

# DATA SHEET

## SURFACE MOUNT MULTILAYER CERAMIC CAPACITORS

High Frequency Automotive Grade

NP0

16 V TO 50 V

0.1 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 I
- AQ 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**

0.1pF

B = ±0.1 pF

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 × 10<sup>1</sup> = 120 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.

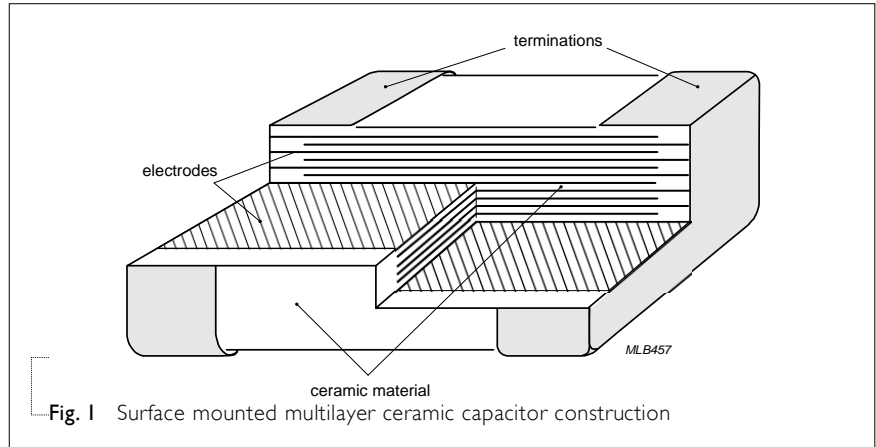


Fig. 1 Surface mounted multilayer ceramic capacitor construction

**DIMENSION**

Table I For outlines see fig. 2

TYPE	L <sub>1</sub> (mm)	W (mm)	T (MM)	L <sub>2</sub> / L <sub>3</sub> (mm)		L <sub>4</sub> (mm)
				min.	max.	min.
0402	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15	0.35	0.40
0603	1.6 ±0.10	0.8 ±0.10	0.8 ±0.10	0.20	0.60	0.40

**OUTLINES**

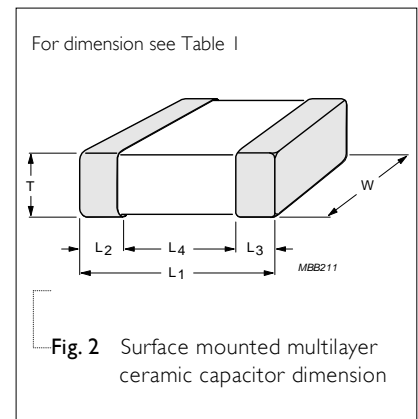


Fig. 2 Surface mounted multilayer ceramic capacitor dimension

**CAPACITANCE RANGE & THICKNESS FOR NP0**

Table 2 Sizes 0402 to 0603

CAP.	0402	0603	CAP.	0402	0603
	50V	50 V		50 V	50 V
0.1 pF	0.5±0.05		2.6 pF	0.5±0.05	0.8±0.1
0.2 pF	0.5±0.05	0.8±0.1	2.7 pF	0.5±0.05	0.8±0.1
0.3 pF	0.5±0.05	0.8±0.1	2.8 pF	0.5±0.05	0.8±0.1
0.4 pF	0.5±0.05	0.8±0.1	2.9 pF	0.5±0.05	0.8±0.1
0.5 pF	0.5±0.05	0.8±0.1	3.0 pF	0.5±0.05	0.8±0.1
0.6 pF	0.5±0.05	0.8±0.1	3.1 pF	0.5±0.05	0.8±0.1
0.7 pF	0.5±0.05	0.8±0.1	3.2 pF	0.5±0.05	0.8±0.1
0.8 pF	0.5±0.05	0.8±0.1	3.3 pF	0.5±0.05	0.8±0.1
0.9 pF	0.5±0.05	0.8±0.1	3.4 pF	0.5±0.05	0.8±0.1
1.0 pF	0.5±0.05	0.8±0.1	3.5 pF	0.5±0.05	0.8±0.1
1.1 pF	0.5±0.05	0.8±0.1	3.6 pF	0.5±0.05	0.8±0.1
1.2 pF	0.5±0.05	0.8±0.1	3.7 pF	0.5±0.05	0.8±0.1
1.3 pF	0.5±0.05	0.8±0.1	3.8 pF	0.5±0.05	0.8±0.1
1.4 pF	0.5±0.05	0.8±0.1	3.9 pF	0.5±0.05	0.8±0.1
1.5 pF	0.5±0.05	0.8±0.1	4.0 pF	0.5±0.05	0.8±0.1
1.6 pF	0.5±0.05	0.8±0.1	4.1 pF	0.5±0.05	0.8±0.1
1.7 pF	0.5±0.05	0.8±0.1	4.2 pF	0.5±0.05	0.8±0.1
1.8 pF	0.5±0.05	0.8±0.1	4.3 pF	0.5±0.05	0.8±0.1
1.9 pF	0.5±0.05	0.8±0.1	4.4 pF	0.5±0.05	0.8±0.1
2.0 pF	0.5±0.05	0.8±0.1	4.5 pF	0.5±0.05	0.8±0.1
2.1 pF	0.5±0.05	0.8±0.1	4.6 pF	0.5±0.05	0.8±0.1
2.2 pF	0.5±0.05	0.8±0.1	4.7 pF	0.5±0.05	0.8±0.1
2.3 pF	0.5±0.05	0.8±0.1	4.8 pF	0.5±0.05	0.8±0.1
2.4 pF	0.5±0.05	0.8±0.1	4.9 pF	0.5±0.05	0.8±0.1
2.5 pF	0.5±0.05	0.8±0.1	5.0 pF	0.5±0.05	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

**CAPACITANCE RANGE & THICKNESS FOR NP0**

Table 3 Sizes 0402 to 0603

CAP.	0402 50V	0603 50 V	CAP.	0402 50 V	0603 50 V
5.1 pF	0.5±0.05	0.8±0.1	8.2 pF	0.5±0.05	0.8±0.1
5.2 pF	0.5±0.05	0.8±0.1	8.3 pF	0.5±0.05	0.8±0.1
5.3 pF	0.5±0.05	0.8±0.1	8.4 pF	0.5±0.05	0.8±0.1
5.4 pF	0.5±0.05	0.8±0.1	8.5 pF	0.5±0.05	0.8±0.1
5.5 pF	0.5±0.05	0.8±0.1	8.6 pF	0.5±0.05	0.8±0.1
5.6 pF	0.5±0.05	0.8±0.1	8.7 pF	0.5±0.05	0.8±0.1
5.7 pF	0.5±0.05	0.8±0.1	8.8 pF	0.5±0.05	0.8±0.1
5.8 pF	0.5±0.05	0.8±0.1	8.9 pF	0.5±0.05	0.8±0.1
5.9 pF	0.5±0.05	0.8±0.1	9.0 pF	0.5±0.05	0.8±0.1
6.0 pF	0.5±0.05	0.8±0.1	9.1 pF	0.5±0.05	0.8±0.1
6.1 pF	0.5±0.05	0.8±0.1	9.2 pF	0.5±0.05	0.8±0.1
6.2 pF	0.5±0.05	0.8±0.1	9.3 pF	0.5±0.05	0.8±0.1
6.3 pF	0.5±0.05	0.8±0.1	9.4 pF	0.5±0.05	0.8±0.1
6.4 pF	0.5±0.05	0.8±0.1	9.5 pF	0.5±0.05	0.8±0.1
6.5 pF	0.5±0.05	0.8±0.1	9.6 pF	0.5±0.05	0.8±0.1
6.6 pF	0.5±0.05	0.8±0.1	9.7 pF	0.5±0.05	0.8±0.1
6.7 pF	0.5±0.05	0.8±0.1	9.8 pF	0.5±0.05	0.8±0.1
6.8 pF	0.5±0.05	0.8±0.1	9.9 pF	0.5±0.05	0.8±0.1
6.9 pF	0.5±0.05	0.8±0.1	10 pF	0.5±0.05	0.8±0.1
7.0 pF	0.5±0.05	0.8±0.1	12 pF	0.5±0.05	0.8±0.1
7.1 pF	0.5±0.05	0.8±0.1	15 pF	0.5±0.05	0.8±0.1
7.2 pF	0.5±0.05	0.8±0.1	18 pF	0.5±0.05	0.8±0.1
7.3 pF	0.5±0.05	0.8±0.1	22 pF	0.5±0.05	0.8±0.1
7.4 pF	0.5±0.05	0.8±0.1	27 pF	0.5±0.05	0.8±0.1
7.5 pF	0.5±0.05	0.8±0.1	33 pF	0.5±0.05	0.8±0.1
7.6 pF	0.5±0.05	0.8±0.1	39 pF	0.5±0.05	0.8±0.1
7.7 pF	0.5±0.05	0.8±0.1	47 pF	0.5±0.05	0.8±0.1
7.8 pF	0.5±0.05	0.8±0.1	56 pF	0.5±0.05	0.8±0.1
7.9 pF	0.5±0.05	0.8±0.1	68 pF	0.5±0.05	0.8±0.1
8.0 pF	0.5±0.05	0.8±0.1	82 pF	0.5±0.05	0.8±0.1
8.1 pF	0.5±0.05	0.8±0.1	100 pF	0.5±0.05	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 4

SIZE CODE	THICKNESS CLASSIFICATION	TAPE WIDTH QUANTITY PER REEL	Ø180 MM / 7 INCH		Ø330 MM / 13 INCH	
			Paper	Blister	Paper	Blister
0402	0.5 ±0.05 mm	8 mm	10,000	---	50,000	---
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 5

DESCRIPTION	VALUE
Capacitance range	0.1 pF to 100 pF
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 <sub>r</sub> (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 6

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

**TESTS AND REQUIREMENTS**

The test of "soldering heat resistance" is carried out in accordance with the schedule of "MIL-STD-202G-method 210F", "The robust construction of chip capacitors allows them to be completely immersed in a solder bath of 260 °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.

Table 7 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 <sub>rms</sub> at 20 °C f = 1 KHz for C > 1nF, measuring at voltage   V <sub>rms</sub> 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 <sub>rms</sub> at 20 °C f = 1 KHz for C > 1nF, measuring at voltage   V <sub>rms</sub> at 20 °C	In accordance with specification
Insulation Resistance	IEC 60384-21/22 4.5.3	At U <sub>r</sub> (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 ΔT: 100°C(=125°C-25°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>&lt;General purpose series&gt;</p> <p>Class I: Δ C/C: ±30ppm</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>Δ 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>ΔC/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>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

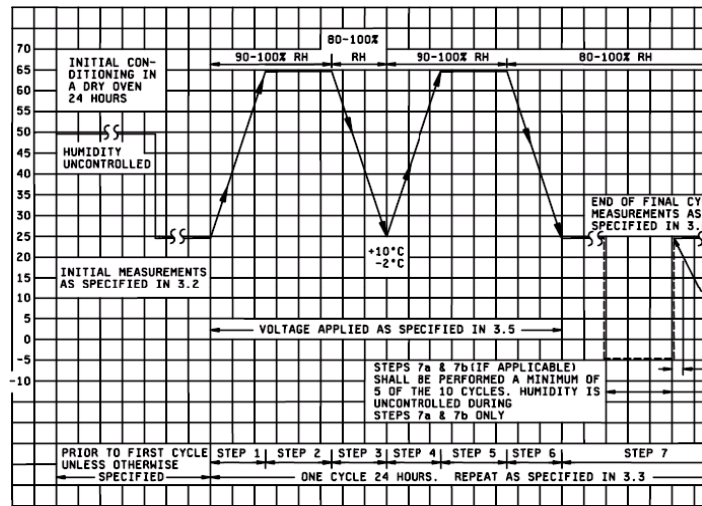
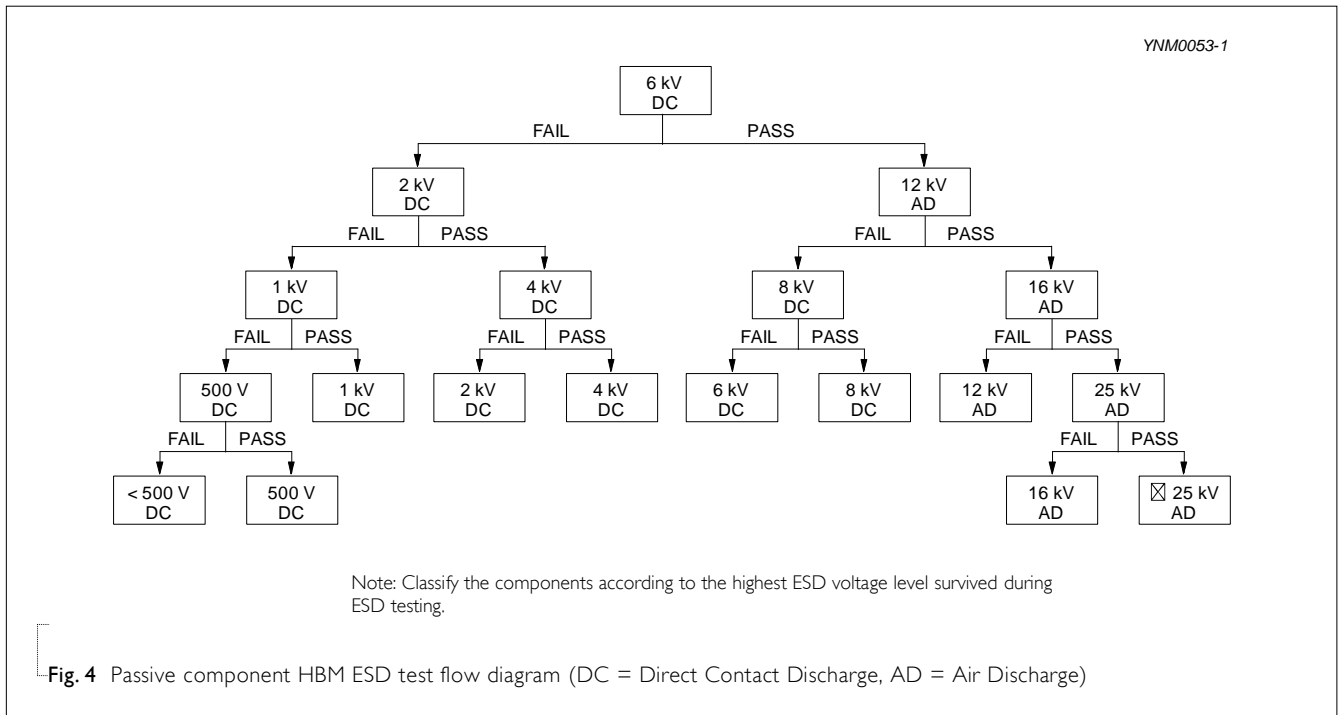


Fig. 3 Moisture resistant

Biased Humidity	AEC-Q200 7	<ol style="list-style-type: none"> <li>Preconditioning, class 2 only: 150 +0/-10 °C /1 hour, then keep for 24 ±1 hour at room temp</li> <li>Initial measure: Parameter: IR Measuring voltage: 1.5V ± 0.1 VDC Note: Series with 100 KΩ</li> <li>Test condition: 85 °C, 85% R.H. connected with 100 KΩ resistor, applied 1.5V/U<sub>r</sub> for 1,000 hours.</li> <li>Recovery: Class I: 6 to 24 hours Class 2: 24 ±2 hours</li> <li>Final measure: IR</li> </ol>	<p>No visual damage after recovery</p> <p>Initial requirement: <b>Class I:</b> - Connected to 100 KΩ: C ≤ 10 nF: I.R. ≥ 10,000 MΩ or C &gt; 10 nF: (I.R.-100 KΩ) × C ≥ 100s.</p> <p>Final measurement: The insulation resistance shall be greater than 0.1 time initial value.</p>
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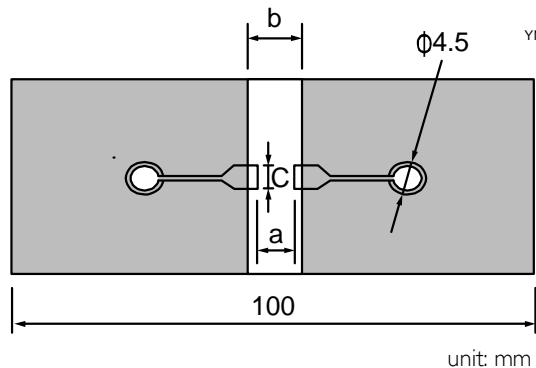
TEST	TEST METHOD		PROCEDURE	REQUIREMENTS
Operational Life	AEC-Q200	8	1. Initial measure: Spec: refer to initial spec C, D, IR  2. Endurance test: Specified stress voltage applied for 1,000 hours: Applied $2.0 \times U_r$ for general products  3. Recovery time: $24 \pm 2$ hours  4. Final measure: C, D, 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 $\pm 2\%$ 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 $\pm 0.5\%$ 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 $\pm 0.5\%$ 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 $24 \pm 1$ hours at room temperature Preheating: for size $\leq 1206$ : $120$ °C to $150$ °C for 1 minute Preheating: for size $>1206$ : $100$ °C to $120$ °C for 1 minute and $170$ °C to $200$ °C for 1 minute Solder bath temperature: $260 \pm 5$ °C Dipping time: $10 \pm 0.5$ seconds Recovery time: $24 \pm 2$ hours	Dissolution of the end face plating shall not exceed 25% of the length of the edge concerned  $\Delta C/C$ Class I: NP0: Within $\pm 1\%$ or 0.5 pF, whichever is greater.  D.F. within initial specified value IR within initial specified value

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
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.



TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability	AEC-Q200 18	<p>Preheated to a temperature of 80 °C to 140 °C and maintained for 30 seconds to 60 seconds.</p> <p>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</p> <p>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</p>	The solder should cover over 95% of the critical area of each termination.
Electrical Characterization	AEC-Q200 19	<p>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.</p> <p>Class I:                      NP0: -55 °C to +125 °C                      Normal temperature: 20 °C</p>	<p>ΔC/C                      Class I:                      NP0: ±30 ppm/°C</p>
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:                      Class I:                      Bending 3 mm at a rate of 1 mm/s, radius jig 340 mm</p>	<p>No visible damage</p> <p>ΔC/C                      Class I:                      NP0: Within ±1% or 0.5 pF, whichever is greater</p>

Test Substrate:



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

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Terminal Strength	AEC-Q200 22	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. This force shall be applied for 60+1 seconds. Also the force shall be applied gradually as not to apply a shock to the component being tested. * Apply 2N force for 0402 size.	Magnification of 20X or greater may be employed for inspection of the mechanical integrity of the device body, terminals and body/terminal junction. Before, during and after the test, the device shall comply with all electrical requirements stated in this specification.
Beam Load Test	AEC-Q200 23	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.	≤ 0805 Thickness > 0.5mm: 20N Thickness ≤ 0.5mm: 8N ≥ 1206 Thickness ≥ 1.25 mm: 54N Thickness < 1.25 mm: 15N
Voltage Proof		1. Specified stress voltage applied for 1~5 seconds 2. $U_r \leq 100V$ : series applied 2.5 $U_r$ 3. $100V < U_r \leq 200V$ series applied (1.5 $U_r + 100$ ) 4. $200V < U_r \leq 500V$ series applied (1.3 $U_r + 100$ ) 5. $U_r > 500V$ : 1.3 $U_r$ 6. $U_r \geq 1000V$ : 1.2 $U_r$ Charge/Discharge current is less than 50 mA	No breakdown or flashover
ESR		Measuring frequency: $1 \pm 0.2GHz$ at room temperature.	$0.1pF \leq C \leq 1pF$ : 350mΩ / C max $1pF < C \leq 5pF$ : 300mΩ max $5pF < C \leq 10pF$ : 250mΩ max C : Nominal cap (pF)
		Measuring frequency: $500 \pm 50MHz$ at room temperature.	$10pF < C \leq 100pF$ : 400mΩ max

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 1	Feb. 08, 2021	-	- Add 0402 / 0.1pf~100pF
Version 0	Dec. 14, 2018	-	- New

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