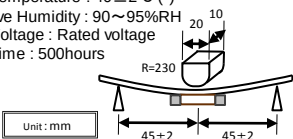


Performance and Test Methods

■ Performance and Test Methods

Item		Performance			Test Methods and Conditions (In accordance with JIS C 5101-1)		
		CG characteristics	R Characteristics	E Characteristics			
Capacitance		Within the tolerance			Class 1		
Dissipation Factor (or Q)		C*30pF → Q≥1,000 C* < 30pF → Q≥ 400+20C*	RC: 5.0% or less BC: 10% or less VC, TH, XC, VH: 2.5% or less *Specifications may differ depending on the product Please check the individual specification sheets.	5.0% or less	Capacitance Value	Measurement Frequency	Measurement Voltage
	C≤1000pF				1MHz±20%	0.5~5Vrms	
	C>1000pF				1kHz±10%	1.0±0.2Vrms	
	Class 2						
					Capacitance Value	Measurement Frequency	Measurement Voltage
					C≤10μF	1kHz±10%	1.0±0.2Vrms
					C>10μF	120Hz±10%	0.5±0.2Vrms
Heat-treated before measuring							
Withstanding Voltage		No insulation breakdown and no failure. Rated Voltage 6.3~100V Rated Voltage 250% Rated Voltage 250~350V Rated Voltage 200% Rated Voltage 630V Rated Voltage 150% Rated Voltage 1,000V~ Rated Voltage 120%			Applied Voltage : 1~5sec. Applied in silicon oil (W.V.630V or more) Charging and Discharging Current: 50mA max.		
Insulation Resistance		No less than 10,000MΩ or 500MΩ・μF, whichever is smaller. (*)			Applied Voltage : Rated Voltage (W.V.630V or more=500V) Applied Time : 1min.		
Adhesion Strength of Termination		No peeling-off or exfoliation shall be manifest or recognizable in its incipient stages.			Applied Force: 5N Keeping Time : 10 sec		
Resistance to Soldering Heat	Visual	No serious mechanical damage			Heat Treatment Temperature : 270±5℃ Immersion Time : 10±1sec. Preheating: ①80~100℃ (1~2min.) ②170~200℃ (1~2min.) Continuous immersion after preheating		
	Rate Change in Capacitance	No more than 2.5% or 0.25pF, whichever is larger.	± 7.5% or less	± 20% or less			
	Dissipation Factor (or Q)	Initial standard values must be satisfied.					
	Insulation Resistance	Initial standard values must be satisfied.					
	Withstanding Voltage	No insulation breakdown and no failure.					
Solderability		Termination surface should be covered with new solder to over 75%.			Temperature : 230±5℃ Immersion Time : 2±1sec.		
Temp. Cycle	Visual	No serious mechanical damage.			Room Temp.→ Minimum Operation Temp. →Room Temp.→ Maximum Operation Temp. 3min. → 30min. →3min. → 30min. Leaving a sample under the temperature of step 1~4 above in order to complete 1 cycle. The cycle is repeated 5 times.		
	Capacitance Change	No more than 2.5% or 0.25pF, whichever is larger.	± 7.5% or less	± 20% or less			
	Dissipation Factor (or Q)	Initial standard values must be satisfied.					
	Insulation Resistance	Initial standard values must be satisfied.					
	Withstanding Voltage	No insulation breakdown and no failure.					
Humidity Load Test	Visual	No serious mechanical damage.			Voltage Treatment Test Temperature : 40±2℃ (*) Relative Humidity : 90~95%RH Test Voltage : Rated voltage Test Time : 500hours 		
	Capacitance Change	No more than 2.5% or 0.25pF, whichever is larger.	± 12.5% or less	± 30% or less			
	Dissipation Factor (or Q)	C*30pF → Q≥350 30pF>C*≥10pF→ Q≥275+(5/2)C* C* < 10pF → Q≥200+10C*	Less than double of the initial value				
	Insulation Resistance	No less than 1,000MΩ or 50MΩ・μF, whichever is smaller. (*)					
Life Test (at Elevated Ambient Temp.)	Visual	No serious mechanical damage.			Voltage Treatment Test Temperature : Maximum Operation Temp.±3℃ Test Voltage : W.V.=250V or less Rated Voltage × 200% of DC Voltage W.V.=630V or more Rated Voltage × 100% of DC Voltage Test Time : 1000hours *Test condition is different for each product. Please check the individual specification sheets.		
	Capacitance Change	No more than 3% or 0.3pF, whichever is larger.	± 12.5% or less	± 30% or less			
	Dissipation Factor (or Q)	C*30pF → Q≥350 30pF>C*≥10pF→ Q≥275+(5/2)C* C* < 10pF → Q≥200+10C*	Less than double of the initial value				
	Insulation Resistance	No less than 1,000MΩ or 50MΩ・μF, whichever is smaller. (*)					
Flexion	Visual	No serious mechanical damage.			Heat Treatment Flexure: 1mm(*) Moving Speed : 0.5mm/sec Have a capacitance meter connected to both ends of the specimen during a test.		
	Capacitance Change	No more than 5% or 0.5pF, whichever is larger.	± 12.5% or less	± 30% or less			

Note1 : Specifications may differ depending on the product Please check the individual specification sheets.

Note2 : C* represents capacitance values (pF).

Note3 : Heat treatment : The capacitor is heat-treated at 150+0/-10°C for 1 hour, then is left at room temperature for 48 ± 4 hours

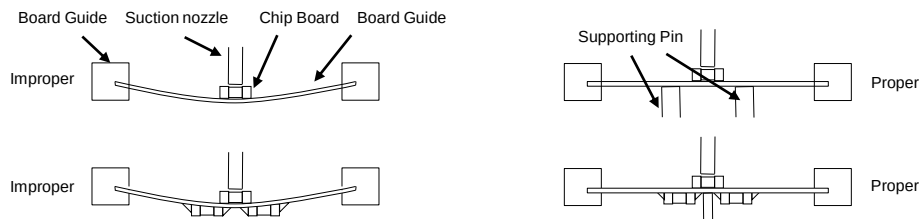
Note4 : Voltage treatment : The capacitor is processed in a prescribed examination condition for 1 hour, then is left at room temperature for 48 ± 4 hours.

Handling Precautions

■ Mounting

1. Chip Mounting

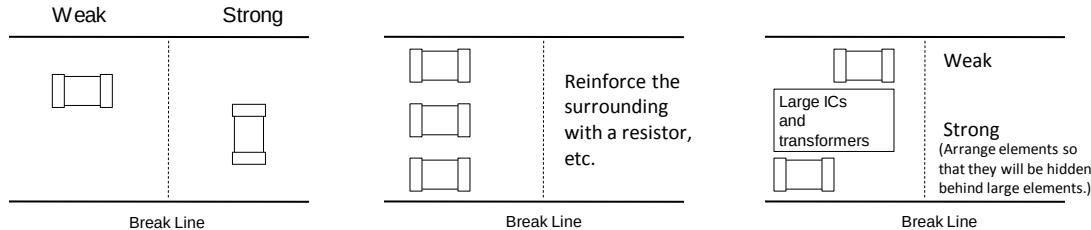
(1) While mounting, if the bottom dead point of the suction nozzle is too low, the force on the chip may be great enough to cause breaking or cracking. Adjust the distance of the bottom dead point of the nozzle from the top surface of the chip, after resetting the substrate straight, to prevent overload on the chip.



- (2) To prevent cracking or breaking, set the static load force between 100~300gf when mounting.
- (3) A worn clamp fixture of the mounter can cause an uneven distribution of the clamping force, leading to cracking or breaking of the capacitor. Check the dimensions of the clamping fixture in the closed position, perform routine maintenance on the suction nozzle and clamping fixture, and inspect or change worn parts on a periodic basis.

2. Board breaking

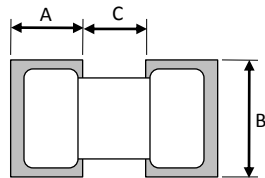
When large multi-circuit boards are broken into individual boards after soldering, flexure stress may be placed on the parts causing them to cracking or breaking. For designing patterns please refer to below.



■ Soldering

1. Basic Design

Recommended land pattern for reflow soldering.



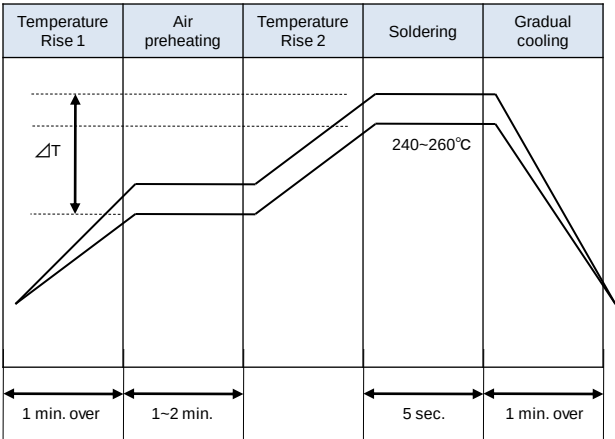
Unit : mm									
	Type	10,11	20	30,35	40,38	44	70,47	63	80,69
	Chip length (L) × Width (W)	1.6 × 0.8	2.0 × 1.25	3.2 × 1.6	3.2 × 2.5	4.6 × 2.0	4.7 × 3.2	5.7 × 2.0	5.7 × 5.0
Land dimension	A	0.6~0.7	0.6~0.7	0.8~0.9	1.0~1.2	1.1~1.3	1.1~1.3	1.5~1.7	1.5~1.7
	B	0.6~0.8	0.8~1.1	1.0~1.4	1.8~2.5	1.8~2.0	2.3~3.2	1.8~2.0	3.5~5.0
	C	0.6~0.8	1.0~1.2	2.2~2.4	2.0~2.4	3.6	2.6~3.4	4.9~5.1	3.6~4.6

Handling Precautions

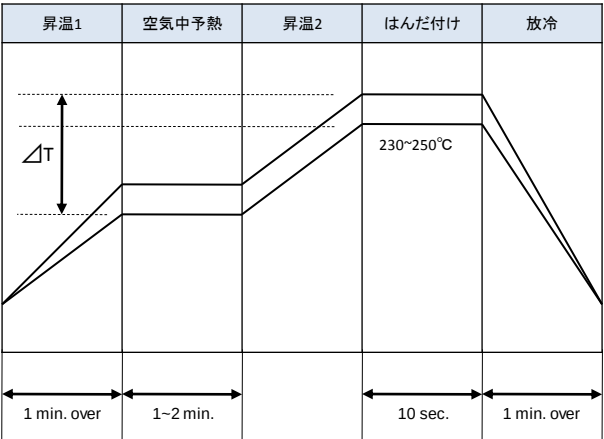
2. General cautions for soldering

- (1) Excessively high soldering temperatures or long soldering times can cause leaching of terminations, and consequently decrease adherence strength, and capacitance value, etc.
- (2) For soldering, please refer to the soldering curves below.
- (3) When using a soldering iron for repair work, make sure to apply the tip of the iron and the solder to the edge of the chip at the same time, being careful not to touch the chip directly with the iron.

①Flow soldering recommended conditions (Lead free)



②Reflow soldering recommended conditions (Lead free)



- note1: Keeping time must be counted from the time that surface temperature of the capacitor reaches the temperature above.
- note2: Temperature tolerance (ΔT) between preheating and soldering must be the tolerance in the right list.
- note3: Keep the temperature rise speed within 2~5°C / sec..
- note4: Keep the cold removal speed within 1~4°C / sec..
- note5: 40 or more types and stacked types are not applicable to flow soldering.

[Temperature Tolerance ΔT]	
Size	Temperature tolerance
30 or less types	ΔT=150°C or less
40 or more types ΔT	ΔT=130°C or less
Stacked type capacitor	ΔT=100°C or less

- (4) Please use a mild flux (containing less than 0.2wt % Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

3. Cleaning

When using ultrasonic cleaning, the board may resonate if the output power is too high. Because this vibration can cause cracking or decrease in the adhesion of the termination, we recommend the conditions below.

- Frequency : 28kHz
- Output power : 20W / Liter
- Cleaning time : 5 minutes max.

Recommended terms of use

- (1) The life of the condenser depends on an applied voltage and environmental temperature. We recommend that we have you use it in the following conditions when it is used our product.

- An applied voltage : Rated voltage × 60% maximum.
- Environmental temperature : Product of operating temperature 85°C / 60°C max.
Product of operating temperature 125°C / 100°Cmax.
*The environmental temperature includes self-fever.

- (2) When the capacitor is designed as DC voltage use and has you use it by a circuit with the electric potential changes such as interchange or the pulse wave pattern, it is necessary to confirm self-fever.

- Permission self fever temperature : 20°C max.
- *Please do request for design so that self-fever temperature is as follows 10 degrees Celsius when I use it by a high reliability circuit.

Handling Precautions

■ Storage/keeping

- (1) Deterioration of solderability can be caused by oxidization/sulfurization because of high temperature, high humidity or chlorine / sulfur gas. Parts should be used within 6 months if possible and stored below 40°C and 70% RH in a atmosphere free of sulfur, chlorine or toxic gasses.
- (2) These capacitors are made of ceramics. Avoid dropping or other mechanical shock that could damage the parts.
- (3) The capacitors kept in your storage for over 6 months should be used only after checking solderability.

■ Guide to application

- (1) The products are designed and manufactured for the use in ordinary electronic products. There is a possibility to cause performance deterioration depends on the way of using. In case of the product breaking down in short mode, capacitor itself become hot then the circuit board might have been damaged by a fire.
If any of these products are used in special applications requiring high reliability, where product defects or its misconduct might pose a safety risk or cause a social problem, please consult sales offices well in advance.
 - ① aerospace instrument
 - ② submarine repeater (bottom of the sea relay, work equipment in the sea inside etc.)
 - ③ atomic power control system
 - ④ vehicle instrument including its accessories
 - ⑤ fuel control equipment
 - ⑥ other transportation equipments (vehicles, airplanes, trains, vessels and traffic rights etc.)
 - ⑦ safety equipment
 - ⑧ medical equipment (life-support equipment etc.)
 - ⑨ power generation control equipment
 - ⑩ disaster prevention and security equipment
 - ⑪ for military and the Defense Agency applications
 - ⑫ information processing equipment (communications infrastructure etc.)
 - ⑬ other equipments required the same quality and reliability as above equipments These capacitors are made of ceramics. Avoid dropping or other mechanical shock that could damage the parts.
- (2) In case of circuit design using the products, the safety for end users should be confirmed if the products have any problem. And products, security must be kept taking into consideration of the sufficient fail safe design (secure the protection circuit) in order not to be unsafe as a system when the products are in defects by single trouble.

■ Others

- (1) The names of products and their specifications listed in this catalog may be changed for improvement or the production of some products may be discontinued without any advance notice. Before using the products, please ask for delivery specifications and confirm its contents.
- (2) The specific characteristic and quality of a product as a single item are guaranteed in this catalog. When using the products, please make sure that you check and evaluate them as they are contained in a package.
- (3) Our warranty does not apply to troubles that may arise as a result of using products ignoring their characteristics, ratings and the application scope described in this catalog.
- (4) Although we have taken all possible measures to ensure the quality and reliability of our products, there is a possibility that accidents causing injury or death, fire or social damage may occur if products are not used as instructed. If you have any questions regarding how to use the products, please consult with our customer service personnel.
- (5) If problem arises regarding a third party's industrial proprietary rights as a result of using this products, our company will have no liability for the problem except for those related to our products' structure and production method.