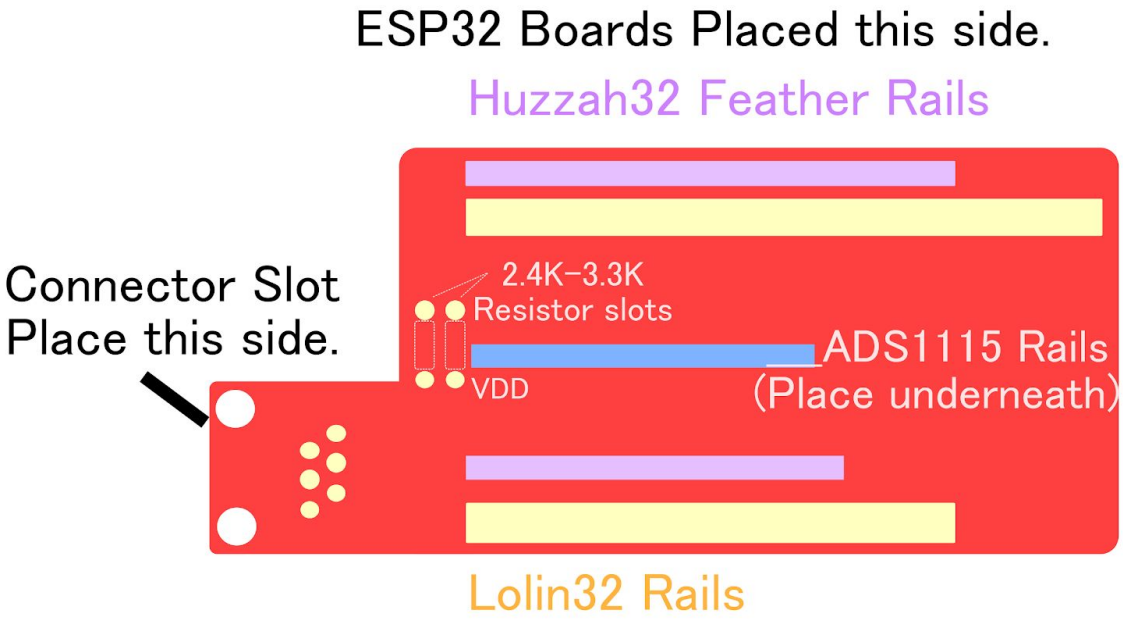
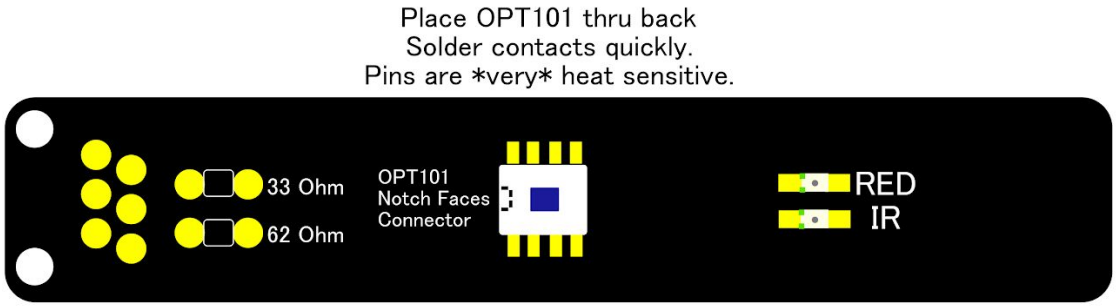
HEGduino Assembly Guide. Beginner-friendly.

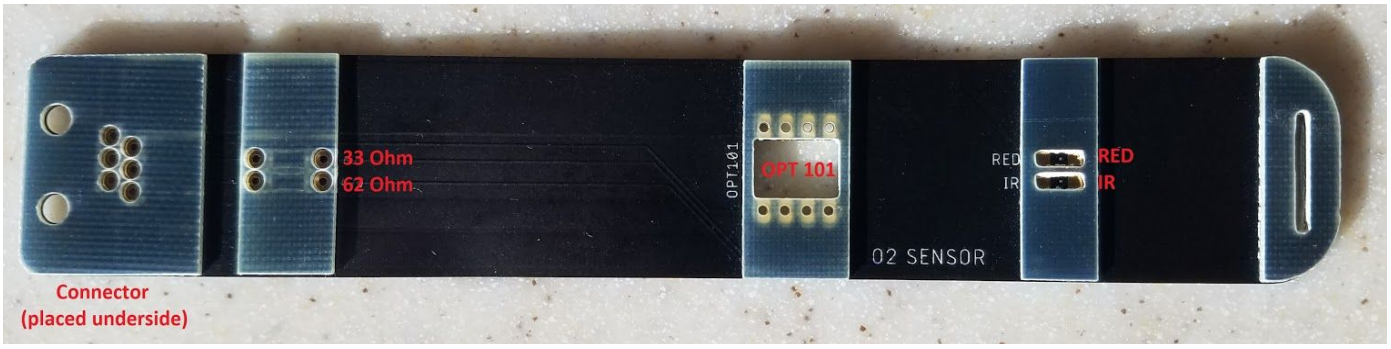
Simplified Diagrams:



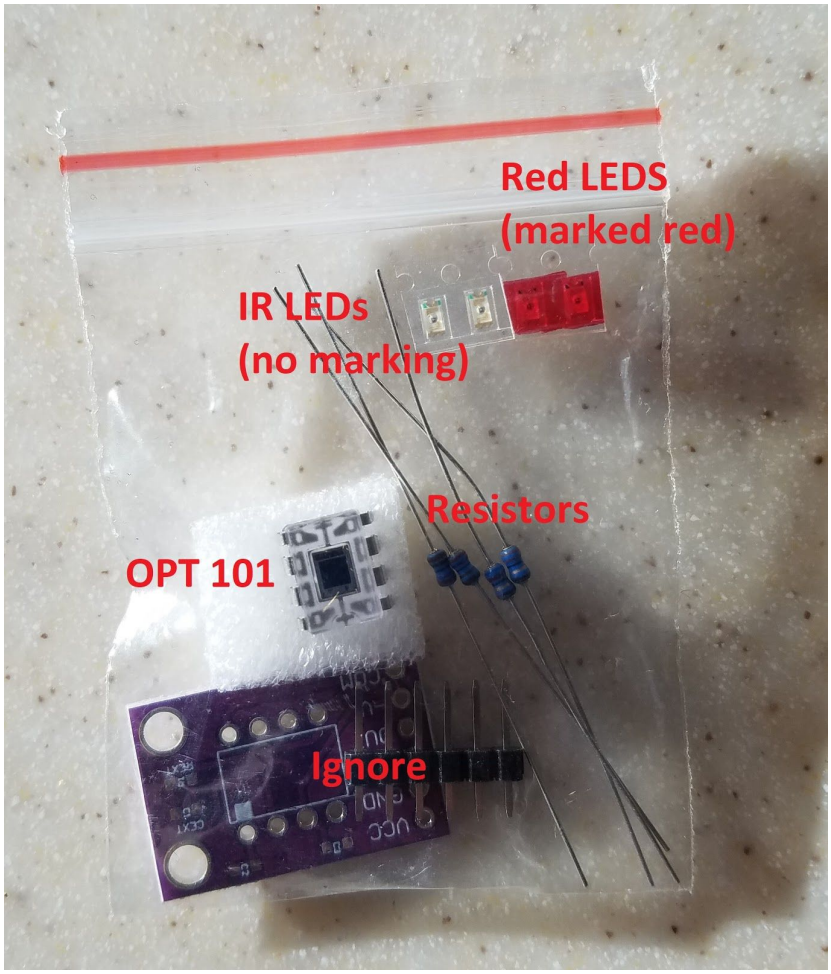


Place Connector and Resistors thru backside.
Heat carefully, the plastic can melt.

Place LEDS in their slots.
Green faces OPT101.
Use as little solder as possible.
Only heat the sides of the pins.

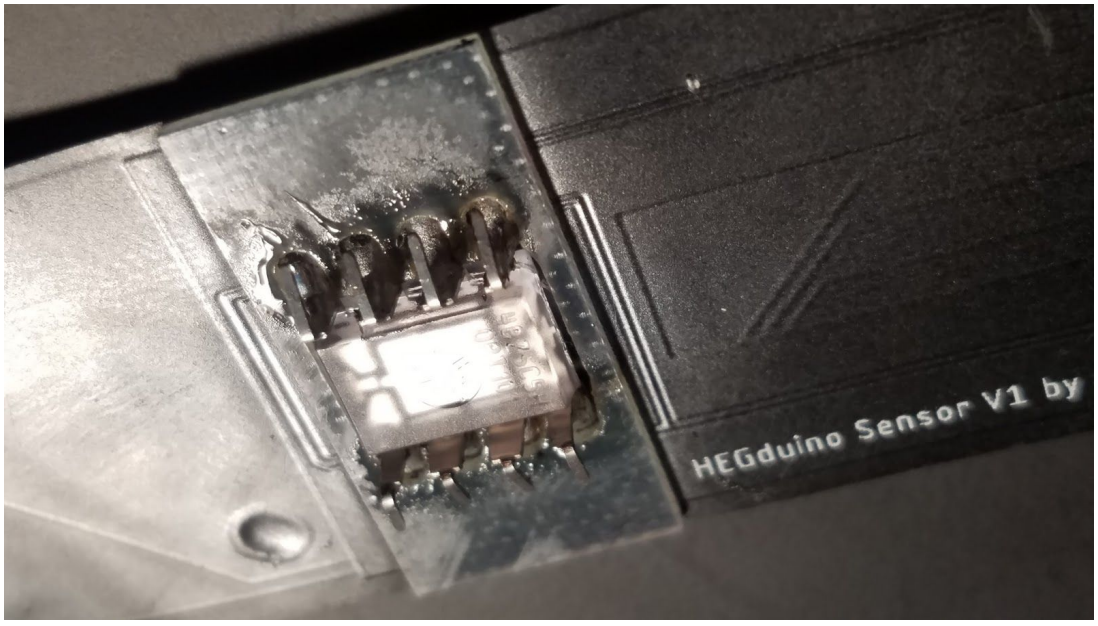


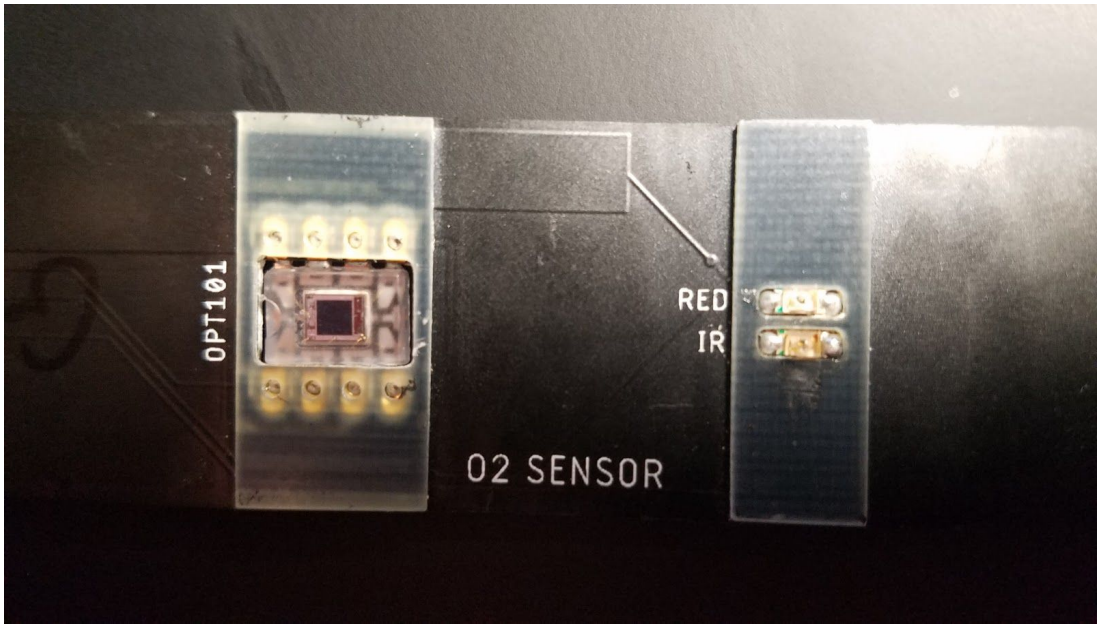
Part 1: Sensor Assembly



Sensor: OPT101. *Caution: Solder carefully as it is very heat sensitive*

Place the OPT101 through the hole from the backside where the solder pads are exposed. Make sure the notch on the front of the OPT101 is facing the 6p6c connector direction. Solder it down so it is about flush with the stiffener on the face. It's safest to *quickly and very lightly* touch the pad next to the pin and place solder wire in-between so it melts onto the pin and pad without you directly heating the OPT101, guaranteeing success much more often.

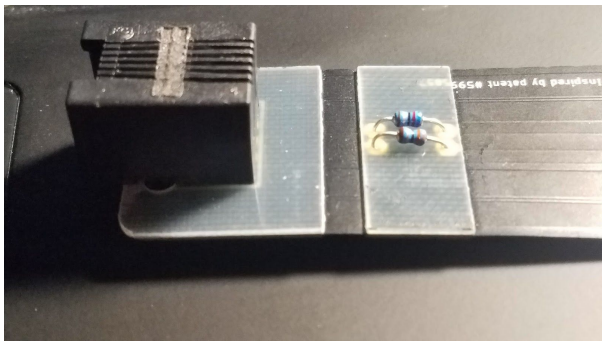


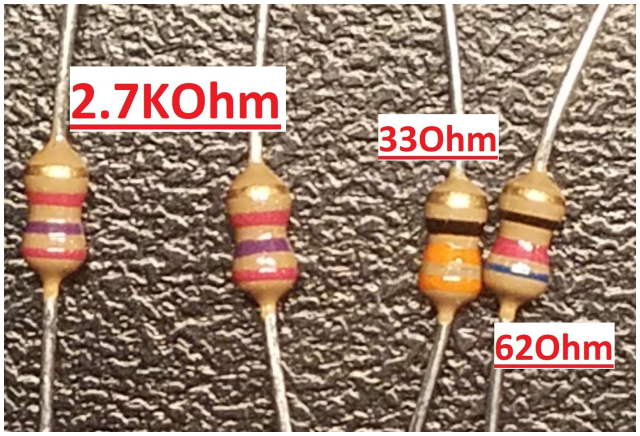


Sensor: LEDs

The LEDs have tiny green notches on them. Put the Red and Infrared LED in each of their respectively labeled positions with the *green notches* facing *toward* the *6p6c connector* (direction also marked by little white notches on the PCB). If you forget which LED is which you can always get the Red one to visibly light up with a multimeter set to Diode mode. ***Use as little solder as possible and avoid heating the plastic casing around the diode.***

Add the *33 ohm resistor to the 62 spot* and the *62 ohm resistor to the 470 spot.* We had to lower the resistance on the IR LED due to sensitivity issues that cropped up on lower power settings. Make sure the resistors are on the back side facing away from your head so it doesn't feel awkward. Clip the leads. Finally, add the 6p6c connector to the correct side. *You may hold off from adding this connector, as you can also attach the sensor directly to the microcontroller if you want to go wire-free and have a slightly more stable signal.*

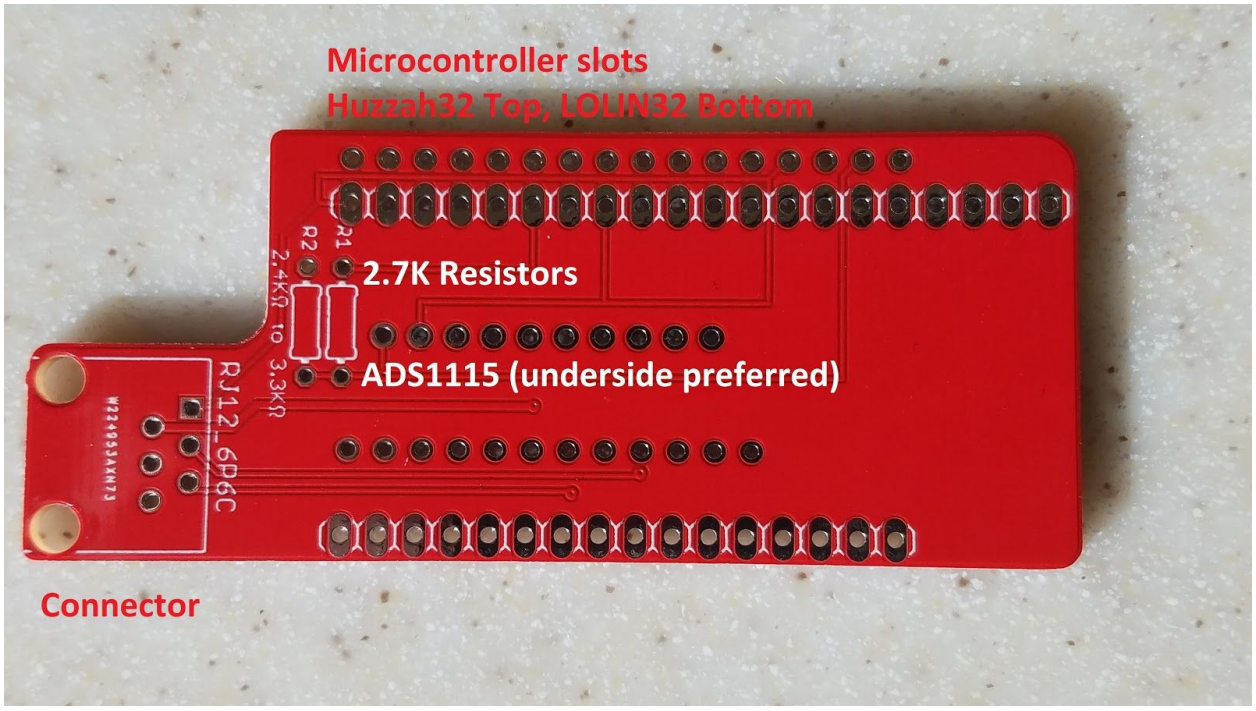




Finally, use vinyl or rubber tape to cover all of the exposed connections (incl LEDs) as well as the edges of the OPT101 Sensor so it isolates the aperture to be only toward your forehead and prevent light or moisture from the sides or back. You want the metal ring around the dark photovoltaic square of the OPT101 in the clear plastic to be exposed to ensure you are not covering up the sensor with too much tape.

Next page for Part 2.

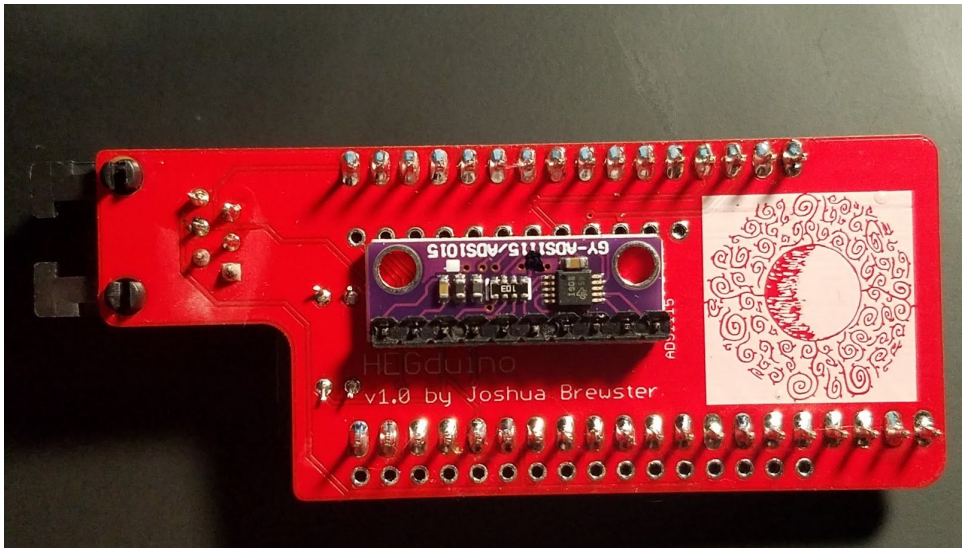
Part 2: Microcontroller hub assembly

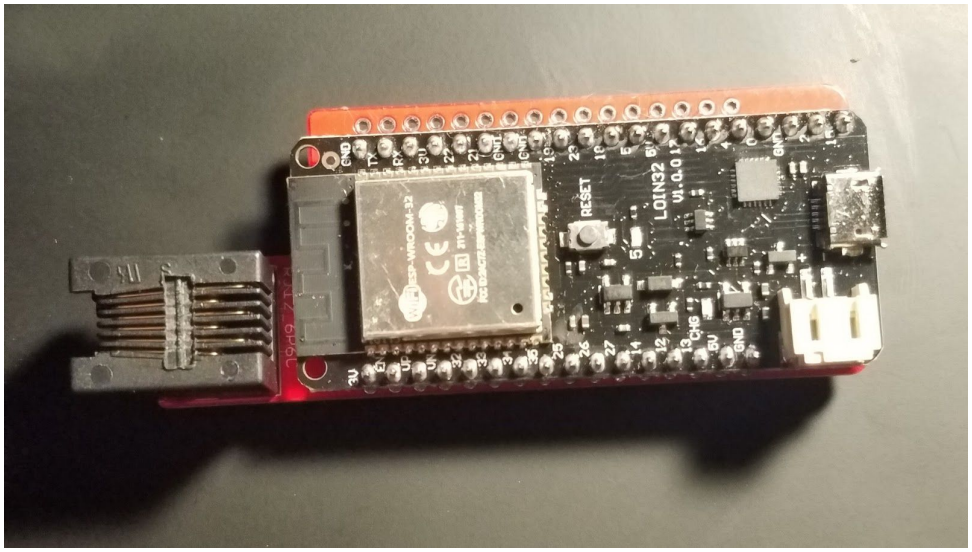


This part is fairly self explanatory as everything is clearly labeled. First add the 2, 2.7kOhm resistors to their respective slots and the ADS1115. The ADS1115 has clearly marked VDD and A0 pins to indicate the direction it should be placed on the hub board. I recommend putting the pin header for the ADS1115 through the top of the ADS1115 to minimize the form factor. Clip the leads to make room for the ESP32 on the other side. Do this first because it won't be easy to add these after the ESP32 is soldered.

If you are using a Huzzah32 form-factor board, the ADS1115 comes pretty close to the pin holes (sorry!) but just make sure you're not completely covering them with the ADS1115. It will work no problem even if there are Huzzah32 pins contacting the edge of the ADS1115 silicon and you are unable to clip them.

After soldering these parts, clip all of the exposed leads as short as possible. There are 2 compatible popular ESP32 boards, the LOLIN32 and Huzzah32 Feather, that only fit in their respective slots on the correct side of the PCB. Next we take care of the connectors.



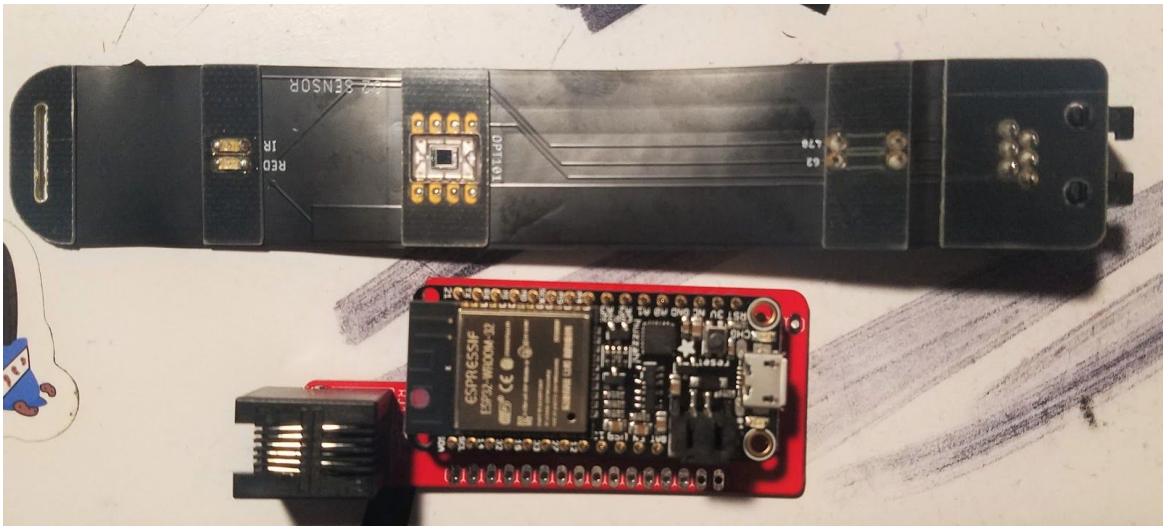


Connectors

There are 2 6p6c connectors that can be used to give your sensor a cord and make the microcontroller placement more flexible. The pinholes are clearly marked and only fit in one direction.

OR, optionally:

You may also connect the connector pin holes on each PCB together directly on the correctly overlapping side for a shorter but more reliable HEG setup since the cord can be finicky or in the way sometimes. For this you just align the pins so the sensor is facing your forehead and the microcontroller is facing away and use standard pin headers to solder them together.



Lastly, cover it all up with electrical tape to prevent shorts or static damage.

Plug it together then plug it in to your computer

With your HEG pieces assembled and connected, voila - an experimental biofeedback device! Go ahead and plug it into your computer and see that a light flashes on the board. You can get the firmware from https://github.com/moothyknight/HEG_ESP32

Setting up Arduino

You need the Arduino IDE, the ESP32 libraries (use the developer libraries rather than the boards manager version so these are modifiable), as well as all of the additional libraries and steps listed in our readme.

When that's all set up, if you followed our readme correctly, you should be able to simply open the sketch we provided and hit upload (ensure your Board is selected as well as the partition scheme “Minimal SPIFFS (Large Apps with OTA)”). Check the serial monitor output and try the command "D" to test the sensor and "f" to deactivate it - or just hit the reset button on your board.

After that, you should find SSID "**My_HEG**" in your WiFi connections list, connect with password **12345678**, go to 192.168.4.1 (or http://esp32.local on Apple or Bonjour-enabled devices) via your browser, and check out our on-board demo thanks to the ESP32's awesome web capabilities! Works best on Chrome and Firefox. We now have an awesome Chrome Extension version of our software, too, enabling direct USB support. This is all a work in progress and will be updated for months to come, so keep an eye out by Watching our Github repository!