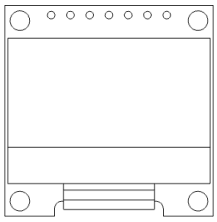
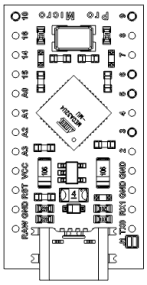
INTRODUCTION TO SURFACE MOUNT SOLDERING

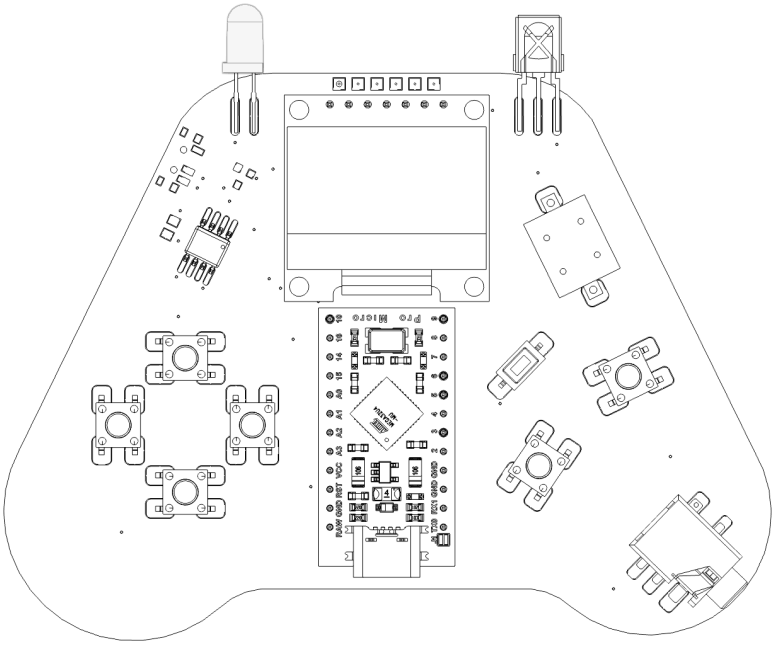
ARDUBOY KIT



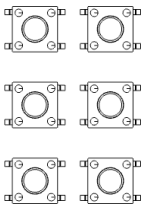
OLED DISPLAY



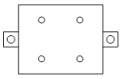
PRO-MICRO



RESET BUTTON

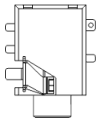


BUTTONS (x6)



SPEAKER

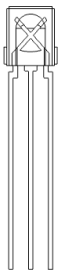
ADVANCED FEATURES



HEADPHONE JACK

FLASH CHIP

IR LED



IR RECEIVER

OPEN-SOURCE GAME SYSTEM COMPATIBLE WITH **OVER 300 FREE GAMES** AVAILABLE AT ARDUBOY.COM

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ORIGINAL DESIGN BY KEVIN BATES

FOR
HOPE CONERENCE JULY 12-14 NEW YORK 2024

SOLDER AND SOLDERING IRON REQUIRED AGES 12+

ARDUBOY.COM / KIT

Arduboy Kit

The Arduboy Kit is a video game system on a circuit board. Based on the popular Arduboy open-source game platform, it is designed to be assembled by hand.

Goals

The Goal of the Arduboy Kit is to be a casual and friendly introduction to surface mount soldering. Most introduction soldering kits feature only through-hole components. Surface mount kits can often be daunting. This kit aims to be somewhere in the middle. While many of the components are surface mount, they are large and easy to manipulate by hand.

Intermediate Difficulty

This kit will be best enjoyed by those with some soldering experience but is accessible to beginners with no experience at all. The most difficult component is the flash chip (SOP-8), but with a little bit of flux and determination anyone can successfully complete this kit. Ages 12 and up.

Materials

Required: Soldering Iron, Solder, Snips

Recommended: Flux, Solder Braid

Included: PCB, Pro-Micro, OLED Display, Short Pin-Headers, Reset Button, Buttons (x6), Speaker, Headphone Jack, Flash Chip, Tweezers, Practice PCB, USB-C 2.0 Cable

Learn to Solder

Soldering involves melting a metal alloy to create a bond between components. Temperature control is important but almost just as important is our friend flux. Flux, or sometimes called rosin, is often integrated into the solder, cleans the surfaces, prevents oxidation, and enhances the soldering process by aiding the flow and bonding of the solder.

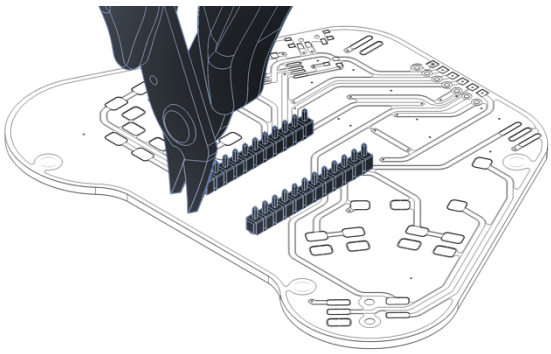
Begin by pre-heating the components and PCB. Apply solder where the components meet, heating the joint sufficiently to allow the solder to flow into place. Use as little solder as possible to avoid bridging nearby connections. Timing is key—hold the iron just long enough for proper wicking without burning the flux. Always ensure you are working in a well-ventilated area, clean the iron's tip frequently, and wear safety glasses to protect against splashes of hot solder.

Solder Practice

Contained within the Arduboy Kit is a green circuit board. Use this board to tune the settings of your iron and practice your soldering before getting started. Practice making solder connections and get a feeling for how quickly the solder melts and how it flows to the PCB. Try to use as little solder as possible. Experiment with and without pre-heating the pad, intentionally use too much solder, make a mess and of course – have fun!

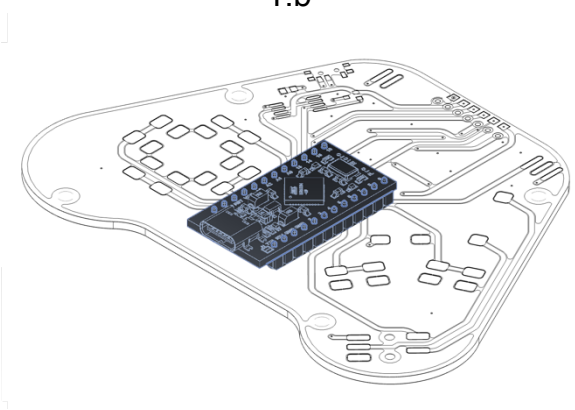
Step 1: Header Pins to Modules

1.a



Cut and place short pin headers
WARNING: Do not solder yet!

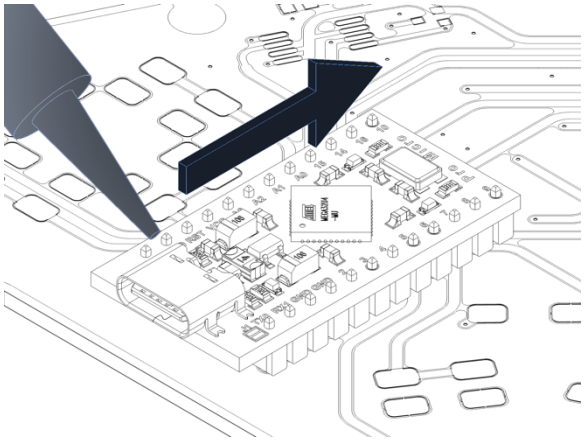
1.b



Place Pro-Micro

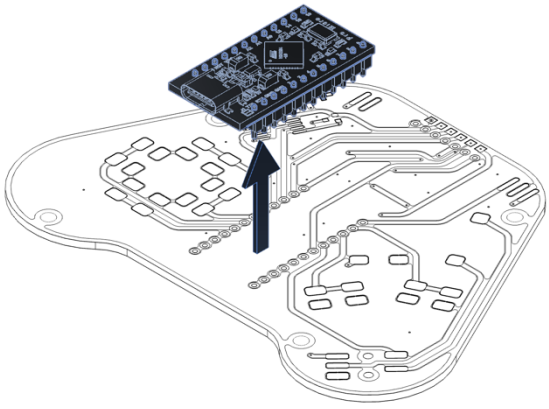
It's recommended to use the PCB for reference instead of counting the number of required pins. The PCB is used as a jig to align the pins to the module
CAUTION: When cutting pin headers, they can go flying

1.c



Solder pins to Pro-Micro

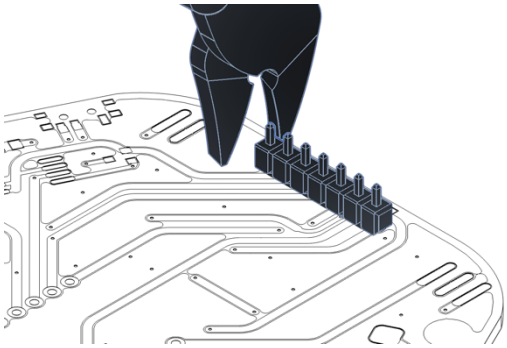
1.d



Remove Pro-Micro with pins

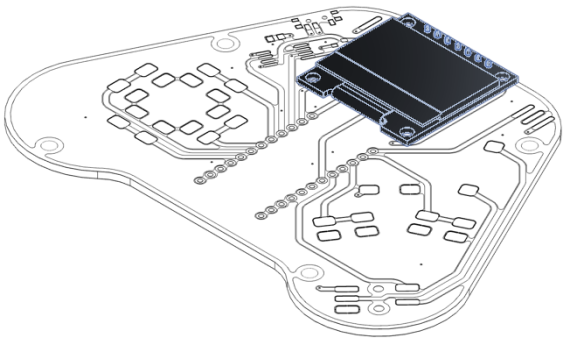
CAUTION: Do not disturb components already mounted to the Pro-Micro. Hold the soldering iron in a way that safely clears other components

1.e



Cut and place pin headers
WARNING: Do not solder yet!

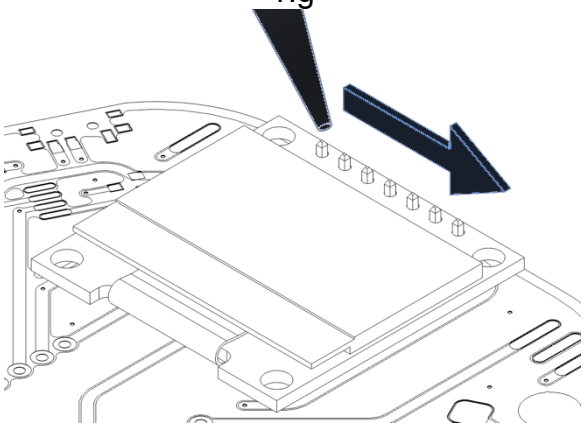
1.f



Place OLED Display
Screen facing up

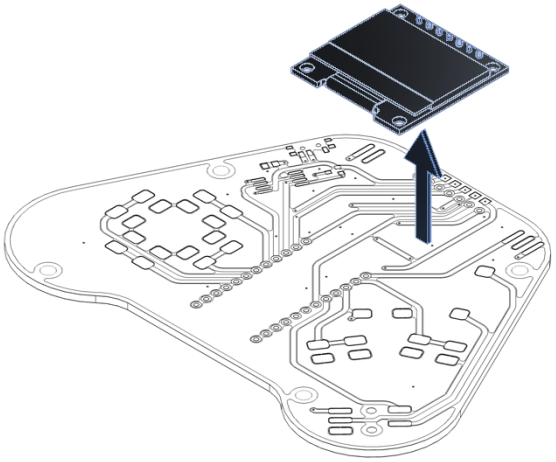
REMINDER: Do not solder to PCB yet, only solder pins to module

1.g



Soler pins to OLED Display

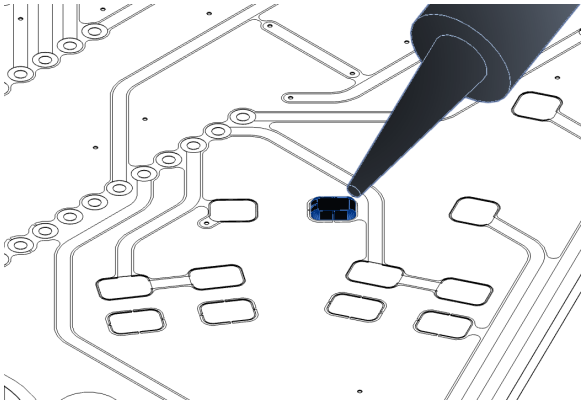
1.h



Remove OLED Display with pins

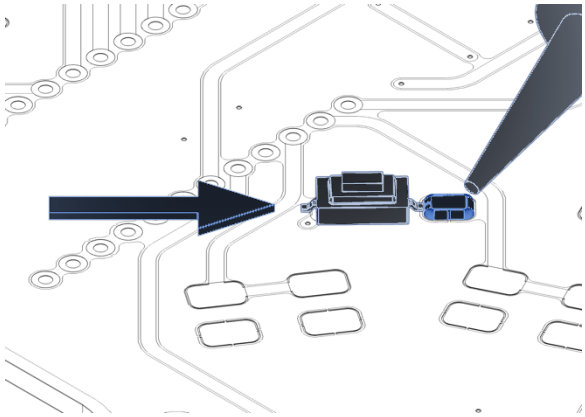
Step 2: Reset Button

2.a



Apply solder to one pad for the reset button
NOTE: Only solder one pad

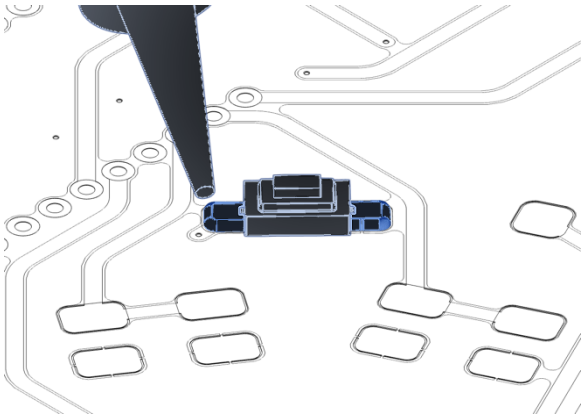
2.b



While re-flowing solder, slide reset button into place, then remove iron.

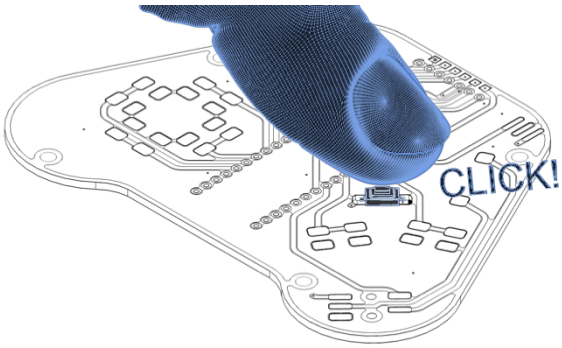
This method of applying solder to the pad is known as “tinning”

2.c



Solder opposite lead of reset button to PCB

2.d

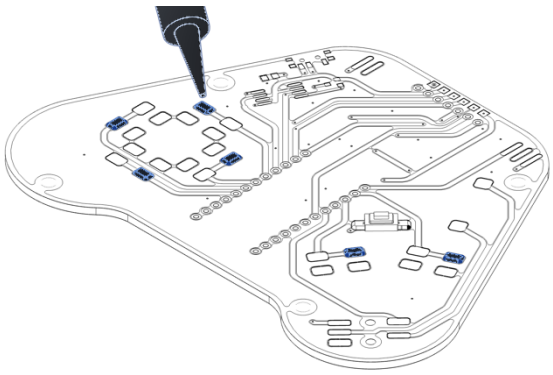


Test the button!
CAUTON: Wait for solder to cool

If you end up with solder tails, peaks generated when removing the soldering iron, try to complete the joint quicker as this is a sign of inadequate flux. This can be fixed by applying additional flux and re-flowing the solder joint.

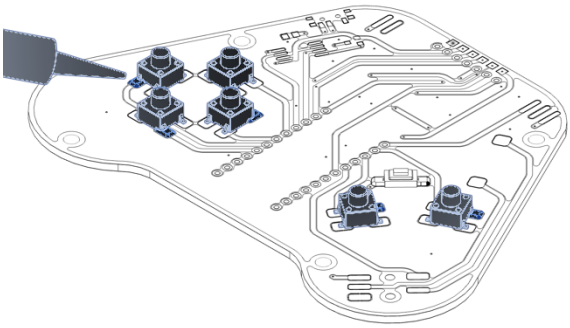
Step 3: Buttons (x6)

3.a



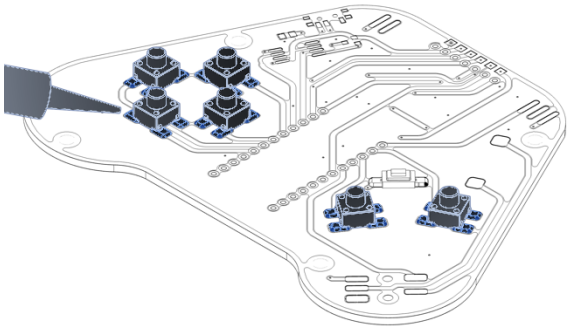
Apply solder to one pad for each of the 6 buttons
NOTE: Only solder one pad each

3.b



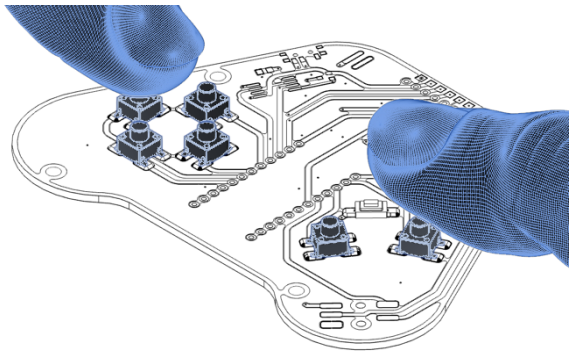
Place each of the 6 buttons, using the same re-flow sliding method as the reset button

3.c



Solder remaining 3 leads of each of the 6 buttons

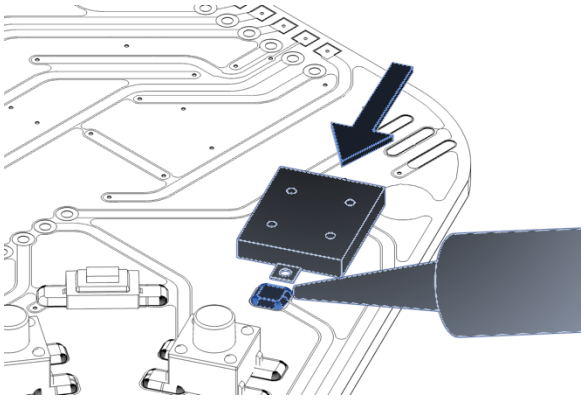
3.d



Test all the buttons!
CAUTON: Wait for solder to cool

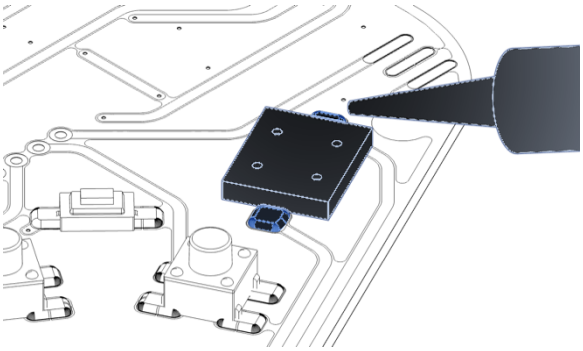
Step 4: Speaker

4.a



Solder one pad for the speaker and slide it into position while re-flowing

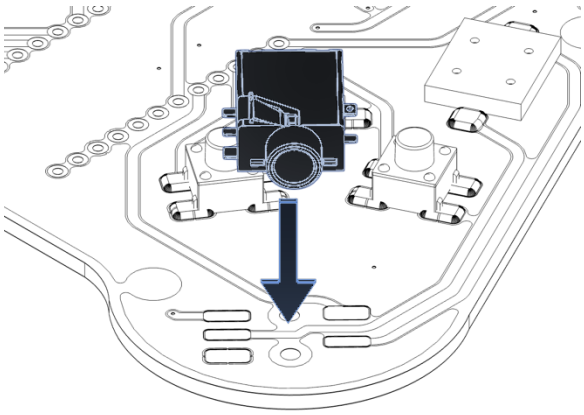
4.b



Solder the opposite lead of the speaker

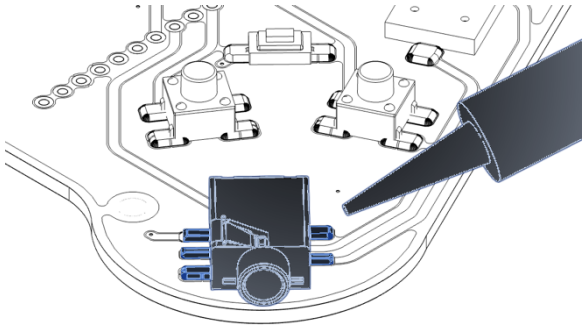
Step 5: Headphone Jack

5.a



Place headphone jack

5.b

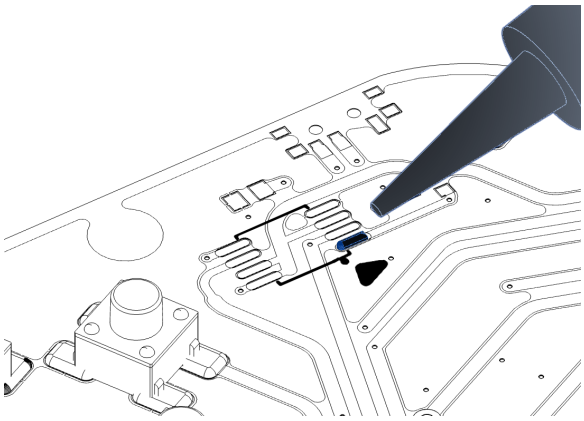


Solder leads of headphone jack

Tinning the pads are not necessary for the headphone jack as it has pins that locate it to the PCB

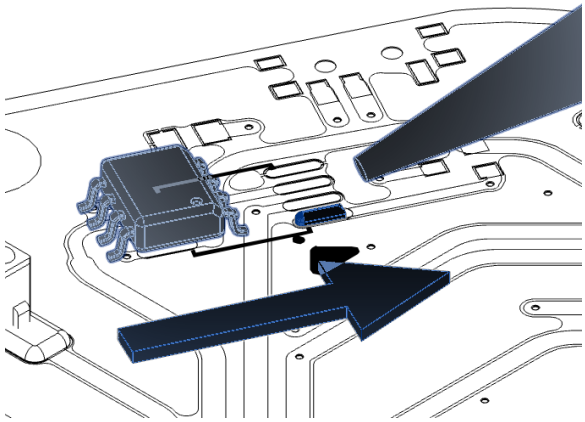
Step 6: Flash Chip

6.a



Solder the pad for the flash chip, closest to the circle and triangle marking on the PCB
NOTE: This is pin 1 of the flash chip

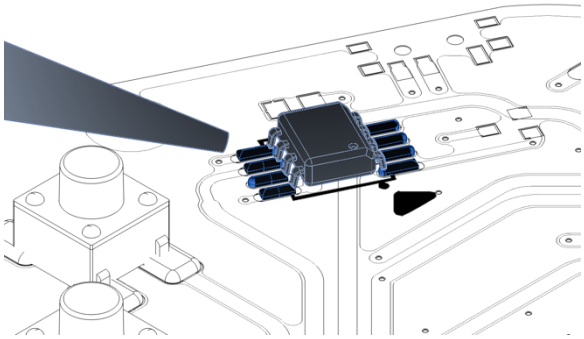
6.b



Align the marking on the flash chip with the marking on the PCB, slide into position while re-flowing solder pad

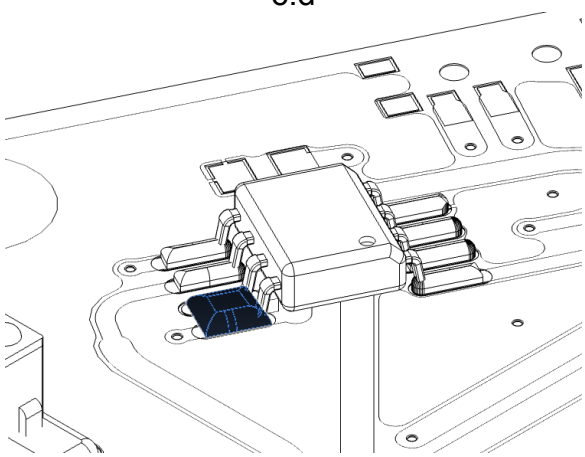
CRITICAL: Ensure the alignment of pin 1

6.c



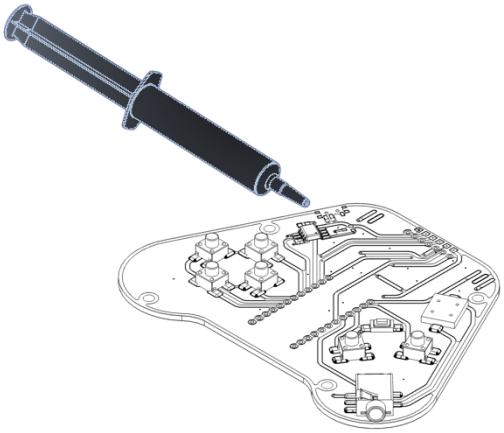
Solder the remaining leads of the flash chip
TIP: Use small amount of solder

6.d



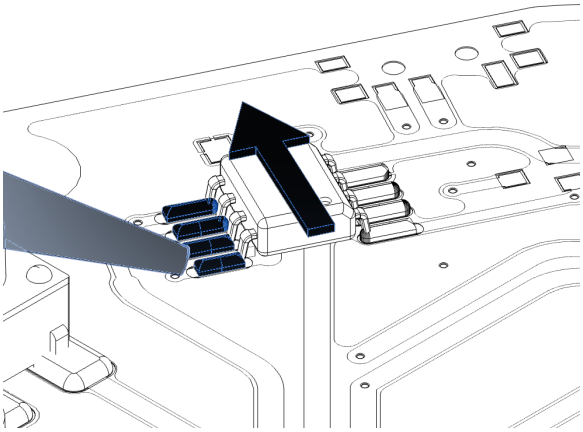
If a solder bridge forms (connecting neighboring leads) it can easily be fixed in the next step

6.e



Apply small amount of flux to flash chip leads

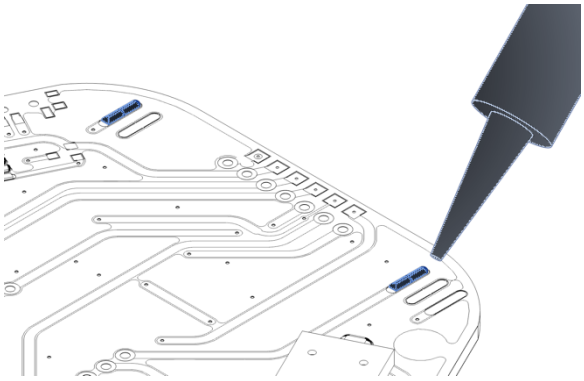
6.f



Use a dragging motion to swipe the soldering iron along the flash chip leads

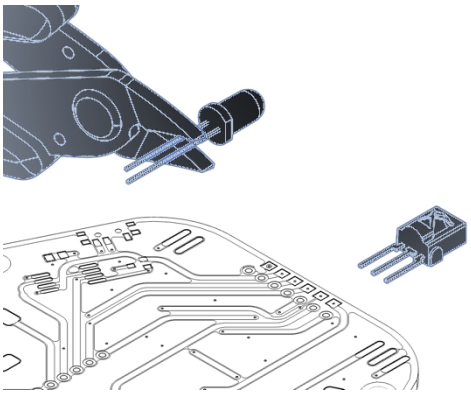
Step 7: IR LED and Receiver

7.a



Solder one pad of each of the IR components

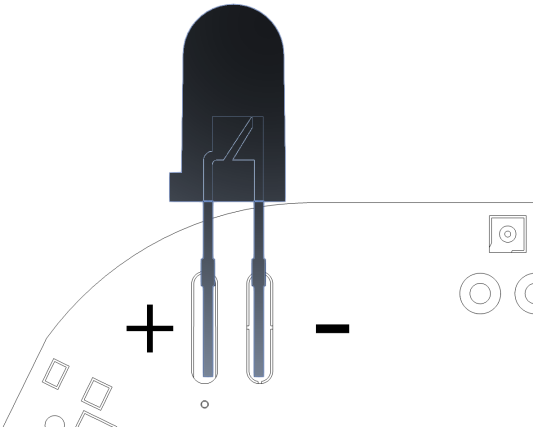
7.b



Cut IR LED and Receiver leads to length

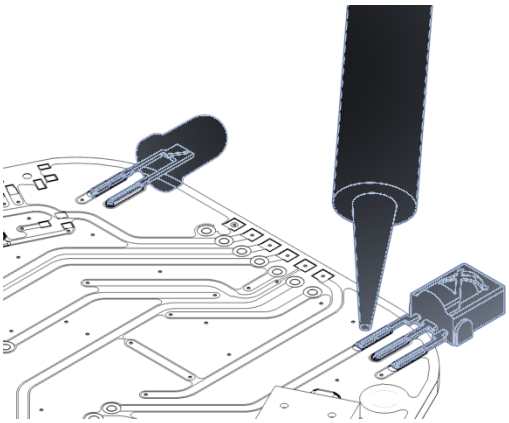
CAUTION: Cutting the leads often causes them to go flying

7.c



Orient the IR LED Polarity
NOTE: Cathode (-) is the flat side of the lens

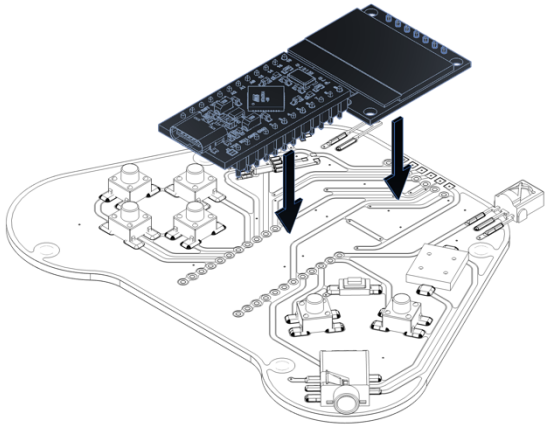
7.d



Solder IR components to PCB using previous methods

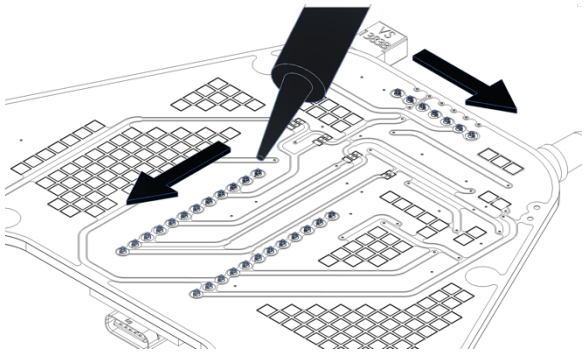
Step 8: Modules to PCB

8.a



Place Pro-Micro and OLED Display with pins on PCB

8.b



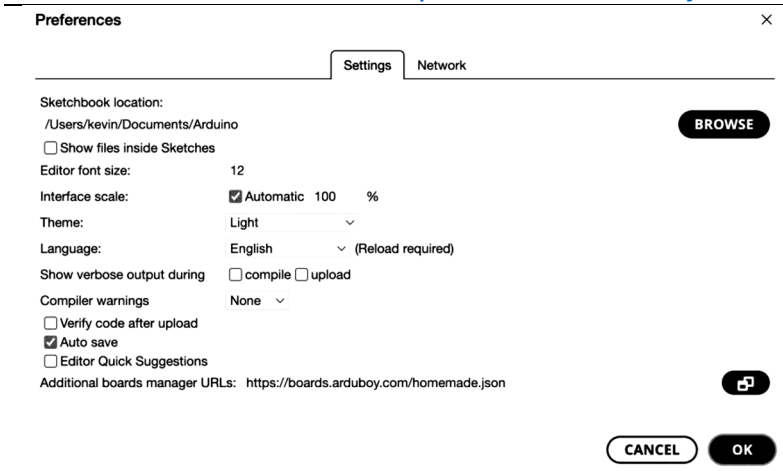
Flip PCB and solder pins to PCB
NOTE: Ensure modules are flush with PCB

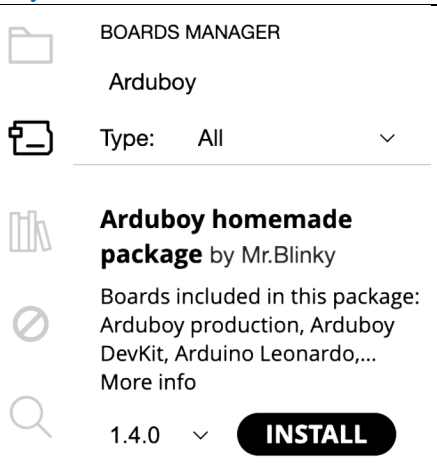
Step 9: Loading Games

Plug into PC via USB	Visit using chrome browser: https://arduboy.github.io/Kit	Use the one-click interface to upload all the games

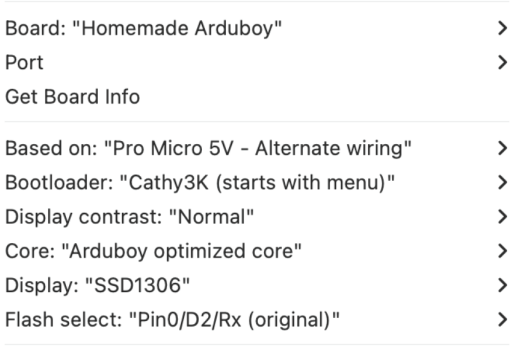
Step 10: Making Games

Install Arduino software: https://www.arduino.cc/en/software
Add custom board files: https://boards.arduboy.com/homemade.json





Configure board: Select from the tool's menu the following configuration



Upload Hello Word

Select from the menu:
File > Examples > Arduboy2 > HelloWorld
Select the Arduboy Kit on the active port:
Tools > Port
Upload the sketch using the Upload Button or:
Sketch > Upload