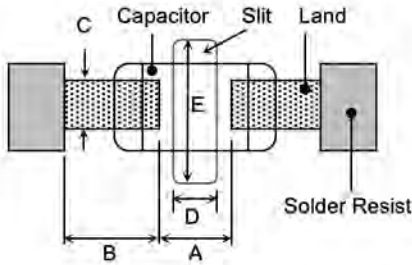


◆ Construction of Board Pattern

Improper circuit layout and pad/land size may cause poor solder joints between the component and the PC board. Insufficient solder may create a weak joint, and excessive solder may increase the potential for mechanical or thermal cracks in the ceramic capacitor. Therefore we recommend the solder pad/land size to be as shown in the following table:

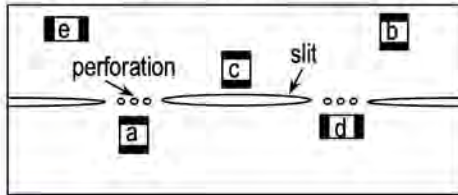
1. Size and recommend land dimensions for reflow soldering



EIA Code	Chip (mm)		Land (mm)				
	L	W	A	B	C	D	E
0201	0.60	0.30	0.2~0.3	0.2~0.4	0.2~0.4	--	--
0402	1.00	0.50	0.3~0.5	0.3~0.5	0.4~0.6	--	--
0603	1.60	0.80	0.4~0.6	0.6~0.7	0.6~0.8	--	--
0805	2.00	1.25	0.7~0.9	0.6~0.8	0.8~1.1	--	--
1206	3.20	1.60	2.2~2.4	0.8~0.9	1.0~1.4	1.0~2.0	3.2~3.7
1210	3.20	2.50	2.2~2.4	1.0~1.2	1.8~2.3	1.0~2.0	4.1~4.6
1808	4.60	2.00	2.8~3.4	1.8~2.0	1.5~1.8	1.0~2.8	3.6~4.1
1812	4.60	3.20	2.8~3.4	1.8~2.0	2.3~3.0	1.0~2.8	4.8~5.3
1825	4.60	6.35	2.8~3.4	1.8~2.0	5.1~5.8	1.0~4.0	7.1~8.3
2208	5.70	2.00	4.0~4.6	2.0~2.2	1.5~1.8	1.0~4.0	3.6~4.1
2211	5.70	2.80	4.0~4.6	2.0~2.2	2.0~2.6	1.0~4.0	4.4~4.9
2220	5.70	5.00	4.0~4.6	2.0~2.2	3.5~4.8	1.0~4.0	6.6~7.1
2225	5.70	6.35	4.0~4.6	2.0~2.2	5.1~5.8	1.0~4.0	7.1~8.3

2. Mechanical strength varies according to location of chip capacitors on the P.C. board.

Design the layout of components on the PC board in such a way to minimize the stress imposed on the components, upon flexure of the boards in depanelization or other processes.

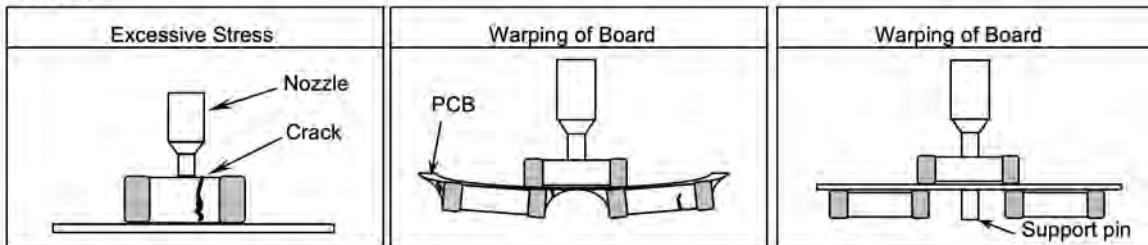


Component layout close to the edge of the board or the "depanelization line" is not recommended. Susceptibility to stress is in the order of: a>b>c and d>e

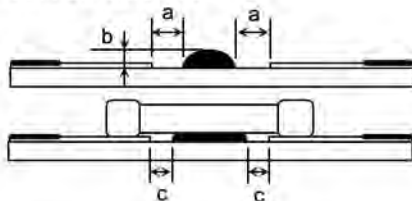
◆ Mounting

1. Sometimes cracking can be caused by the impact load of the pick and place nozzle.

In the pick and place operation, if the low dead point is too low, excessive stress is applied to component. This may cause cracks in the ceramic capacitor, therefore it is required to move the low dead point of the nozzle to the higher level to minimize the board warpage and stress on the components. Nozzle pressure should be adjusted to 1N to 3N (static load) during the pick and place operation.



2. Amount of Adhesive

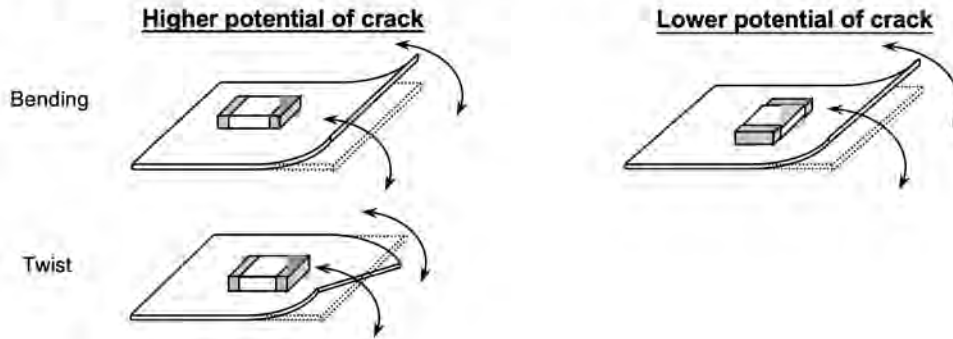


Example : 0805 & 1206

a	0.2mm min.
b	70 ~ 100 μm
c	Do not touch the solder land

◆ Handling after chip mounted

1. Proper handling of the PCB is recommended since excessive bending and twisting of the PC board may induce mechanical stress and cause internal cracking of the capacitor.

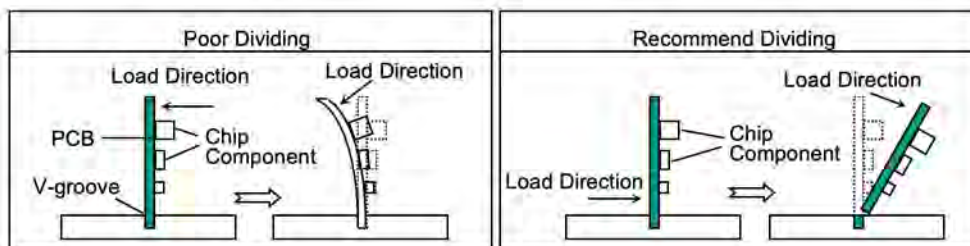
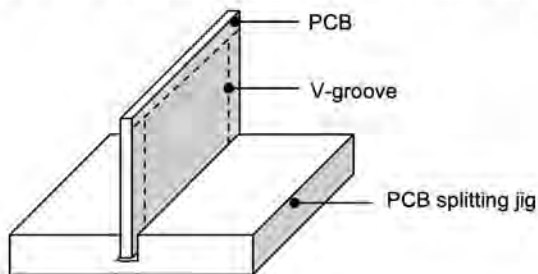


2. There is a potential of cracking if board is warped due to excessive load from the check pin.



3. Examples of PCB de-panelization jigs:

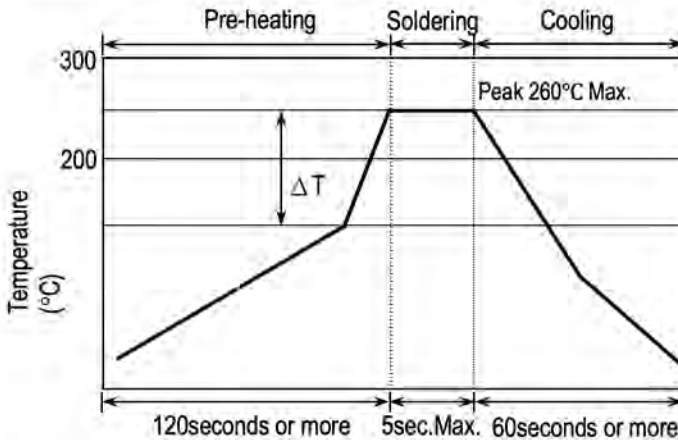
The outline of PCB breaking jig is shown below. It is recommended when dividing or breaking PCB that they are held near the jig where no bending will occur, this way there will be no compressive stress is applied to the capacitors on the PCB. Do not hold the PCB at a position which is far away from the jig, tensile stress to the capacitors may cause them to crack.



◆Soldering

1. Wave Soldering

Most of components are wave soldered with solder at Peak Temperature. Adequate care must be taken to prevent the potential of thermal cracks on the ceramic capacitors. Refer to the soldering methods below for optimum soldering benefits.



Soldering Method	Peak Temp.(°C) / Duration (sec)
1206/0805/0603	$\Delta T \leq 100\sim 150^{\circ}\text{C max.}$
Pb-Sn Solder	$250^{\circ}\text{C(max.)} / 3\text{sec(max.)}$
Lead Free Solder	$260^{\circ}\text{C(max.)} / 5\text{sec(max.)}$

Recommended solder compositions
 Sn-37Pb (Pb - Sn Solder)
 Sn-3.0Ag-0.5Cu (Lead Free Solder)

To optimize the result of soldering, proper preheating is essential:

- 1) Preheat temperature is too low
 - a. Flux flows to easily
 - b. Possibility of thermal cracks
- 2) Preheat temperature is too high
 - a. Flux deteriorates even when oxide film is removed
 - b. Causes warping of circuit board
 - c. Loss of reliability in chip and other components

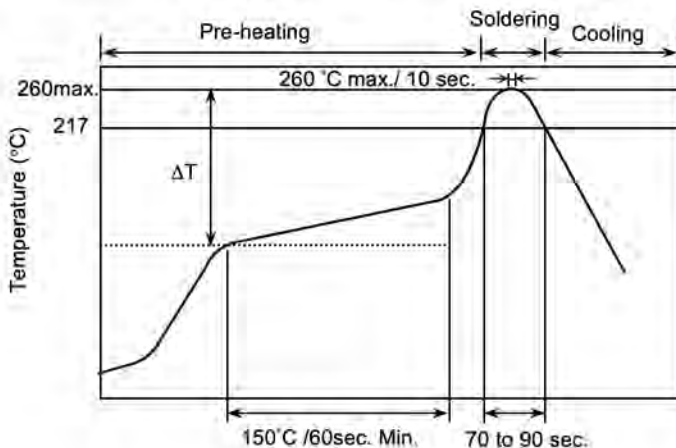
Cooling Condition:

Natural cooling in air is recommended. Forced cooling should be avoided, however if the chips are dipped into a solvent for cleaning, the temperature difference (ΔT) between the solvent and the chips must be less than 100°C.

2. Reflow Soldering

Preheat and gradual increase in temperature to the reflow temperature is recommended to decrease the potential of thermal crack on the components. The recommended heating rate depends on the size of component, however it should not exceed 3°C/Sec.

Recommend reflow profile for Lead-Free soldering temperature Profile (J-STD-020D)

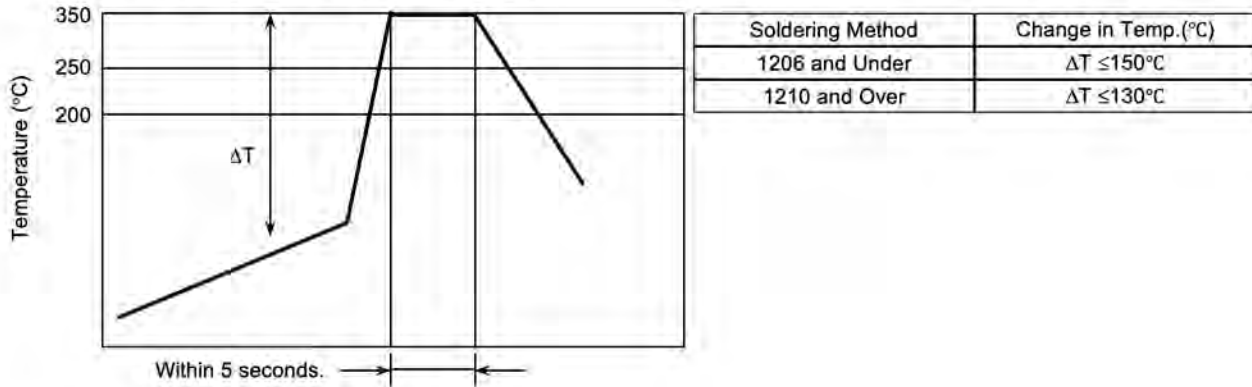


Soldering Method	Change in Temp.(°C)
1206 and Under	$\Delta T \leq 190^{\circ}\text{C}$
1210 and Over	$\Delta T \leq 130^{\circ}\text{C}$

※ The cycles of soldering : Twice (Max.)

3. Hand Soldering

Sudden temperature changes in ceramic capacitors will result in a temperature gradient within the component and therefore may cause internal thermal cracking. In general a hand soldering method is not recommended unless proper preheating and handling practices have been taken. Care must also be taken not to touch the ceramic body of the capacitor with the tip of solder iron. The soldering iron tip should always be placed on to the solder pad.



How to Solder Repair by Solder Iron

1) Selection of the soldering iron tip

The required temperature of soldering iron for any type of repair depends on the type of the tip, the substrate material, and the solder land size.

2) recommended solder iron condition

- a.) Preheating Condition : Board and components should be preheated sufficiently at 150°C or over, and soldering should be conducted with soldering iron as boards and components are maintained at sufficient temperatures
- b.) Soldering iron power shall not exceed 30 W.
- c.) Soldering iron tip diameter shall not exceed 3mm.
- d.) Temperature of the iron tip shall not exceed 350°C, and the process should be finished within 5 seconds. **(refer to MIL-STD-202G)**
- e.) Do not touch the ceramic body with the tip of solder iron. Direct contact of the soldering iron tip to ceramic body may cause thermal cracks.
- f.) After soldering operation, let the products should be allowed to cool down naturally in air.

◆Storage

Store the capacitors where the temperature and relative humidity do not exceed 40°C and 70%RH. We recommend that the capacitors be used within 12 months from the date of manufacturing. Store the products in the original package and do not open the outer polyethylene bag until just before usage. If it is open, seal it as soon as possible or keep it in a desiccant with a desiccation agent.