



# **SPECIFICATION**

(Reference sheet)

· Supplier : Samsung electro-mechanics · Samsung P/N : CL10A476MR8NZNE

· Product : Multi-layer Ceramic Capacitor · Description : CAP, 47uF, 4V, ±20%, X5R, 0603

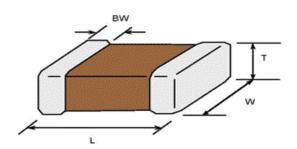
### A. Samsung Part Number

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1	Series	Samsung Multi-layer Ceramic Capacitor				
2	Size	0603 (inch code)	L: 1.60	± 0.30 mm	W:	$0.80 \pm 0.30 \text{ mm}$
3	Dielectric	X5R	8	Inner electrode		Ni
4	Capacitance	47 uF		Termination		Cu
(5)	Capacitance	±20 %		Plating		Sn 100% (Pb Free)
	tolerance		9	Product		Size control code
6	Rated Voltage	4 V	10	Special		Reserved for future use
7	Thickness	$0.80 \pm 0.30$ mm	11)	Packaging		Embossed Type, 7" reel

#### **B. Structure & Dimension**



Samsung P/N	Dimension(mm)					
Samsung F/N	L	W	Т	BW		
CL10A476MR8NZNE	1.60 ± 0.30	0.80 ± 0.30	0.80 ± 0.30	0.30 ± 0.20		

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

		Judgement	Test condition		
Tan δ (DF)	Capacitance	Within specified tolerance	120Hz ±20% / 0.5±0.1Vrms		
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         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 δ, IR: initial spec.       Amplitude: 1.5mm From 10Hz to 55Hz (return: 1min.) 2hours × 3 direction (x, y, z)         Wibration Test       Capacitance change: within ±12.5%       With rated voltage         Resistance       Tan δ: 0.25 max IR: 500Mohm or 1Mohm × μF	Tan δ (DF)	0.125 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 voltageTemperatureX5RCharacteristics(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 toCapacitance change : within ±7.5%Solder pot : 270±5°C, 10±1sec.Soldering HeatTan δ, IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)MoistureCapacitance change : within ±12.5%With rated voltageResistanceTan δ : 0.25 max IR : 500Mohm or 1Mohm × μFWith rated voltage	Insulation	10,000Mohm or 10Mohm×μF	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 δ, IR: initial spec.       Amplitude: 1.5mm From 10Hz to 55Hz (return: 1min.) 2hours × 3 direction (x, y, z)         Woisture       Capacitance change: within ±12.5%       With rated voltage         Resistance       Tan δ: 0.25 max IR: 500Mohm or 1Mohm × μF       With rated voltage	Resistance	Whichever is smaller			
Voltage       mechanical breakdown         Temperature       X5R         Characteristics       (From-55 ℃ to 85 ℃, 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)         Wibration Test       Capacitance change : within ±12.5%       With rated voltage         Resistance       Tan δ : 0.25 max IR : 500Mohm or 1Mohm × μF	Appearance	No abnormal exterior appearance	Microscope (×10)		
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Characteristics       (From-55℃ to 85℃, 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 Soldering Heat       Capacitance change : within ±7.5%       Solder pot : 270±5°C, 10±1sec.         Vibration Test       Capacitance change : within ± 5%       Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)         Moisture       Capacitance change : within ±12.5%       With rated voltage         Resistance       Tan δ : 0.25 max IR : 500Mohm or 1Mohm × μF					
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	Characteristics	(From-55℃ to 85℃, Capacitance change sl	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 $245\pm5^{\circ}$ C, $3\pm0.3$ sec. (preheating : $80\sim120^{\circ}$ C for $10\sim30$ sec.)Resistance toCapacitance change : within $\pm 7.5\%$ Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Soldering HeatTan $\delta$ , IR : initial spec.Amplitude : $1.5$ mm From $10$ Hz to $55$ Hz (return : $1$ min.) $2$ hours $\times 3$ direction (x, y, z)WoistureCapacitance change : within $\pm 12.5\%$ With rated voltageResistanceTan $\delta$ : $0.25$ max IR : $500$ Mohm or $1$ Mohm $\times \mu$ FWith rated voltage $40\pm2^{\circ}$ C, $90\sim95\%$ RH, $500+12$ J-0hrs	Adhesive Strength	No peeling shall be occur on the			
$\begin{tabular}{cccccccccccccccccccccccccccccccccccc$	of Termination	terminal electrode			
SolderabilityMore than 75% of terminal surface is to be soldered newlySnAg3.0Cu0.5 solder $245\pm5^{\circ}$ C, $3\pm0.3$ sec. (preheating : $80\sim120^{\circ}$ C for $10\sim30$ sec.)Resistance to Soldering HeatCapacitance change : within $\pm7.5\%$ Solder pot : $270\pm5^{\circ}$ C, $10\pm1$ sec.Vibration TestCapacitance change : within $\pm5\%$ Tan $\delta$ , IR : initial spec.Amplitude : $1.5$ mm From $10$ Hz to $55$ Hz (return : $1$ min.) $2$ hours $\times 3$ direction (x, y, z)Moisture ResistanceCapacitance change : within $\pm12.5\%$ Tan $\delta$ : $0.25$ max IR : $500$ Mohm or $1$ Mohm $\times \mu$ FWith rated voltage $40\pm2^{\circ}$ C, $90\sim95\%$ RH, $500+12$ J-0hrs	Bending Strength	Capacitance change: within ±12.5%	Bending to the limit (1mm)		
is to be soldered newly $ 245\pm5^{\circ}\text{C}, \ 3\pm0.3\text{sec.} $ $ (\text{preheating}: 80\sim120^{\circ}\text{C for }10\sim30\text{sec.}) $ $ \text{Resistance to} \qquad \text{Capacitance change}: \qquad \text{within }\pm7.5\% \qquad \text{Solder pot}: 270\pm5^{\circ}\text{C}, \ 10\pm1\text{sec.} $ $ \text{Soldering Heat} \qquad \text{Tan }\delta, \ IR: \text{ initial spec.} $ $ \text{Capacitance change}: \qquad \text{within }\pm5\% \qquad \text{Amplitude}: 1.5\text{mm} $ $ \text{From }10\text{Hz to }55\text{Hz (return : }1\text{min.}) $ $ \text{2hours}\times3 \text{ direction }(x,y,z) $ $ \text{Moisture} \qquad \text{Capacitance change}: \qquad \text{within }\pm12.5\% \qquad \text{With rated voltage} $ $ \text{Resistance} \qquad \text{Tan }\delta:  0.25\text{ max} $ $ \text{IR}:  500\text{Mohm or }1\text{Mohm}\times \mu\text{F} $ $ \text{With }12.5\% \qquad \text{With }2.5\% \qquad \text{Tan }3.5\% \qquad Tan$			with 1.0mm/sec.		
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	•	is to be soldered newly	245±5°C, 3±0.3sec.		
Soldering HeatTan δ, IR : initial spec.Amplitude : 1.5mmVibration TestCapacitance change : Tan δ, IR : initial spec.Within $\pm$ 5% Amplitude : 1.5mmFrom 10Hz to 55Hz (return : 1min.) 2hours $\times$ 3 direction (x, y, z)MoistureCapacitance change : Within $\pm$ 12.5% Tan δ : 0.25 max IR : 500Mohm or 1Mohm $\times \mu$ FWith rated voltage 40 $\pm$ 2°C, 90~95%RH, 500+12/-0hrs			(preheating: 80~120°C for 10~30sec.)		
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Resistance       Tan δ : 0.25 max       40±2℃, 90~95%RH, 500+12/-0hrs         IR : 500Mohm or 1Mohm × μF	Vibration Test	1	From 10Hz to 55Hz (return : 1min.)		
IR : 500Mohm or 1Mohm × μF	Moisture	Capacitance change: within ±12.5%	With rated voltage		
	Resistance	Tan δ : 0.25 max	40±2°C, 90~95%RH, 500+12/-0hrs		
Whichever is smaller		IR: 500Mohm or 1Mohm × $\mu$ F			
		Whichever is smaller			
High Temperature Capacitance change: within ±12.5% With 100% of the rated voltage	High Temperature	Capacitance change: within ±12.5%	With 100% of the rated voltage		
Resistance       Tan δ :       0.25 max       Max. operating temperature	Resistance	Tan δ : 0.25 max	Max. operating temperature		
IR : 1,000Mohm or 2Mohm × $\mu$ F 1000+48/-0hrs		IR : 1,000Mohm or 2Mohm × $\mu$ F	1000+48/-0hrs		
Whichever is smaller		Whichever is smaller			
Temperature Capacitance change: within ±15% 1 cycle condition	Temperature	Capacitance change: within ±15%	1 cycle condition		
Cycling       Tan δ, IR : initial spec.       Min. operating temperature $\rightarrow$ 25°C	Cycling	Tan δ, IR : initial spec.	Min. operating temperature → 25°C		
→ Max. operating temperature → 25°C			→ Max. operating temperature → 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±5°C, 30sec. )



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.