Basic Homemade PCB

Posted by D Mohankumar in Theory with no comments yet
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Printed circuit board or PCB is one of the important things to assemble an electronic circuit. It provides support to the components and makes electrical connection between the parts. In PCB assembling, the components are placed on one side of the Copper laminate passing their pins or leads to the other side through the holes. The pins/leads are then soldered to connect with the PCB tracks. Here explains the easiest method to make a homemade PCB for prototyping.

To make the PCB, following materials are required

1. Copper clad board

This is available in different sizes. Select a suitable size to accommodate all the components. If the copper clad board is large in size, cut it to the required size using a Hacksaw blade. The copper clad board has a copper coated side which forms the soldering side. The other side is the component side on which the components are placed. If there is any dirt or copper oxide on the copper side, clean it throughly using a pencil eraser.

2. Ferric chloride solution

This is the Etching solution of Ferric chloride. It removes the unwanted copper layers from the copper clad board. The Etching solution can be prepared by dissolving 50 gms Ferric chloride powder in 100 ml Luke warm water.

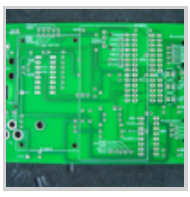
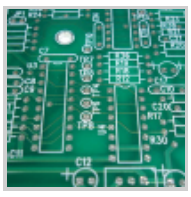
3. PCB drill and bits

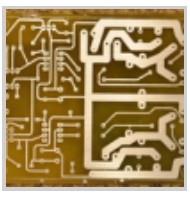
PCB drill is used to drill holes in the PCB. A hand drill with suitable bits is sufficient for the purpose. Use drill bits of the following size to make holes for different components

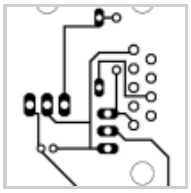
- 1mm – for IC pins
- 1.2mm – for Resistor, capacitor, transistor etc.
- 1.5mm – for diode, LED pins, presets etc.
- 5mm – for LED, nuts, screws etc.
- 8mm – for switches, pots etc.

4. Miscellaneous: OHP Permanent Marker Pen, Tracing / Butter paper, Pencil Carbon paper, Varnish etc.

Making of Printed Circuit Board




PCB making involves the following stages

- Draw the circuit diagram as compact as possible on a paper. Mark the points (component pins) to be drilled. This diagram is used for Pattern drawing on the copper clad board.
- Draw the same diagram in the tracing / butter paper using the OHP marker pen. Draw the diagram carefully without any overlapping or shorting of tracks or components. The neatness of the PCB lies in the Pattern drawing. After drawing, see the other side of the paper. There is a Mirror Sketch of the tracks. This is the actual pattern of the PCB.
- Place the Pencil carbon on the copper side of the copper clad board. The ink side of the carbon paper should face the copper layer.
- Place the tracing paper with diagram over the carbon paper. The diagram should be in the middle part of the copper clad board. Fold the sides of the tracing and carbon papers and stick it using cello tape. This prevents the movement while drawing.
- Once again redraw the diagram using the OHP marker pen so that the carbon ink will create a mirror sketch on the copper clad board.
- Remove the tracing paper and carbon paper. Using the OHP marker pen, redraw the carbon pattern of the mirror sketch on the copper laminate. So that the tracks will be created using the permanent marker ink. Keep it for 10 minutes to dry the ink.
- Mark points to be drilled.
- Take a Plastic or Porcelain tray and place the copper clad board with the track side facing upwards. Carefully pour the Ferric chloride solution over the copper clad till the copper clad immerse in the ferric chloride solution. Keep the tray in sunlight and shake occasionally. Etching will be completed in one to two hours.
- After etching, thoroughly clean the copper clad using tap water. This will remove the dissolved copper from the copper laminate except the copper beneath the OHP pen markings.
- Drill holes using appropriate drill bits.
- Remove the OHP pen markings using Petrol or Thinner so that the tracks will appear as copper lines.
- If required, tin the tracks carefully using solder lead. Dip in varnish to prevent copper oxidation in tracks.

Commercial PCB

It is made using the following methods

- 1. Drawing the diagram in ORCAD or similar PCB drawing computer software (you can use free pcb design software). Diagrams include, Mirror sketch, Component values and symbols of components (Legend), diagram of pin holes.
- 2. Laser printing of the diagrams
- 3. Making Positive and Negative films of the diagrams
- 4. Screen printing of Mirror sketch and Legend on both sides of Copper clad board
- 5. Etching
- 6. Drilling of holes using machine drill
- 7. Tinning of holes in tinning machine
- Masking using dyes

Caution: Ferric chloride solution is toxic. It can cause skin burning or irritation. Use hand gloves during etching. Do not spill the ferric chloride on the skin. If this happens accidently, wash with water. Do not keep ferric chloride in places accessible to children.

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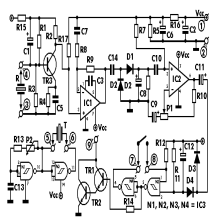
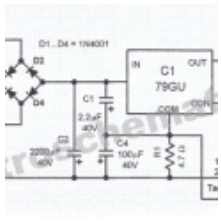
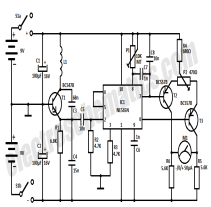


Ultrasonic Sensor Circuit



Drill Speed Regulator Circuit



Homemade Metal Detector

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