

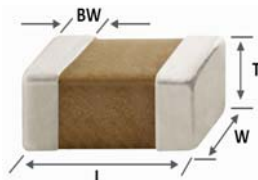
Specification of Automotive MLCC (Reference sheet)

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

- Samsung P/N : **CL10C471JB81PNL**
- Description : **CAP, 470pF, 50V, ± 5%, COG, 0603**
- AEC-Q200 Qualified

A. Dimension

● Dimension



Size	0603 inch
L	1.60±0.10 mm
W	0.80±0.10 mm
T	0.80±0.10 mm
BW	0.30±0.20 mm

B. Samsung Part Number

CL **10** **C** **471** **J** **B** **8** **1** **P** **N** **L**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

① Series	Samsung Multi-layer Ceramic Capacitor		
② Size	0603 (inch code)	L: 1.60±0.10 mm	W: 0.80±0.10 mm
③ Dielectric	COG	⑧ Inner electrode	Ni
④ Capacitance	470 pF	Termination	Cu
⑤ Capacitance tolerance	± 5%	Plating	Sn 100% (Pb Free)
⑥ Rated Voltage	50 V	⑨ Product	Automotive
⑦ Thickness	0.80±0.10 mm	⑩ Special code	Normal
		⑪ Packaging	Cardboard Type, 13" Reel

C. Reliability Test and Judgement condition

	Performance	Test condition
High Temperature Exposure	Appearance : No abnormal exterior appearance Capacitance Change : Within ±2.5% or ±0.25pF whichever is larger Q : 1,000 min. IR : More than 10,000 MΩ or 500 MΩ×μF Whichever is smaller	Unpowered, 1,000hrs @ Max. temperature Measurement at 24±2hrs after test conclusion
Temperature Cycling	Appearance : No abnormal exterior appearance Capacitance Change : Within ±2.5% or ±0.25pF whichever is larger Q : 1,000 min. IR : More than 10,000 MΩ or 500 MΩ×μF Whichever is smaller	1,000Cycles Measurement at 24±2hrs after test conclusion 1 cycle condition : -55+0/-3℃(30±3min) → Room Temp. (1min) → 125+3/-0℃(30±3min) → Room Temp. (1min)
Destructive Physical Analysis	No Defects or abnormalities	Per EIA 469
Humidity Bias	Appearance : No abnormal exterior appearance Capacitance Change : Within ±2.5% or ±0.25pF whichever is larger Q : 200 min. IR : More than 500 MΩ or 25 MΩ×μF Whichever is smaller	1,000hrs 85℃/85%RH, Rated Voltage and 1.3~1.5V, Add 100kohm resistor The charge/discharge current is less than 50mA.
High Temperature Operating Life	Appearance : No abnormal exterior appearance Capacitance Change : Within ±3% or ±0.3pF whichever is larger Q : 350 min. IR : More than 1,000 MΩ or 50 MΩ×μF Whichever is smaller	1,000hrs @ 125℃, 200% Rated Voltage, Measurement at 24±2hrs after test conclusion The charge/discharge current is less than 50mA.

	Performance	Test condition								
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 $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger Q, 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"> <thead> <tr> <th>Peak value</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>	Peak value	Duration	Wave	Velocity	1,500G	0.5ms	Half sine	4.7m/sec
Peak value	Duration	Wave	Velocity							
1,500G	0.5ms	Half sine	4.7m/sec							
Vibration	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger Q, IR : Initial spec.	5g's for 20min., 12cycles each of 3 orientations, Use 8"x5" 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 10~2,000Hz.								
Resistance to Solder Heat	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger Q, IR : Initial spec.	Preheating : 150°C for 60~120 sec. Solder pot : 260 \pm 5°C, 10 \pm 1sec.								
ESD	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger Q, IR : Initial spec.	AEC-Q200-002 or ISO/DIS10605								
Solderability	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 \pm 5°C b) Steam aging for 8 hours, Immerse in solder for 5s at 245 \pm 5°C c) Steam aging for 8 hours, Immerse in solder for 120s at 260 \pm 5°C solder : a solution ethanol and rosin								
Electrical Characterization	Capacitance : Within specified tolerance Q : 1,000 min. IR(25°C) : More than 100,000 M Ω or 1,000 M Ω \times μF Whichever is smaller. IR(125°C) : More than 10,000 M Ω or 100 M Ω \times μF Whichever is smaller. Dielectric Strength	The Capacitance / D.F. should be measured at 25°C, 1 MHz \pm 10%, 0.5~5 Vrms I.R. should be measured with a DC voltage not exceeding Rated Voltage @25°C, @125°C for 60~120 sec. Dielectric Strength : 300% of the rated voltage for 1~5 seconds								
Board Flex	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 5\%$ or $\pm 0.5\text{pF}$ whichever is larger	Bending to the limit, 3 mm for 60 seconds								
Terminal Strength(SMD)	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger	10 N, for 60 sec.								
Beam Load	Destruction value should be exceed 20 N	Beam speed : 0.5 \pm 0.05 mm/sec								
Temperature Characteristics	C0G From -55°C to 125°C, Capacitance change should be within 0 \pm 30ppm/°C									

D. Recommended Soldering method :

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



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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- 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
- ⑨ Data-processing equipment
- ⑩ Electric heating apparatus, burning equipment
- ⑪ Safety equipment
- ⑫ Any other applications with the same as or similar complexity or reliability to the applications