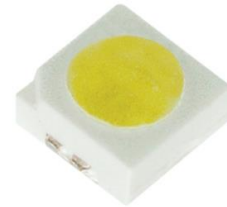


Introduction:

Primax is a newly release LED package by Dominant with 120 degree viewing angle, it has the following attractive characteristic compare to comparable footprint LED package in the market:



- Super high brightness
- Compact package outline of 3.5mm x 3.5mm
- Ultra low package profile – 1.2mm
- Low thermal resistance
- High ESD threshold voltage
- Comparable to lead free IR reflow

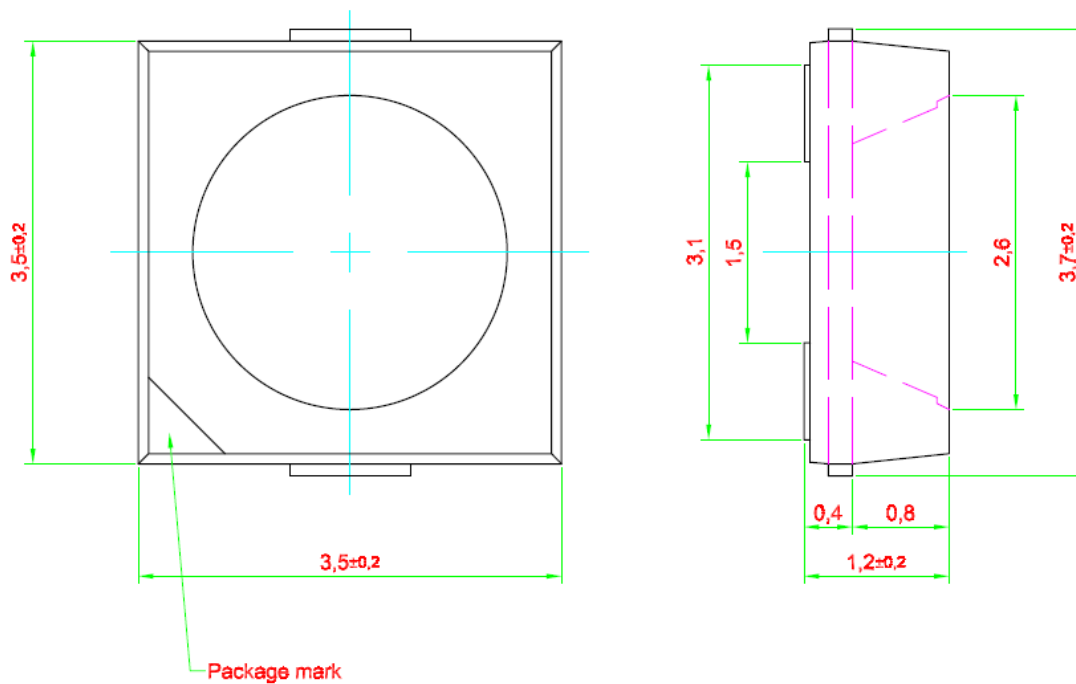


Figure 1: Primax package dimension

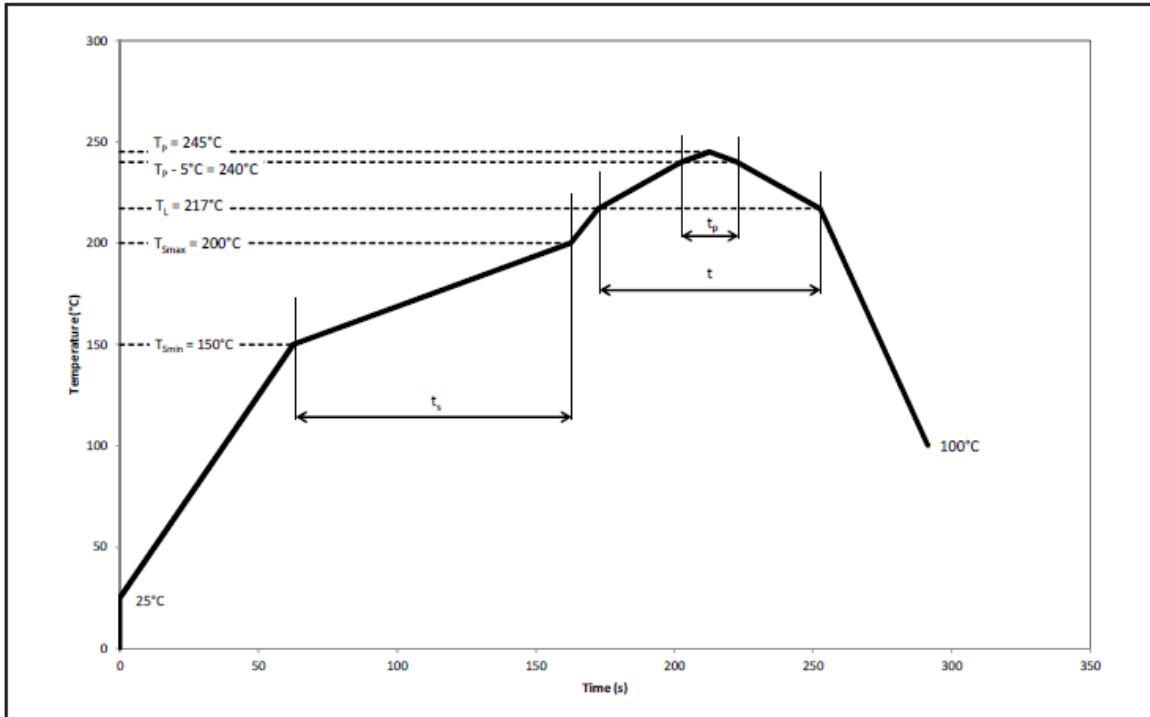
Standard Soldering Process:

The Primax soldering surfaces are plated with 100% tin (Sn) and are therefore RoHS compliant. The component is designed to be compatible to the existing industry SMT process and IR-reflow. There are no special processes or equipment required for the mounting of the components onto applications. Both the thermal and electrical connections are provided by the conventional process. Therefore, there is no need to provide for additional process or material to take care for the thermal connection.

However, due to the unique design, all the soldering terminals are located at the bottom surface of the component. This greatly reduces the space required and also enhances the thermal dissipation capability of the component. Heat from the LED chip is directly conducted via the soldering terminals to the external environment. Thermal path is kept to the very minimum.

Recommended IR Reflow Profile:

Product complies to MSL Level 2 acc. to JEDEC J-STD-020E



Profile Feature	Symbol	Pb-Free Assembly			Unit
		Min.	Recommended	Max.	
Ramp-up rate to preheat 25°C to T_{smin}	-	-	2	3	°C/s
Time t_s T_{smin} to T_{smax}	t_s	60	100	120	s
Ramp-up rate to peak T_L to T_p	-	-	2	3	°C/s
Liquidous temperature	T_L	-	217	-	°C
Time above liquidous temperature	t	60	80	150	s
Peak temperature	T_p	-	245	260	°C
Time within 5°C of the specified peak temperature $T_p - 5^\circ\text{C}$	T_p	10	20	30	s
Ramp-down rate T_p to 100°C	-	-	3	6	°C/s
Time 25°C to T_p	-	-	-	480	s

Surface Mounting – Factors to Consider:

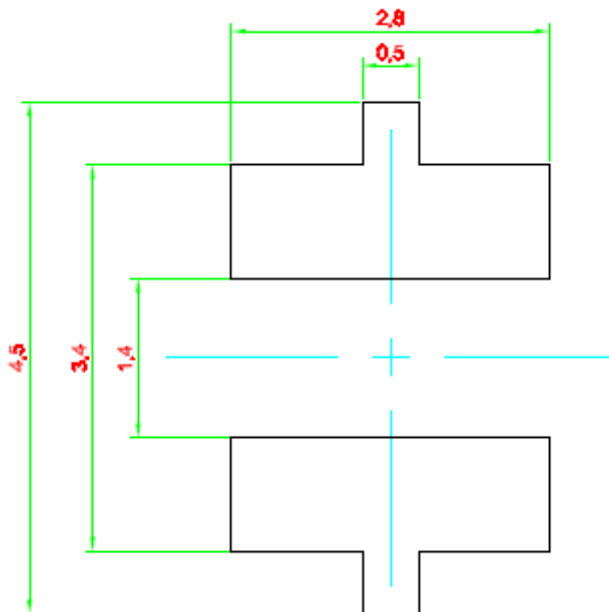
This application note provides a guideline for the surface mounting of Primax. The following parameters have to be considered in order to optimize the surface mounting performance.

- > Solder pad size
- > Solder stencil size
- > Pipette (nozzle)
- > Solder paste thickness

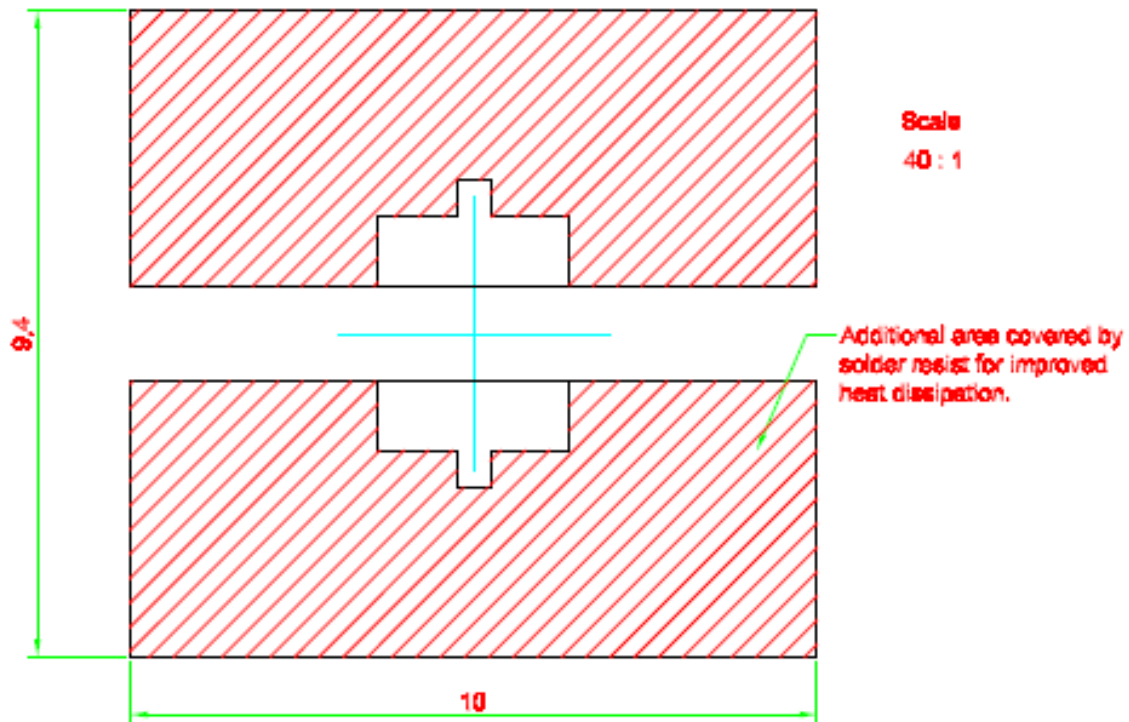
Solder pad size

The recommended solder pad design is as illustrated in the data-sheet.

Primax solder lead design:



A typical recommended solder pad design:



Solder Stencil

In order to minimize solder bridging problems, it is common to design stencil aperture size smaller than the recommended solder pad. Excessive amount of solder paste deployed will result to tilted parts and inaccurate placement position. It is recommended that the aperture is reduced to 75% of the recommended solder pad design.

Pipette

Pick and place machine should be able to process Primax devices with the required placement accuracy. Care should be observed that the surface of the pipette which is in contact with the LED is flat and smooth. The pick and place nozzle use must be bigger than the LED emission area. This would prevent LED from sticking to the pick and place nozzle. Parameter settings for the pick and place process should also be evaluated to ensure no damage to the LEDs.

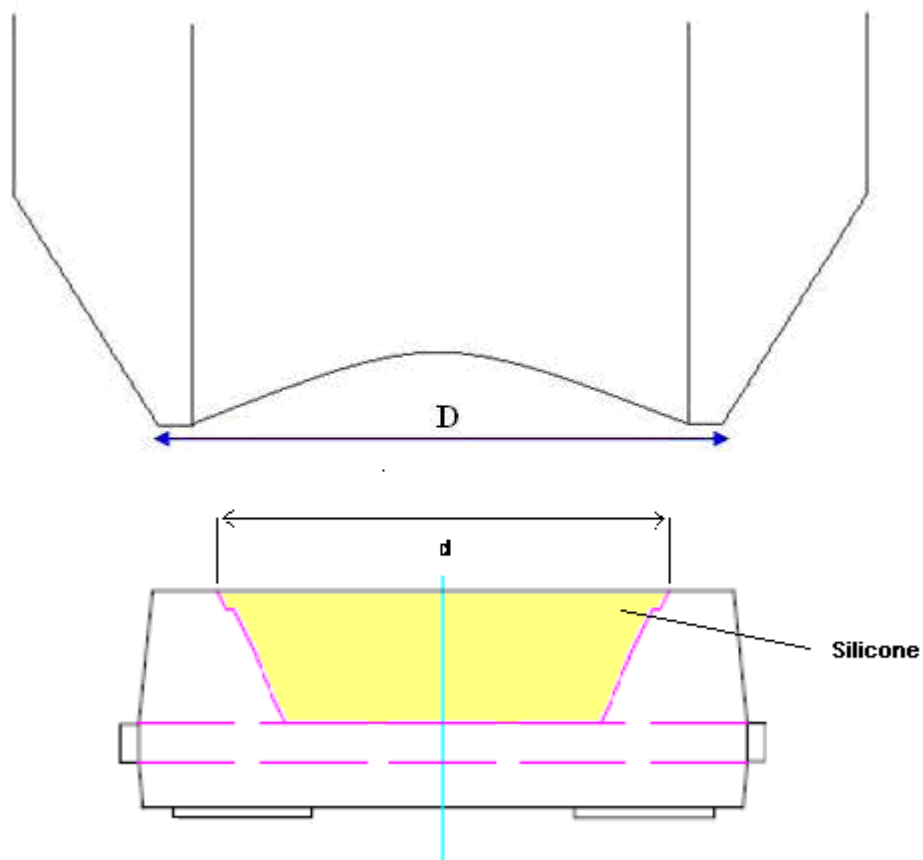


Figure 2: Pick & place nozzle diameter (D) should be larger than the opening (d)

Solder paste thickness

We recommend using minimum solder paste in order to achieve a good solder formation. A solder paste thickness of 0.125 mm will be optimum.

For Primax components, no solder fillet will be observed after re-flow process as the soldering surfaces are at the bottom.



Soldering surfaces are located on the bottom of the components.

Primax Alternative Solder Pad Layout Design

The Primax unit only has a single large anode and cathode lead at the bottom of the package compare to common available LED in the same market segment which is 6 leaded. The reason for large anode and cathode lead design is to enhance package thermal performance which correlated directly to the improvement of product reliability.

Compatibility of Surface Mounting 2 Lead Primax On 6 Lead PCB Layout Design

With the fact of solder paste stays only on solder lead pad when going through IR reflow, there is a concern that different number of leads on SMT unit and solder lead pads would potentially cause the SMT unit misalign after IR reflow due to its liquid surface tension to the solder lead pads.

To validate whether Primax unit with 2 leads will cause misalignment problem when mount on a common six solder lead pcb pads, an evaluation being carried out as follow:

Sample size use: 84 LED X 3 separate runs = 252 pieces of Primax LED

Procedure:

1. Dispense equal amount of solder paste on the 6 solder lead pads
2. Pick and place the Primax unit on to the PCB
3. Inspect all the unit to ensure no misalignment before reflow
4. Place all the PCB into IR reflow oven.
5. Re-inspect all the unit after IR reflow to check if there is any unit with misalignment

Results:

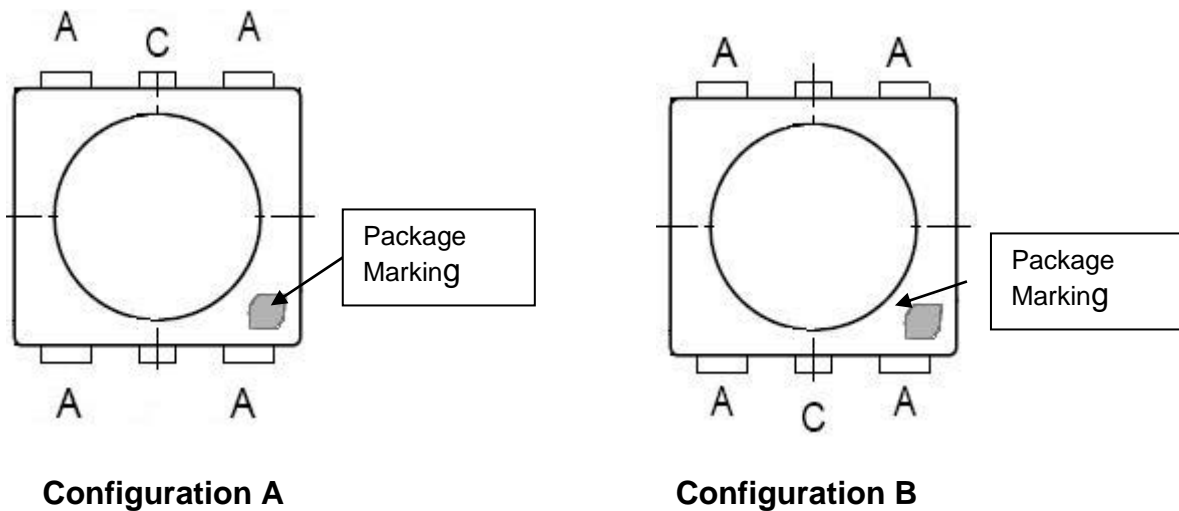
0/84 x 3 = 0/252 pieces of Primax LED showing misalignment problem after IR reflow on 6 solder lead pads

Summary:

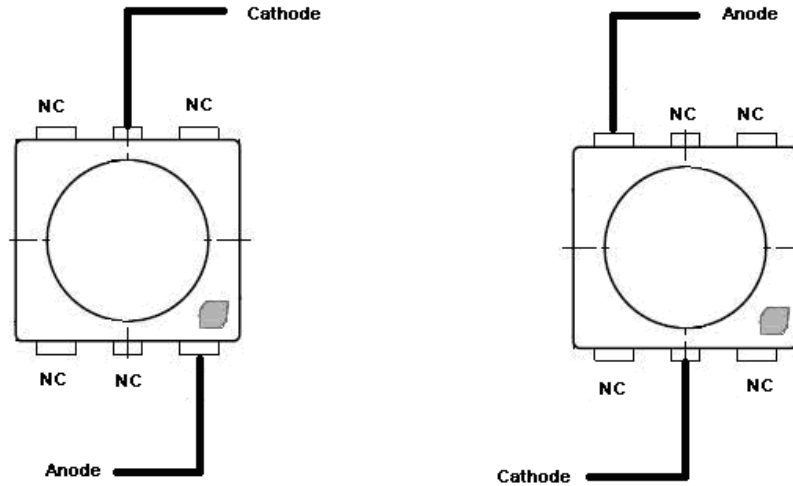
Based on the analysis above, it is confirmed that Primax unit can be IR reflow into common six solder lead pads pcb design without problem.

Polarity and Electrical Connection Consideration When Mounting Primax to Common Six-Solder Lead Pads

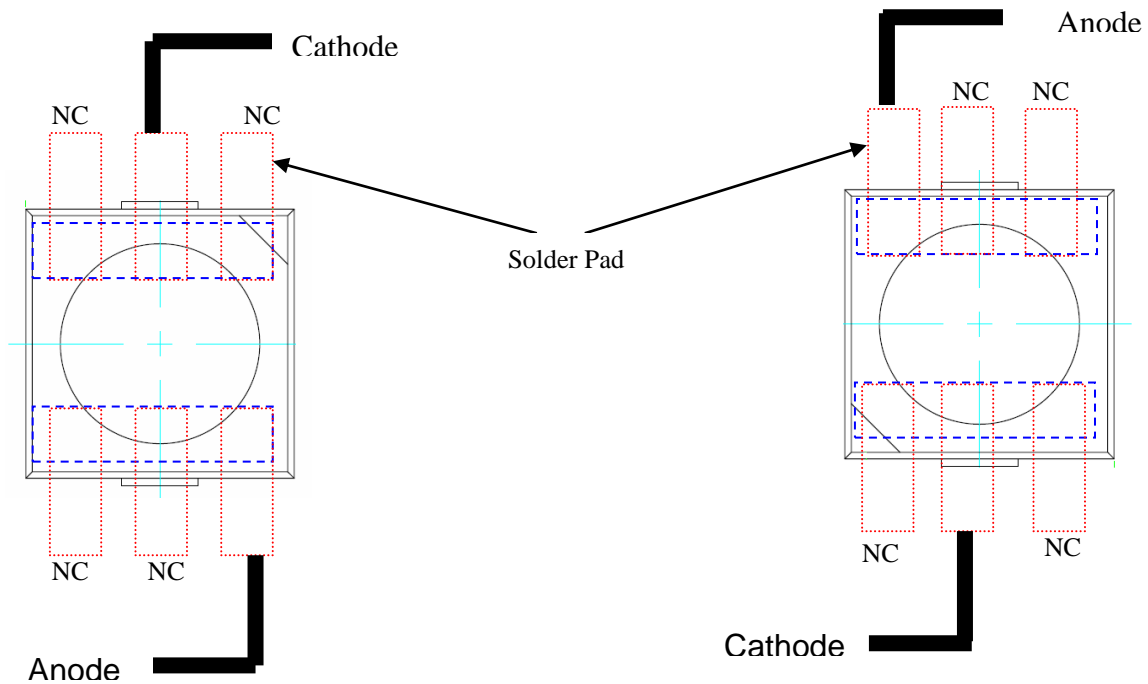
The polarity for the common 6 leaded LED package is depicted below.



There are 4 anode leads at the both side of the package. Anyway in actual circuit design, usually only 1 single anode and 1 single cathode lead is connected electrically as depicted below. The remaining leads (NC) just intended to provide extra contact area for heat dissipation without electrical connection.

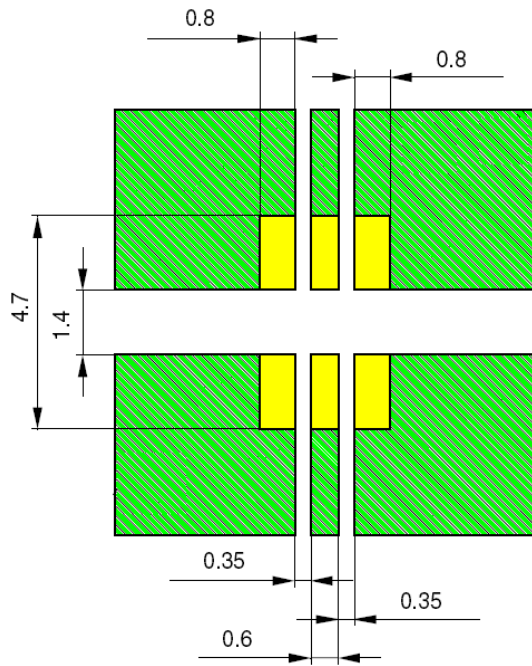


For Primax, there is only single anode and single cathode lead available, thus it can be connected as example depicted below where the center lead at 1 side is electrically connected as cathode while the side pad on another side is connected as anode. The remaining of the pad (NC) is without electrical connection but provide extra contact area for heat dissipation.



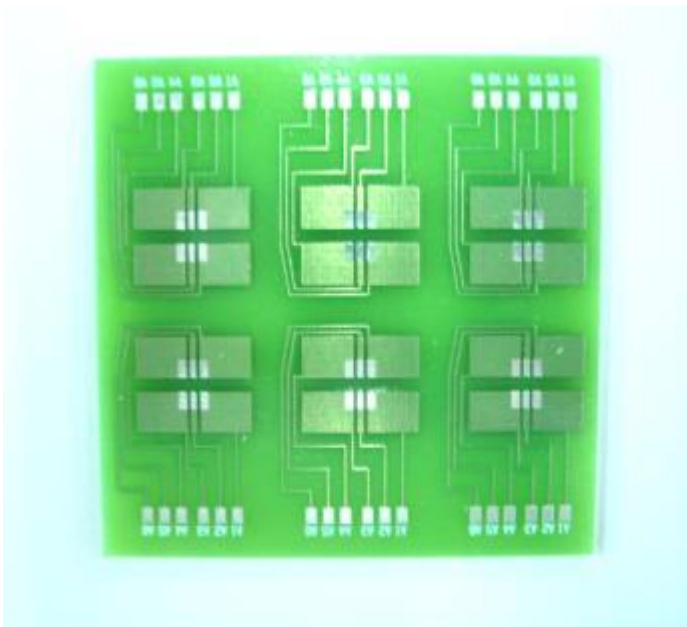
Appendix:

1. Common 6 leaded solder pad design

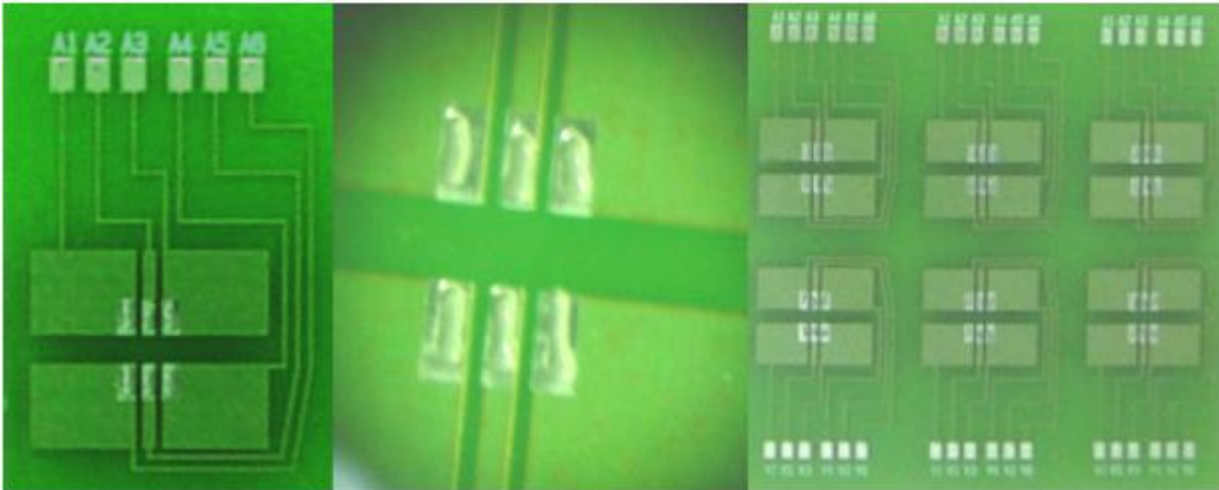


Note : Dimension in mm

2. FR4 PCB use for the above evaluation.



3. Solder paste applied on a common six solder lead pads board for each SMT unit.



4. Primax units with 2 leads can align well with common six solder lead pads board layout after IR reflow.

