Muscle BioAmp Patchy

Upside Down Labs

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CONTENTS

1 Overview **1**

2 Features & Specifications **2**

3 Hardware **3**

4 Contents of the kit **5**

5 Software requirements **6**

6 Using the kit **7**

6.1 Step 1: Connect reference cable 7
6.2 Step 2: Connecting Muscle BioAmp Patchy to Gel Electrodes 7
6.3 Step 3: Skin Preparation 7
6.4 Step 4: Electrode Placements 7
6.5 Step 5: Connect Arduino UNO R3 8
6.6 Step 6: Upload the code 8
6.7 Step 7: Visualizing the EMG signals 8

CHAPTER

ONE

OVERVIEW

Muscle BioAmp Patchy is a wearable ElectroMyoGraphy or EMG sensor that snaps directly to gel electrodes and connects to your muscle like a patch. It comes with reverse polarity projection, power indicator, onboard snap connectors, and Upside Down Labs'power ful BioAmp sensing technology for precise muscle signal recording. This enables you to easily integrate this sensor in your EMG- based Human-Computer Interface (HCI).

CHAPTER

TWO

FEATURES & SPECIFICATIONS

Operating Voltage	5 V
Input Impedance	10^12 ohm
Fixed Gain	x2420
Bandpass filter	72 – 720 Hz
Wearable	Yes
Compatible Hardware	Any development board with an ADC (Arduino UNO & Nano, Adafruit QtPy, STM32 Blue Pill, BeagleBone Black, Raspberry Pi Pico, to name just a few) or a standalone ADC of your choice
BioPotentials	EMG (Electromyography)
No. of channels	1
Electrodes	3 (Positive, Negative, and Reference)
Dimensions	4.7 x 1.4 cm
Open Source	Hardware + Software

https://youtu.be/qRKU_HvapDE

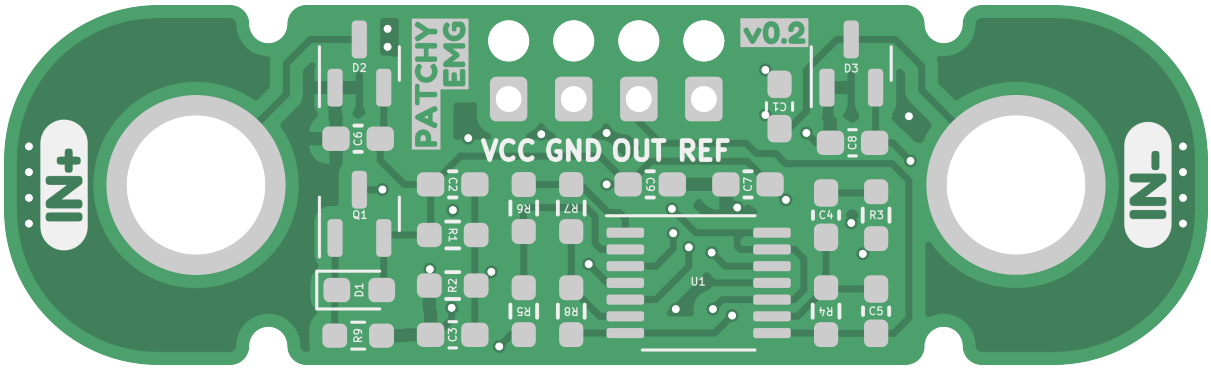
CHAPTER

THREE

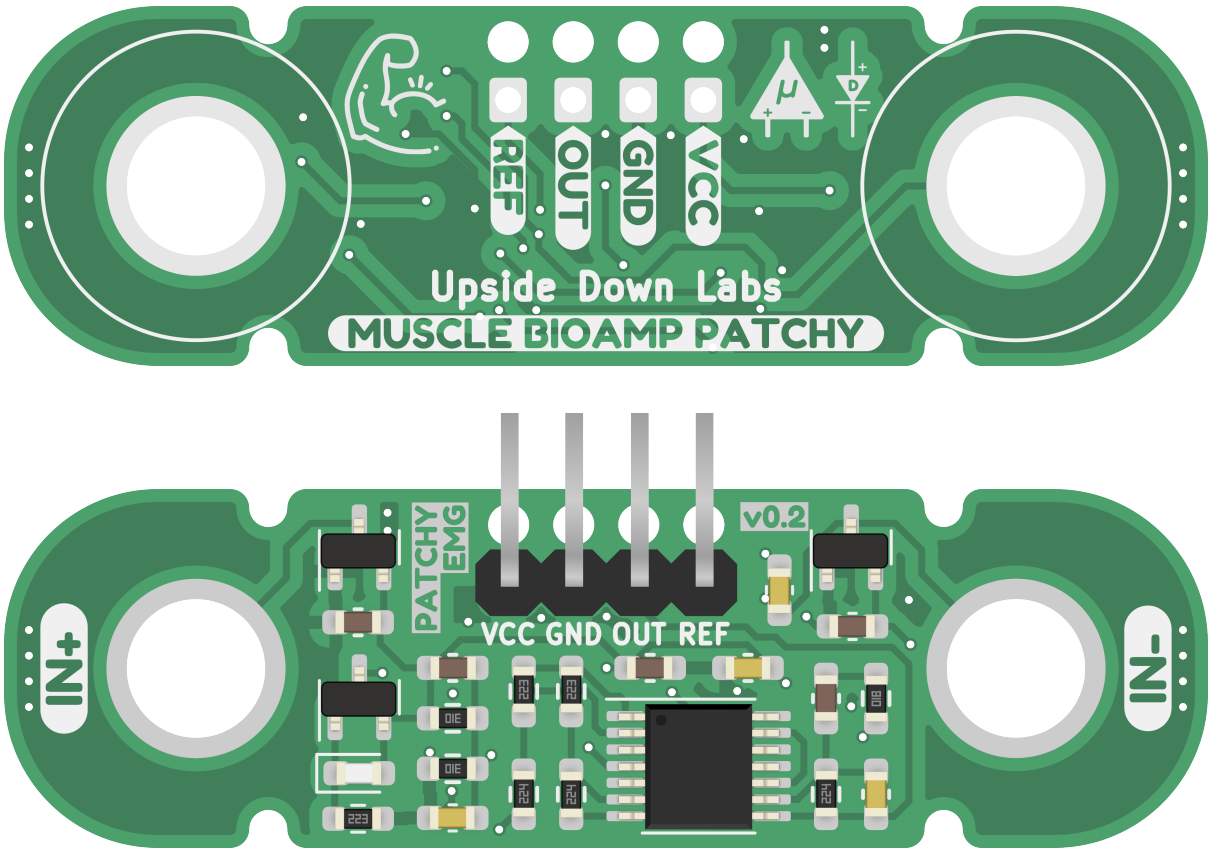
HARDWARE

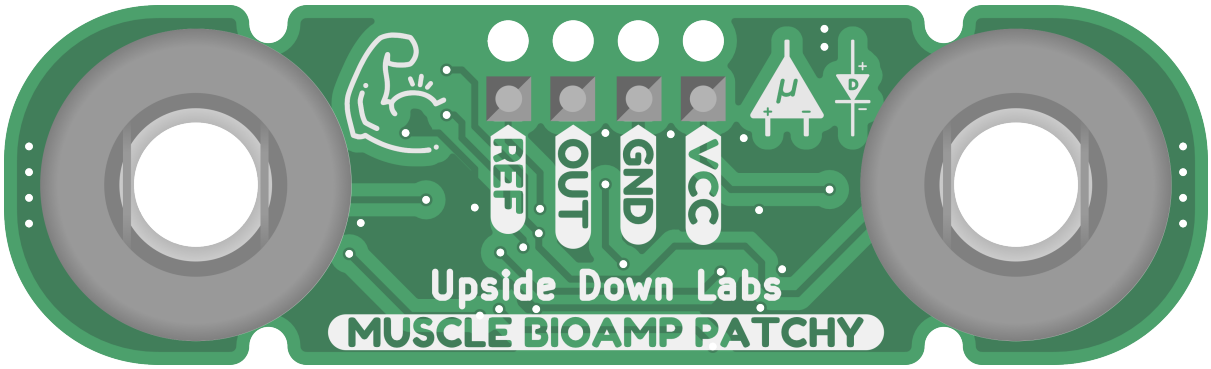
Images below shows a quick overview of the hardware design.

PCB Front



PCB Back




REF
OUT
GND
VCC
Upside Down Labs
MUSCLE BIOAMP PATCHY

CHAPTER

FOUR

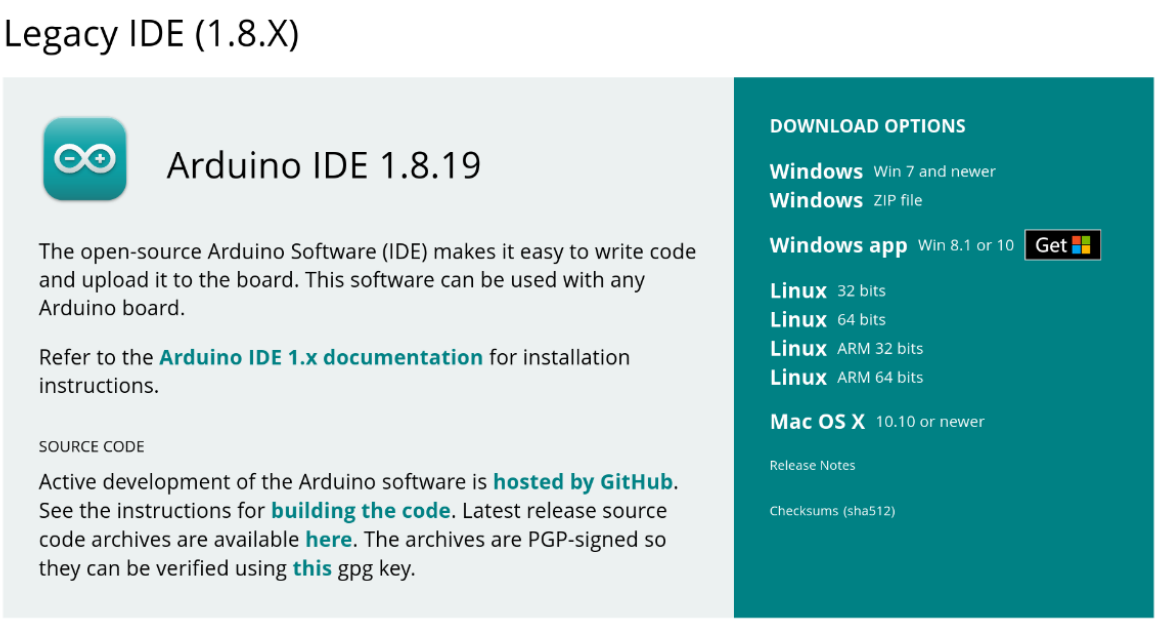
CONTENTS OF THE KIT

CHAPTER

FIVE

SOFTWARE REQUIREMENTS

Before you start using the kit, please download Arduino IDE v1.8.19 (legacy IDE). Using this you'll be able to upload the arduino sketches on your development board and visualise the data on your laptop.



CHAPTER

SIX

USING THE KIT

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6.1 Step 1: Connect reference cable

Connect the reference cable to the Muscle BioAmp Patchy as shown in the diagram.

6.2 Step 2: Connecting Muscle BioAmp Patchy to Gel Electrodes

Connect the Muscle BioAmp Patchy to gel electrodes (Don't peel the plastic backing from the electrodes at this moment).

6.3 Step 3: Skin Preparation

Apply Nuprep Skin Preparation Gel on the skin surface where electrodes would be placed to remove dead skin cells and clean the skin from dirt. After rubbing the skin surface thoroughly, clean it with a wet wipe.

For more information, please check out detailed step by step skin-preparation.

6.4 Step 4: Electrode Placements

Now peel off the plastic backing from the gel electrodes and place the Muscle BioAmp Patchy on the targeted muscle and the reference on the bony part of your elbow as shown in the diagram.

Note: In this demonstration we are recording EMG signals from the ulnar nerve, but you can record EMG from other areas as well (biceps, triceps, legs, jaw etc) as per your project requirements. Just make sure to place the IN+, IN- electrodes on the targeted muscle and REF on a bony part.

6.5 Step 5: Connect Arduino UNO R3

Connect VCC to 5V, GND to GND, and OUT to Analog pin A0 of your Arduino UNO via jumper cables provided by us. If you are connecting OUT to any other analog pin, then you will have to change the INPUT PIN in the arduino sketch accordingly.

Note: For demonstration purposes we are showing connections of the sensor with Arduino UNO R3 but you can use any other development board or a standalone ADC of your choice.

6.6 Step 6: Upload the code

Connect your Arduino UNO to your laptop using the USB cable (Type A to Type B). Copy paste any one of the arduino sketches given below in Arduino IDE v1.8.19 that you downloaded earlier:

EMG Filter: https://github.com/upsidedownlabs/Muscle-BioAmp-Arduino-Firmware/blob/main/2_EMGFilter/2_EMGFilter.ino

EMG Envelope: https://github.com/upsidedownlabs/Muscle-BioAmp-Arduino-Firmware/blob/main/3_EMGEnvelope/3_EMGEnvelope.ino

Go to **"tools"** from the menu bar, select **"board"** option then select Arduino UNO. In the same menu, select the COM port on which your Arduino Uno is connected. To find out the right COM port, disconnect your board and reopen the menu. The entry that disappears should be the right COM port. Now upload the code, & open the serial plotter from the tools menu to visualize the EMG signals.

After opening the serial plotter make sure to select the baud rate to 115200.

> **Warning:** Make sure your laptop is not connected to a charger and sit 5m away from any AC appliances for best signal acquisition.

6.7 Step 7: Visualizing the EMG signals

Now flex your arm to visualize the muscle signals in real time on your laptop.

Video tutorial:

https://youtu.be/4dnCX3U7LS8