

Specification of Automotive MLCC

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

- Samsung P/N : **CL21B333KBC5PNC**
- Description : **CAP, 33nF, 50V, ±10%, X7R, 0805**
- AEC-Q 200 Specified

A. Samsung Part Number

CL 21 B 333 K B C 5 P N C
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

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|--------------------------------|---------------------------------------|--------------------------------------|---|
| ① Series | Samsung Multi-layer Ceramic Capacitor | | |
| ② Size | 0805 (inch code) | L: 2.0 ± 0.1 mm | W: 1.25 ± 0.1 mm |
| ③ Dielectric | X7R | ⑧ Inner electrode Termination | Ni , Open mode Cu , Ag-epoxy |
| ④ Capacitance | 33 nF | ⑨ Plating | Sn 100% (Pb Free) |
| ⑤ Capacitance tolerance | ±10 % | ⑩ Product | Automotive |
| ⑥ Rated Voltage | 50 V | ⑪ Grade code | Standard |
| ⑦ Thickness | 0.85 ± 0.1 mm | | ⑪ Packaging Cardboard 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 : 0.03 max IR : More than 10,000MΩ or 500MΩ×μF Whichever is Smaller | Unpowered, 1000hrs@T=150°C Measurement at 24±2hrs after test conclusion |
| Temperature Cycling | Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ : 0.03 max IR : More than 10,000MΩ or 500MΩ×μF Whichever is Smaller | 1000Cycles Measurement at 24±2hrs after test conclusion 1 cycle condition : -55+0/-3°C (15±3min) -> Room Temp(1min.) -> 125+3/-0°C (15±3min) -> Room Temp(1min.) |
| Destructive Physical Analysis | No Defects or abnormalities | Per EIA 469 |
| Moisture Resistance | Appearance : No abnormal exterior appearance Capacitance Change : Within ±12.5% Tan δ : 0.03 max IR : More than 10,000MΩ or 500MΩ×μF Whichever is Smaller | 10Cycles, t=24hrs/cycle Heat (25~65°C) and humidity (80~98%), Unpowered measurement at 24±2hrs after test conclusion |
| Humidity Bias | Appearance : No abnormal exterior appearance Capacitance Change : Within ±12.5% Tan δ : 0.035 max IR : More than 500MΩ or 25MΩ×μF Whichever is Smaller | 1000hrs 85°C/85%RH, Rated Voltate and 1.3~1.5V, Add 100kohm resistor 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 : 0.035 max IR : More than 1000MΩ or 50MΩ×μF Whichever is Smaller | 1000hrs @ TA=125°C, 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 ($\times 10$) | | | | | | | | |
| Physical Dimensions | Within the specified dimensions | Using The calipers | | | | | | | | |
| Mechanical Shock | Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$ 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. | | | | | | | |
| 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"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 10~2000Hz. | | | | | | | | |
| Resistance to Solder Heat | Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$ Tan δ , IR : initial spec. | Solder pot : $260\pm 5^{\circ}\text{C}$, $10\pm 1\text{sec}$. | | | | | | | | |
| Thermal Shock | Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$ Tan δ , IR : initial spec. | $-55^{\circ}\text{C}/+125^{\circ}\text{C}$. Note: Number of cycles required-300, Maximum transfer time-20 sec, Dwell time-15min. Air-Air | | | | | | | | |
| ESD | Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$ Tan δ , IR : initial spec. | AEC-Q200-002 | | | | | | | | |
| 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 Tan δ (DF) : 0.025 max. IR(25°C) : More than $10,000\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ IR(125°C) : More than $1,000\text{M}\Omega$ or $10\text{M}\Omega \times \mu\text{F}$ Whichever is Smaller Dielectric Strength | The Capacitance /D.F. should be measured at 25°C , $1\text{kHz} \pm 10\%$, $1.0 \pm 0.2\text{Vrms}$ I.R. should be measured with a DC voltage not exceeding Rated Voltage @ 25°C , @ 125°C for 60~120 sec. Dielectric Strength : 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 (2mm) for 5 seconds | | | | | | | | |
| Terminal Strength(SMD) | Appearance : No abnormal exterior appearance Capacitance Change : Within $\pm 10\%$ | 18N, for 60 ± 1 sec. | | | | | | | | |
| Beam Load | Destruction value should not be exceed Chip Length < 2.5mm a) Chip Thickness > 0.5mm : 20N b) Chip Thickness \leq 0.5mm : 8N | Beam speed $0.5 \pm 0.05\text{mm}/\text{sec}$ | | | | | | | | |
| Temperature Characterisitcs | X7R (From -55°C to 125°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

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