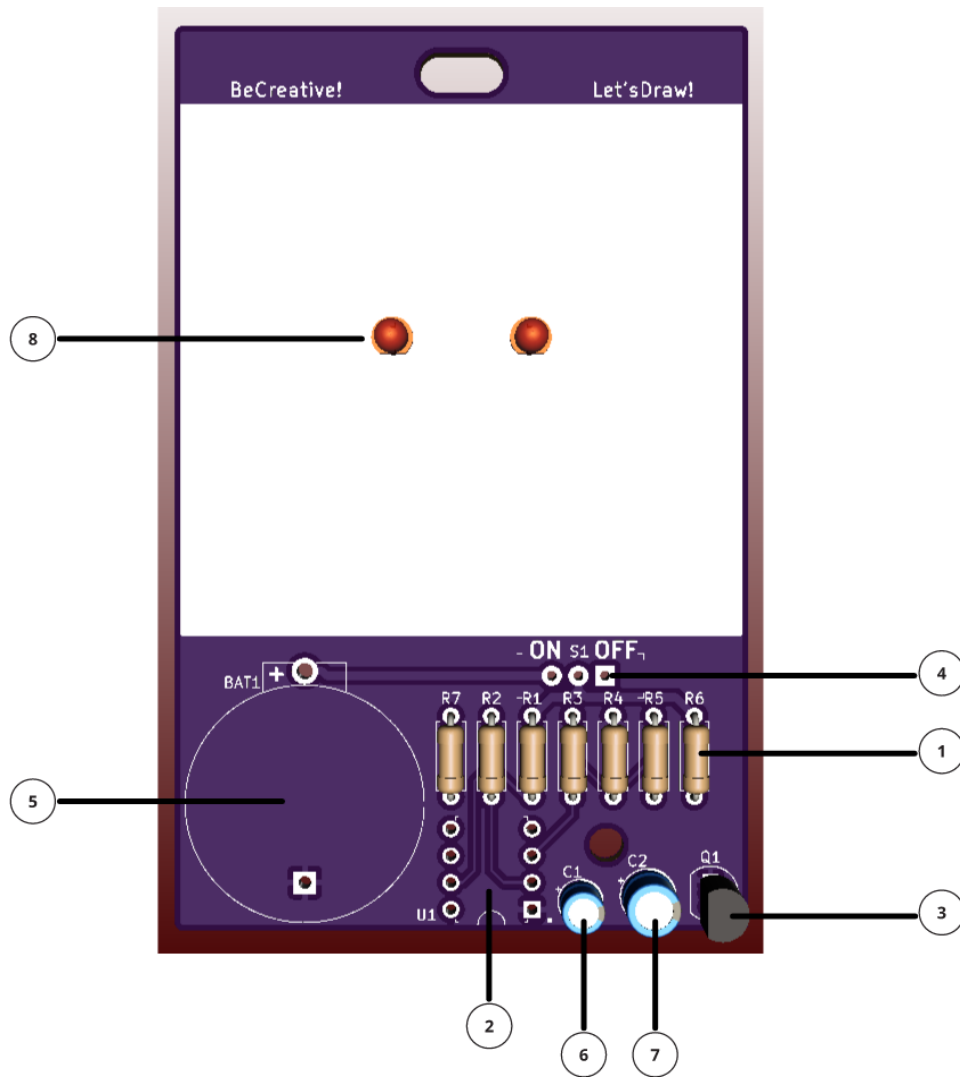


ToyTronix Soldering Kit



Materials & Tools

- Soldering Iron
- Solder
- Cutters (*not provided in the kit*)

* If the maker is younger than 12 years, it is recommended to wear safety goggles too.

Number	Item	Quantity
1	Resistors	7
2	Timer Chip	1
3	NPN Transistor	1
4	Slide Switch	1
5	Battery Holder	1
6	10 μ F Capacitor	1
7	100 μ F Capacitor	1
8	Red LEDs	2

Preface

Electricity powers our world. And we harness it through engineering. Electrical engineering is the field that focuses on the application of electricity and electromagnetism in our everyday lives. Just as you have blood pumping through your veins, machines and systems often need electrical power flowing through their wires to work. It is the lifeblood of our society.

How do we get around from place to place without having to walk everywhere? How can we communicate with people who live far away from us? Before, there were no cars, phones, or computers. Do you know who invented them? Engineers. But do you know what an engineer is? The short answer is that an engineer is someone who wants to know how and why things work. Besides being naturally curious, an engineer is a person who designs and builds things like machines or systems, or structures, that help solve real life problems.

Inventors in the field of electronics are individuals who possess the knowledge, intuition, creativity, and technical know-how to turn their ideas into real-life electrical gadgets. It is my hope that this education kit will provide you with an intuitive understanding of practical aspects of electronics in a way that fuels your creativity and inspires you to create.

Here is a step-by-step guide on how to ignite your passion for soldering:

What is Soldering?

Soldering is a process of joining two or more metals by melting a filler called “tin” (or solder) into the joint where the metals meet. Soldering is often used in making electronics, jewellery and musical instruments.

Who can Solder?

Children can usually begin soldering as young as 6 years old with the help of an adult. This soldering kit is designed to help young inventors to build their own personal electronic badge.

How to Solder?

1. Heat the Iron - Plug an and/or turn on your soldering iron to warm up. Set it to 400°C.
2. Immobilize the Joint - Components can be immobilized by simply bending the legs on the solder-side/back side of the board. This step is important because it will be difficult to make a good solder joint if your components are moving.

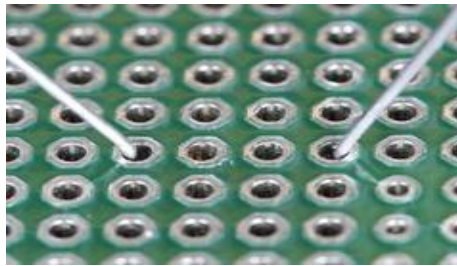


Figure 1 - Immobilize the Joint

3. Steady the Board - Try to level the PCB by placing it on the table or putting something (e.g a pen or a screwdriver) underneath it to hold it in place.
4. Tin the Tip - Apply a small amount of solder to the tip of your iron (you should have a tinny, shiny layer of molten solder on the tip).



Figure 2 - Tin the Tip

5. Grip the Iron - Grip the iron as if you were holding a pencil. Hold it in one hand and hold the solder in the other.

6. Heat the Joint - Heat the joint with the tip of the iron. Be sure to heat both the solder pad and the component leg.



Figure 3 - Heat the Joint

7. Apply the Solder - Touch the end of the solder to the joint so that it contacts both the solder pad and the component leg. It should melt and flow smoothly onto both the leg and the pad. If the solder does not flow, heat the joint for another second or two and try again.



Figure 4 - Apply the Solder

8. Let It Cool - Once enough solder has been added to the joint and it has flowed well onto both the component leg and the solder pad, remove the iron from the joint and allow it to cool down for a second.
9. Trim the Legs - Use your cutters to trim the component legs close to the board.



Figure 5 - Trim the Legs

WARNING

- The soldering iron can reach temperatures up to 450 °C. Proceed with caution.
- Solder only under adult supervision.

How to Complete the ToyTronix Kit - Steps:

It is a good practice to begin soldering with components in the middle of the board and work your way out. This allows you to get your iron in hard to reach places. Speaking of our ToyTronix board, we should start by soldering the shorter components first (7555 Timer, Resistors, Transistor, and the Switch) and then work our way to the taller ones (Battery holder, Capacitors, and LEDs).

Resistors:

Firstly, let's put all resistors in their place. To start, find R1 and R3 which should be your 22k Ohm resistors. Bend the leads so that they can be inserted into the resistor footprints and place them into their respective spots. On the back side, bend the leads out so that the resistors stay in place. Repeat this process for the rest of the resistors, making sure that you put the correct resistor in the right spot and pay attention to the reference markings on the board. With all the resistors in place, turn the board over and solder all the leads. Remember to hold the soldering iron so that the tip is touching both the component lead and annular ring. Wait a moment and then feed solder into that three-way junction. When you get a nice little mountain shape, remove the solder first and then remove the soldering iron. Use a set of clippers to cut the excess leads. Make sure you don't cut into the solder joint.

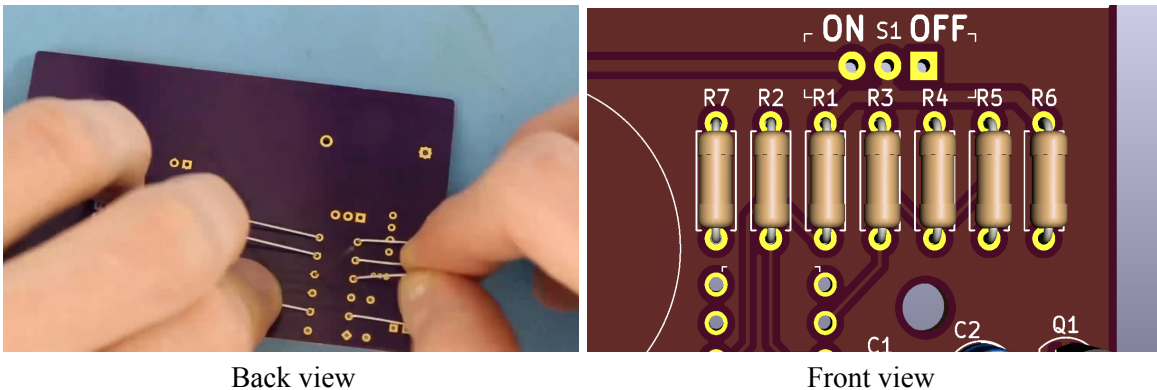


Figure 6 - Placing resistors and bending their legs on the back side of the PCB.

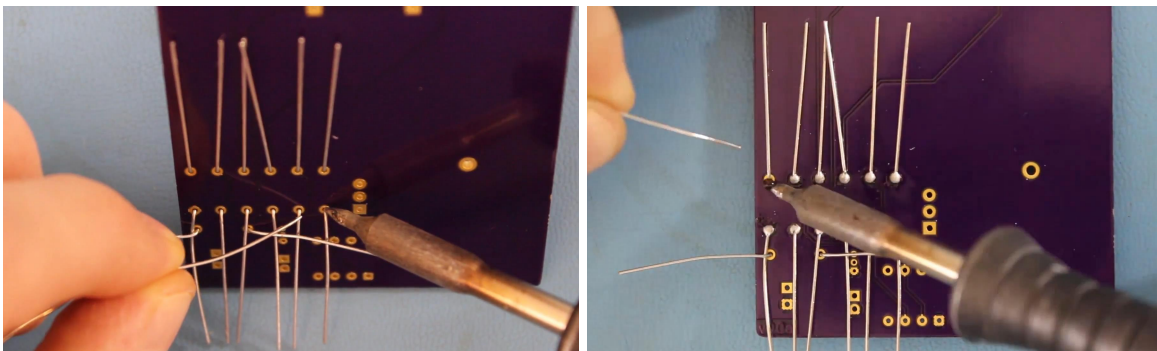


Figure 7 - Soldering resistor legs to the PCB.

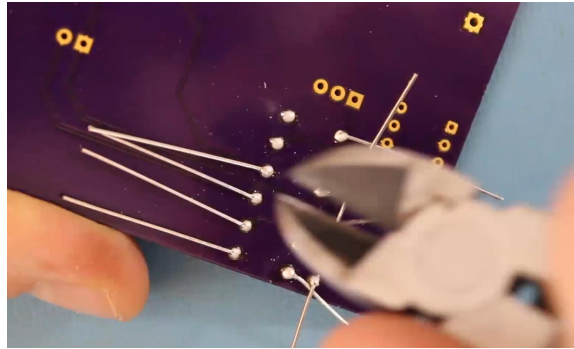


Figure 8 - Trimming the legs.

7555 Timer:

You might have to bend the legs to get it to fit. Place the 7555 on the board. Note that the notch should be pointing to our pin 1 marker on the PCB. Because the 7555 is taller than the resistors, we can rest the board on the chip so that we can solder all the legs.

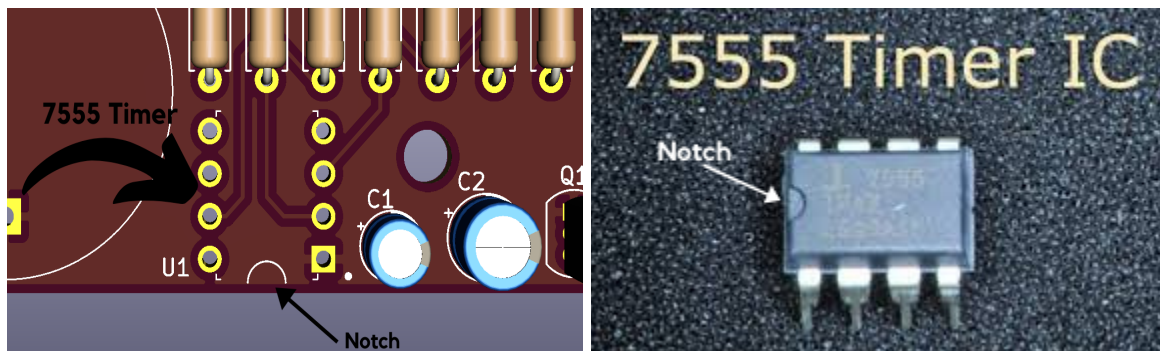


Figure 9 - Placing 7555 Timer on the PCB.

Transistor:

Place the transistors next. The transistor's round edge should be placed facing outwards the board. Flip the board over, bend the leads out to have the transistor stay in place, solder the joint, and then clip off the excess.

Switch:

Place the switch next. The orientation does not matter. Once again, you can rest the board on the switch to get at the legs. If necessary, you can also put a pen, pencil, screwdriver or other object under the opposite side of the board to keep the board parallel to your work surface. Solder the legs and clip off the excess.

Battery holder:

Place the battery holder and note that it should line up with the outline drawn on the board. This will ensure that the polarity is correct. Flip the board over and balance it on another object. Solder the battery holder legs. They are short enough that you don't have to worry about trimming them.

Capacitors:

Take a look at the footprints of the two capacitors. C1 and C2. You should see a little plus (+) symbol on the board showing the positive terminal. The filled in white semi-circle is the negative terminal. Take C1 and look for the minus sign marking down one side. This is the negative terminal and it should be placed in the through hole with the filled in semi-circle. Bend, once again, the legs on the other side to hold it in place. Do the same for C2. Solder all four connections and then clip off the legs.

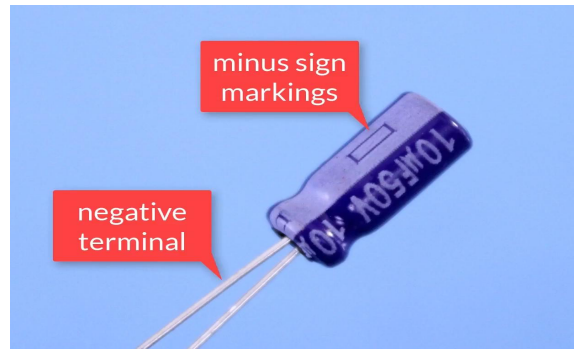


Figure 10 - Placing 7555 Timer on the PCB.

LEDs:

There are no clear polarity marking on the LEDs. The top pin, the one closest to the notch cut out, is the positive pin. If you look closely, most LEDs will have a flat edge on the ring around the bottom of the component body. This flat edge denotes the cathode, or negative pin of the LED. If the LED does not have this flat edge, then the longer pin will almost always be the positive pin or anode. Place the LEDs with the positive pins going through the holes, closer to the top of the board. Bend the leads, solder them and cut off the excess.

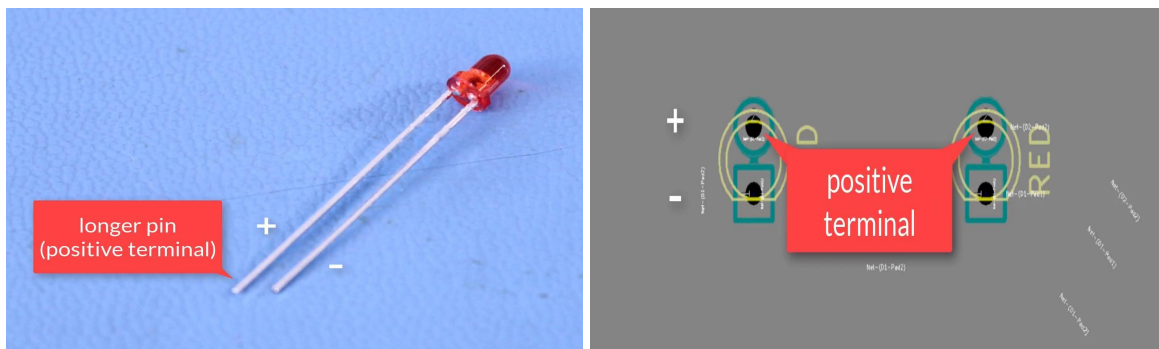


Figure 11 - Placing LEDs on the PCB.

And now, the moment of truth. Place your battery into the battery holder with the positive side facing up. Flip the switch and hope that nothing explodes 😊. With some luck, you should see the LEDs slowly start to fade. Feel free to get creative and draw something fun on your new badge.