Hongda Capacitors®
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HSLC Series Single Layer Capacitor

1. Capacitor characteristics and applications

1. 1 Characteristics

- Size specifications are standardized and suitable for surface mount components in hybrid integrated circuits or printed circuits;
- Low ESR and high reliability;
- Low loss, high capacitance stability, high operating frequency;

1. 2 Main performance

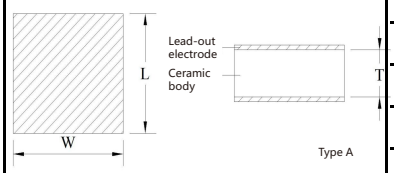
- Insulation resistance: Class I and II ceramics≥10000 MΩ , Class III ceramics≥1,000 MΩ at 20℃
- Operating temperature: W/F/G: -55℃~125℃; X: -35℃~+85℃

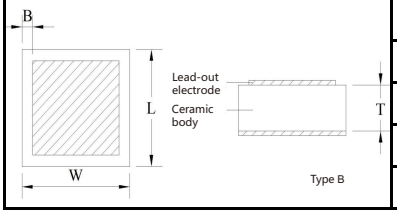
2. How to order

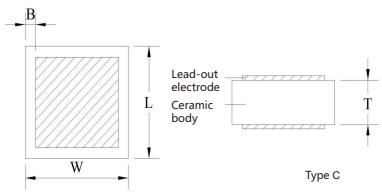
HSLC | 1111 | C0G | 1R0 | B | 501 | N | T

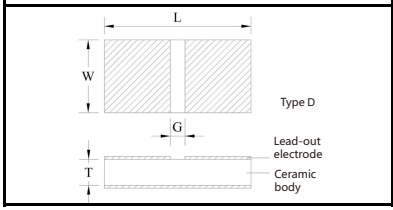
Type	Size	Dielectric	Capacitance unit: (pF)	Tolerance	Rated voltage	Termination	Packaging style
HSLC series single layer capacitor	0402 2525 0603 3838 0805 6243 0505 7676 1111	C0G: +30ppm/°C	The first two digits are significant figures, and the last digit is the power of 10	A: ± 0.05pF B: ±0.10pF C: ±0.25pF D: ±0.50pF F: ±1.0% G: ±2.0% J: ±5.0% K: ±10.0%	The first two digits are significant figures, and the last digit is the power of 10	N: Leading-out Terminal: Ag/Ni/Sn Z: Leading-out Terminal: Ag/Ni/ SnPb E: Non-magnetic Terminal M: Microstrip A: Axial tape RW: Radial wire RN: Non-magneticradialwire	T: Tape & reel C: Cut Tray B: Bulk

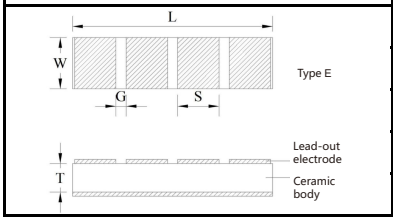
3. Product Dimensions

Product Type	Size Code	Dimensions (mm)			Size Code	Dimensions (mm)		
		L	W	T		L	W	T
	10	0.254±0.076	0.254±0.076	0.20±0.06	15	0.381±0.076	0.381±0.076	0.20±0.06
	20	0.508±0.127	0.508±0.127	0.20±0.06	25	0.635±0.127	0.635±0.127	0.20±0.06
	30	0.762±0.127	0.762±0.127	0.20±0.06	35	0.889±0.127	0.889±0.127	0.20±0.06
	40	1.016±0.127	1.016±0.127	0.20±0.06	50	1.270±0.254	1.270±0.254	0.20±0.06
	70	1.780±0.254	1.780±0.254	0.20±0.06	90	2.290±0.254	2.290±0.254	0.20±0.06

Product Type	Size Code	Dimensions (mm)				Size Code	Dimensions (mm)			
		L	W	T	B		L	W	T	B
	10	0.254±0.076	0.254±0.076	0.20±0.06	0.05±0.025	15	0.381±0.076	0.381±0.076	0.20±0.06	0.05±0.025
	20	0.508±0.127	0.508±0.127	0.20±0.06	0.05±0.025	25	0.635±0.127	0.635±0.127	0.20±0.06	0.05±0.025
	30	0.762±0.127	0.762±0.127	0.20±0.06	0.05±0.025	35	0.889±0.127	0.889±0.127	0.20±0.06	0.05±0.025
	40	1.016±0.127	1.016±0.127	0.20±0.06	0.05±0.025	50	1.270±0.254	1.270±0.254	0.20±0.06	0.05±0.025
	70	1.780±0.254	1.780±0.254	0.20±0.06	0.05±0.025	90	2.290±0.254	2.290±0.254	0.20±0.06	0.05±0.025

Product Type	Size Code	Dimensions (mm)				Size Code	Dimensions (mm)			
		L	W	T	B		L	W	T	B
	10	0.254±0.076	0.254±0.076	0.20±0.06	0.05±0.025	15	0.381±0.076	0.381±0.076	0.20±0.06	0.05±0.025
	20	0.508±0.127	0.508±0.127	0.20±0.06	0.05±0.025	25	0.635±0.127	0.635±0.127	0.20±0.06	0.05±0.025
	30	0.762±0.127	0.762±0.127	0.20±0.06	0.05±0.025	35	0.889±0.127	0.889±0.127	0.20±0.06	0.05±0.025
	40	1.016±0.127	1.016±0.127	0.20±0.06	0.05±0.025	50	1.270±0.254	1.270±0.254	0.20±0.06	0.05±0.025
	70	1.780±0.254	1.780±0.254	0.20±0.06	0.05±0.025	90	2.290±0.254	2.290±0.254	0.20±0.06	0.05±0.025

Product Type	Size Code	Dimensions (mm)			
		L	W	T	G
	0201	0.508±0.127	0.254±0.051	0.20±0.06	0.102±0.051
	0402	1.016±0.127	0.508±0.127	0.20±0.06	0.102±0.051
	0603	1.524±0.127	0.762±0.127	0.20±0.06	0.102±0.051
	0805	2.032±0.254	1.270±0.127	0.20±0.06	0.102±0.051
	1206	3.048±0.254	1.524±0.254	0.20±0.06	0.102±0.051

Product Type	Size Code	Dimensions (mm)				
		L	W	S	G	T
	15	Customization	0.381±0.076	Customization	0.102±0.051	0.20±0.06
	20		0.508±0.127		0.102±0.051	0.20±0.06
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4. Technical requirements and test conditions

4.1 General specifications and detailed specifications

- **General specification: GJB 2442A-2021**

《General Specification for Single-Layer Chip Ceramic Capacitors with High Reliability》

- **Detailed specification: Q/CT 07B-2022**

《Detailed Specification for Single-Layer Chip Capacitors》

4.2 Conventional technical indicators and test methods

Item	Technical specifications	Test method			
Operating Temperature Range	(-55 ~ +125)℃				
Appearance	No obvious defects	Visual inspection			
Capacitance	Within the tolerance of specification	Nominal capacitance	Test frequency	Test voltage	Environment
		≤100pF	1MHz(±10%)	(1.0±0.2)Vrms	Temperature(25±2)℃ Humidity<75%
		>100pF	1KHz(±10%)	(1.0±0.2)Vrms	
Loss Tangent	<0.025	Test method: Same as 'Capacitance'			
Insulation Resistance	Class I and II ceramics≥10000 MΩ Class III ceramics≥1,000 MΩ	Test voltage	Test time	Charge and discharge current	Environment
		U_R	≤60 sec	≤50mA	Temperature(25±2)℃ Humidity<75%

<table>
<tr><td>Dielectric Withstand Voltage</td><td>No dielectric breakdown or damage</td><td colspan="3"><table><tr><td>Rated voltage</td><td>Test voltage</td><td>Time</td><td>Charge and discharge current</td></tr><tr><td>U_R</td><td>$2.5U_R$</td><td>5 sec</td><td>≤50mA</td></tr></table></td></tr>
<tr><td>Voltage Temperature Characteristics</td><td>C0G: 0±30ppm/℃
Y5V: +22%～-82%
X7R: ±15%
BD(DM): -3300±1000ppm/℃</td><td colspan="3">Measured after the temperature is stable for 30 minutes in the following temperature order (△C is based on T3)<table><tr><td>Step</td><td>Temperature (℃)</td></tr><tr><td>T1</td><td>25±2</td></tr><tr><td>T2</td><td>-55±3</td></tr><tr><td>T3</td><td>25±2</td></tr><tr><td>T4</td><td>125±2</td></tr><tr><td>T1</td><td>25±2</td></tr></table></td></tr>
<tr><td>Bond Strength</td><td>No cracks at the interface between the wire and the electrode, nor any separation between the dielectric and the electrode.</td><td colspan="3">Capacitors should be tested according to GJB 548C-2021, Method 2011.2, using the following specifications:
a) Sample Installation: Capacitors should be installed as specified;
b) Test Conditions: D;
c) Minimum Bond Strength: ≥6 gf.</td></tr>
</table>

4.3 Reliability indicators and periodic testing methods

<table>
<tr><th>Item</th><th colspan="2">Technical specifications</th><th>Test method</th></tr>
<tr><td rowspan="2">Solderability</td><td>Appearance</td><td>No mechanical damage</td><td rowspan="2">Capacitors should be tested according to the following procedures:
a) Sample Installation: The capacitor should be placed horizontally on a hot plate.
b) Testing: Heat the hot plate with the sample to 310°C and hold for (5±1) seconds.
c) Recovery time after testing before measurement: Minimum 10 minutes, maximum 24 hours.
d) Post-test Inspection and Measurement: Visually inspect the capacitor's appearance and measure the capacitance as specified.</td></tr>
<tr><td>△C/C</td><td>Change from the initial measurement value ≤ ±10%</td></tr>
<tr><td>Shear Strength</td><td colspan="2">Within the specified applied force range, the capacitor should not exhibit the failure conditions specified in 4.3.1 of Method 2019.3 of GJB 548C-2021.</td><td>Capacitors should be tested according to Method 2019.3 of GJB 548C-2021, using the following specifications:
a) Sample Installation: Capacitors should be installed in accordance with 4.5.1.
b) Minimum Shear Strength: According to Figure 4 in GJB 548C-2021, Method 2019.3.
c) Applied Force: Twice the minimum shear strength or cutting the product from a fixed position（Take the first occurring value).</td></tr>
<tr><td rowspan="5">Temperature Shock</td><td>Appearance</td><td>No visible damage</td><td rowspan="5">Number of cycles: 5 times, one cycle is divided into the following 4 steps:<table><tr><td>Step</td><td>Temperature (°C)</td><td>Time (min)</td></tr><tr><td>Step1</td><td>-55±3</td><td>30</td></tr><tr><td>Step2</td><td>25±3</td><td>3</td></tr><tr><td>Step3</td><td>125±3</td><td>30</td></tr><tr><td>Step4</td><td>25±3</td><td>3</td></tr></table>100% test. After the test, place it at room temperature for 24±2 hrs before measuring again.</td></tr>
<tr><td>C</td><td>Same as the initial standard</td></tr>
<tr><td>D.F.</td><td>Same as the initial standard</td></tr>
<tr><td>I.R.</td><td>Same as the initial standard</td></tr>
<tr><td>D.W.V.</td><td>Same as the initial standard</td></tr>
</table>

<table>
<tr><td rowspan="4">Voltage Conditioning</td><td>Appearance</td><td>No visible damage</td><td>Rated voltage</td><td>Applied voltage</td><td rowspan="4">Test temperature:
125°C
Test time:
100 hours</td></tr>
<tr><td>C</td><td>Same as the initial standard</td><td rowspan="3">U_R</td><td rowspan="3">$2U_R$</td></tr>
<tr><td>D.F.</td><td>Same as the initial standard</td></tr>
<tr><td>I.R.</td><td>Same as the initial standard</td></tr>
<tr><td>D.W.V.</td><td>Same as the initial standard</td><td colspan="3">100% test. After the test, place it at room temperature for 24±2 hrs before visual inspection.</td></tr>
<tr><td rowspan="5">Impregnation</td><td>Appearance</td><td>No corrosion or mechanical damage</td><td colspan="3" rowspan="5">Capacitors should be tested according to GJB 360B-2009 Method 104, using the following specifications:
a) Test Condition: B;
b) Inspection and Measurement after the Final Cycle: Visually inspect the capacitor's appearance and measure capacitance, loss tangent, dielectric withstand voltage, and insulation resistance as specified.</td></tr>
<tr><td>△C/C</td><td>Change from the initial measured value: ≤±10%</td></tr>
<tr><td>D.F.</td><td>Same as the initial standard</td></tr>
<tr><td>I.R.</td><td>Should be no less than 30% of the initial required value at 25°C.</td></tr>
<tr><td>D.W.V.</td><td>Same as the initial standard</td></tr>
<tr><td rowspan="3">Steady State Damp Heat (Low Voltage)</td><td>Appearance</td><td>No corrosion or mechanical damage</td><td colspan="3" rowspan="3">Capacitors should be tested according to GJB 360B-2009, Method 103, using the following specifications:
a) Pre-test Measurement: Measure capacitance as specified;
b) Test Conditions: Temperature: 85±2°C, relative humidity: 85%±5%, time: 240 hours. DC voltage of 1.3V±0.25V should be continuously applied to the capacitor through a 100kΩ resistor.
c) Post-test inspection and measurement: Remove the capacitor from the test chamber and allow it to dry and stabilize at 25°C for 3.5h ± 0.5h (while applying a voltage of 1.3V ± 0.25V through a 100k Ω resistor). Measure the insulation resistance (test voltage 1.3V ± 0.25V) and capacitance as specified, and visually inspect the capacitor's appearance.
d) During the test, the voltage applied to any capacitor under test must not exceed 1.55V. Capacitors may be equipped with leads for mounting and loading, and loading may be applied mechanically.</td></tr>
<tr><td>△C/C</td><td>Change from the initial measured value: ≤±10%</td></tr>
<tr><td>I.R.</td><td>Should be no less than the initial required value at 25°C.</td></tr>
<tr><td rowspan="4">Life Test</td><td>Appearance</td><td>No mechanical damage</td><td colspan="3" rowspan="4">Capacitors should be tested according to GJB 360B-2009, Method 108, using the following specifications:
a) Sample Installation: Capacitors should be installed as specified.
Test Temperature: 125°C
c) Operating Conditions: The capacitor should be loaded with twice the rated DC voltage, and the surge current should not exceed 50mA. An appropriate current-limiting resistor should be connected to the circuit.
d) Test Conditions: F (2000h).
e) Measurements During the Test: After 1000h and at the end of the test, while the capacitor is still at the maximum operating temperature, insulation resistance should be measured as specified.
f) Post-Test Inspection and Measurements: The capacitor should be restored to the specified inspection conditions.
Visually inspect the capacitor's appearance, and then measure capacitance, loss tangent, and insulation resistance as specified.</td></tr>
<tr><td>△C/C</td><td>Change from the initial measured value: ≤±10%</td></tr>
<tr><td>D.F.</td><td>≤ 1.2 times the initial standard</td></tr>
<tr><td>I.R.</td><td>Should be no less than 30% of the initial required value at 25°C</td></tr>
</table>

5. Precautions for use

1. Precautions before use

In harsh operating environments or under external mechanical overpressure that exceed the operating conditions described it, single-layer capacitors may be damaged. Therefore, when consider applying according to the relevant instructions in this approval using.

2. Wire Bonding

2.1 If wire bonding is used, it is recommended that the maximum temperature not exceed 320°C in a nitrogen atmosphere, and that the bonding time not exceed 10 seconds in environments above 300°C.

2.2 Wire Connection:

Wire Type: Gold wire（25 μm）

It is recommended that the bonding area not be located at the edge of the electrode, but as close to the center as possible; It is recommended to use thermocompression bonding or ultrasonic ball bonding and the temperature should be maintained between 100°C and 120°C.

2.3 Reliability may be reduced if the capacitor is exposed to rapid thermal shock.

(For example: heating: 2-5°C/second; cooling: 1-4°C/second)

3. Issues to consider for automatic installation

If the suction pipe is lowered beyond the minimum limit, it will exert excessive pressure on the Single Layer Capacitor and cause SLCC to rupture.

When lowering the suction pipe, pay attention to the following points:

3.1 After correcting the deviation of the load board, adjust the lower limit of the suction pipe to the surface level of the load board.

3.2 It is recommended to adjust the pickup pressure to a value that just barely picks up the capacitor.

4. Welding

4.1 This product features a four-layer metal system (TaN/TiW/Ni/Au) on the surface. This metal system is suitable for Welding with conductive adhesives.

4.2 Single-layer capacitors are a combination of ceramic and metal. Metal has good thermoplasticity and responds quickly to heat, while ceramic has poor thermoplasticity and responds more slowly to heat. Therefore, under heating conditions, there must be a certain degree of inconsistency in expansion between metal parts and ceramic parts, this will cause internal stress and easily cause ceramic body cracking. If soldering is to be performed at a higher temperature, It is recommended to preheat continuously for more than 1 minute before welding.

5. Cleaning

Ultrasonic cleaning is recommended for single - layer capacitors.

Ultrasonic output: less than 20W/L; Ultrasonic frequency: less than 40KHz; Ultrasonic cleaning time: 5 minutes or less

6. Storage method

In order to maintain the bonding strength of single-layer capacitors and ensure that packaging materials are in good condition, recommended storage conditions are as follows:

Storage temperature: 5 - 40°C; Storage relative humidity: 20 - 70%RH.

Even if stored under ideal storage conditions, the bonding strength of the terminal electrodes of single-layer capacitors will decrease over time.

Therefore single-layer capacitors should be used within 6 months from date of shipment.

6. Product Packaging

6.1 Box

Spec(Specification)	Qty （Quantity）	Comment
15	400/box	The packaging form and quantity can be customized
30	400/box	

7. Inspection results of prohibited substances in products about RoHS

All products meet the requirements of the RoHS compliances:

- Lead(pb) (< 1000ppm)
- Mercury (Hg) (< 1000ppm)
- Cadmium(cd) (< 100ppm)
- Hexavalent Chromium Content(Cr6+) (< 1000ppm)
- Polybrominated Biphenyls(PBBs) (< 1000ppm)
- Polybrominated diphenyl ethers(PBDE) (< 1000ppm)