

Specification of Automotive MLCC (Reference sheet)

- Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor
- Samsung P/N : **CL21B225KOFVPE**
- Description : **CAP, 2.2 μ F, 16V, \pm 10%, X7R, 0805**
- AEC-Q 200 Specified

A. Samsung Part Number

CL **21** **B** **225** **K** **O** **F** **V** **P** **J** **E**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

① Series	Samsung Multi-layer Ceramic Capacitor									
② Size	0805 (inch code)	L: 2.00 \pm 0.10 mm		W: 1.25 \pm 0.10 mm						
③ Dielectric	X7R	⑧ Inner electrode		Ni						
④ Capacitance	2.2 μ F	Termination		Soft Termination						
⑤ Capacitance tolerance	\pm 10 %	Plating		Sn 100% (Pb Free)						
⑥ Rated Voltage	16 V	⑨ Product		Automotive						
⑦ Thickness	1.25 \pm 0.10 mm	⑩ Grade code		Higher bending strength						
		⑪ Packaging		Embossed Type, 7" reel						

B. Reliability Test and Judgement condition

	Performance	Test condition								
High Temperature Exposure	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ : 0.125 max IR : More than 10,000MΩ or 500MΩ×μF Whichever is Smaller	Unpowered, 1000hrs@T=125℃ Measurement at 24±2hrs after test conclusion Initial Measurement 2* Final Measurement 3*								
Temperature Cycling	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ : 0.125 max IR : More than 10,000MΩ or 500MΩ×μF Whichever is Smaller	1000Cycles Initial Measurement 2* Final Measurement 3* Measurement at 24±2hrs after test conclusion 1 cycle condition : -55+0/-3℃(15±3min) -> Room Temp(1min.) -> 125+3/-0℃(15±3min) -> Room Temp(1min.)								
Destructive Physical Analysis	No Defects or abnormalities	Per EIA 469								
Humidity Bias	Appearance : No abnormal exterior appearance Capacitance Change : Within ±12.5% Tan δ : 0.125 max IR : More than 500MΩ or 25MΩ×μF Whichever is Smaller	1000hrs 85℃/85%RH, Rated Voltage and 1.3~1.5V, Add 100kohm resistor Initial Measurement 2* Final Measurement 4* Measurement at 24±2hrs after test conclusion The charge/discharge current is less than 50mA.								
High Temperature Operating Life	Appearance : No abnormal exterior appearance Capacitance Change : Within ±12.5% Tan δ : 0.125 max IR : More than 1000MΩ or 50MΩ×μF Whichever is Smaller	1000hrs @ TA=125℃, 200% Rated Voltage, Initial Measurement 2* Final Measurement 4* Measurement at 24±2hrs after test conclusion The charge/discharge current is less than 50mA.								
External Visual	No abnormal exterior appearance	Microscope (´10)								
Physical Dimensions	Within the specified dimensions	Using The calipers								
Mechanical Shock	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks) <table><tr><td>Peakvalue</td><td>Duration</td><td>Wave</td><td>Velocity</td></tr><tr><td>1,500G</td><td>0.5ms</td><td>Half sine</td><td>4.7m/sec.</td></tr></table> Initial Measurement 2* Final Measurement 5*	Peakvalue	Duration	Wave	Velocity	1,500G	0.5ms	Half sine	4.7m/sec.
Peakvalue	Duration	Wave	Velocity							
1,500G	0.5ms	Half sine	4.7m/sec.							

	Performance	Test condition
Vibration	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$ Tan δ , IR : initial spec.	5g's for 20min., 12cycles each of 3 orientations, Use 8"×5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000Hz. Initial Measurement 2* Final Measurement 5*
Resistance to Solder Heat	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$ Tan δ , IR : initial spec.	Solder pot : 260 $\pm 5^{\circ}\text{C}$, 10 ± 1 sec. Initial Measurement 2* Final Measurement 3*
ESD	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$ Tan δ , IR : initial spec.	AEC-Q200-002 Initial Measurement 2* Final Measurement 4*
Solderability	95% of the terminations is to be soldered evenly and continuously	a) Preheat at 155 $^{\circ}\text{C}$ for 4 hours, Immerse in solder for 5s at 245 $\pm 5^{\circ}\text{C}$ b) Steam aging for 8 hours, Immerse in solder for 5s at 245 $\pm 5^{\circ}\text{C}$ c) Steam aging for 8 hours, Immerse in solder for 120s at 260 $\pm 5^{\circ}\text{C}$ solder : a solution ethanol and rosin
Electrical Characterization	Capacitance : Within specified tolerance Tan δ (DF) : 0.1max. IR(25 $^{\circ}\text{C}$) : More than 10,000M Ω or 500M $\Omega \times \mu\text{F}$ IR(125 $^{\circ}\text{C}$) : More than 1,000M Ω or 10M $\Omega \times \mu\text{F}$ Whichever is Smaller Dielectric Strength	*A capacitor prior to measuring the capacitance is heat treated at 150 +0/-10 $^{\circ}\text{C}$ for 1hour and maintained in ambient air for 24 \pm 2 hours The Capacitance /D.F. should be measured at 25 $^{\circ}\text{C}$, 1kHz $\pm 10\%$, 1.0 ± 0.2 Vrms I.R. should be measured with a DC voltage not exceeding Rated Voltage @25 $^{\circ}\text{C}$, @125 $^{\circ}\text{C}$ for 60~120 sec. Dielectric Strength : 250% of the rated voltage for 1~5 seconds
Board Flex	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$	Bending to the limit (6mm) for 60 seconds 1* Initial Measurement 2* Final Measurement 5*
Terminal Strength(SMD)	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$	18N, for 60 ± 1 sec. Initial Measurement 2* Final Measurement 5*
Beam Load	Destruction value should be exceed Chip Length < 2.5mm a) Chip Thickness > 0.5mm : 20N b) Chip Thickness $\leq 0.5\text{mm}$: 8N	Beam speed 0.5 $\pm 0.05\text{mm/sec}$
Temperature Characteristics	X7R (From -55 $^{\circ}\text{C}$ to 125 $^{\circ}\text{C}$, Capacitance change should be within $\pm 15\%$)	

C. Recommended Soldering method :

Reflow (Reflow Peak Temperature : 260+0/-5 $^{\circ}\text{C}$, 10sec. Max)
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 $^{\circ}\text{C}$ 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 $^{\circ}\text{C}$ 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.



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.