

# **Circuit Sticker Sketchbook**



**LEDs, Switches & Sensors**  
**by Jie Qi**

**and you:**

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## HOW TO USE THIS BOOK

Welcome to the Circuit Sticker Sketchbook!

This book will guide you through the process of building paper circuits. You can craft your circuits right on the pages, following the explanations and templates.

Start with the **Components & Materials** section to get familiar with all the parts in your kit. Then go through the activities. Each chapter introduces a new idea that builds on previous chapters. Once you've built your **template circuit**, check out the **drawing activity**. Half the fun of creating circuits is telling stories with light! The **Your Turn** page lets you be even more creative by building your own circuit and story. The **Try This!** section gives ideas for even more things to explore.

If you run into problems, check out the **debugging** section in the back for answers to common questions. If you need more help, please visit our forum at **[chibitronics.com/community](http://chibitronics.com/community)**.

Happy circuit crafting!



# Components & Materials

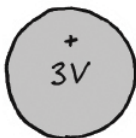






## COMPONENTS & MATERIALS

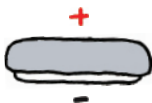
### Coin cell battery



top (+)



bottom (-)



side view

A battery provides power to your circuit. The top side is marked “+” and the edges of the battery are also positive. The bottom side is negative. Simply touching conductive material to the battery causes an electrical connection.

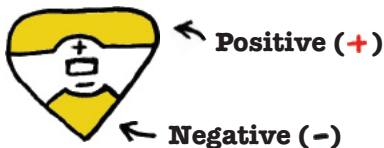
**Note:** *store your batteries separately, and away from other bits of metal. This avoids accidental connections that can drain the batteries.*

### Binder clip



Binder clips are handy for holding your battery in place. You can also use other types of clips. For more battery holder ideas, go to **chibitronics.com**

## LED stickers



LEDs, which stand for **light emitting diodes**, glow when powered. The LED sticker is shaped like an arrow pointing from + to -. The wide, flat metal pad is the “+” end and the pointy metal pad is the “-” end.

Connections to the LED sticker are made by sticking the metal pads on top of conductive materials. You can also solder to the metal pads, for a robust, permanent connection. Stickers can also be sewn into material using conductive thread. Small starter holes in each pad help a sewing needle pass through easily.



LED stickers come in clusters of 6 stickers. W is for white, R for red, B for blue and Y for yellow.

## Copper foil tape

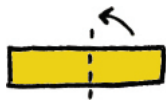


Copper foil tape is made of copper metal, so it is a great conductor of electricity. It also solders just like metal wire, and the adhesive on the back is partially conductive.

Copper tape is soft enough to cut, fold and tear by hand so you can treat it like regular tape. Thinner tape is easier to work with, so we recommend cutting your tape in half length-wise.



A connection works best when made with a continuous strip of tape. Thus, when turning corners it's recommended to fold the tape, rather than cut the tape and stick it together.



Fold tape back, exposing the sticky side



Flip and turn the tape, to form a corner



Flatten the corner and you're done!

## **Black conductive plastic sheet**



The black plastic sheet conducts electricity, but not nearly as well as metal foils. Also, its conductivity changes when you press or stretch the sheet. We will use this material to create do-it-yourself pressure sensors.

## **Extra double-sided adhesive sheet**



Use this double-sided conductive adhesive to recycle used stickers that have lost their tack. This is the same adhesive that comes on the back of the stickers.

To “resticker” old stickers, carefully clean off the old adhesive on the bottom of the sticker. Be careful not to fold or crease the sticker, as this can break the internal circuitry.

Peel the paper backing off one side of the double-sided adhesive, and apply the adhesive to the cleaned sticker. Finally, cut away any extra adhesive, and your circuit sticker is ready to use again!





# 1. SIMPLE CIRCUIT

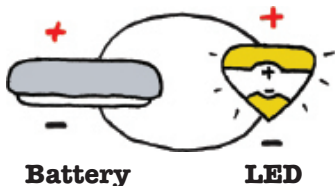






## 1. SIMPLE CIRCUIT

Let's get started by lighting an LED! We will use the foil tape to connect a battery to the LED in a loop. The "+" side of the LED sticker needs to connect to the "+" side of the battery and the "-" point of the sticker to the "-" side of the battery. This continuous loop is a **complete circuit**.



Electrons only flow in loops, and this complete circuit allows electrons to flow from the battery, through the LED, and back into the battery. This round-trip flow of electrons, called **current**, causes the light to turn on and shine.

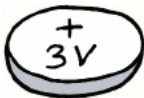
Electrons are lazy, and always take the path of least resistance. Since electrons prefer to take a "shortcut" through foil, rather than do work lighting an LED, an accidental foil connection from + to - will quickly drain the battery, and the LED will not light. This condition is called a **short circuit**.

## You will need:



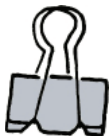
x 1

LED circuit sticker



x 1

3V coin cell battery



x 1

binder clip



conductive foil tape

## Directions:

1. Turn to the template on the next page and stick foil tape over the gray lines.



**Note:** Apply the foil as a continuous piece, rather than separate pieces, even when turning corners. The adhesive on the bottom side of the foil makes a weak connection.

2. Fold the page corner along dotted line and place the battery “+” side-up over the “-” circle.



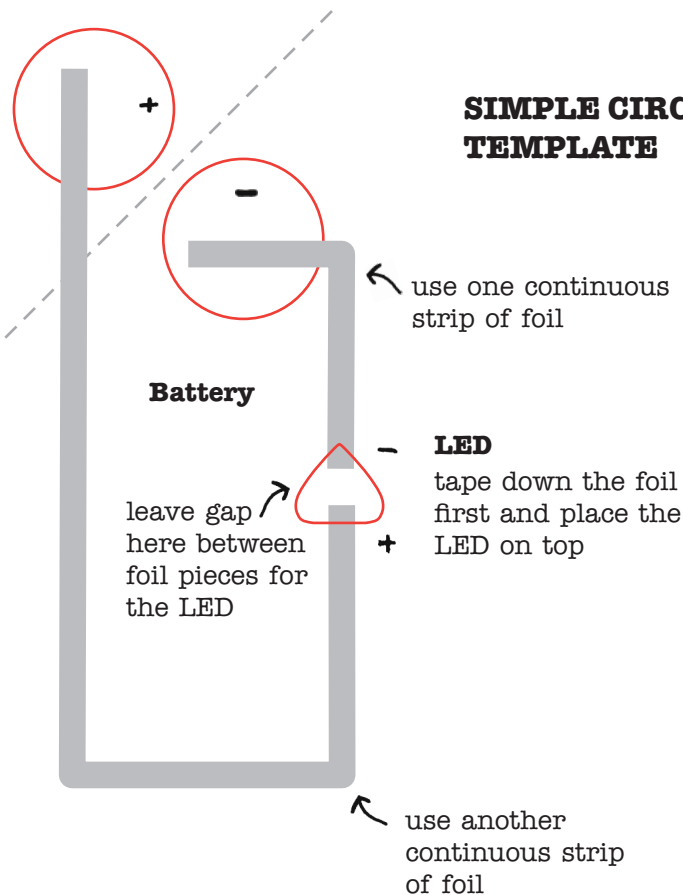
3. Fold the corner flap over, and clip the battery in place with a binder clip.



4. Stick the LED sticker onto the foil, over the footprint. The light will turn on!



## SIMPLE CIRCUIT TEMPLATE



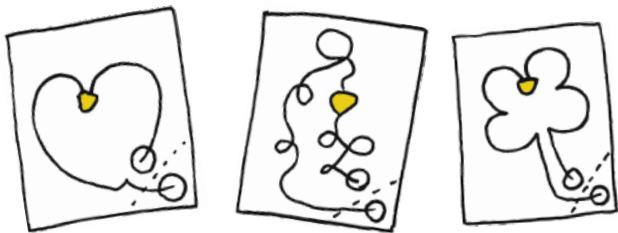
- 5.** With the LED on, flip to the next page.  
You've turned on the lightbulb! What is the lightbulb illuminating? Complete the scene with your own drawing!



What does the lightbulb illuminate?  
Draw it here!

## YOUR TURN!

On the blank template to the right, build another circuit that turns on a light. Play with the foil to make different lines and shapes!



Make sure that the two pieces of copper do not touch or cross, or else you will create a short circuit.

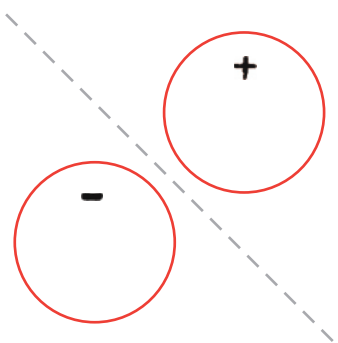


If you want two pieces of copper to cross without connecting, just place a piece of paper in between the two copper foils.



To connect two pieces of copper foil, tape one piece over the other and press the tape down firmly for the conductive adhesive to make a good contact. For more permanent connections, you can also solder the copper tape pieces together.







## TRY THIS!

Now that you've learned how to make a light shine, here are some more things to try!

### Make a circuit drawing

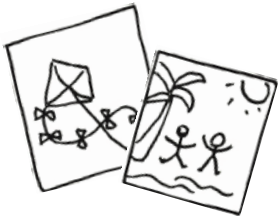


Use the foil tape in your circuit to create a design. Decorate your circuit with other craft materials to complete the scene.

### Play with light diffusion



What happens when you put a tissue over the light? How about a piece of fabric? Or even a photograph?



Try diffusing your LED's light through different materials and see what effects you can come up with!

