

Etch Lab Procedures

Updated 05/05/05 by Dr. Janet Lumpp

Safety and Lab Maintenance

The chemicals used in this lab are hazardous to your health. Avoid contact with skin, eyes, and clothing. Wear proper safety gloves and goggles. **NO FOOD OR BEVERAGES IN THE LAB.** Clean up after yourself.

Questions

If you have any questions about how to use the lab safely and effectively, please contact a faculty member or lab technician:

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Negative Preparation

1. Print the circuit pattern 1:1 scale with black features on a white page. The pattern should contain only copper areas such as traces and pads, and an outline of the board size. Do not include component outlines.
2. Make a transparency on the photocopier using a darker image density than regular copies.

The following steps are performed in the etch lab with only the yellow light on:

3. If you are planning to etch a board immediately after negative preparation, then begin preheating the developer at this point.
4. Cut a piece of green reversing film slightly larger than the pattern.
5. Make a small scratch in the corner of the film to determine the emulsion side.
6. Place the emulsion side face down on the table.
7. Place the transparency over the film.
8. Flip the pair of films over and place on the light box so the light will shine through the transparency first.
9. Close the top and lock.
10. Turn the lights on manual and time for 2.5 to 3 minutes for green reversing film. Turn the lights off.

11. Rinse the reversing film in reversing film developer until all pattern areas are clean. Wiping gently with a sponge will decrease the developing time.
12. Rinse film with water.
13. Dry by blotting with paper towels.
14. Pour the developer back into the bottle.

Single Side Board Etching

1. Preheat the developer for one hour by turning on the heater and sprayers.
2. Properly align the negative film over the copper side of the board. Single sided PCBs have the through hole components on the blank side of the board with leads passing through to be soldered to the copper pattern on the bottom side of the board. It is important to orient the orange negative film properly. The pattern is drawn looking at the component side of the board. When looking at the bottom of the board the pattern will look reversed compared to the way it was drawn.
3. Flip the board and film over onto the light box so the light will shine through the film to the board.
4. Close the top and lock.
5. Turn the lights on manual and time for 45 seconds. Turn the lights off.
6. Prevent the circuit board from being exposed to light for 15 minutes.
7. Remove the plastic cover from the board.

Put on gloves and goggles for the remaining steps.

8. Mount the board on a hanger by hand tightening the screw.
9. Develop the board for 3-4 minutes.
10. Rinse the board with water before moving it to the etcher.
11. Etch 15-18 minutes (checking every 5 minutes and turning the board over to spray on new areas).
12. Rinse the board with water.

13. Pour the photoresist stripper solution on the board in the flat pan. The etch resist comes off faster if wiped with a paper towel in the stripper solution (wear gloves!). Pour the used solution back into the bottle.
14. Rinse the board and flat pan with water.
15. Pour the immersion tin solution into the flat pan. Place the board in the solution and gently rock the pan to flow fresh solution over the surface for 2-3 minutes or until the surface looks a grey-silver color. Pour the used solution back into the bottle.
16. Rinse the board with water.
17. Dry.

Double Sided Board Patterning and Etching

1. Preheat the developer for one hour by turning on the heater and sprayers.
2. Prepare negatives of the top and bottom side patterns as described above.
3. Attach one negative to an L shaped holder using clear tape. Place the pattern near the inner corner of the L. Do not allow the tape to cover any circuit features.
4. Place the other negative on the opposite side of the L shaped holder. Use the light table to align the two patterns. Tape the second negative to the holder.
5. Verify that the two patterns are properly oriented.
6. Slide a piece of double sided circuit board between the negatives. Carefully tape the circuit board to the holder or negatives. Do not allow the tape to cover any circuit features.
7. Place the assembly onto the light box.
8. Close the top and lock.
9. Turn the lights on manual and time for 45 seconds. Turn the lights off.
10. Carefully turn the assembly over without disturbing the alignment of the negatives and board. Place the assembly on the lightbox.

11. Close the top and lock.
12. Turn the lights on manual and time for 45 seconds. Turn the lights off.
13. Prevent the circuit board from being exposed to light for 15 minutes.
14. Carefully remove the board from between the negatives.
15. Remove the plastic covers from the board.

Put on gloves and goggles for the remaining steps.

16. Mount the board on a hanger by hand tightening the screw.
17. Develop the board for 3-4 minutes.
18. Rinse the board with water before moving it to the etcher.
19. Etch 15-18 minutes (checking every 5 minutes and turning the board over to spray on new areas).
20. Rinse the board with water.
21. Pour the photoresist stripper solution on the board in the flat pan. The etch resist comes off faster if wiped with a paper towel in the stripper solution (wear gloves!). Pour the used solution back into the bottle.
22. Rinse the board and flat pan with water.
23. Pour the immersion tin solution into the flat pan. Place the board in the solution and gently rock the pan to flow fresh solution over the surface for 2-3 minutes or until the surface looks a grey-silver color. Pour the used solution back into the bottle.
24. Rinse the board with water.
25. Dry.