temperature ResistanceCapacitance change :within ±12.5% With 150% of the rated voltage Max. operating temperature 1000+48/-0hrs	Moisture	Capacitance change : within ±12.5%				
Whichever is smallerHigh Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Tan δ : 0.125 max IR : 1,000Mohm or 25Mohm × μ FWith 150% of the rated voltage Max. operating temperature 1000+48/-0hrs	Resistance	Tan δ : 0.125 max	40±2℃, 90~95%RH, 500+12/-0hrs			
High Temperature ResistanceCapacitance change : 0.125 maxwithin $\pm 12.5\%$ Max. operating temperatureWith 150% of the rated voltage Max. operating temperature $1000+48/-0hrs$		IR : 500Mohm or 12.5Mohm × μ F				
ResistanceTan δ :0.125 maxMax. operating temperatureIR:1,000Mohm or 25Mohm × μ F1000+48/-0hrs		Whichever is smaller				
Resistance Tan δ: 0.125 max Max. operating temperature IR: 1,000Mohm or 25Mohm × μF 1000+48/-0hrs	High Temperature	Capacitance change : within ±12.5%	With 150% of the rated voltage			
		Tan δ : 0.125 max	-			
Whichever is smaller		IR : 1,000Mohm or 25Mohm × μF	1000+48/-0hrs			
		Whichever is smaller				
Temperature Capacitance change : within ±7.5% 1 cycle condition	Temperature	Capacitance change : within ±7.5%	1 cycle condition			
Cycling Tan δ , IR : initial spec. Min. operating temperature $\rightarrow 25^{\circ}$ C	-	Tan δ, IR : initial spec.	-			
\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.