

# Specification of Automotive MLCC

- Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor

- Samsung P/N : **CL31B105KBH5PNE**
- Description : **CAP, 1 $\mu$ F, 50V,  $\pm$ 10%, X7R, 1206**
- AEC-Q 200 Specified

## A. Samsung Part Number

CL   31   B   105   K   B   H   5   P   N   E  
 ①   ②   ③   ④   ⑤   ⑥   ⑦   ⑧   ⑨   ⑩   ⑪

① <b>Series</b>	Samsung Multi-layer Ceramic Capacitor										
② <b>Size</b>	1206 (inch code)	L: 3.2 $\pm$ 0.2	mm	W: 1.6 $\pm$ 0.2	mm						
③ <b>Dielectric</b>	X7R			⑧ <b>Inner electrode Termination</b>	Ni , Open mode Cu , Ag-epoxy						
④ <b>Capacitance</b>	1 $\mu$ F			⑨ <b>Plating</b>	Sn 100% (Pb Free)						
⑤ <b>Capacitance tolerance</b>	$\pm$ 10 %			⑩ <b>Product</b>	Automotive						
⑥ <b>Rated Voltage</b>	50 V			⑪ <b>Grade code</b>	Standard						
⑦ <b>Thickness</b>	1.6 $\pm$ 0.2	mm	⑪ <b>Packaging</b>								Embossed Type, 7" reel

## B. Reliability Test and Judgement condition

	Performance	Test condition
<b>High Temperature Exposure</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm$ 10% Tan $\delta$ : 0.03 max IR : More than 10,000M $\Omega$ or 500M $\Omega$ $\times$ $\mu$ F Whichever is Smaller	Unpowered, 1000hrs@T=150 $^{\circ}$ C Measurement at 24 $\pm$ 2hrs after test conclusion
<b>Temperature Cycling</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm$ 10% Tan $\delta$ : 0.03 max IR : More than 10,000M $\Omega$ or 500M $\Omega$ $\times$ $\mu$ F Whichever is Smaller	1000Cycles Measurement at 24 $\pm$ 2hrs after test conclusion 1 cycle condition : -55+0/-3 $^{\circ}$ C (15 $\pm$ 3min) -> Room Temp(1min.) -> 125+3/-0 $^{\circ}$ C (15 $\pm$ 3min) -> Room Temp(1min.)
<b>Destructive Physical Analysis</b>	No Defects or abnormalities	Per EIA 469
<b>Moisture Resistance</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm$ 12.5% Tan $\delta$ : 0.03 max IR : More than 10,000M $\Omega$ or 500M $\Omega$ $\times$ $\mu$ F Whichever is Smaller	10Cycles, t=24hrs/cycle Heat (25~65 $^{\circ}$ C) and humidity (80~98%), Unpowered measurement at 24 $\pm$ 2hrs after test conclusion
<b>Humidity Bias</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm$ 12.5% Tan $\delta$ : 0.035 max IR : More than 500M $\Omega$ or 25M $\Omega$ $\times$ $\mu$ F Whichever is Smaller	1000hrs 85 $^{\circ}$ C/85%RH, Rated Voltate and 1.3~1.5V, Add 100kohm resistor Measurement at 24 $\pm$ 2hrs after test conclusion The charge/discharge current is less than 50mA.
<b>High Temperature Operating Life</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm$ 12.5% Tan $\delta$ : 0.035 max IR : More than 1000M $\Omega$ or 50M $\Omega$ $\times$ $\mu$ F Whichever is Smaller	1000hrs @ TA=125 $^{\circ}$ C, 200% Rated Voltage, Measurement at 24 $\pm$ 2hrs after test conclusion The charge/discharge current is less than 50mA.

	Performance	Test condition								
<b>External Visual</b>	No abnormal exterior appearance	Microscope (×10)								
<b>Physical Dimensions</b>	Within the specified dimensions	Using The calipers								
<b>Mechanical Shock</b>	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 border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Peakvalue</th> <th>Duration</th> <th>Wave</th> <th>Velocity</th> </tr> </thead> <tbody> <tr> <td>1,500G</td> <td>0.5ms</td> <td>Half sine</td> <td>4.7m/sec.</td> </tr> </tbody> </table>	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.							
<b>Vibration</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±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.								
<b>Resistance to Solder Heat</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	Solder pot : 260±5°C, 10±1sec.								
<b>Thermal Shock</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	-55°C/+125°C. Note: Number of cycles required-300, Maximum transfer time-20 sec, Dwell time-15min. Air-Air								
<b>ESD</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	AEC-Q200-002								
<b>Solderability</b>	95% of the terminations is to be soldered evenly and continuously	a) Preheat at 155°C for 4 hours, Immerse in solder for 5s at 245±5°C 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±5°C solder : a solution ethanol and rosin								
<b>Electrical Characterization</b>	Capacitance : Within specified tolerance Tan δ (DF) : 0.025 max. IR(25°C) : More than 10,000MΩ or 500MΩ×μF IR(125°C) : More than 1,000MΩ or 10MΩ×μF Whichever is Smaller Dielectric Strength	The Capacitance /D.F. should be measured at 25°C, 1kHz±10%, 1.0±0.2Vrms I.R. should be measured with a DC voltage not exceeding Rated Voltage @25°C, @125°C for 60~120 sec. Dielectric Strength : 250% of the rated voltage for 1~5 seconds								
<b>Board Flex</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10%	Bending to the limit (2mm) for 5 seconds								
<b>Terminal Strength(SMD)</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10%	18N, for 60±1 sec.								
<b>Beam Load</b>	Destruction value should not be exceed Chip Length ≥ 3.2mm a) Chip Thickness < 1.25mm : 15N b) Chip Thickness ≥ 1.25mm : 54.5N	Beam speed 2.5±0.25mm/sec								
<b>Temperature Characterisitcs</b>	X7R (From -55°C to 125°C, Capacitance change should be within ±15%)									

### C. Recommended Soldering method :

Reflow ( Reflow Peak Temperature : 260+0/-5°C, 10sec. Max )

Meet IPC/JEDEC J-STD-020 D Standard

\* For the more detail Specification, Please refer to the Samsung MLCC catalogue.