

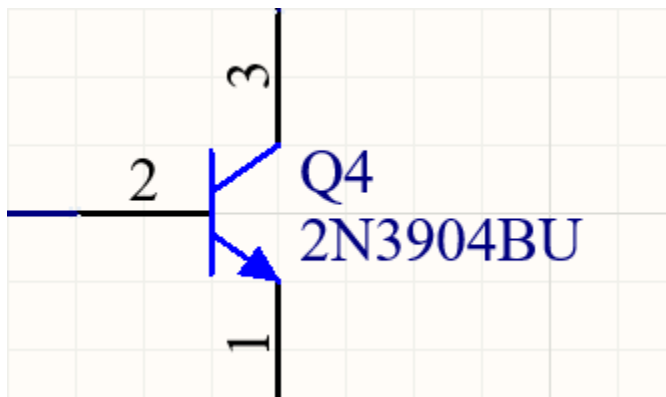
Guide to making a Fuzz pedal:

Introduction Fuzz pedals are used to make a guitar sound very distorted and buzzy. The pedal uses a relatively basic amplifier circuit to cause the output to sound like square waves. This fuzz pedal could take either a day or up to a week and a half depending on the availability of parts and how much experience you have.

1. Decide what type of components you want to use:

Here is a sample basic schematic for the circuit:

Transistors:



Firstly it is most important to look at what transistor you want to use. BJTs are the most common transistors used because they naturally clip when driven hard. Germanium PNP is seen most commonly if you want a more classic smooth sound but is quite expensive compared to other silicon based transistors. Also note PNP transistors have different circuitry than NPN transistors. The transistor that I ended up using was a 2N2222 transistor.

Additionally, the transistor's gain (h_{FE}) plays a crucial role in shaping the sound. Lower gain values produce a softer, more gated fuzz, while higher gain results in a more compressed and saturated tone. Therefore, selecting an appropriate transistor involves balancing desired tone characteristics, gain, and circuit compatibility.

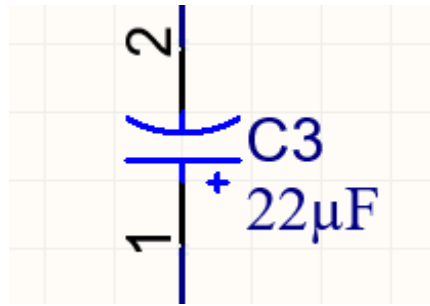
Each BJT transistor has three pins:

- Emitter (E): Usually connected to ground in NPN circuits

- Base (B): This is the input signal pin that controls the transistor
- Collector (C): This is where the amplified output signal is taken from

Note: The pin order is not always the same for every transistor, so always check the datasheet before wiring.

Capacitors:



Think of capacitors as filters. This is because the wave that a guitar sends is an AC wave that can be filtered through the impedance of the capacitor. Capacitors let higher frequencies go through and block most of the lower frequencies. The frequencies that get passed through are proportional to $1 / (2\pi fC) = X$. However, under a certain frequency not all of the signal is completely blocked, it is only attenuated.

The input capacitor controls how much bass reaches the circuit. A larger capacitance allows more bass into the circuit and can lead to a more muddy tone. This capacitor acts like a high-pass filter.

The output capacitor effectively controls the final tone of the sound. It determines how much low frequency content is present at the output.

So the most important capacitors in a basic fuzz pedal schematic are the input capacitor and the capacitor connected to the output/potentiometer stage. These strongly influence whether the fuzz sounds aggressive or smooth.

Typical capacitor values:

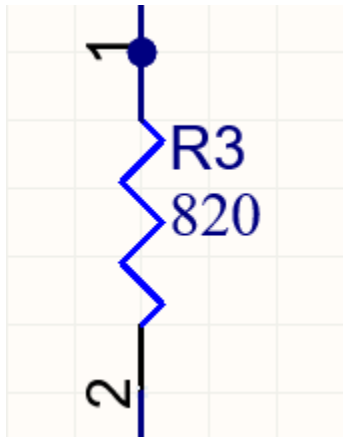
Input capacitor: 0.01 μ F – 0.1 μ F

Output capacitor: 0.01 μ F – 1 μ F

Emitter bypass capacitor: 1 μ F – 100 μ F for increased gain

Just make sure to check polarity before plugging any capacitors in as some capacitors will only work as intended if polarity is correctly addressed by inputting to negative and outputting through positive.

Resistors:



Resistors are components that are used to control current and set the operating point (bias) of the transistor. Proper resistor selection is important because it determines how the transistor amplifies and clips the signal.

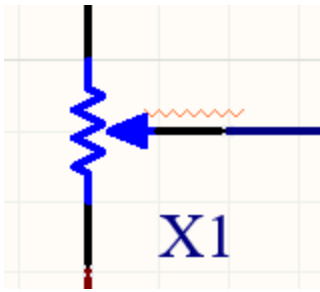
Key resistors in a fuzz circuit:

- **Collector resistor:** Controls output voltage swing and gain
- **Emitter resistor:** Stabilizes the circuit and controls gain
- **Base resistor:** Controls how much signal enters the transistor

Typical resistor values:

- Collector resistor: 4.7k Ω – 10k Ω
- Emitter resistor: 100 Ω – 1k Ω
- Base resistor: 10k Ω – 100k Ω

Potentiometers:



Potentiometers are similar to resistors but allow you to vary resistance and split the signal across two paths.

For this project I recommend:

- 100k ohm logarithmic (audio taper) potentiometer for volume, as humans detect changes in sound logarithmically
- 1k ohm to 10k ohm linear potentiometer for fuzz (gain control)

Jacks:

I highly recommend buying a stereo jack for input, as you can use it to turn the battery on only when a cable is plugged in. Otherwise you will need a switch or the battery will slowly drain.

Input jack (stereo):

Tip: signal input

Ring: battery connection. Negative terminal if using NPN and positive terminal if using a PNP.

Sleeve: ground

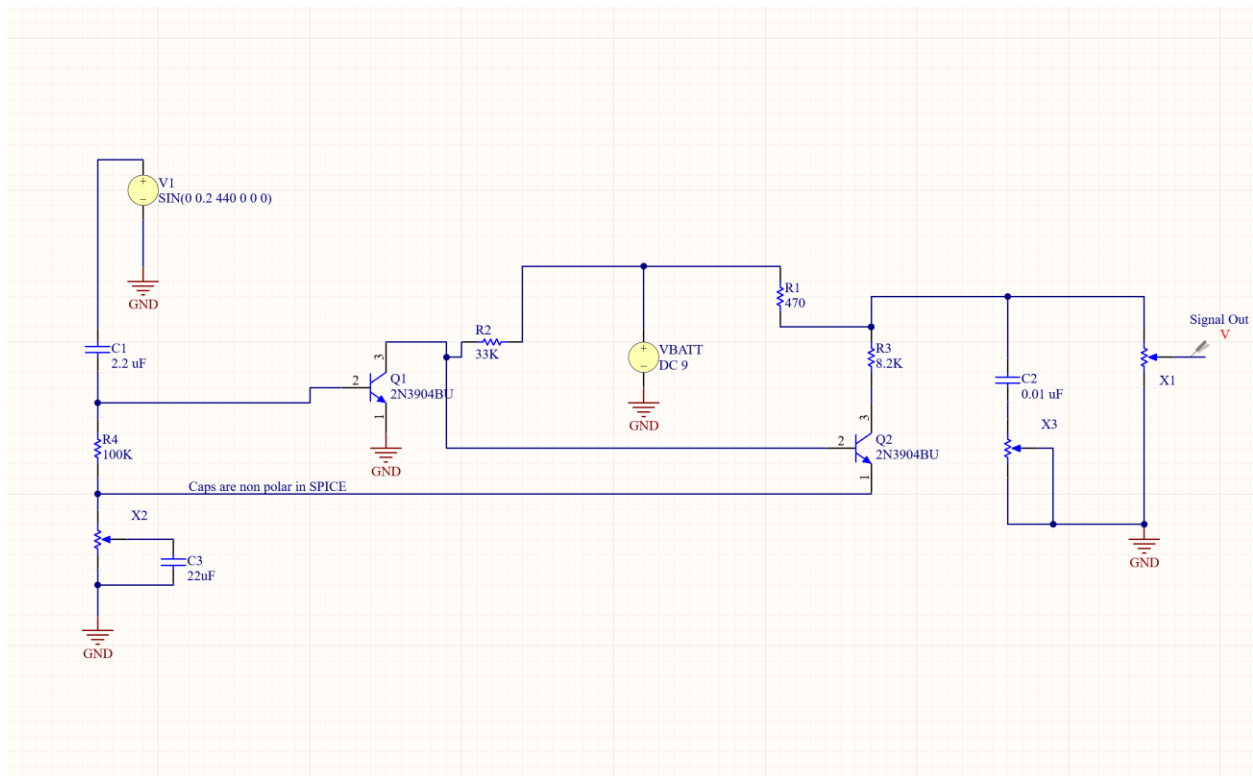
Output jack (mono):

Tip: signal output

Sleeve: ground

2. Create Schematic

The base schematic of a NPN transistor pedal looks like this:



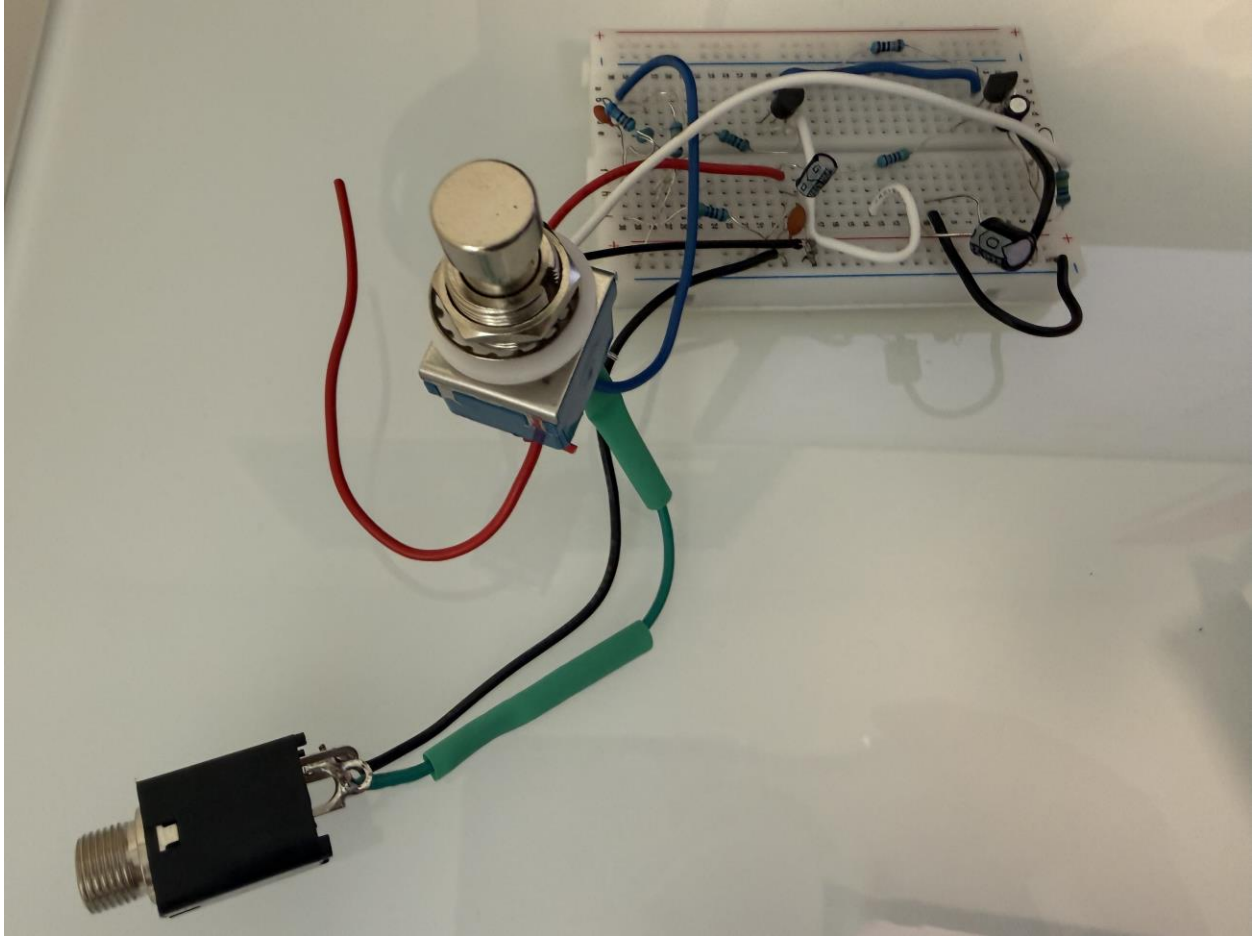
Think of the voltage sources as V1 as the guitar and VBATT as the Battery

The PNP version will look different I recommend using [this analysis](#) if using a PNP transistor setup.

This guide is mostly focuses on a NPN transistor pedal.

3. (optional) Wire up a prototype

I highly recommend some bread board and wires to test your wiring and fuzz pedal before soldering onto a perf board or even a making PCB. Its good practice to prototype and test before you commit. Here is my prototype.



4. Create housing:

Housings are purchasable online. However, I recommend trying to 3D print a housing or even making one out of wood. I decided to do a mix of the two with a 3D printed outer housing with a wood panel that I engraved. Otherwise, you can download the CAD and laser cutting files for this project below.

5. Wire and attach all connections.

Follow your schematic and have fun jamming out!



6. Extra Mod

Personally I wanted to add a tone knob to change the outgoing tone.

This basically works through forming a low-pass filter. It removes high frequencies and lets you choose how smooth and dark the sound is. If you don't have an amp with a large amount of tone adjustment I recommend adding this.

Typical values for tone control:

- Capacitor: 0.01 μF – 0.1 μF

- Potentiometer: 10k Ω

I hope you enjoyed reading this guide.

Feel free to email me if you have any questions, I'll do my best to give good answers.