CCAI AEC-Q200

Dielectric	X7R | B	NPO|COG N|CG
Tem.range	-55℃--125℃	-55℃--125℃
Tem.coefficient	±15%	±30ppm/℃

Use precautions

Please be sure to attach the purchase specification before using this product.

Safety precautions

When using this product, please pay attention to safety matters.

Application restrictions

Before using our products, please contact us with the following applications that require high reliability in particular to prevent defects that may directly cause damage to the life, body or property of a third party.

① Aircraft equipment ② Aerospace equipment ③ Underwater equipment ④ Power plant control equipment
⑤ Medical equipment ⑥ Transportation equipment (vehicles, trains, ships, etc.) ⑦ Traffic signal equipment
⑧ disaster prevention/crime prevention equipment ⑨ Data processing equipment
⑩ Complexity and/or reliability requirements similar to those of the above applications.

Transportation and storage methods

1. Transport

The packaging products are suitable for modern transportation, and should be protected from rain and acid and alkali corrosion during transportation. They shall not be thrown by gravity or squeezed violently.

2. Storage:

The storage period of the product with good weldability is one year from the date of production. Do not open the tape before using the product (in the case of well packed and delivered), and the product should be used within three months after opening the tape.

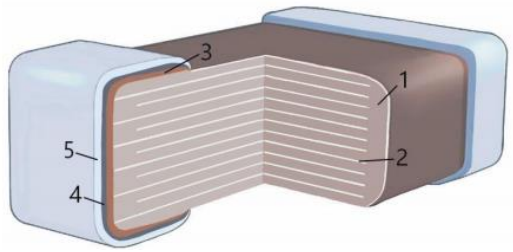
Storage temperature: 0℃~35℃

Storage relative humidity <70%

characteristic

- Complies with AEC-Q200 standard
- Complies with MSL 1
- Complies with J-STD-020D
- High reliability and equipment reliability
- Passed 100% six-sided appearance inspection test

Structure diagram



No.	name
1	dielectric ceramic
2	Inner electrode (nickel)
3	External electrodes (copper)
4	nickel dam
5	The tin layer

Application

- Automotive safety equipment
- Automotive powertrain
- Smooth and decoupling applications of electric lines in automobiles

CCAI AEC-Q200

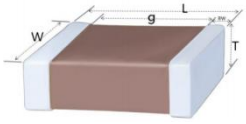
Part number example

CCA I 0603 B 104 K 500 G T

(1) (2) (3) (4) (5) (6) (7) (8)

No.	Size code					
(1) Application	CCAA: Vehicle specification (safety parts)					
(2) Product size (L * W)	encoding	British system (inch)	the metric system (mm)			
	00R4	008004	0201			
	01R5	01005	0402			
	0201	0201	0603			
	0402	0402	1005			
	0603	0603	1608			
	0805	0805	2012			
	1206	1206	3216			
	1210	1210	3225			
	1808	1808	4520			
	1812	1812	45332			
(3 Temperature characteristics	C0G X7R					
(4) Capacitance value	The expression of capacitance value>= 10pF: First Two×10^ third 104=10×10^4=100nF 123=12×10^3=12nF The expression of capacitance value <10pF: R30=0.3pF, 1R0=1pF					
(5) Capacitance tolerance	A：±0.05pF	B：±0.1pF	C：±0.25pF		D：±0.5pF	F：±1.0%
	G：±2%	J：±5%	K：±10%		M：±20%	Z：80/-20%
(6) rated voltage Vdc	0E：2.5	0G：4.0	0J：6.3	1A：10	1C：16	1E：25
	1V：35	1H：50	1J：63	1K：80	2A：100	2D：200
	2E：250	2G：400	2W：450	2H：500	2J：630	3A：1000
	3D：2000	3E：2500	3U：3000	3G：4000		
(7) Product thickness (mm)	A：0.10	B：0.13	C：0.18	D：0.20	E：0.30	F：0.45
	G：0.50	H：0.60	J：0.80	K：0.85	L：1.15	M：1.25
	N：1.60	P：1.90	Q：2.00	R：2.50		
(8) Packaging method	T: Finished packaging (7"Reel)					

packing specifications



In general, φ180mm (7") trays are used for packaging.

Five discs are packaged in one box and twelve boxes are a whole box.

specifications	size (mm)				Packaging (7")	
	Length	Width	Thickness	g	Packaging quantity (pieces)	manner of packing
0201	0.60±0.03	0.30±0.03	0.30±0.03	0.20	15,000	paper tape
0402	1.00±0.05	0.50±0.05	0.50±0.05	0.30	10,000	paper tape
0603	1.60±0.10	0.80±0.10	0.80±0.10	0.30	4,000	paper tape
0805	2.00±0.20	1.25±0.20	0.85±0.20	0.50	4,000	Plastic strips
			1.25±0.20		3,000/2,000	
1206	3.20±0.20	1.60±0.20	0.85±0.20	1.00	4,000	paper tape
			1.25±0.20		3,000/2,000	Plastic strips
			1.60±0.20		2,000	
1210	3.20±0.30	2.50±0.20	1.25±0.20	1.00	3,000	Plastic strips
			1.60±0.20		2,000	
			2.50±0.20		1,000	

CCAI AEC-Q200

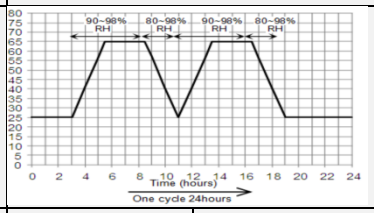
Capacitance range【C0G】0402~0805

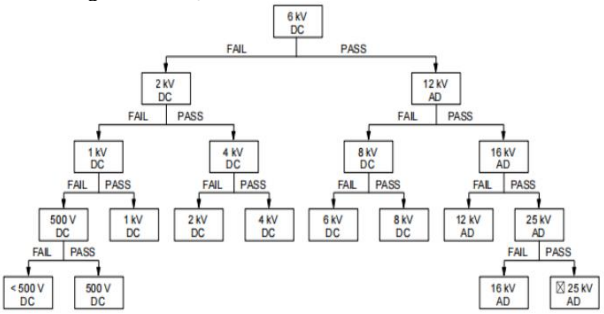
Size (inch)	Thick (Code)	RV (Vdc)	1pF			10pF						100pF						1nF
			1R0	2R2	4R7	100	150	220	330	470	680	101	151	221	331	471	681	102
0402	0.50 (G)	25		■	■													
		50	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
0603	0.80 (J)	50	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		100				■	■	■	■	■	■	■	■	■	■	■	■	■
0805	0.60 (H)	50				■	■	■	■	■	■	■	■	■	■	■	■	■

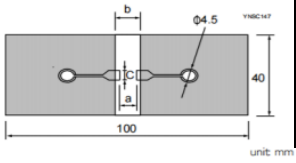
【X7R】0201~1206

Size (inch)	Thick (Code)	RV (Vdc)	220pF		1nF				10nF			100nF			1uF
			221	471	102	152	222	472	103	223	473	104	224	474	105
0201	0.30 (E)	25			■	■	■	■	■						
0402	0.50 (G)	16	■	■	■	■	■	■	■	■	■	■			
		25	■	■	■	■	■	■	■	■	■	■			
		50	■	■	■	■	■	■	■						
		100	■	■	■	■									
0603	0.80 (J)	10													■
		16			■	■	■	■	■	■	■	■	■	■	■
		25			■	■	■	■	■	■	■	■	■	■	■
		50			■	■	■	■	■	■	■	■	■		
		100			■	■	■	■	■	■	■	■			
0805	0.85 (K)	16									■	■	■		
		25									■	■	■		
		50				■	■	■	■	■	■	■			
		100			■	■	■	■	■	■					
		250			■	■	■	■							
	1.25 (M)	16												■	■
		25												■	■
		50											■	■	■
		100									■	■			
		250							■	■					
1206	1.60 (N)	50													■

Test methods

No	Item	Test specifications		Test method (refer to AEC-Q200)		
1	Pre-treatment/post-treatment Pre-and-Post-Stress Electrical Test	--		--		
2	high-temperature storage High Temperature Exposure(Storage)	surface	No defects or anomalies.	method of erection	Weld the capacitor to the test substrate	
		Capacitance changes	Refer to the specification sheet for a single unit	Test temperature	150+/-3℃	
		Quality factor/dissipation coefficient	To the initial value.	testing time	1000 +/-12 hours	
		Insulation impedance	To the initial value.	reprocessing	Leave at room temperature for 24 +/-2 hours, then measure	
3	temperature cycle Temperature Cycling	surface	No defects or anomalies.	method of erection	Weld the capacitor to the test substrate	
				pretreatment	Heat treatment for 1 hour at 150+/-0/-10℃, then leave at room temperature for 24+/-2 hours before measurement.	
		Capacitance changes	Please refer to the specification sheet for a single particle	period	1000 cycles	
				temperature cycle:		
				step	temperature (℃)	Time (minutes)
		Quality factor/dissipation coefficient	To the initial value.	1	Minimum operating temperature +0/-3	130+/-3
				2	room temperature	1
				3	Maximum operating temperature +3/-0	30+/-3
		Insulation impedance	To the initial value.	4	room temperature	1
				reprocessing	Leave at room temperature for 24 +/-2 hours, then measure	
4	Destructive Physical Analysis (DPA)	surface	No defects or anomalies.	Per EIA-469		
5	moisture resistance Moisture Resistance	surface	No defects or anomalies.	method of erection	Weld the capacitor to the test substrate	
				Test temperature	+25℃ to +65℃	
				Test humidity	80% to 98% R.H.	
		Capacitance changes	Please refer to the specification sheet for a single particle	testing time	Test 10 times for 24 hours (see figure below)	
				Temperature and humidity cycle:		
		Quality factor/dissipation coefficient	To the initial value.			
		Insulation impedance	To the initial value.	reprocessing	Leave at room temperature for 24±2 hours, then measure	
6	High temperature and humidity Biased Humidity	surface	No defects or anomalies.	method of erection	Weld the capacitor to the test substrate	
				Test temperature	85+/-3℃	
		Capacitance changes	Please refer to the specification sheet for a single particle	Test humidity	80% to 85% R.H.	
				testing time	1000 +/-12 hours	
		Quality factor/dissipation coefficient	To the initial value.	test voltage	1. Rated voltage (not exceeding 630V) 2. Apply 1.5V (silver electrode) Connect 100KΩ resistor	
No	project	Test specifications		Test method (refer to AEC-Q200)		
				Charging/discharge current	Maximum 50mA	
		Insulation impedance	To the initial value.	reprocessing	Leave at room temperature for 24 +/-2 hours, then measure	
7	DURABILITY TESTING Operational Life	surface	No defects or anomalies.	method of erection	Weld the capacitor to the test substrate	
		Capacitance changes	Please refer to the specification sheet for a single particle	Test temperature	Maximum operating temperature +/-3℃	
		quality factor /	To the initial value.	testing time	1000+/-12h	
				Test voltage (R.V.)	Please refer to the specification sheet for a	

					single particle
		Insulation impedance	To the initial value.	Charging /discharge current	Maximum 50mA
				reprocessing	Leave at room temperature for 24 +/-2 hours, then measure
8	Appearance Appearance	No defects or anomalies.		Visual (microscopic) examination	
9	Size Dimension	In terms of size		Use a size measuring instrument	
10	Resistant to solvents Resistance to Solvents	surface	No defects or anomalies.	According to MIL-STD-202 Method 215 (for points with a Mark only)	
		Capacitance changes	To the initial value.		
		Quality factor/dissipation coefficient	To the initial value.		
		Insulation impedance	To the initial value.		
11	mechanical shock Mechanical Shock	surface	No defects or anomalies.	method of erection	Weld the capacitor to the test substrate
				wave form	Half sine
		Capacitance changes	To the initial value.	peak value	1500g
		Quality factor/dissipation coefficient	To the initial value.	holding time	0.5ms
				velocity change	4.7m/s
		Insulation impedance	To the initial value.	Direction and time of impact	Each direction should be subjected to three impacts (18 impacts) along the three mutually perpendicular axes of the specimen
12	mechanical vibration Mechanical Vibration	surface	No defects or anomalies.	method of erection	Weld the capacitor to the test substrate
		Capacitance changes	To the initial value.	Vibration type	A 10Hz ~2000Hz~10Hz
		Quality factor/dissipation coefficient	To the initial value.	Vibration time	20 minutes
				total amplitude	1.5mm
		Insulation impedance	To the initial value.	Direction and time of vibration	Do 12 items (36 times in total) for every 3 mutually perpendicular directions
13	Resistant to welding heat Resistance to Soldering Heat	surface	No defects or anomalies.	test method	Solder bath method
		Capacitance changes	To the initial value.	Welding material type	Sn-3.0Ag-0.5Cu（Lead Free Solder）
		quality factor /	To the initial value.	Test temperature	260+/-5℃
		Insulation impedance	To the initial value.	testing time	10+/-1s
				reprocessing	Leave at room temperature for 24 +/-2 hours, then measure
14	Electrical static testing (ESD)	surface	No defects or anomalies.	According to AEC-Q200-002  Note: classified according to the highest electrostatic voltage level that can be withstand during electrostatic testing. Passive component HBM anti-static test flow chart (DC= direct contact discharge, AD= air discharge)	
		Capacitance changes	To the initial value.		
		Quality factor/dissipation coefficient	To the initial value.		
		Insulation impedance	To the initial value.		

<table>
<tr><th>No</th><th>Item</th><th colspan="2">Test specifications</th><th colspan="3">Test method (refer to AEC-Q200)</th></tr>
<tr><td rowspan="6">15</td><td rowspan="6">solderability
Solderability（a）</td><td colspan="2" rowspan="6">Ninety-five percent of the terminals should be welded continuously and evenly</td><td>pretreatment</td><td colspan="2">Heat treatment for 4 hours at 155℃</td></tr>
<tr><td>flux</td><td colspan="2">Solution of rosin ethanol 25（mass）%</td></tr>
<tr><td>Welding material type</td><td colspan="2">Sn-3.0Ag-0.5Cu（Lead Free Solder）</td></tr>
<tr><td>welding temperature</td><td colspan="2">Sn-3.0Ag-0.5Cu solder solution at245+/-5℃</td></tr>
<tr><td>soak period</td><td colspan="2">5+0/-0.5s</td></tr>
<tr><td>Infiltration rate and reproduction rate</td><td colspan="2">25+/-5mm/s</td></tr>
<tr><td rowspan="13">16</td><td rowspan="13">electrical character
Electrical Characterization</td><td>Capacitance value
Capacitance</td><td>See rated value</td><td colspan="2">Test temperature</td><td>25℃</td></tr>
<tr><td rowspan="2">Quality factor/dissipation coefficient Q/D.F.</td><td rowspan="2">Please refer to the specification sheet for a single particle</td><td colspan="2">Frequency of testing</td><td>1.0+/-0.1MHz</td></tr>
<tr><td colspan="2">test voltage</td><td>1.0±0.2Vrms</td></tr>
<tr><td rowspan="4">Insulation impedance
Insulation Resistance(I.R.)</td><td rowspan="4">To the initial value.</td><td colspan="2">Test temperature</td><td>25℃</td></tr>
<tr><td colspan="2">test voltage</td><td>rated voltage</td></tr>
<tr><td colspan="2">charging interval</td><td>One minute</td></tr>
<tr><td colspan="2">Charging/discharge current</td><td>Maximum 50mA</td></tr>
<tr><td rowspan="9">withstand voltage
Voltage proof</td><td rowspan="9">No defects or anomalies.</td><td>material quality</td><td>rated voltage</td><td>test voltage</td></tr>
<tr><td rowspan="5">C0G</td><td>RV≤50V</td><td>300% RV</td></tr>
<tr><td>50V < RV≤100V</td><td>250% RV</td></tr>
<tr><td>100V < RV≤250V</td><td>200% RV</td></tr>
<tr><td>250V < RV≤500V</td><td>150% RV</td></tr>
<tr><td>500V < RV≤1000V</td><td>130% RV</td></tr>
<tr><td rowspan="4">X7R</td><td>RV≤100V</td><td>250% RV</td></tr>
<tr><td>100V < RV≤250V</td><td>200% RV</td></tr>
<tr><td>250V < RV≤630V</td><td>150% RV</td></tr>
<tr><td>630V < RV≤1000V</td><td>120% RV</td></tr>
<tr><td rowspan="5">17</td><td rowspan="5">Flat board test
Board Flex</td><td>surface</td><td>No defects or anomalies.</td><td>method of erection</td><td colspan="2">Weld the capacitor to the test substrate</td></tr>
<tr><td rowspan="2">Capacitance changes</td><td rowspan="2">Please refer to the specification sheet for a single particle</td><td>test method</td><td colspan="2">The force is applied at a speed of 1mm/s to bend it, and the fixture radius is 340 mm</td></tr>
<tr><td>The amplitude of bending</td><td colspan="2">COG：3mm X7R：2mm</td></tr>
<tr><td rowspan="2">Quality factor/dissipation coefficient</td><td rowspan="2">To the initial value.</td><td>duration</td><td colspan="2">60s</td></tr>
<tr><td colspan="3"> 

<table>
<tr><th>size</th><th>a</th><th>b</th><th>c</th></tr>
<tr><td>0201</td><td>0.3</td><td>0.9</td><td>0.3</td></tr>
<tr><td>0402</td><td>0.5</td><td>1.5</td><td>0.6</td></tr>
<tr><td>0603</td><td>0.6</td><td>2.2</td><td>0.9</td></tr>
<tr><td>0805</td><td>0.8</td><td>3</td><td>1.3</td></tr>
<tr><td>1206</td><td>2</td><td>4.4</td><td>1.7</td></tr>
<tr><td>1210</td><td>2</td><td>4.4</td><td>2.6</td></tr>
</table>
unit:mm</td></tr>
<tr><td>Insulation impedance</td><td>To the initial value.</td></tr>
<tr><td rowspan="4">18</td><td rowspan="4">Thrust test
Terminal Strength</td><td>surface</td><td>No defects or anomalies.</td><td>method of erection</td><td colspan="2">Weld the capacitor to the test substrate</td></tr>
<tr><td>Capacitance changes</td><td>To the initial value.</td><td rowspan="2">acting force</td><td colspan="2" rowspan="2">Apply a continuous force of 17.7N (1.8Kg)
*0402 Apply a force of 2N
*0201 Apply a force of 1N
Note: Apply force gradually to avoid impact on the measuring part</td></tr>
<tr><td>Quality factor/dissipation coefficient</td><td>To the initial value.</td></tr>
<tr><td>Insulation impedance</td><td>To the initial value.</td><td>duration</td><td colspan="2">60+1s</td></tr>
</table>

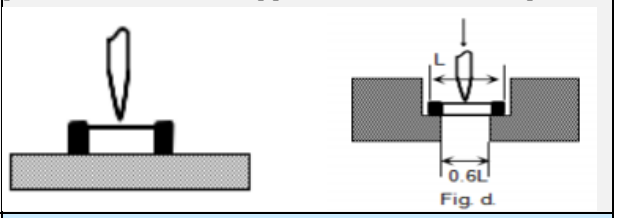
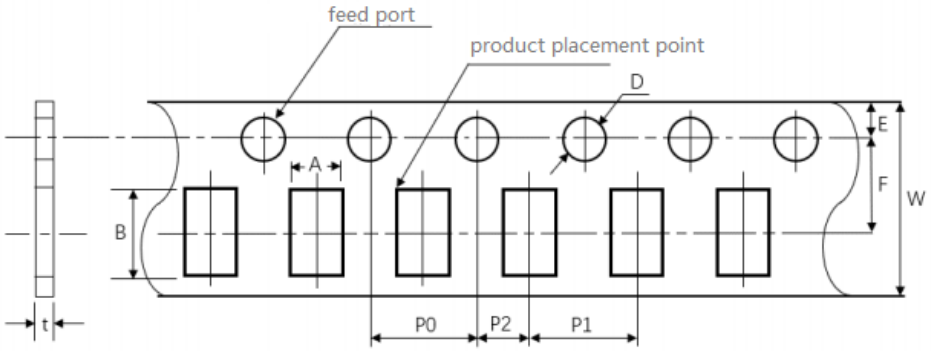
<table>
<tr><th>No</th><th>Item</th><th colspan="2">Test specifications</th><th colspan="2">Test method (refer to AEC-Q200)</th></tr>
<tr><td rowspan="2">19</td><td rowspan="2">Load testing
Beam Load Test</td><td colspan="2" rowspan="2">The allowable value shall exceed the following values:
Product L size is less than 2.5mm Product L size is more than 3.2mm Product L size is less than 2.5mm Product L size is more than 3.2mm
Product T thickness>0.5mm: 20N Product T thickness ≥1.25mm: 54N Product T thickness>0.5mm: 20N Product T thickness ≥1.25mm: 54N
Product T thickness <0.5mm: 8N Product T thickness <1.25mm: 15N Product T thickness <0.5mm: 8N Product T thickness <1.25mm: 15N</td><td colspan="2">The pressure load provides a speed of 0.1mm/s</td></tr>
<tr><td colspan="2">Location diagram: [Product L size ≤ 2.5mm] [Product L size ≥ 3.2mm] Location diagram: [Product L size ≤ 2.5mm] [Product L size ≥ 3.2mm]
 

Fig. d</td></tr>
<tr><td rowspan="5">20</td><td rowspan="5">Temperature characteristics
Temperature Characteristics of Capacitance</td><td rowspan="2">change in capacitance</td><td rowspan="2">The nominal value of the temperature coefficient is shown in the rated value. The change of capacitance at reference temperature is shown in Table A.</td><td colspan="2">The capacitance change should be measured after 5 minutes at each specified temperature stage.</td></tr>
<tr><td colspan="2">The capacitance value is used as a reference value and is the step value marked with "*".</td></tr>
<tr><td colspan="2" rowspan="3">Capacitance change: C0G: ±30ppm/℃
X7R：±15%</td><td>Capacitance changes</td><td>The value of the change is calculated by dividing the difference between the maximum and minimum values</td></tr>
<tr><td>test voltage</td><td>Less than 1.0Vrms (refer to individual data sheets)</td></tr>
<tr><td colspan="2">Temperature steps:(A)</td></tr>
<tr><td colspan="2" rowspan="6"></td><td>step</td><td>temperature</td></tr>
<tr><td>1</td><td>Reference temperature +/-2</td></tr>
<tr><td>2</td><td>Minimum operating temperature +/-3</td></tr>
<tr><td>3*</td><td>Reference temperature +/-2</td></tr>
<tr><td>4</td><td>Maximum operating temperature +/-3</td></tr>
<tr><td>5</td><td>Reference temperature +/-2</td></tr>
</table>

product packaging

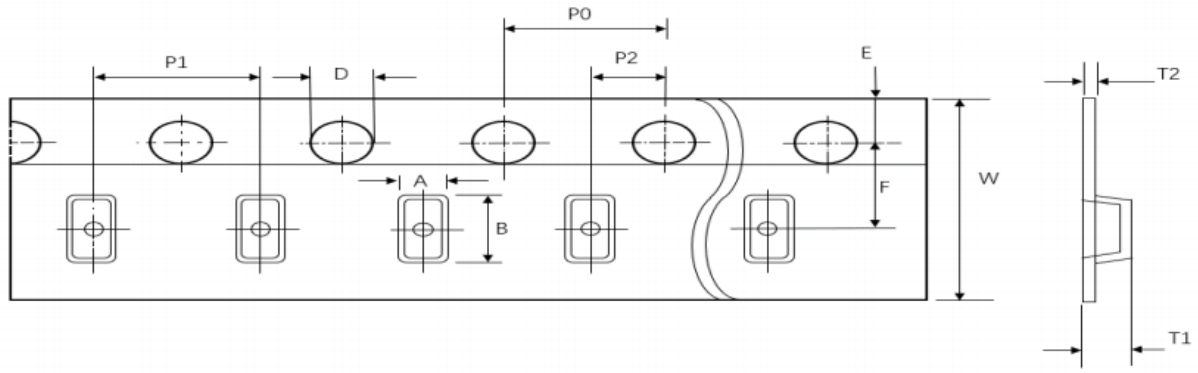
The tape reel packaging is the most common packaging method at present. A reel with a diameter of 180mm (7") can contain 1000~20000 capacitors, and can also be packaged according to customer requirements.

1. Tape size



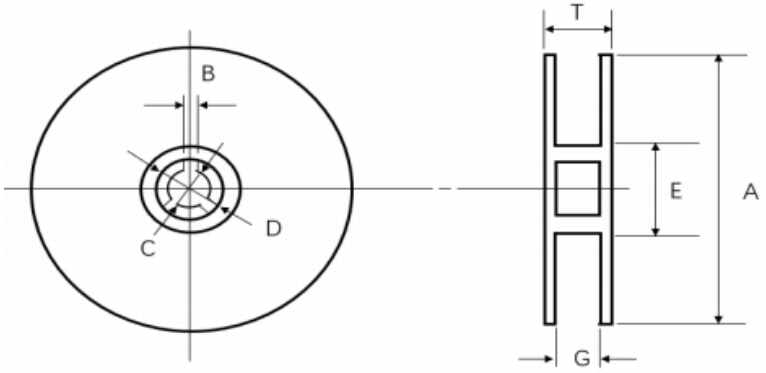
No.	01005（0402）	0201（0603）	0402（1005）	0603（1608）	0805（2012）	1206（3216）
P1	2.00±0.05（1.0±0.05）			4.00±0.10		
P0	4.00±0.10			4.00±0.10		
P2	2.00±0.05			2.00±0.05		
A	0.25±0.02	0.38±0.03	0.62±0.05	1.00±0.01	1.55±0.10	2.05±0.10
B	0.46±0.02	0.68±0.03	1.12±0.05	1.90±0.10	2.30±0.10	3.60±0.10
W	8.00±0.30			8.00±0.30		
E	1.75±0.10			1.75±0.10		
F	3.50±0.05			3.50±0.05		
D	φ1.50+0.10/-0.03			φ1.50+0.10/-0		
t	0.25±0.02	0.35±0.03	0.60±0.05	1.1Below		

2. Size of plastic bags



	0603（1608）	0805（2012）	1206（3216）	1210（3225）
P1	4±0.1	4±0.1	4±0.1	4±0.1
P0	4±0.1	4±0.1	4±0.1	4±0.1
P2	2±0.05	2±0.05	2±0.05	2±0.05
A	1.2±0.2	1.45±0.2	1.9±0.2	2.8±0.2
B	2.0±0.2	2.3±0.2	3.5±0.2	3.6±0.2
W	8±0.3	8±0.2	8±0.2	8±0.2
E	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
F	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05
D	1.5（+0.1/-0.0）	1.5（+0.1/-0.0）	1.5（+0.1/-0.0）	1.5（+0.1/-0.0）
T1	1.4max	2.5max.	2.5max.	2.5max.
T2	0.25±0.1	0.305±0.1	0.30±0.1	0.30±0.1

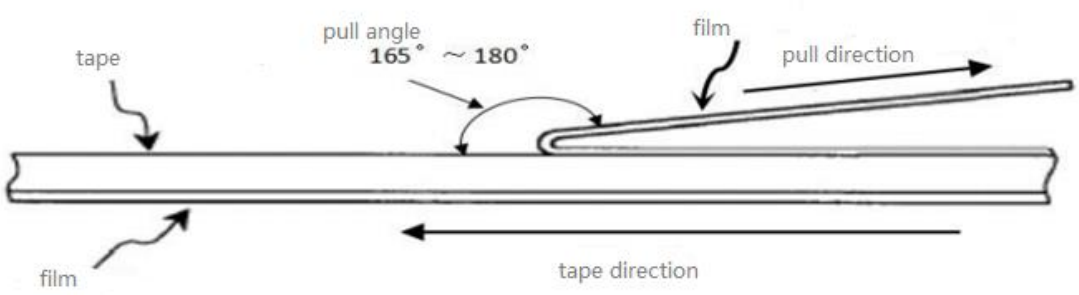
3. Disk size



Disc size	A（mm）	B（mm）	C（mm）	D（mm）	E（mm）	G（mm）	T（mm）
7"Reel	φ178±2.0	2.0±0.5	φ13±1.0	φ21±0.8	φ 50 or more	10±1.0	13±1.0

4. Instructions for use of roll tape

When the finished product is used, the tape (membrane) is peeled at a speed of 3300±10mm/min and an Angle of 165°~180° (as shown in the figure below), with a peel strength of 0.1N~0.7N(10g.f≤peel force≤70g.f).



Use precautions

Multilayer ceramic chip capacitors (MLCCs) may experience short circuits, open circuits, or even smoke, burn, or explode under harsh

working conditions exceeding the usage frequency specified in this acceptance document or related manuals, or when subjected to excessive external mechanical forces. Therefore, when using them, please first refer to the relevant instructions in this acceptance document. If you have any questions, please contact our Technical Department, Quality Control Department, or Production Department.

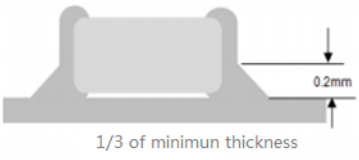
1. The amount of solder used in welding

A. Too much solder can cause damage to the capacitor due to excessive pressure at the end of the capacitor.

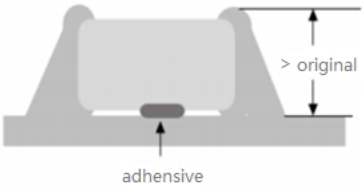
B. Too little solder and insufficient fixing force may cause poor contact between the capacitor chip and the circuit.

2. Recommended solder usage:

A. Optimal solder quantity for reflow welding



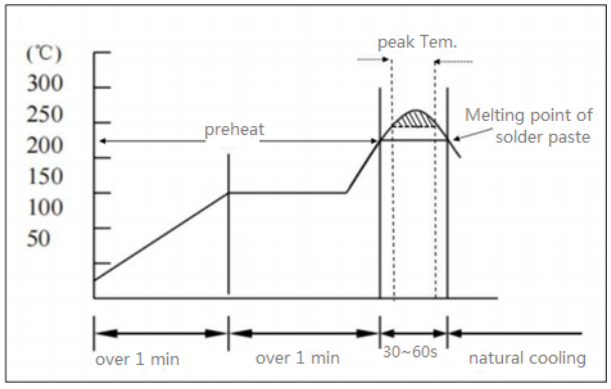
B. Optimal solder usage for peak welding



C. The best amount of solder to use when using a soldering iron for repair

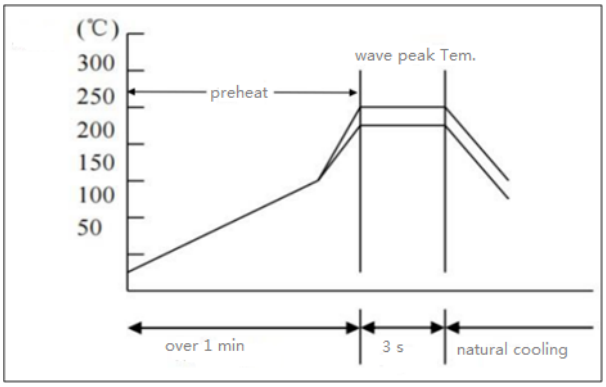
3. Recommended welding temperature curve:

reflow soldering



Type of solder	Pb-Sn weld	lead-free soldering
Peak temperatures	230℃~250℃	240℃~260℃
Peak time	3s~10s	3s~10s

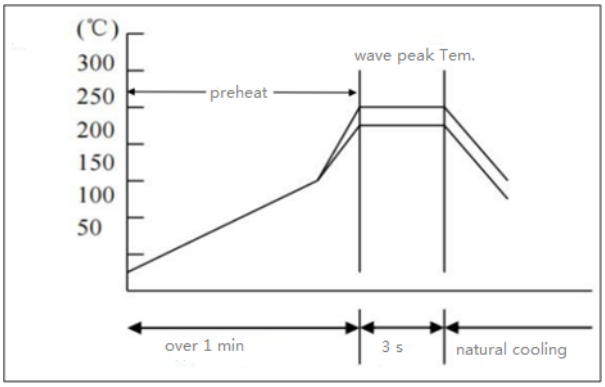
Boltzman distribution law



Type of solder	Pb-Sn weld	lead-free soldering
Peak temperatures	230℃~260℃	240℃~270℃
Peak time	Within 3 seconds	Within 3 seconds

manual welding

Manual welding is easy to cause micro-cracking or local bursting of porcelain body because of uneven heating of the capacitor. Therefore, when using soldering iron for manual welding, it should be carefully operated, and more care should be taken in the selection of the tip of the soldering iron and the control of the tip temperature.



preheat	The temperature of the soldering iron	Wattage of the soldering iron	Diameter of the soldering iron head	weld period	The amount of ointment	matters need attention
△≤ 130℃	≤350℃	≤20W	Suggest 1mm	≤3s	Less than 1/2 capacitance height	Do not touch the ceramic body directly with the iron head