



# **SPECIFICATION**

- · Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor
- · Samsung P/N :
- CL21B202KBANNNC

(Reference sheet)

- · Description :

- CAP, 2nF, 50V, ±10%, X7R, 0805

A. Samsung Part Number

		<u>CL</u> ①	<u>21</u> ②	<u>В</u> З	<u>202</u> ④	<u>K</u> 5	<u>B</u> 6	<b>A</b> 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	0805 (inch o	code)		L: :	2.00	± 0.10	mm			W:	1.25 ± 0.10	mm	
3	Dielectric	X7R				8	Inner	elect	rode			Ni		
4	Capacitance	2 nF					Term	inatio	n			Cu		
5	Capacitance	±10 %					Platir	ng				Sn 100%	(Pb Free)	
	tolerance					9	Prod	uct				Normal		
6	Rated Voltage	50 V				10	Spec	ial				Reserved fo	r future use	
$\bigcirc$	Thickness	0.65 ± 0.10 mm				1	Pack	aging	I			Cardboard T	ype, 7" reel	

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



Samsung P/N	Dimension(mm)							
Samsung F/N	L	W	Т	BW				
CL21B202KBANNNC	2.00 ± 0.10	1.25 ± 0.10	0.65 ± 0.10	0.50 +0.2/-0.3				

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

		Judgement	Test condition
Tan δ (DF)       0.025 max.       treated at 150℃ +00-10℃ for 1 hour and maintained in ambient air for 24±2 hours.         Insulation       10.000Mohm or 500Mohm×/d <sup>c</sup> Rated Voltage       60~120 sec.         Resistance       Whichever is smaller       Microscope (×10)         Appearance       No abnormal exterior appearance       Microscope (×10)         Withstanding       No dielectric breakdown or       250% of the rated voltage         Temperature       X7R       Characteristics       (From-55℃ to 125℃, Capacitance change should be within ±15%)         Adhesive Strength       No peeling shall be occur on the of Termination       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±°C, 3±0.3sec.         Vibration Test       Capacitance change : within ±7.5%       Solder pot : 270±5℃, 10±1sec.         Soldering Heat       Tan δ, IR : initial spec.       Yibration Test         Vibration Test       Capacitance change : within ±12.5%       Amplitude : 1.5mm         Resistance       Tan δ : 0.05 max       With red voltage         Moisture       Capacitance change : within ±12.5%       With red voltage         Resistance       Tan δ : 0.05 max	Capacitance	Within specified tolerance	1 <sup>kHz</sup> ±10% / 1.0±0.2Vrms
ResistanceWhichever is smallerAppearanceNo abnormal exterior appearanceMicroscope (×10)WithstandingNo dielectric breakdown or mechanical breakdown250% of the rated voltageYoltagemechanical breakdown250% of the rated voltageCharacteristics(From-55°C to 125°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 : 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% Tan δ, IR : initial spec.Solder pot : 270±5°C, 10±1sec.Vibration Test emistion TestCapacitance change : within ±12.5% Tan δ, IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (returm : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : within ±12.5% Tan δ : 0.05 max IR : 500Mohm or 25Mohm × μ <sup>F</sup> Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature Capacitance change : within ±12.5% Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature Capacitance change : within ±12.5% Whichever is smallerVib200% of the rated voltage Max. operating temperature 1000+48/-0hrs	Tan δ (DF)	0.025 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.
AppearanceNo abnormal exterior appearanceMicroscope (×10)WithstandingNo dielectric breakdown or mechanical breakdown250% of the rated voltageYottagemechanical breakdown250% of the rated voltageTemperatureX7R250% of the rated voltageCharacteristics(From-55°C to 125°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 : within ±12.5% Bending StrengthBending to the limit (1mm) with 1.0mm/sec.SolderabilityMore than 75% of terminal surface is to be soldered newlySnAg3.0Cu0.5 solder 2445±5°C, 340.3sec. (preheating : 80~120°C for 10~30sec.)Resistance to Soldering HeatCapacitance change : within ±7.5% Tan 5, IR : initial spec.Solder pot : 270±5°C, 10±1sec.Vibration Test ResistanceCapacitance change : within ±12.5% Tan 5 : 0.05 max IR : 500Mohm or 25Mohm × μF Whichever is smallerWith 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 × μF Whichever is smallerWith 200% of the rated voltage Max. operating temperature 100+48/-0hrsHigh Temperature Capacitance change : within ±7.5%1 cycle condition Min. operating temperature 100+48/-0hrs1 cycle condition Min. operating temperature 1000+48/-0hrs	Insulation	10,000Mohm or 500Mohm× <i>μ</i> F	Rated Voltage 60~120 sec.
Withstanding VoltageNo dielectric breakdown or mechanical breakdown $250\%$ of the rated voltageYoltagemechanical breakdown $250\%$ of the rated voltageTemperature CharacteristicsX7R (From-55°C to 125°C, Capacitance change should be within ±15%)Adhesive Strength of Termination Bending StrengthNo 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.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 : within ±12.5%Solder pot : 270±5°C, 10±1sec.Vibration TestCapacitance change : within ±12.5%More than 75% of terminal surface is to be soldered newlyVibration TestCapacitance change : within ±12.5%With rated voltageWoisture ResistanceCapacitance change : ma $\delta$ . 0.05 max IR : Michever is smallerWith rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature ResistanceCapacitance change : mith : 1,000Mohm or 50Mohm × $\mu^{\rm F}$ Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature Capacitance change : Whichever is smaller1 cycle condition Min. operating temperature Min. operating temperatureTemperature Cupacitance change : Whichever is smaller1 cycle condition Min. operating temperature Min. operating temperature	Resistance	Whichever is smaller	
Voltagemechanical breakdownTemperatureX7RCharacteristics(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. (preheating : 80~120°C for 10~30sec.)Resistance to Soldering HeatCapacitance change : man δ, IR : initial spec.within ±7.5% Moint ±12.5%Solder pot : 270±5°C, 10±1sec.Vibration TestCapacitance change : within ±10within ±12.5% Moisture ResistanceAmplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : man δ : N : 0.05 maxWith 122.5% Mith ±12.5%With rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature ResistanceCapacitance change : man δ : N : N : Nobol on 0.05 maxWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature Capacitance change : Whichever is smallerUse 200% man is no.8No 200% mon is no.8Proceedition max. Mith ±12.5%Temperature Capacitance change : Whichever is smaller1 cycle condition Min. operating temperature Min. operating temperature25°C	Appearance	No abnormal exterior appearance	Microscope (×10)
Temperature CharacteristicsX7R (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.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% Tan δ, IR : initial spec.Solder pot : 270±5°C, 10±1sec.Vibration Test ResistanceCapacitance change : within ±5% Tan δ : 0.05 max IR : 500Mohm or 25Mohm × μF Whichever is smallerAmplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : within ±12.5% Tan δ : 0.05 max IR : 500Mohm or 25Mohm × μF Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature ResistanceCapacitance change : within ±12.5% Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μF Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature Capacitance change : within ±7.5% ResistanceCapacitance change : within ±7.5% Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μF Whichever is smaller1 cycle condition Min. operating temperature 1000+48/-0hrs	Withstanding	No dielectric breakdown or	250% of the rated voltage
Characteristics       (From-55 °C to 125 °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 104z to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)         Moisture       Capacitance change : within ±12.5% Tan δ : 0.05 max IR : 500Mohm or 25Mohm × μ <sup>F</sup> Whichever is smaller       With rated voltage 40±2°C, 90~95%RH, 500+12/-0hrs         High Temperature Resistance       Capacitance change : within ±12.5% Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μ <sup>F</sup> Whichever is smaller       With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs         High Temperature Capacitance change : within ±12.5% Tan δ : 0.05 max IR : 1,000Mohm or 50Mohm × μ <sup>F</sup> Whichever is smaller       With 200% of the rated voltage Max. operating temperature 1000+48/-0hrs         Temperature Capacitance change : within ±7.5%       1 cycle condition Min. operating temperature → 25°C	Voltage	mechanical breakdown	
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, IR : initial spec.within ±7.5% solder pot : 270±5°C, 10±1sec.Vibration TestCapacitance change : vibration Testwithin ±12.5% Tan δ, IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : vibrichever is smallerWithin ±12.5% With 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 : m δ, IR : initial spec.Within ±12.5% mithin ±12.5% Min is 17.5%1 cycle condition Min. operating temperature monetation	Temperature	X7R	
of Terminationterminal electrodeBending 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 :within ±7.5% Tan δ, IR : initial spec.Solder pot : 270±5°C, 10±1sec.Vibration TestCapacitance change :within ±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 ±12.5% Whichever is smallerAmplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)High Temperature ResistanceCapacitance change :within ±12.5% Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsHigh Temperature Capacitance change :within ±12.5% Whichever is smallerVith 200% of the rated voltage Max. operating temperature 1000+48/-0hrs1 cycle condition Min. operating temperature 1000+48/-0hrs25°C	Characteristics	(From-55℃ to 125℃, Capacitance change	should be within ±15%)
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 :within ±7.5% Tan δ, IR : initial spec.Solder pot : 270±5°C, 10±1sec.Vibration Test ResistanceCapacitance change :within ±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 ±12.5% Whichever is smallerWith 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 ±12.5% With 27.5%1 cycle condition Min. operating temperature 1 cycle condition Min. operating temperature> 25°C	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±5°C, 3±0.3sec. (preheating : 80~120°C for 10~30sec.)Resistance to Soldering HeatCapacitance change : Tan $\delta$ , IR : initial spec.within $\pm 7.5\%$ Solder pot : 270 $\pm$ 5°C, 10 $\pm$ 1sec.Vibration TestCapacitance change : capacitance change : Tan $\delta$ , IR : initial spec.Amplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Tan $\delta$ : 0.05 max IR : Soldom or 25Mohm × $\mu$ F 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 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : within $\pm 7.5\%$ Vibration Tupe and the sec of the se	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 : $80 \sim 120^{\circ}C$ for $10 \sim 30$ sec.)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 : Capacitance change : 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 $\delta$ : $0.05$ max IR : $500$ Mohm or 25Mohm × $\mu^{F}$ Whichever is smallerWith $200\%$ of the rated voltage Max. operating temperature $100+48/-0$ hrsHigh Temperature ResistanceCapacitance change : $1,000$ Mohm or 50Mohm × $\mu^{F}$ Whichever is smallerWith $200\%$ of the rated voltage Max. operating temperature $1000+48/-0$ hrsTemperature CyclingCapacitance change : $12,000$ Tan $\delta$ , IR : initial spec.I cycle condition Min. operating temperature $1 cycle condition$	Bending Strength	Capacitance change : within ±12.5%	Bending to the limit (1mm)
is to be soldered newly $245\pm5^{\circ}C, 3\pm0.3sec.$ (preheating : $80-120^{\circ}C$ for $10-30sec.$ )Resistance to Soldering HeatCapacitance change : within $\pm 7.5\%$ Solder pot : $270\pm5^{\circ}C, 10\pm1sec.$ Vibration TestCapacitance 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 : within $\pm 12.5\%$ Tan $\delta : 0.05 max$ IR : $500Mohm$ or $25Mohm × \mu^{F}$ Whichever is smallerWith rated voltage $40\pm2^{\circ}C, 90-95\%$ RH, $500+12/-0hrs$ High Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Tan $\delta : 0.05 max$ IR : $500Mohm$ or $25Mohm × \mu^{F}$ Whichever is smallerWith $200\%$ of the rated voltage Max. operating temperature $1000+48/-0hrs$ Temperature CyclingCapacitance change : within $\pm 7.5\%$ Tan $\delta, IR : initial spec.I cycle conditionMin. operating temperature1 cycle conditionMin. operating temperature\rightarrow 25^{\circ}C$			with 1.0mm/sec.
$ \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 $\pm 5\%$ From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : Tan $\delta$ : 0.05 maxwithin $\pm 12.5\%$ Whichever is smallerWith rated voltage 40 $\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : within $\pm 12.5\%$ Whichever is smallerWith $\pm 12.5\%$ Mith $\pm 12.5\%$ Whichever is smallerWith $200\%$ of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature Capacitance change : Whichever is smallerUth $\pm 7.5\%$ Michever is smallerI cycle condition Min. operating temperature $- 25^{\circ}$ C		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 : $Tan \delta$ : $0.05 max$ IR : $500Mohm or 25Mohm × \muF$ Whichever is smallerAmplitude : 1.5mm From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)High Temperature ResistanceCapacitance change : $10.05 max$ IR : $1,000Mohm or 25Mohm × \muF$ Whichever is smallerWith 200% of the rated voltage Max. operating temperature $1000+48/-0hrs$ Temperature CyclingCapacitance change : Which is spallerWith $\pm 7.5\%$ I cycle condition Min. operating temperature $1 cycle condition$ Min. operating temperature1 cycle condition Min. operating temperature $1 cycle condition$			(preheating : 80~120℃ for 10~30sec.)
Vibration TestCapacitance change : Tan $\delta$ , IR : initial spec.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 $\delta$ : 0.05 maxwithin $\pm 12.5\%$ Tan $\delta$ : 0.05 maxWith rated voltage 40 $\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsHigh Temperature ResistanceCapacitance change : Whichever is smallerwithin $\pm 12.5\%$ Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : Whichever is smallerwithin $\pm 7.5\%$ Min. operating temperature T cyclingCapacitance change : Whichever is smallerMith $\pm 7.5\%$ Min. operating temperature Min. operating temperature25°C	Resistance to	Capacitance change : within ±7.5%	Solder pot : 270±5°C, 10±1sec.
Tan $\delta$ , IR : initial spec.From 10Hz to 55Hz (return : 1min.) 2hours × 3 direction (x, y, z)Moisture ResistanceCapacitance change : within ±12.5% Tan $\delta$ : 0.05 max IR : 500Mohm or 25Mohm × $\mu^{F}$ Whichever is smallerWith 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 $\delta$ , IR : initial spec.I cycle condition Min. operating temperature Min. operating temperature	Soldering Heat		
$ \begin{array}{c} \mbox{Moisture} \\ \mbox{Resistance} & \begin{tabular}{lllllllllllllllllllllllllllllllllll$	Vibration Test	5	From 10Hz to 55Hz (return : 1min.)
ResistanceTan $\delta$ :0.05 max $40\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsIR:500Mohm or 25Mohm × $\mu$ F $40\pm 2^{\circ}$ C, 90~95%RH, 500+12/-0hrsHigh TemperatureCapacitance change : within $\pm 12.5\%$ With 200% of the rated voltageResistanceTan $\delta$ :0.05 maxMax. operating temperatureIR:1,000Mohm or 50Mohm × $\mu$ F1000+48/-0hrsWhichever is smallerWhichever is smaller1 cycle conditionTemperatureCapacitance change : within $\pm 7.5\%$ 1 cycle conditionCyclingTan $\delta$ , IR: initial spec.1 cycle condition	Moisture	Capacitance change : within ±12.5%	
Whichever is smallerWith200% of the rated voltageHigh Temperature ResistanceCapacitance change :within $\pm 12.5\%$ Tan $\delta$ :With200% of the rated voltageResistanceTan $\delta$ :0.05 max 1,000Mohm or 50Mohm × $\mu$ F Whichever is smallerWith200% of the rated voltageTemperature CyclingCapacitance change :within $\pm 7.5\%$ 1 cycle conditionTim $\delta$ , IR : initial spec.1 cycle conditionMin. operating temperature	Resistance	Tan δ : 0.05 max	40±2℃, 90~95%RH, 500+12/-0hrs
High Temperature ResistanceCapacitance change : 0.05 max IR : 1,000Mohm or 50Mohm × $\mu^{F}$ Whichever is smallerWith 200% of the rated voltage Max. operating temperature 1000+48/-0hrsTemperature CyclingCapacitance change : max Tan $\delta$ , IR : initial spec.With ±7.5% 1 cycle condition Min. operating temperature		IR : 500Mohm or 25Mohm × $\mu$ F	
ResistanceTan $\delta$ :0.05 maxMax. operating temperatureIR:1,000Mohm or 50Mohm × $\mu$ F1000+48/-0hrsWhichever is smaller1 cycle conditionTemperature CyclingCapacitance change :within ±7.5%Tan $\delta$ , IR : initial spec.1 cycle condition		Whichever is smaller	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	High Temperature	Capacitance change : within ±12.5%	With 200% of the rated voltage
Whichever is smallerWhichever is smallerTemperature CyclingCapacitance change : within $\pm 7.5\%$ Tan $\delta$ , IR : initial spec.1 cycle condition Min. operating temperature $\rightarrow 25^{\circ}C$			-
Temperature CyclingCapacitance change : Tan $\delta$ , IR : initial spec.within $\pm 7.5\%$ Min. operating temperature1 cycle condition Min. operating temperature		IR : 1,000Mohm or 50Mohm × $\mu$ F	1000+48/-0hrs
CyclingTan $\delta$ , IR : initial spec.Min. operating temperature $\rightarrow$ 25°C		Whichever is smaller	
	Temperature	Capacitance change : within ±7.5%	1 cycle condition
$\rightarrow$ Max. operating temperature $\rightarrow$ 25°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.

- *①* Aerospace/Aviation equipment
- 2 Automotive or Transportation equipment (vehicles, trains, ships, etc)
- 3 Medical equipment
- (4) Military equipment
- 5 Disaster prevention/crime prevention equipment
- Ø Power plant control equipment
- ⑦ Atomic energy-related equipment
- Indersea equipment
- Itraffic signal equipment
- Data-processing equipment
- ① Electric heating apparatus, burning equipment
- ② Safety equipment
- 13 Any other applications with the same as or similar complexity or reliability to the applications