

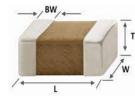
Specification of Automotive MLCC (Reference sheet)



- Supplier : Samsung Electro-Mechanics
- Product : Multi-layer Ceramic Capacitor
- Samsung P/N : CL21B222KB6WPNC
- Description : CAP, 2.2nF, 50V, ± 10%, X7R, 0805
- AEC-Q200 Qualified

A. Dimension

Dimension



Size	0805 inch
L	2.00±0.10 mm
W	1.25±0.10 mm
Т	0.60±0.10 mm
BW	0.50+0.20/-0.30 mm

B. Samsung Part Number

<u>CL</u>	<u>21</u>	B	<u>222</u>	<u>K</u>	B	<u>6</u>	w	<u>P</u>	<u>N</u>	<u>c</u>
1	2	3	4	5	6		8	9	10	1

1 Series	Samsung Multi-layer Ceramic Capacitor		
② Size	0805 (inch code)	L: 2.00±0.10 mm	W :1.25±0.10 mm
③ Dielectric	X7R	⑧ Inner electrode	Ni, Open Mode Design
④ Capacitance	2.2 nF	Termination	Metal-Epoxy
⑤ Capacitance	± 10%	Plating	Sn 100% (Pb Free)
tolerance		9 Product	Automotive
⑥ Rated Voltage	50 V	Special code	Normal
⑦ Thickness	0.60±0.10 mm	① Packaging	Cardboard Type, 7" Reel

C. Reliability Test and Judgement condition

Test items	Performance	Test condition
High Temperature	Appearance : No abnormal exterior appearance	Unpowered, 1,000hrs @ Max. temperature
Exposure	Capacitance Change Within ±10 %	Measurement at 24±2hrs after test conclusion
	Tan δ :0.03 max.	
	IR :More than 10,000 ^M Ω or 500 ^M Ω× <i>μ</i> F	Initial Measurement 2*
	Whichever is smaller	Final Measurement 3*
Temperature Cycling	Appearance : No abnormal exterior appearance	1,000Cycles
	Capacitance Change Within ±10 %	Initial Measurement 2*
	Tan δ :0.03 max.	Final Measurement 3*
	IR : More than 10,000 $^{M\Omega}$ or 500 $^{M\Omega}$ × μ F	Measurement at 24±2hrs after test conclusion
	Whichever is smaller	1 cycle condition : -55+0/-3 °C (30±3min) → Room Temp. (1min)
		→ 125+3/-0 $^{\circ}$ C (30±3min) → Room Temp. (1min)
Destructive Physical	No Defects or abnormalities	Per EIA 469
Analysis		
Humidity Bias	Appearance : No abnormal exterior appearance	1,000hrs 85 °C/85%RH, Rated Voltage and 1.3~1.5V,
	Capacitance Change Within ±12.5 %	Add 100kohm resistor
	Tan δ :0.035 max.	Initial Measurement 2*
	IR :More than 500 ^M Ω or 25 ^M Ω× <i>μ</i> F	Final Measurement 4*
	Whichever is smaller	Measurement at 24±2hrs after test conclusion
		The charge/discharge current is less than 50mA.
High Temperature	Appearance : No abnormal exterior appearance	1,000hrs @ 125℃, 200% Rated Voltage,
Operating Life	Capacitance Change Within ±12.5 %	Initial Measurement 2*
	Tan δ :0.035 max.	Final Measurement 4*
	IR :More than 1,000 [№] or 50 [№] ×µ ^F	Measurement at 24±2hrs after test conclusion
	Whichever is smaller	The charge/discharge current is less than 50mA.

	Performance	Test condition					
External Visual	No abnormal exterior appearance	Microscope ('10)					
Physical Dimension	Within the specified dimensions	Using The calipers					
Mechanical Shock	Appearance : No abnormal exterior appearance	Three shocks in each direction should be applied along					
	Capacitance Change Within ±10 %	3 mutually perpendicular axes of the test specimen (18 shocks)					
	Tan δ, IR : Initial spec.	Peak value Duration Wave Velocity					
		1,500G 0.5ms Half sine 4.7m/sec					
		Initial Measurement 2*					
		Final Measurement 5*					
Vibration	Appearance : No abnormal exterior appearance	5g's for 20min., 12cycles each of 3 orientations,					
	Capacitance Change Within ±10 %	Use 8"×5" PCB 0.031" Thick 7 secure points on one long side					
	Tan δ, IR : Initial spec.	and 2 secure points at corners of opposite sides. Parts mounted					
		within 2" from any secure point. Test from $10~2,000$ Hz.					
		Initial Measurement 2*					
		Final Measurement 5*					
Resistance to	Appearance : No abnormal exterior appearance	preheating : 150℃ for 60~120 sec.					
Solder Heat	Capacitance Change Within ±10 %	Solder pot : 260±5℃, 10±1sec.					
	Tan δ, IR : Initial spec.	Initial Measurement 2*					
		Final Measurement 3*					
ESD	Appearance : No abnormal exterior appearance	AEC-Q200-002 or ISO/DIS10605					
	Capacitance Change Within ±10 %	Initial Measurement 2*					
	Tan δ, IR : Initial spec.	Final Measurement 4*					
Solderability	95% of the terminations is to be soldered	a) Preheat at 155 $^\circ\!$					
	evenly and continuously	b) Steam aging for 8 hours, Immerse in solder for 5s at 245±5°C					
		c) Steam aging for 8 hours, Immerse in solder for 120s at 260±					
		solder : a solution ethanol and rosin					
Electrical	Capacitance : Within specified tolerance	*A capacitor prior to measuring the capacitance is heat treated at $150 \pm 0/10^{\circ}$ for theur and maintained in ambient air for 24+2 bours					
Characterization	Tan δ :0.025 max.	150 +0/-10 $^{\circ}$ C for 1 hour and maintained in ambient air for 24±2 hours					
	IR(25°C): More than 10,000 M $_{\Omega}$ or 500 M $_{\Omega} \times \mu F$	The Capacitance / D.F. should be measured at 25° C,					
	Whichever is smaller	$1 \text{ kHz} \pm 10\%$, $1 \pm 0.2 \text{ Vrms}$					
	IR(125℃) More than 1,000 ^M or 10 ^M ×µ ^F	I.R. should be measured with a DC voltage not exceeding					
	Whichever is smaller	Rated Voltage @25°C, @125°C for 60~120 sec.					
	Dielectric Strength	Dielectric Strength : 250% of the rated voltage for 1~5 seconds					
Board Flex	Appearance : No abnormal exterior appearance	Bending to the limit, 3 mm for 60 seconds 1*					
Doard Flex	Capacitance Change Within ±10 %	Initial Measurement 2*					
		Final Measurement 5*					
Terminal	Appearance : No abnormal exterior appearance	18 N, for 60 sec.					
Strength(SMD)	Capacitance Change Within ±10 %	Initial Measurement 2*					
	-	Final Measurement 5*					
Beam Load	Destruction value should be exceed 20 N	Beam speed : 0.5±0.05 mm/sec					
Temperature	X7R	1					
Characteristics	From -55 ℃ to 125 ℃, Capacitance change shoul	ld be within ±15%					

D. Recommended Soldering method :

Reflow (Reflow Peak Temperature : 260 +0/-5 °C, 30sec.), Meet IPC/JEDEC J-STD-020 D Standard

- *1 : The figure indicates typical specification. Please refer to individual specifications.
- *2 : Initial measurement : Perform a heat treatment at 150 +0/-10 °C for one hour after soldering process. and then let sit for 24±2 hours at room temperature. Perform the initial measurement.
- *3 : Final measurement : Let sit for 24±2 hours at room temperature after test conclusion, then measure.
- *4 : Final measurement : Perform a heat treatment at 150 +0/-10 °C for one hour after soldering process. and then let sit for 24±2 hours at room temperature. Perform the initial measurement.
- *5 : Final measurement : Let measure within 24 hours at room temperature after test conclusion.

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.

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- Aerospace/Aviation equipment
- ② Medical equipment
- *③ Military equipment*
- ④ Disaster prevention/crime prevention equipment
- *5* Power plant control equipment
- *6* Atomic energy-related equipment
- ⑦ Undersea equipment
- ⑧ Traffic signal equipment
- Data-processing equipment
- 10 Electric heating apparatus, burning equipment
- *1* Safety equipment
- 2 Any other applications with the same as or similar complexity or reliability to the applications