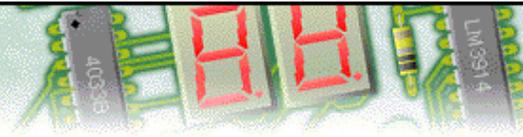


Tutorials

Making a PCB using an etch tank



Step 1 of 4: Introduction

This tutorial shows you how to manufacture a printed circuit board (PCB) using an etch tank. You should follow this tutorial to learn the basic skills you will need to use PCB Wizard effectively.

Difficulty Level:  **Medium** (suitable for moderately experienced users)

Getting started

In this tutorial you will turn an on-screen circuit design into a finished printed circuit board.

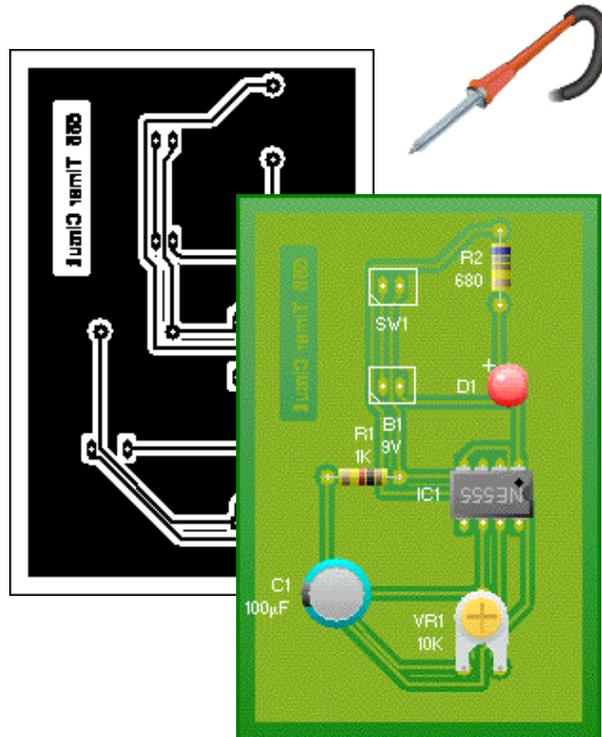
Along the way, you will learn how to:

- [Print the PCB artwork mask](#)
- [Etch and clean the PCB](#)
- [Populate the printed circuit board](#)

Equipment

You will need the following equipment:

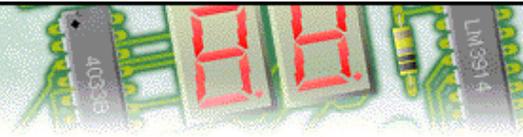
- Clear laminate
- Photo-sensitive copper-clad board
- UV light box
- Developer solution
typically sodium hydroxide
- Etchant crystals or solution
typically ferric chloride
- PCB etch tank and developer tank
- 17/18 watt soldering iron and stand
- Lead-free solder (18 swg)
- Desoldering pump
- Wire cutters
- Wire strippers
- Long nosed pliers



 When using making printed circuit boards, remember to always use safety equipment to protect your eyes, skin and clothes.

Tutorials

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Step 2 of 4: Printing the PCB artwork mask

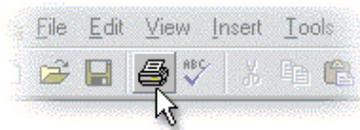
The first step when producing a printed circuit board using an etch tank is to create an artwork mask for your circuit. This mask is printed onto a clear laminate sheet and is used to mark the areas that will eventually become copper on the printed circuit board.



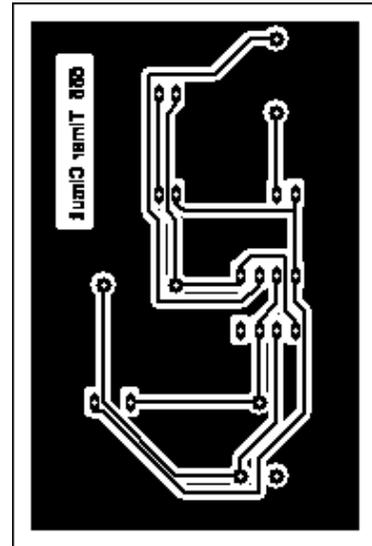
To print the artwork, click on the **Artwork** button on the Style toolbar that is shown on the left-hand side of the main PCB Wizard window.

You will see a preview of the artwork on the screen. It is worth giving the artwork a final check at this point.

With Artwork style still selected, click on the **Print** button on the top toolbar.



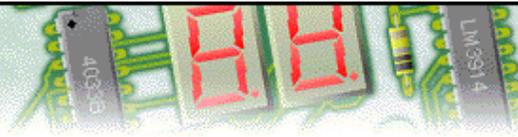
In the window that appears, select the required options and then click on the **OK** button. Your artwork mask will then be printed.



 For double-sided boards, you will need to print two artwork masks—one for the bottom (solder side) copper layer and another for the top (component side) copper layer. First click on the **More** button on the left-hand Style toolbar and select the **Solder Side Artwork** option. Next, click on the Print button to print the first mask. Once printed, you will need to click on the **More** button again to select the **Component Side Artwork** option. Finally, click on the Print button to print the second mask.

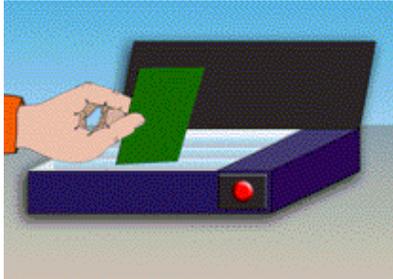
Tutorials

Making a PCB using an etch tank



Step 3 of 4: Etching the printed circuit board

With the artwork mask printed, the image of the circuit next needs to be transferred to your printed circuit board. Printed circuit boards are manufactured using special copper-clad boards that have a coating which is sensitive to ultra-violet (UV) light. By exposing the photo-sensitive board to UV light, an image of your circuit will be burnt into this photo-sensitive coating.



Place the laminate containing artwork face down onto the glass plate of the UV light box. If your circuit contains text, you should see the text in reverse from above.

Next, remove the 'peel off black plastic cover from the photo-sensitive board. Place the board, copper-clad side down, on top of the laminate making sure that the photo-sensitive board covers it completely.

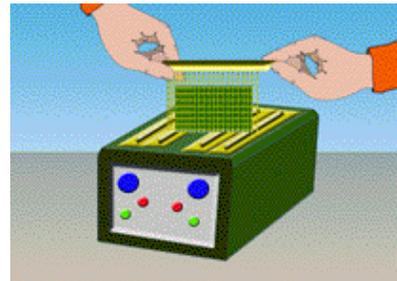
Close the lid of the UV light box and set the timer to approximately 6 minutes. This will enable the UV light to remove all the unwanted coating. Larger board sizes require longer exposure times.

Next, the board is immersed in a developer tank. A developer solution, such as sodium hydroxide, is used to remove the photo-sensitive coating from the areas of the board burnt by the UV light box.

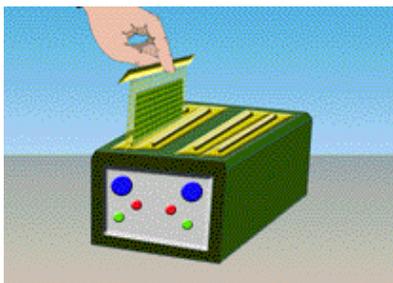
Take the printed circuit board from the UV light box and immerse it in the developer tank for approximately 2 minutes. If there is a temperature control on the developer tank, make sure it is set to about 20°C.

This process prepares the printed circuit board for the etch tank leaving only the tracks, pads and text resistant coated.

Clean any residue developer away with water and dry the printed circuit board.



The developed board is then placed in an etch tank to remove the unwanted copper, using a corrosive chemical etchant such as ferric chloride. Any exposed copper that was not covered by the resistant coating will be etched away. Many etch tanks also pump air bubbles through the chemical solution to help speed up the etching process.



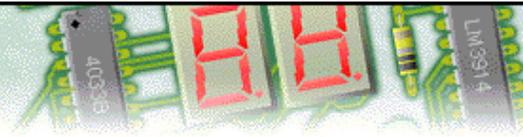
If there is a temperature control on the etch tank, make sure it is set to about 40°C.

Place the board in the cradle of the etch tank. Immerse in the etching solution for approximately 5 minutes. During the etching process, the board should be regularly removed from the acid tank and visually inspected. Clean the board with water and check to see if the tracks and pads are fully outlined.

Repeat this process until the copper-clad board has been fully etched. Remove the board from the solution, clean with water and then dry.

Tutorials

Making a PCB using an etch tank



Step 4 of 4: Populating the printed circuit board

Once the printed circuit board (PCB) has been etched and cleaned, the component pads need to be drilled in order to accommodate the pins or legs of the components.



You should rest the PCB on a scrap piece of wood when drilling. This not only supports the PCB, but gives you warning when the twist drill has gone through the board by the evidence of small wooden chips that turn onto the top surface of the board.



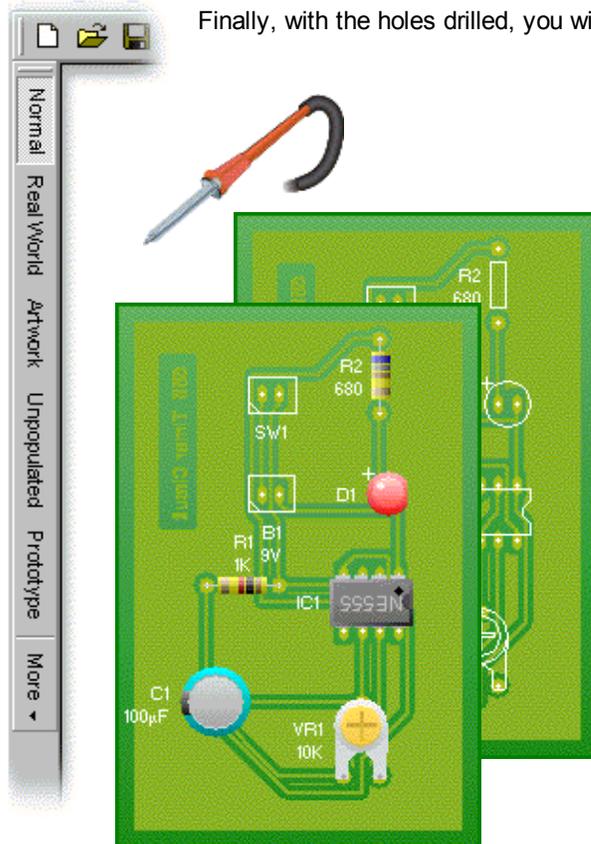
A 1mm-diameter drill would be an optimum choice for most of the drill holes on a typical printed circuit board. If a number of different sized component pad holes need to be drilled, always drill all the holes with a 1 mm diameter twist drill first. Then change to a bigger drill size and re-work the pads that require larger diameters.

Also, it is advisable to allow only 6 to 8 mm of drill shank to protrude from the drill chuck before setting the drill. This improves the life of the twist drill and also reduces the chances of snapping the twist drill during the drilling operation.



Always remember to use the proper safety guards when using a drilling machine.

Finally, with the holes drilled, you will need to solder each component in place.



Switch on the soldering iron. It will only take a few minutes for the iron to reach operating temperature. Once the soldering iron is hot, clean the soldering iron bit with a moist sponge.

Melt some solder at the chamfered end of the soldering iron bit. This is called 'tinning' and it will aid the flow of solder from the soldering iron to the copper track on the printed circuit board and component pins.

Fit each component onto the board. When fitting components such as resistors, you should use long-nosed pliers to bend the legs through 90 degrees. This will make them easier to fit.

To solder a pin, hold the soldering iron onto the board for a few seconds, then quickly touch the tip with a small amount of solder.

You should always remember to replace the soldering iron back into the stand after soldering and repeat cleaning the tip of the iron with the moist sponge before the start of each soldering operation.



You can use the Style toolbar to help determine where each component needs to go.

Finally, cut off any excess wire or component legs for a tidy finish.