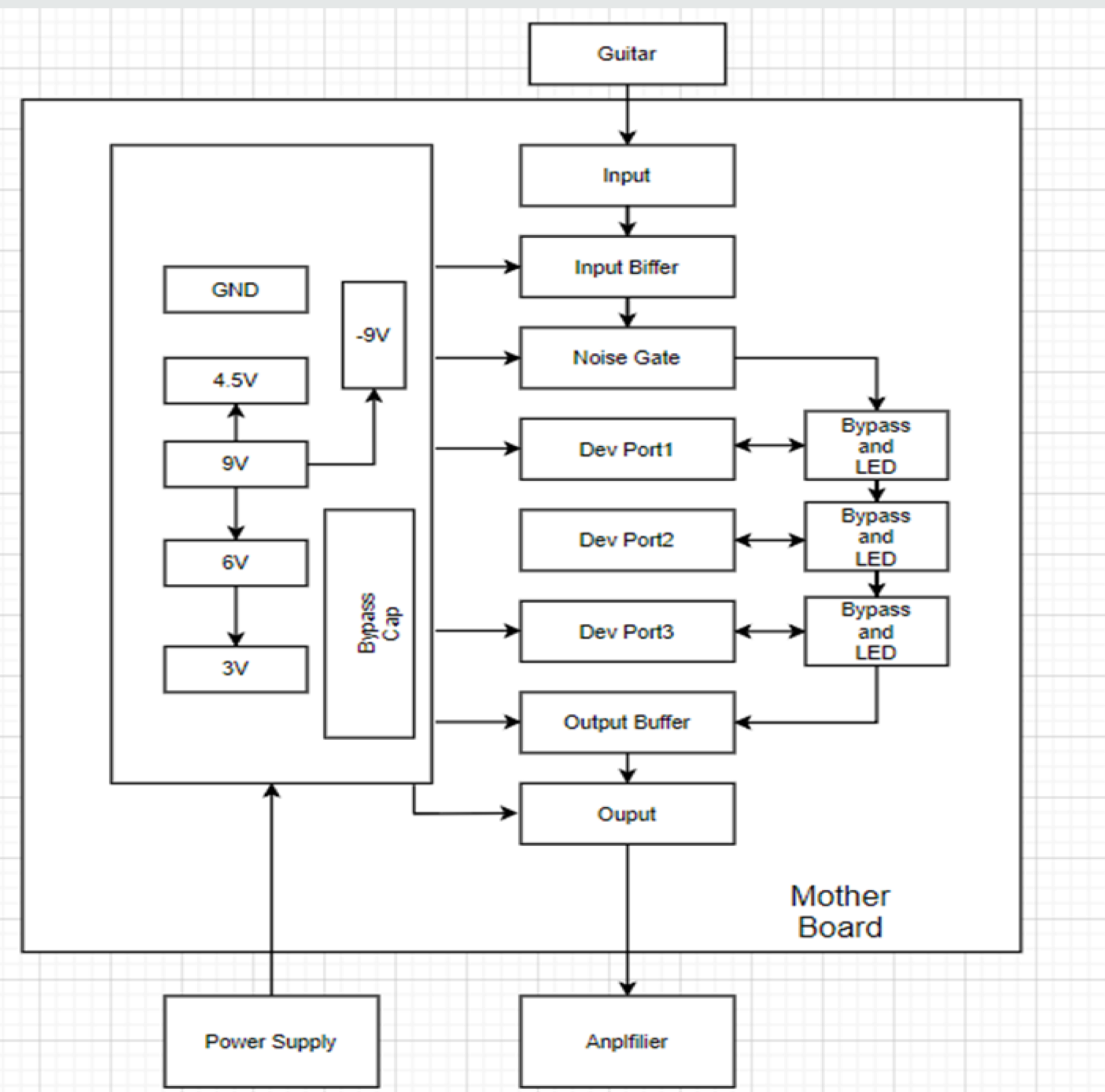


Guitar Pedal Development Board

Introduction

Our client has requested a device that can be used by both guitar pedal designers and musicians. The designer should be a development board whose sole purpose is implement circuits for guitar pedals. As such, the designer need not concern him or herself with input connection, preliminary stages, preceding stages, nor output connection since the device shall include all such stages. The designer can therefore implement a circuit and then immediately test it by connected a guitar and amplifier to the device. Additionally, a musician can use this device as a multi-effect pedal, assuming some circuit has been implemented in the device. A logical layout of footswitches, knobs, LEDs and jacks for power, guitar, and amplifier will be used to facilitate ease-of-use for the musician. Finally, as an example, a Fuzz-Overdrive pedal will be designed and implemented using this device. The Overdrive characteristics will aid in reducing negative, sonic qualities of the Fuzz pedal, in specific *muddiness*. Furthermore, this Fuzz-Overdrive pedal will incorporate a unity gain transformer as part of its design as this unity gain transformer will be *overdriven*.

Design Process & Architecture



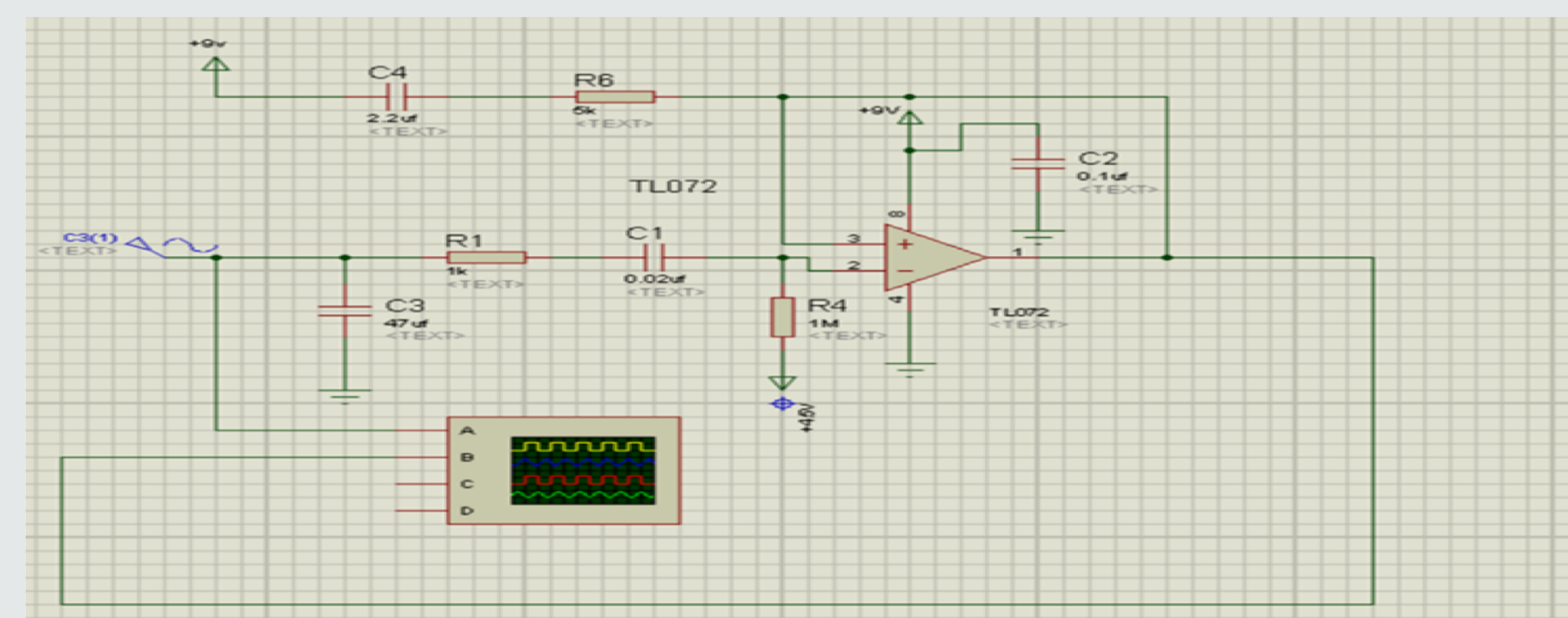
The total diagram is shown above. Observe that the input buffer is implemented to isolate the input signal. The noise gate is utilized to block noise caused by DC voltage and guitar pickups. 3 development ports are used to experiment with circuits. The output buffer transfer signal to an amplifier. The total system is powered by a power management system which can convert 110V AC input into 9V, 3V, 4.5V and 6V DC output.

Input / Output jack



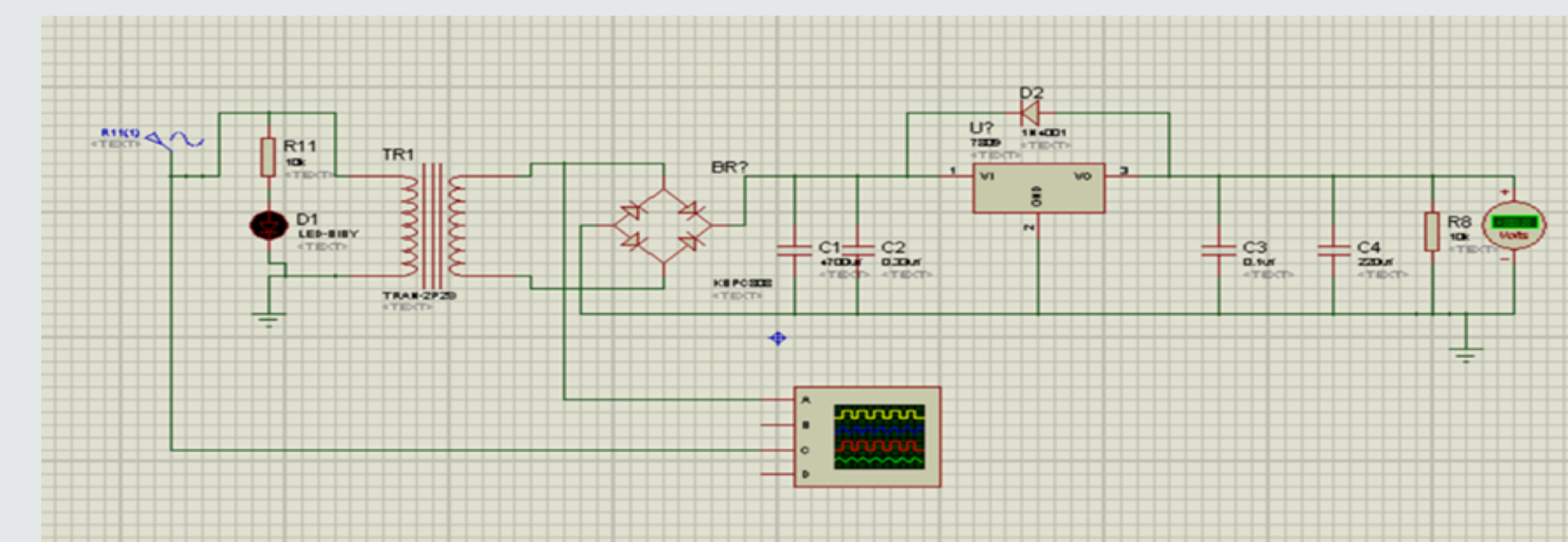
1/4" TS jack is mono and has three terminals. This jack, seen in Appendix B, table 1, is designed for to interface with a male 1/4" TS jack from a guitar. The terminal 1 is connected to the ground wire and terminal 2 is the signal line carrying output of the guitar to the GPDB.

Input Buffer



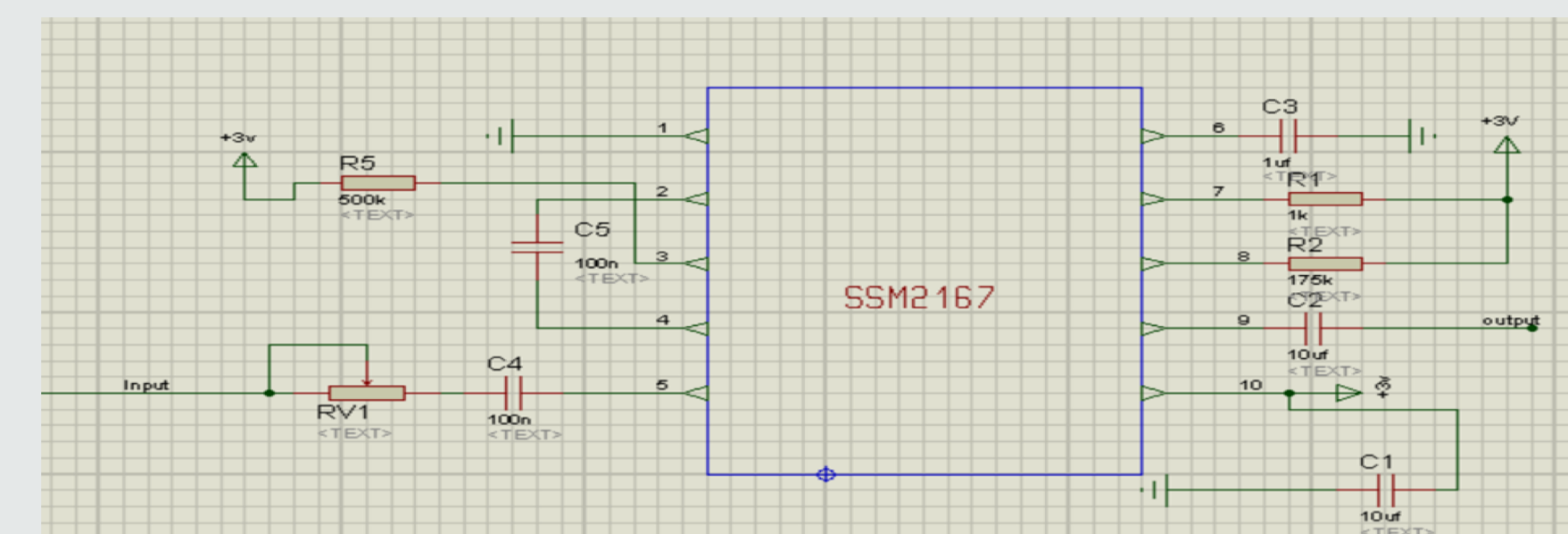
This kind of buffer has a strong load capacity and current amplification characteristic. It will isolate the guitar signal and make processing effective and create a clean signal. The TL072 operating amplifier is used in this design.

Power Supply



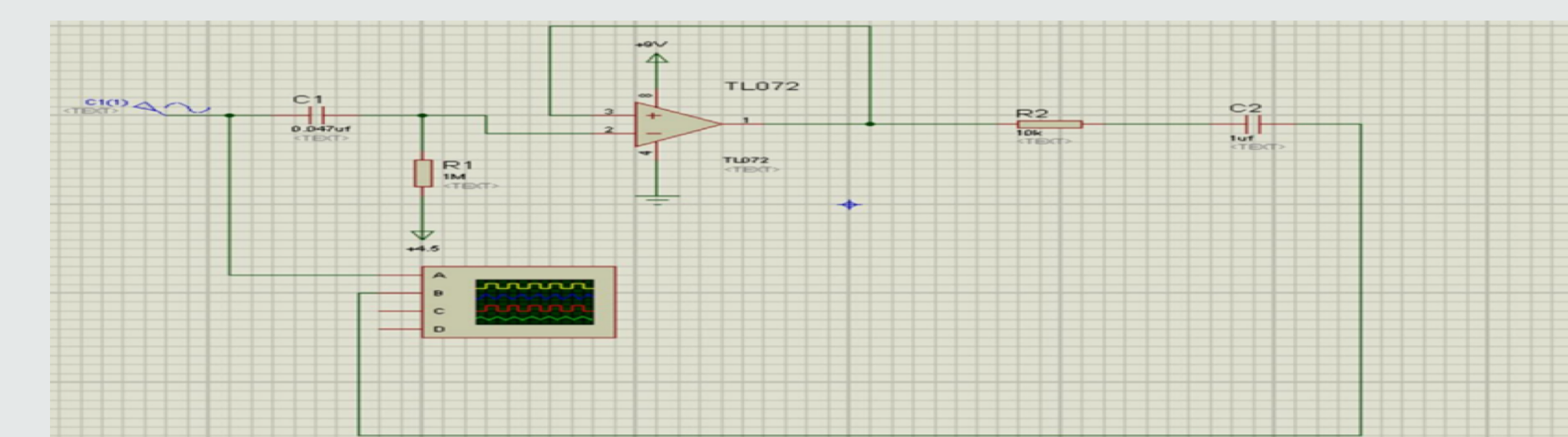
The power supply powers the entire device. The power conversion submodule converts a 110V AC input signal into 9V DC voltage. Then, the voltage divider module divides the 9V DC voltage into 4.5V, 3V, 6V, DC voltage to power the remaining stages of the device.

Noise Gate



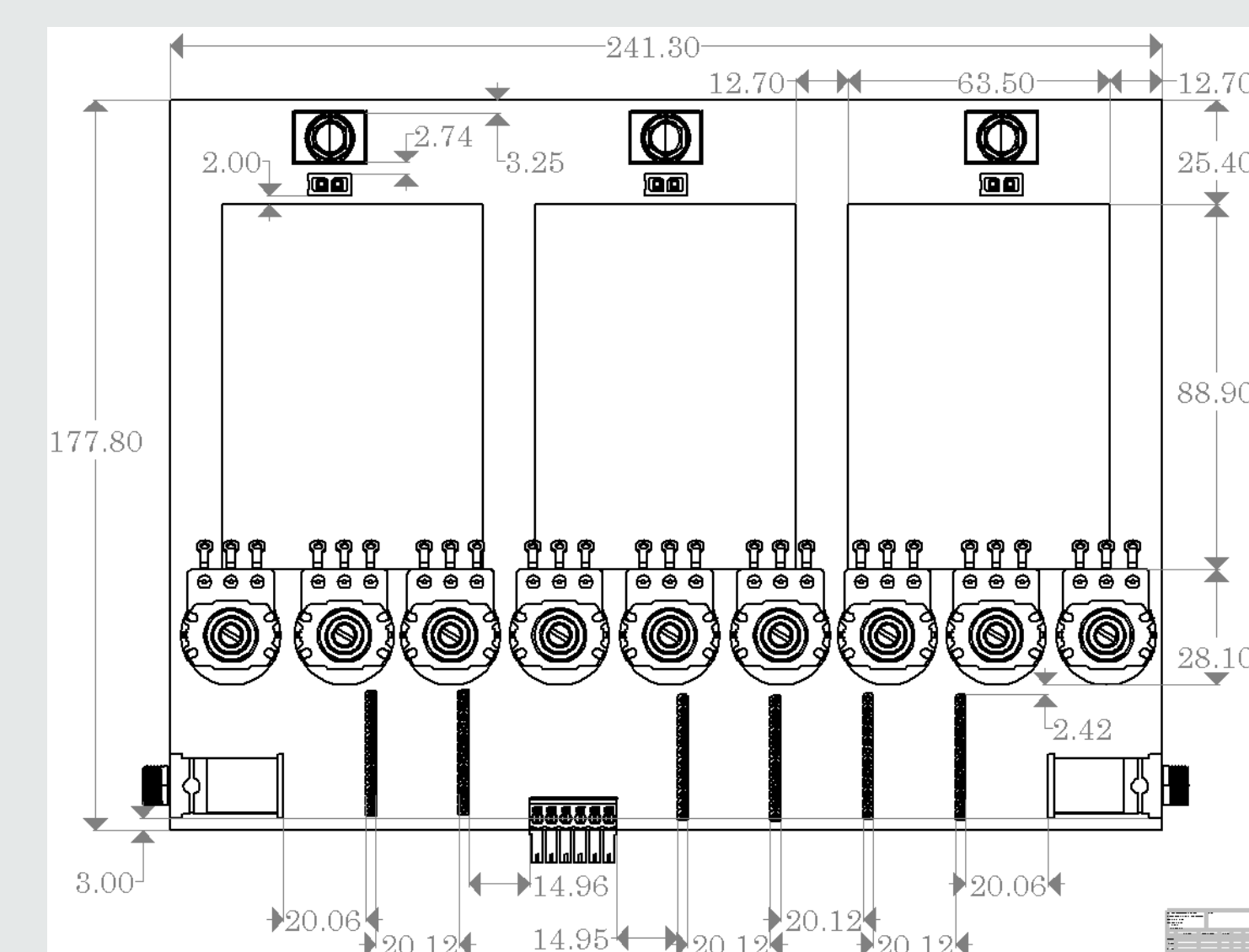
The noise gate, can block DC voltage noise in the signal. It can filter 3.535mV noise and its attenuation factor is set to 10. The attack of the gate is set to 5ms and the hold of gate is 5 -10ms. The SSM2167 IC is used in this implementations

Output Buffer



The output buffer is unity gain and transfer the signal to an amplifier with low output resistance. It is designed similarly to the input buffer.

Motherboard Floorplan



The general layout of the motherboard for the guitar pedal development board has been modeled in SolidWorks. Directly mounted elements: input and output jacks and the development ports. Indirectly mounted elements: input and output buffer and the noise gate. PCB sizes:
 Motherboard PCB: 177.8 x 241.3 mm or 7 x 9.5 in
 Dev. Port Size: 63.5 x 88.9 mm or 2.5 x 3.5 in
 Output Buffer: 32.98 x 55 mm
 In Buffer: 32.98 x 50.24 mm
 Noise Gate: 32.98 x 45.15 mm

Conclusion and Recommendations

In summary, this team has designed a development board tailored to experimenting with and implementing guitar pedals. The final product will double as a multi-effects guitar pedal that a musician can use as this musician would use any other guitar pedal, the only caveat being that the musician must create the circuit(s) for the pedal(s). All stages of this device have been designed, simulated, and tested in a simulated environment. The motherboard has been laid out such that all PCB sizes have been established. At this point in the project, the team can begin testing circuits on breadboards and designing PCBs for the final product. A verification and validation plan has been established to properly test the device and ensure it meets all client requirements.

Once this major milestone is accomplished and the team has a finished product for the Guitar Pedal Development Board, the team will use this device to design and implement a Fuzz-Overdrive pedal. The client has request that this pedal be specifically design to *overdrive* a unity gain transformer as its saturation characteristics past its linear mode of operation are superior to those of a transistor.

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