

DATA SHEET

SURFACE MOUNT MULTILAYER CERAMIC CAPACITORS

High Frequency Automotive Grade

NP0

16 V TO 50 V

0.2 pF to 100 pF

RoHS compliant & Halogen Free



SCOPE

This specification describes Automotive grade NPO series chip capacitors with lead-free terminations and used for automotive equipments.

APPLICATIONS

All general purpose applications
Entertainment applications
Comfort / security applications
Information applications

FEATURES

- AEC-Q200 qualified
- MSL class: MSL 1
- AC series soldering is compliant with J-STD-020D
- Halogen free epoxy
- RoHS compliant
- Reduce environmentally hazardous waste
- High component and equipment reliability
- The capacitors are 100% performed by automatic optical inspection prior to taping.

ORDERING INFORMATION - GLOBAL PART NUMBER

All part numbers are identified by the series, size, tolerance, TC material, packing style, voltage, process code, termination and capacitance value.

GLOBAL PART NUMBER

AQ XXXX X X XXX X **B** X XXX
(1) (2) (3) (4) (5) (6) (7)

(1) SIZE – INCH BASED (METRIC)

0603 (1608)

(2) TOLERANCE

- 0.2pF to 2.0pF
- A = ±0.05 pF
- B = ±0.1 pF
- C = ±0.25 pF
- 2.1pF to 5.0pF
- A = ±0.05 pF
- B = ±0.1 pF
- C = ±0.25 pF
- D = ±0.5 pF
- 5.1pF to 9.9pF
- B = ±0.1 pF
- C = ±0.25 pF
- D = ±0.5 pF
- 10pF and over
- F = ±1%
- G = ±2%
- J = ±5%

(3) PACKING STYLE

- R = Paper/PE taping reel; Reel 7 inch
- P = Paper/PE taping reel; Reel 13 inch

(4) TC MATERIAL

NPO

(5) RATED VOLTAGE

- 7 = 16 V
- 8 = 25 V
- 9 = 50 V

(6) PROCESS

N = NPO

(7) CAPACITANCE VALUE

2 significant digits+number of zeros
The 3rd digit signifies the multiplying factor, and letter R is decimal point
Example: 121 = $12 \times 10^1 = 120 \text{ pF}$

CONSTRUCTION

The capacitor consists of a rectangular block of ceramic dielectric in which a number of interleaved metal electrodes are contained. This structure gives rise to a high capacitance per unit volume.

The inner electrodes are connected to the two end terminations and finally covered with a layer of plated tin (Matte Sn). The terminations are lead-free. A cross section of the structure is shown in Fig.1.

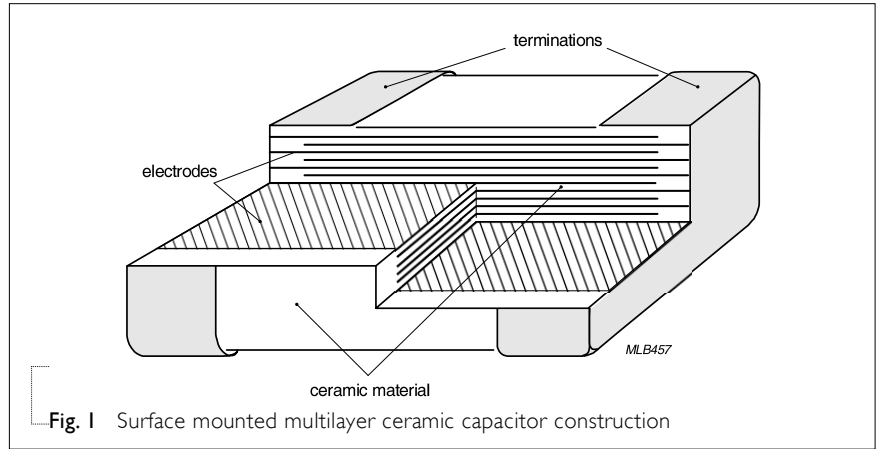


Fig. 1 Surface mounted multilayer ceramic capacitor construction

DIMENSION

Table I For outlines see fig. 2

| TYPE | L ₁ (mm) | W (mm) | T (MM) | L ₂ / L ₃ (mm) | | L ₄ (mm) |
|------|---------------------|-----------|-----------|--------------------------------------|------|---------------------|
| | | | | min. | max. | min. |
| 0603 | 1.6 ±0.10 | 0.8 ±0.10 | 0.8 ±0.10 | 0.20 | 0.60 | 0.40 |

OUTLINES

For dimension see Table I

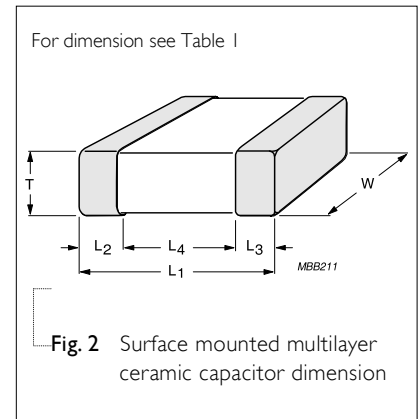


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

CAPACITANCE RANGE & THICKNESS FOR NPO

Table 3 Sizes 0603

| CAP. | 0603 | | | CAP. | 0603 | | |
|--------|---------|---------|---------|--------|---------|---------|---------|
| | 16 V | 25 V | 50 V | | 16 V | 25 V | 50 V |
| 0.2 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 9 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 0.3 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 10 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 0.4 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 12 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 0.5 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 15 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 0.6 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 18 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 0.7 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 22 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 0.8 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 27 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 0.9 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 33 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.0 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 39 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.2 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 47 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.5 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 56 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 1.8 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 68 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 2.0 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 82 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 2.2 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | 100 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 |
| 2.4 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 2.7 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 3.0 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 3.3 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 3.6 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 3.9 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 4.0 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 4.7 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 5.0 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 5.6 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 6.0 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 6.8 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 7.0 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 8.0 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |
| 8.2 pF | 0.8±0.1 | 0.8±0.1 | 0.8±0.1 | | | | |

NOTE

1. Values in shaded cells indicate thickness class in mm
2. Capacitance value of non E-12 series is on request

THICKNESS CLASSES AND PACKING QUANTITY

Table 13

| SIZE CODE | THICKNESS CLASSIFICATION | TAPE WIDTH QUANTITY PER REEL | Ø180 MM / 7 INCH | | Ø330 MM / 13 INCH | |
|-----------|--------------------------|------------------------------|------------------|---------|-------------------|---------|
| | | | Paper | Blister | Paper | Blister |
| 0603 | 0.8 ±0.1 mm | 8 mm | 4,000 | --- | 15,000 | --- |

ELECTRICAL CHARACTERISTICS

NP0 DIELECTRIC CAPACITORS; NI/SIN TERMINATIONS

Unless otherwise specified, all test and measurements shall be made under standard atmospheric conditions for testing as given in 5.3 of IEC 60068-1:

- Temperature: 15 °C to 35 °C
- Relative humidity: 25% to 75%
- Air pressure: 86 kPa to 106 kPa

Before the measurements are made, the capacitor shall be stored at the measuring temperature for a time sufficient to allow the entire capacitor to reach this temperature.

The period as prescribed for recovery at the end of a test is normally sufficient for this purpose.

Table 14

| DESCRIPTION | VALUE |
|--|--------------------------------------|
| Capacitance range | 0.2 pF to 100 µF |
| Capacitance tolerance | |
| NP0 C < 10 pF | ±0.05 pF, ±0.1 pF, ±0.25 pF, ±0.5 pF |
| C ≥ 10 pF | ±1%, ±2%, ±5% |
| Dissipation factor (D.F.) | |
| NP0 C < 30 pF | ≤ 1 / (400 + 20C) |
| C ≥ 30 pF | ≤ 0.1 % |
| Insulation resistance after 1 minute at U _r (DC) | IR ≥ 10 GΩ |
| Maximum capacitance change as a function of temperature (temperature characteristic/coefficient): | |
| NP0 | ±30 ppm/°C |
| Operating temperature range: | |
| NP0 | -55 °C to +125 °C |

SOLDERING RECOMMENDATION

Table 15

| SOLDERING METHOD | SIZE | | | | |
|------------------|----------|----------|----------|----------|-------------|
| | 0402 | 0603 | 0805 | 1206 | ≥ 1210 |
| Reflow | ≥ 0.1 μF | ≥ 1.0 μF | ≥ 2.2 μF | ≥ 4.7 μF | Reflow only |
| Reflow/Wave | < 0.1 μF | < 1.0 μF | < 2.2 μF | < 4.7 μF | --- |

SOLDERING CONDITIONS

The lead free MLCCs are able to stand the reflow soldering conditions as below:

- Temperature: above 220 °C
- Endurance: 95 to 120 seconds
- Cycles: 3 times

The test of "soldering heat resistance" is carried out in accordance with the schedule of "MIL-STD-202F-method 210F", "The robust construction of chip capacitors allows them to be completely immersed in a solder bath of 270 °C for 10 seconds". Therefore, it is possible to mount MLCCs on one side of a PCB and other discrete components on the reverse (mixed PCBs). Surface Mount Capacitors are tested for solderability at 245 °C during 2 seconds. The test condition for no leaching is 260°C for 30 seconds.

TESTS AND REQUIREMENTS

Table 16 Test procedures and requirements

| TEST | TEST METHOD | | PROCEDURE | REQUIREMENTS |
|---------------------------|-----------------|-------|--|----------------------------------|
| Mounting | IEC 60384-21/22 | 4.3 | The capacitors may be mounted on printed-circuit boards or ceramic substrates | No visible damage |
| Capacitance | IEC 60384-21/22 | 4.5.1 | Class I: At 20 °C, 24 hours after annealing f = 1 MHz for C ≤ 1nF, measuring at voltage V _{rms} at 20 °C f = 1 KHz for C > 1nF, measuring at voltage V _{rms} at 20 °C | Within specified tolerance |
| Dissipation Factor (D.F.) | IEC 60384-21/22 | 4.5.2 | Class I: At 20 °C, 24 hours after annealing f = 1 MHz for C ≤ 1nF, measuring at voltage V _{rms} at 20 °C f = 1 KHz for C > 1nF, measuring at voltage V _{rms} at 20 °C | In accordance with specification |
| Insulation Resistance | IEC 60384-21/22 | 4.5.3 | At U _r (DC) for 1 minute | In accordance with specification |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS | | | | | | | | | | | | |
|-------------------------------|-----------------------|---|---|-----------------|---|------|---|-----------------------|---|------|---|-----------------------|---|------|---|
| Temperature coefficient | 4.6 | <p>Capacitance shall be measured by the steps shown in the following table.</p> <p>The capacitance change should be measured after 5 min at each specified temperature stage.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>25±2</td> </tr> <tr> <td>b</td> <td>Lower temperature±3°C</td> </tr> <tr> <td>c</td> <td>25±2</td> </tr> <tr> <td>d</td> <td>Upper Temperature±2°C</td> </tr> <tr> <td>e</td> <td>25±2</td> </tr> </tbody> </table> <p>(1) Class I</p> <p>Temperature Coefficient shall be calculated from the formula as below</p> $\text{Temp. Coefficient} = \frac{C2 - C1}{C1 \times \Delta T} \times 10^6 \text{ [ppm/°C]}$ <p>C1: Capacitance at step c C2: Capacitance at 125°C $\Delta T: 100^\circ\text{C}(=125^\circ\text{C}-25^\circ\text{C})$</p> <p>(2) Class II</p> <p>Capacitance Change shall be calculated from the formula as below</p> $\Delta C = \frac{C2 - C1}{C1} \times 100\%$ <p>C1: Capacitance at step c C2: Capacitance at step b or d</p> | Step | Temperature(°C) | a | 25±2 | b | Lower temperature±3°C | c | 25±2 | d | Upper Temperature±2°C | e | 25±2 | <p><General purpose series></p> <p>Class I: $\Delta C/C: \pm 30\text{ppm}$</p> |
| Step | Temperature(°C) | | | | | | | | | | | | | | |
| a | 25±2 | | | | | | | | | | | | | | |
| b | Lower temperature±3°C | | | | | | | | | | | | | | |
| c | 25±2 | | | | | | | | | | | | | | |
| d | Upper Temperature±2°C | | | | | | | | | | | | | | |
| e | 25±2 | | | | | | | | | | | | | | |
| High Temperature Exposure | AEC-Q200 3 | <p>Unpowered ; 1000hours @ T=150°C</p> <p>Measurement at 24±2 hours after test conclusion.</p> | <p>No visual damage</p> <p>$\Delta C/C :$</p> <p>Class I: NP0: within ±0.5% or 0.5 pF whichever is greater</p> | | | | | | | | | | | | |
| Temperature Cycling | AEC-Q200 4 | <p>Preconditioning: 150 +0/-10 °C for 1 hour, then keep for 24 ±1 hours at room temperature</p> <p>1000 cycles with following detail: 30 minutes at lower category temperature 30 minutes at upper category temperature</p> <p>Recovery time 24 ±2 hours</p> | <p>No visual damage</p> <hr/> <p>$\Delta C/C$</p> <p>Class I: NP0: Within ±1% or 0.5pF, whichever is greater.</p> <hr/> <p>D.F. meet initial specified value IR meet initial specified value</p> | | | | | | | | | | | | |
| Destructive Physical Analysis | AEC-Q200 5 | <p>10ea X 3 lots.</p> <p>Note: Only applies to SMD ceramics. Electrical test not required.</p> | | | | | | | | | | | | | |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---------------------|-------------|--|---|
| Moisture Resistance | AEC-Q200 6 | T=24 hrs/per cycle; 10 continuous cycles unpowered. Measurement at 24 ±2 hours after test condition. | No visual damage ΔC/C NP0: Within ±3% or 3 pF, whichever is greater D.F. Within initial specified value IR NP0: ≥ 10,000 MΩ |

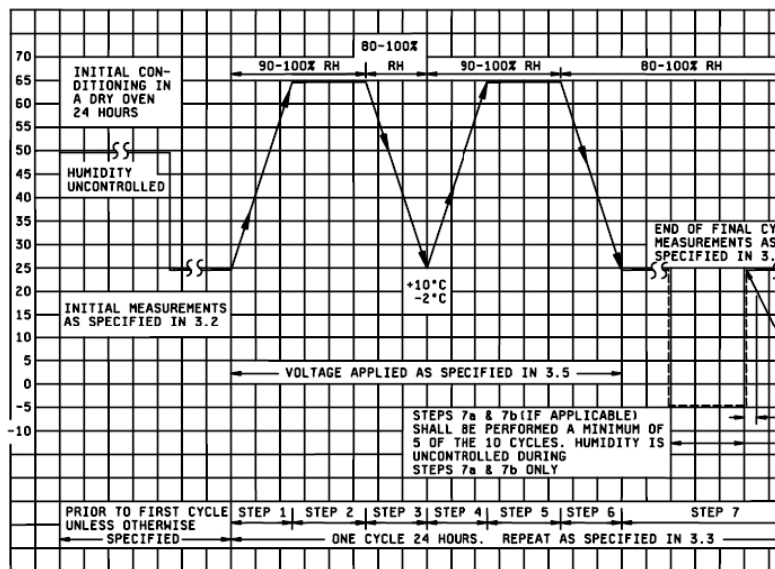
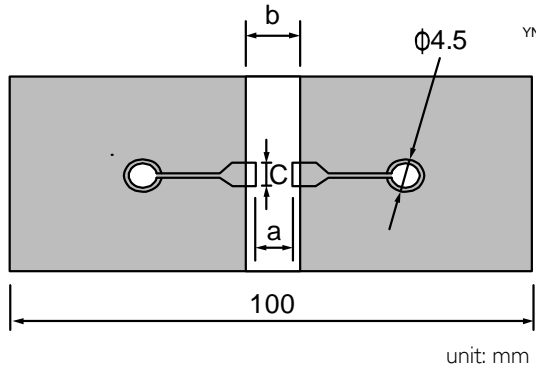


Fig. 4 Moisture resistant

| | | | |
|-----------------|------------|--|--|
| Biased Humidity | AEC-Q200 7 | <ol style="list-style-type: none"> Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp Initial measure: Parameter: IR Measuring voltage: 1.5V ± 0.1 VDC Note: Series with 100 KΩ & 6.8 KΩ Test condition: 85 °C, 85% R.H. connected with 100 KΩ resistor, applied 1.5V/U_r for 1,000 hours. Recovery: Class 1: 6 to 24 hours Class 2: 24 ±2 hours Final measure: IR | No visual damage after recovery Initial requirement: Class I: - Connected to 100 KΩ: C ≤ 10 nF: I.R ≥ 10,000 MΩ or C > 10 nF: (I.R-100 KΩ) × C ≥ 100s. - Connected to 6.8 KΩ: C ≤ 10 nF: I.R ≥ 10,000 MΩ or C > 10 nF: (I.R-6.8 KΩ) × C ≥ 100s. Final measurement: The insulation resistance shall be greater than 0.1 time initial value. |
|-----------------|------------|--|--|

| TEST | TEST METHOD | | PROCEDURE | REQUIREMENTS |
|------------------------------|-------------|----|---|---|
| Operational Life | AEC-Q200 | 8 | 1. Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp 2. Initial measure: Spec: refer to initial spec C, D, IR 3. Endurance test: Specified stress voltage applied for 1,000 hours: Applied $2.0 \times U_r$ for general products 4. Recovery time: 24 ±2 hours 5. Final measure: C, D, IR Note: If the capacitance value is less than the minimum value permitted, then after the other measurements have been made the capacitor shall be preconditioned according to "IEC 60384 4.1" and then the requirement shall be met. | No visual damage $\Delta C/C$ NP0: Within ±2% or 1 pF, whichever is greater D.F. NP0: $\leq 2 \times$ specified value. IR NP0: $\geq 4,000 \text{ M}\Omega$ or $\text{IR} \times C_r \geq 40\text{s}$ whichever is less |
| External Visual | AEC-Q200 | 9 | Any applicable method using $\times 10$ magnification | In accordance with specification |
| Physical Dimension | AEC-Q200 | 10 | Verify physical dimensions to the applicable device specification. | In accordance with specification |
| Mechanical Shock | AEC-Q200 | 13 | Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen (18 shocks) Peak value: 1,500 g's Duration: 0.5 ms Velocity change: 15.4 ft/s Waveform: Half-sin | $\Delta C/C$ NP0: Within ±0.5% or 0.5 pF, whichever is greater D.F. Within initial specified value IR Within initial specified value |
| Vibration | AEC-Q200 | 14 | 5 g's for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8" x 5" PCB. 0.31" 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 10-2000 Hz. | $\Delta C/C$ NP0: Within ±0.5% or 0.5 pF, whichever is greater D.F: meet initial specified value IR meet initial specified value |
| Resistance to Soldering Heat | AEC-Q200 | 15 | Precondition: 150 +0/-10 °C for 1 hour, then keep for 24 ±1 hours at room temperature Preheating: for size ≤ 1206 : 120 °C to 150 °C for 1 | Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|-----------------------------|-------------|--|---|
| | | minute Preheating: for size >I206: 100 °C to 120 °C for 1 minute and 170 °C to 200 °C for 1 minute Solder bath temperature: 260 ±5 °C Dipping time: 10 ±0.5 seconds Recovery time: 24 ±2 hours | ΔC/C Class I: NP0: Within ±1% or 0.5 pF, whichever is greater. <hr/> D.F. within initial specified value IR within initial specified value |
| Thermal Shock | AEC-Q200 16 | 1. Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp 2. Initial measure: Spec: refer to initial spec C, D, IR 3. Rapid change of temperature test: NP0: -55 °C to +125 °C; 300 cycles 15 minutes at lower category temperature; 15 minutes at upper category temperature. 4. Recovery time: Class1: 6 to 24 hours Class2: 24 ±2 hours 5. Final measure: C, D, IR | No visual damage <hr/> ΔC/C NP0: Within ±1% or 1 pF, whichever is greater <hr/> D.F: meet initial specified value IR meet initial specified value |
| ESD | AEC-Q200 17 | Per AEC-Q200-002 | A component passes a voltage level if all components stressed at that voltage level pass. |
| Solderability | AEC-Q200 18 | Preheated to a temperature of 80 °C to 140 °C and maintained for 30 seconds to 60 seconds. Test conditions for lead containing solder alloy Temperature: 235 ±5 °C Dipping time: 2 ±0.2 seconds Depth of immersion: 10 mm Alloy Composition: 60/40 Sn/Pb Number of immersions: 1 Test conditions for lead-free containing solder alloy Temperature: 245 ±5 °C Dipping time: 3 ±0.3 seconds Depth of immersion: 10 mm Alloy Composition: SAC305 Number of immersions: 1 | The solder should cover over 95% of the critical area of each termination. |
| Electrical Characterization | AEC-Q200 19 | Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures. Class I: NP0: -55 °C to +125 °C Normal temperature: 20 °C | ΔC/C Class I: NP0: ±30 ppm/°C |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|---------------|--|---|------|---------------|--|--|---|---|---|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|------|------|-----|-----|------|------|-----|-----|-----|------|-----|-----|-----|
| Board Flex | AEC-Q200 21 | <p>Part mounted on a 100 mm X 40 mm FR4 PCB board, which is 1.6 ±0.2 mm thick and has a layer-thickness 35 μm ± 10 μm.</p> <p>Part should be mounted using the following soldering reflow profile.</p> <p>Conditions:</p> <p>Class I:</p> <p>Bending 3 mm at a rate of 1 mm/s, radius jig 340 mm</p> <p>Test Substrate:</p>  | <p>No visible damage</p> <p>ΔC/C</p> <p>Class I:</p> <p>NPO: Within ±1% or 0.5 pF, whichever is greater</p> <table border="1" data-bbox="1098 638 1385 1064"> <thead> <tr> <th rowspan="2">Type</th> <th colspan="3">Dimension(mm)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr><td>0201</td><td>0.3</td><td>0.9</td><td>0.3</td></tr> <tr><td>0402</td><td>0.4</td><td>1.5</td><td>0.5</td></tr> <tr><td>0603</td><td>1.0</td><td>3.0</td><td>1.2</td></tr> <tr><td>0805</td><td>1.2</td><td>4.0</td><td>1.65</td></tr> <tr><td>1206</td><td>2.2</td><td>5.0</td><td>1.65</td></tr> <tr><td>1210</td><td>2.2</td><td>5.0</td><td>2.0</td></tr> <tr><td>1808</td><td>3.5</td><td>7.0</td><td>3.7</td></tr> </tbody> </table> | Type | Dimension(mm) | | | a | b | c | 0201 | 0.3 | 0.9 | 0.3 | 0402 | 0.4 | 1.5 | 0.5 | 0603 | 1.0 | 3.0 | 1.2 | 0805 | 1.2 | 4.0 | 1.65 | 1206 | 2.2 | 5.0 | 1.65 | 1210 | 2.2 | 5.0 | 2.0 | 1808 | 3.5 | 7.0 | 3.7 |
| Type | Dimension(mm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | a | b | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0201 | 0.3 | 0.9 | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0402 | 0.4 | 1.5 | 0.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0603 | 1.0 | 3.0 | 1.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0805 | 1.2 | 4.0 | 1.65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1206 | 2.2 | 5.0 | 1.65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1210 | 2.2 | 5.0 | 2.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1808 | 3.5 | 7.0 | 3.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Terminal Strength | AEC-Q200 22 | <p>With the component mounted on a PCB obtained with the device to be tested, apply a 17.7N (1.8Kg) force to the side of a device being tested.</p> <p>This force shall be applied for 60+1 seconds.</p> <p>Also the force shall be applied gradually as not to apply a shock to the component being tested.</p> <p>* Apply 2N force for 0402 size.</p> | <p>Magnification of 20X or greater may be employed for inspection of the mechanical integrity of the device body, terminals and body/terminal junction.</p> <p>Before, during and after the test, the device shall comply with all electrical requirements stated in this specification.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Beam Load Test | AEC-Q200 23 | <p>Place the part in the beam load fixture. Apply a force until the part breaks or the minimum acceptable force level required in the user specification(s) is attained.</p> | <p>≤ 0805</p> <p>Thickness > 0.5mm: 20N</p> <p>Thickness ≤ 0.5mm: 8N</p> <p>≥ 1206</p> <p>Thickness ≥ 1.25 mm: 54N</p> <p>Thickness < 1.25 mm: 15N</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage Proof | | <ol style="list-style-type: none"> 1. Specified stress voltage applied for 1~5 seconds 2. $U_r \leq 100$ V: series applied 2.5 U_r 3. 100 V < $U_r \leq 200$ V series applied (1.5 U_r + 100) 4. 200 V < $U_r \leq 500$ V series applied (1.3 U_r + 100) 5. $U_r > 500$ V: 1.3 U_r 6. $U_r \geq 1000$ V: 1.2 U_r <p>Charge/Discharge current is less than 50 mA</p> | <p>No breakdown or flashover</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|------|-------------|--|--|
| ESR | | Measuring frequency: 1 ± 0.2 GHz at room temperature. | $0.2\text{pF} \leq C \leq 1\text{pF} : 350\text{m}\Omega / C \text{ max}$ $1\text{pF} < C \leq 5\text{pF} : 300\text{m}\Omega \text{ max}$ $5\text{pF} < C \leq 10\text{pF} : 250\text{m}\Omega \text{ max}$ C : Nominal cap (pF) |
| | | Measuring frequency: 500 ± 50 MHz at room temperature. | $10\text{pF} < C \leq 100\text{pF} : 400\text{m}\Omega \text{ max}$ |

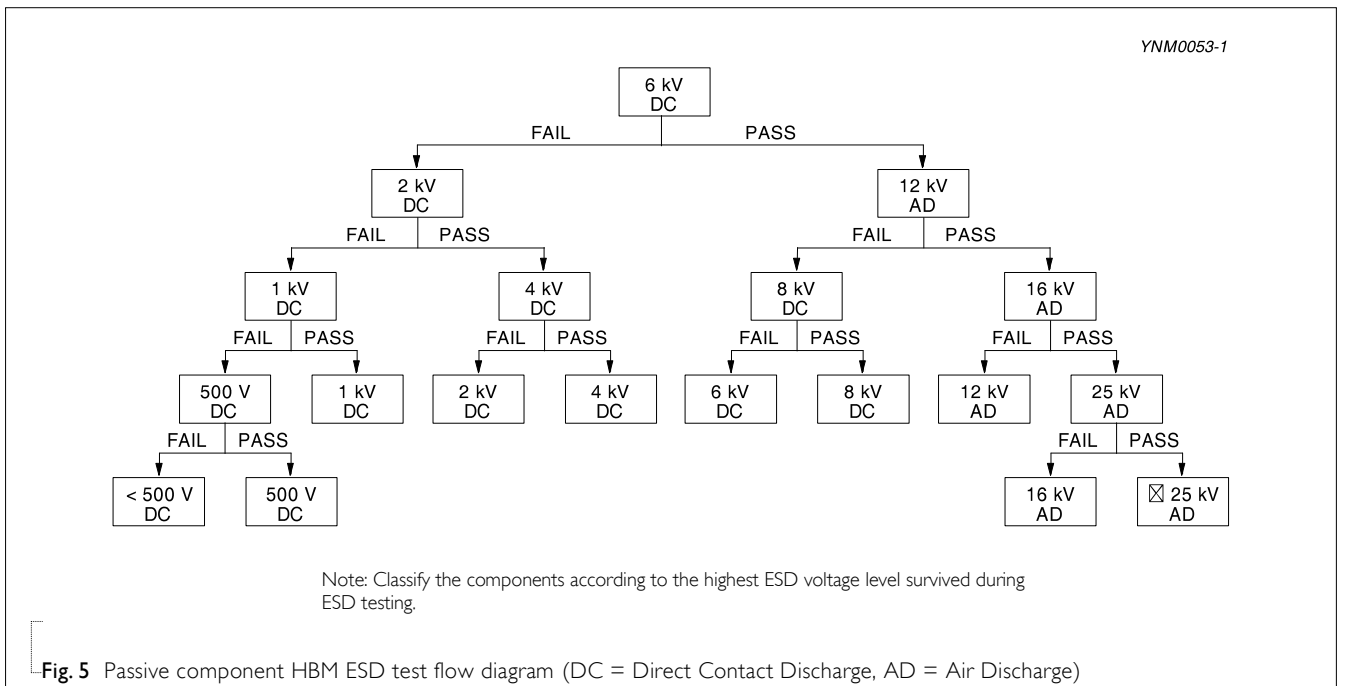


Fig. 5 Passive component HBM ESD test flow diagram (DC = Direct Contact Discharge, AD = Air Discharge)

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|----------|------|---------------------|-------------|
|----------|------|---------------------|-------------|

| | | | |
|-----------|---------------|---|-------|
| Version 0 | Dec. 14, 2018 | - | - New |
|-----------|---------------|---|-------|

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[CDR14BP471CJUR](#) [CDR31BX103AKWR](#) [CDR33BX683AKUS](#) [CGA2B2C0G1H010C](#) [CGA2B2C0G1H040C](#) [CGA2B2C0G1H050C](#)
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