



FLORA TV-B-Gone

Created by Becky Stern



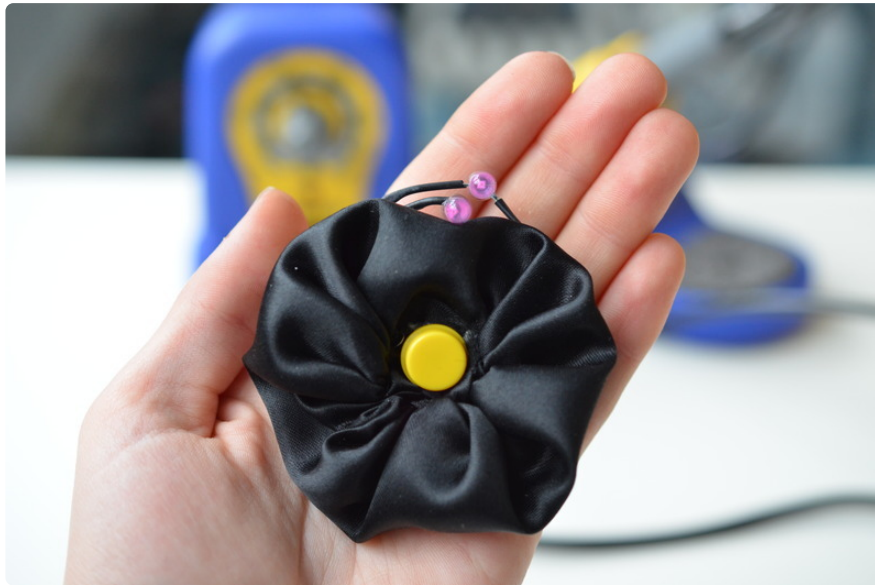
<https://learn.adafruit.com/flora-tv-b-gone>

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Table of Contents

Overview	3
Parts	4
• Tutorials	
Transistors	6
Resistors	8
LEDs	10
Pushbutton	14
Program it	19
Power	23
Fabric pinwheel	24
Wear it	25

Overview



Hidden inside this fashion accessory is a stealthy purpose-- it powers down television sets from across the room! This guide will walk you through the steps for creating your own Flora TV-B-Gone, a wearable gadget triggered by the button in the center of its flower design. The infrared LEDs communicate with TVs the same way your remote does (invisibly to the human eye) but the program contains codes to power down just about every TV brand. You can embellish your design however you like to match your outfit or encase it completely in a jacket pocket. The basic design is here, how you make yours is up to you!

New to FLORA? Check out these other guides:

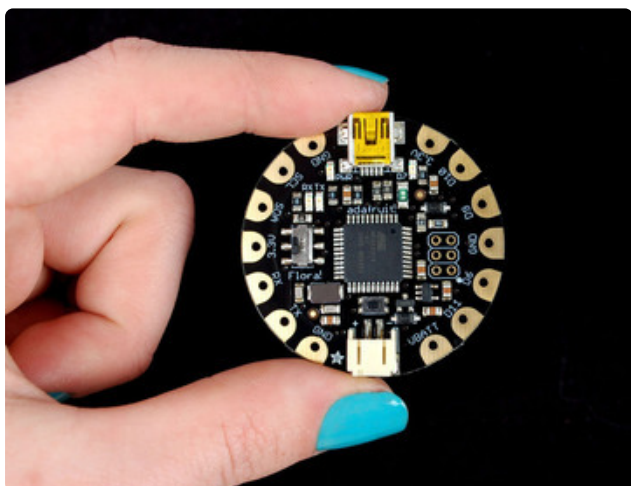
- [Getting Started with FLORA \(https://adafru.it/aSZ\)](https://adafru.it/aSZ)
- [Flora RGB Smart Pixels \(https://adafru.it/aRT\)](https://adafru.it/aRT)
- [Flora Wearable GPS \(https://adafru.it/aRP\)](https://adafru.it/aRP)
- [Flora Pixel Brooch \(https://adafru.it/aTj\)](https://adafru.it/aTj)

Most photographs in this guide by John De Cristofaro.

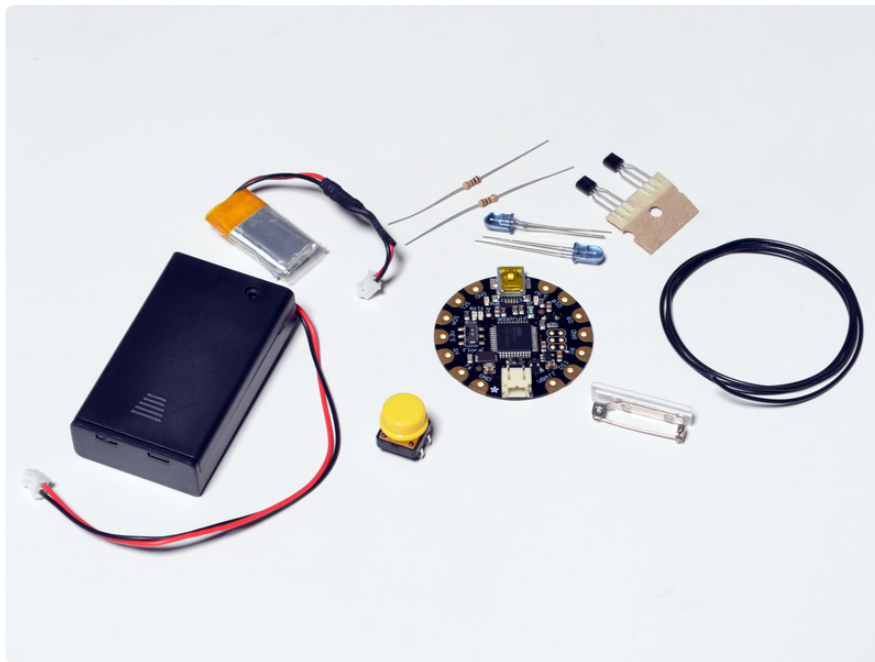
Arduino-ported [TV-B-Gone code updated for Flora \(https://adafru.it/aTO\)](https://adafru.it/aTO) by Phillip Burgess.



Parts



You'll need a [FLORA \(http://adafru.it/659\)](http://adafru.it/659)! If you have the [Flora GPS Starter Pack \(http://adafru.it/1090\)](http://adafru.it/1090), you already have most of the parts, just pick up a [simple pushbutton \(http://adafru.it/1009\)](http://adafru.it/1009) and adhesive pinback.



You'll need two [IR LEDs](http://adafru.it/387) (<http://adafru.it/387>), two NPN bipolar transistors like our [PN2222s](http://adafru.it/756) (<http://adafru.it/756>), two 100-ohm resistors, a [simple pushbutton](http://adafru.it/1009) (<http://adafru.it/1009>), a [3xAAA battery holder](http://adafru.it/727) (<http://adafru.it/727>) or lipoly battery, some [hookup wire](http://adafru.it/290) (<http://adafru.it/290>), [heat shrink tubing](http://adafru.it/344) (<http://adafru.it/344>), and an adhesive pinback.

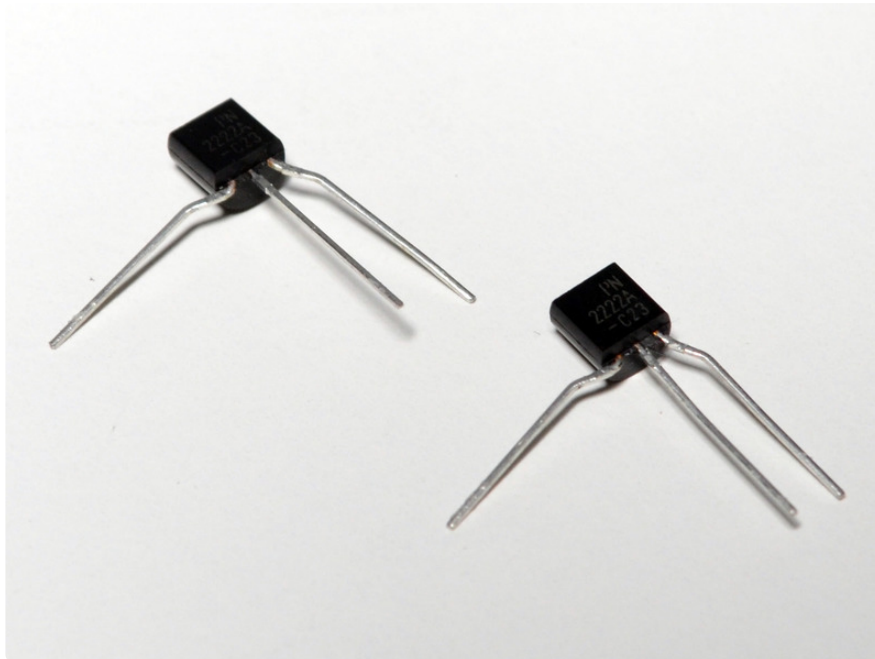


Tools! You'll also want a [soldering iron](https://adafru.it/aTs), [solder](https://adafru.it/aTs) (<https://adafru.it/aTs>), [wire strippers](http://adafru.it/147) (<http://adafru.it/147>), flush snips, a [panavise](http://adafru.it/151) (<http://adafru.it/151>) or [helping hands](http://adafru.it/291) (<http://adafru.it/291>), a lighter or heat gun. To make an embellishment for your project, grab some fabric and sewing supplies or tools and materials needed for your craft of choice (crochet? knit? felt?)-- anything goes.

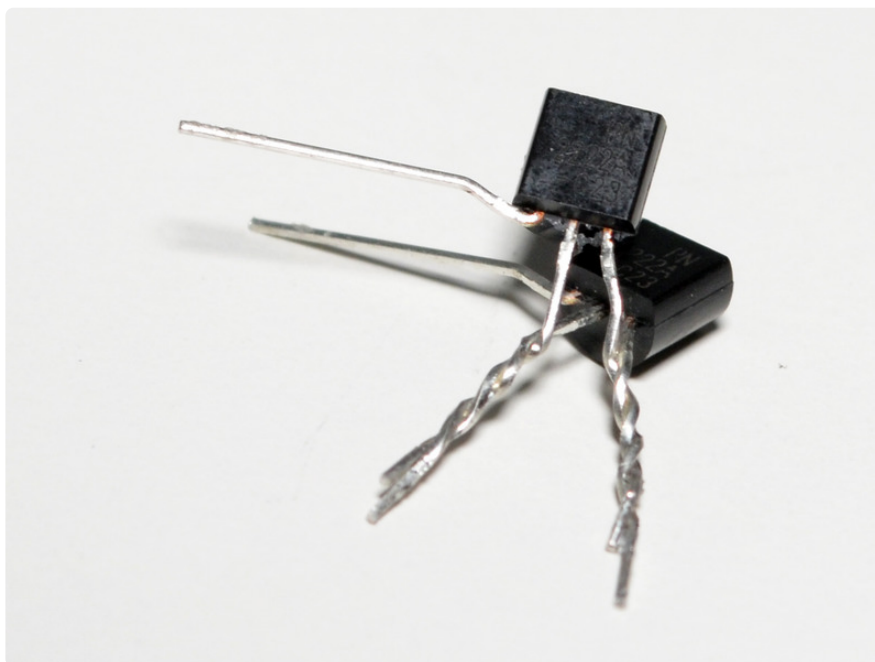
Tutorials

- [Learn how to solder with tons of tutorials!](https://adafru.it/aTk) (<https://adafru.it/aTk>) (<https://adafru.it/aOm>)
- [Don't forget to learn how to use your multimeter too!](https://adafru.it/aOy) (<https://adafru.it/aOy>)

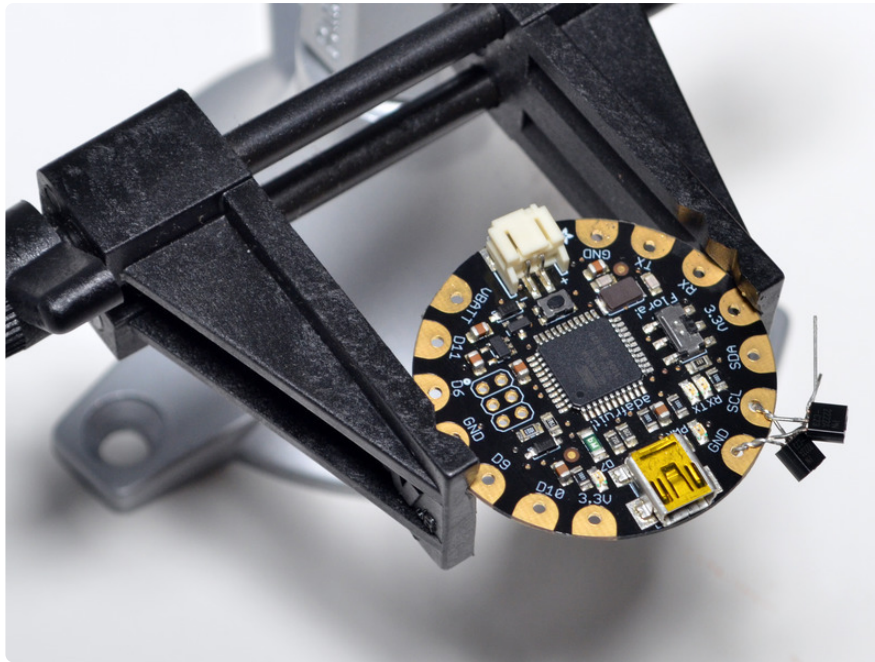
Transistors



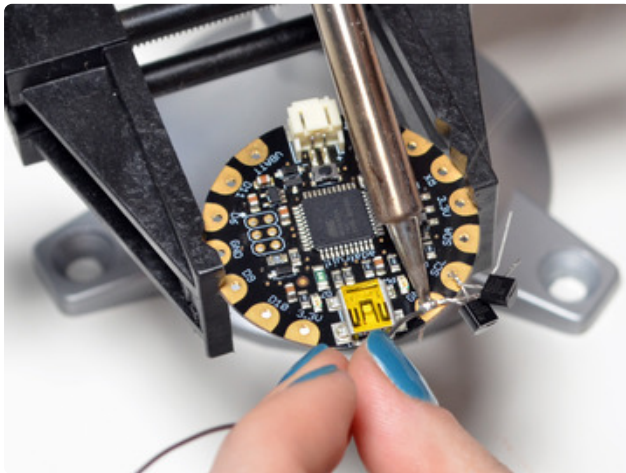
Start with two [PN2222 transistors](http://adafru.it/756) (<http://adafru.it/756>). Bend the emitter legs outward, away from the other legs, as shown.



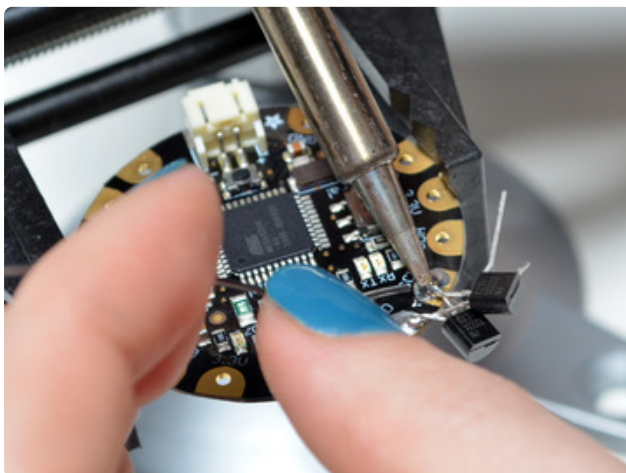
Twist the base legs of both transistors together. Repeat with the collector legs.



Insert the twisted legs of the transistors into holes in the Flora board. The center (base) legs of the transistor should go in the hole marked SCL. The twisted collector legs should go in the hole marked GND (ground). The non-twisted emitter legs of the transistor should stick out as shown, following the edge of the Flora board.

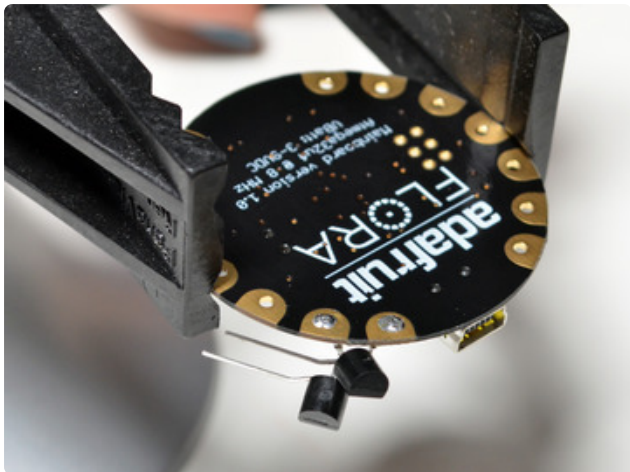


Solder the transistor wires to the pads of the Flora.





Use flush snips to clip off the excess wire on the other side of the board. The other transistor legs will be attached to the IR LEDs later.



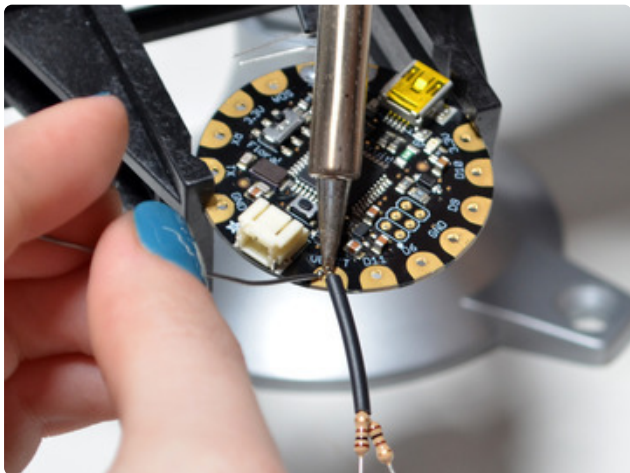
Resistors



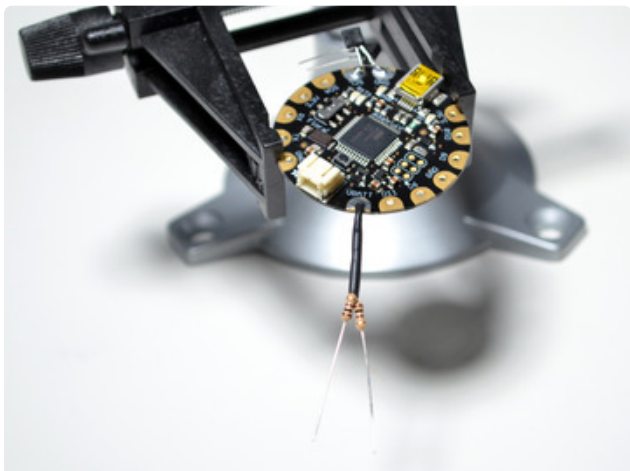
Next we'll attach the two 100-ohm resistors. Twist one set of their legs together as shown. Resistors don't have polarity, so it doesn't matter which way they are facing.

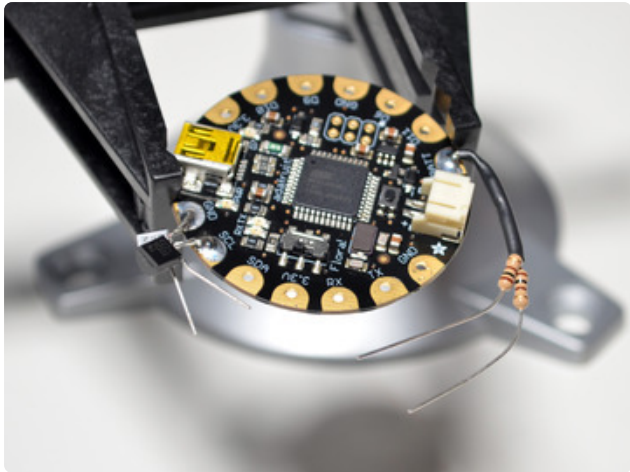


Slide a short piece of heat shrink tubing around the twisted resistor legs, leaving a small section of wire exposed at the end.

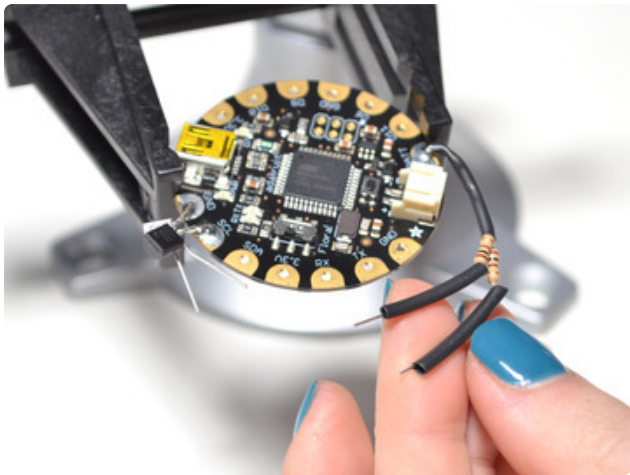


Insert the short wire end into the hole marked VBATT (battery voltage +) and solder in place. Clip any excess wire on the other side of the Flora.





Bend the resistor legs to follow the curve of the Flora board, as shown.

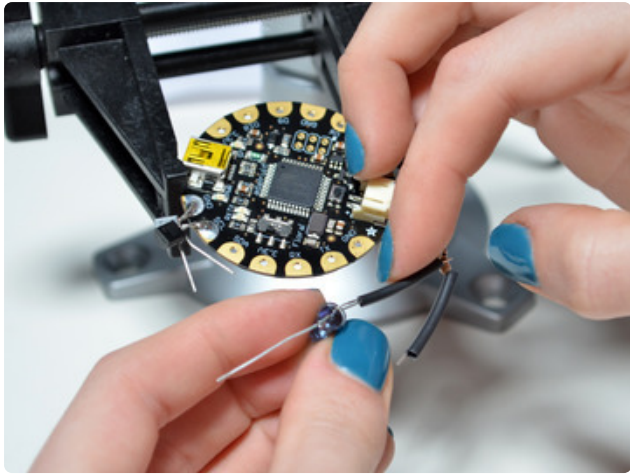


Add heat shrink tubing to the resistor leads. Next we'll install the IR LEDs between the transistors and resistors!

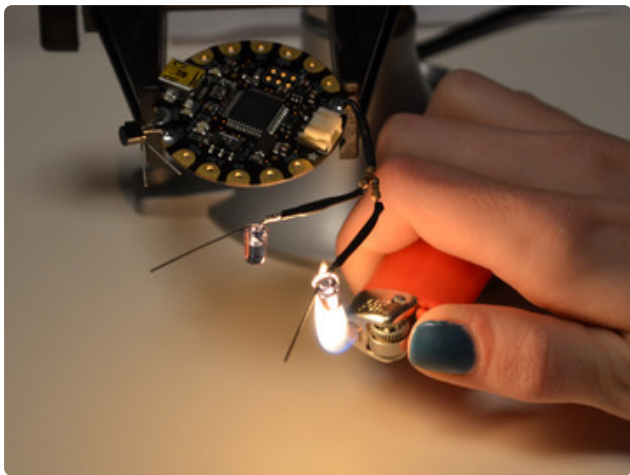
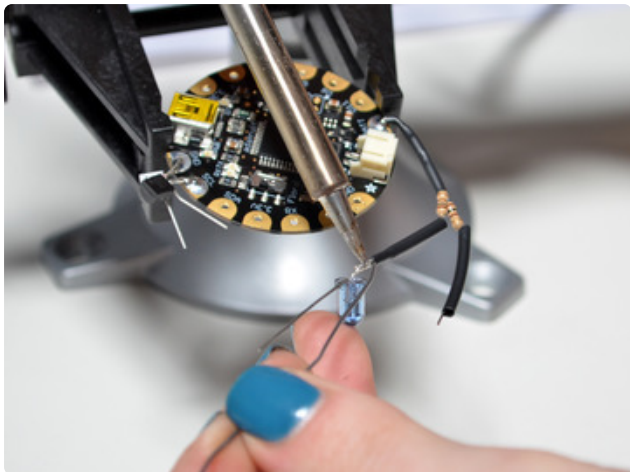
LEDs



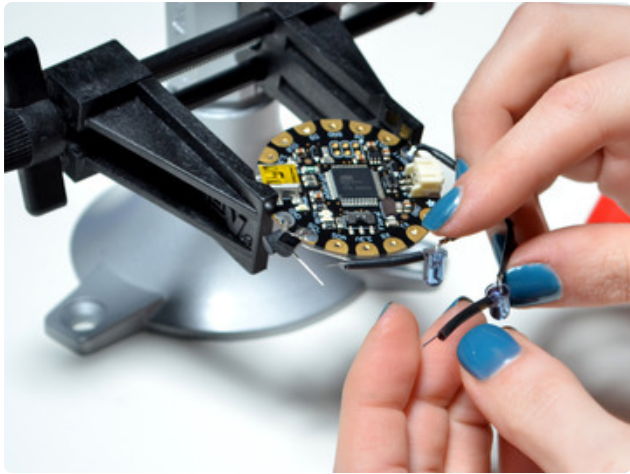
LEDs have polarity, so it's important to install them the correct way. The positive leg is longer and is on the right in this photo (top LED). Splay the leads of the IR LEDs out like the bottom LED in this photo, taking care to keep the positive (+) legs facing to the right, so you remember which is which.



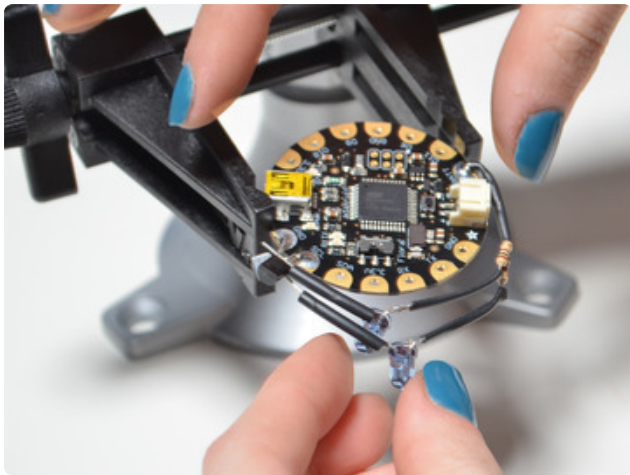
Insert the positive leg of one IR LED into the heatshrink tubing covering one of the resistor legs. When you're wearing the Flora TV-B-Gone, the LEDs should point outward toward any TVs, so make sure it's pointing that way first, then solder the leg of the LED to the leg of the resistor.



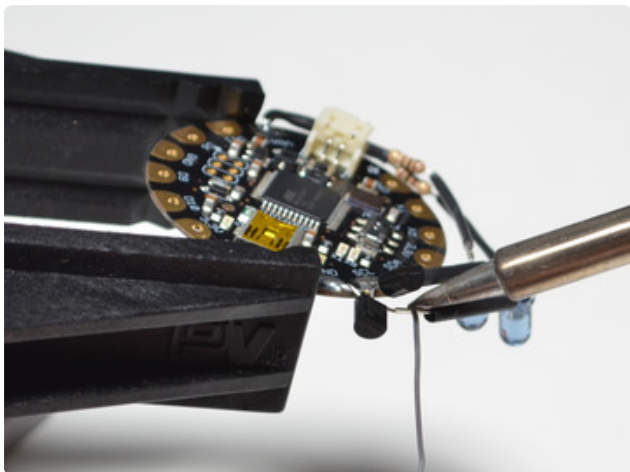
Repeat with the other LED. Now each LED's positive leg is connected to a resistor. Shrink the heat shrink tubing with a lighter or heat gun.



Slide a piece of heat shrink tubing over each LED's negative (-) leg.



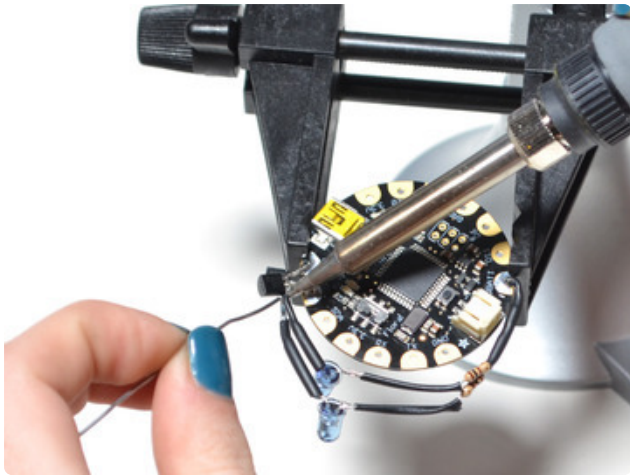
Connect each negative (-) LED leg to a transistor leg in the same manner as in the last step.



Solder one of the LED-transistor connections.



Cut the other LED leg just a tiny bit shorter so the two LEDs are slightly offset. Solder this LED leg to the remaining transistor leg.





Now this part of the circuit is complete!
Each transistor drives one LED/resistor set.
Heat the remaining heat shrink tubing.



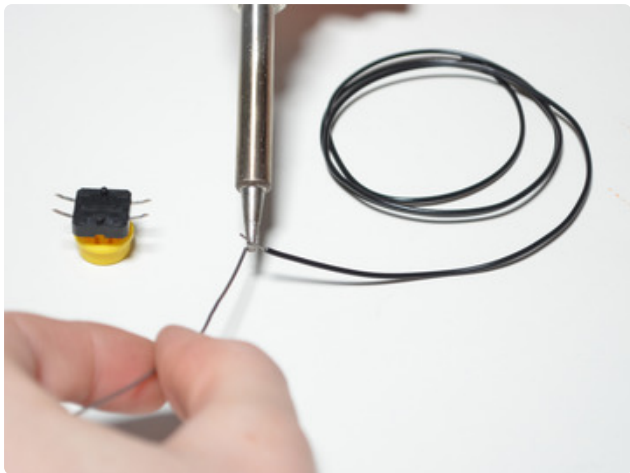
Pushbutton



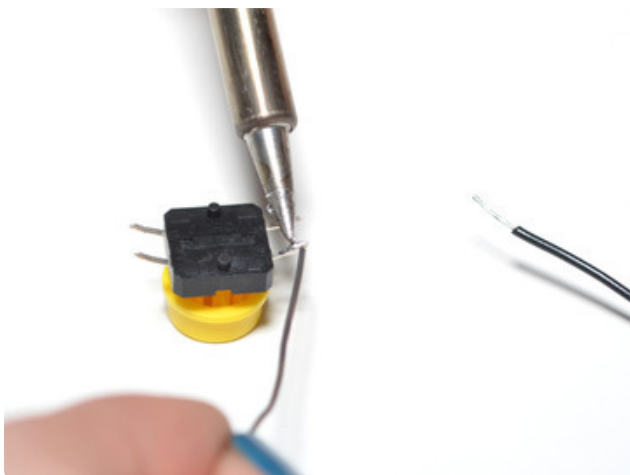
Use a colorful pushbutton to activate your
TV-B-Gone! This yellow switch makes a
nice center in a flower motif brooch. Use
pliers to flatten the legs of the button.



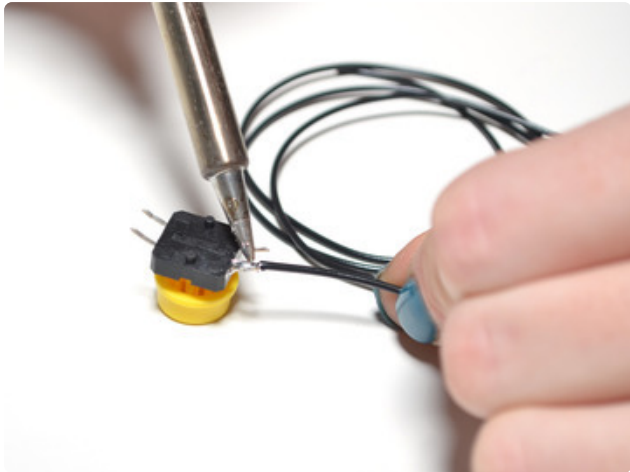
The base of the button should sit flat as shown.



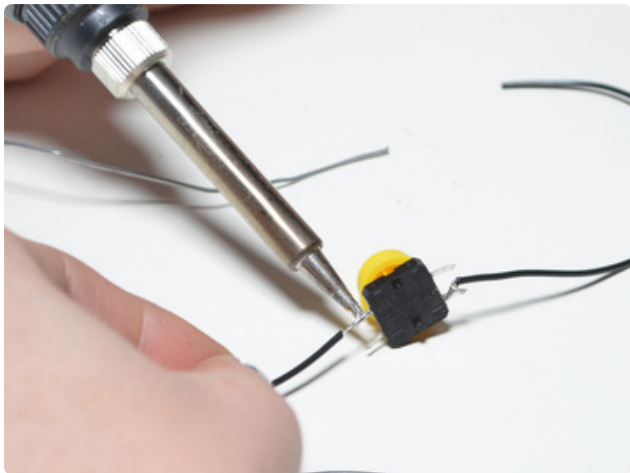
Next we'll connect some wire leads to the pushbutton. Use wire strippers to remove the insulation from the end of some hookup wire. Apply a small amount of solder to this wire end-- this is called "tinning" the wire.



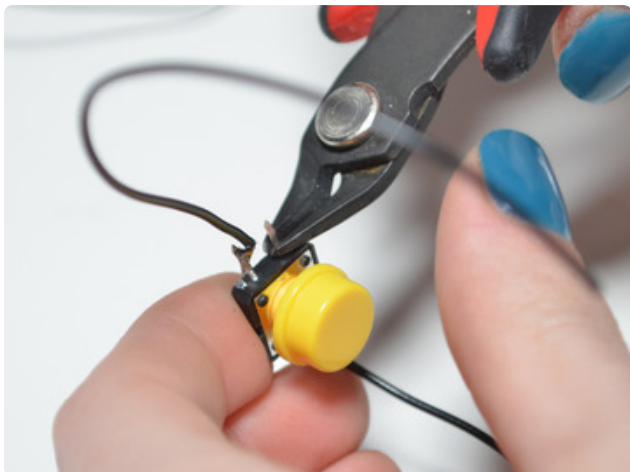
Also tin one of the legs on the pushbutton.



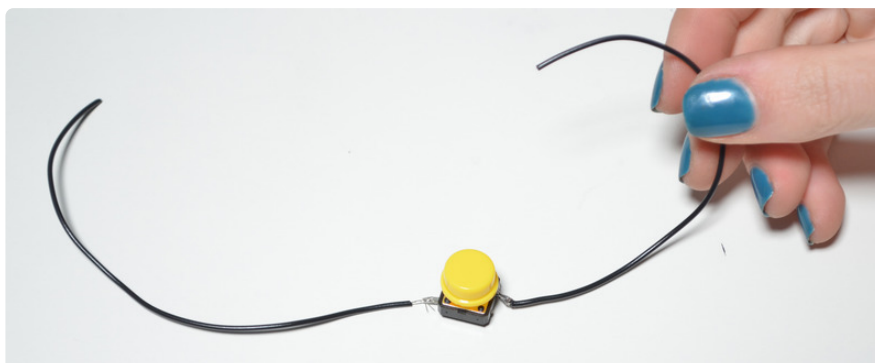
Since both the wire and pushbutton leg now already have solder on them, you can hold them together and reheat the solder. Apply the soldering iron until solder flows between the two, then remove the iron and allow the joint to cool.



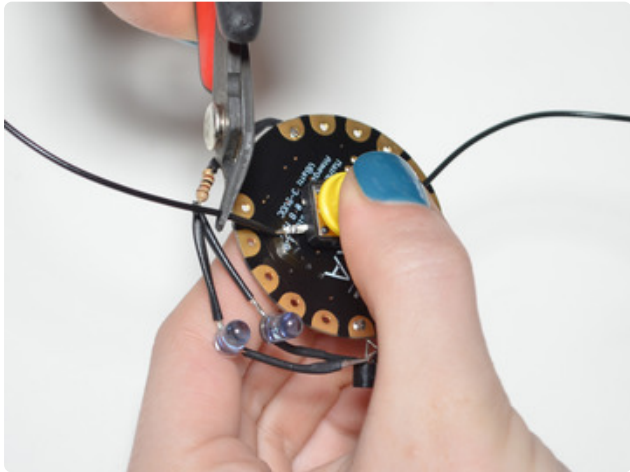
Affix another wire (using the method above) to a diagonally opposite leg on the pushbutton.



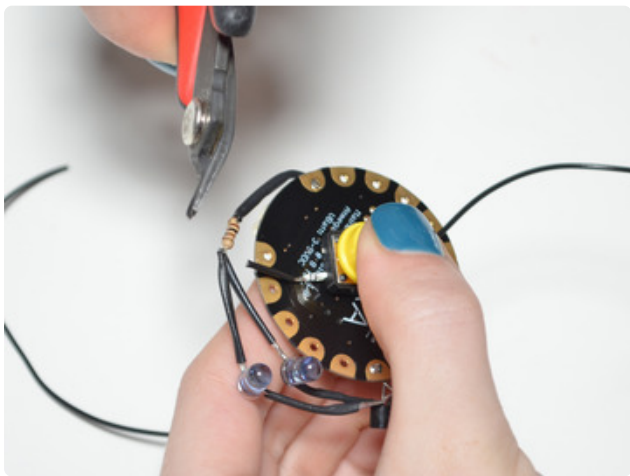
Clip off the unused legs from the pushbutton.



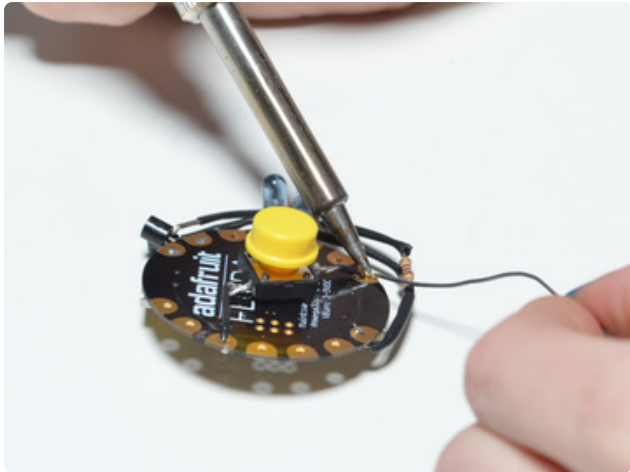
Congrats, your pushbutton is prepped! Now it's time to attach it to the Flora.



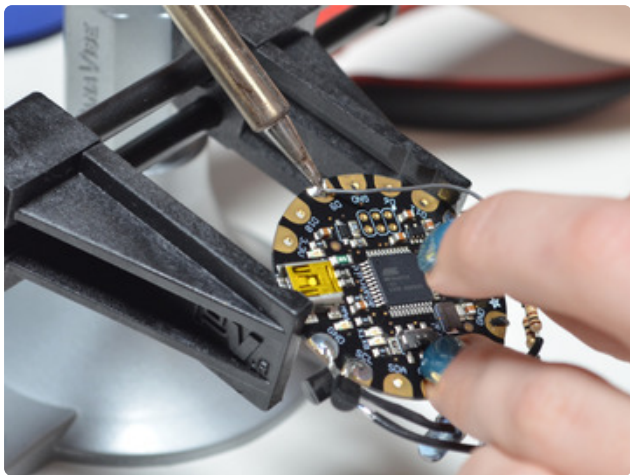
Place the button in the center of the back of the Flora, with the wire leads pointing straight out. Trim the wire leads so that they only stick out past the edge of the Flora board by about 1/4 inch.



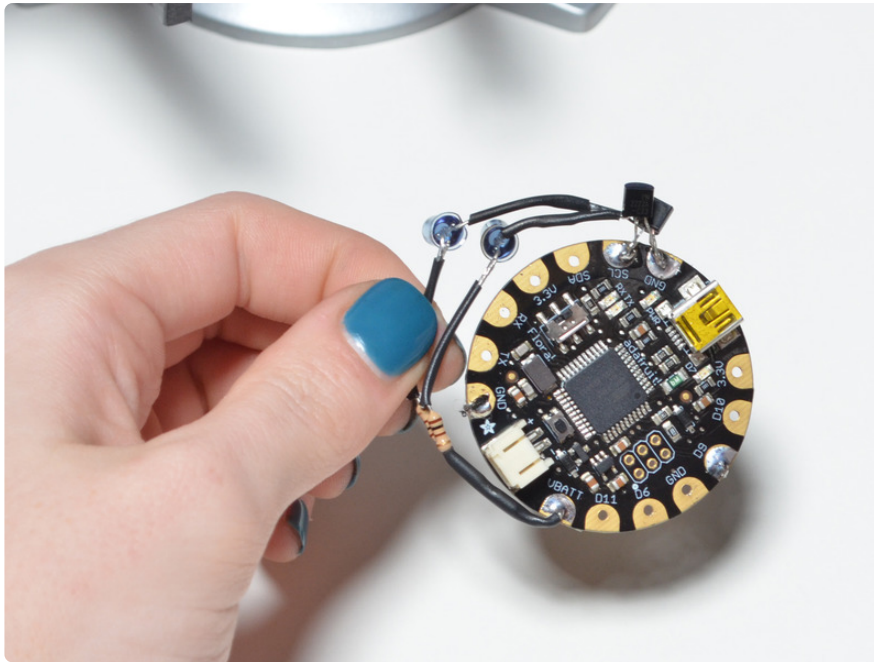
Use wire strippers to remove the insulation from the ends of the button leads. Now you'll be able to connect the button two opposite holes on the Flora.



Insert one button wire into the hole D9 on the Flora, and the other button wire into the hole marked GND. There are multiple grounds on Flora, so pick the one that is most opposite D9, so that the two wires can better hold the pushbutton in place.

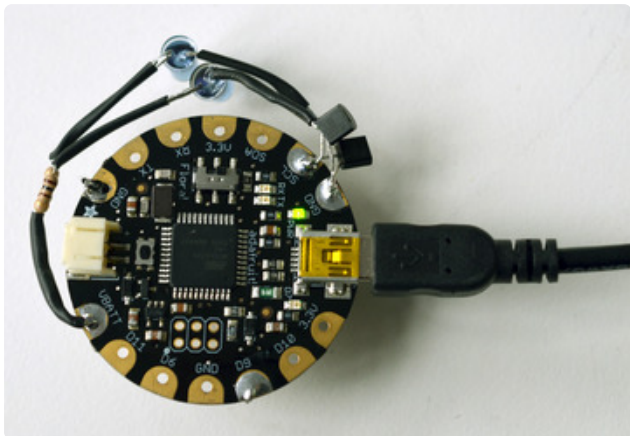


You can solder these wires from either side of the board.



Congrats, you're done with the wiring! Next we'll program and power it up!

Program it

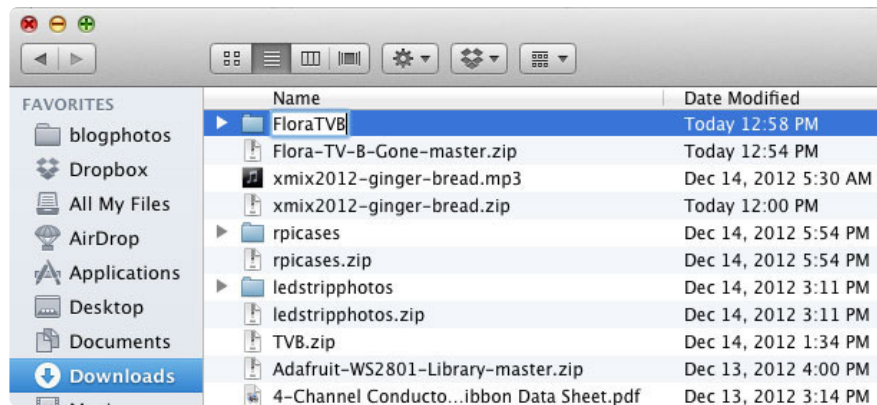


Connect your Flora to your computer with a mini USB cable. Be sure your battery is either unplugged or that the Flora's onboard power switch is set to off.

**Flora TV-B-Gone Arduino code from
GitHub**

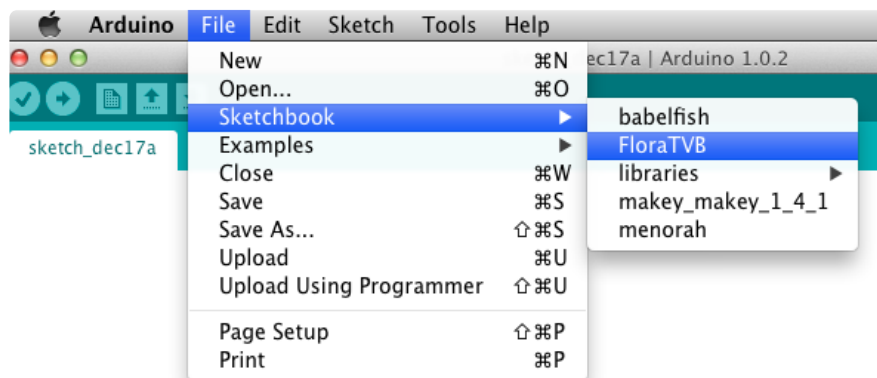
<https://adafru.it/19Bm>

To download the [Flora TV-B-Gone software from Github \(https://adafru.it/19Bn\)](https://adafru.it/19Bn), click the blue button above.

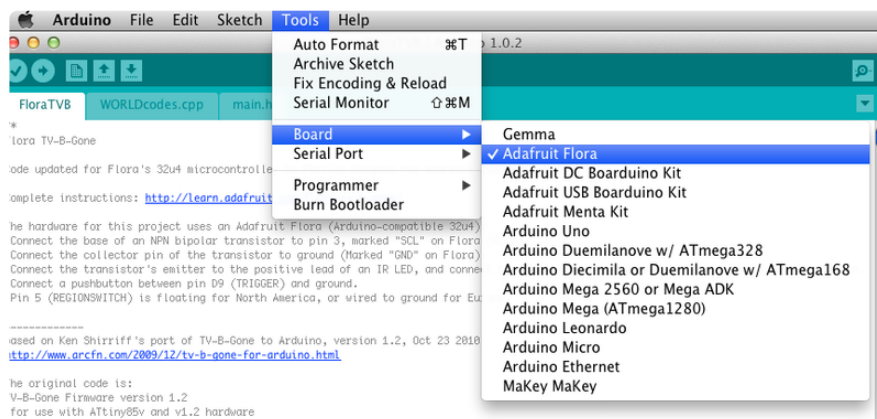


Extract the zip file and rename the resulting folder "Flora_TV_B_Gone"

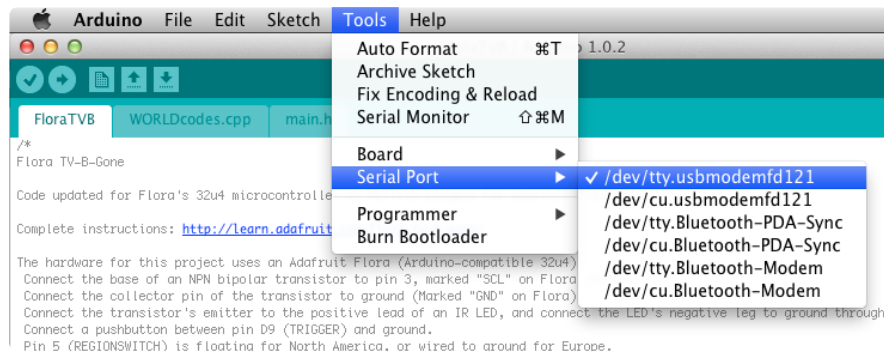
Move the folder into your Arduino sketches folder, which is located in your Documents folder by default on OS X. This is where your Arduino software looks for programs to edit and upload.



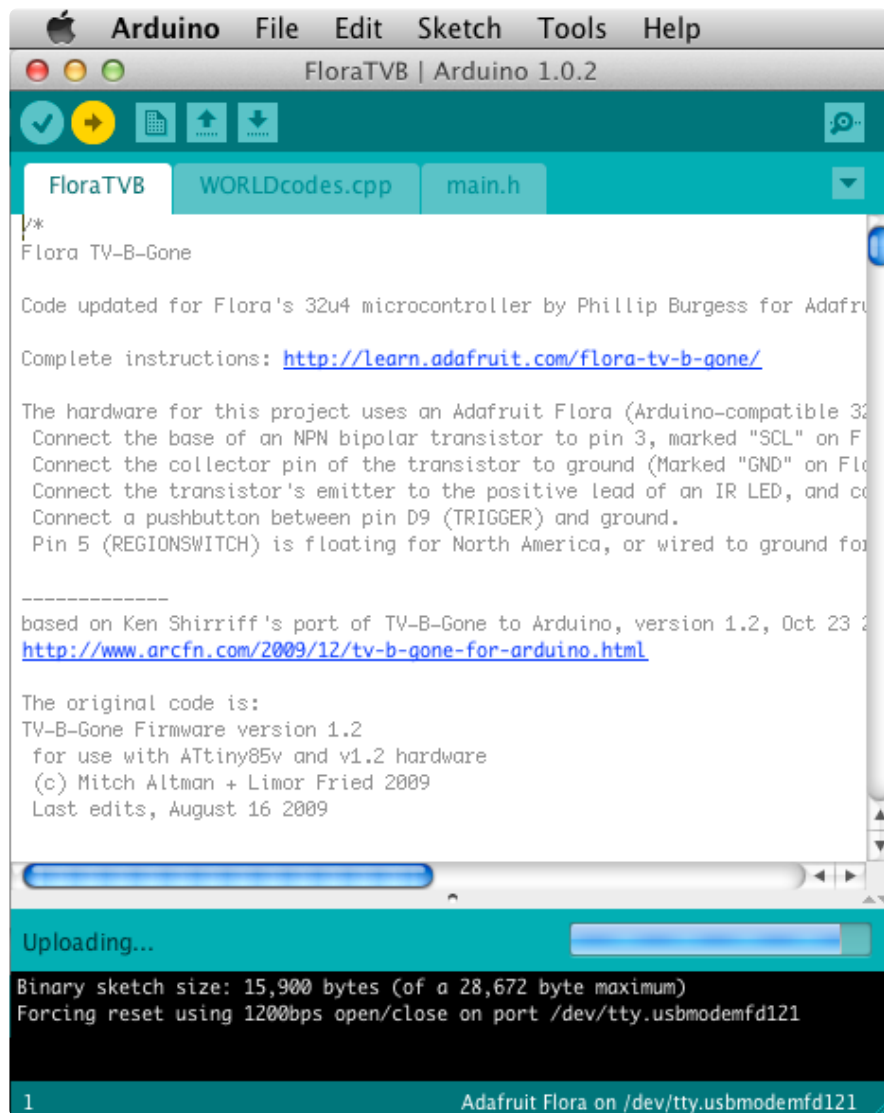
Open the Arduino IDE (don't have it? check out our [Getting Started with Flora guide \(https://adafru.it/aSZ\)](https://adafru.it/aSZ)), and navigate to File-->Sketchbook-->FloraTVB. This will open the program so you can load it onto your Flora.



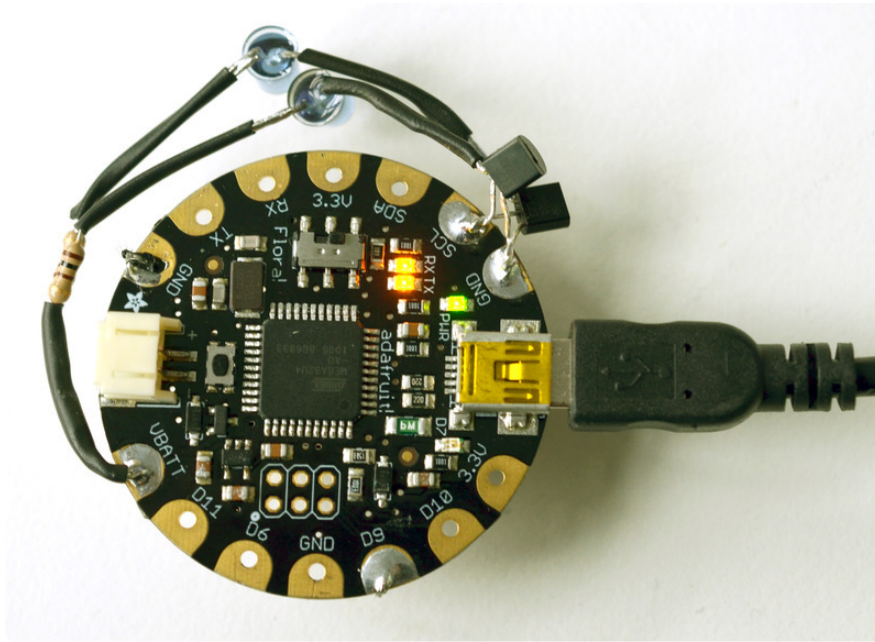
In Tools-->Board, you should have "Adafruit Flora" selected.



Also under Tools, be sure you have selected the correct serial port. Flora appears similar to the image above.



Click the Upload button (shown in yellow above) to program your Flora to execute the TV-B-Gone code.

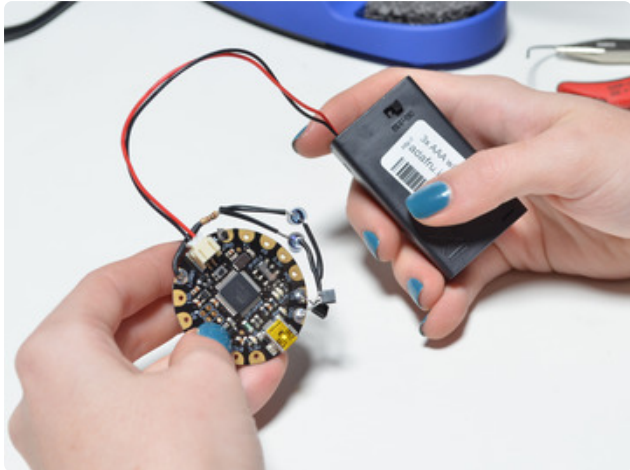


The yellow lights on the Flora board should flash as the program uploads.

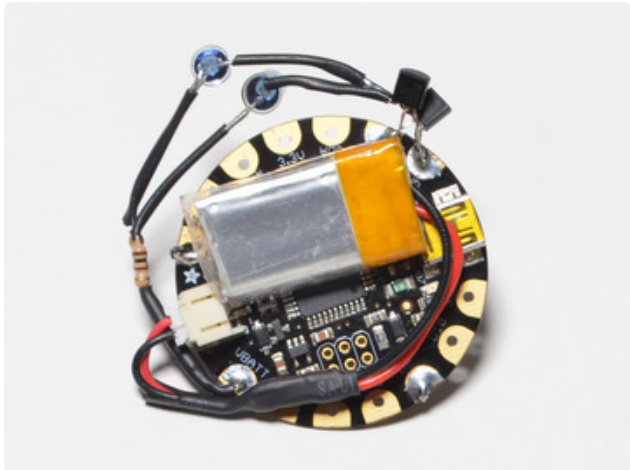


After the program is done uploading, you can press the pushbutton to test the circuit. The red LED connected to D7 should flash, and so should your IR LEDs. Since the human eye can't see infrared light unaided, you can use a digital camera to see if the LEDs are lighting up. The sensors in digital cameras are sensitive to IR and display it as a sort of purple. If everything's working properly, you can now disconnect your USB cable.

Power



The easiest and safest way to power your Flora is with a 3xAAA battery pack. You can use alkaline or rechargeable batteries.



If you are more experienced, you can also use a lithium polymer rechargeable battery, which require a separate charger and can be hazardous if shorted, bent, crushed, or punctured.

This tiny lipoly can be wrapped in tape and double-stuck directly to the Flora board.



Now the circuit is functionally complete! Next we'll disguise the circuit as a fashion accessory.

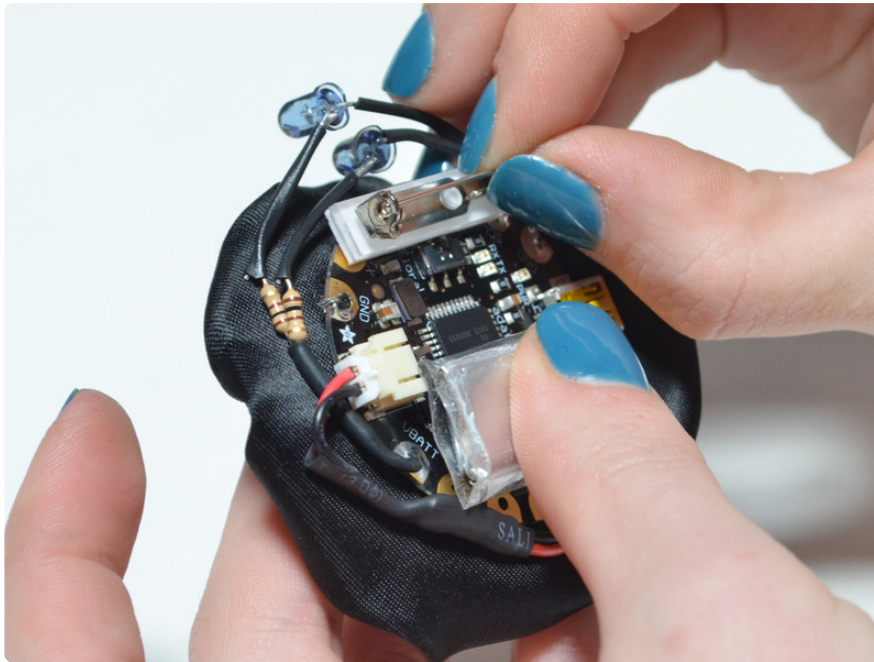
Fabric pinwheel



The functional circuit is quite attractive as-is, but it's pretty conspicuous. You can dress it up however you like! Below is just one example.

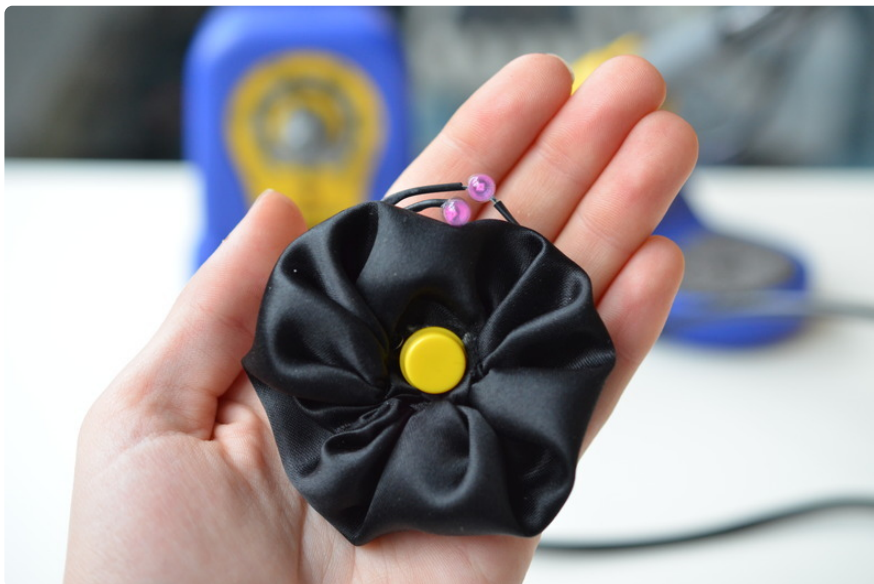


You can make a fabric yoyo and install it right over the pushbutton in the center of the Flora. There are dozens of [fabric yoyo tutorials](https://adafru.it/aTJ) (<https://adafru.it/aTJ>) online!



Apply an adhesive pinback to the front side of the Flora board. Be careful to avoid obscuring the Flora's on/off switch.

Wear it





This Flora TV-B-Gone is made to look like a black flower with a yellow center. It matches most of my black clothing, but make yours your own by changing up the design! Just make sure the IR LEDs poke out above or through any fabric accents.



Tapping the pushbutton activates the TV-B-Gone sequence, which will flash the IR LEDs in sequence to power down many brands of television sets. Infrared light is not visible to the human eye, so you can be super stealthy.

