Introduction

Welcome to CircuitMess Clockstar build guide!

By following this build guide, you'll learn how to assemble your new DIY smartwatch.

With Clockstar, you'll learn about AI and machine learning, edge computing, Bluetooth and wireless communication, gyroscopes, accelerometers, motion detection, and much more.

Age group

Like it says on the box, Clockstar is designed for anyone who's at least **11 years old**.

You should approach some of the assembly steps carefully, so make sure to have an adult

jump in if you need some help with soldering or tightening the bolts later in the process. It's okay to ask for help.

Don't worry, though! We'll go through the assembly step by step and provide some useful tips along the way. We'll give you a heads-up if there's something important to keep in mind while assembling.

Assembly time

It should take you approximately **1 hour** to fully assemble your Clockstar.

Of course, the assembly time depends on your previous knowledge and experience. If you don't have any experience yet, don't worry! It just might take you a little longer to get into the groove and overcome the challenges in the beginning.

Skills

You don't need to have any specific skills before getting your hands dirty with this DIY project.

The main objective here is to have fun and learn something new.

So hold on tight, read all the instructions, and get ready to have fun! This is a great opportunity and your first step in your big engineering career.

Learning with Clockstar

As previously mentioned, Clockstar will teach you a few useful things in the following few hours.

Here's what you'll learn:

- How to solder and assemble your very own electronic device
- Wearable technology
- Bluetooth and wireless communication
- Gyroscopes, accelerometers, and motion detection
- Coding in C++ and in CircuitBlocks
- AI and machine learning

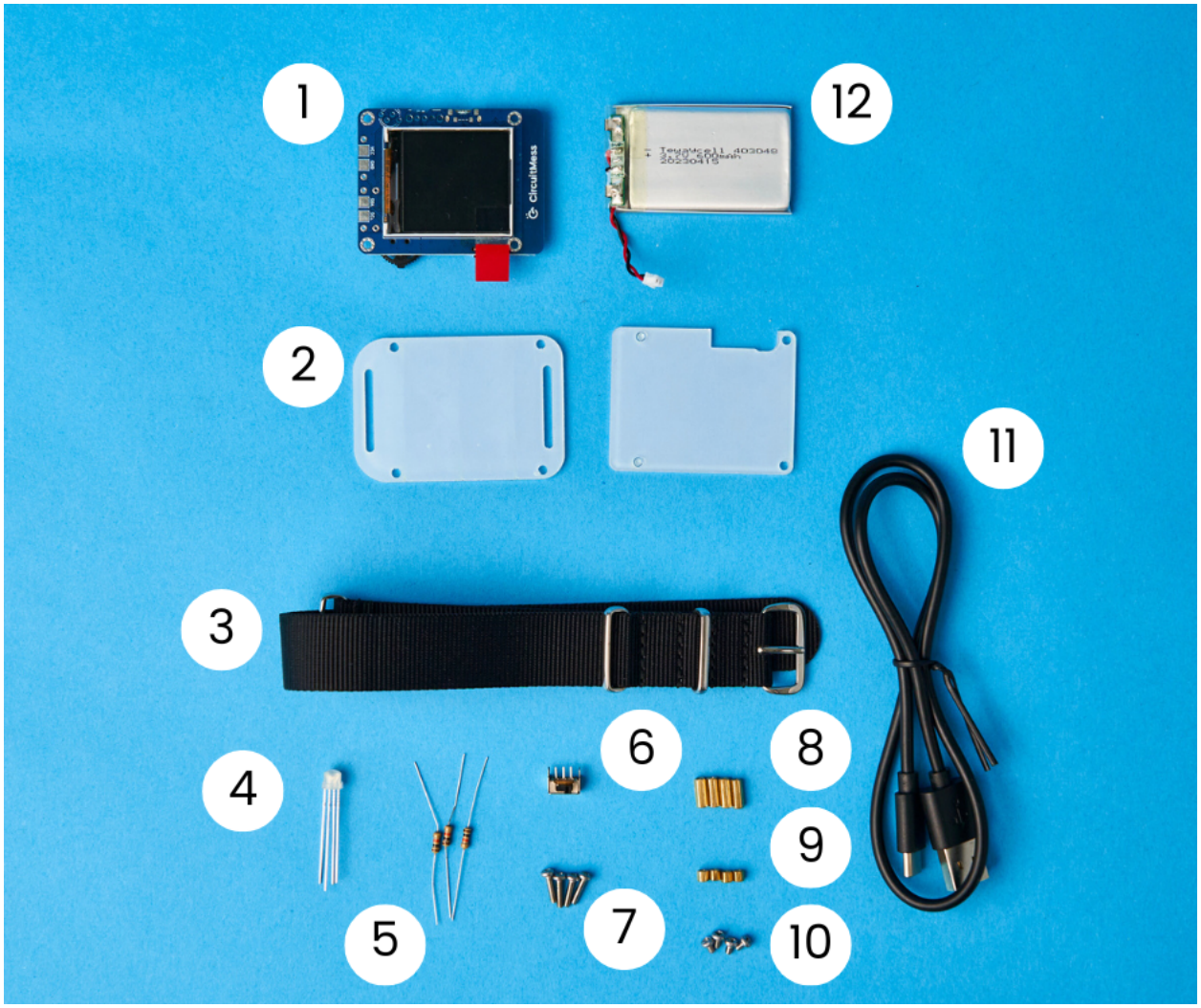
- Edge computing
- Watch interface design

What's in the box?

Let's meet all the components that arrived in the box!

Open your CircuitPet box and check if you have all the components. Make sure to lay it all on a clean surface where you'll inspect if everything is there according to the photo and the list below.

In case something is missing, please contact us at contact@circuitmess.com.
Send us a photo of everything that came in the box, and we'll get back to you as soon as possible to resolve the issue.



Here's the list of components:

1. Main circuit board
2. Acrylic casings
3. Watch strap
4. RGB LED diode
5. Resistors
6. Switch
7. Long metal screws (4)
8. Long spacers (4)
9. Small spacers (4)
10. Small metal screws (4)
11. USB C cable
12. Li-Po battery

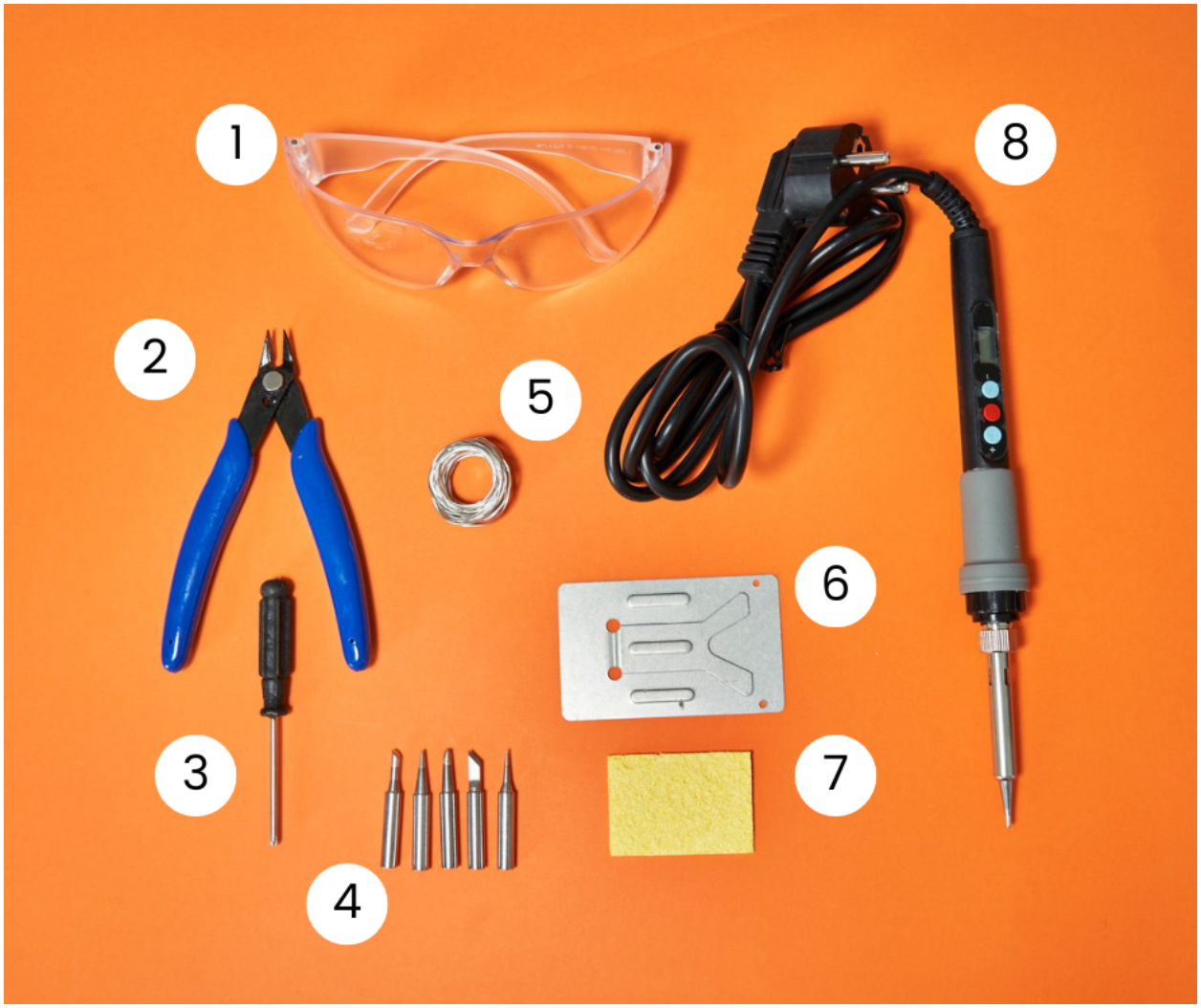
Meet the tools

In this chapter, we'll explain what tools you'll need to assemble your Clockstar.

If you have your CircuitMess Tools pack in front of you, you should be all set!

In case you got the Clockstar kit without the Tools pack, this is a good time to borrow some of the tools or purchase them.

The tools required are essential whenever you assemble, fix, or modify electronic devices and are the tools of the trade for every maker/hardware hacker/modder/electrician.



1. Glasses
2. Cutter pliers
3. Small screwdriver
4. Replacement soldering tips
5. Lead-free solder
6. Soldering stand
7. Sponge
8. Soldering iron

Soldering iron

This is the most important tool in a maker’s arsenal.

For Clockstar's assembly, any entry-level soldering iron will suffice.

If you plan to dive into the world of DIY projects, you should consider getting a more expensive one with more features. Many soldering irons with interchangeable tips can be particularly useful when working with much smaller components.

In the next chapter, you'll find the instructions on how to properly solder and take care of your soldering iron.

You'll also need a soldering iron stand and a small reel of rosin-cored solder.

Soldering sponge

Make sure your soldering toolkit has a sponge that can be used for wiping your soldering iron clean. Make sure that the sponge isn't dripping wet or bone dry - it should be damp.

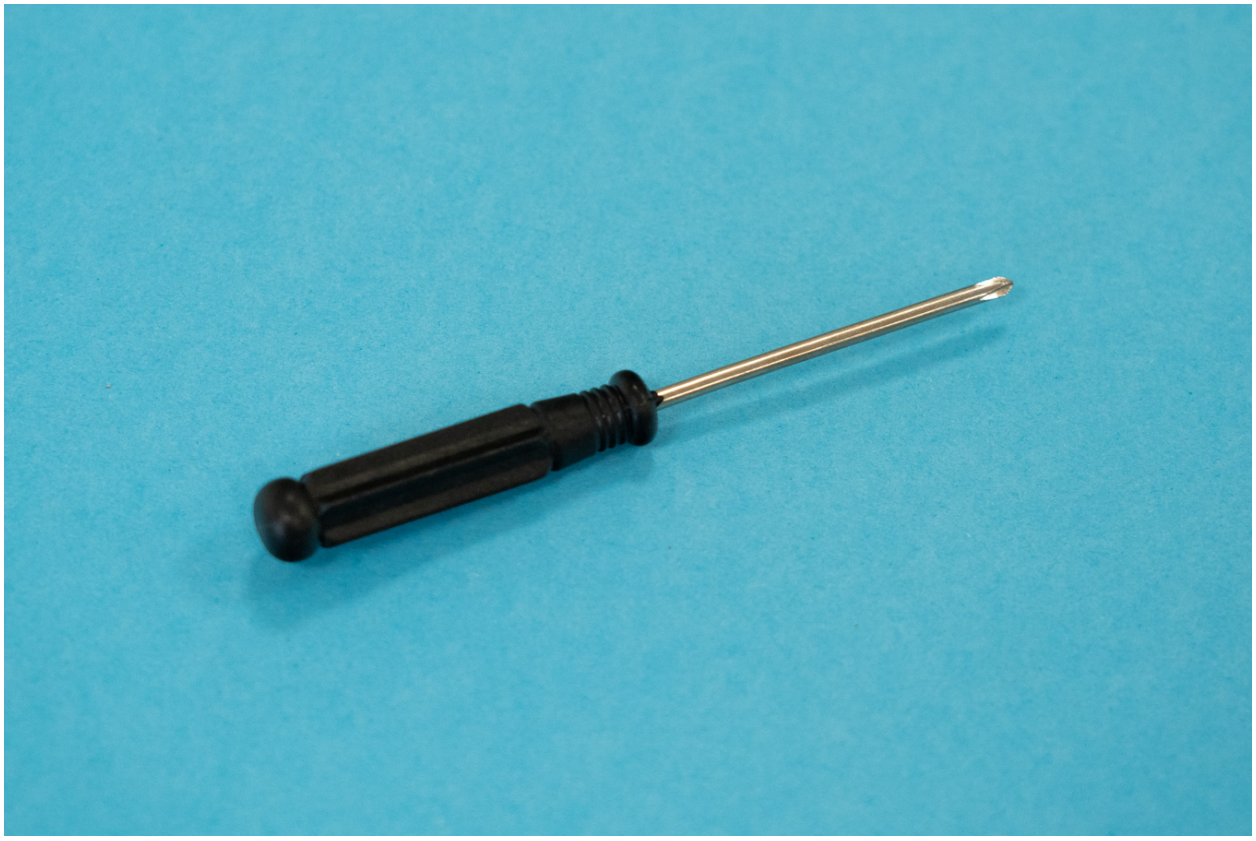
Diagonal cutter pliers

We prefer this type shown in the picture (Plato, model 170), but any other type will do.

Standard cross screwdriver

You'll need this cross (Phillips) screwdriver to assemble the casing.

A standard 2.0mm cross screwdriver should do the trick.



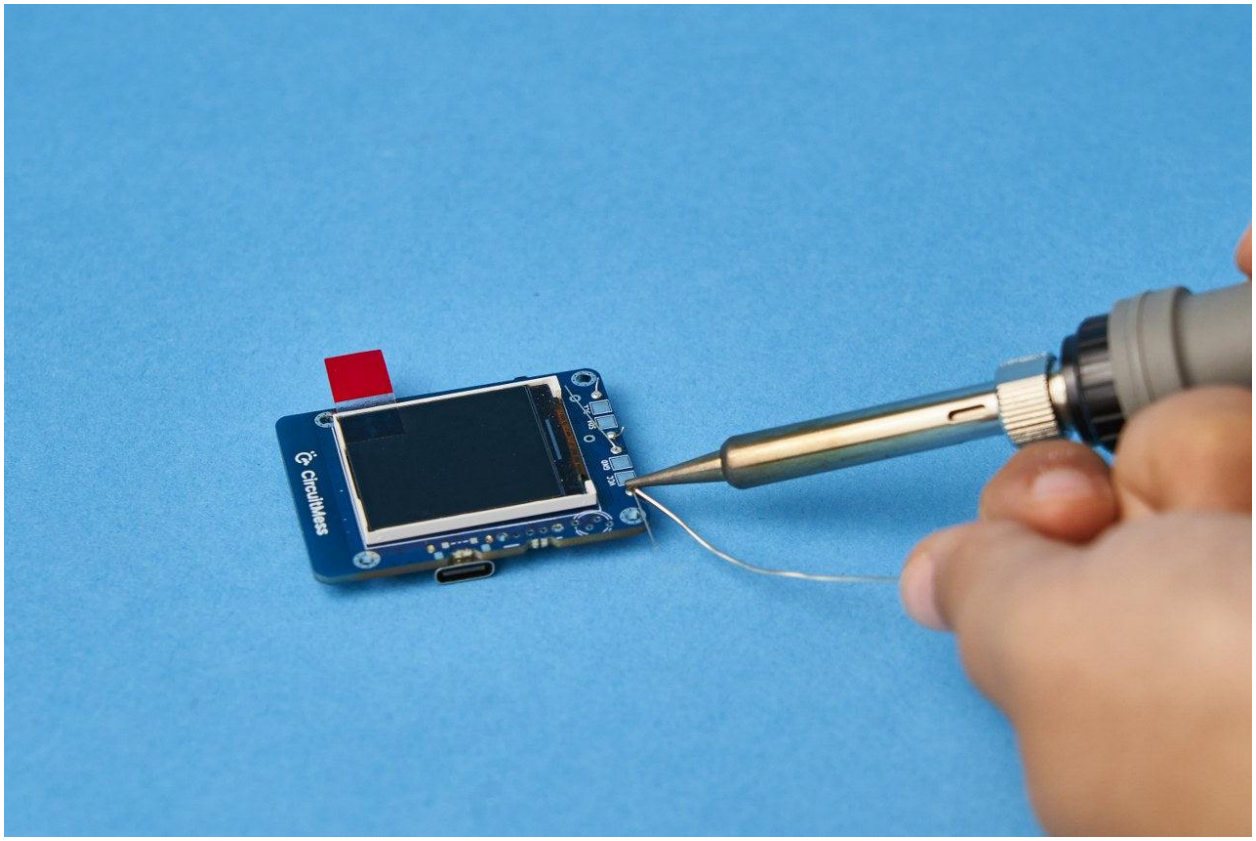
Learn to solder

The first thing that you'll do as a part of the Clockstar assembly process is soldering!

Have you ever done that before? If your answer is no, we suggest you look at the following few links, where you'll find useful tutorials and blogs about soldering. It will only take you 10 minutes to get into the zone and understand how it's done. Here are the links:

- Adafruit's video tutorial featuring Collin Cunningham - A tutorial featuring Collin Cunningham, a super charismatic electronics guru.
- Adafruit's standard soldering tutorial - A great and thorough video tutorial. An absolute must-read, even if you know how to solder. Make sure to check the "common soldering mistakes" section at the end.
- Sparkfun's video soldering tutorial - Another well-made how-to-solder video tutorial.

- Sparkfun’s standard soldering tutorial - A detailed tutorial made by Sparkfun.



There are several rules of soldering that everybody, regardless of their skill level, should follow at all times.

- Never inhale the dust and the fumes that can be produced by the soldering iron! These can be hazardous, so please don't inhale them.

- Never touch the tip of the soldering iron! Even if the soldering iron is turned off or completely disconnected from the power source, there is still a possibility that it’s very hot and, therefore, can cause very uncomfortable pain if touched. Always keep it facing away from your hands. If you’re finished with the soldering iron, unplug it from the power source and leave
it to cool off for at least five minutes before putting it back in the box.

- Clean the soldering iron! The sponge is your best friend while soldering. Make sure to use it often and clean your soldering iron if you wish to have an easy and simple soldering experience. Carefully hold one part of the sponge with

one hand and wipe the tip of the soldering iron on the other part of the sponge to remove the extra solder. Repeat the process until the tip of the iron is nice and clean from the old solder.

- Check your solder joints twice (at least)! Most of the malfunctions in the world of electronics are due to bad solder joints, so regardless if this is your first or 100th soldering project, always make sure to inspect your joints multiple times before proceeding to the next step.

- Keep the soldering iron on the stand when you're not using it.

- Know how much solder is needed! Make sure to put just enough solder, not too much, and not too little, since both can cause the device to malfunction.

- Don't leave any residual solder on the board! The solder should only be on the parts where the pins connect to the board. Everything else should be clean. Little pieces of solder all over the board are a big no-no!

Now go over these rules a couple of times so you don't forget them!

Here are the pictures that can help you recognize good and bad solder joints:

1

HEAT PART AND PAD

2–3 sec

2

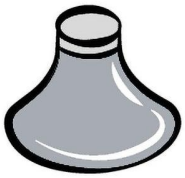
ADD SOLDER

3

CONTINUE HEATING

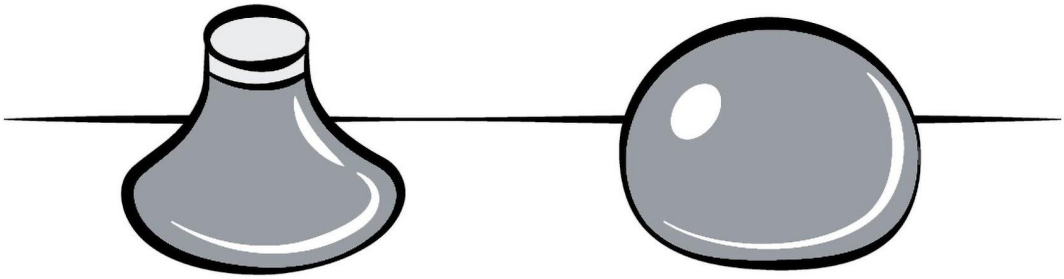
1–2 sec

4



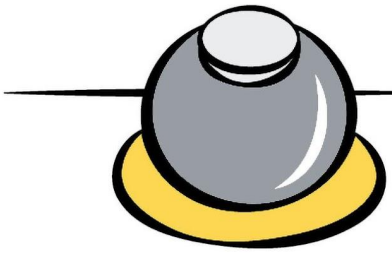
LET COOL

don't blow!

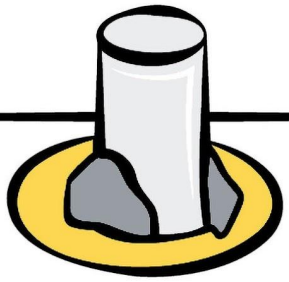


PERFECT

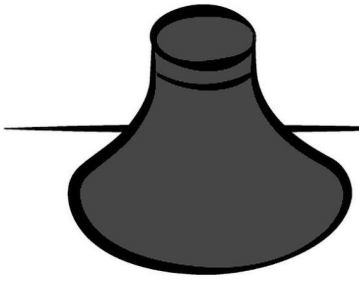
TOO MUCH SOLDER



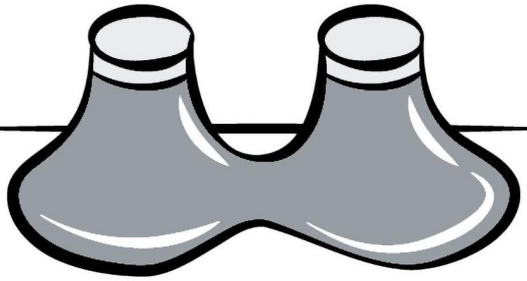
COLD JOINT



NOT ENOUGH SOLDER



TOO MUCH HEAT



SHORT

If you follow these rules, your soldering experience should be easy peasy.

Using the soldering iron

The soldering iron is very easy to use but only when used properly.

If you have purchased the CircuitMess tools pack with your Clockstar kit, you have gotten a the soldering iron with it.

Remember the rules mentioned previously? Good! Let's go over the instructions on how to use the soldering iron now…

If you're using your soldering iron for the first time or need help with cleaning its tip, check our video tutorial.

Soldering iron instructions

The soldering iron is very easy to use but only when used properly.

Step 1 - plug it in

Put the soldering iron on a soldering iron stand, and plug it into a power outlet.

Step 2 - Select the right temperature

The temperature will set to 390 degrees Celsius by turning the soldering iron on.

Step 3 - Don't forget to turn it off when you're finished

We'll tell you when you're done with soldering, and you'll unplug the iron from the power outlet to turn it off.

Please use the metal stand every time you are not using the soldering iron to make sure you don't burn the surface or the circuit board.

Make sure not to touch the soldering iron tip for at least five minutes after you have turned it off.

Solder your Clockstar

Now you know how to solder, let's put it to the test. Ready?

Part one - Soldering the resistors

Before soldering, please check our video tutorial once again to make sure you're doing everything right.

The first components we'll use are the main PCB and resistors.

You will need all three resistors for this part.

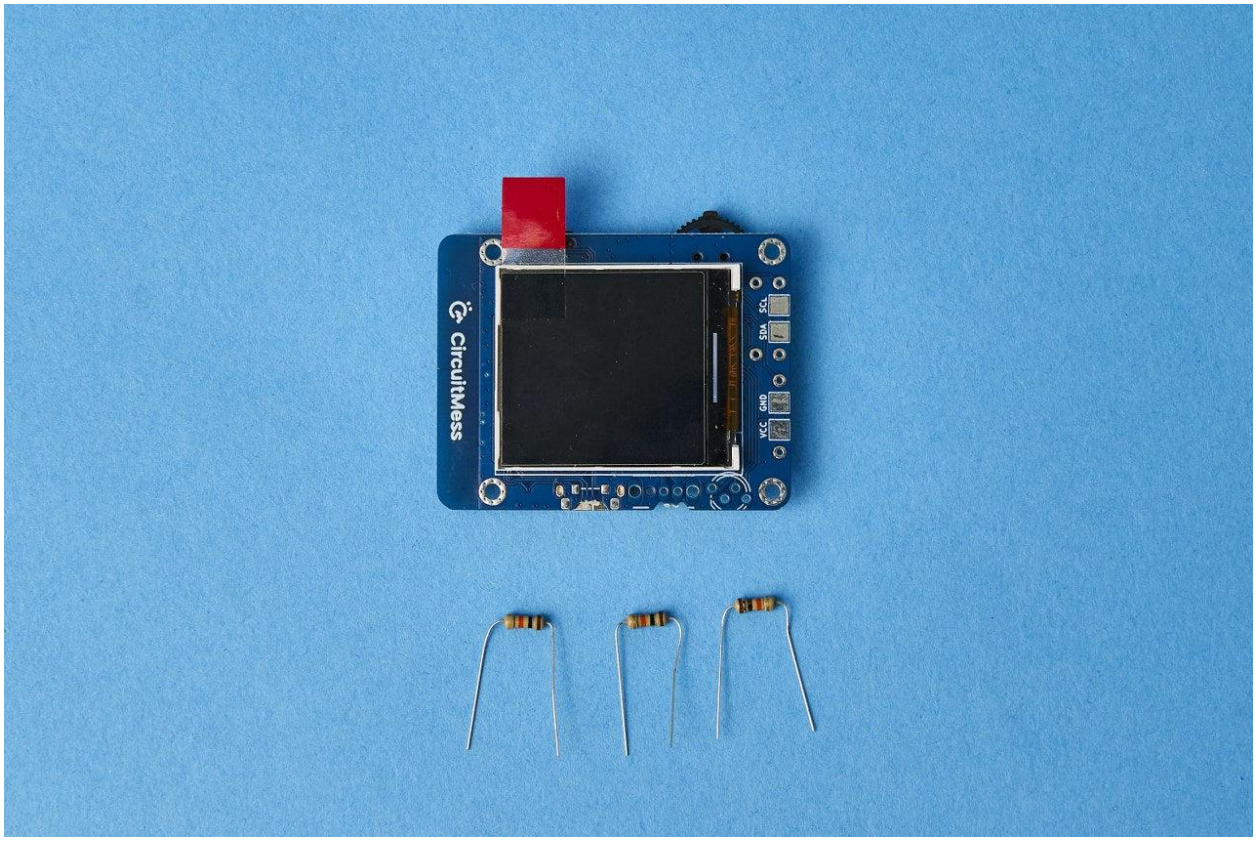
Resistors are the most basic electronic components found in almost every electronic device.

They just modify the flow of electrical energy in their own unique way.

The resistors that you have gotten in your package have a cylindrical shape and two tiny metal legs. We call these legs “component leads”.

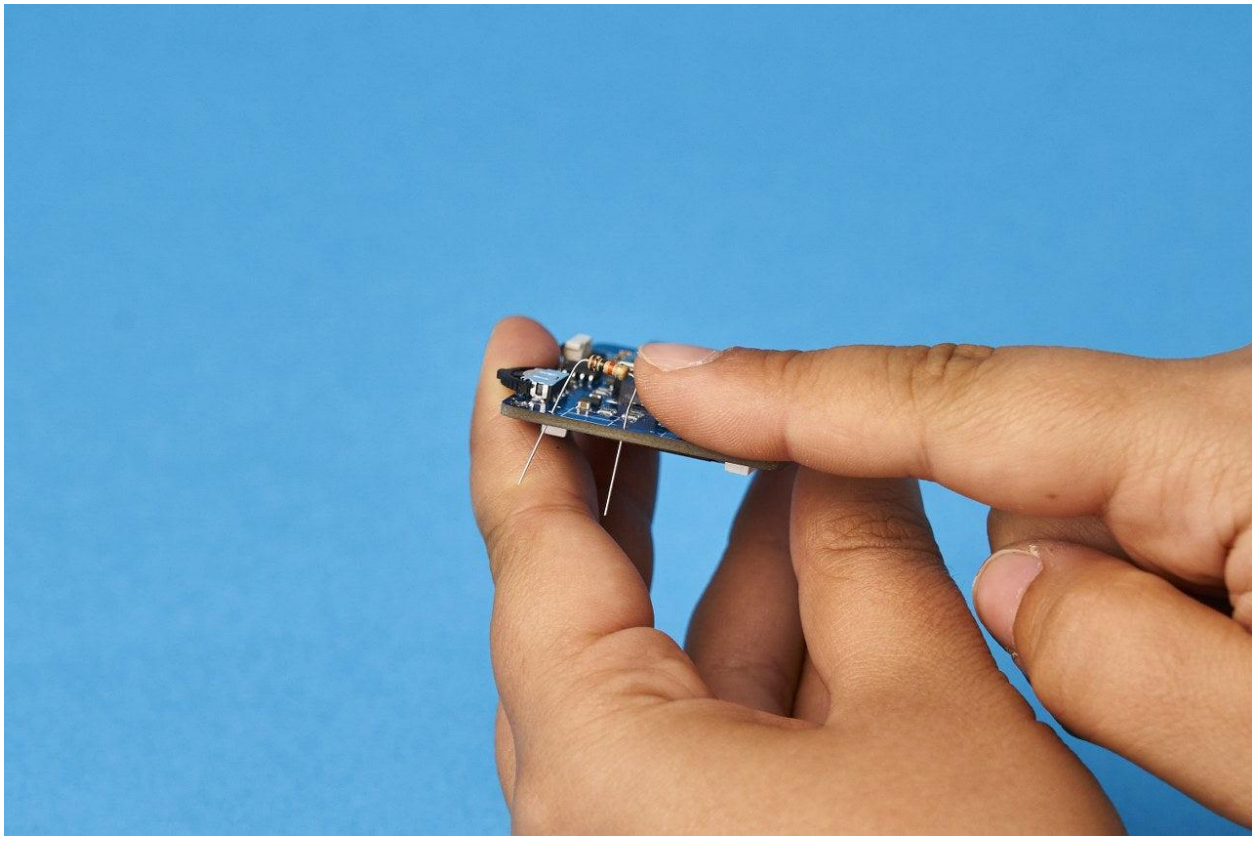
Firstly, you'll have to bend the resistors' legs in the shape of the letter U. Be careful because they break easily!

You can bend them either with your fingers or with needle-nose pliers.

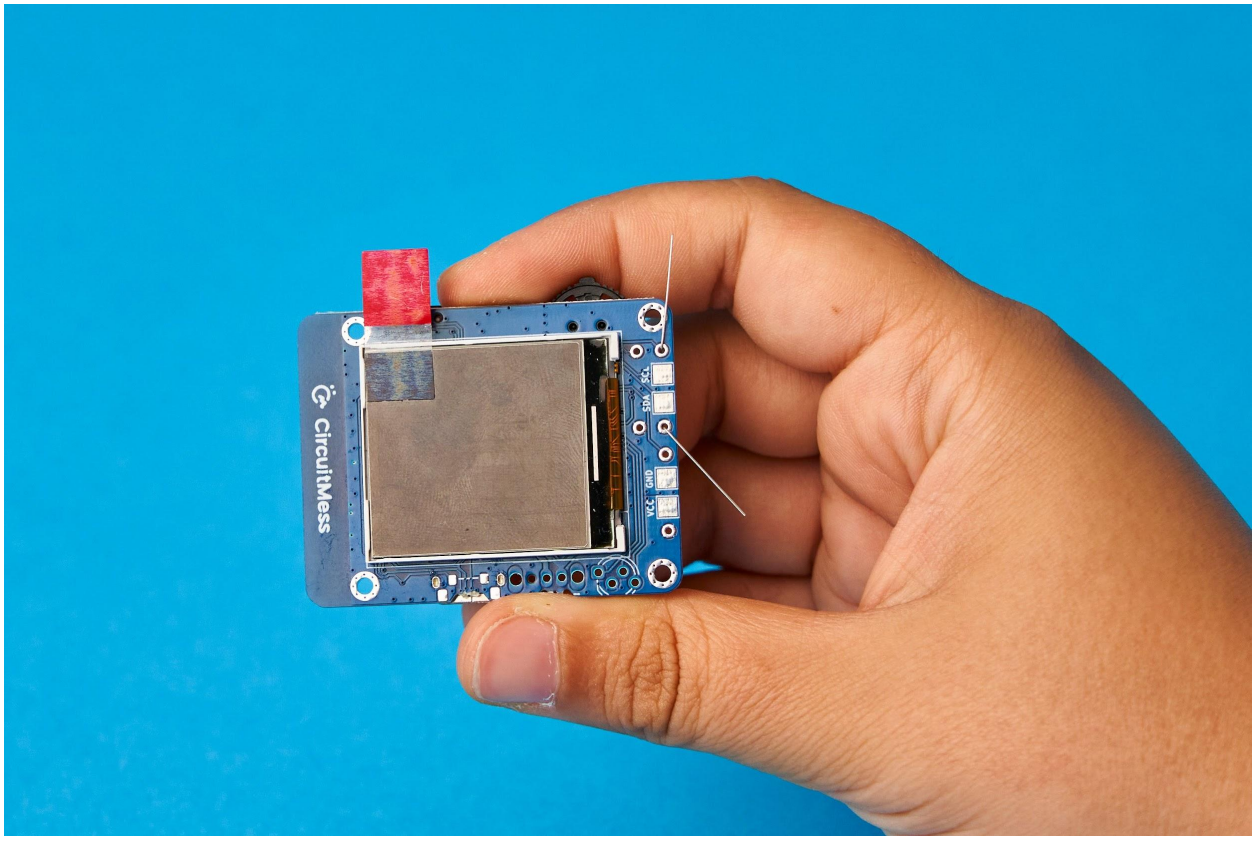


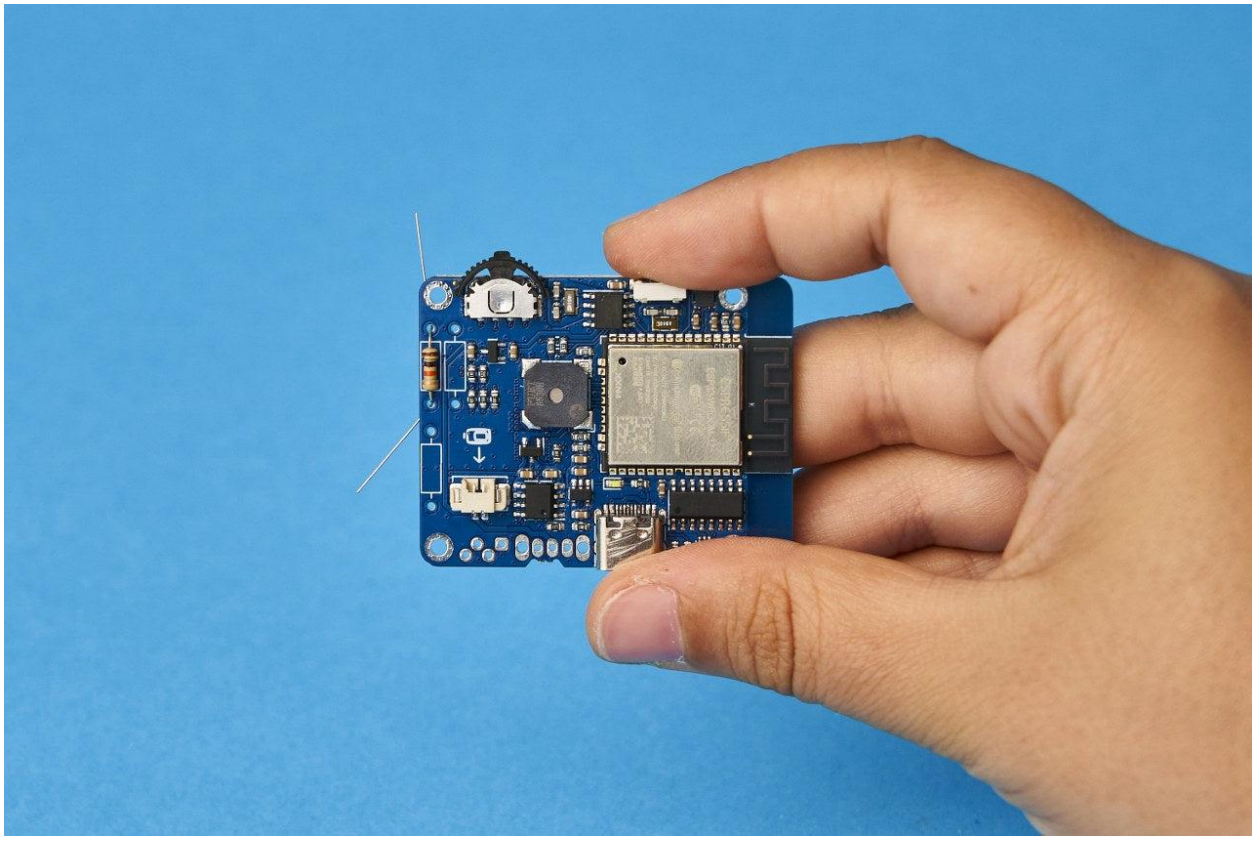
Because all of the resistors in the set have the same resistance, it doesn't matter where you put them.

Take one of them, and place it here:

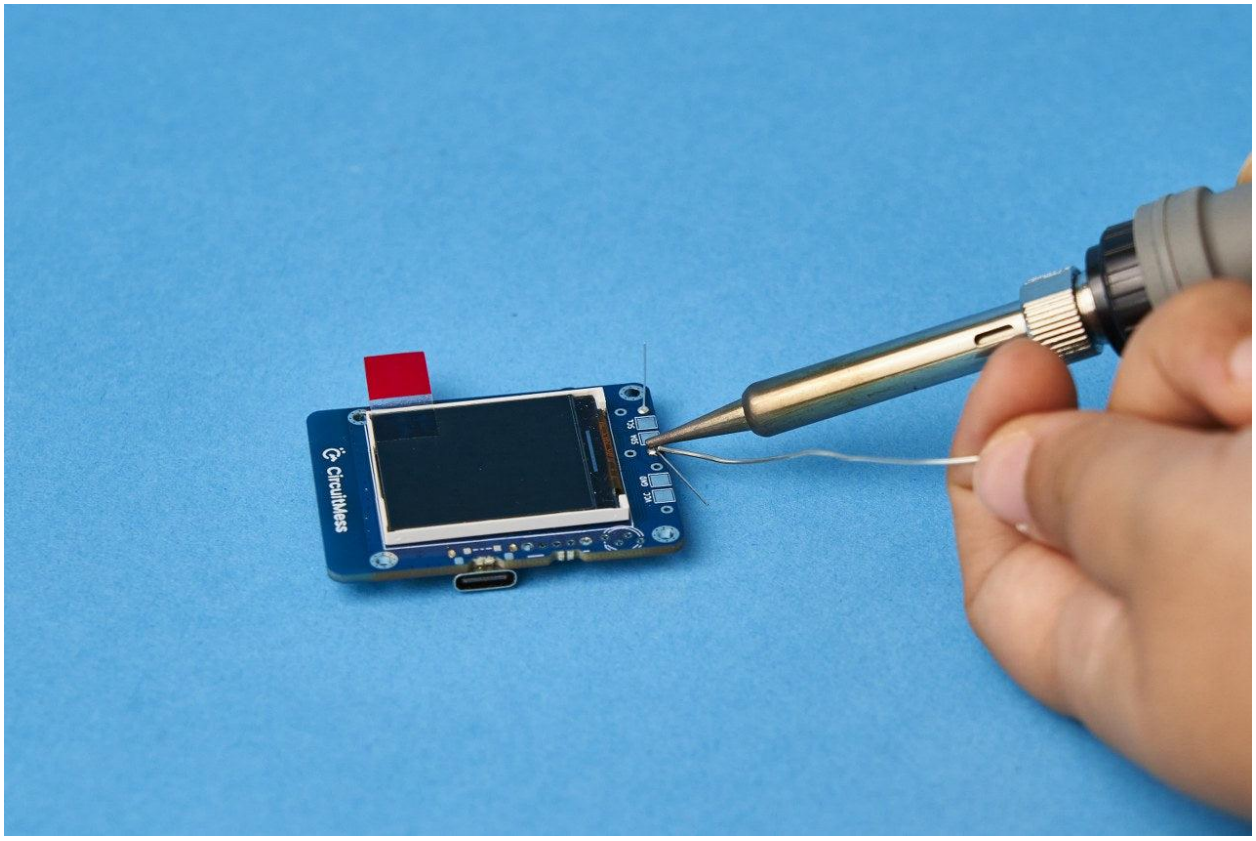


Make sure it's on the right side (the back) so you can solder it on the front.


CircuitMess
SCL
SDA
GND
VCC



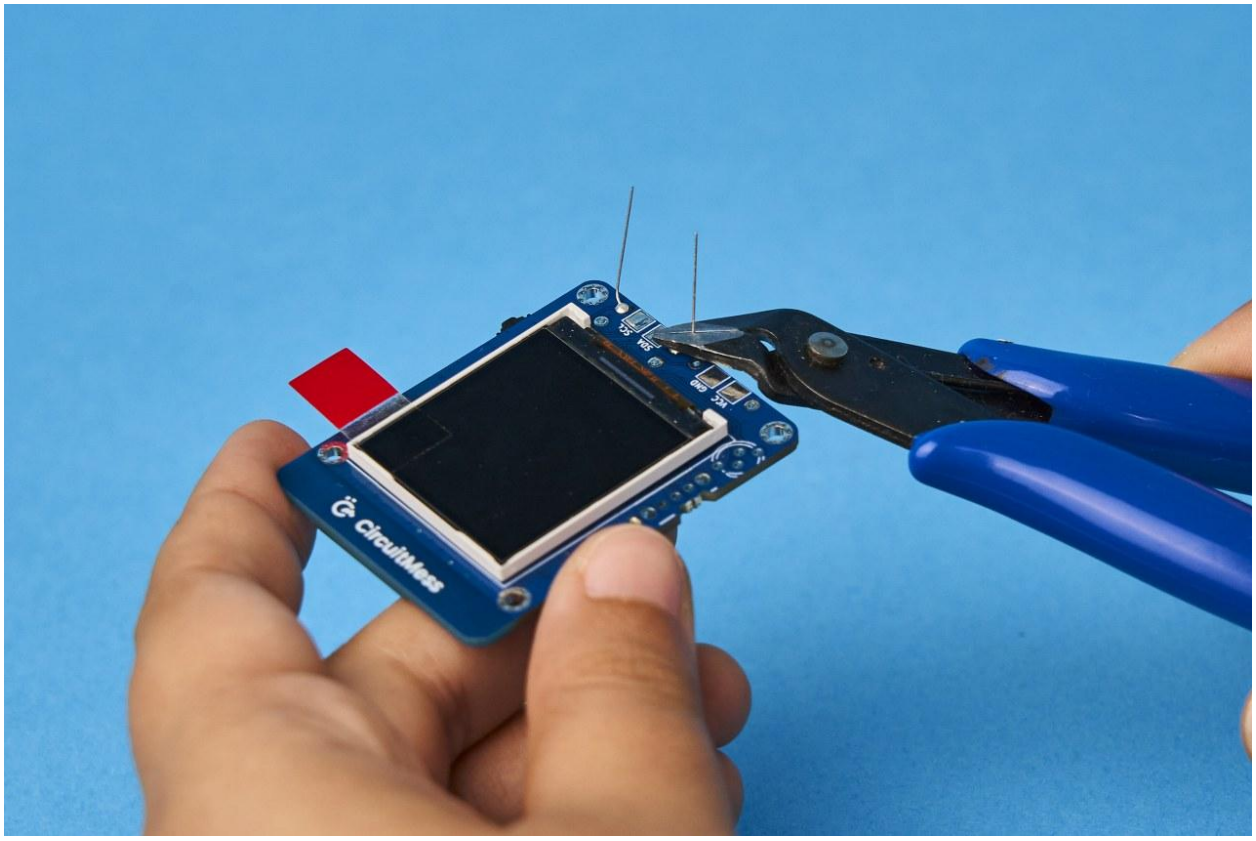
Take the soldering iron, and begin to solder.



After you've done, check if the soldering joints look good.

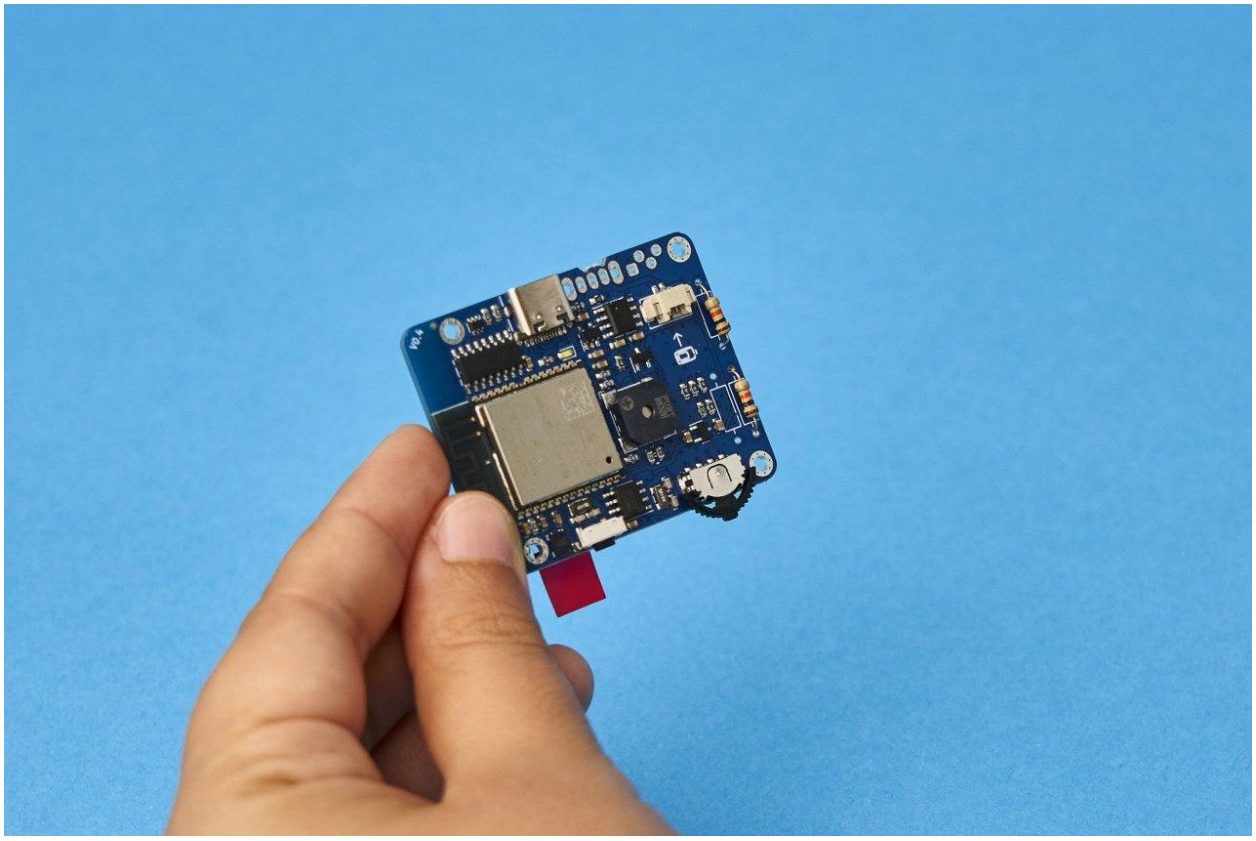
Using the pliers, cut the remaining legs of the resistor.

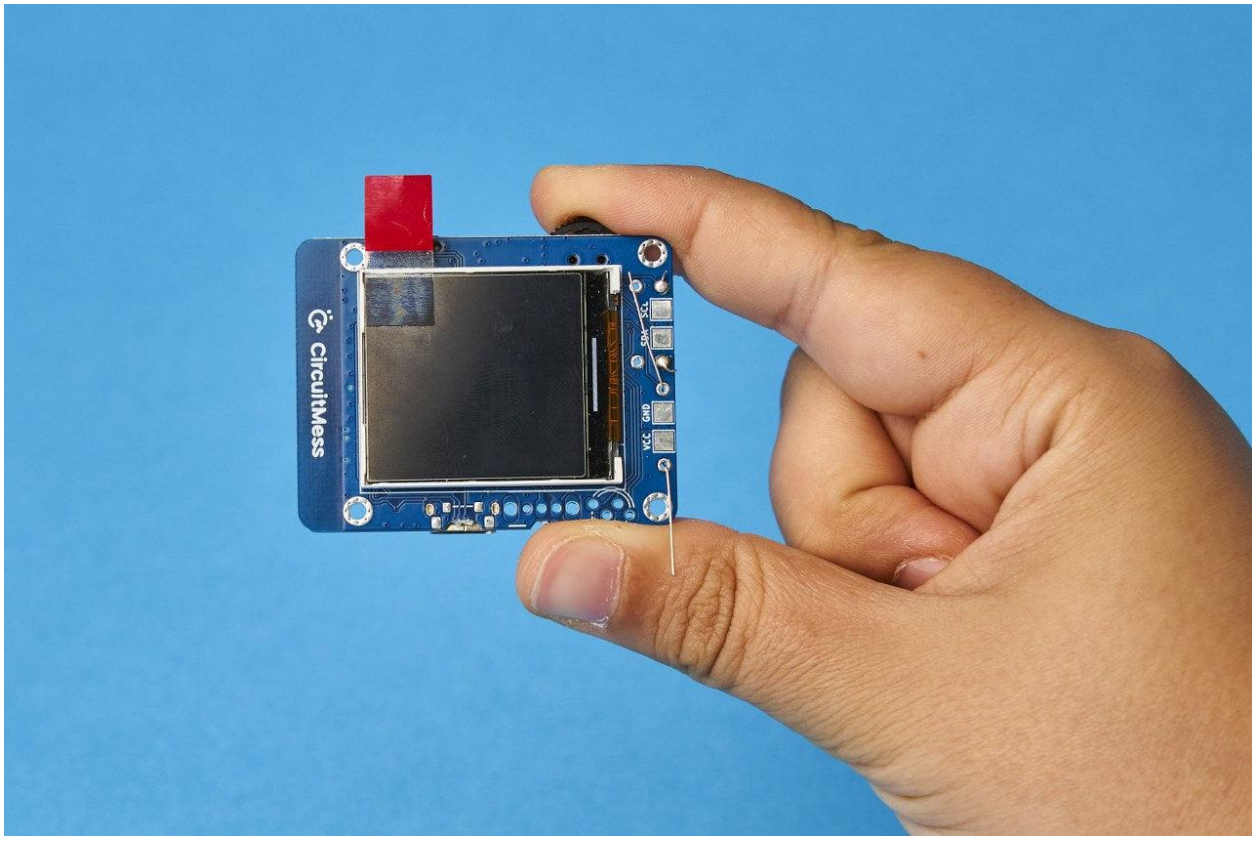
To protect your eyes, turn the board away from your face when cutting.



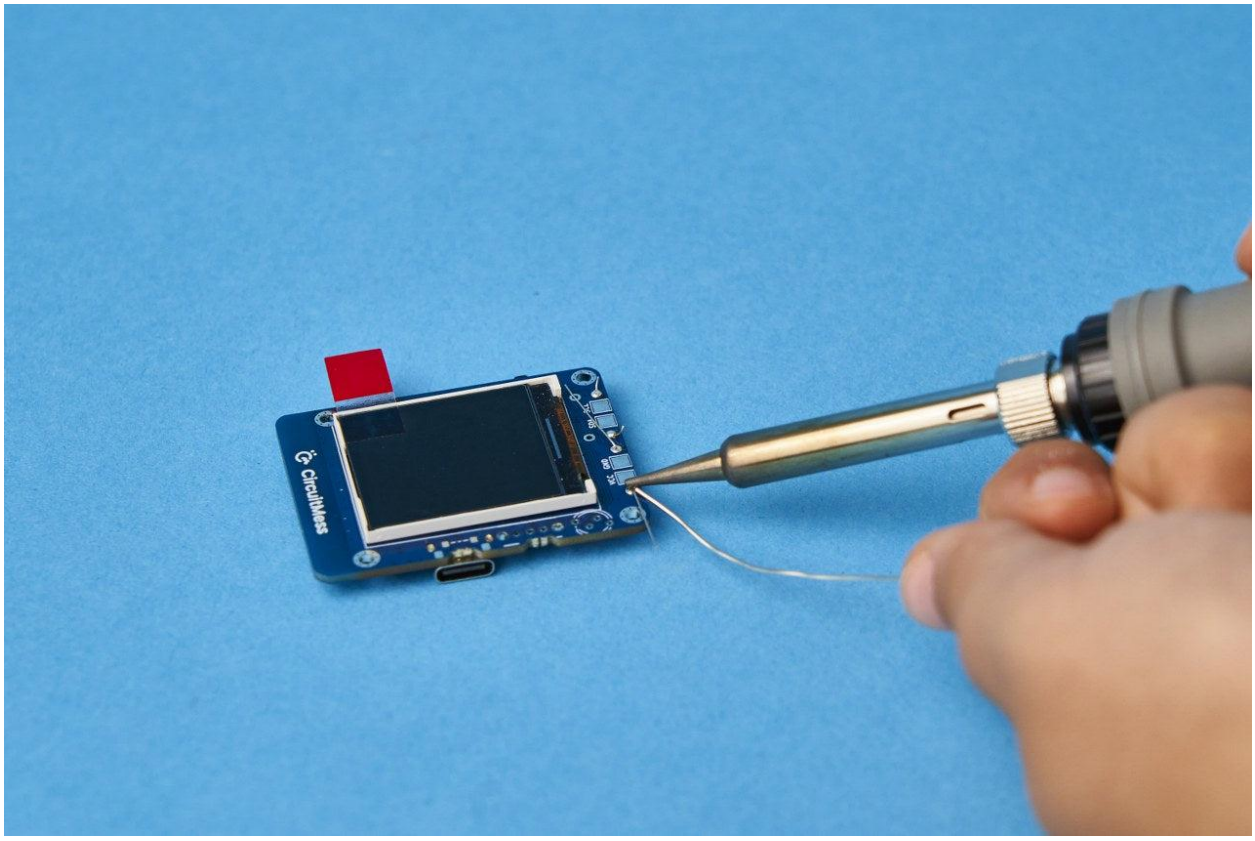
Take another resistor, and put it next to the first one.

This one will also be soldered on the front.

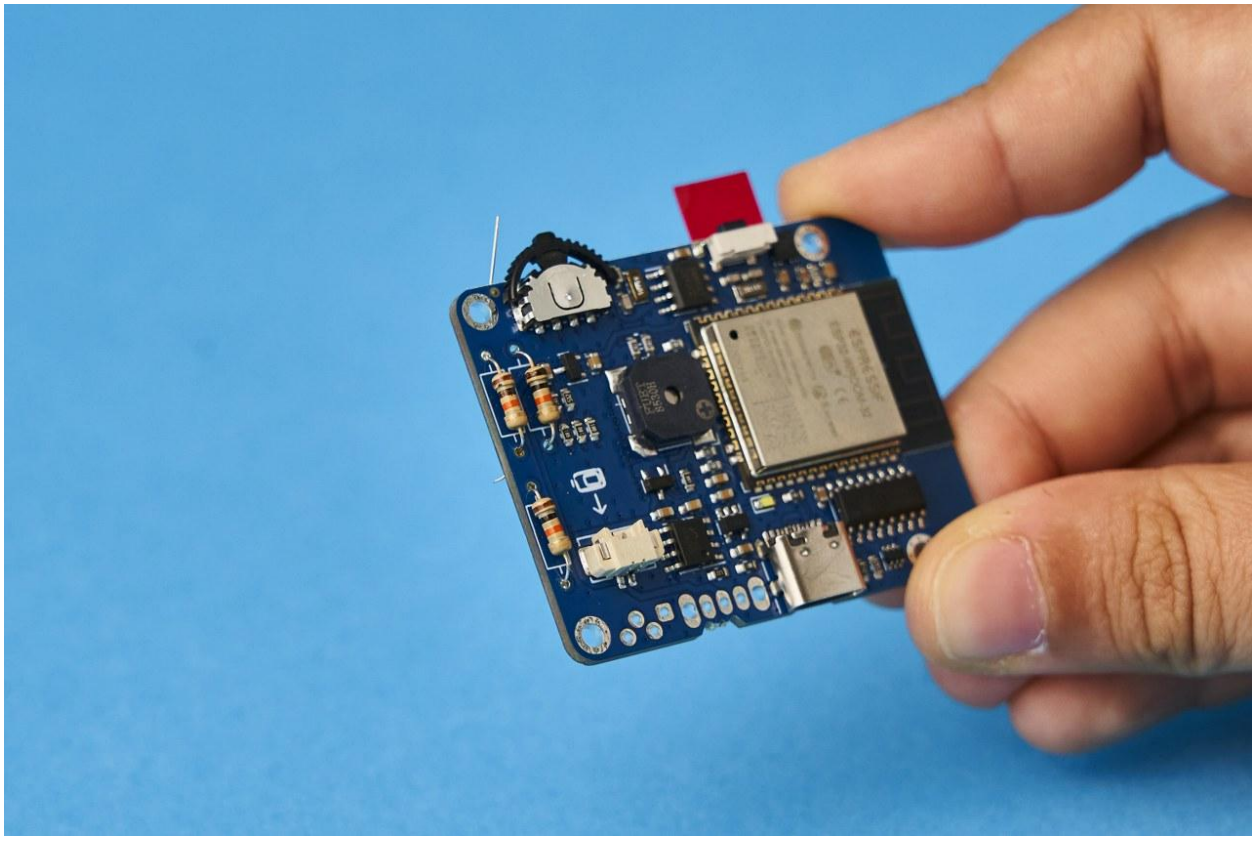


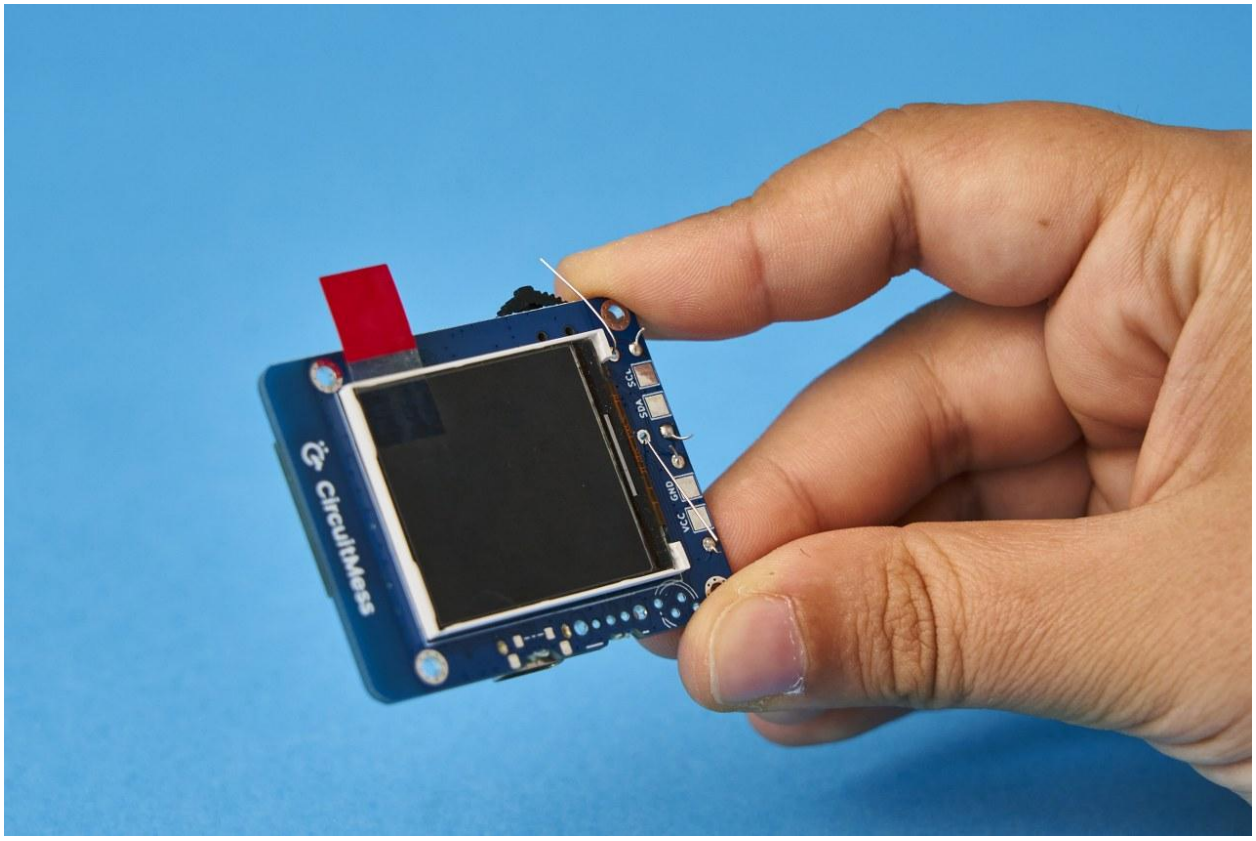


Start soldering.

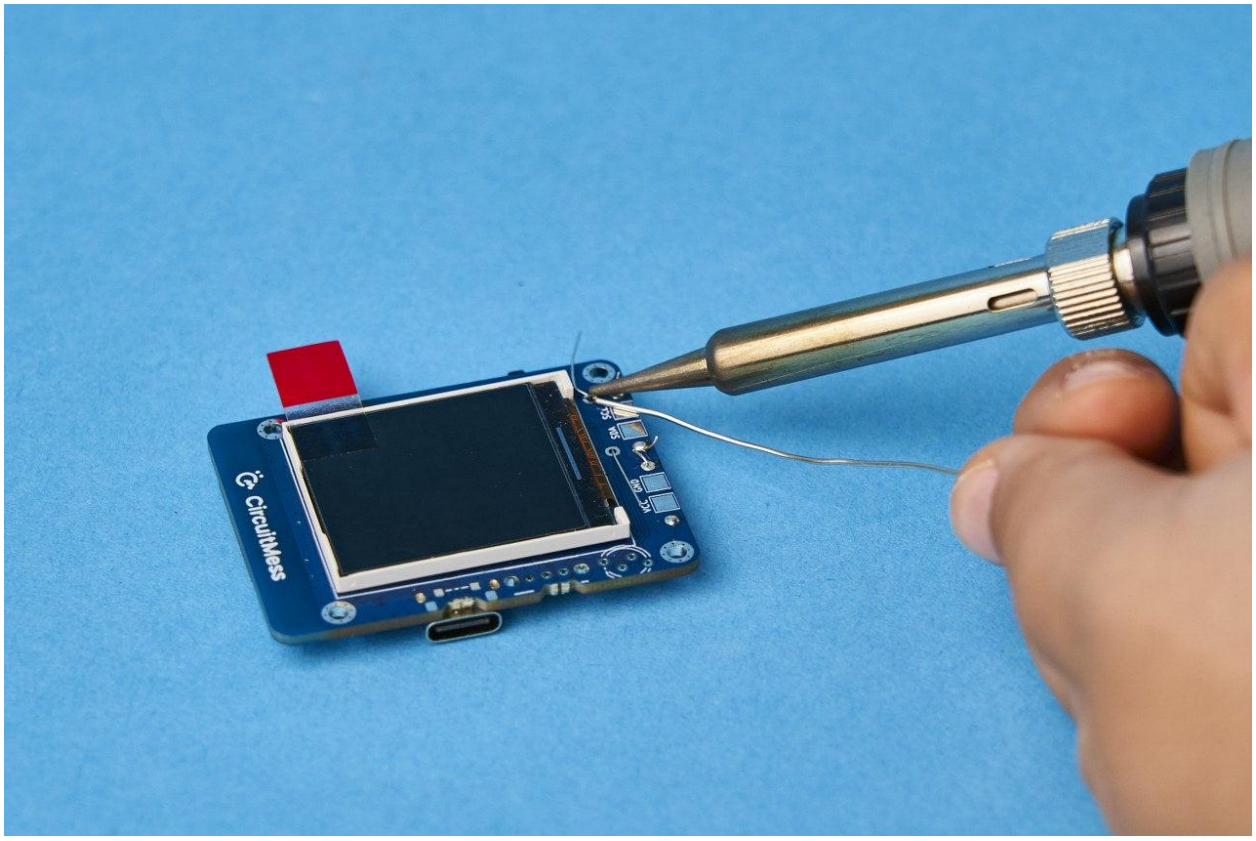


And, finally, place the last resistor here:

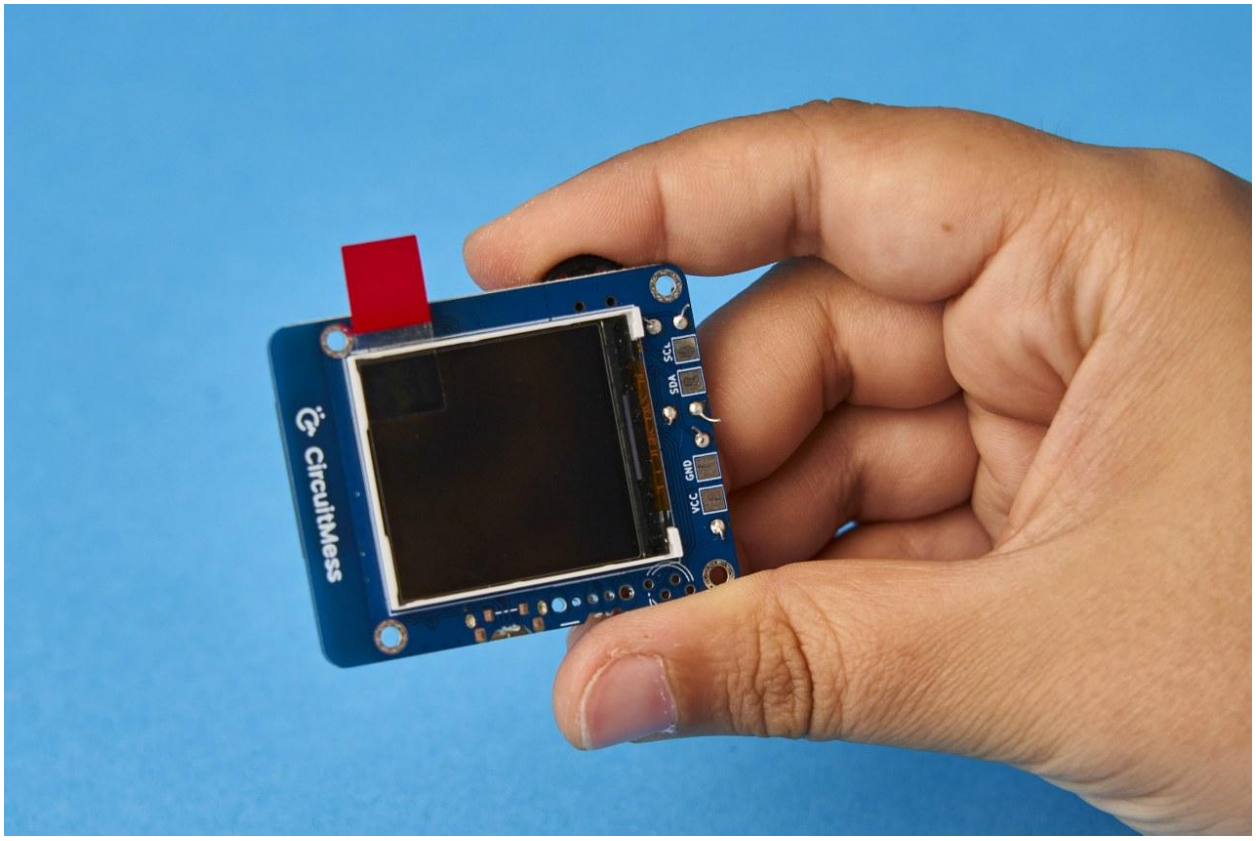




You must be careful not to touch the display with the tip of the soldering iron, since this will melt it.



This is what your Clockstar should look like when you cut the resistor legs:


CircuitMess
SCL
SDA
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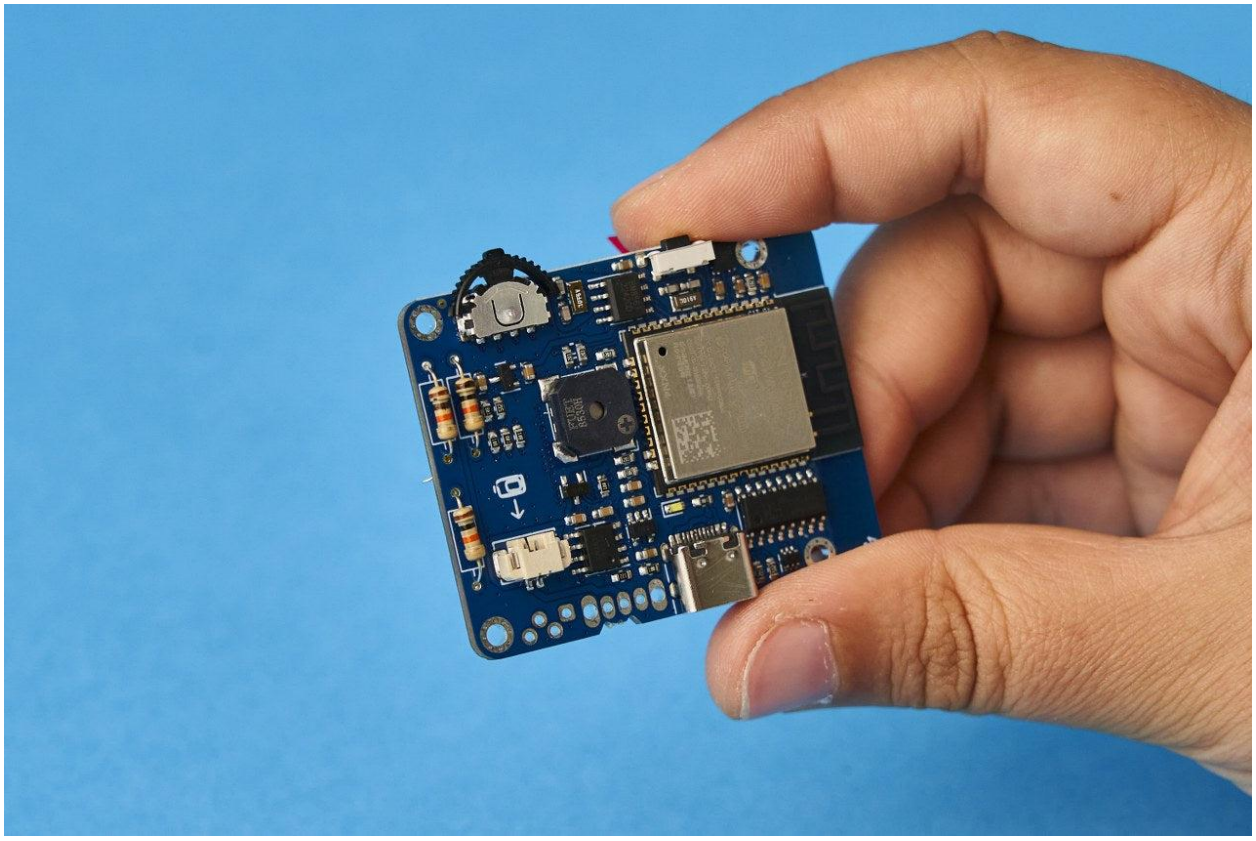
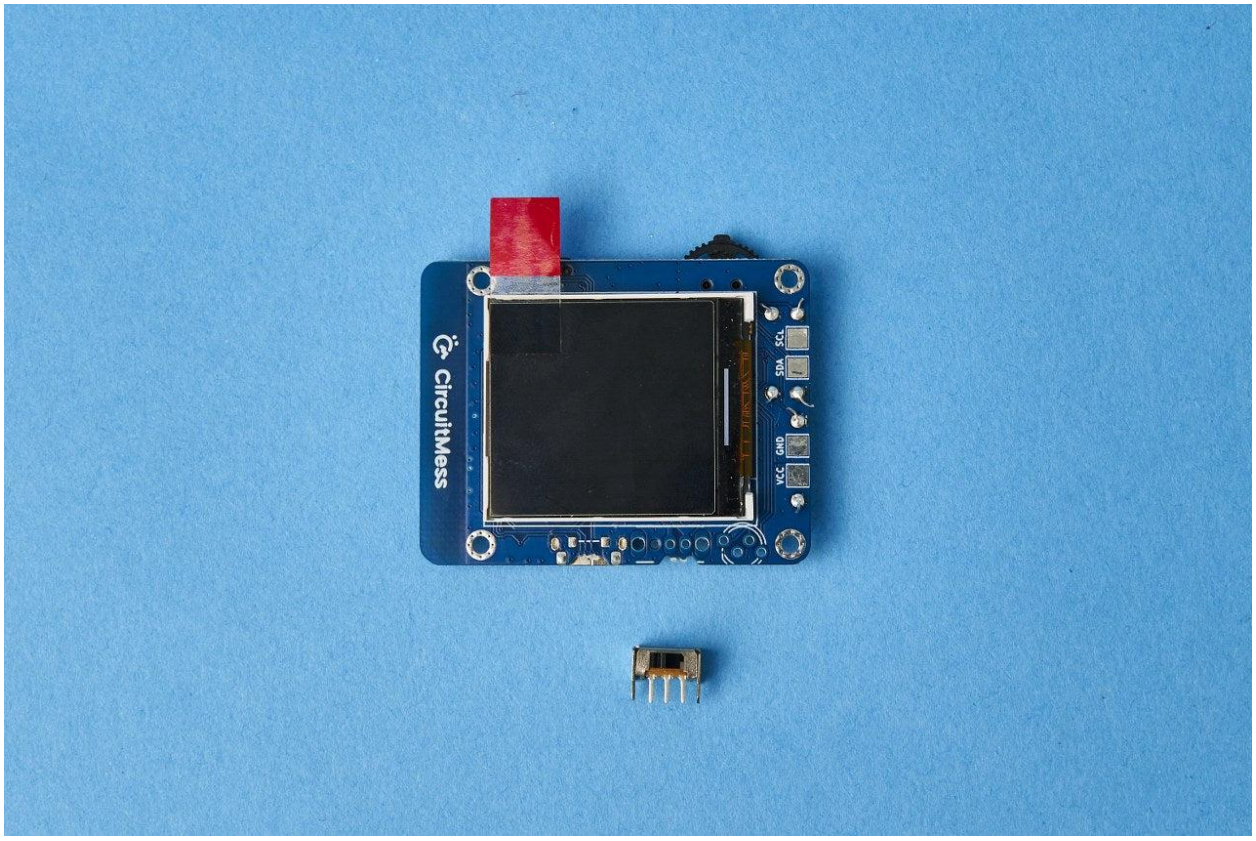


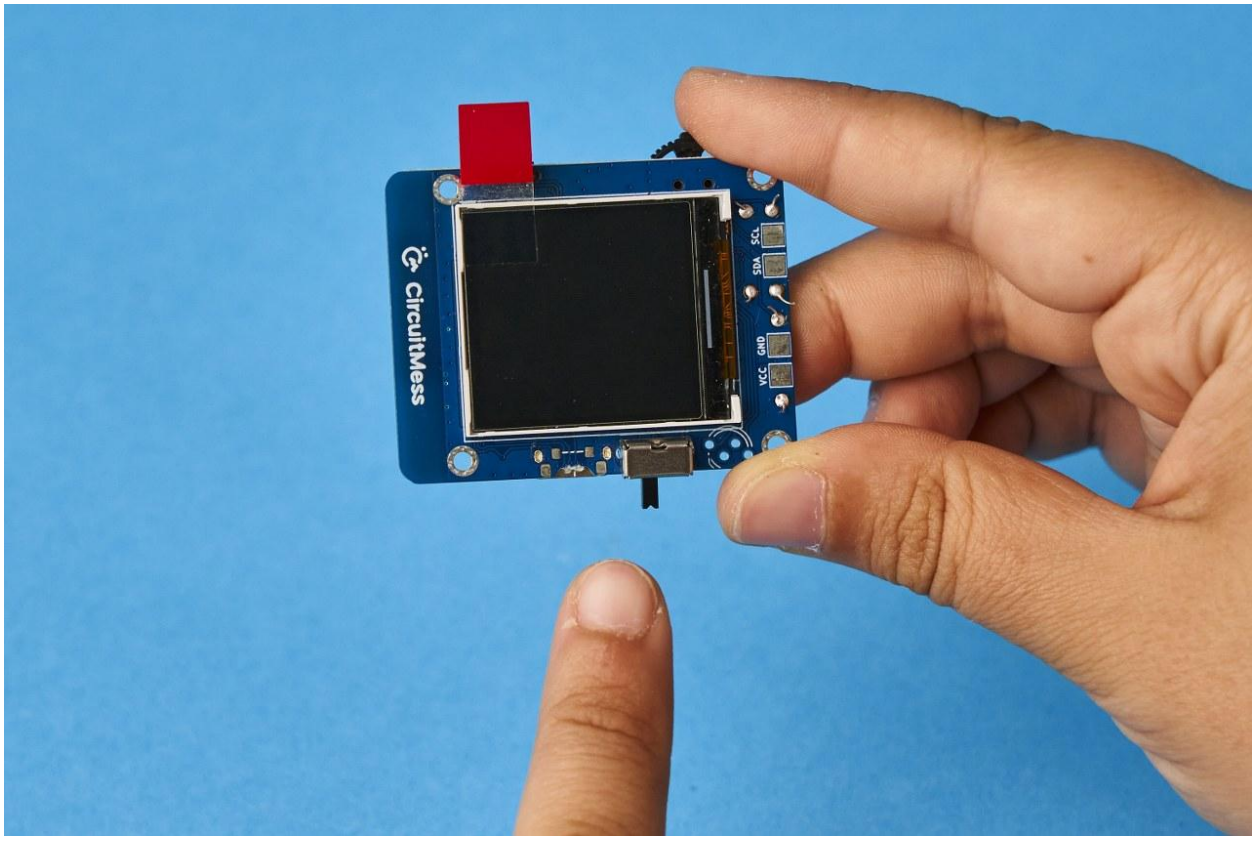
Part two - Soldering the switch

Make sure all the soldering joints on the resistors are looking good before proceeding.

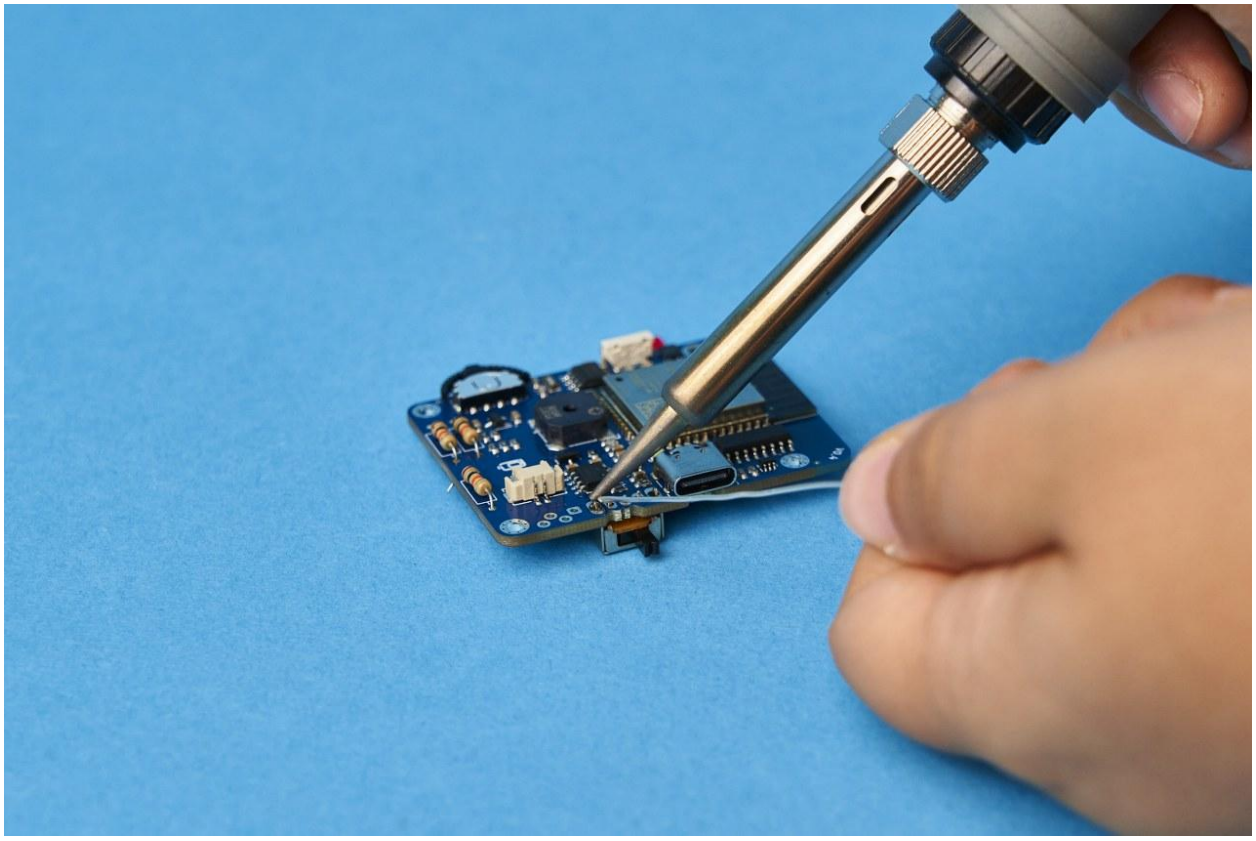
If they are, take the switch.

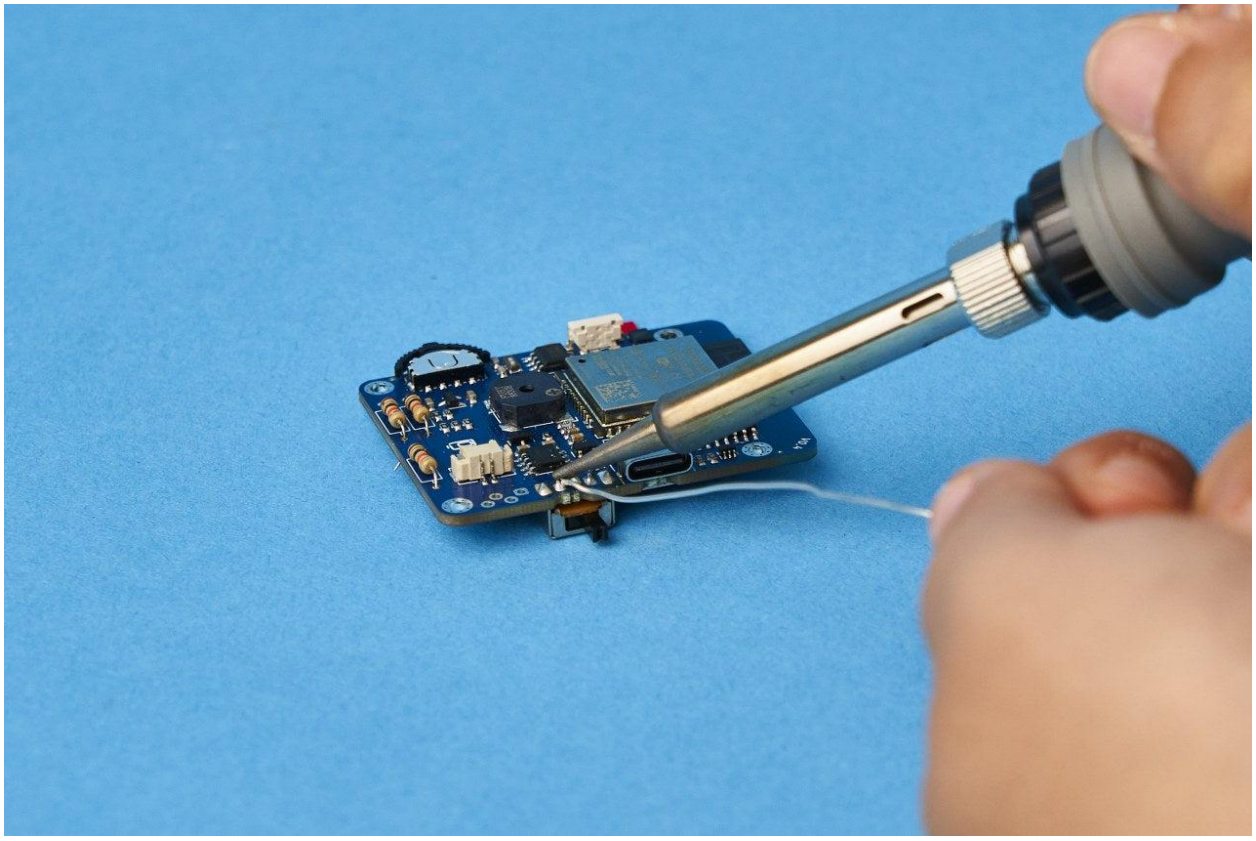


This is where you should place the switch. This component will be soldered at the back of the PCB.



The first and last soldering joints are the easiest to solder.
Make sure that the switch is pushed all the way to the board and that it's not tilted.

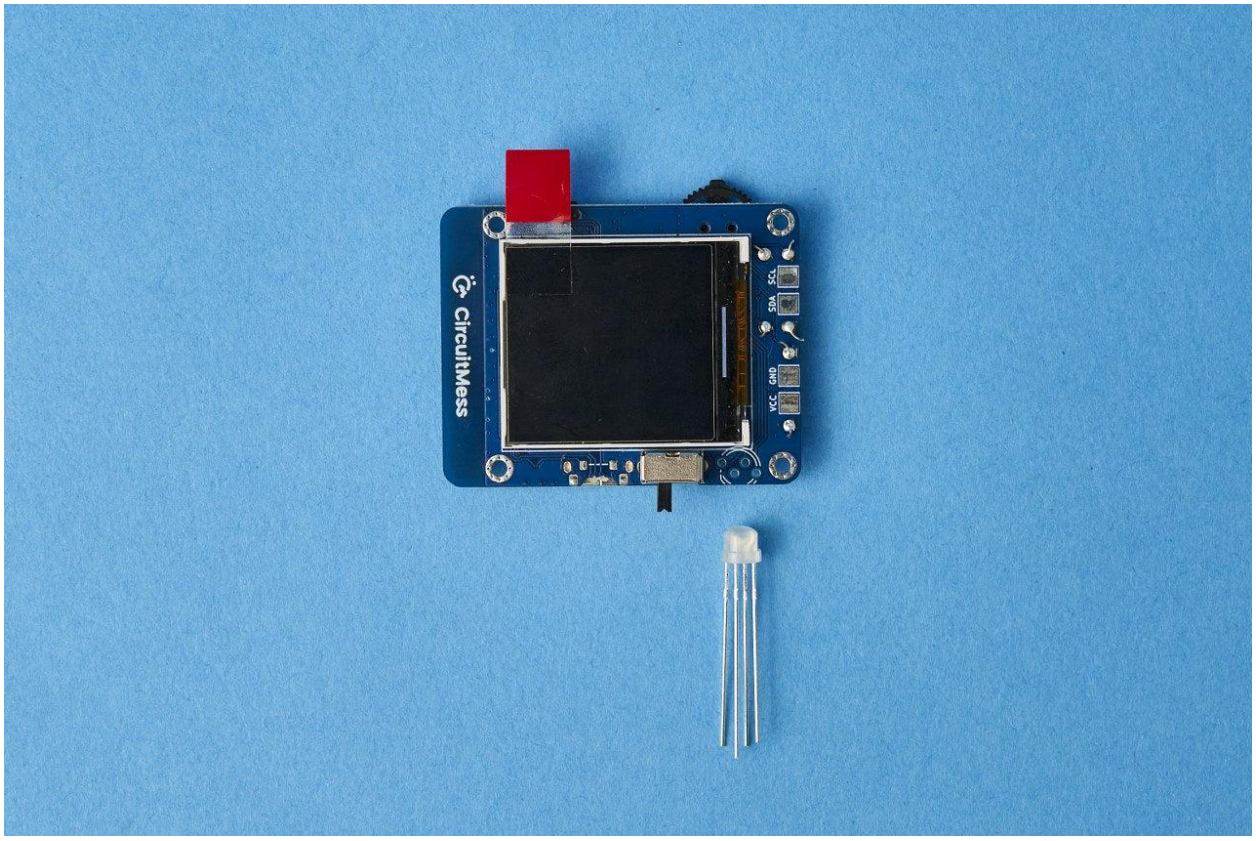




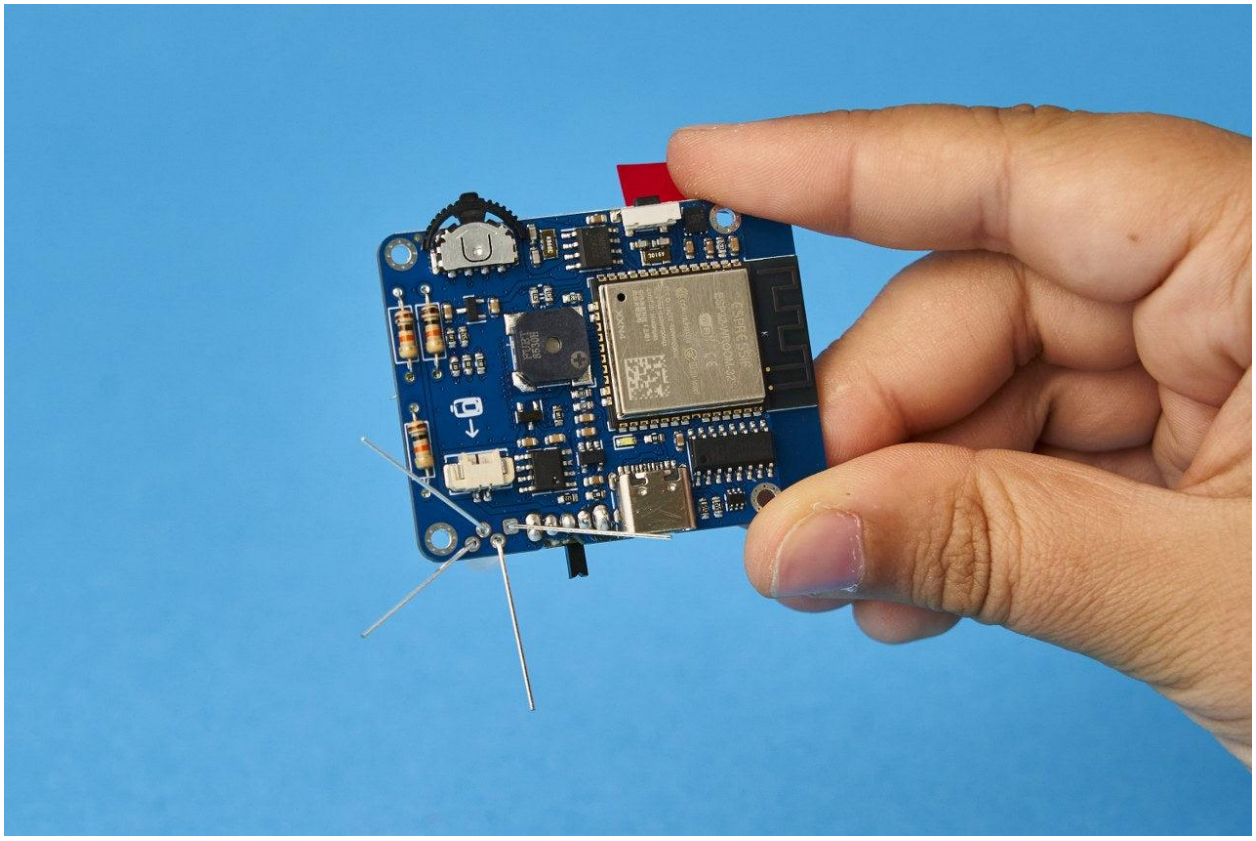
Check the soldering joints and make sure that there are no bridges made. If they are, you must clean them. Otherwise, your Clockstar will not turn on.

Part three - Soldering the LED

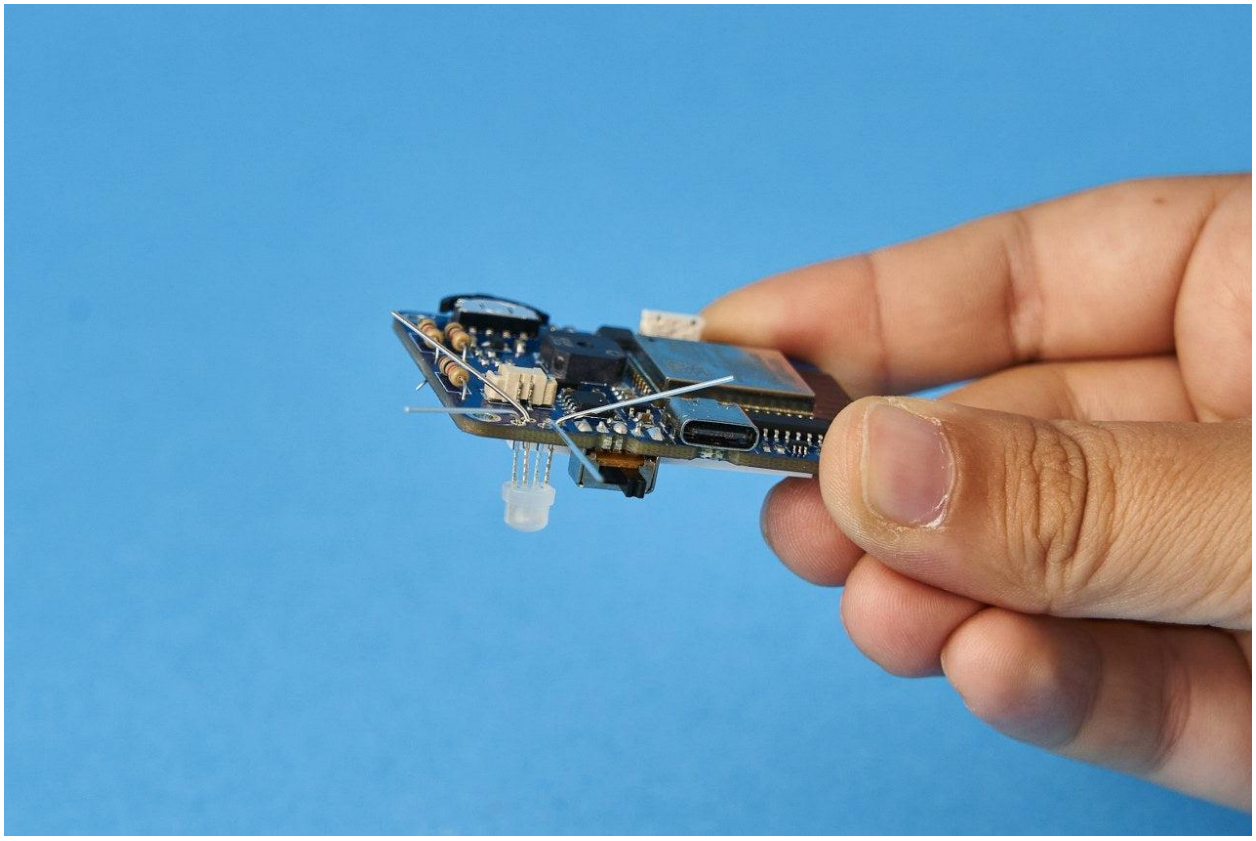
Now is the time to solder the LED.



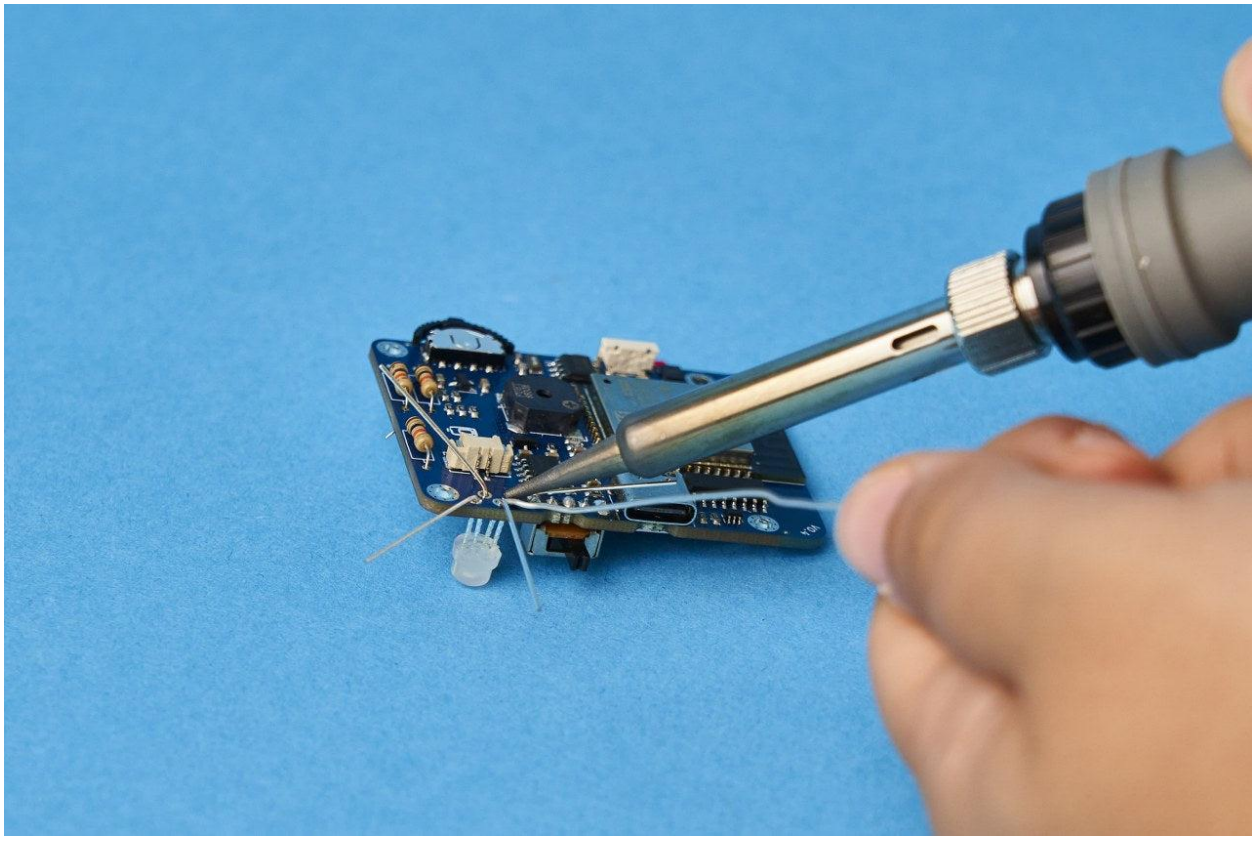
On the PCB, you can see the "cut-off" part drawn where the LED should go.
Your LED's head also has a somewhat cut-off part. You must ensure that the parts are aligned.



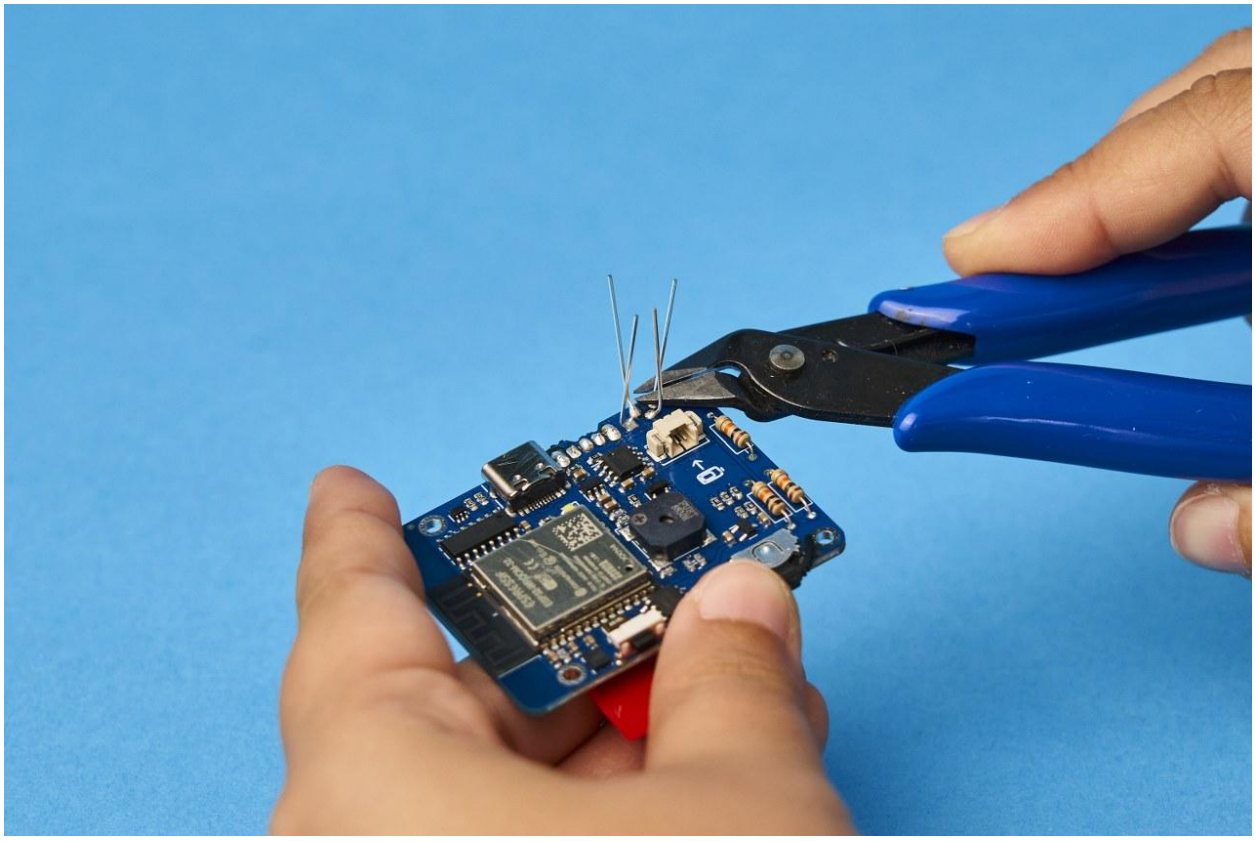
The LED will be on the front, so the soldering will take place at the back.

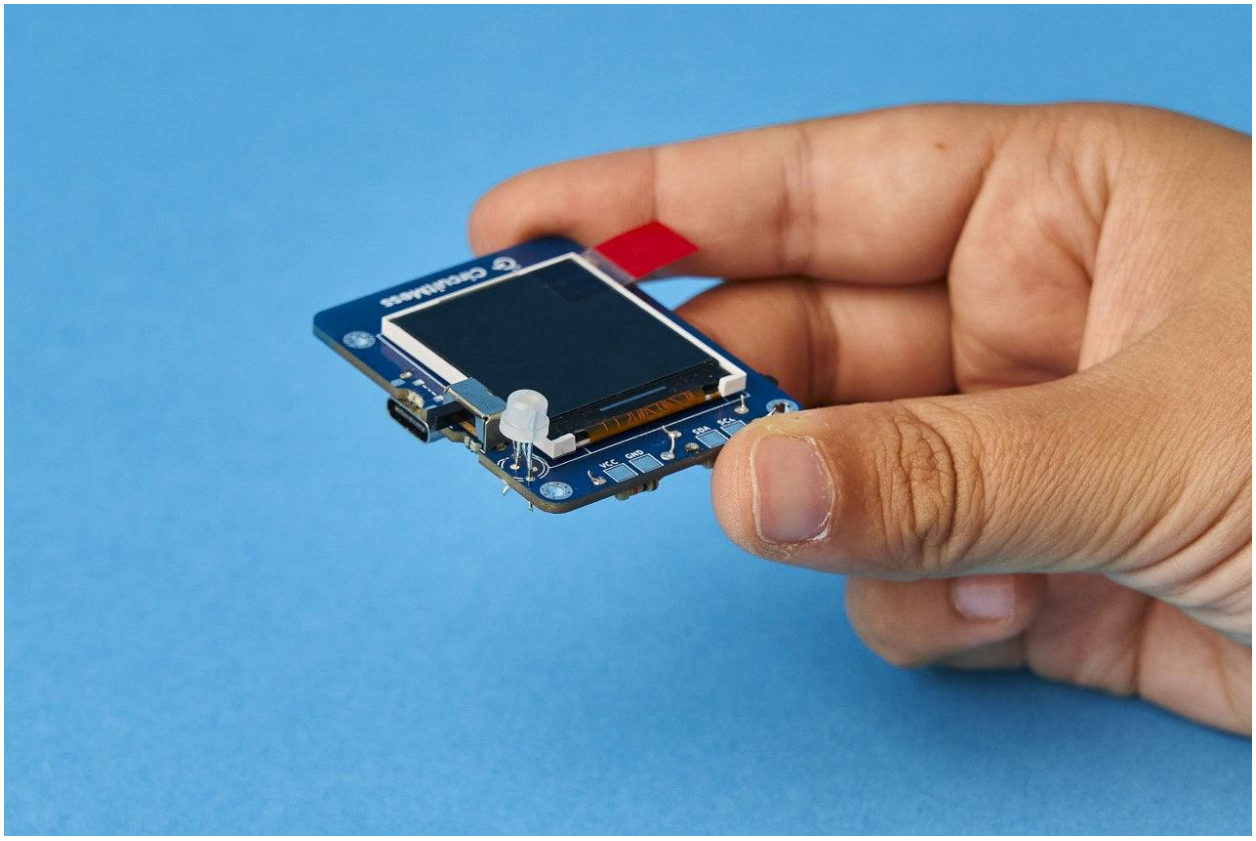


LED does not have to go all the way to the board. Don't push it too hard or it will break.



You can cut the rest of the LED's legs if all of the soldering joints appear clean and there are no bridges.





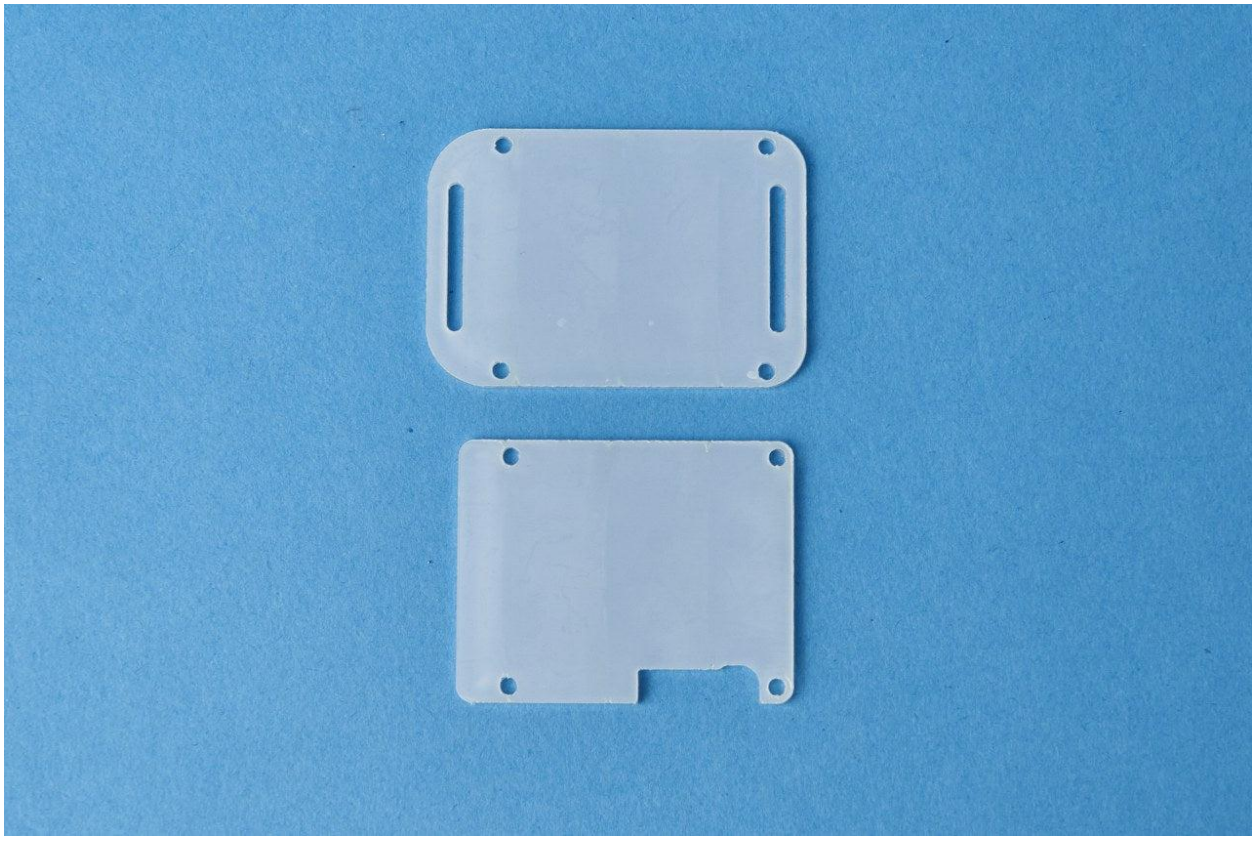
We are done with soldering!

Check all of the soldering joints again before moving on to the next chapter, where we'll continue assembling Clockstar.

Time for the casings

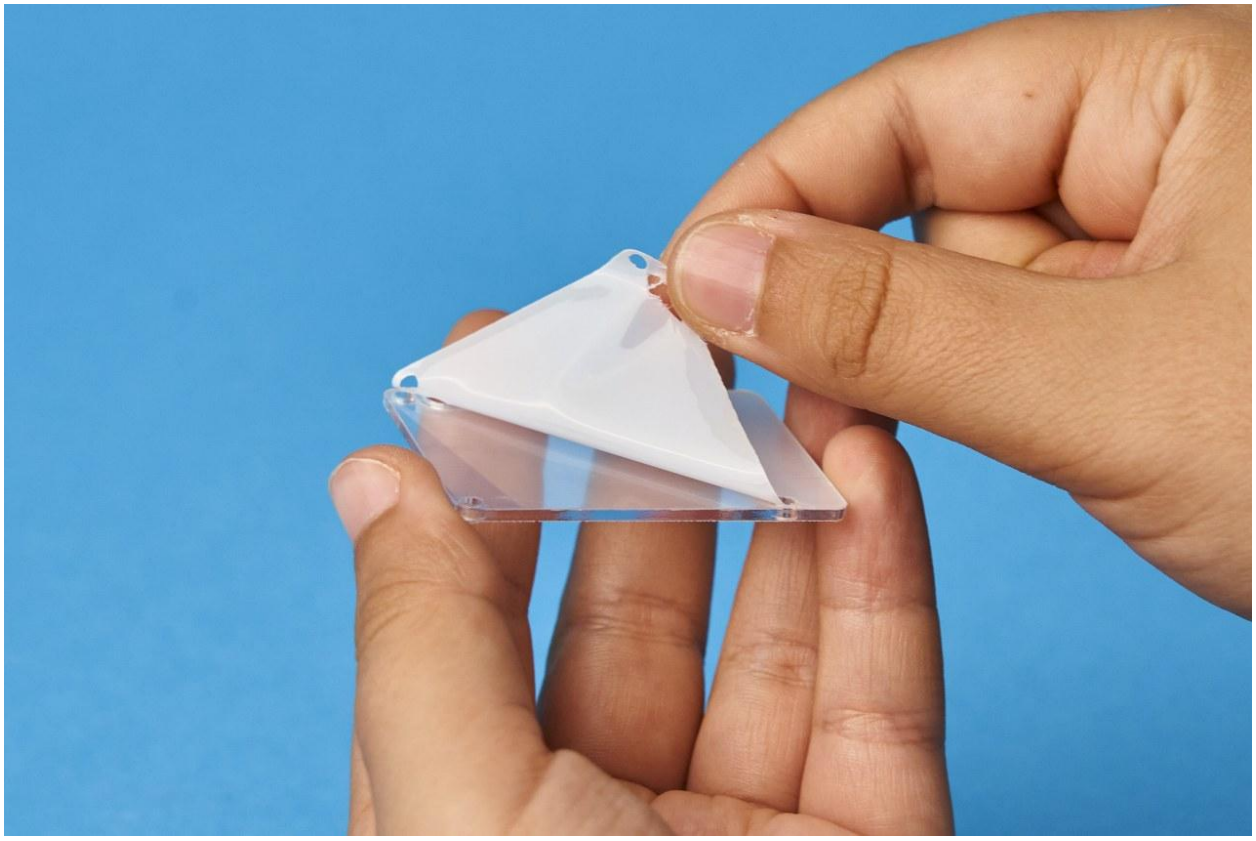
Welcome to the chapter where you'll see how to assemble the casing for your Clockstar!

Let's take two square-shaped acrylic casings.

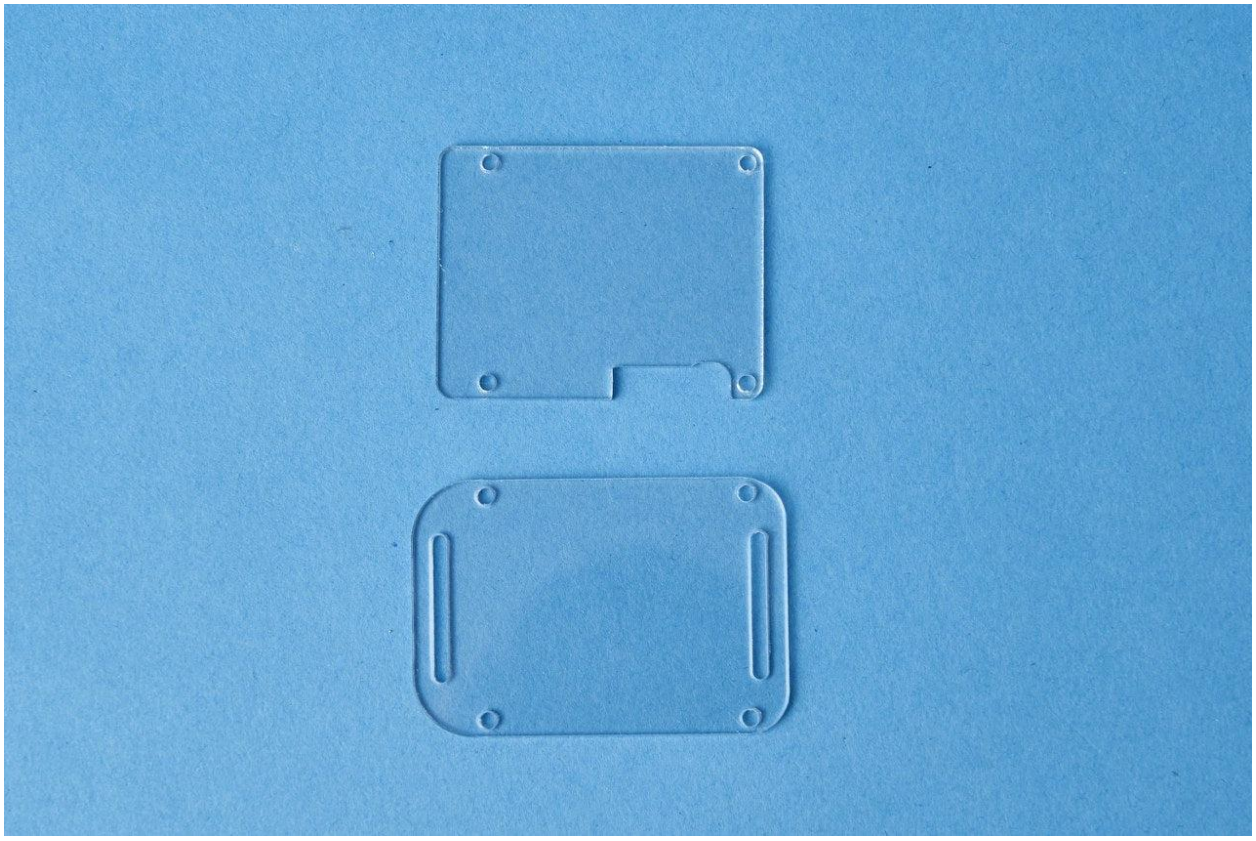


The first thing you need to do is to peel off the white protective layers.

As you can see, each of the acrylic casing parts has a protective layer on both sides that needs to be peeled off. They are not yet fully transparent, but they should be once you finish this step!

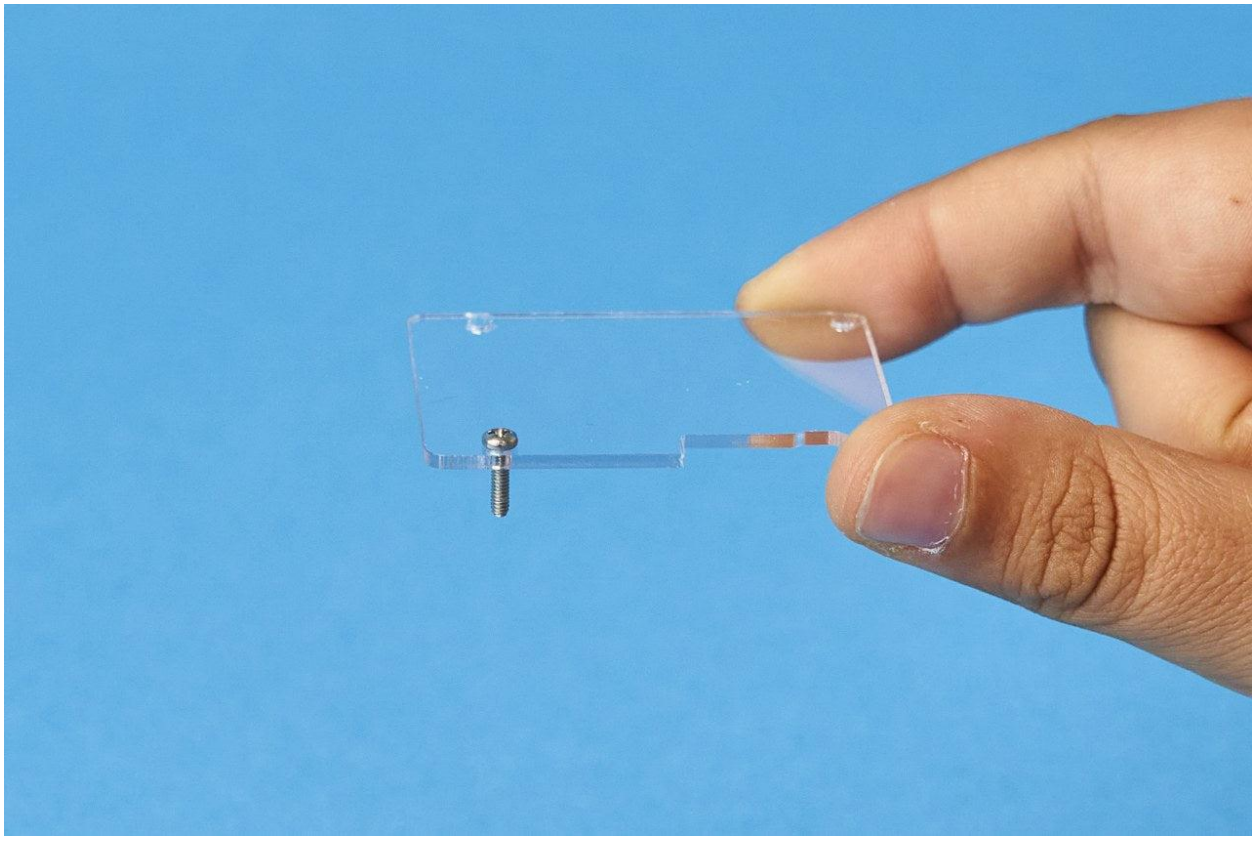


This is what the casings should look like once you remove all the protective layers:



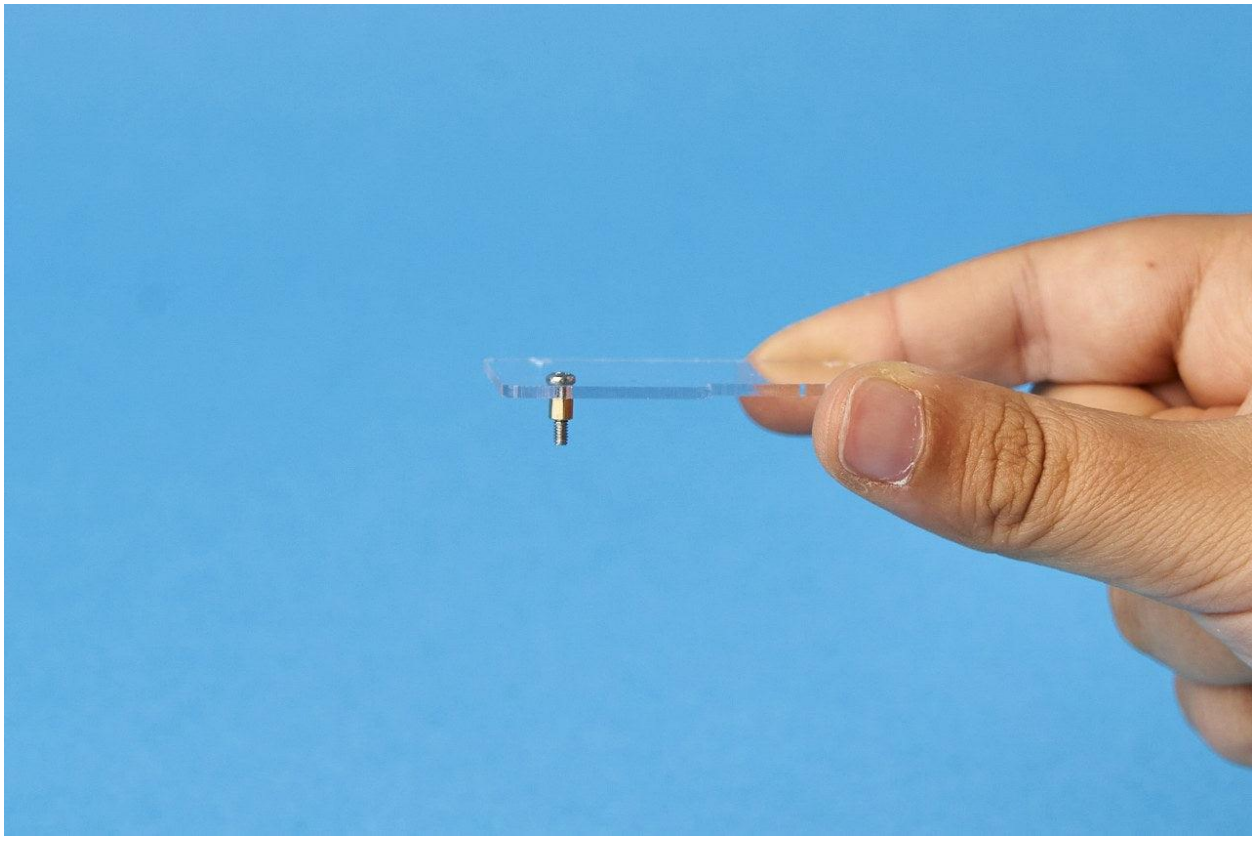
Take the upper casing from the photo above, four longer screws and four smaller spacers.

Put the screw through the casing like this:

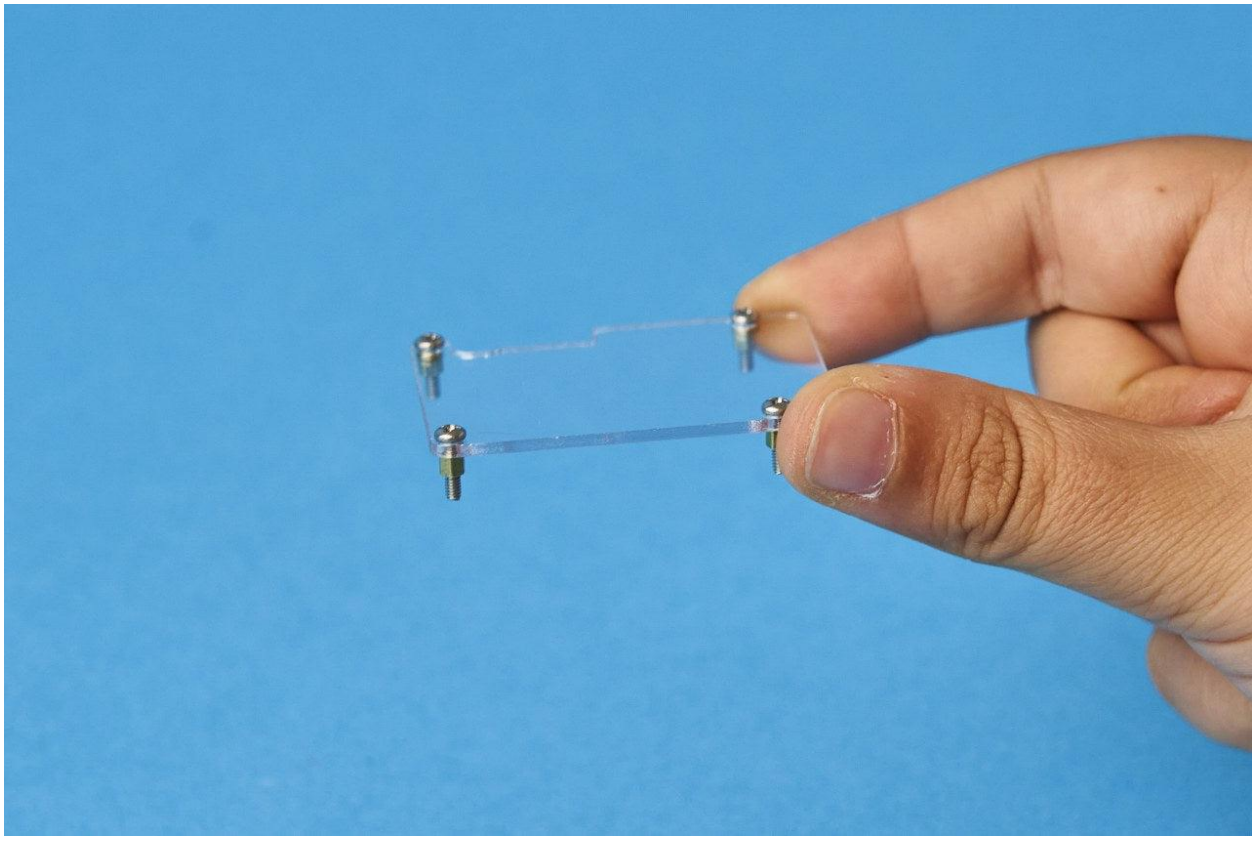


If you're not sure which side to put the screws on, you can check it by placing it on the PCB. This one will be placed in the front, and the cut-off part is where the switch will go.

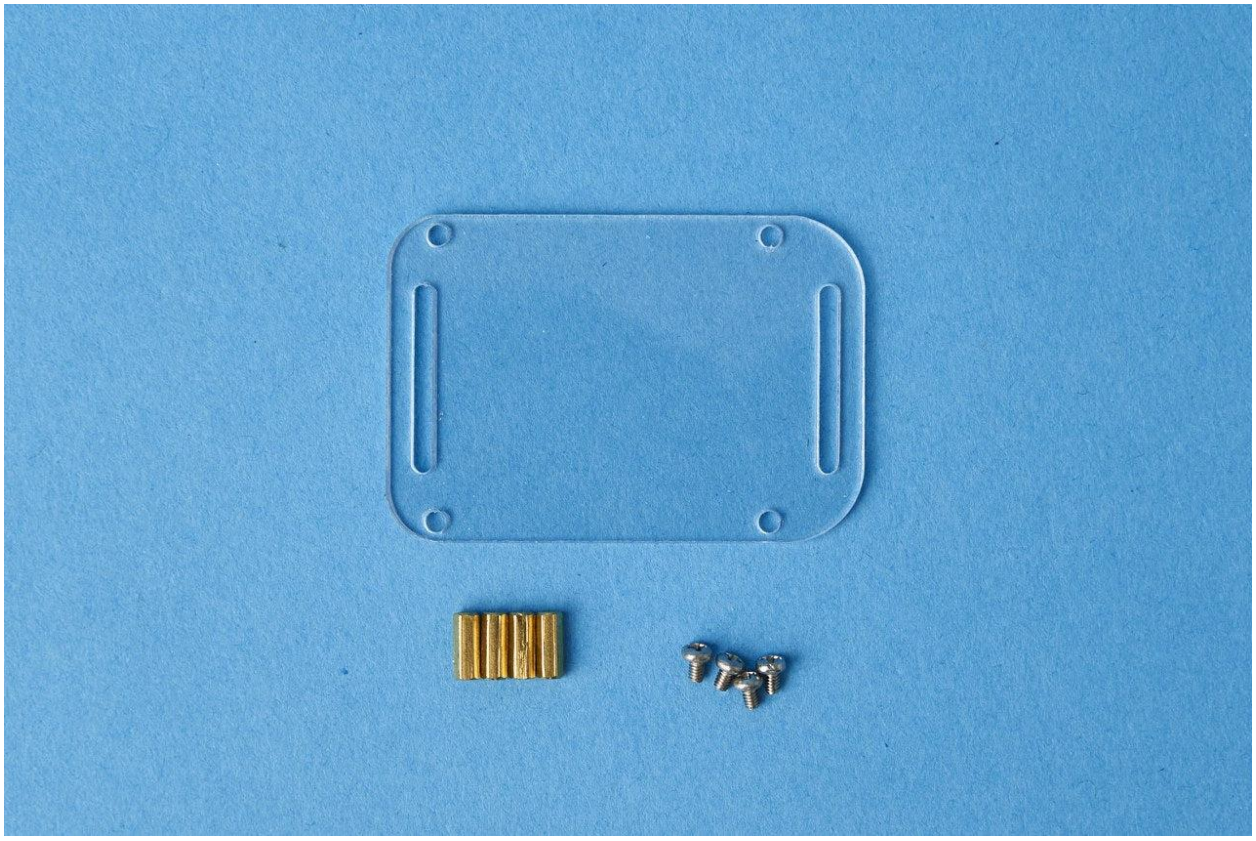
Add the spacer. Fasten it with your fingers.



Repeat this process for all four screws.

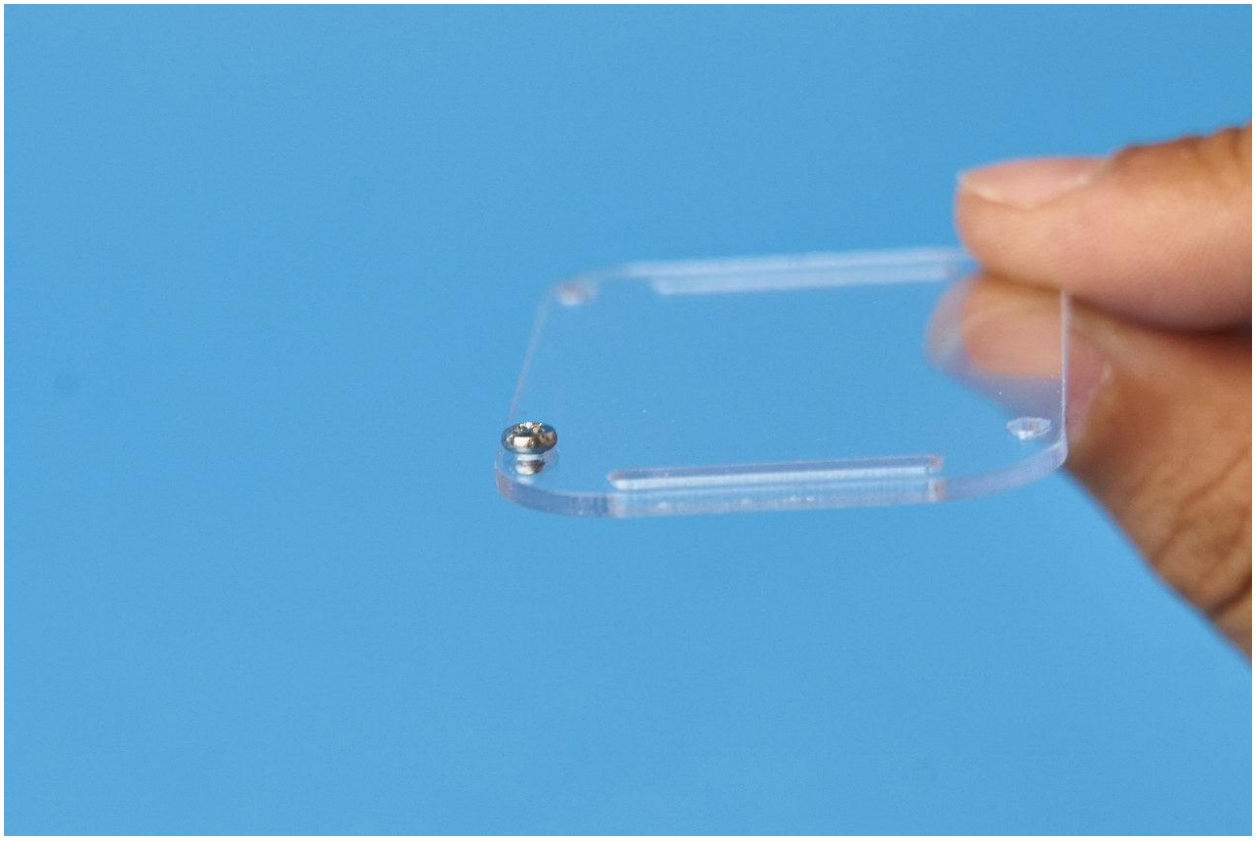


Take the second casing, four smaller screws, and four bigger spacers.

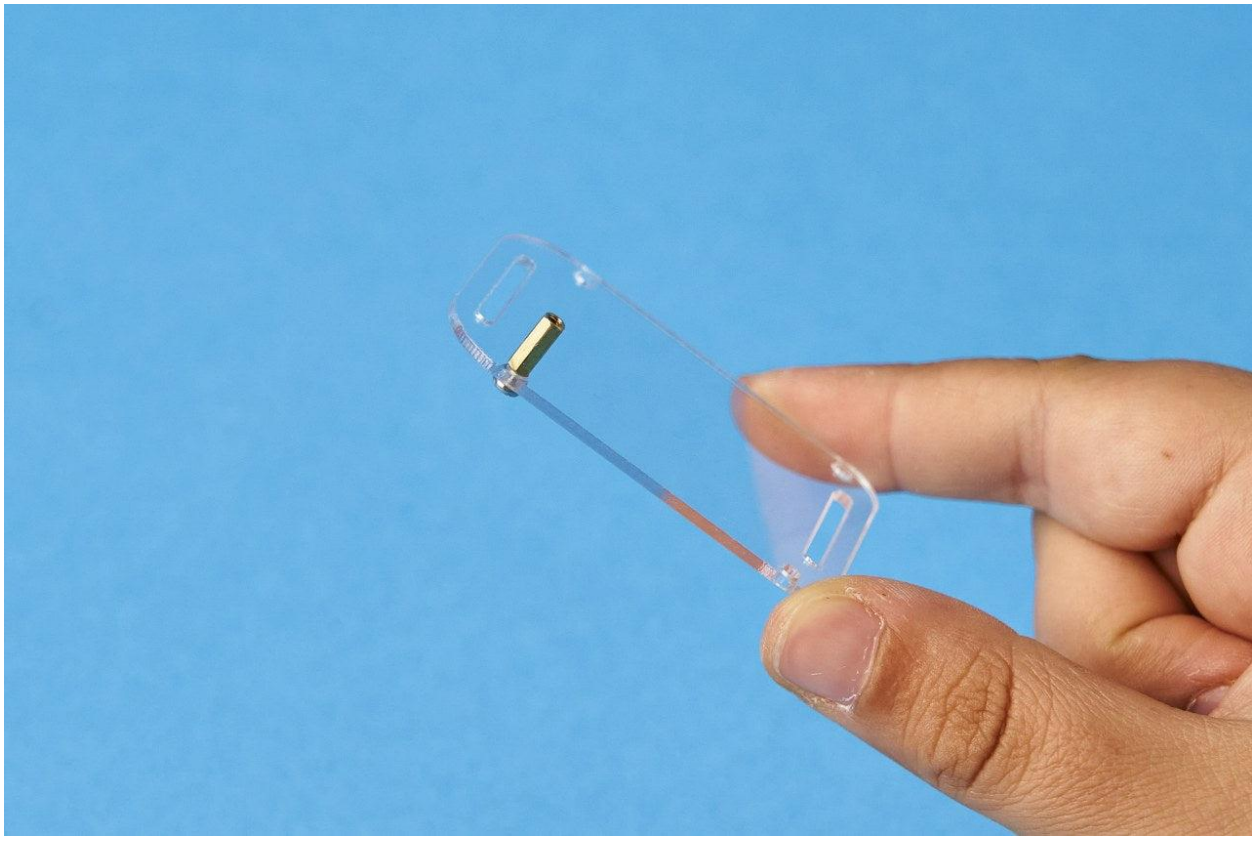


This one will be placed on the back.

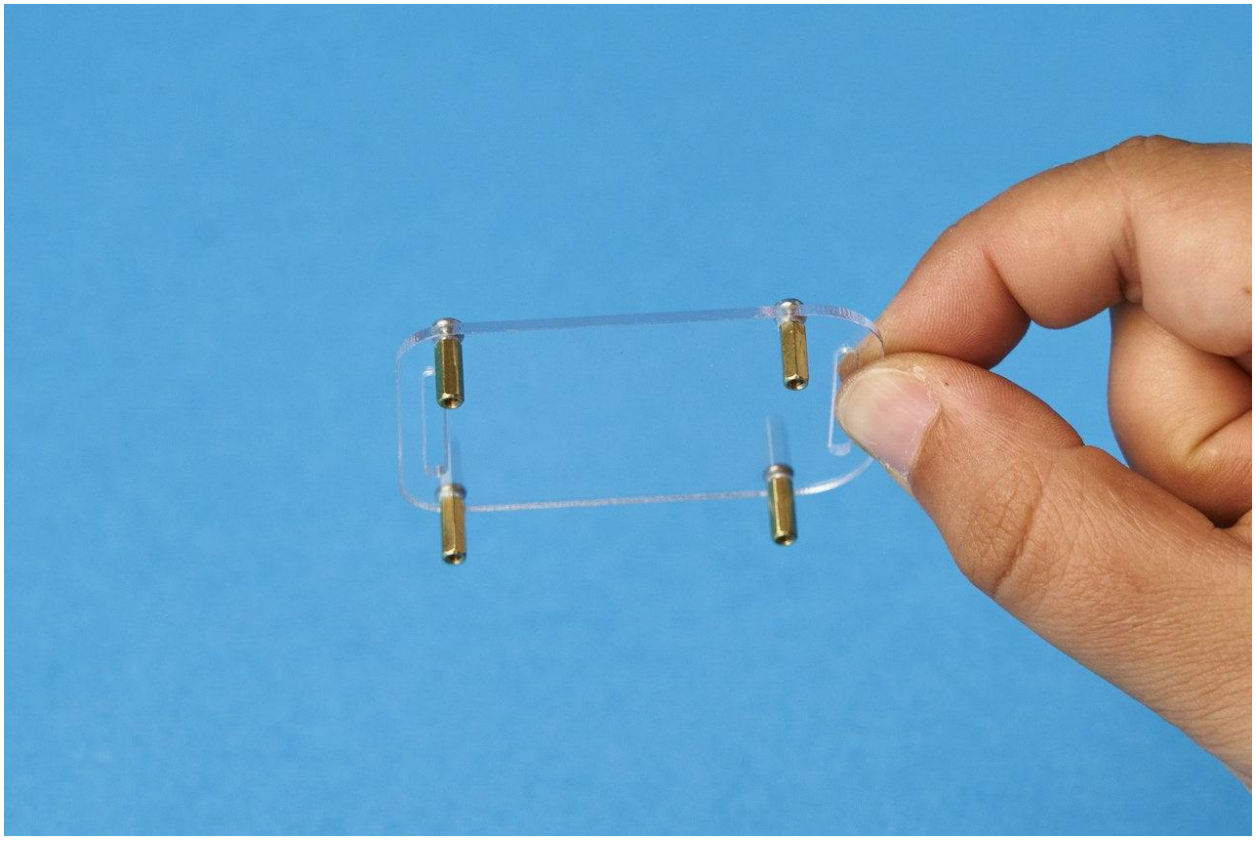
Put the screws through the casing like this:



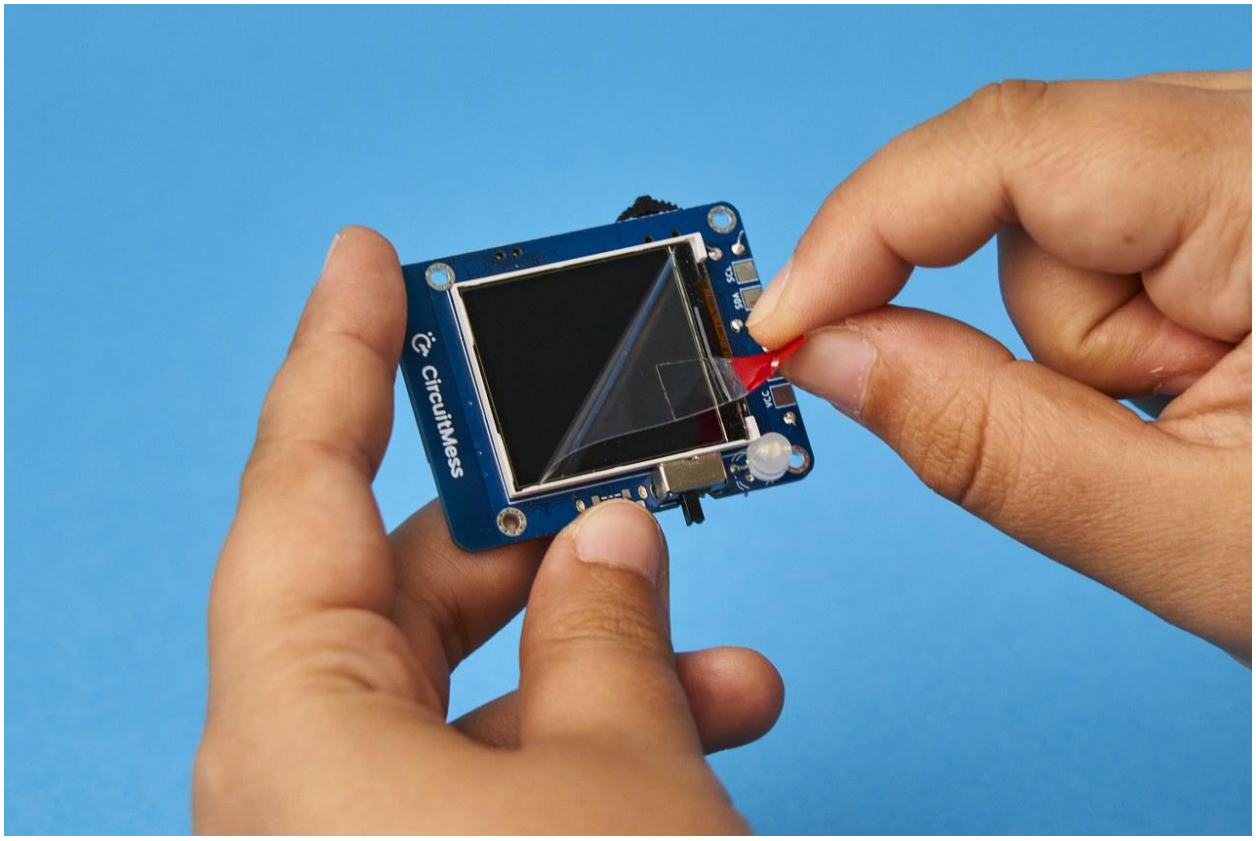
Put the spacer on the other side and fasten it with your fingers.



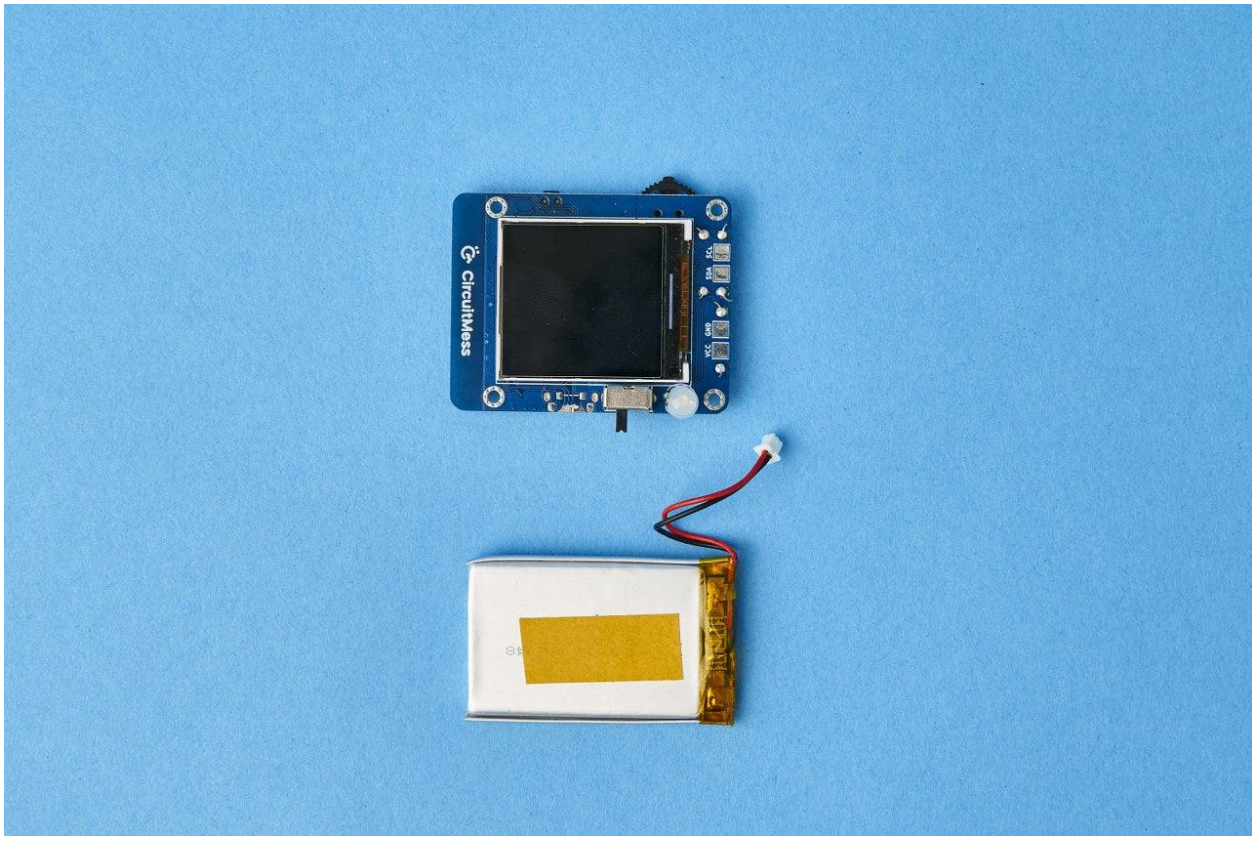
Repeat this step for all four screws.



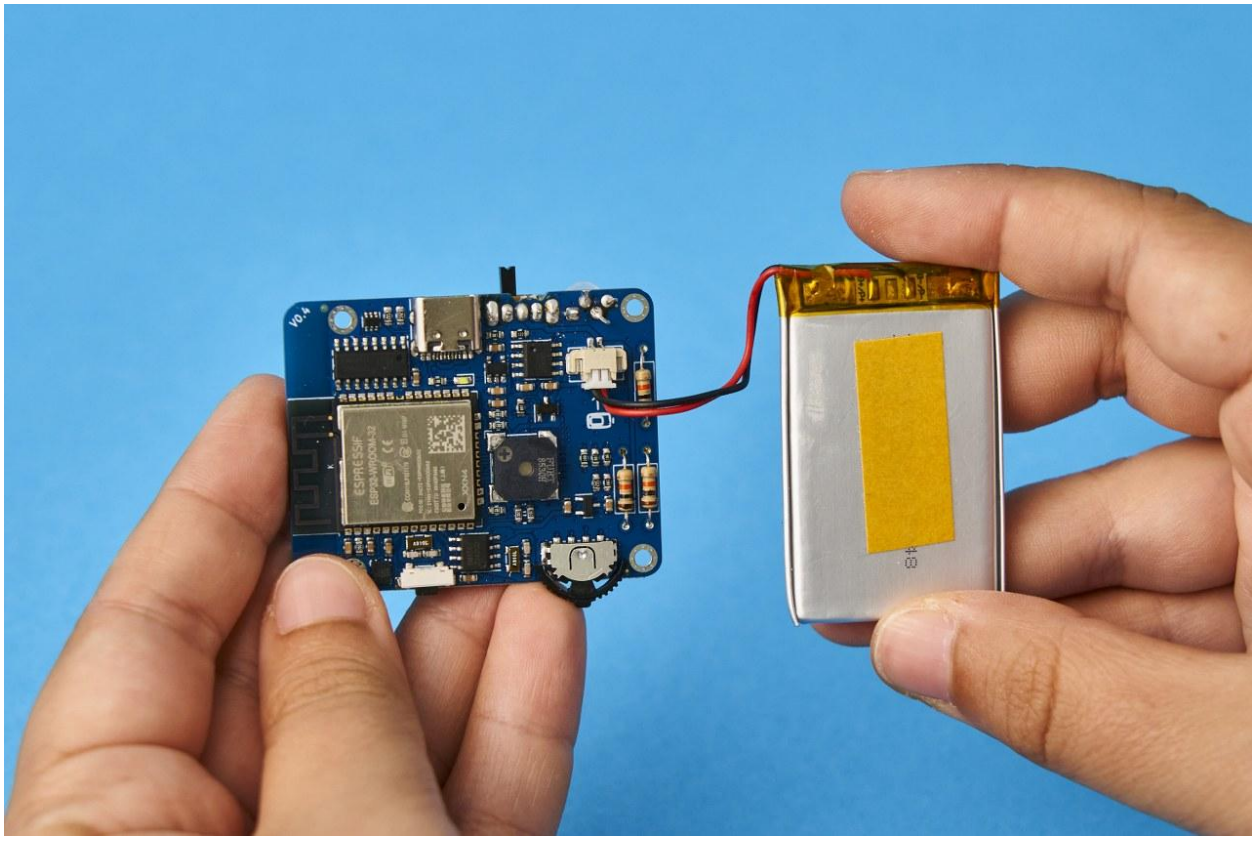
Now is the time to remove the protective foil from the display.



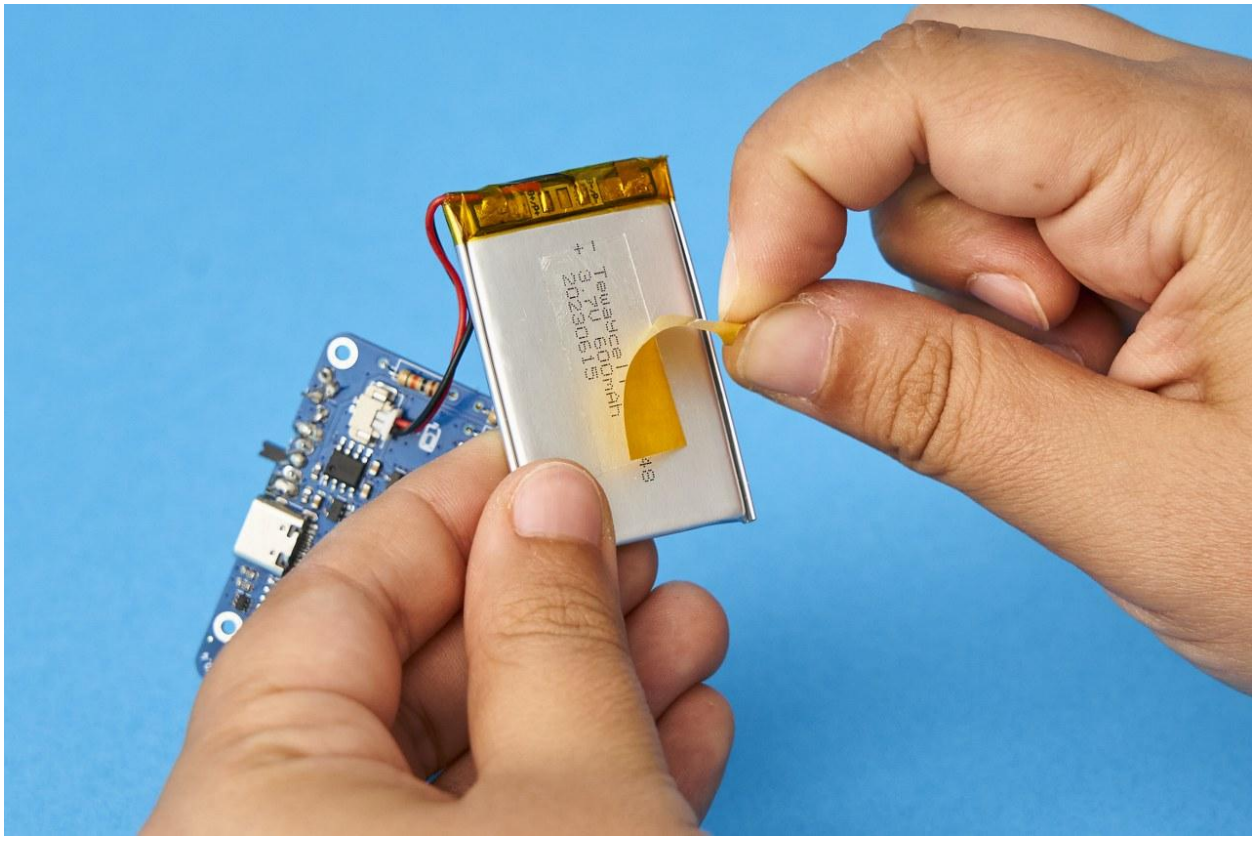
Put this aside for a bit and take the battery.



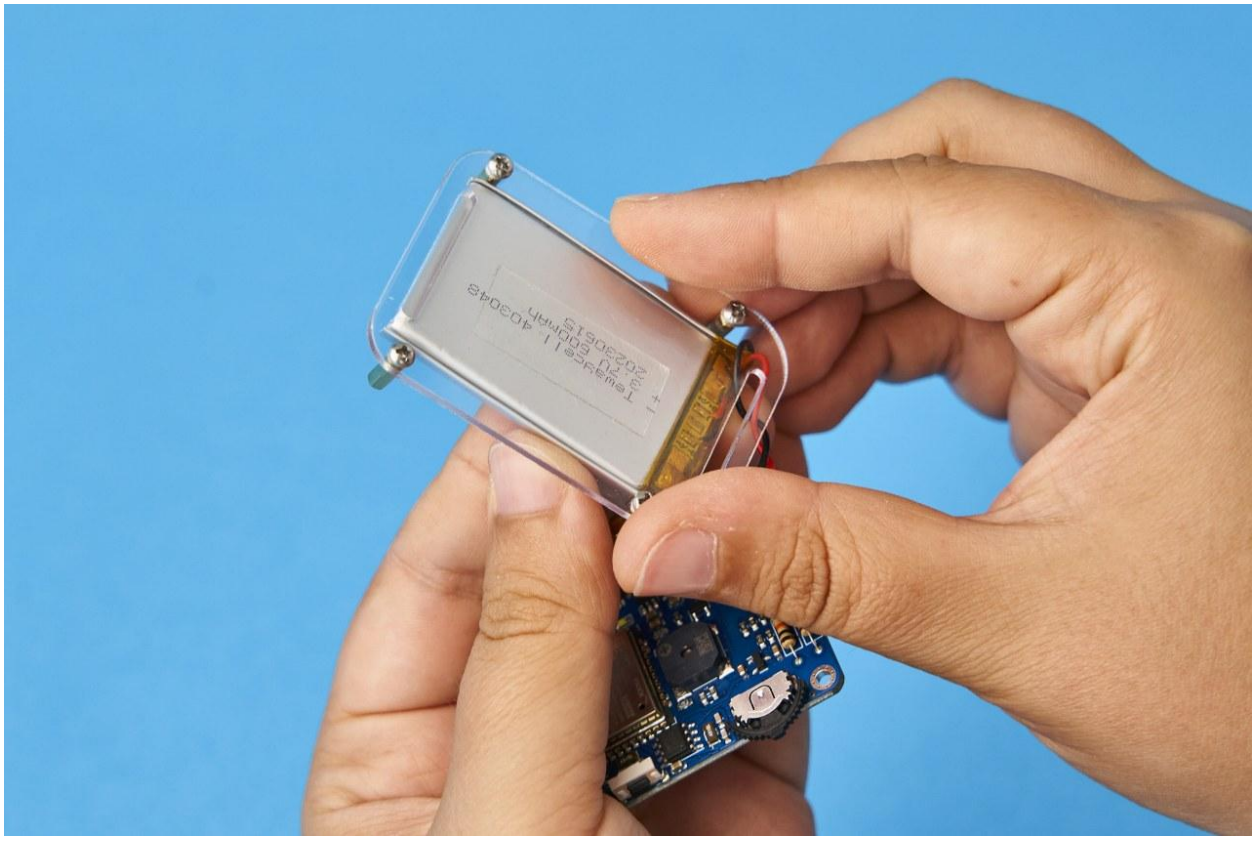
This is where you'll connect it with the PCB:



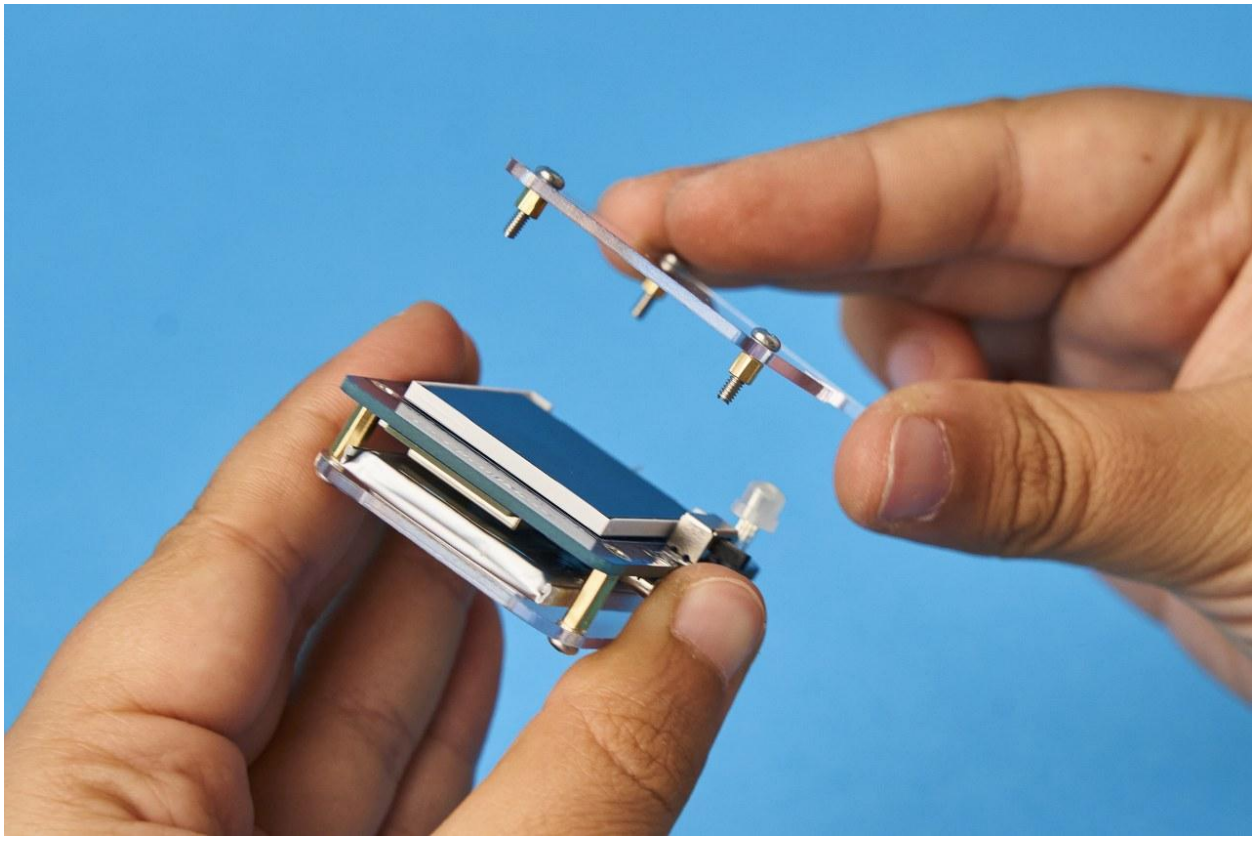
Remove the sticky yellow pad from the battery:

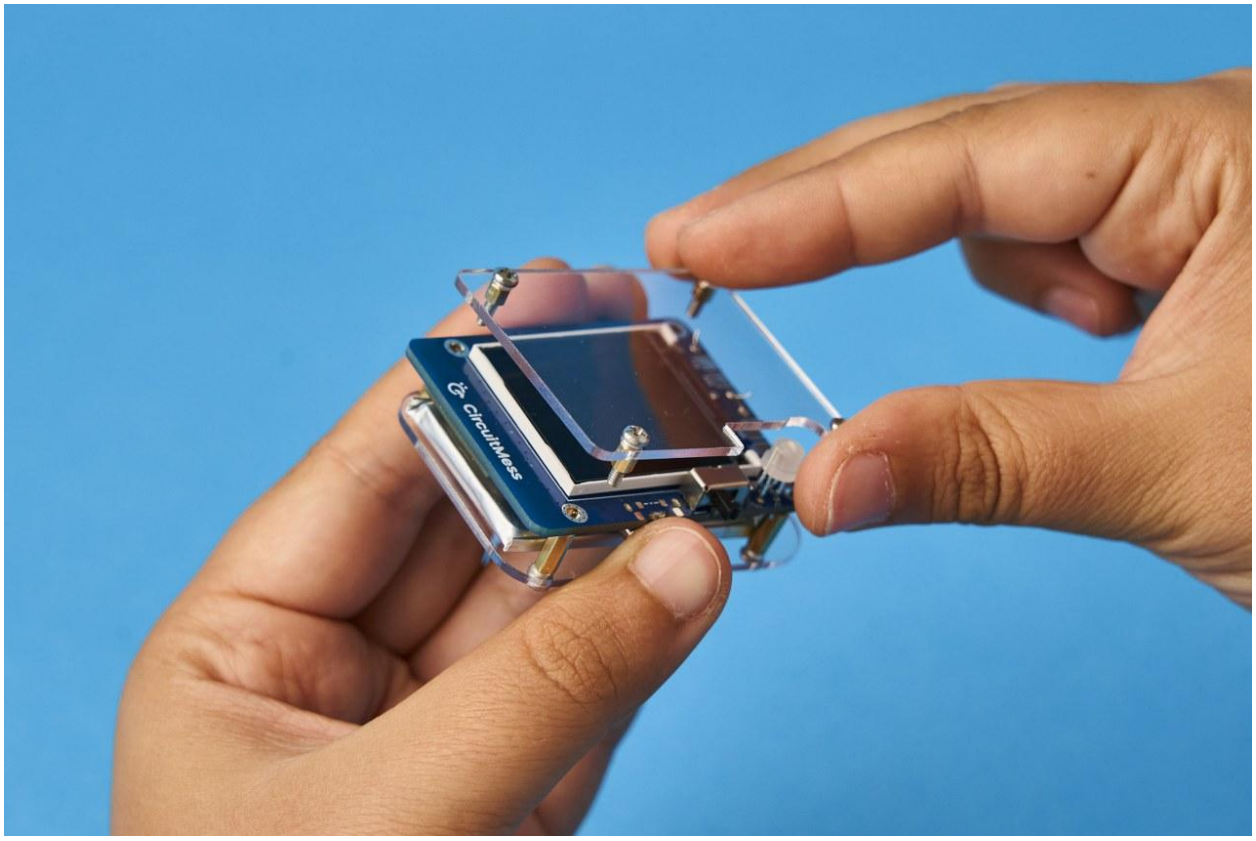


Put the sticky side of the battery on the back casing, like this:



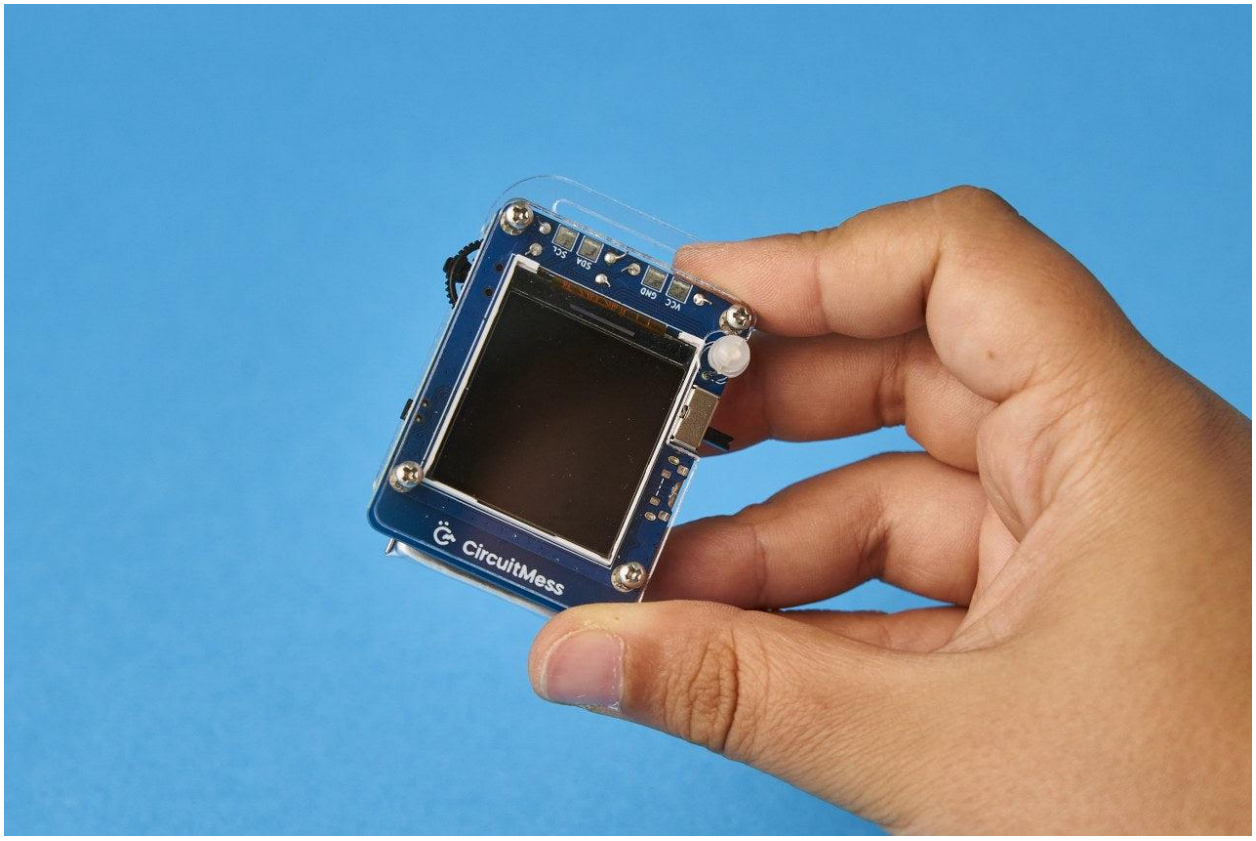
Now, put the casings on the PCB.



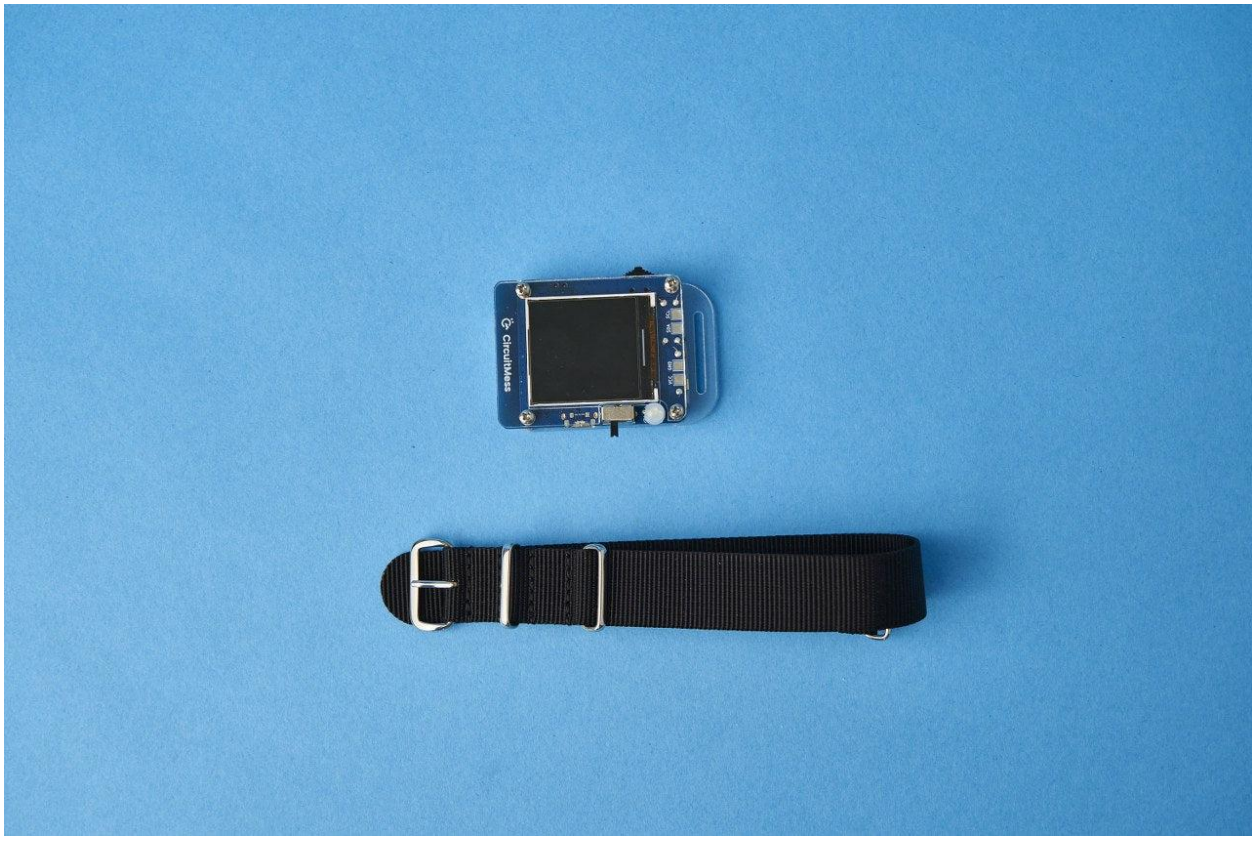


Take the screwdriver to attach the casings one to another.

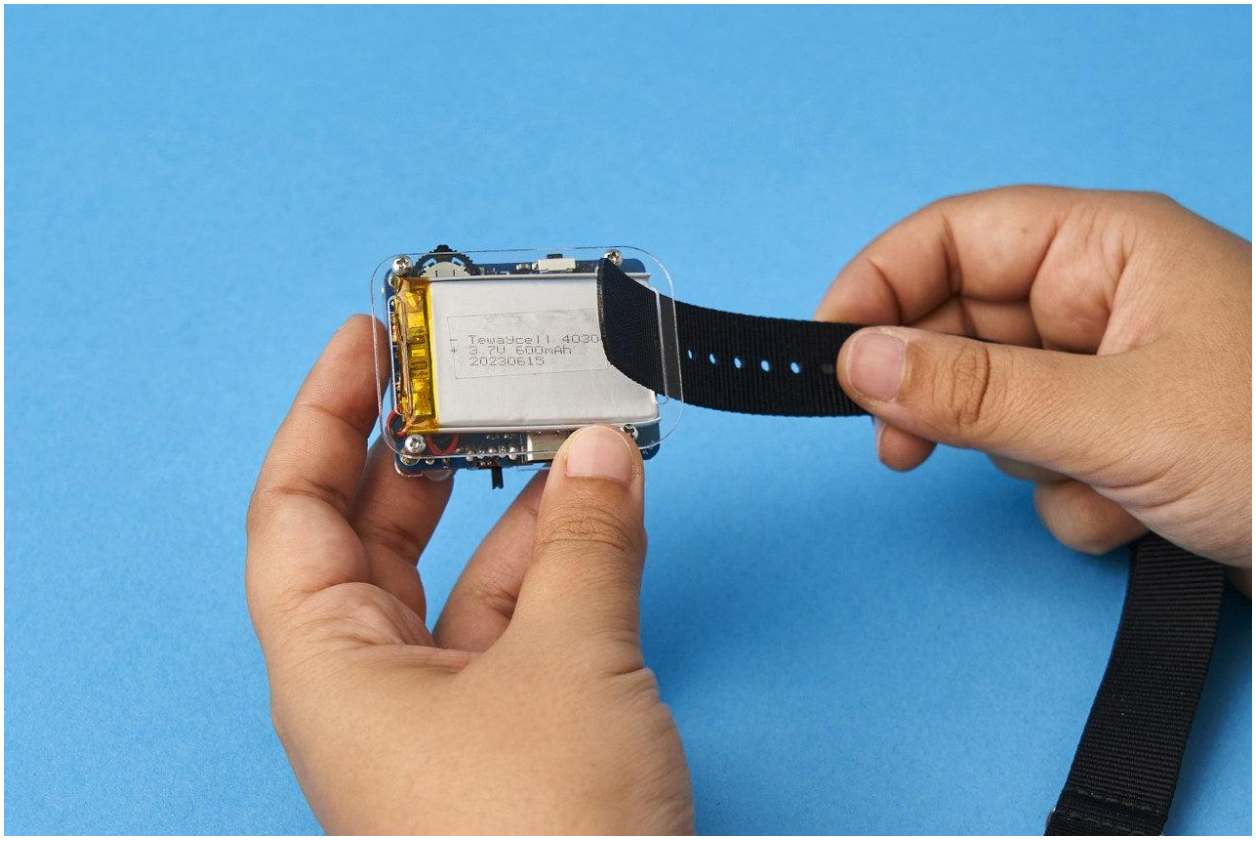
This is what your Clockstar should look like by now:



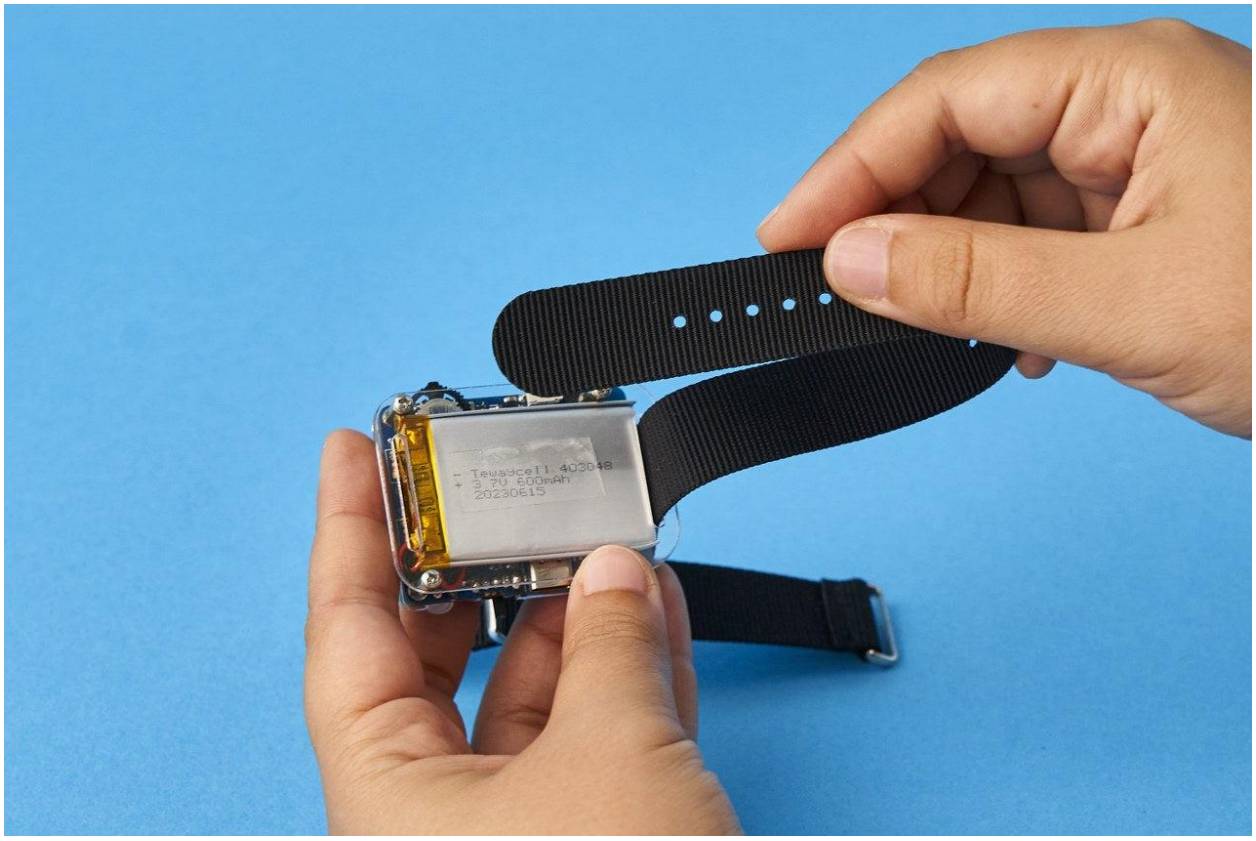
Now is the time to add the watch strap.



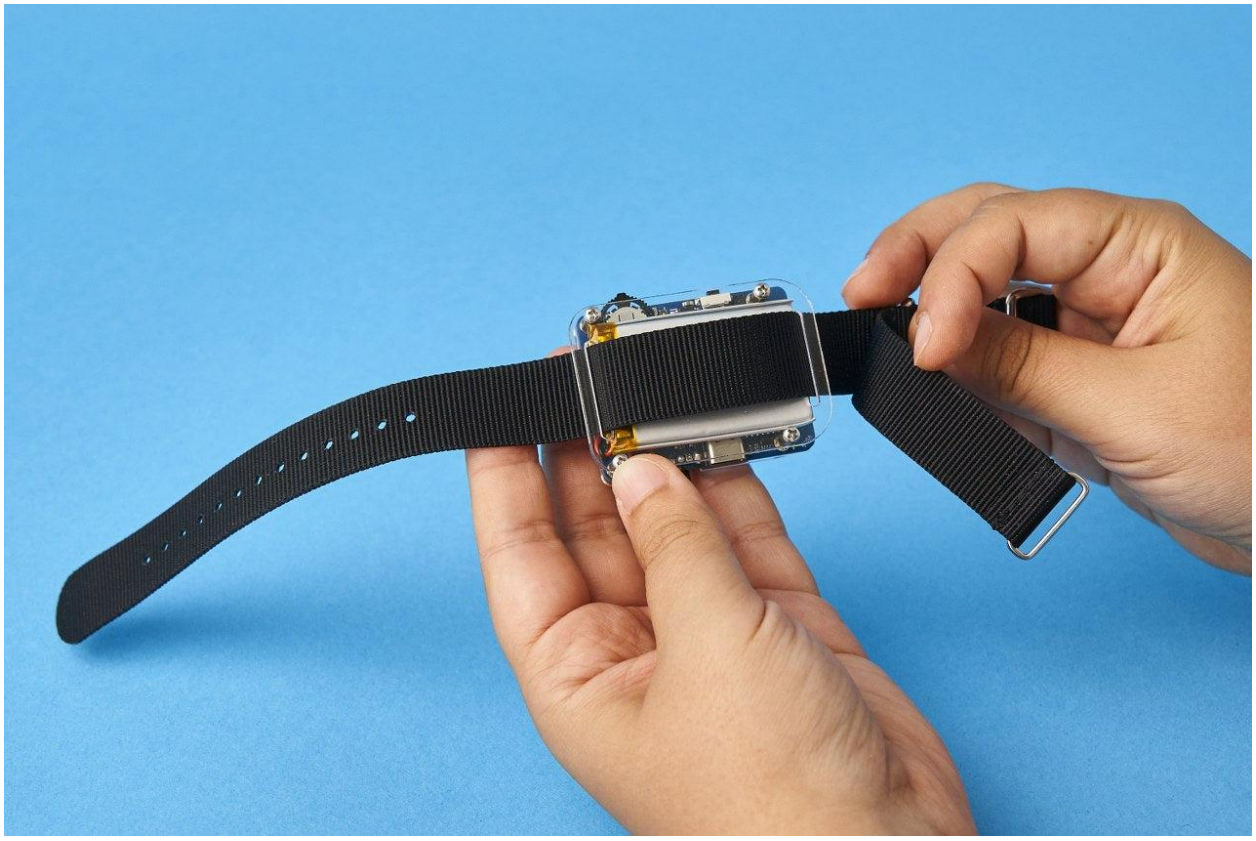
Pull the strap through like this:



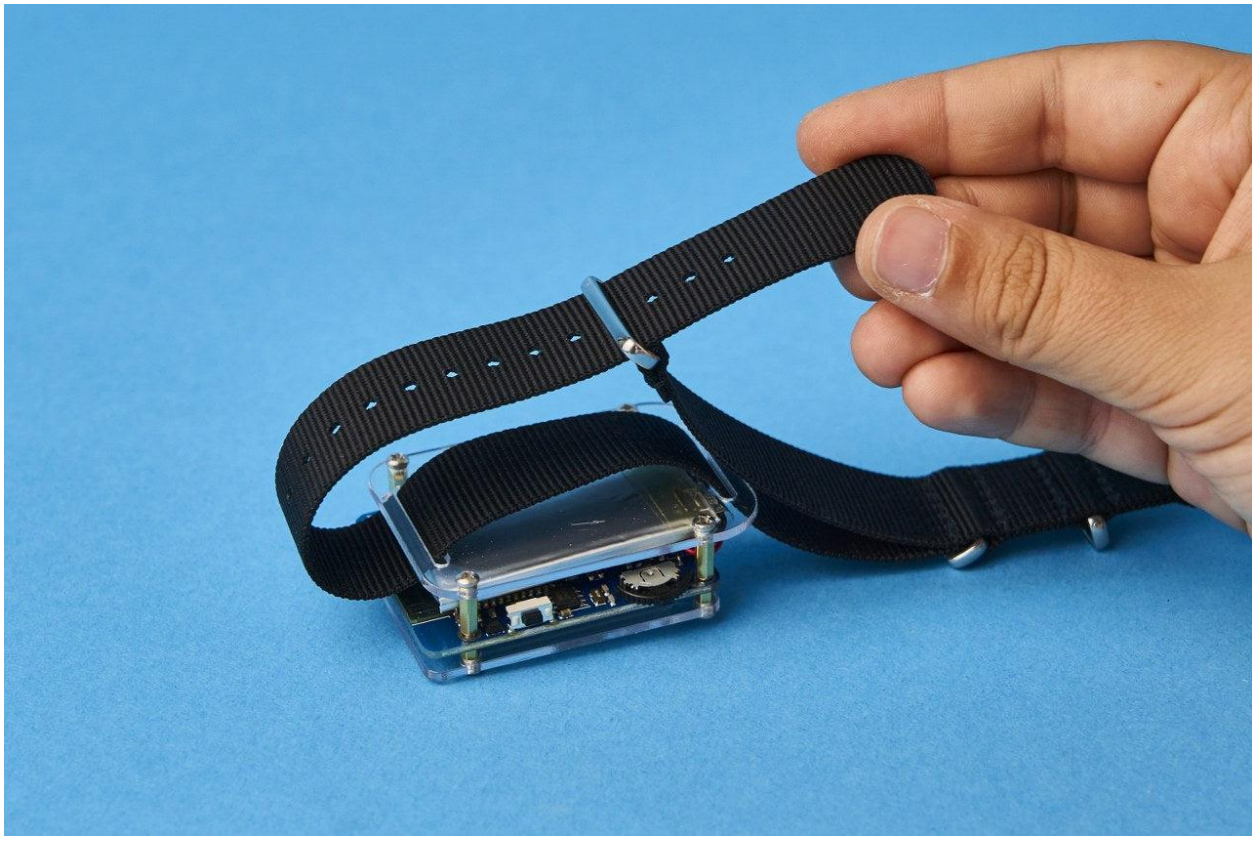
And now, pull the strap through the second hole on the casing.



Like this:



Take part with the holes, and pull it through the metal part:



Ta-daaa!

Put it on your hand, turn it on, and have fun!

Congrats!

You successfully soldered your DIY smartwatch - Clockstar.

What's next?

Congratulations! You successfully assembled a DIY smartwatch, Clockstar.

The next thing you'll have to check is how to use it, and what amazing features we prepared for your, and how to code it!

We are currently in the process of creating coding and usage guides, so we'll have to ask you for a bit more patience.

In the meantime, we invite you to join our Discord channel and Facebook group where you'll be able to share ideas, photos, and feedback with fellow makers and get exclusive news from CircuitMess.