

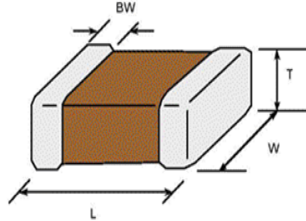
Specification of Automotive MLCC (Reference sheet)

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

- Samsung P/N : CL10C470FB81PNC
- Description : CAP, 47pF, 50V, ±1%, C0G, 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** **470** **F** **B** **8** **1** **P** **N** **C**
 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	C0G	⑧ Inner electrode	Ni
④ Capacitance	47 pF	Termination	Cu
⑤ Capacitance tolerance	±1%	⑨ Plating	Sn 100% (Pb Free)
⑥ Rated Voltage	50 V	⑩ Product	Automotive
⑦ Thickness	0.80±0.10 mm	⑪ Special code	Normal
		⑪ Packaging	Cardboard Type, 7" 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 $0.25\mu\text{F}$ 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 $0.25\mu\text{F}$ 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 $0.25\mu\text{F}$ whichever is larger Q, IR : Initial spec.	preheating : 150°C for 60~120 sec. Solder pot : $260\pm 5^{\circ}\text{C}$, $10\pm 1\text{sec}$.								
ESD	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 2.5\%$ or $0.25\mu\text{F}$ 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 $245\pm 5^{\circ}\text{C}$ 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 Q : 1,000 min. IR(25°C) : More than 100,000 $\text{M}\Omega$ or $1,000 \text{M}\Omega \times \mu\text{F}$ Whichever is smaller IR(125°C) : More than 10,000 $\text{M}\Omega$ or $100 \text{M}\Omega \times \mu\text{F}$ Whichever is smaller Dielectric Strength	The Capacitance / D.F. should be measured at 25°C , $1 \text{kHz} \pm 10\%$, $0.5\sim 5 \text{Vrms}$ 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 $0.5\mu\text{F}$ 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 $0.25\mu\text{F}$ whichever is larger	10 N, for 60 sec.								
Beam Load	Destruction value should be exceed 20 N	Beam speed : $0.5\pm 0.05 \text{mm/sec}$								
Temperature Characteristics	C0G From -55°C to 125°C , Capacitance change should be within $0\pm 30\text{ppm}/^{\circ}\text{C}$									

D. Recommended Soldering method :

Reflow (Reflow Peak Temperature : $260 \pm 0/-5^{\circ}\text{C}$, 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.

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.