

BYTES & BITES CIRCUIT SHENANIGANS



Intermediate Soldering Workshop



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PDF: https://go.hawaii.edu/Si8

Materials



4cm x 6cm PCB Board

Blue or White LEDs

1Ω Resistor

Switch

Battery Holder





Circuit Schematic



Light Emitting Diode (LED)

The triangle with a horizontal line above it is called a diode, an LED is notated with the arrows pointing away from it. You will notice that the LEDs in your hand has a long leg and a short leg. The long leg is called the anode and the short leg is called the cathode.

Note: For this circuits the LEDs are all in parallel so if one goes out the rest won't, making it easier to power to circuit.







Start by holding the LED in with your fingers and hold the LED so that the anode is on the left side like in Figure 1.







Figure 1

Figure 2a

Figure 2b

2

Bend the anode down 90° between the anode and cathode, as shown in Figures 2a & 2b.Repeat this for all 8 of your LEDs.

3.

Next place two LEDs into the jig as you seen in Figure 3a & 3b. The jig makes each vertical layer, so if you want to make a design keep that in mind. You can see the model or ask someone for clarification.



Figure 3a



Figure 3b





Anodes should be touching, we want to line up the LEDs so that the two anodes are as straight as possible. If not, make the adjustments necessary now. As shown in Figures 3c & 3d, make sure the two anodes are in parallel and the cathodes are perpendicular to the anodes.

In Figure 3d, the blue line is the anode and red line is the cathode, notice how the lines are drawn if your LED legs do not resemble that fix accordingly.







Figure 3d



Solder the anodes together.

The solder we use melts at 420°F. (Do not set the iron any higher, the solder WILL explode and pop in your face.) You should solder right at the base of the left LED's anode. You don't need to solder everything just a small drop to connect it. If you can hold the array with your hands and it doesn't fall apart, that means its secure. Make sure your LED's stay straight while you solder. You may need to ask for help from a partner or mentor.



Figure 4a



Figure 4b



Repeat Step 6 for the other 6 LEDs.





Once you solder all the LED pairs together, **use a plier or your hands, and bend the bottom LED's cathode upward so that it touches the top LED's anode** as shown in Figures 6a & 6b.





Figure 6a

Figure 6b

7. Now face the LED's away from you and bend the top LED's cathode to the right shown in Figure 7.



Figure 7





8.



Place the two LED pairs into the jig as shown in Figures 9a & 9b and solder the three points to connect all the cathodes together. Before soldering, make sure that the cathodes and anodes are NOT touching, if they touch your LED will short circuit. Now solder the three points together.

Make sure you did not accidentally solder a cathode and anode together, to check you can visually inspect or have a volunteer help you check with a multimeter.



Figure 9a



Figure 9b



11.

Place your two arrays into the pcb wherever you see fit. The LEDs are to be arranged in a cube.



Figure 11





Once you have the position you like, **lift of the arrays so that the** cathode is barely sticking out from the other side and solder that in.







Figure 12

Figure 13a

Figure 15b

13. This is just to temporarily secure it, **now liquify the solder by putting the iron into it and correct the LED array so that it is square to the PCB,** as shown below.

14.

Repeat for the other array.

15.

Get the switch and place it on the PCB. Make sure one of the outer legs of the switch is in the same row/column as the anodes of your LED. The red line in Figure 15b shows that it's in the same row



Figure 15a



Figure 15b

In the photo above, bend the opposite outer leg to temporarily secure the switch in place.



16.

Now pull wire from the spool, cut to length, remove the insulation, and solder onto the PCB to connect all the anodes together along with the outer leg of the switch.



Figure 16a



Figure 16b



Take another wire and solder the two cathodes together on the top of the arrays, this connects it electrically and provides structural support.





18.

Solder a resistor in series with all the diodes to help regulate current through it. Solder it like in Figures 18a & 18b. It doesn't have to be in the exact same holes just make it in series with one of the cathodes and the black wire from the battery pack.



Figure 18a



Figure 18b

19. Solder the red wire from the battery pack to your PCB, solder it to the middle leg of the switch, you can put the wire on the top or bottom of the PCB, preferably the bottom but it will work either way.

Just to clarify, you should only be using two of the switch's legs, one will be the middle and the second will be one of the legs on the edge, it doesn't matter which one.



