



Team EchoVerse

Guitar Headphone Amplifier

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Introduction

- Our compact and portable guitar amplifier, perfect for any guitarist who wants to practice quietly with their headphones.
- Our design accepts a mono input, amplifies the guitar signal, and outputs crystal-clear mono audio for a stereo headphones, ensuring a smooth and immersive listening experience. This amplifier is ideal for musicians on the go, offering powerful sound in a small form factor.



Component Selection

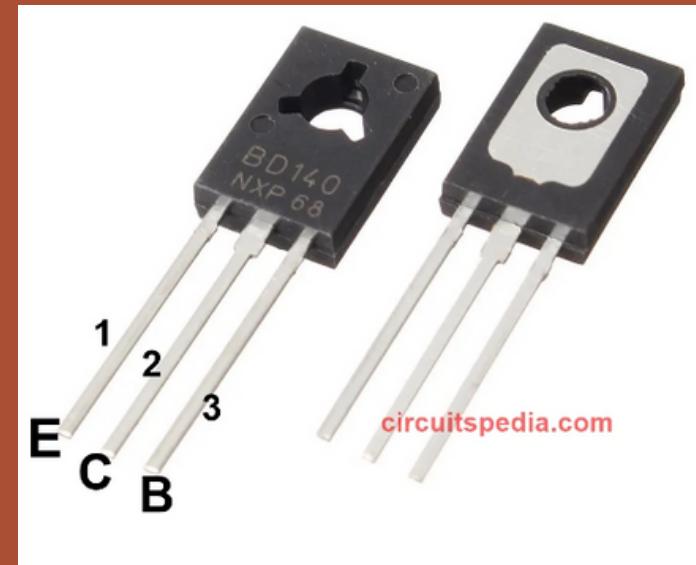
NE5532 low noise op-amp

NE5532 is a dual operational amplifier, commonly used for low-noise audio applications.



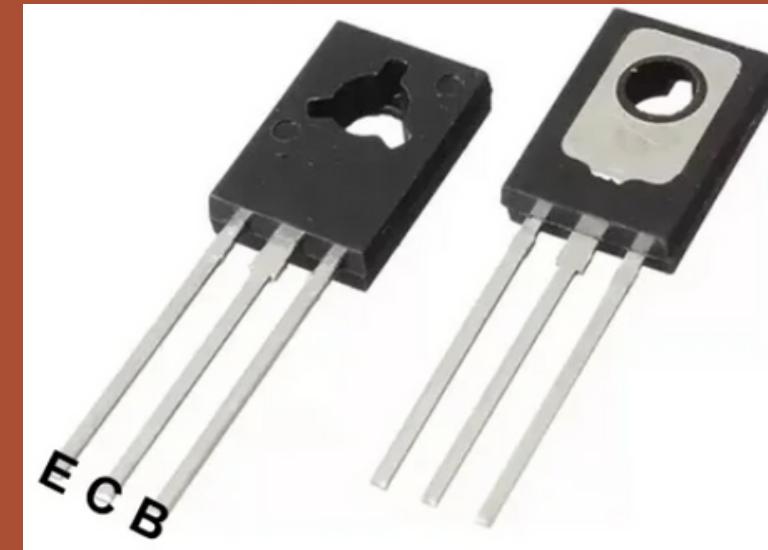
BD140 Transistor

This PNP transistor is used as an audio amplifier and it amplifies the negative half of the AC signal.



BD139 Transistor

This NPN transistor is used as an audio amplifier as it amplifies the positive half of the AC signal.



1N4148 Diode

Used for biasing the transistors to ensure proper operation.



1n4148 Diode

Component Selection

0.5 W Resistors

0.5W resistors can handle twice the power of 0.25W resistors, reducing the risk of overheating or failure.

Capacitors

330 pF, 680 pF , 2.2 μ F, 10 μ F valued polarised capacitors were used for their compact size and higher voltage resistance.

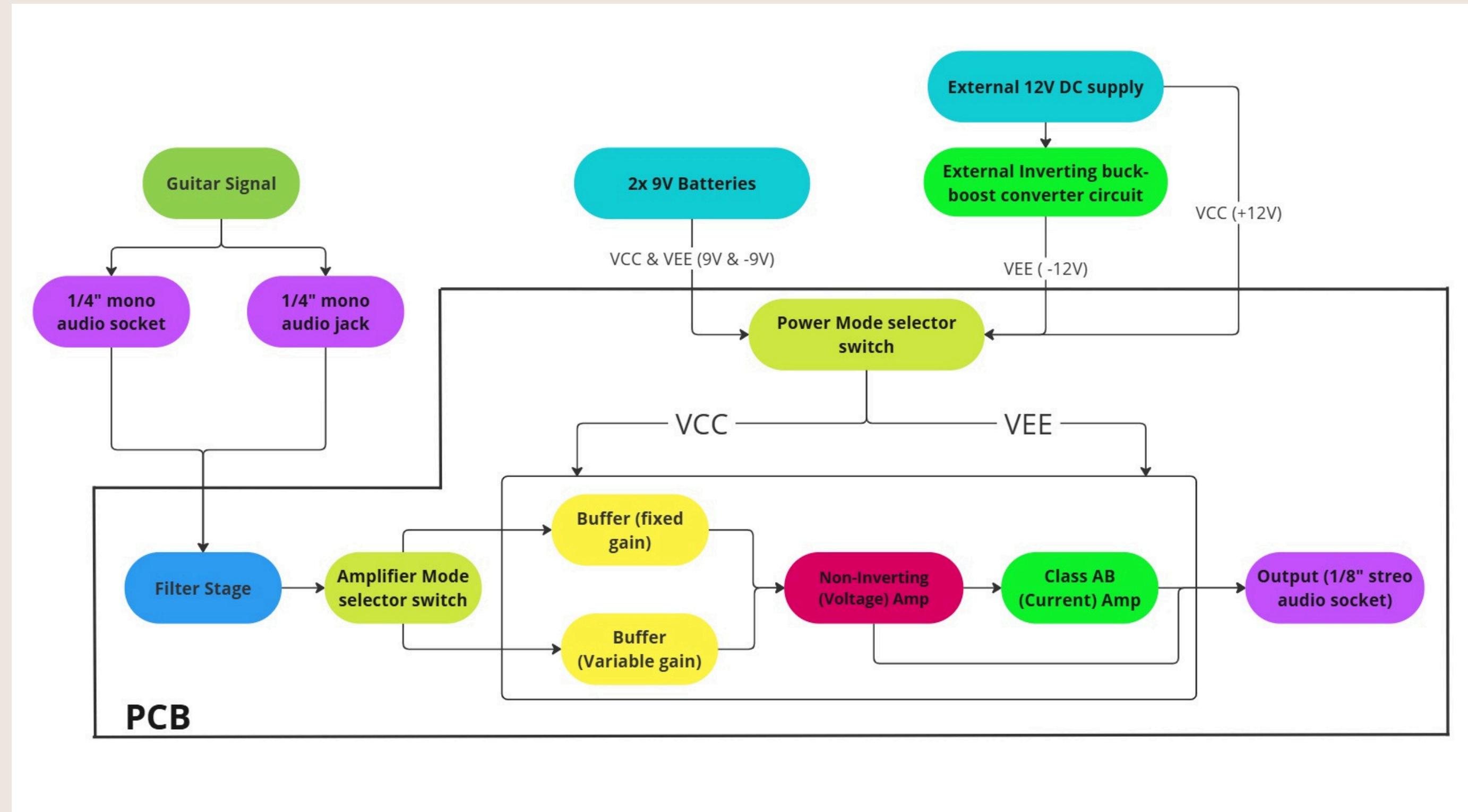
10K resistor , 2.2 μ F capacitor combination was used to implement high pass filter with 7Hz cutoff and 10K resistor, 680F capacitor combination was used to implement low pass filter with 23 kHz cutoff.

10K Potentiometer

10K potentiometer was selected to adjust gain as required for our design



System Overview

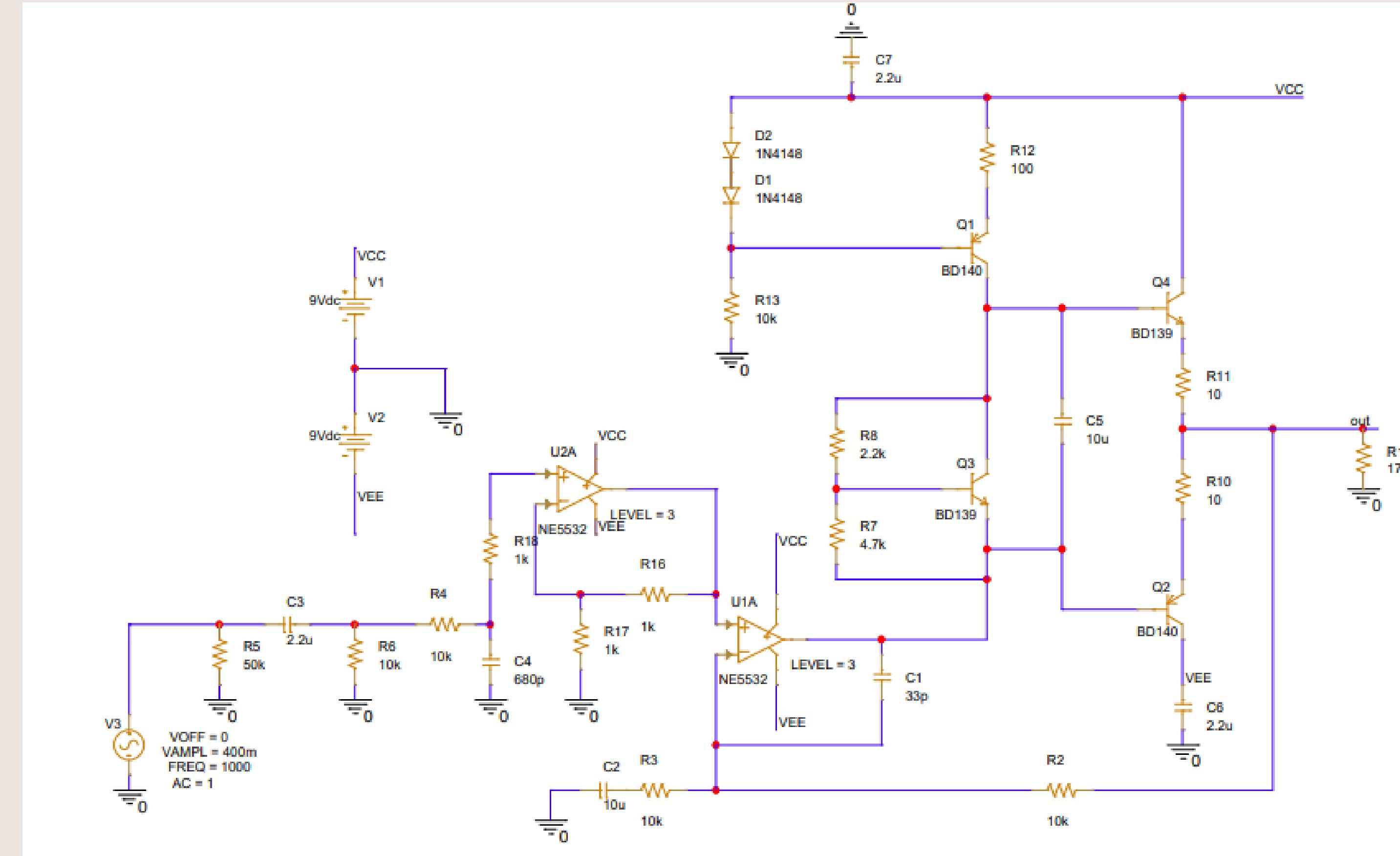


Working Principle

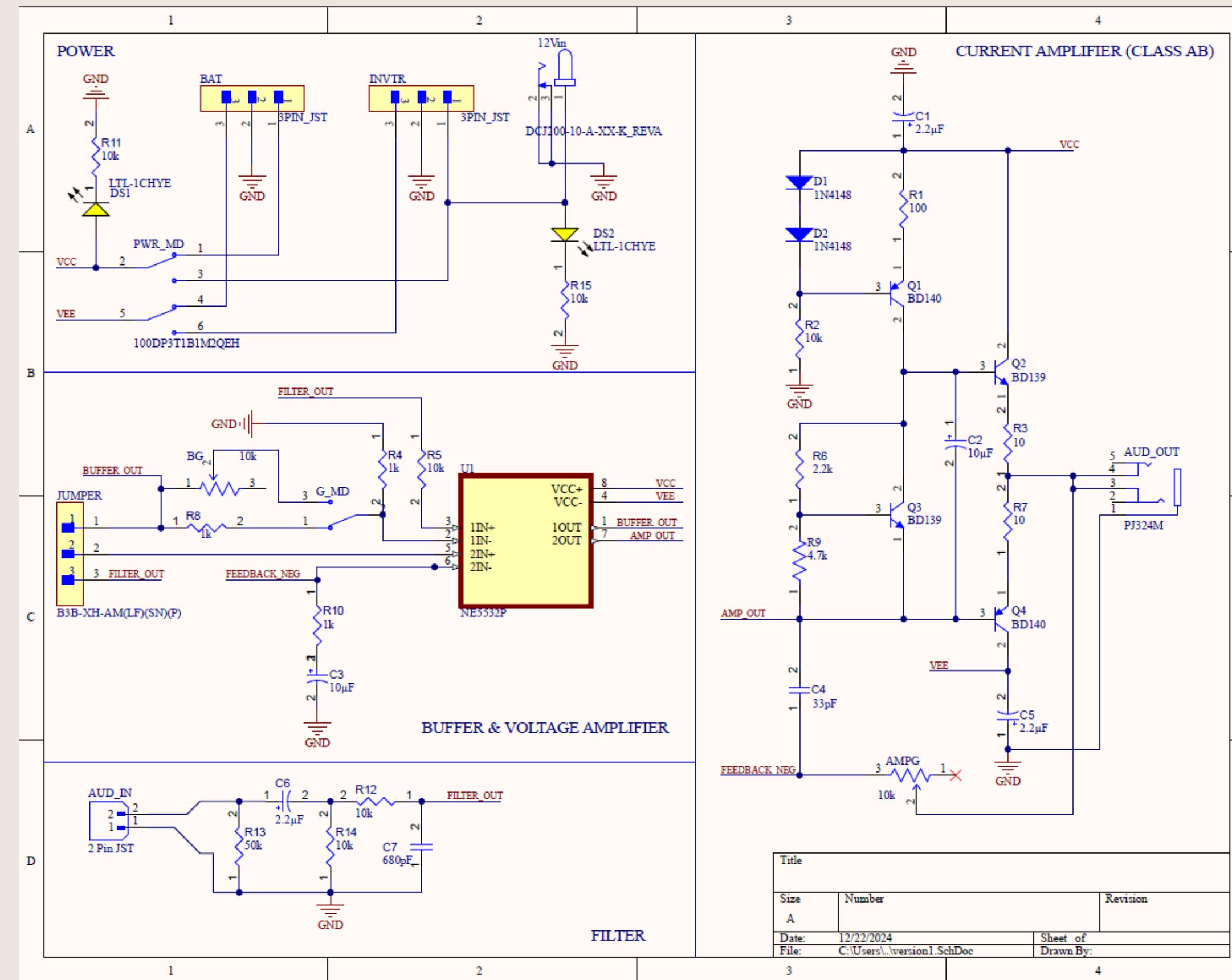
- The Pre-amplifier provides the initial amplification with gain controlled by feedback resistors.
- This low-power audio amplifier uses a push-pull transistor configuration for efficient amplification.
- The push-pull stage, with complementary transistors, amplifies both halves of the AC signal, reducing distortion and boosting efficiency.
- Powered by a $\pm 9V$ dual supply, the circuit uses capacitors for AC coupling and filtering, delivering a clear amplified output to a small load, such as a speaker.

Schematic

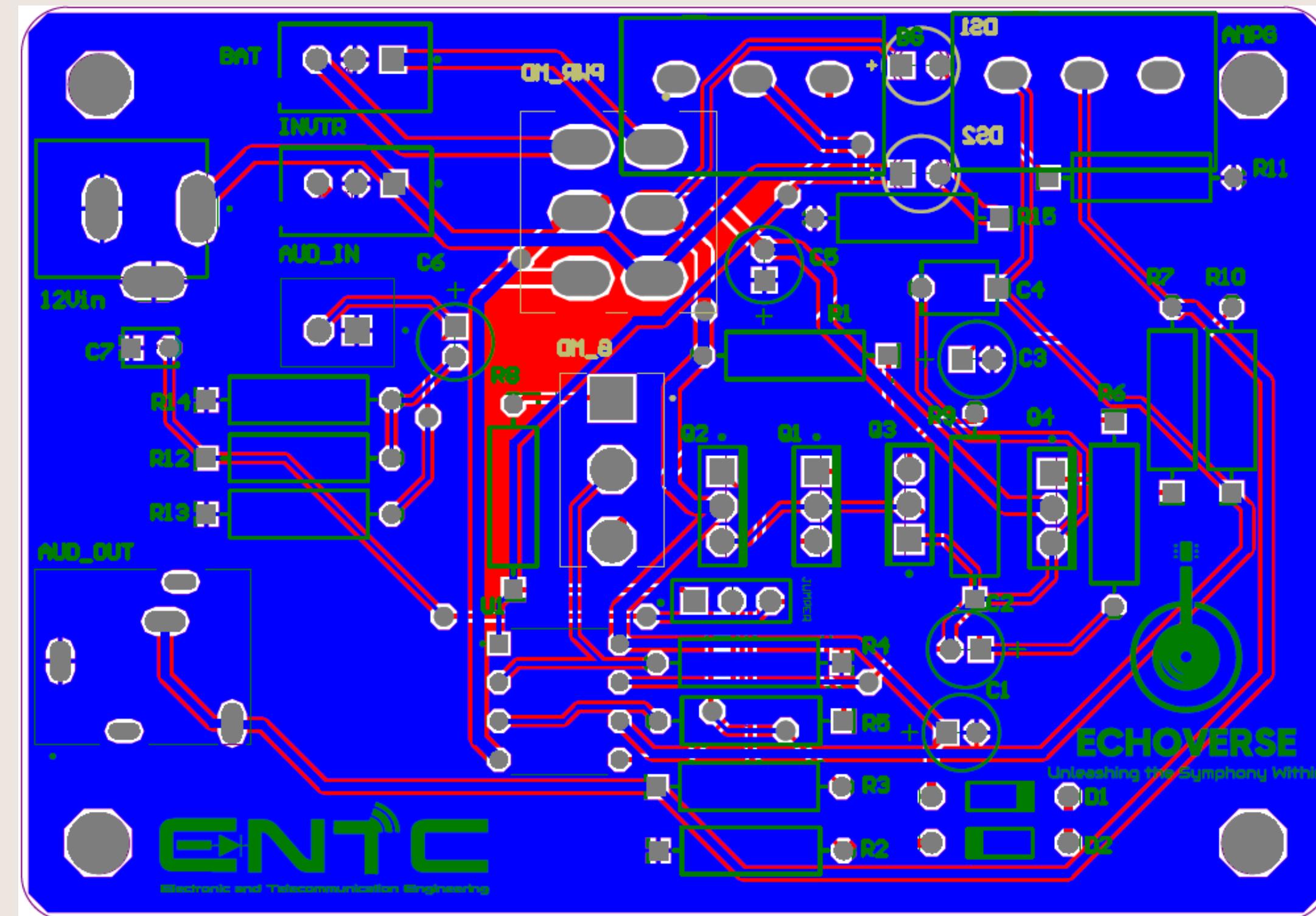
Initial



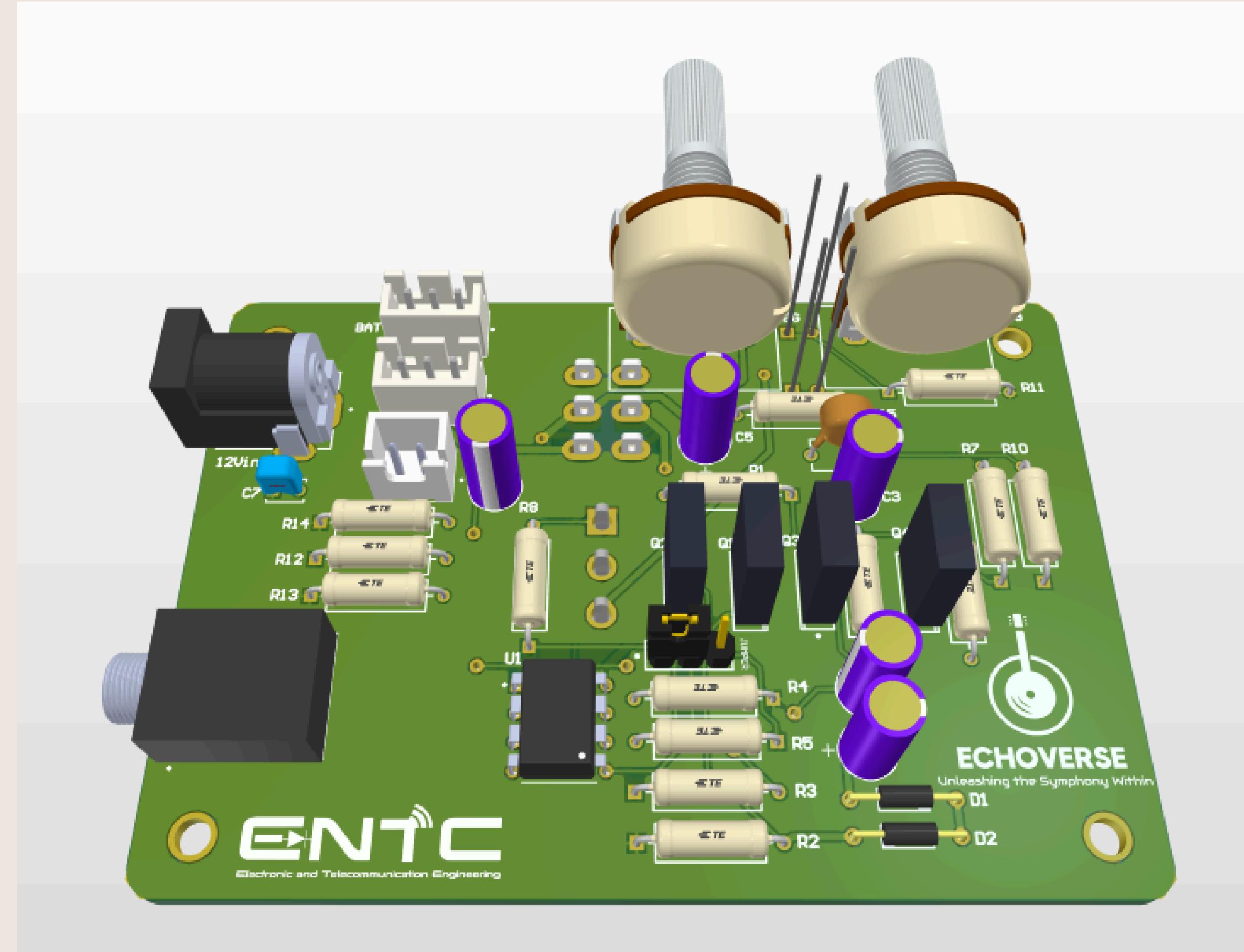
PCB Implemented Schematic



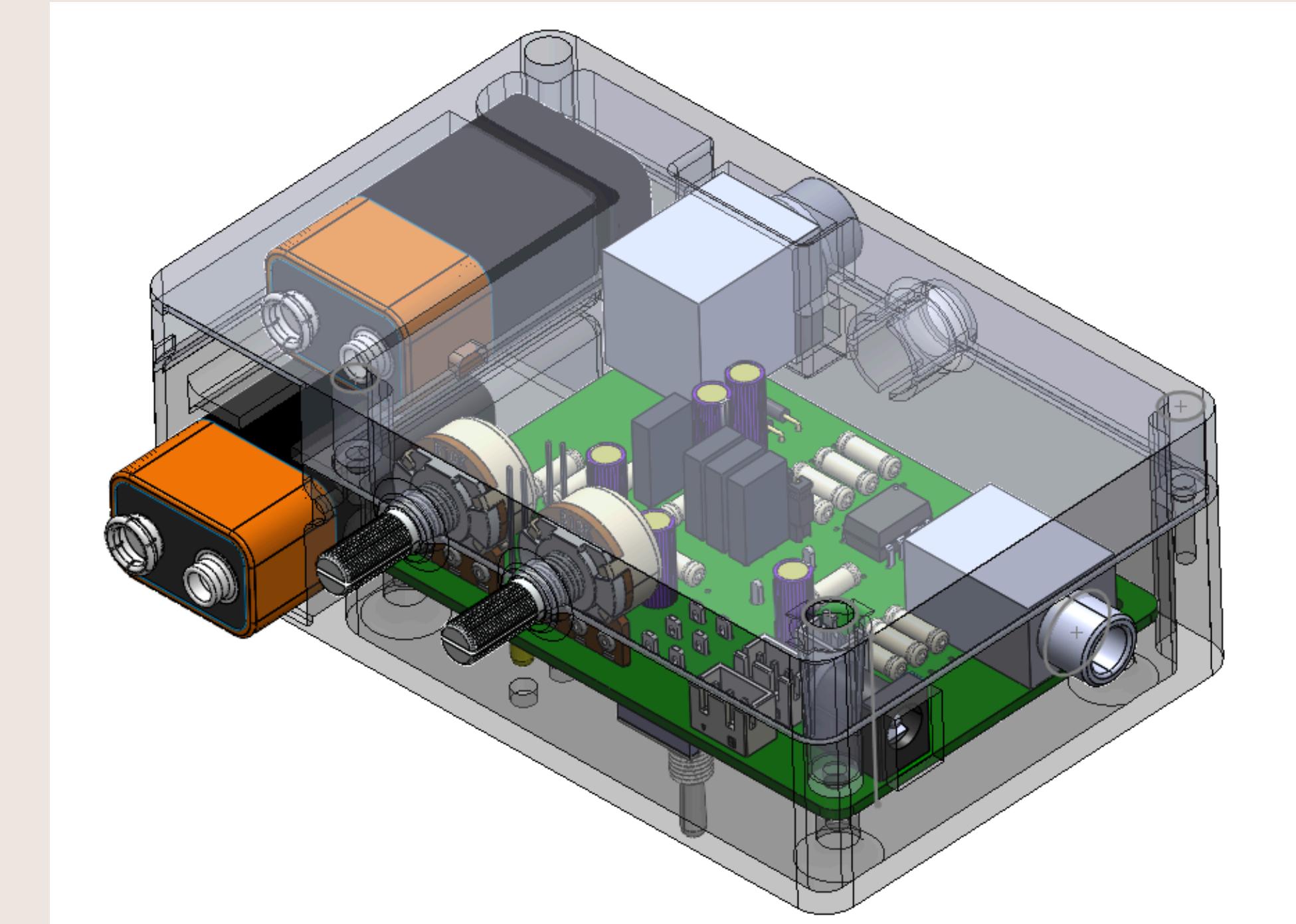
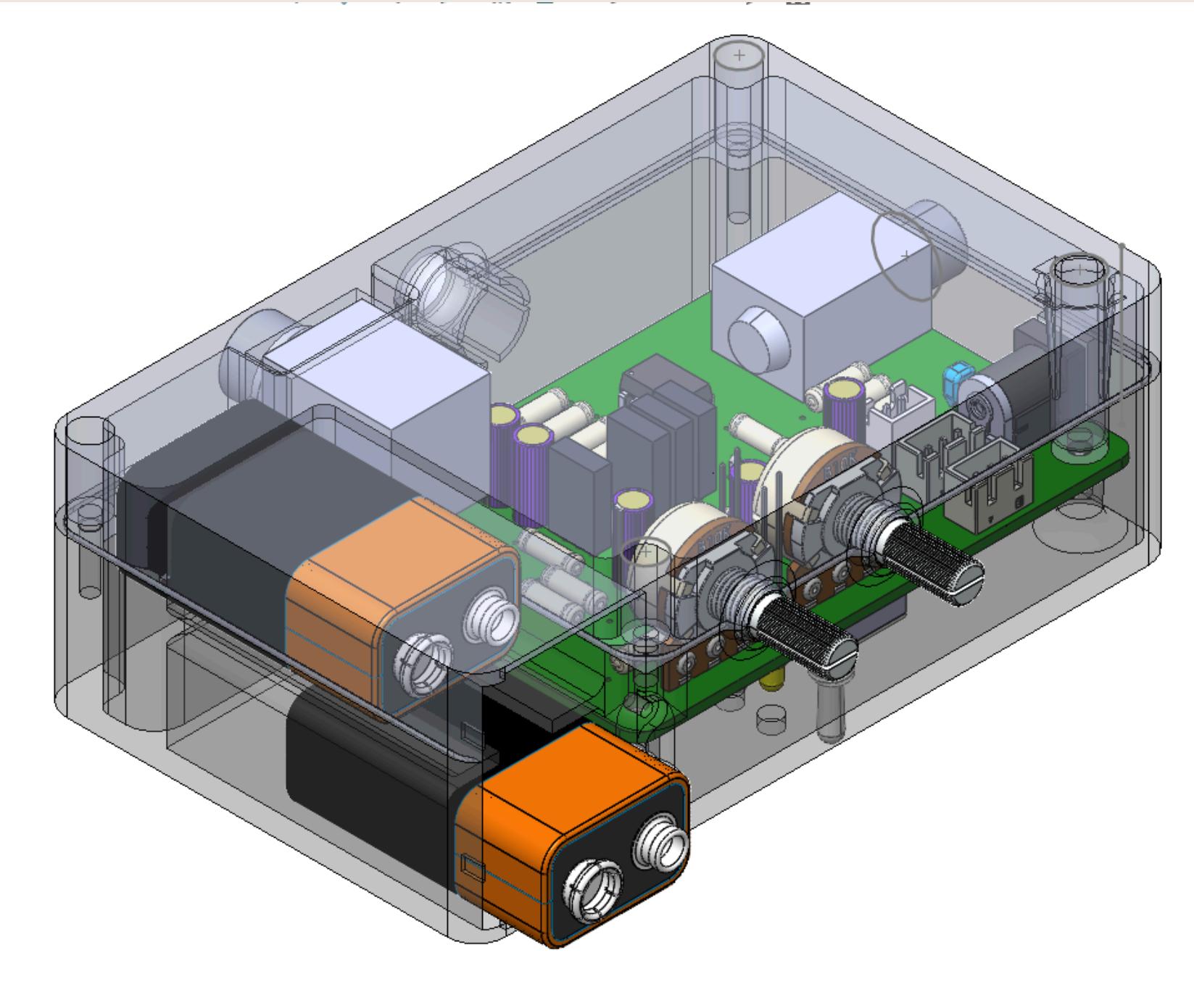
PCB Design



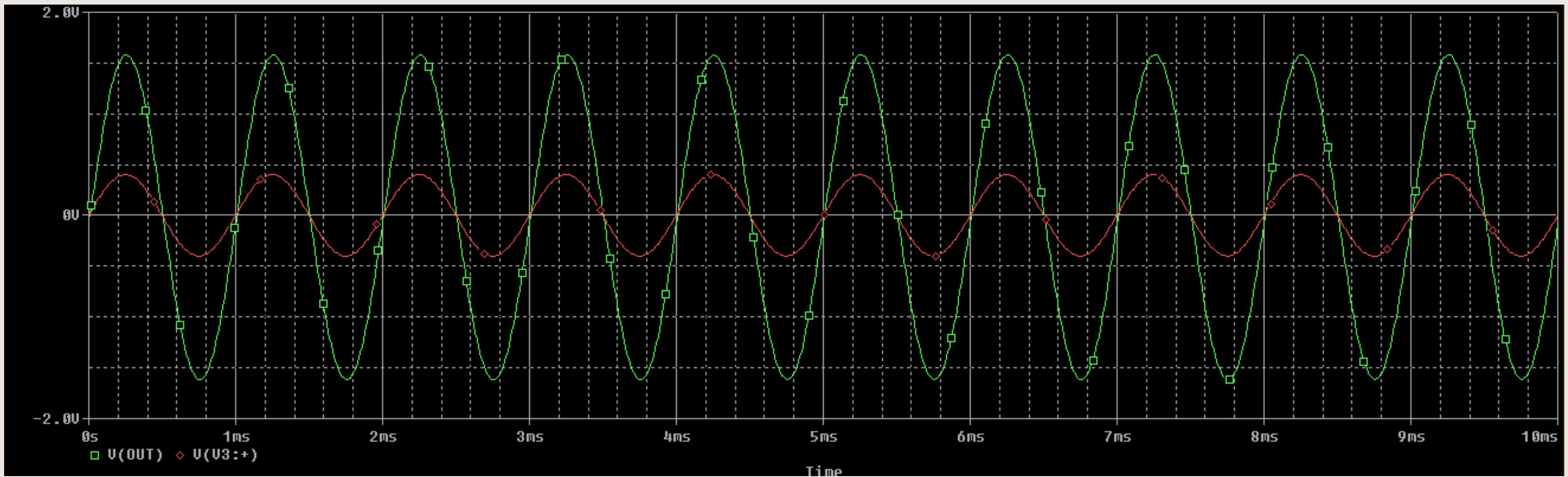
PCB Design



Enclosure Design

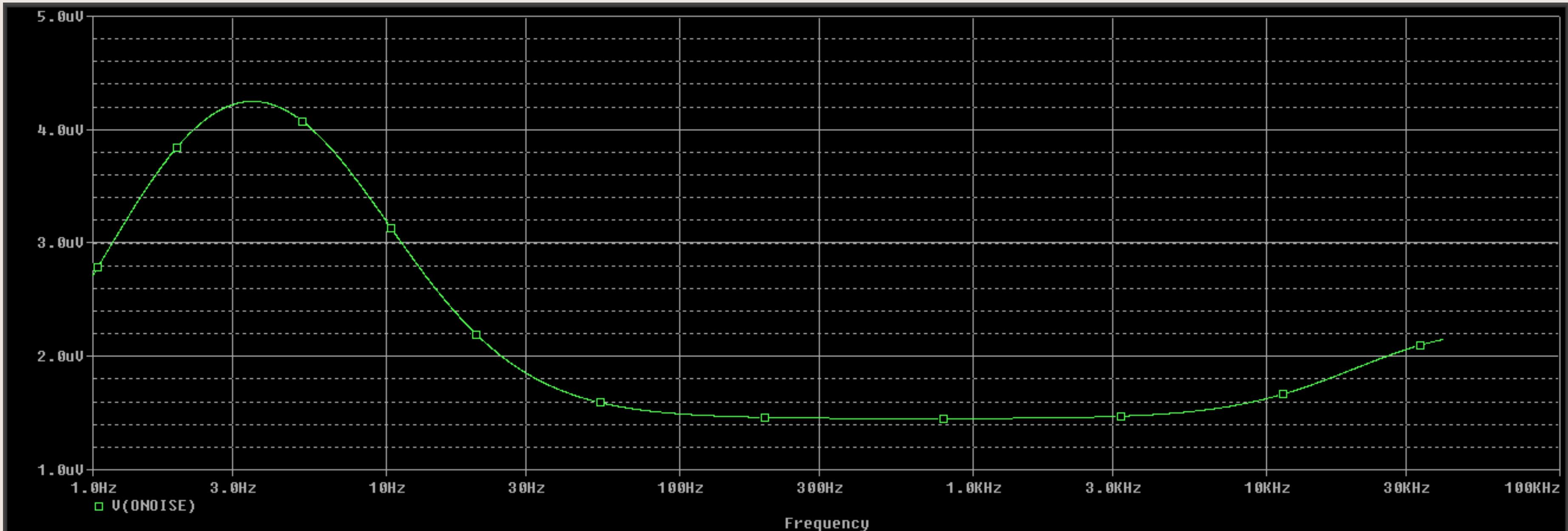


OrCAD PSpice Simulations



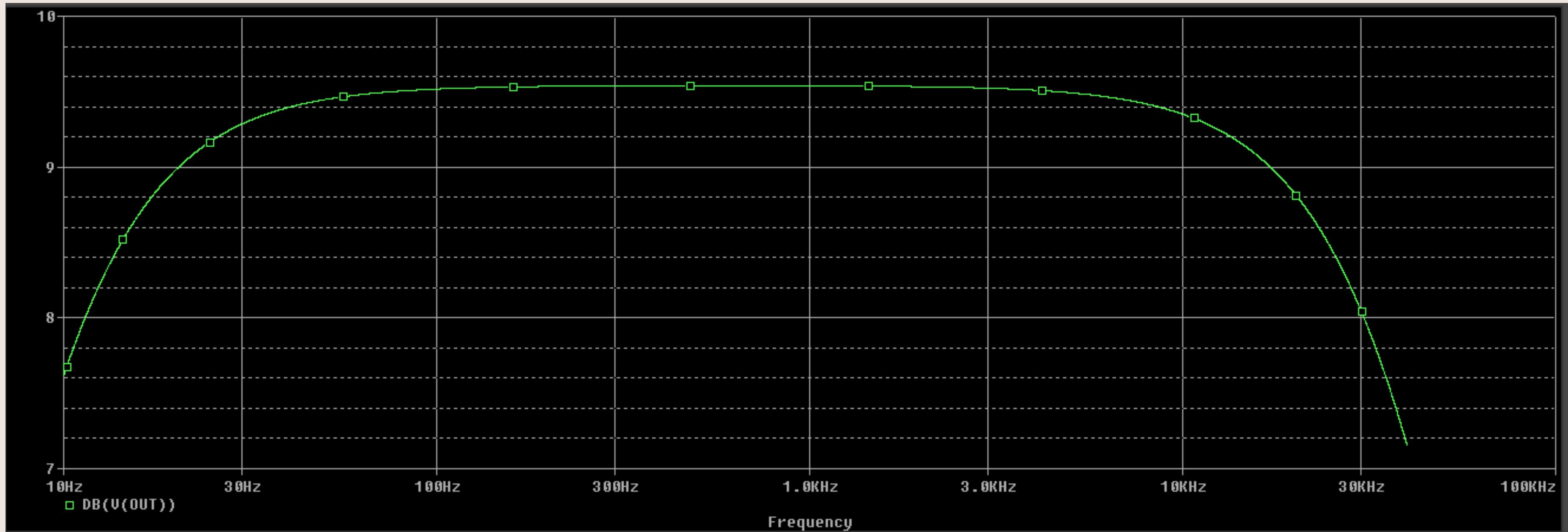
Transient Analysis with a 400mV p-p Sinusoid Signal

OrCAD PSpice Simulations



Output Noise Analysis

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Frequency Range

Oscilloscope Readings



Thank you