

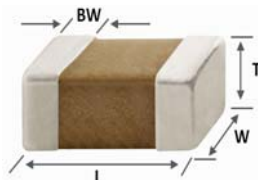
# Specification of Automotive MLCC (Reference sheet)

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

- Samsung P/N : **CL05C2R2CC51PNC**
- Description : **CAP, 2.2pF, 100V, ± 0.25pF, COG, 0402**
- AEC-Q200 Qualified

## A. Dimension

### ● Dimension



Size	0402 inch
L	1.00±0.05 mm
W	0.50±0.05 mm
T	0.50±0.05 mm
BW	0.25±0.10 mm

## B. Samsung Part Number

CL   05   C   2R2   C   C   5   1   P   N   C  
 ①   ②   ③   ④   ⑤   ⑥   ⑦   ⑧   ⑨   ⑩   ⑪

① Series	Samsung Multi-layer Ceramic Capacitor		
② Size	0402 (inch code)	L: 1.00±0.05 mm	W: 0.50±0.05 mm
③ Dielectric	COG	⑧ Inner electrode	Ni
④ Capacitance	2.2 pF	Termination	Cu
⑤ Capacitance tolerance	± 0.25pF	Plating	Sn 100% (Pb Free)
⑥ Rated Voltage	100 V	⑨ Product	Automotive
⑦ Thickness	0.50±0.05 mm	⑩ Special code	Normal
		⑪ Packaging	Cardboard Type, 7" Reel

## C. Reliability Test and Judgement condition

	Performance	Test condition
<b>High Temperature Exposure</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±2.5% or ±0.25pF whichever is larger Q : 444 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
<b>Temperature Cycling</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±2.5% or ±0.25pF whichever is larger Q : 444 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)
<b>Destructive Physical Analysis</b>	No Defects or abnormalities	Per EIA 469
<b>Humidity Bias</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±2.5% or ±0.25pF whichever is larger Q : 107.326 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.
<b>High Temperature Operating Life</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within ±3% or ±0.3pF whichever is larger Q : 222 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								
<b>External Visual</b>	No abnormal exterior appearance	Microscope (X10)								
<b>Physical Dimensions</b>	Within the specified dimensions	Using The calipers								
<b>Mechanical Shock</b>	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							
<b>Vibration</b>	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.								
<b>Resistance to Solder Heat</b>	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.								
<b>ESD</b>	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								
<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 $\pm$ 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								
<b>Electrical Characterization</b>	Capacitance : Within specified tolerance Q : 444 min. IR(25°C) : More than 100,000 M $\Omega$ or 1,000 M $\Omega$ $\times$ $\mu\text{F}$ Whichever is smaller. IR(125°C) : More than 10,000 M $\Omega$ or 100 M $\Omega$ $\times$ $\mu\text{F}$ 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 : 200% of the rated voltage for 1~5 seconds								
<b>Board Flex</b>	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								
<b>Terminal Strength(SMD)</b>	Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger	2 N, for 60 sec.								
<b>Beam Load</b>	Destruction value should be exceed 8 N	Beam speed : 0.5 $\pm$ 0.05 mm/sec								
<b>Temperature Characteristics</b>	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  $\pm$ 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.

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.

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The products listed in this Specification sheet are **NOT** designed and manufactured for any use and applications set forth below.

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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