Fading LED Circuit

Objectives

- Accurately reproduce a PCB layout.
- Troubleshoot an electronic circuit if it is not working.
- Solder a printed circuit board to a satisfactory level.
- Identify electronic components.

Introduction

- For this project you are to build a small fading LED circuit that consists of an LED, resistor, coin battery and a switch. Once you have built the circuit board you will use the laser engraver and a 3D printer to make a case that the circuit board will be assembled into.

Marking

Layout and cutting *(compared to original)*	/5
Drilling layout *(compared to original)*	/5
Soldering *(neatness)*	/5
Components Flat	/5
Enclosure *(quality, cutting)*	/5

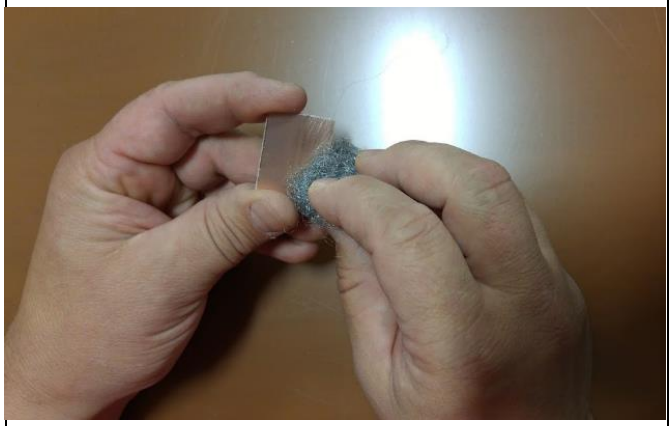
Procedure

Step 1

- Obtain the supplies you need to begin making the circuit board
  - Copper clad board
  - A vinyl sticker
  - Pencil
  - Utility knife
  - Steel Wool
  - Ruler

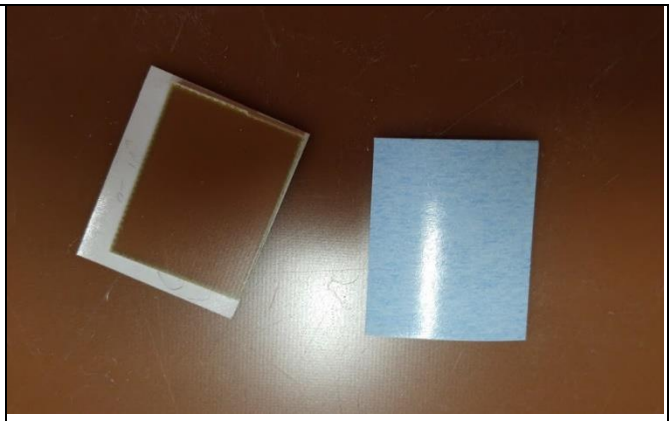
Step 2

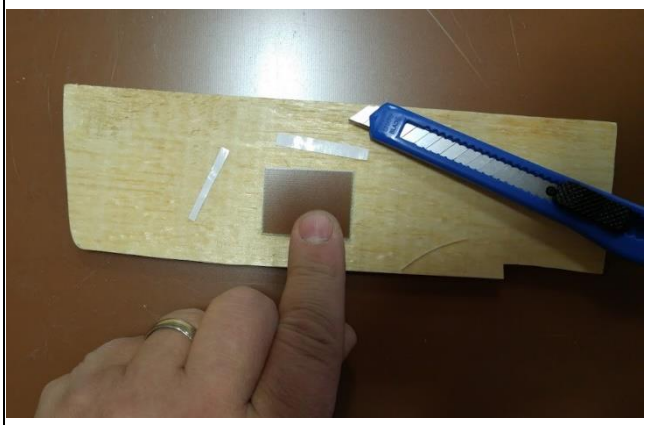
- Steel wool the copper clad board to clean off any dirt and grease.



Step 3

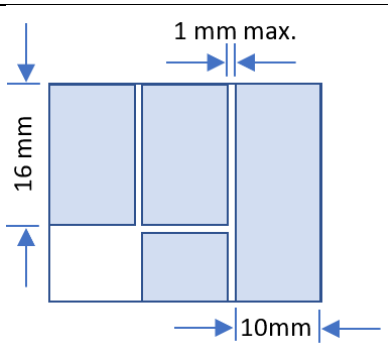
- Peel the back off the white vinyl and place it over the **COPPER** side of the board.
- Using a cutting board, NOT THE TABLE, to cut off the excess vinyl.





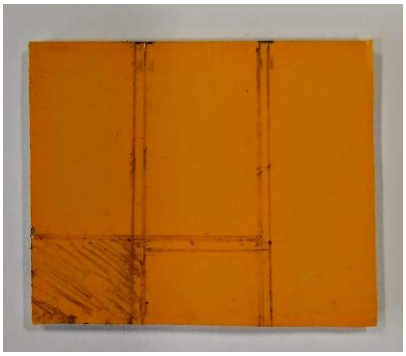
Step 4

- Carefully look at the circuit board layout in the diagram to the right.
- Each “trace” is 10mm wide and the gap between each trace is 1mm



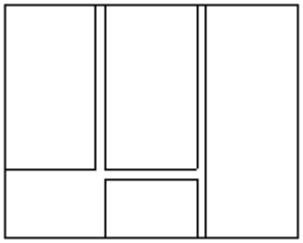
Step 5

- Draw out the circuit board layout on the vinyl using a **SHARP PENCIL and a RULER!**



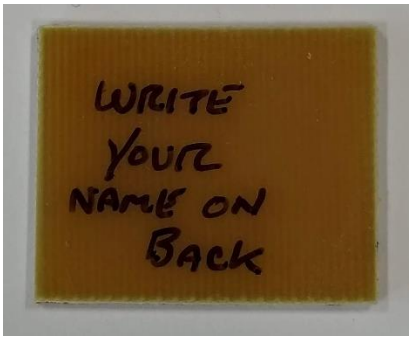
Step 6

- Using a utility knife, carefully cut the circuit board layout out of the vinyl. Remove the material that is not needed
- When you are finished, it should look exactly like the layout.
- Marks will be given for accuracy.



Step 7

- Use a Sharpie to write your name on the back (the fiberglass side) of your board.
- Let the ink dry for a couple of minutes

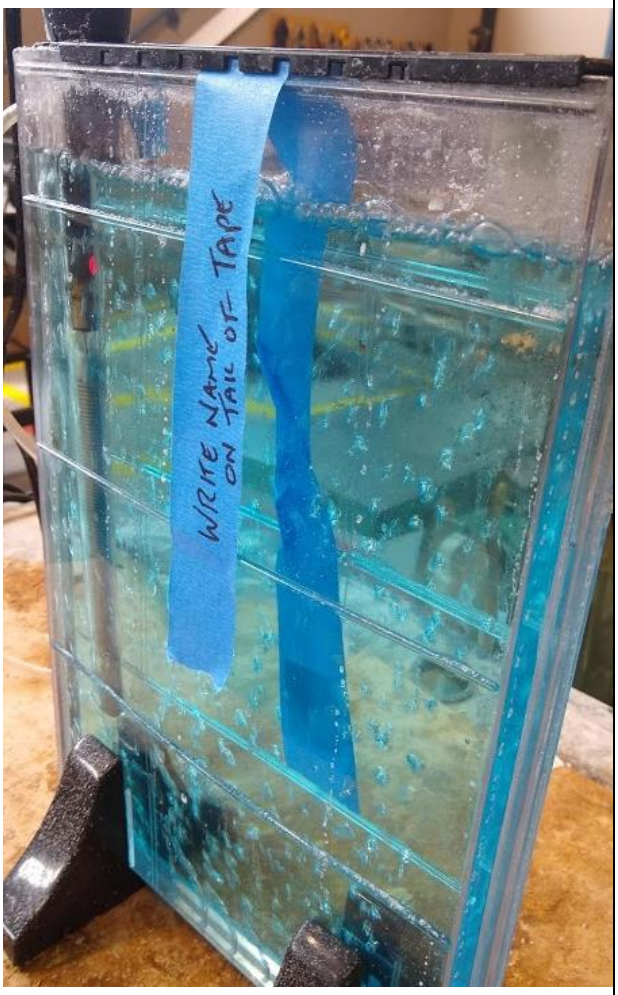


Step 8

- Use a piece of blue masking tape to create a way to suspend your board in the etchant tank
- Write your name on the end of the tape that will stick to the tank
- Twist the tape 180 just before the board so the board will face away from the side of the tank

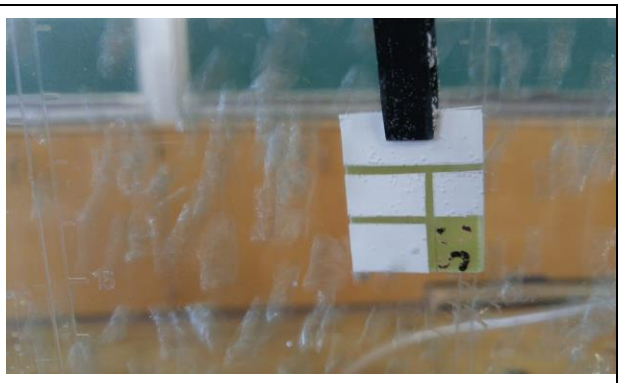
Step 9

- **Make sure you have safety glasses on!!**
- Hang the circuit board into the etching tank.
- The tank should be bubbling and the heater should be on. The warmer the chemical, the faster it will etch
- The lighter colour of the chemical, the faster it will etch.



Step 10

- **Make sure you have safety glasses on!!**
- When the etching process is complete, you should be able to see through the board and no copper colour should be left.
- Take your circuit board out of the etching tank and put it in a bowl or dish and take it to the sink to wash it off and dry.

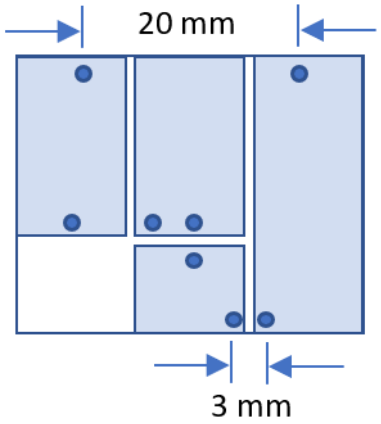


Step 11

- Peel off the vinyl to expose the copper remaining

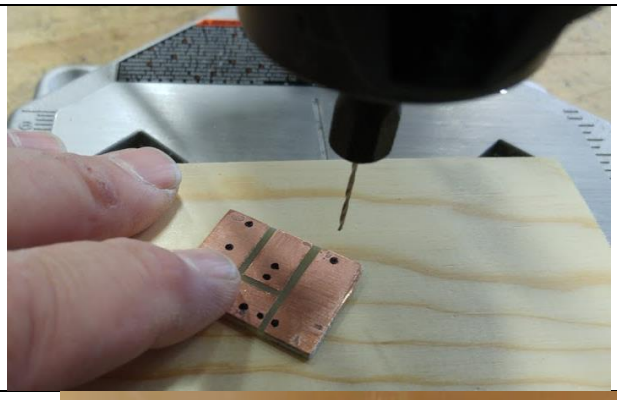
Step 12

- Layout the holes using the following diagram.
- **Have your teacher check your hole layout!**



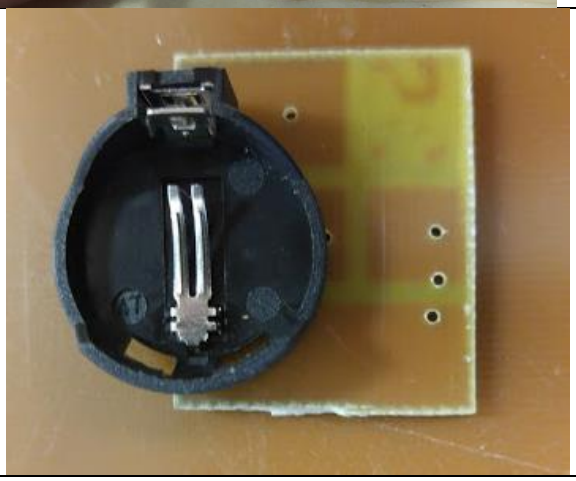
Step 13

- Use an Awl to lightly centre punch all holes.
- Drill all the holes using a Dremel drill (*inspect the drill bit prior to using*)
- After drilling, clean the copper using steel wool. This will make soldering easier.



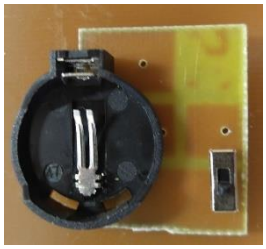
Step 14

- Install the battery holder as shown (note part on fiberglass side of board)



Step 15

- Use electronics side cutting pliers to trim off one outside leg of the switch leaving only two.
- Install the switch in place as shown



Step 16

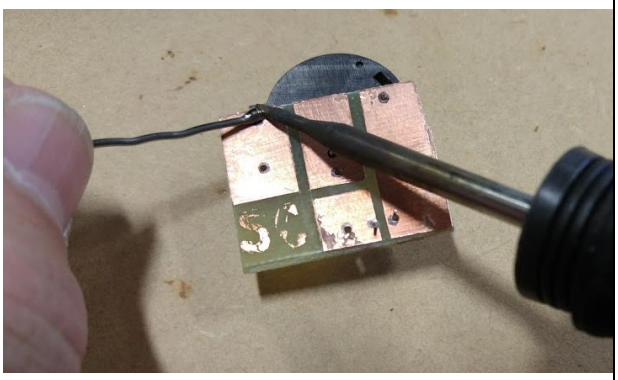
- Flip the board over and ensure the legs of both the battery holder and switch are sticking out of the holes.
- If components fall out use blue masking tape to temporarily hold them in place

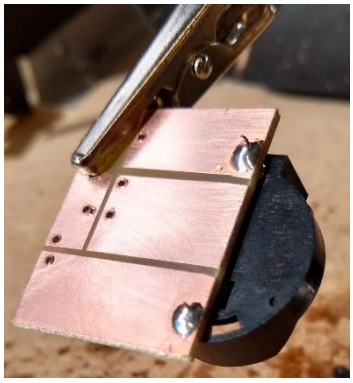
Step 17

- Solder the battery holder and switch in place

***remember to heat the pad and component lead so they are hot enough to melt the solder ***

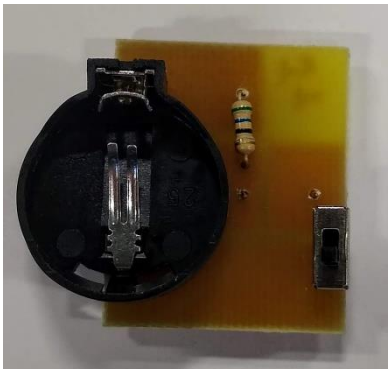
- ‘Mt. Fuji’ solder joints are the goal.





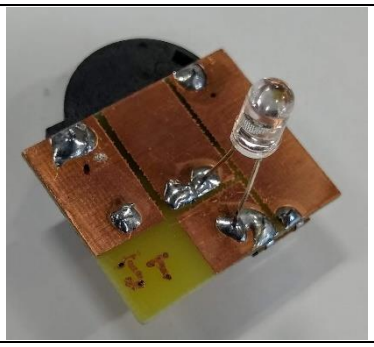
Step 18

- Insert the resistor as shown and solder in place



Step 19

- Insert the LED as shown and solder in place
- The LONG leg (positive) of the LED connects towards the resistor!!



Step 20

- Get a coin battery from the teacher
- Install the battery with the positive side up.
- Flip the switch on to see if it works.