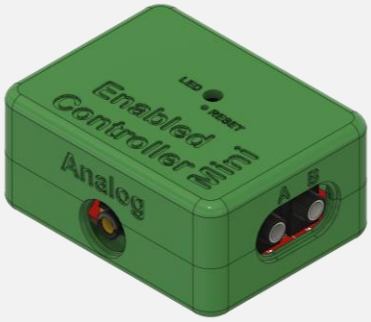

ENABLED-CONTROLLER-MINI INSTRUCTIONS MANUAL (V1.11)

An accessible switch adapter box for gaming

Milad Hajihassan
https://github.com/milador/Enabled-Controller-Mini

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Components List

1. ADAFRUIT QT PY - SAMD21 DEV BOARD **x 1**
2. 7 POSITION HEADER **x 2**
3. CONN JACK STEREO 3.5MM R/A **x 4**
4. CONN JACK 4COND 3.5MM **x 1**
5. ANALOG 2-AXIS THUMB JOYSTICK WIT **(Optional) x 1**
6. HEX NUT 0.245" STEEL 6-32 **x 4**
7. MACH SCREW PAN HEAD SLOTTED 6-32 **x 4**

The bill of materials can also be downloaded from GitHub repository under main directory.

https://github.com/milador/Enabled-Controller-Mini/blob/master/Components/Enabled_Controller_Mini_BOM.csv

Software

The Enabled-Controller-Mini software can be downloaded from the GitHub repository under software directory.

https://github.com/milador/Enabled-Controller-Mini/tree/master/Software/Arduino/

There are two flavors of Enabled-Controller-Mini and each one requires different hardware. The Enabled-Controller-Mini software is offered in the following flavors:

1. USB Keyboard/Mouse Version
2. Joystick Version

Installing Arduino IDE

The Arduino IDE is required to compile and upload the source code to the MCU in your Adafruit QT Py board. You can download and install the Arduino from official Arduino website that you can find using following link:

https://www.arduino.cc/en/software

Installing Arduino Libraries

The following instructions on how to install additional Arduino libraries helps you to get started with setting up Arduino IDE with required libraries and dependencies.

https://www.arduino.cc/en/guide/libraries

USB Version

Board Support Packages

You can find the official instructions to install Board Support Packages on Adafruit website using following link:

https://learn.adafruit.com/adafruit-qt-py/arduino-ide-setup

Alternatively, you can perform following instructions to install Board Support Packages:

1. Open and start the Arduino IDE.
2. Go to ***File > Preferences***.
3. Add following link as a new line under ***Additional Board Manager URLs***
    - ***https://www.adafruit.com/package_adafruit_index.json***
4. Restart the Arduino IDE
5. Open the ***Boards Manager*** option from the ***Tools > Board*** menu and install ***Adafruit SAMD Boards by Adafruit***
6. Wait until the IDE finishes installing the cross-compiling toolchain and tools associated with Board Support Package. This may take few minutes.
7. That's it! The installation of Board Support Packages is finished.

Required Software and libraries

The USB version of the software requires the following files and libraries:

- StopWatch library
- EasyMorse library
- Adafruit_NeoPixel library
- FlashStorage library
- Enabled_Controller_Mini_USB_Software.ino

StopWatch library helps to calculate the reaction time and timeout in the morse code interface.

Enabled-Controller-Mini is using Adafruit_NeoPixel library to provide visual feedback using RGB LED.

You can use the following instructions to download and install the required libraries:

1) Visit the StopWatch library github repository page.
2) Click on ***Code > Download Zip*** to download ***StopWatch*** library.
3) Extract ***Stopwatch_RT-master.zip*** file
4) Rename ***Stopwatch_RT-master*** folder to ***Stopwatch*** folder under ***Stopwatch_RT-master*** subdirectory.
5) Copy or move ***Stopwatch*** folder to Arduino installation library subdirectory. As an example: This is found under ***C:\Program Files (x86)\Arduino\libraries*** in windows 10.
6) Visit the EasyMorse library github repository page.
7) Click on ***Code > Download Zip*** to download ***EasyMorse*** library.
8) Extract ***EasyMorse-master.zip*** file
9) Rename ***EasyMorse-master*** folder to ***EasyMorse*** folder under ***EasyMorse-master*** subdirectory.
10) Copy or move ***EasyMorse*** folder to Arduino installation library subdirectory. As an example: This is found under ***C:\Program Files (x86)\Arduino\libraries*** in windows 10.
11) Visit the EasyMorse library github repository page.
12) Click on ***Code > Download Zip*** to download ***FlashStorage*** library.
13) Extract ***FlashStorage-master.zip*** file
14) Rename ***FlashStorage-master*** folder to ***FlashStorage*** folder under ***FlashStorage-master*** subdirectory.
15) Copy or move ***FlashStorage*** folder to Arduino installation library subdirectory. As an example: This is found under ***C:\Program Files (x86)\Arduino\libraries*** in windows 10.
16) Visit the Enabled_Controller_Mini_USB_Software.ino raw source code file under ***Enabled-Controller-Mini*** github repository page.
17) Right click on the source code or any place on this page and select ***Save Page As…***
18) Select the directory you would like to save the software in your computer.
19) Change ***File name*** from ***Enabled_Controller_Mini_USB_Software*** to ***Enabled_Controller_Mini_USB_Software.ino***
20) Change ***Save as type*** to ***All Files***.
21) Click on ***Save*** button.
22) Open the directory you selected in ***step 13***.
23) Double left click or open ***Enabled_Controller_Mini_USB_Software*** file

24) Arduino IDE will ask your permission to create a new sketch folder named ***Enabled_Controller_Mini_USB_Software*** and move ***Enabled_Controller_Mini_USB_Software.ino*** under this folder.
25) Click on the ***Ok*** button.
26) Arduino IDE should now open the ***Enabled_Controller_Mini_USB_Software.ino*** file automatically.

Uploading Software

Note: Make sure all files are included in your local copy of Software directory before uploading it to the Adafruit* QT PY *board. The libraries can be installed in Arduino libraries.

You can go ahead and upload the downloaded ***.ino*** code to Adafruit QT PY board using Arduino IDE once all the necessary libraries are installed.

1. Start the Arduino IDE
2. Open ***Enabled_Controller_Mini_USB_Software.ino***
3. Select the Board under ***Tools > Board > Adafruit SAMD Boards*** as ***Adafruit QT PY (SAMD21)***
4. Select the correct port number under ***Tools > Port*** which should show ***COM XX (Adafruit QT PY)***

Note: It's very important to make sure the correct Board and port number are selected as selecting the wrong board may result problems with bootloader of Adafruit* QT PY *board.

5. Press the ***Verify*** button to make sure there is no problem with the software and libraries.
6. Press ***Upload*** button

You can now go ahead and upload the software. Arduino IDE will show you a ***Done Uploading*** message indicating the software is uploaded to your Enabled-Controller-Mini.

The LED on the QT PY board blinks two times in ***teal*** to indicate the start of initialization process has been started and it will blink again two times in green to indicate end of the initialization process.

You can also open the Serial Monitor in Arduino IDE on 115200 baud-rate to read initialization information about the version of software.

Joystick Version

Board Support Packages

You can find the official instructions to install Board Support Packages on Adafruit website using following link:

https://learn.adafruit.com/adafruit-qt-py/arduino-ide-setup

Alternatively, you can perform following instructions to install Board Support Packages:

1. Open and start the Arduino IDE.
2. Go to ***File > Preferences***.
3. Add following link as a new line under ***Additional Board Manager URLs***
    - ***https://www.adafruit.com/package_adafruit_index.json***
4. Restart the Arduino IDE
5. Open the ***Boards Manager*** option from the ***Tools > Board*** menu and install ***Adafruit SAMD Boards by Adafruit***
6. Wait until the IDE finishes installing the cross-compiling toolchain and tools associated with Board Support Package. This may take few minutes.
7. That's it! The installation of Board Support Packages is finished.

Required Software and libraries

The Joystick version of the software requires the following files and libraries:

- StopWatch library
- Joystick library (SAMD Version) (SAMD Version)
- Adafruit_NeoPixel library
- Enabled_Controller_Mini_Joystick_Software.ino

StopWatch library helps to calculate the reaction time and timeout in the morse code interface.

The joystick library is used to turn Enabled Controller Mini into a joystick USB HID device which can be used for gaming. Please make sure you install the SAMD version of the joystick library.

Enabled-Controller-Mini is using Adafruit_NeoPixel library to provide visual feedback using RGB LED.

You can use the following instructions to download and install the required libraries:

1) Visit the StopWatch library github repository page.
2) Click on ***Code > Download Zip*** to download ***StopWatch*** library.
3) Extract ***Stopwatch_RT-master.zip*** file
4) Rename ***Stopwatch_RT-master*** folder to ***Stopwatch*** folder under ***Stopwatch_RT-master*** subdirectory.

5) Copy or move ***Stopwatch*** folder to Arduino installation library subdirectory. As an example: This is found under ***C:\Program Files (x86)\Arduino\libraries*** in windows 10.
6) Visit the EasyMorse library github repository page.
7) Click on ***Code > Download Zip*** to download ***ArduinoJoystickLibrary-samd_patch*** library.
8) Extract ***ArduinoJoystickLibrary-samd_patch.zip*** file
9) Copy or move ***Joystick*** folder under ***ArduinoJoystickLibrary-samd_patch-master*** subdirectory to Arduino installation library subdirectory. As an example: This is found under ***C:\Program Files (x86)\Arduino\libraries*** in windows 10.
10) Visit the Enabled_Controller_Joystick_Software.ino raw source code file under ***Enabled-Controller-Mini*** github repository page.
11) Right click on the source code or any place on this page and select ***Save Page As…***
12) Select the directory you would like to save the software in your computer.
13) Change ***File name*** from ***Enabled_Controller_Mini_Joystick_Software*** to ***Enabled_Controller_Mini_Joystick_Software.ino***
14) Change ***Save as type*** to ***All Files***.
15) Click on ***Save*** button.
16) Open the directory you selected in ***step 12***.
17) Double left click or open ***Enabled_Controller_Mini_Joystick_Software*** file
18) Arduino IDE will ask your permission to create a new sketch folder named ***Enabled_Controller_Mini_Joystick_Software*** and move ***Enabled_Controller_Mini_Joystick_Software.ino*** under this folder.
19) Click on the ***Ok*** button.
20) Arduino IDE should now open the ***Enabled_Controller_Mini_Joystick_Software.ino*** file automatically.

Uploading Software

Note: Make sure all files are included in your local copy of Software directory before uploading it to the Adafruit* QT PY *board. The libraries can be installed in Arduino libraries.

You can go ahead and upload the downloaded ***.ino*** code to Adafruit QT Py board using Arduino IDE once all the necessary libraries are installed.

1. Start the Arduino IDE
2. Open ***Enabled_Controller_Mini_Joystick _Software.ino***
3. Select the Board under ***Tools > Board > Adafruit SAMD Boards*** as ***Adafruit QT PY (SAMD21)***
4. Select the correct port number under ***Tools > Port*** which should show ***COM XX (Adafruit QT PY)***

Note: It's very important to make sure the correct Board and port number are selected as selecting the wrong board may result problems with bootloader of Adafruit* QT PY *board.

5. Press the ***Verify*** button to make sure there is no problem with the software and libraries.
6. Press ***Upload*** button

You can now go ahead and upload the software. Arduino IDE will show you a ***Done Uploading*** message indicating the software is uploaded to your Enabled-Controller-Mini.

The LED on the QT PY board blinks two times in ***teal*** to indicate the start of initialization process has been started and it will blink again two times in green to indicate end of the initialization process.

You can also open the Serial Monitor in Arduino IDE on 115200 baud-rate to read initialization information about the version of software.

Hardware Assembly

Printed circuit Board design

The printed circuit boards (PCB) can be downloaded from GitHub repository under Hardware directory.

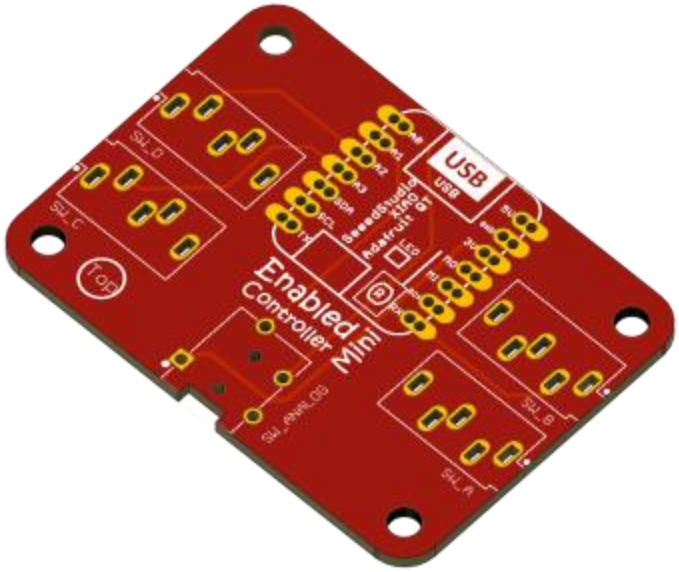
https://github.com/milador/Enabled-Controller-Mini/tree/master/Hardware/PCB

Enclosure design

The enclosure/housing files in STL format can be downloaded from GitHub repository under Hardware directory.

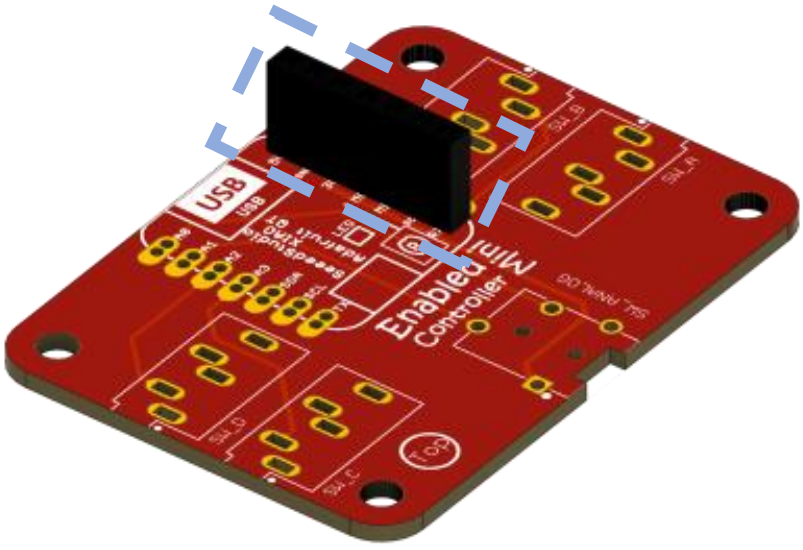
https://github.com/milador/Enabled-Controller-Mini/tree/master/Hardware/Enclosure

Enabled-Controller-Mini Assembly



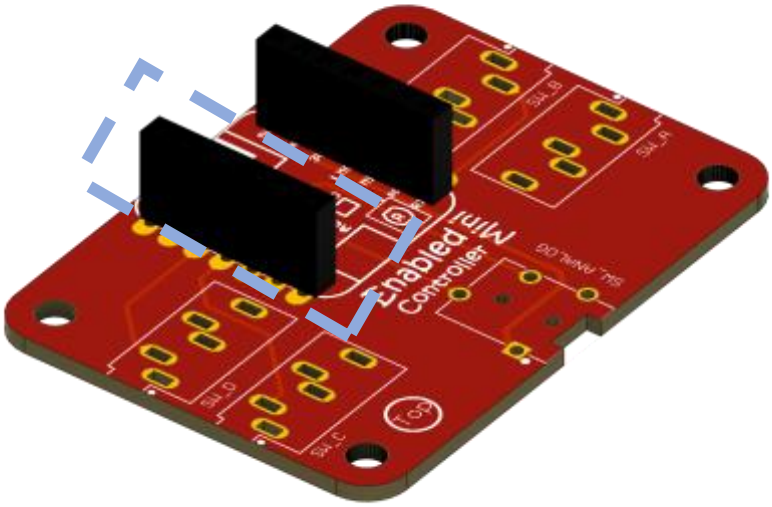
1

Step 1: Enabled-Controller-Mini board x 1.



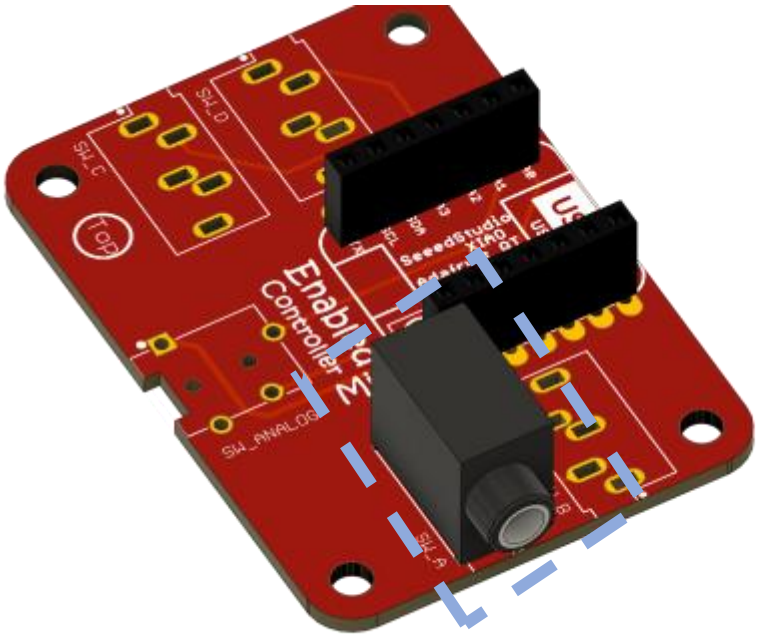
2

Step 2: Solder the first 7 position female headers over the Enabled-Controller-Mini board



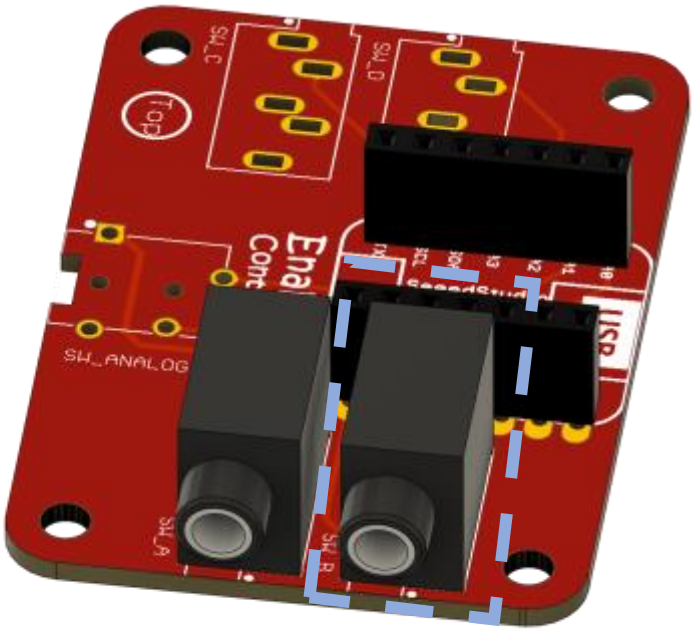
3

Step 3: Solder the second 7 position female headers over the Enabled-Controller-Mini board



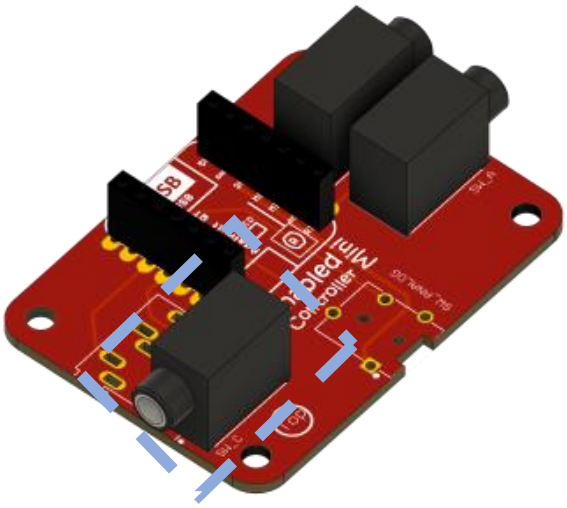
4

Step 4: Position a 3.5mm jack on the A switch outline and solder the pins x 1.



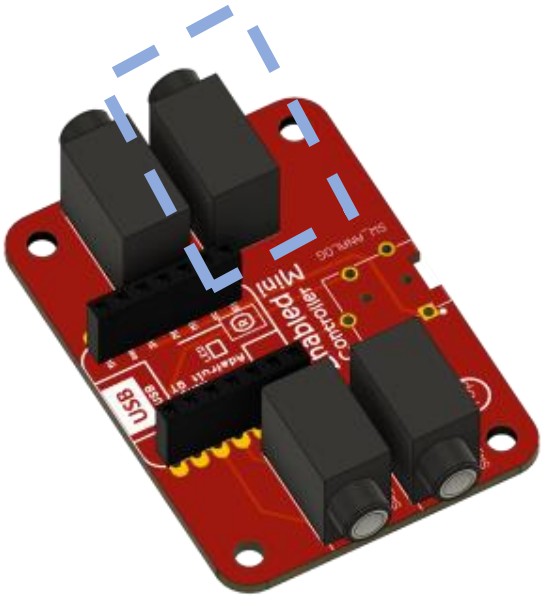
5

Step 5: Position a 3.5mm jack on the B switch outline and solder the pins x 1.



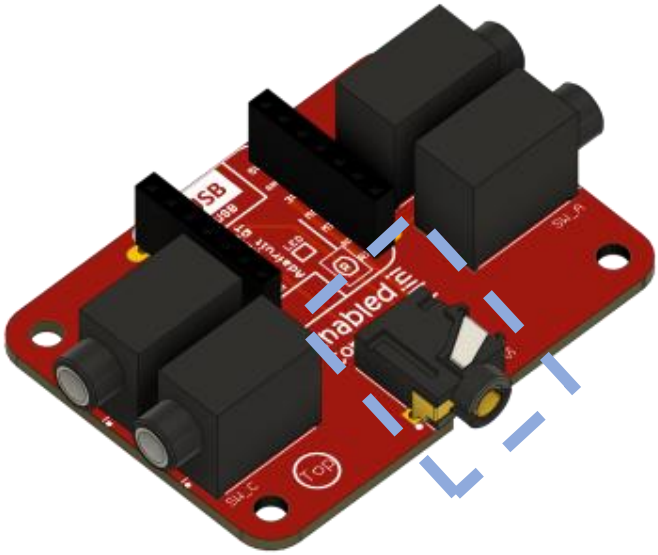
6

Step 6: Position a 3.5mm jack on the C switch outline and solder the pins x 1.



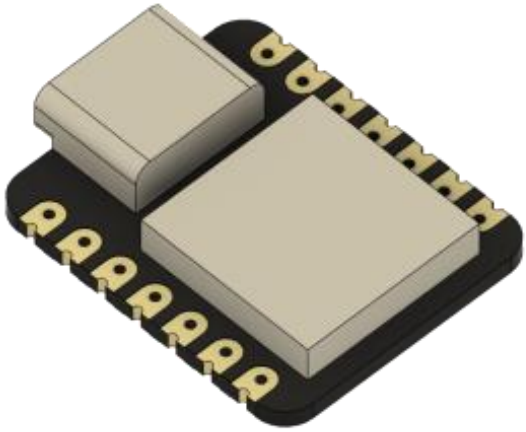
7

Step 7: Position a 3.5mm jack on the D switch outline and solder the pins x 1.



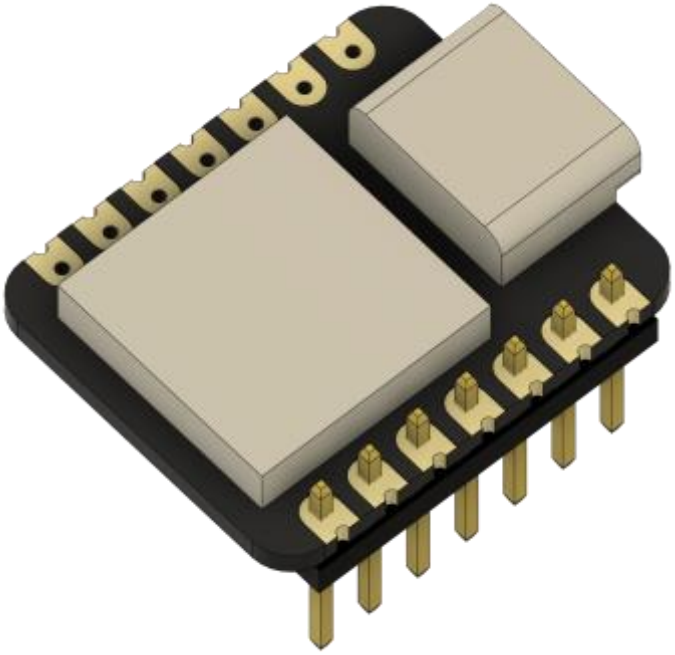
8

Step 8: Position a 4 Conductor 3.5mm jack on the AN switch outline and solder the pins x 1.



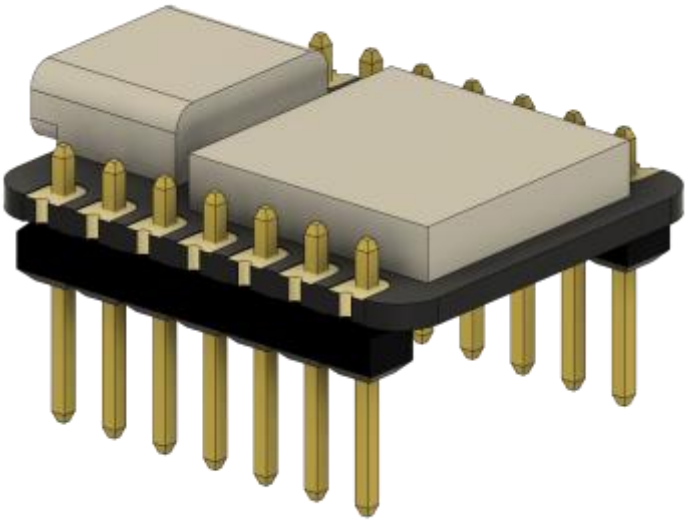
9

Step 9: Position the QT Py on a breadboard or prepare it for soldering x 1.



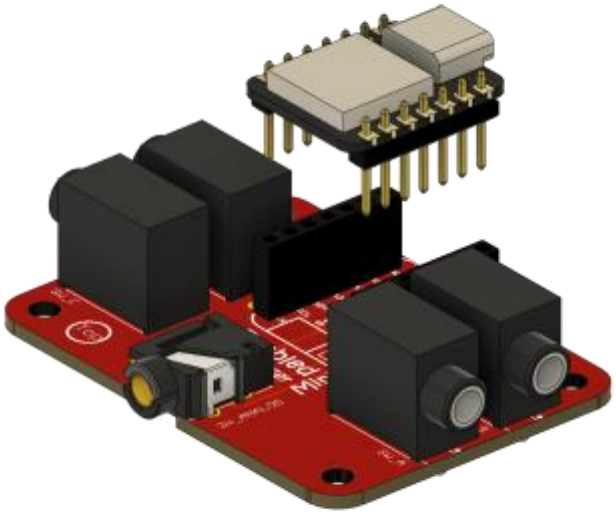
10

Step 10: Position and solder the first 7 position male header under QT PY board x 1.



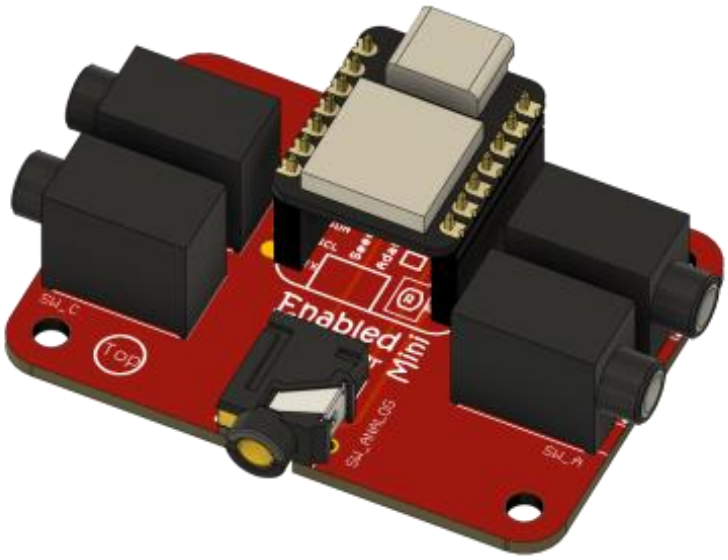
11

Step 11: Position and solder the second 7 position male header under QT PY board x 1.



12

Step 12: Position the soldered QT PY board over Enabled-Controller-Mini board

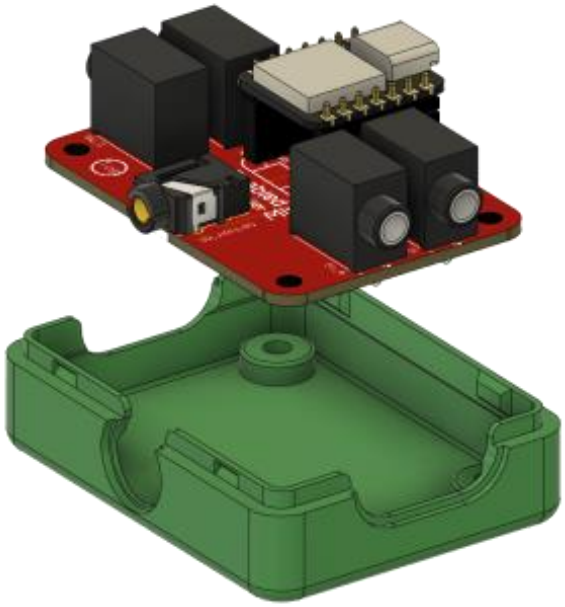


13

Step 13: Stack the soldered QT PY board over Enabled-Controller-Mini board

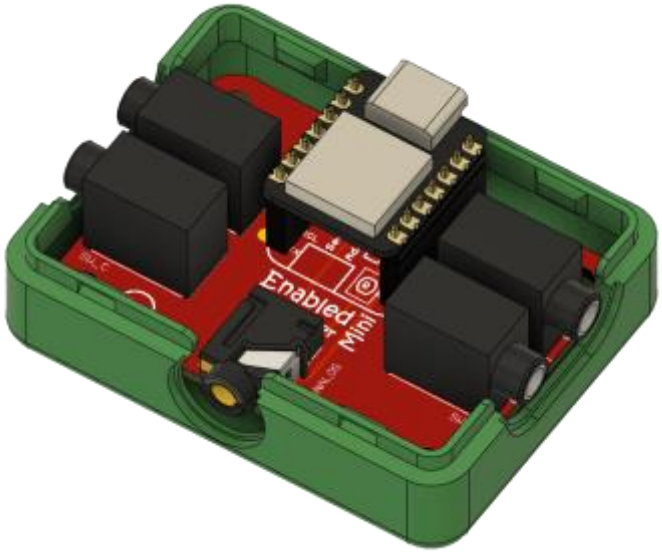
14

Step 14: Take the bottom part of Enabled-Controller-Mini enclosure



15

Step 15: Position the assembled Enabled-Controller-Mini board in the bottom enclosure part.



16

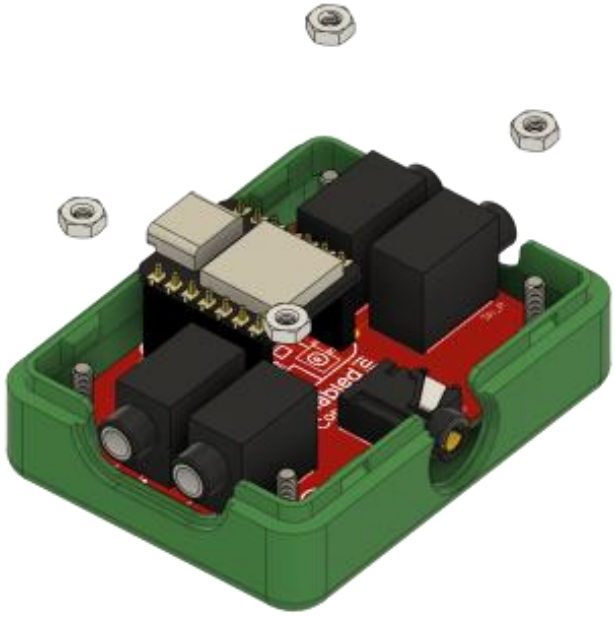
Step 16: Position the 6-32 screws under the bottom enclosure x 4.

17

Step 17: Position the 6-32 screws under the bottom enclosure part x 4.

18

Step 18: Insert the 6-32 screws and push them until they pass Enabled-Controller-Mini drill holes x 4.



19

Step 19: Insert the 6-32 screw nuts x 4.

20

Step 20: Make sure the 6-32 screws hold the Enabled-Controller-Mini board by tightening the nuts .

21

Step 21: Enabled-Controller-Mini top enclosure x 1.

22

Step 22: Insert the top enclosure part over the bottom enclosure and snap them together.

23

Step 23 – That's it! Your Enabled-Controller-Mini is fully assembled and ready to use.

ready to use.

Joystick Assembly

Enabled-Controller includes one 4 conductors input 3.5mm jack reserved to connect a dual axis joystick. The order of pins in joystick boards can vary depending on the brand but the following general configuration can be used to attach analog joystick. Enabled-Controller is designed to work with analog joystick which rated to work with 3.3V input voltage.

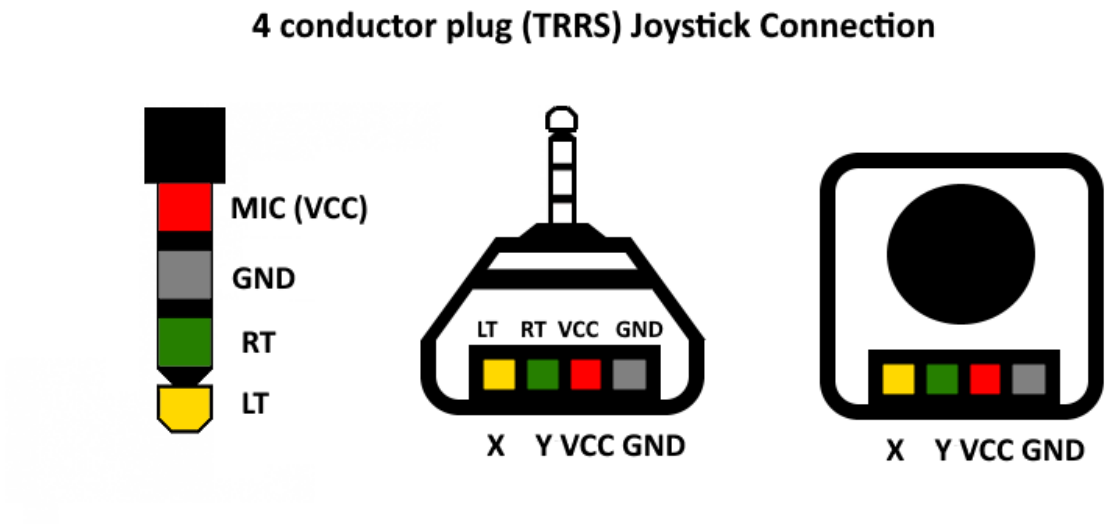


Figure 1: 4 Conductor plug (TRRS) pin mapping

The following table can summarize figure 1 as following:

PIN	FUNCTION
1 (Sleeve)	Microphone – VCC (3.3V)
2 (Ring 2)	GND
3 (Ring 1)	RT(Right Audio Channel)
4 (Tip)	LT(Left Audio Channel)

Table 1: 4 Conductor plug (TRRS) pin mapping