Chip Three-terminals Ceramic Filter (EMI)

• Features

* Has good current properties.
* No reverse, suitable for high-density surface-mounting.
* Good filter property.
* Good noise suppression and surge suppression.
* Good solderability and soldering resistance.

• Applications:

* Mobile telephone and mobile base.
* Communication equipment.
* Automatization instruments and process controller.
* Bus circuits.
* Computers and outside equipment.

• Product Part Number Expression

508	1	CG	101	J	500	B	T
①	②	③	④	⑤	⑥	⑦	⑧

①Dimensions		
Type	British (Inch)	Metric (mm)
508	0.05 × 0.08	1.25 × 2.0
512	0.05 × 0.12	1.25 × 3.20
618	0.06 × 0.18	1.60 × 4.57

②Code	
1	Electromagnetism Disturbance Suppression

③Dielectric Type	
Code	Dielectric Material
CG	NPO
B	X7R
F	Y5V

④Normal Capacitance(PF)	
Expression Method	Actual Value
102	10×10^2
222	22×10^2

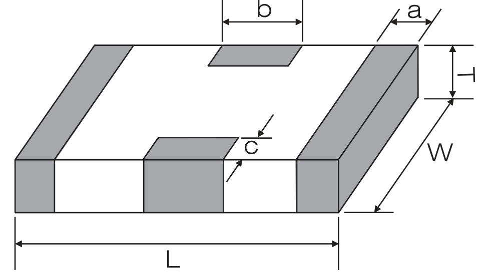
⑤Capacitance Tolerance	
CODE	TOLERANCE
M	±20%
S	+50% ~ 20%

⑥Rated Voltage	
Expression Method	Actual Value
6R3	6.3
160	16
250	25
101	100

⑦Rated Current	
Expression Method	Actual Value
B	0.3A
C	0.4A
D	1A
E	2A

⑧Package Method	
Expression Method	Packaging
NOMARKS	Bulk Bag Packaging
T	Taping Packaging
B	Bulk Plastic Box Packaging

• Outside Dimension



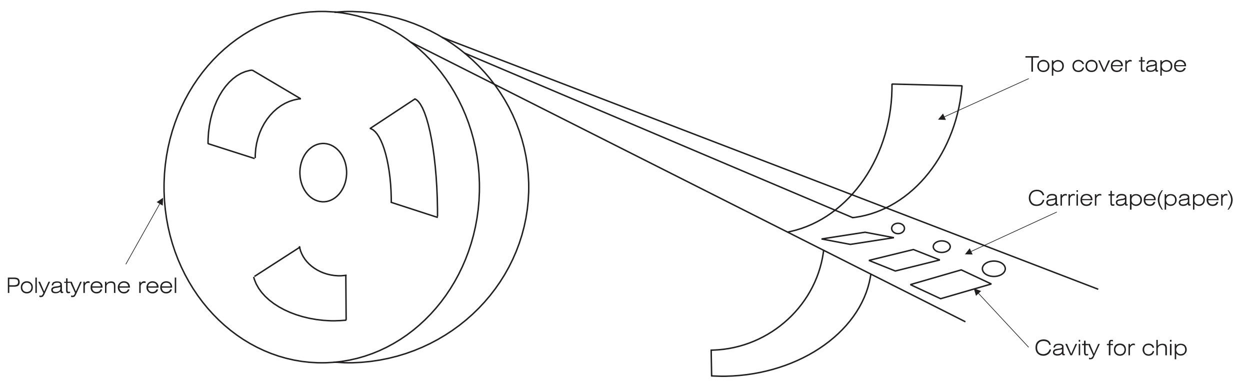
Size \ Item	L	W	H	Termination thickness	Third Temination Width	Third Temination Thickness
508	2.00±0.20	1.25±0.20	0.80±0.20	0.25±0.10	0.60±0.20	0.25±0.15
512	3.20±0.20	1.25±0.20	0.70±0.20	0.30±0.20	1.10±0.30	0.25±0.20
618	4.50±0.30	1.60±0.20	1.00±0.20	0.40±0.30	1.50±0.30	0.30±0.20

- Capacitance Range

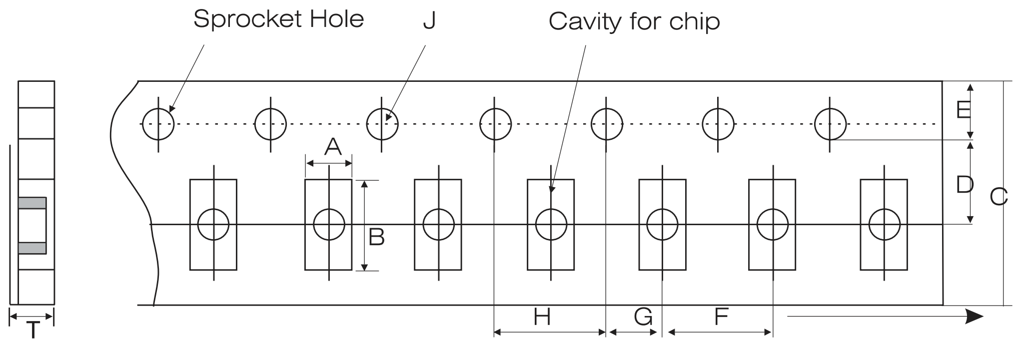
Product Code	Size	Cap.	Cap. Tolerance	Temp-erature Charac-teristics	Rated Voltage (V)	Rated Current (A)	Insulation Resistance (mΩ)	DC Resistance (A)	Operating Temperature Range
5081CG220S500CNT	0805	22	+50/-20%	COG	50	0.4	10,000	0.3	-55~+125℃
5081CG470S500CNT	0805	47	+50/-20%	COG	50	0.4	10,000	0.3	-55~+125℃
5081CG101S500CNT	0805	100	+50/-20%	COG	50	0.4	10,000	0.3	-55~+125℃
5081CG221S500CNT	0805	220	+50/-20%	COG	50	0.4	10,000	0.3	-55~+125℃
5081B471S500CNT	0805	470	+50/-20%	X7R	50	0.4	10,000	0.3	-55~+125℃
5081B102S500CNT	0805	1000	+50/-20%	X7R	50	0.4	10,000	0.3	-55~+125℃
5081B222S500CNT	0805	2200	+50/-20%	X7R	50	0.4	10,000	0.3	-55~+125℃
5081B223S500CNT	0805	22000	+50/-20%	X7R	50	1.0	10,000	0.8	-55~+125℃
5121CG220S500CNT	1205	22	+50/-20%	COG	50	0.3	10,000	0.3	-55~+125℃
5121CG470S500CNT	1205	47	+50/-20%	COG	50	0.3	10,000	0.3	-55~+125℃
5121CG101S500CNT	1205	100	+50/-20%	COG	50	0.3	10,000	0.3	-55~+125℃
5121CG221S500CNT	1205	220	+50/-20%	COG	50	0.3	10,000	0.3	-55~+125℃
5121CG471S500CNT	1205	470	+50/-20%	COG	50	0.3	10,000	0.3	-55~+125℃
5121B102S500CNT	1205	1000	+50/-20%	X7R	50	0.3	10,000	0.3	-55~+125℃
5121B222S500CNT	1205	2200	+50/-20%	X7R	50	0.3	10,000	0.3	-55~+125℃
5121B223S500CNT	1205	22000	+50/-20%	X7R	50	1.0	10,000	0.3	-55~+125℃
5121B473S500CNT	1205	47000	+50/-20%	X7R	50	2.0	5,000	0.8	-55~+125℃
6181F224S500CNT	1806	220000	+50/-20%	Y5V	50	100	5,000	0.4	-25~+85℃
6181CG220S500CNT	1806	22	+50/-20%	COG	100	0.3	10,000	0.3	-55~+125℃
6181CG470S500CNT	1806	47	+50/-20%	COG	100	0.3	10,000	0.3	-55~+125℃
6181CG101S500CNT	1806	100	+50/-20%	COG	100	0.3	10,000	0.3	-55~+125℃
6181CG221S500CNT	1806	220	+50/-20%	COG	100	0.3	10,000	0.3	-55~+125℃
6181B471S500CNT	1806	470	+50/-20%	X7R	100	0.3	10,000	0.3	-55~+125℃
6181B102S500CNT	1806	1000	+50/-20%	X7R	100	0.3	10,000	0.3	-55~+125℃
6181B222S500CNT	1806	2200	+50/-20%	X7R	100	0.3	10,000	0.3	-55~+125℃
6181B223S500CNT	1806	22000	+50/-20%	X7R	100	0.3	10,000	0.4	-55~+125℃

Package

- Paper Tape Taping

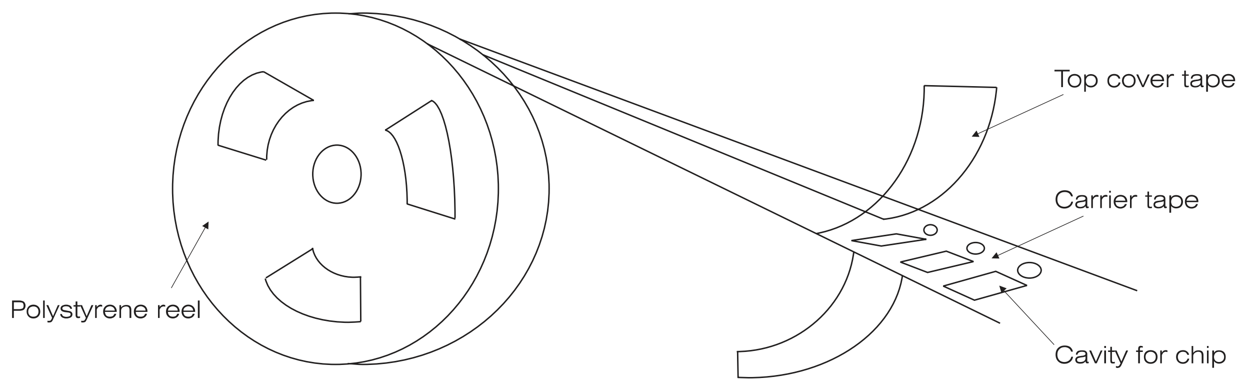


※Dimensions of paper take taping for0402,0603，0805，1206

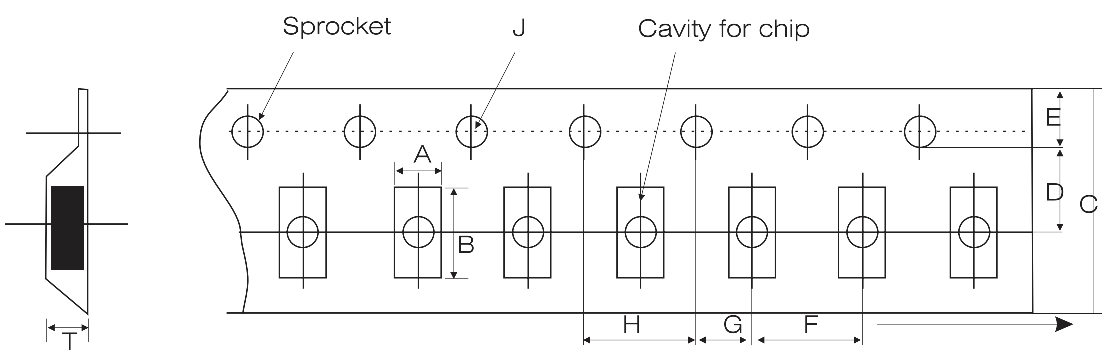


Code / Paper size	A	B	C	D	E	F	G	H	J	T*
0402	0.65 ±0.10	1.15 ±0.10	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.00 ±0.10	1.50-0/ +0.10	Below 0.80
0603	1.10 ±0.20	1.90 ±0.20	8.00 ±0.20	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.50-0/ +0.10	Below 1.10
0805	1.45 ±0.20	2.30 ±0.20	8.00 ±0.20	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.50-0/ +0.10	Below 1.10
1206	1.80 ±0.20	3.40 ±0.20	8.00 ±0.20	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.50-0/ +0.10	Below 1.10

• Embossed Taping



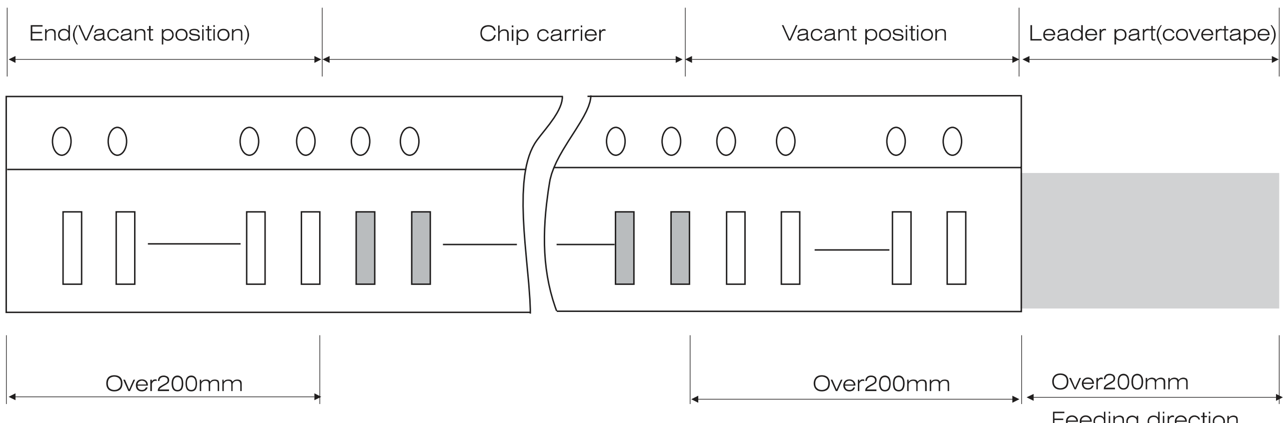
※Dimensions of embossed taping for 0805，1206，1210，1808，1812 type



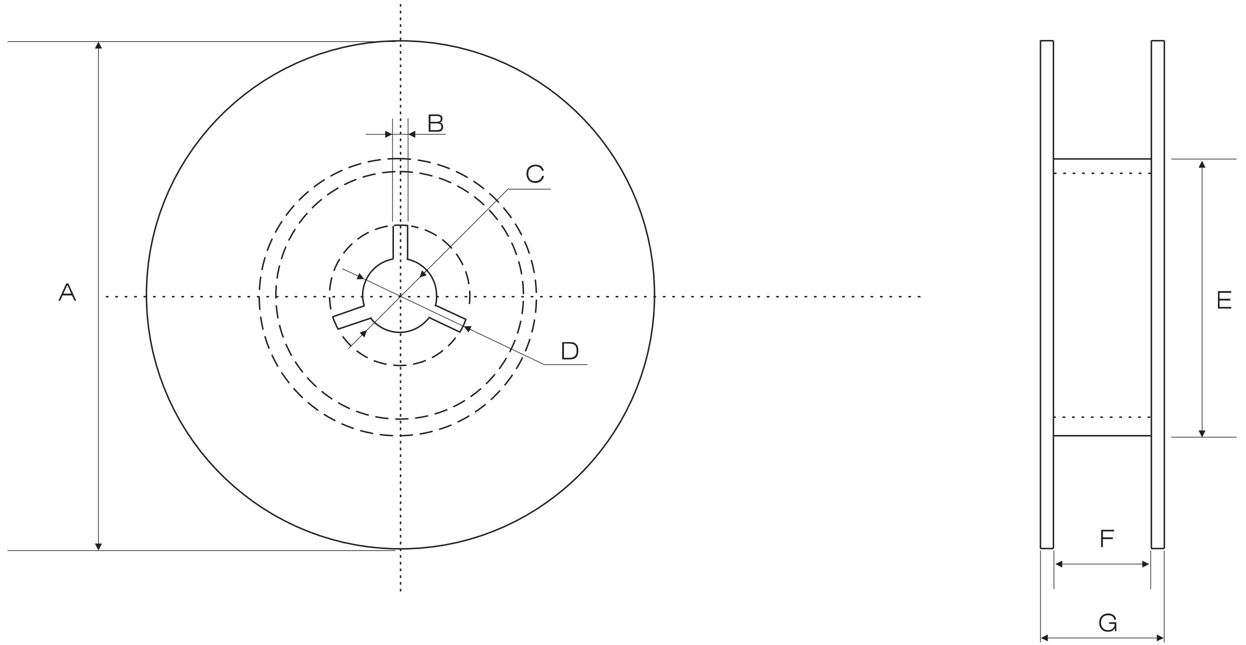
Code / Tape size	A	B	C	D	E	F*	G	H	J	T
0805	1.55 ±0.20	2.35 ±0.20	8.00 ±0.20	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.50-0/ +0.10	低于 1.50
1206	1.95 ±0.20	3.60 ±0.20	8.00 ±0.20	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.50-0/ +0.10	低于 1.85
1210	2.70 ±0.10	3.42 ±0.10	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.05	4.00 ±0.10	1.50-0/ +0.10	低于 3.2
1808	2.20 ±0.10	4.95 ±0.10	12.00 ±0.10	5.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.05	4.00 ±0.10	1.50-0/ +0.10	低于 3.0
1812	3.66 ±0.10	4.95 ±0.10	12.00 ±0.10	5.50 ±0.05	1.75 ±0.10	8.00 ±0.10	2.00 ±0.05	4.00 ±0.10	1.50-0/ +0.10	低于 4.0

Note:The place with "*" means where needs exactly dimensions.

- Structure of leader part and end part of the carrier paper



- Reel Dimensions (unit:mm)



- Code

A	B	C	D	E	F	G
Φ178.00±2.00	3.00	Φ13.00±0.50	Φ21.00±0.80	Φ50.00 or max	10.00±1.50	12MAX
Φ330.00±2.00	3.00	Φ13.00±0.50	Φ21.00±0.80	Φ50.00 or max	10.00±1.50	12MAX

TAPING SPECIFICATION

- Top cover tape peeling strength

(A)Paper Taping　　　(b)Cover tape peeling direction

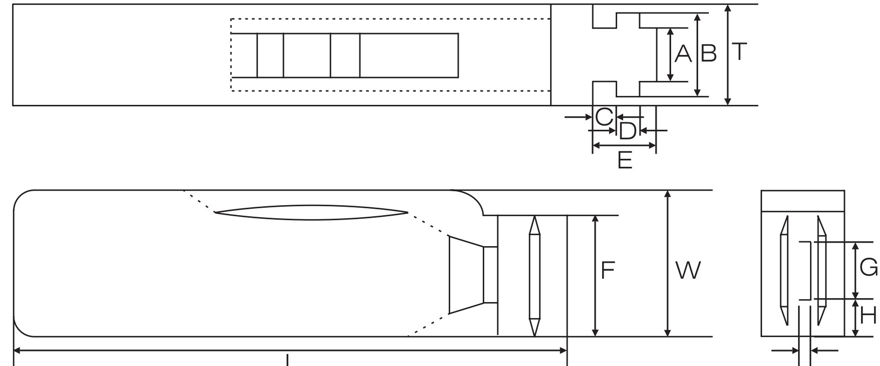
Cover tape peeling direction
Cover tape
0-15°
Carrier

Cover tape peeling direction
Cover
0-15°

Standard：0.1N<peeling forc<0.7N；
No paper dirty remains on the scotch when peeling，and no sticks to top and bottom cover tape.

- Bulk Case Package

Symbol	A	B	T	C	D	E
Dimension	6.80±0.10	8.80±1.00	12.00±0.10	15.00+0. 10/-1	2.00±0/-0.10	4.70±0.10
Symol	F	W	G	H	L	I
Dimension	31.50+0.20/-0	36.00+0/-0.2	19.00±0.35	7.00±0.35	110.00±0.70	5.00±0.35



- Pack Quantity

Size	Pakaging method and quantity			
	Paper tape taping	Plastistic embossed taping	Bulk plastic box packaging	Normal bulk packaging
0402	10000		20000	5000
0603	4000		15000	5000
0805	4000	3000	10000	5000
1206	4000	T≤1.35mm 3000 T>1.35mm 2000	5000	5000
1210		T≤1.80mm 2000 T>1.80mm 1000		2000
1808		2000		2000
1812		T≤1.85mm 1000 T>1.85mm 500		2000
2225		500		500
3035		500		

Note：We can choose packing style and quantity can be according to the customer's requirement.

Precautions for the use of general MLCC

Stages	Precaution	Technical considerations
1.Circuit Design	Verification of operating environment: If there were any malfunction in medical equipment, spacecraft or nuclear reactors, etc. it will causes serious damage to human life or social ramifications. For this reason , any capacitors to be used in such equipments must have very high safety and reliability considerations and must have high requirements than capacitor normal for applications.	Electrical rating and performance: Operating Voltage (Verification of Rated voltage) 1. The operating voltage for capacitors must always be lower than their rated values. If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages should be lower than the rated value of the capacitor chosen. For a circuit where both an AC and a pulse voltage may be present, the sum of their peak voltages should also be lower than the capacitor's rated voltage. 2. Even if the applied voltage is lower than the rated value, the reliability of capacitors might be reduced if either a high frequency AC voltage or a pulse voltage having rapid rise time is present in the circuit.
2.PCB Design	Pattern configurations (Design of Land-patterns) When capacitors are mounted on a PCB, the amount of solder used (size of fillet) can directly affect capacitor performance. Therefore, the following items must be carefully considered in the design of solder land patterns: (1)The amount of solder applied can affect the 8ability of chips to withstand mechanical stresses, which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads, which determines the amount of solder necessary to form the fillets. (2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed so that each component's soldering point is separated by soldering-resist.	1. The following diagrams and tables show some examples of recommended patterns to prevent excessive solder amounts (larger fillets will extend above the component's end terminations). Examples of improper pattern designs are also shown. Recommended land dimensions for PCB (see diagram and tables below) Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when designing land-patterns.

Land
Chip
Solder-resis
C
B A B

Recommend land dimensions for wave-soldering (unit: mm)

Type		0603	0805	1206	1210
Size	L	1.60	2.00	3.20	3.20
	W	0.80	1.25	1.60	2.50
A		0.80~1.00	1.00~1.40	1.80~2.50	1.80~2.50
B		0.50~0.80	0.80~1.50	0.80~1.70	0.80~1.70
C		0.60~0.80	0.90~1.20	1.20~1.60	1.80~2.50

Recommend land dimensions for reflow-soldering (unit: mm)

Type		0402	0603	0805	1206	1210	1812	2225
Size	L	1.00	1.60	2.00	3.20	3.20	4.50	5.70
	W	0.50	0.80	1.25	1.60	2.50	3.20	6.30
A		0.45~0.55	0.6~0.8	0.8~1.2	1.8~2.5	1.8~2.5	2.5~3.5	3.7~4.7
B		0.40~0.50	0.6~0.8	0.6~1.2	0.6~1.5	0.6~1.5	1.0~1.8	1.0~2.3
C		0.45~0.55	0.6~0.8	0.9~1.6	1.2~2.0	1.8~3.2	2.3~3.5	3.5~5.5

Stages	Precautions	Technical considerations

Examples of good and bad solder application.

Items	Not recommended	Recommended
Mixed mounting of SMD and leaded components		
Component placement close to the chassis		
Hand -soldering of leaded components near mounted components		
Horizontal component placement		

Pattern configurations (Capacitor layout on panelized [breakaway] PC boards)

After capacitors have been mounted on the boards, chips can be subjected to mechanical stresses in subsequent manufacturing processes (PCB cutting, board inspection, mounting of additional parts, assembly into the chassis, wave soldering the reflow-soldering boards etc.). For this reason, planning pattern configurations and the position of SMD capacitors should be carefully performed to minimize stress.

1.The following are examples of good and bad capacitor layout: SMD capacitors should be located to minimize any possible mechanical stresses from board warp or deflection.

	Not recommended	Recommended
Deflectio n of the board		

2.To layout the capacitors for the breakaway PC board, it should be noted that the amount of mechanics stresses given will vary depending on capacitor layout, The example below shows recommendations for better design.

E
D
C
Perforation
B
A
Slit

Magnitude of stress A>B=C>D>E

<table>
<tr><th>Stages</th><th>Precautions</th><th>Technical considerations</th></tr>
<tr><td></td><td></td><td>3. When breaking PC boards along their perforations, the amount of mechanical stress on the capacitors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, any ideal SMD capacitor layout must also consider the PCB splitting method.</td></tr>
<tr><td>3.Considerations for automatic placement</td><td>Adjustment of mounting machine
Excessive impact load should not be imposed on the capacitors when mounting onto the PC boards.The maintenance and inspection of the mounting devices must minimize the stresses..</td><td>1. If the pick-up nozzle is lower than the low limit, too much force may be imposed on the capacitors, causing damage. To avoid this, the following points should be considered before lowering the pick-up nozzle:
(1) The lower limit of the pick-up nozzle should be adjusted to the surface level of the PC board after correcting for deflection of the board.
(2) The pick-up pressure should be adjusted between 1 and 3 N static loads.
(3) To reduce the amount of deflection of the board caused by impact of the pick-up nozzle, supporting pins of back-up should be used the under PC board. The following diagrams show some typical examples of good pick-up nozzle placement:
<table>
<tr><th></th><th>Not recommended</th><th>Recommended</th></tr>
<tr><td>Single-sided mounting</td><td>Cracks</td><td>Supporting pin</td></tr>
<tr><td>Double-sided mounting</td><td>Solder peeking
Cracks</td><td>Supporting pin</td></tr>
</table>
2. As the alignment pin wears out, adjustment of the nozzle height can cause chipping or cracking of the capacitors because of mechanical impact on the capacitors. To avoid this, should have periodically inspection, maintenance, repair and change about the alignment pin width and supporting pins, and all this actions should be done under stopped position.</td></tr>
</table>

Stages	Precautions	Technical considerations
3.Considerations for automatic placement	Selection of Adhesives 1.Mounting capacitors with adhesives in land patterns, before the soldering stage, may lead to degraded capacitor characteristics unless the following factors are appropriately checked: the size of land patterns, type of adhesive, amount applied, hardening temperature and hardening period. Therefore , users must pay attention to the using method and using amount of adhesives during using the adhesives.	1. .Some adhesives may cause reduced insulation resistance, The difference between the shrinkage percentage of the adhesive and that of the capacitors may result in stresses on the capacitors and lead to cracking. Moreover, too little or too much adhesive applied to the board may adversely affect component placement, so the following precautions should be noted in the application of adhesives. (1) Required adhesive characteristics a. The adhesive should be strong enough to hold parts on the board during the mounting & solder process. b. The adhesive should have sufficient strength at high temperatures. c. The adhesive should have good coating and thickness consistency. d. The adhesive should be used during its prescribed shelf life. e. The adhesive should harden rapidly. f. The adhesive must not be contaminated. g. The adhesive should have excellent insulation characteristics. h. The adhesive should not be toxic and have no emission of toxic gasses. 2.The recommended amount of adhesives is as follows.

Figure	0805/1206 case sizes as examples
a	0.3 mm min
b	100~120 μm
c	Adhesives should not contact the pad

After capacitors are bonded

Amount of adhesive

Stages	Precautions	Technical considerations
4.Soldering	1.	When too much halogenated substance(Chlorine, etc) content is used to activate the flux, or highly acidic flux is used, an excessive amount of residue after soldering may lead to corrosion of the terminal electrodes or degradation of insulation resistance on the surface of the capacitors.

2. Flux is used to increase solderability in flow soldering, but if too much flux is applied, a large amount of flux gas may be emitted and may detrimentally affect solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system.
3. Since the residue of water-soluble flux is easily dissolved by water content in the air, the residue on the surface of capacitors in high humidity conditions may cause a degradation of insulation resistance and therefore affect the reliability of the components. The cleaning methods and the capability of the machines used should also be considered carefully when selecting water-soluble flux.

Preheating when soldering

Heating: Preheat the chips at 100℃ to 130 100℃before soldering.

Cooling: The temperature difference between the components and cleaning process should not be greater than 100℃.

Ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling, Therefore, the soldering process must be conducted with great care so as to prevent malfunction of the components due to excessive thermal shock.

Reconmmended Soldering Method

Size	Temperature Characteristics	RatedVoltage	Capacitance	Soldering Method
0201	NPO	/		R
	X7R	/		R
	Y5V	/		R
0402	NPO	/		R
	X7R	/		R
	Y5V	/		R
0603	NPO	/		R/W
	X7R	/	C≥1μF	R
			C<1μF	R/W
	Y5V	/	C≥1μF	R
			C<1μF	R/W
0805	NPO	/	/	R/W
	X7R	/	C≥4.7μF	R
			C<4.7μF	R/W
	Y5V	/	C≥1μF	R
			C<1μF	R/W
1206	NPO	/	/	R/W
	X7R	/	C≥10μF	R
			C<10μF	R/W
	Y5V	/	C≥10μF	R
			C<10μF	R/W
≥1210	NPO	/	/	R
	X7R	/	/	R
	Y5V	/	/	R

Soldering method：R—Reflow Solering
W—Wave Soldering

Stages	Precautions	Technical considerations
4. Soldering	1.	Recommended conditions for soldering [Re-flow soldering] Temperature profile Temperature (℃) 300 250 200 150 100 Preheating 230℃ Over 1 minute Over 1 minute Within 10 seconds Gradual cooling Cautions 1.The ideal condition is to have solder mass (fillet)controlled to 1/2 to 1/3 of the thickness of the capacitor, as shown below 1/2T～1/3T Capacitor Solder Tin T PCB board Because excessive dwell times can detrimentally affect solderability, soldering duration should be kept as close to recommended times as possible. [Wave soldering] Temperature profile Temperature (℃) 300 250 200 150 100 50 230℃～250℃ Over 1 minute within 3s Gradual cooling Caution 1. Make sure the capacitors are preheated sufficiently. 2. The temperature difference between the capacitor and melted solder should not be greater than 100 to 130℃. 3. Cooling after soldering should be as gradual as possible. 4. Wave soldering must not be applied to the capacitors designated as for reflow soldering only.

Stages	Precautions	Technical considerations
		[Hand soldering] Temperature profile Temperature (℃): 300, 250, 200, 150, 100 Preheating 230℃ ~250℃ Over 1 minute Within 3s Gradual cooling Caution 1. Use soldering iron with a maximum tip diameter of 1.0 mm. The soldering iron should not directly touch the capacitor. [Wave soldering]
5. Cleaning	Cleaning conditions 1.When cleaning the PC board after the Capacitors are all mounted, select the appropriate cleaning solution according to the type of flux used and purpose of the cleaning (e. g. to remove soldering flux or other materials from the production process.) 2.Cleaning conditions should be determined after verifying. Make sure that the cleaning process does not affect the capacitors characteristics.	1.The use of inappropriate solutions can cause foreign substances such as flux residue to adhere to the capacitor or deteriorate the capacitor's outer coating ,resulting in a degradation of the capacitor's electrical (especially insulation resistance). 2.Inappropriate cleaning conditions (insufficient or excessive cleaning) may detrimentally affect the performance of the capacitors. (1)Excessive cleaning In the case of ultrasonic cleaning, too much power output can cause excessive vibration of the PC board which may lead to the cracking of the capacitor or the soldered portion, or decrease the terminal electrodes, strength, thus the following conditions should be carefully checked; Ultrasonic output Below20W/L Ultrasonic frequency Below 40KHZ Ultrasonic washing period 5min or less

Stages	Precautions	Technical considerations
6.Post cleaning Processes	With some type of resins a decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or even while left under normal storage conditions will result in the deterioration of the capacitor ’ s performance. 1. When a resin’s hardening temperature is higher than the capacitor ’ s operating temperature. The stresses generated by the excess heat may lead to capacitor damage or destruction. The use of such resins molding materials is not recommended.	
7. Handling	Breakaway PC boards (splitting along perforations) 1. When splitting the PC board after mounting capacitors and other components, care is required so as not to give any stresses of twisting to board. 2. Board separation should not be done manually, but by using the appropriate devices.	Mechanical considerations 1. Be careful not to subject the capacitors to excessive mechanical shocks. (1) If ceramic capacitors are dropped onto the floor or a hard surface, they should not be used. (2) When handling the mounted boards, be careful that the mounted components do not come in contact with or bump against other boards or components.
8.Storage Conditions	Storage 1. To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible. ※Recommended conditions Temperature 0～40℃ Humidity Below 70% RH	1. If the parts are stored in a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place. For this reason, components should be used within 6 months from the rime of delivery. If exceeding the above period, please check solderability before using the capacitors.
	※The room temperature must below 40℃.Even under ideal storage conditions capacitor electrode solderability decreased as time passes, so ceramic chip capacitors should be used within 6 months from the time of delivery. ※The packaging material should be kept where nochlorine or sulfur exist in the air. 2.The capacitance value of high dielectric constant capacitors (type 2&3) will gradually decrease with the Passage of time, so this should be taken into consideration in the circuit design. If such a capacitance reduction occurs, a heat treatment of 150℃ for 1 hour will return the capacitance to its initial level.	