

DIY Arduino RC Transmitter



by Dejan • 124 Comments

In tutorial we will learn how to build a DIY Arduino RC transmitter. Very often I need wireless control for the projects that I make, so therefore I built this multifunctional radio controller which can be used for pretty much everything.

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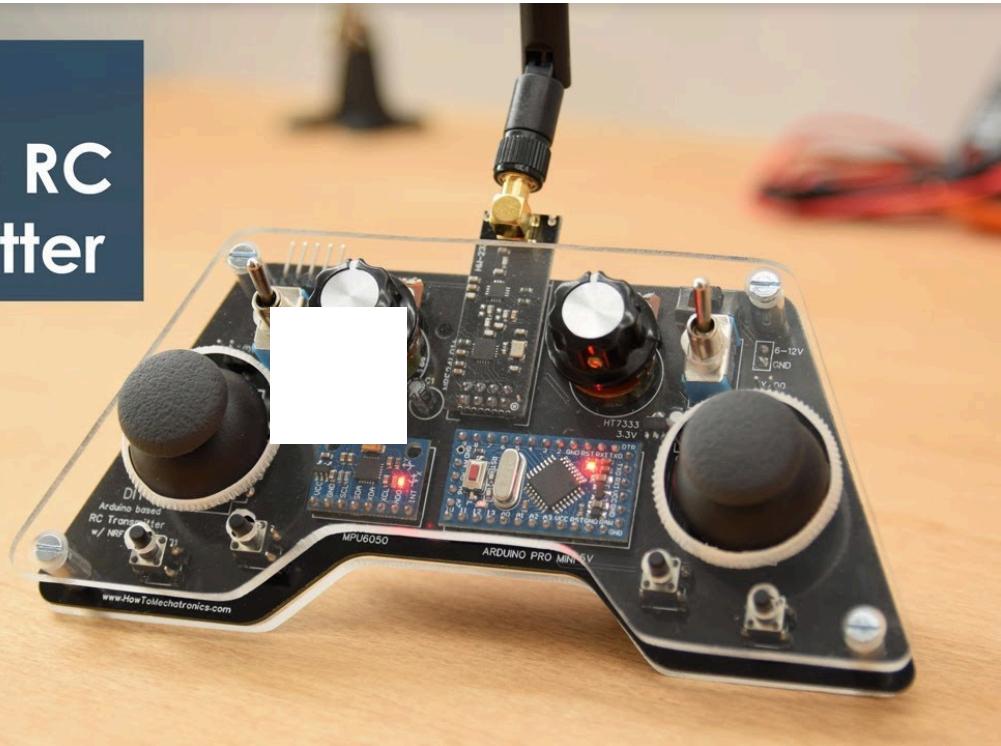
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You can watch the following video or read the written tutorial below.



DIY Arduino RC Transmitter



Overview

Now I can wirelessly control any Arduino project with just some small adjustments at the receiver side. This transmitter can be also used as any commercial RC transmitter for controlling RC toys, cars, drones and so on. For that purpose it just needs a simple Arduino receiver which then generates the appropriate signals for controlling those commercial RC devices.

I will explain how everything works in this video through few examples of controlling an Arduino robot car, controlling the Arduino Ant Robot from my previous video and controlling a brushless DC motor using an ESC and some servo motors.





The radio communication of this controller is based on the NRF24L01 transceiver module which if used with an amplified antenna it can have a stable range of up to 700 meters in open space. It features 14 channels, 6 of which are analog inputs and 8 digital inputs.

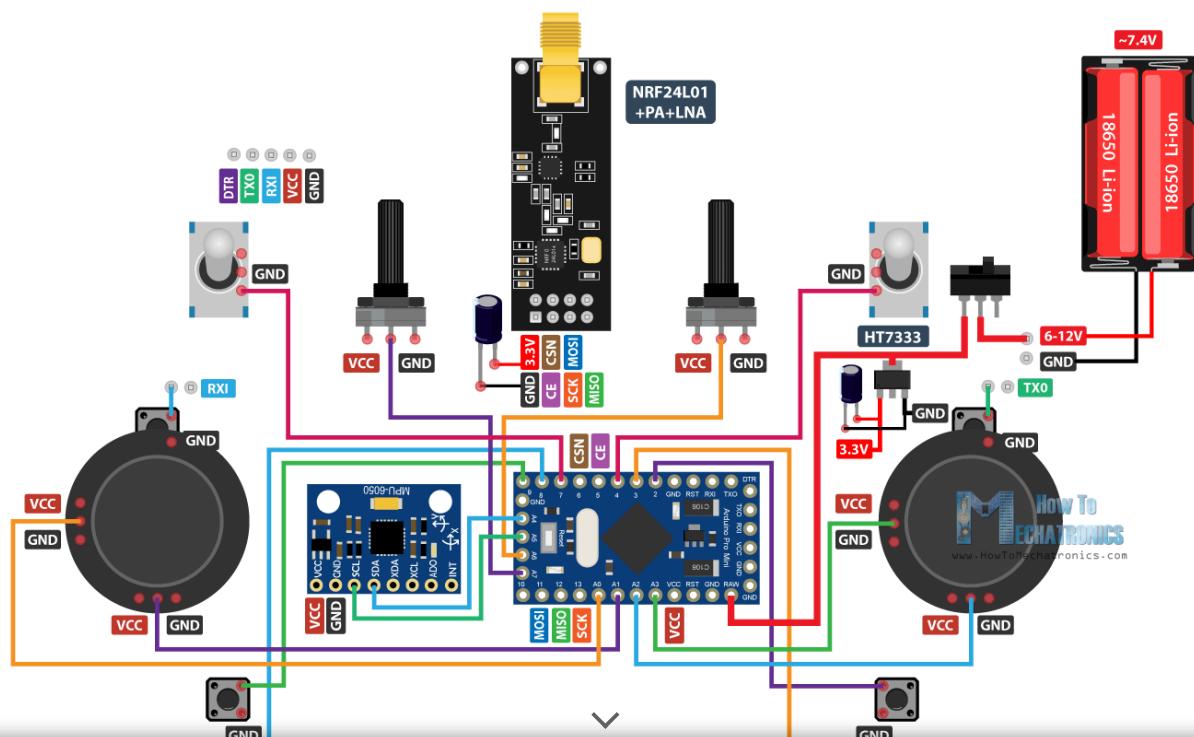


It has two joysticks, two potentiometers, two toggle switches, six buttons and



Arduino RC Transmitter Circuit Diagram

To begin with, let's take a look at the circuit diagram. The brain of this RC controller is an Arduino Pro Mini which is powered using 2 LiPo batteries producing around 7.4 volts. We can connect them directly to the RAW pin of the Pro Mini which has a voltage regulator that reduced the voltage to 5V. Note that there are two versions of the Arduino Pro Mini, like the one I have that operates at 5V and the other operates at 3.3V.



to 3.3V. Also we need to use a decoupling capacitor right next to the module in order to keep the voltage more stable, thus the radio communication will be more stable as well. The NRF24L01 module communicates with the Arduino using SPI protocol, while the MPU6050 accelerometer and gyro module uses the [I2C protocol](#).

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You can get the components needed for this Arduino Tutorial from the links below:

- NRF24L01 Transceiver Module..... [Amazon](#) / [Banggood](#) / [AliExpress](#)
- NRF24L01 + PA + LNA [Amazon](#) / [Banggood](#) / [AliExpress](#)
- Potentiometer [Amazon](#) / [Banggood](#) / [AliExpress](#)
- Servo Motor [Amazon](#) / [Banggood](#) / [AliExpress](#)
- Toggle Switch [Amazon](#) / [Banggood](#) / [AliExpress](#)
- Joystick [Amazon](#) / [Banggood](#) / [AliExpress](#) – this Joystick comes with a breakout board so you will have to desolder the Joystick from it
- Joystick without breakout board [Ebay](#)
- Arduino Pro Mini..... [Amazon](#) / [Banggood](#) / [AliExpress](#)– You need PCB V2 or V3 version for this boards
- Arduino Pro Mini like the one I used..... [Ebay](#) – PCB V1



- AMS1117 3.3v voltage regulator [Amazon](#) / [Banggood](#) / [AliExpress](#) – PCB V3

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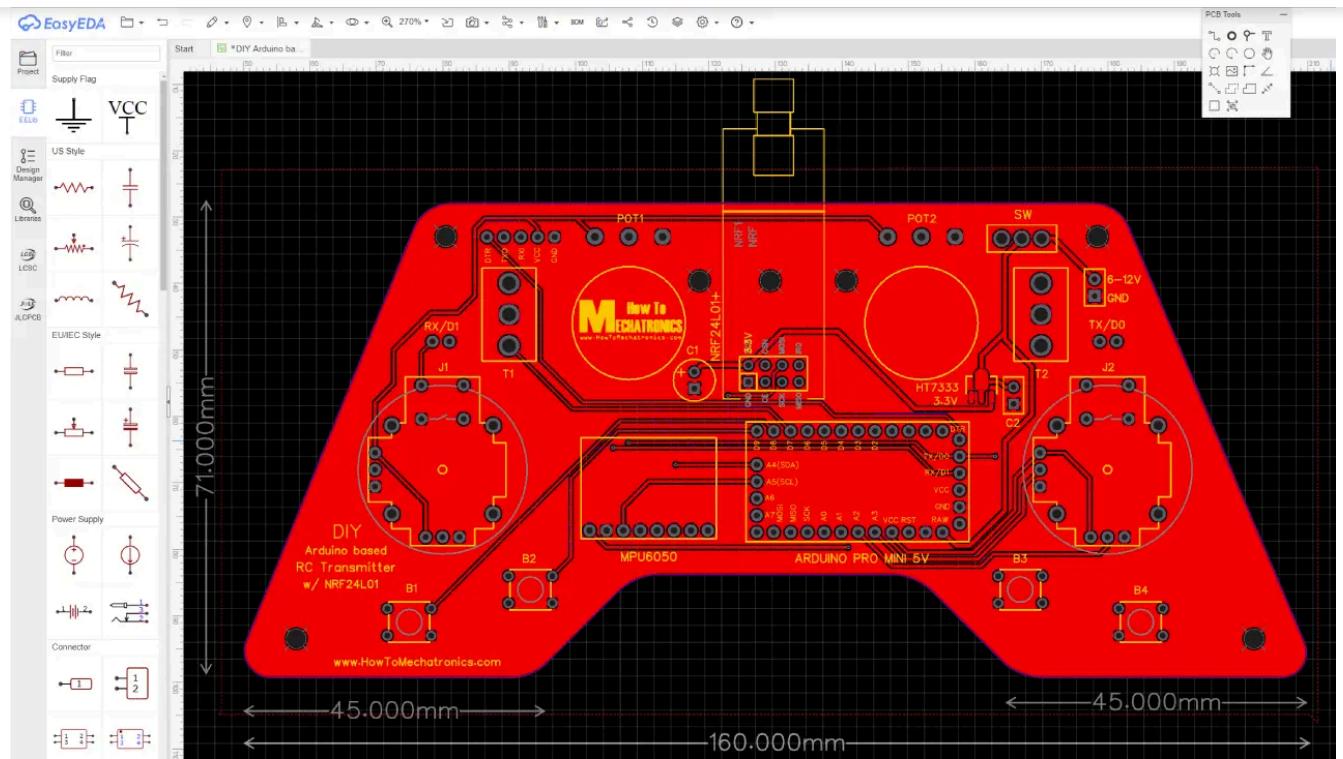
Disclosure: These are affiliate links. As an Amazon Associate I earn from qualifying purchases.

PCB Design

I actually ended up utilizing all analog and digital pins of the Arduino Pro Mini. So now if I try to connect everything together using jump wires it will be quite a mess. Therefore I designed a custom PCB using the EasyEDA free online circuit design software.

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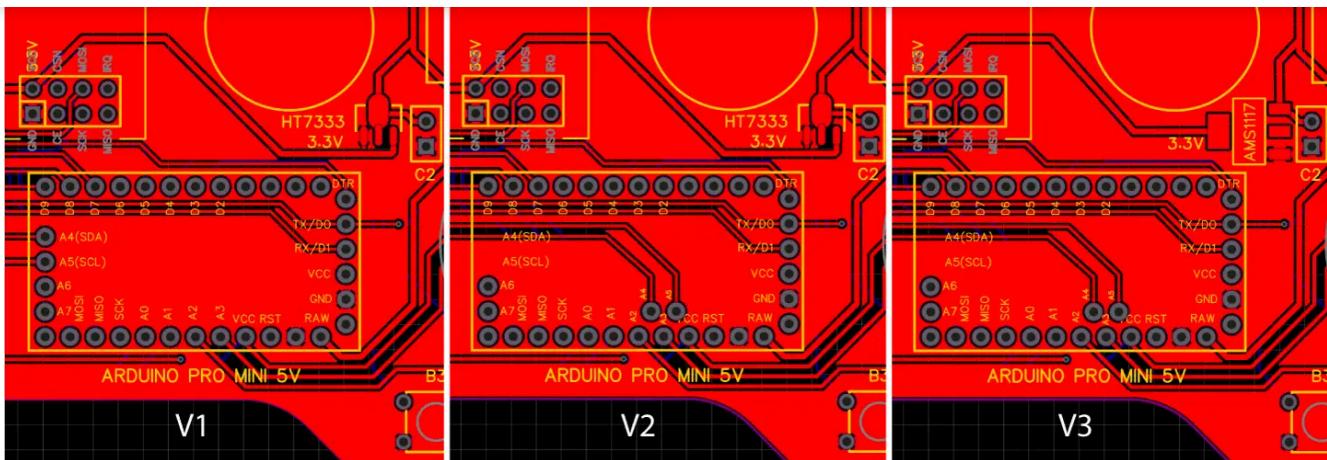




Here I took into consideration the ergonomics of the controller and designed it to be easily held by two hands, while all controls are within the range of the fingers. I made the edges round and added some 3mm holes so I can mount the PCB onto something later. I placed the pins for programming the Arduino Pro Mini at the top side of the controller so they can be easily accessed in case we want to reprogram the Arduino. We can also notice here that I used the RX and TX pins of the Arduino for the joystick buttons. However these two lines needs to be disconnected from anything while we are uploading the sketch to the Arduino. So therefore they are interrupted with two pins which can be then easily connected using simple jumper caps.

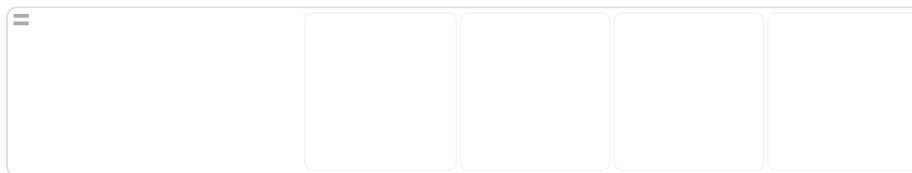
Please note: Make sure you have the right Arduino Pro Mini version to mach the PCB or modify the PCB design according to it. Here's a comparison photo between the three different versions, depending on your Arduino and the voltage regulator.





Here's a link to the project files of this PCB design. These opens the three different version in separate tabs, so you can choose the one you need.

So once I finished the design, I generated the Gerber file needed for manufacturing the PCB.



Gerber file:



[DIY Arduino based RC Transmitter PCB Gerber file V1](#)

[Download](#)

1 file(s) 0.00 KB



[DIY Arduino based RC Transmitter PCB Gerber file V2](#)

[Download](#)

1 file(s) 135.39 KB



[DIY Arduino based RC Transmitter PCB Gerber file V3](#)

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1 file(s) 134.82 KB

Then I ordered the PCB from [JLCPCB](#) which are also the sponsor of this video.

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PCB Prototype		SMT Stencil	
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Dimensions	100 x 100 mm	Quantity	Choose Num (10pc)
Layers	2 Layers	Thickness	1.6 mm
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Here we can simply drag and drop the Gerber file and once uploaded, we can review our PCB in the Gerber viewer. If everything is all right then we can go on and select the properties that we want for our PCB. This time I chose the PCB color to be black. And that's it, now we can simply order our PCB at a reasonable price. Note that if it's your first order from JLCPCB, you can get up to 10 PCBs for only \$2.





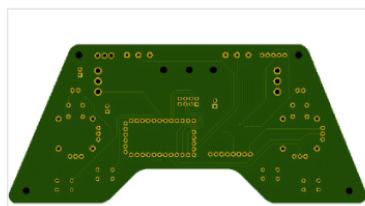
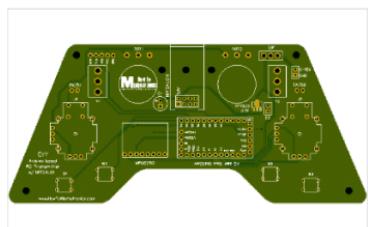
PCB



SMT-Stencil

Detected 2 layer board of 71x160mm(2.81x6.29 inches).

Your upload has finished processing. Enter the project details below and we'll move on to checking all the individual layers to make sure that they're correct.



Gerber Viewer



<< Back to Upload File

Layers 1 2 4 6

Dimensions 71 * 160 mm

PCB Qty 5

PCB Thickness 0.4 0.6 0.8 1.0 1.2 1.6 2.0

PCB Color Green Red Yellow Blue White Black

Surface Finish HASL(with lead) LeadFree HASL-RoHS ENIG-RoHS

Copper Weight 1 oz 2 oz

Charge Details

Engineering Fee: \$8.00

Color: \$15.00

Board: \$3.80

Build Time:

 1-2 days \$0.00

Shipping Estimate:

Charge: Choose the country of arrival first

Total Price: \$26.80

Weight: 190g

SAVE TO CART

How to order electronic parts along with my PCB to save on shipping?

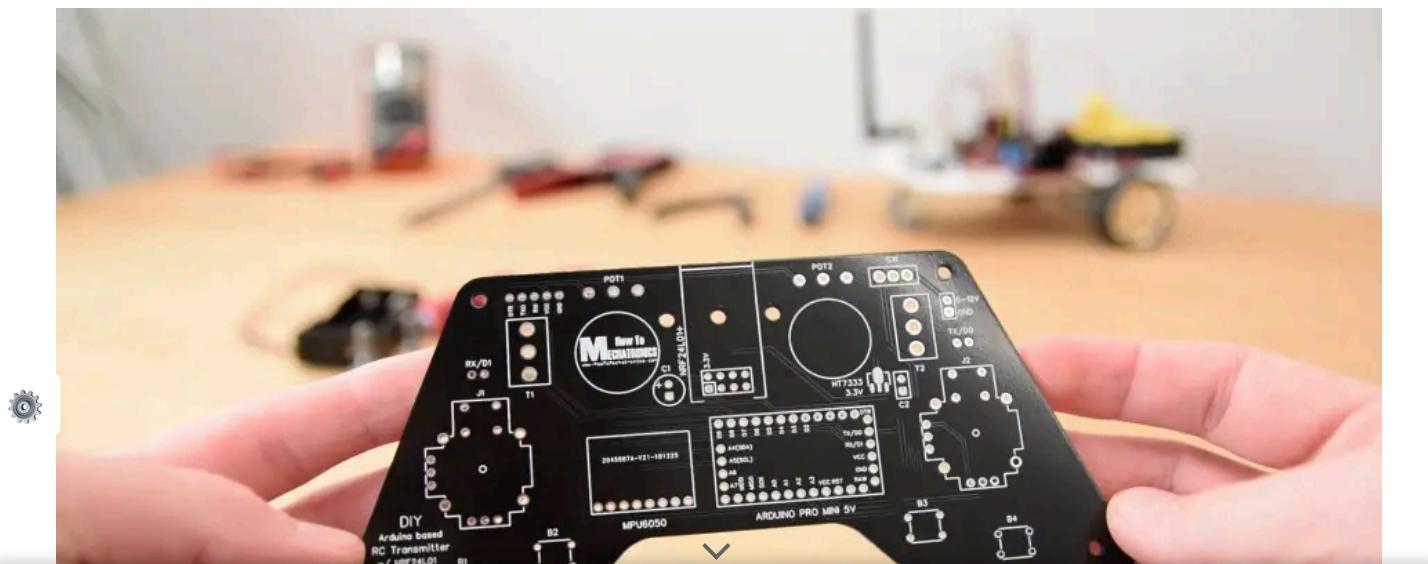
Step 1. Place a PCB order at JLC

Step 2. Select parts at LCSC.COM

Step 3. Choose to ship with your PCB at LCSC checkout

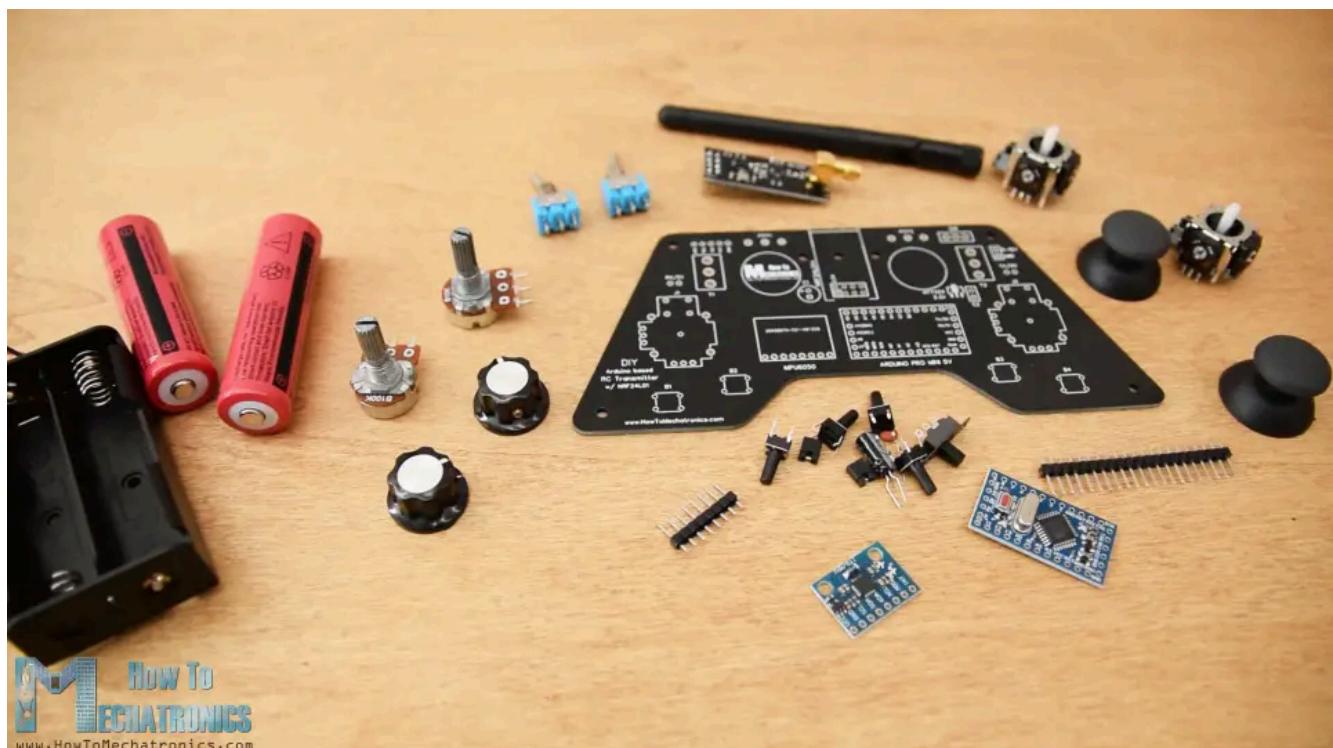
Get FREE LCSC Electronic Parts >>

And here it is. I just really love how this PCB turned out in this black color. The quality of the PCB is great, and everything is exactly the same as in the design.



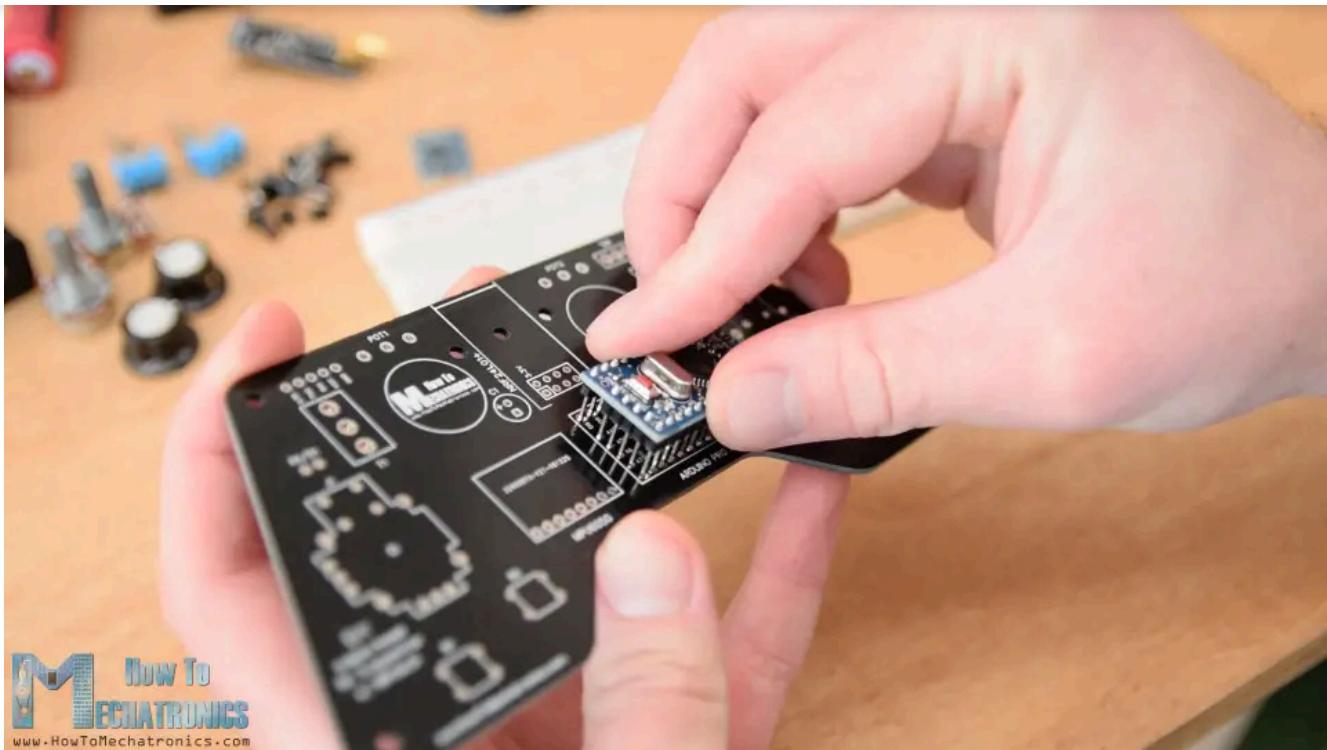
Assembling the PCB

Ok now we can move on with assembling the PCB. I started with a soldering the pin headers of the Arduino Pro Mini. An easy and good way to do that is to place them onto a breadboard and so they will stay firmly in place while soldering.



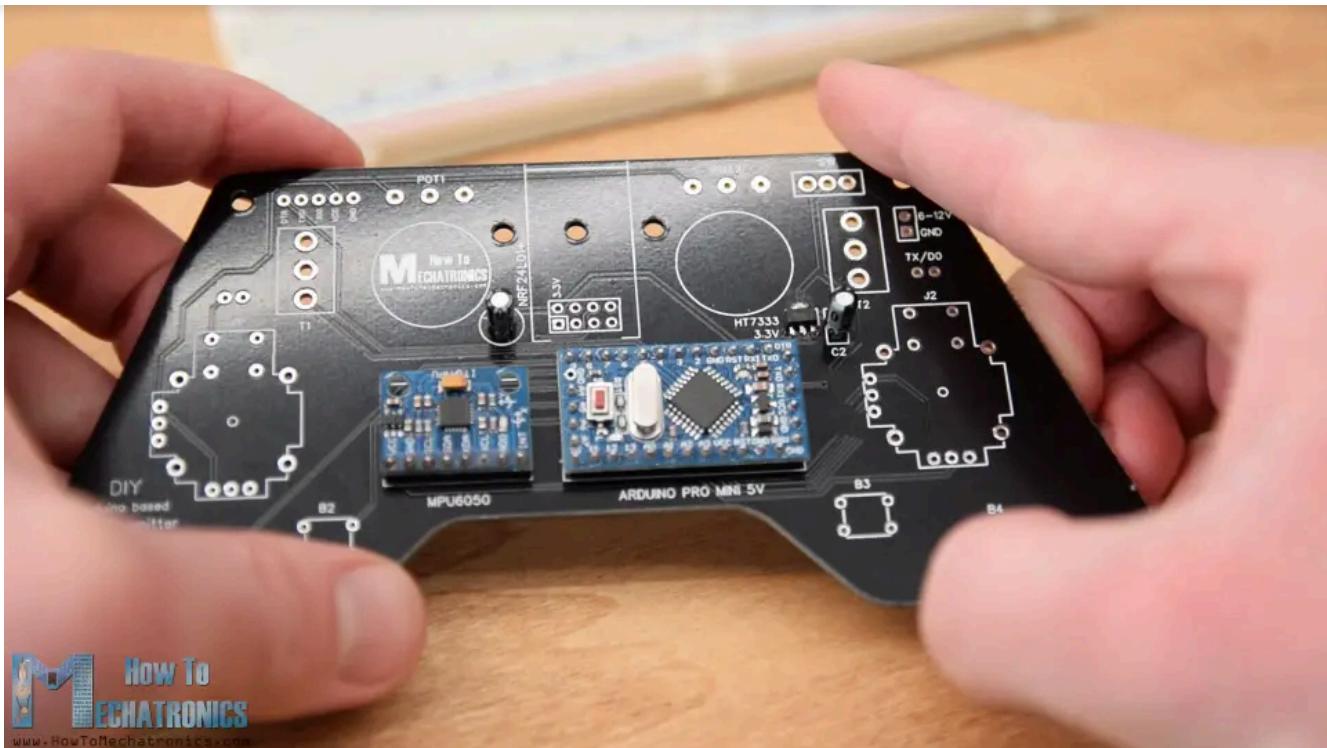
The Pro Mini also have pins on the sides, but note that these pins location might vary depending on the manufacturer.



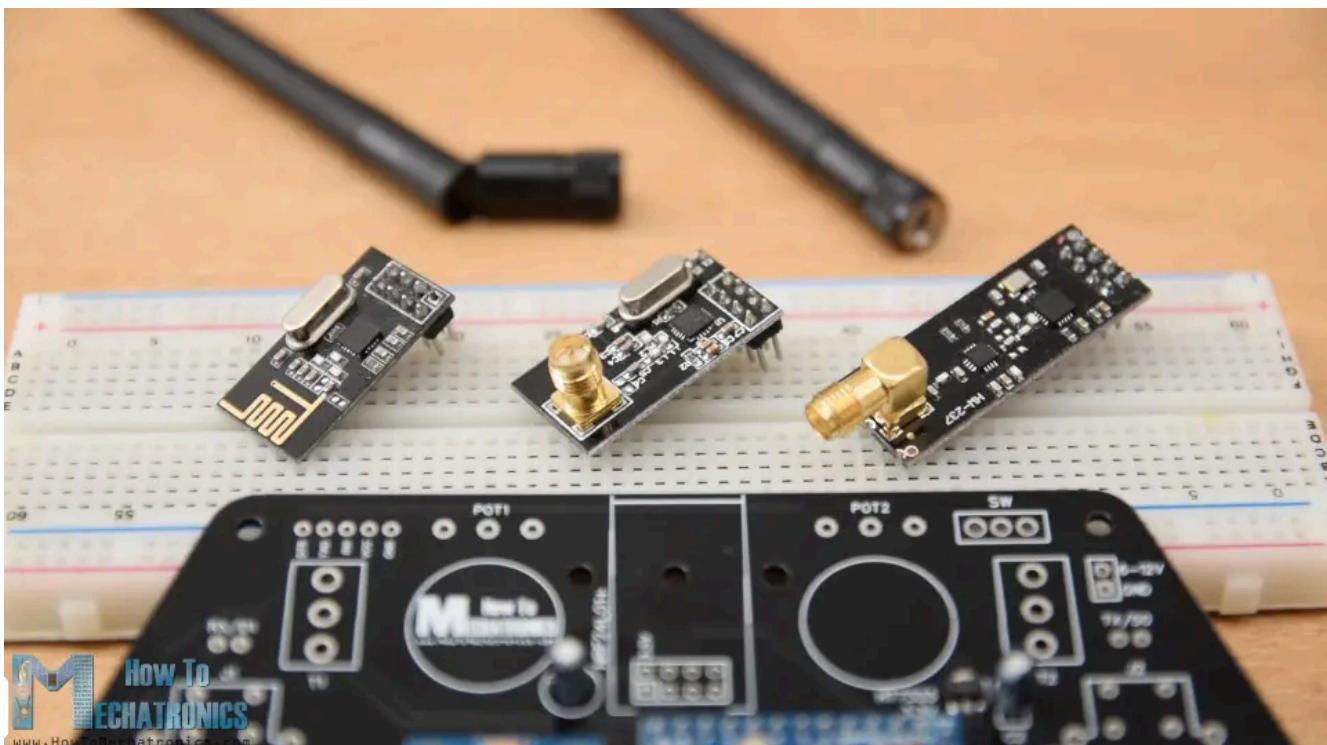


For the particular model that I have, I need 5 pins for each side, while leaving one GND pin empty because I used its area below on the PCB for running some traces. I soldered the Arduino Pro Mini directly onto the PCB and cut the excess length of the headers. Right next to it goes the MPU6050 accelerometer and gyroscope module.

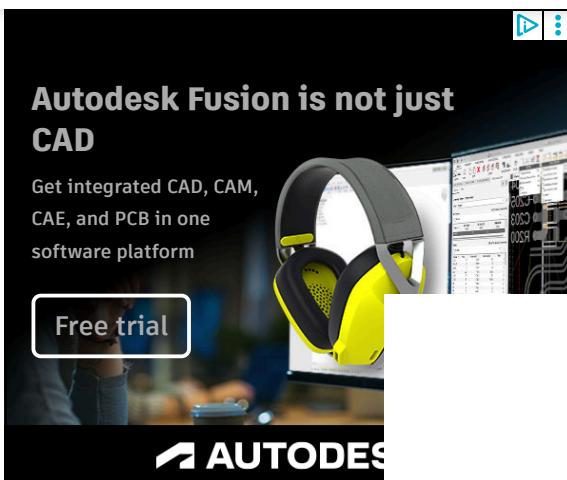




Then I soldered the 3.3V voltage regulator with a capacitor next to it, and another capacitor near the NRF24L01 module. This module have three different versions and we can use any of them here.



I continued with the pins for programming the Arduino, the RX and TX pins, the power supply pins and the power switch.



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AUTODES

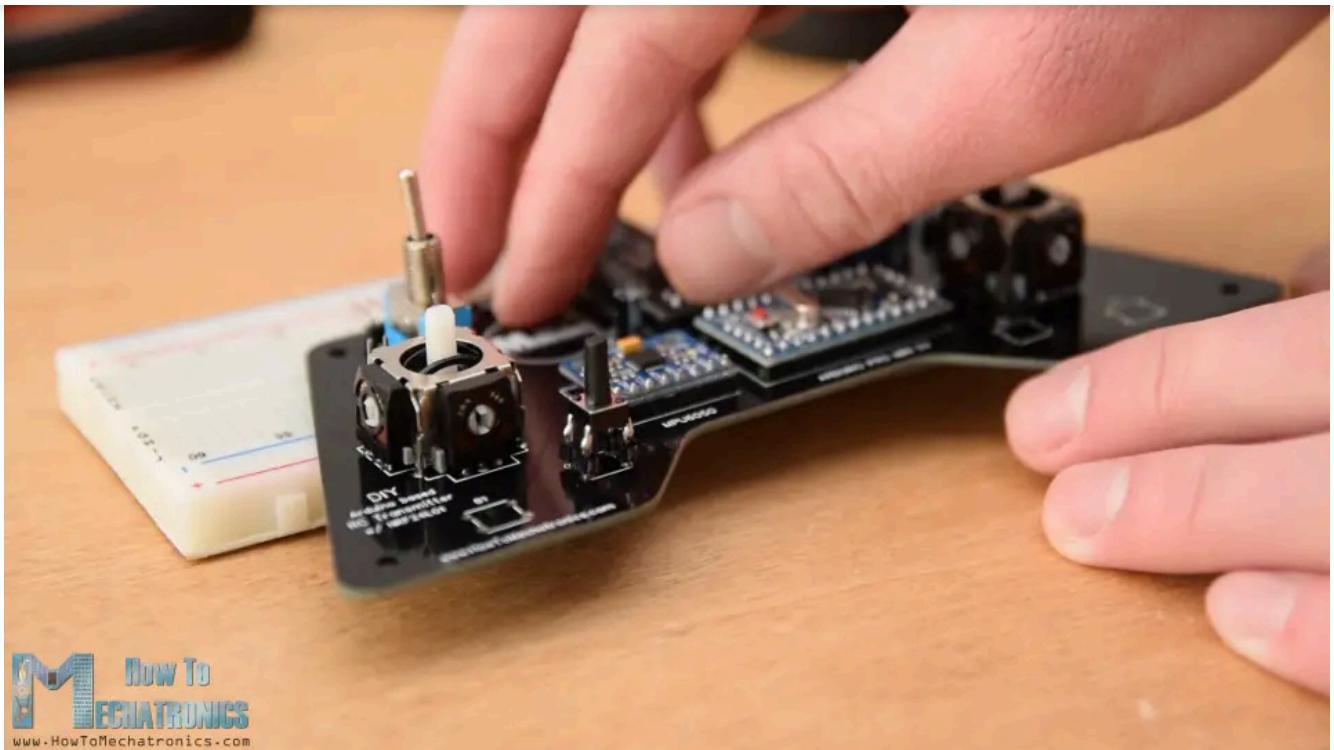
This block contains an advertisement for Autodesk Fusion. It features a top banner with the text "Autodesk Fusion is not just CAD" and "Get integrated CAD, CAM, CAE, and PCB in one software platform". Below the banner is a yellow and black headphones image. To the right is a screenshot of the Autodesk Fusion interface showing a circuit board design. At the bottom left is a "Free trial" button, and at the bottom right is the Autodesk logo.

Next for soldering the potentiometers to the PCB I had to extend their pins using some pin headers.



We can note here that I previously cut the length of the knobs so I can properly fit some caps onto them. However, we will solder the potentiometers to the PCB a bit later.

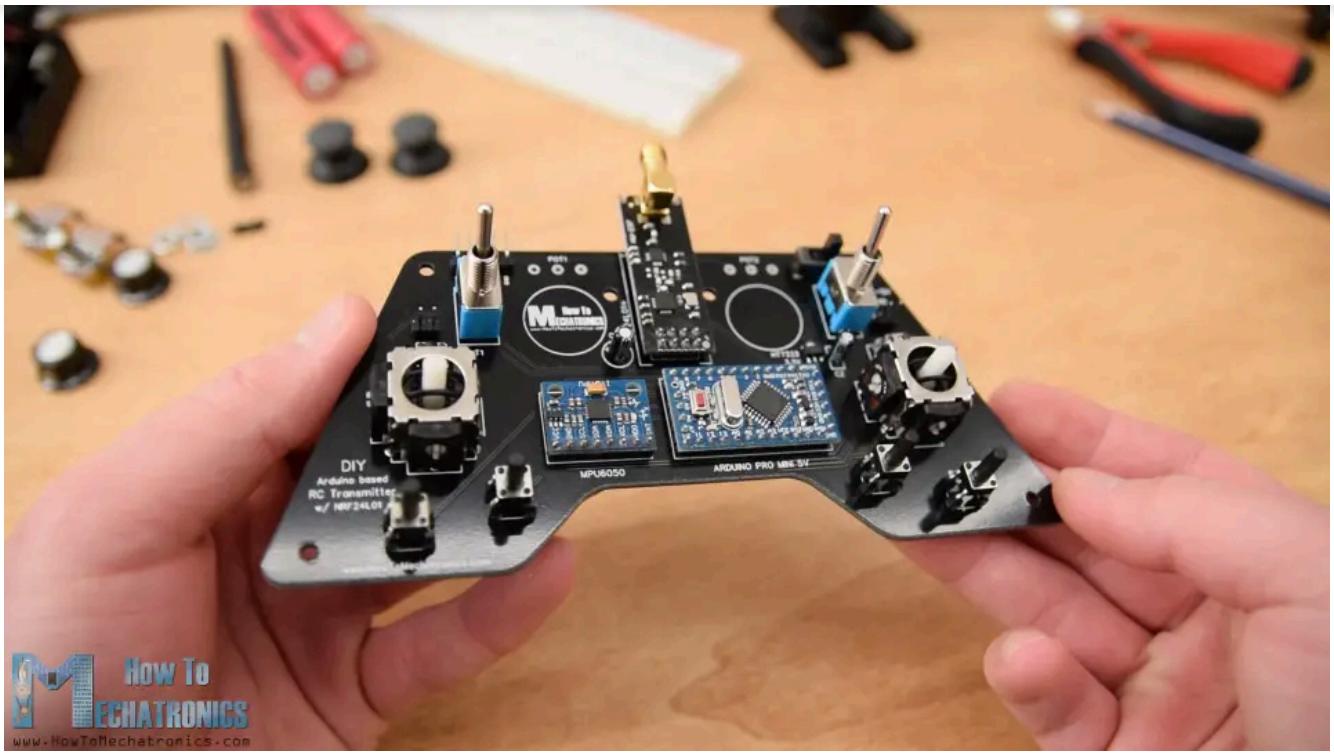




Finally what's left is to solder the four push buttons. However they don't have the proper height, so again I used pin headers to extend their pins a little bit.

And that's it, our PCB is now ready so we can continue with making the cover for it. Because I like how the PCB looks and I want to be visible I decided to use transparent acrylic for the cover.





Here I have 4 mm tick transparent acrylic which currently have a protective foil and appears to be blue. The idea for the cover is to make two plates with the shape of the PCB and secure one of them at the top side and the other at the bottom side of the PCB.

