University of North Carolina at Charlotte
Department of Electrical and Computer Engineering

Laboratory Experiment Report # 6

Lab Report # 6

Authors: Sean Gilbert, David Ojo, Daniel Zykov, Alberto Hernandez

Date: December 11, 2024

Objectives

The objective of this lab is for students to learn how to design a PCB, navigate websites like Digikey to order physical components and to use techniques like soldering to bring the PCB design to life and test it to verify functionality.

Equipment List

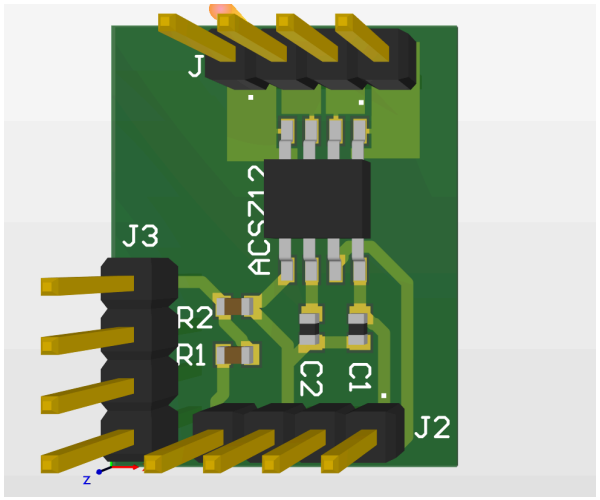
- Matlab Simulink
- Altium Designer Suite
- F28379D Launchpad
- Hands-on Power Electronics
- Oscilloscopes
- 1 3.3k Ω Resistor
- 1 6.8k Ω Resistor
- 1 1000pF Capacitor
- 1 0.1μFCapacitor
- Current sensor “ACS712ELCTR-20A-T”

Relevant Theory/Background Information

Altium Designer is a designing software that allows the user to plan and create PCB schematics and upload or create components like resistors, capacitors and more. After designing the PCB a website called Advance PCB was used to manufacture the PCB itself and Digikey was used to order the components that were put together at the lab via a soldering station.

Experimental Data/Analysis

Below in Figures 0-1 and 0-2 are the Altium Designer models for the PCB that is used in the lab. We chose this design for its small size though we were told that this reduced size would affect how much current it could handle.



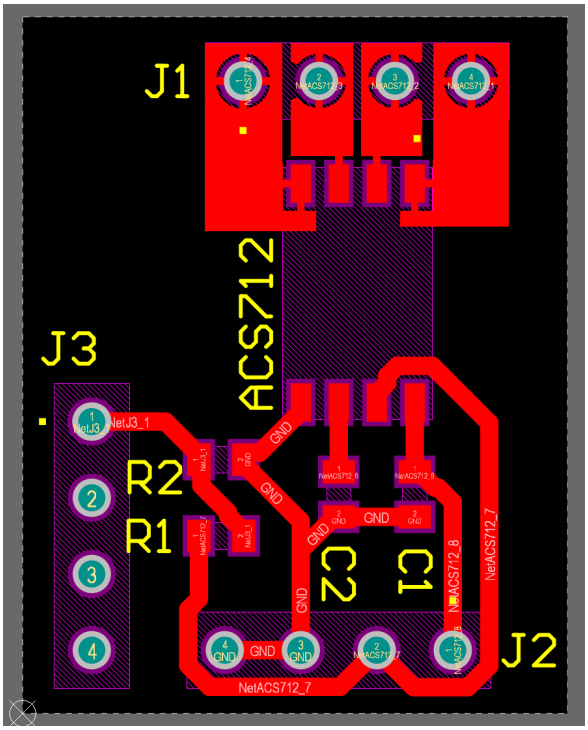


Figure 0-1(Left) and 0-2(right)

Table 0–1 below is the components used to populate the PCB for the lab, we used Digikey to order these components.

Table 0-1

Part	Quantity	Specification	Notes	Name
ACS712ELCTR-20A-T	1	Current Sensor IC	Measures Current and outputs proportional voltage	ACS712ELCTR-20A-T
Resisitor	1	6.8kΩ, 1% tolerance	For voltage divider	RC0603FR-106K8L
Resisitor	1	3.3kΩ, 1% tolerance	For voltage divider	RC0603FR-073K3L
Capacitor(Bypass)	1	0.1µF	Stabilizes power supply	CC0603KRX7R7BB104
Capacitor(Filter)	1	1nF	Noise filtering for pin 6	CC0603KRX7R9BB102
Test Points	1	Pin Headers	Probing for debugging	826646-4
High-Current Connectors	2	5A-rated	For current input/output	826646-4

Below in Figure 1-1 is our PCB schematic design that was made in Altium Designer

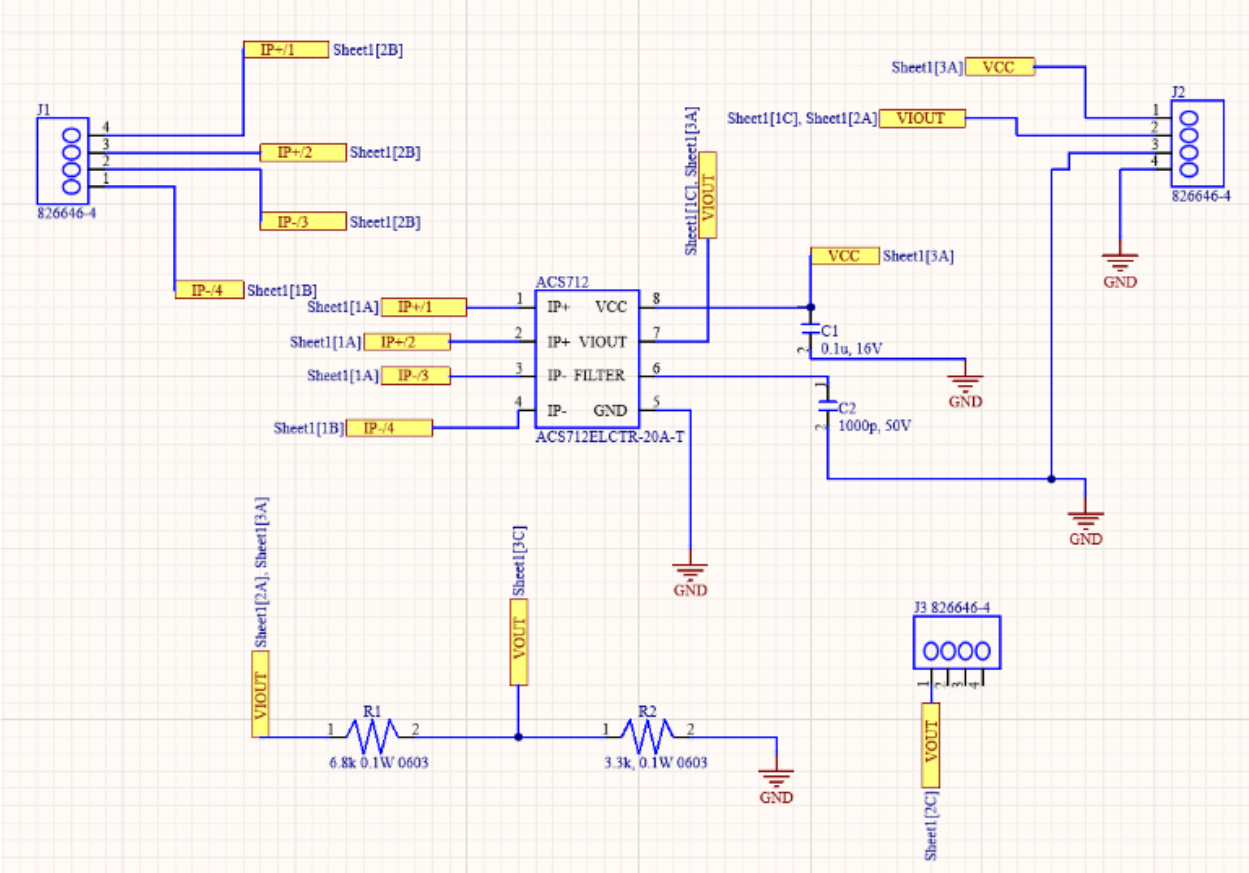


Figure 1-1

The set-up can be seen below in Figure -2 where as can be seen in our schematic diagram in Figure 0-1 power and ground are connected on the right side of PCB and the Current is being read from the bottom with IP1 and 1P4 being paired on the left.

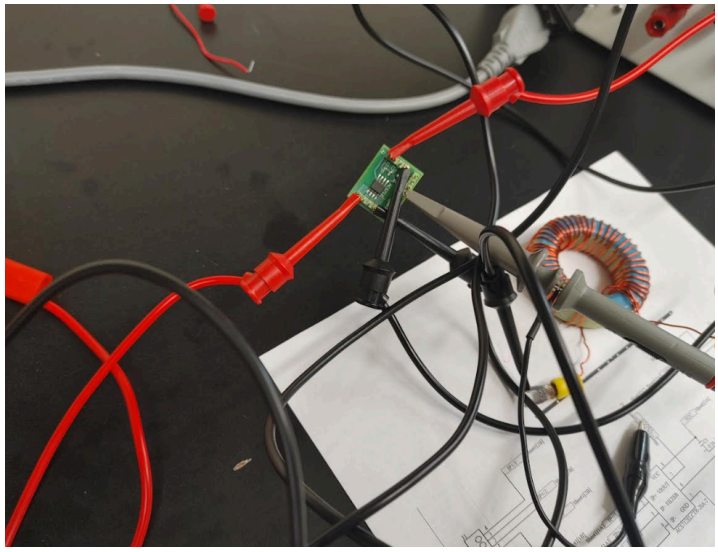


Figure 1-2

Below is Figure 2-1 and 2-2 which shows the Open loop and Closed loop waves respectively. As can be seen, like lab 5-2 the edited sine function of 76 was the most effective at giving an output of 60 Hz. Attached to this report is the video recording for both.

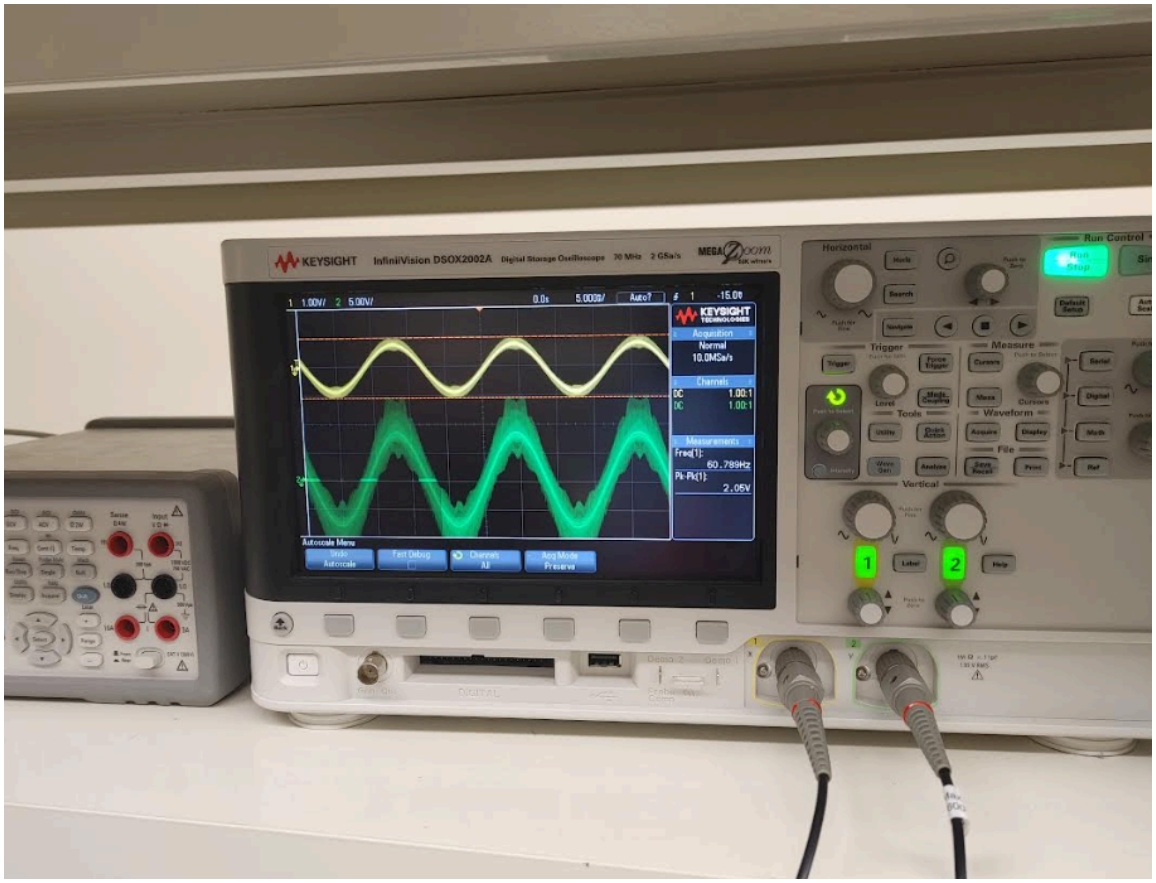


Figure 2-1

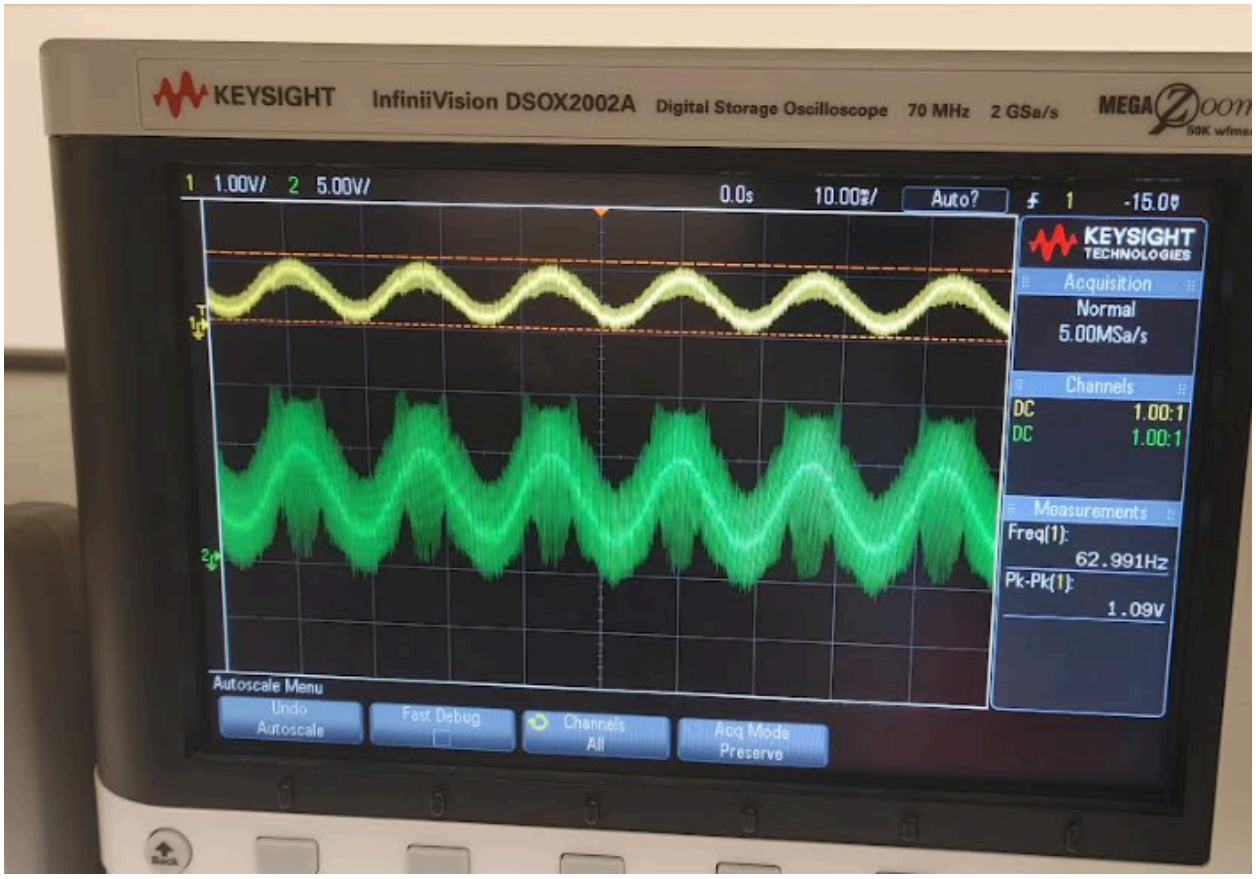


Figure 2-2

Conclusion

Going through this lab has taught the group about the importance of ordering more components in case of potential problems that may occur during soldering or other parts of the lab. In addition we learned about looking at more options of ordering a PCB that would have been far cheaper to order than others. We also learned about soldering and proper practices to do so as well as the different types of solder and their use cases. We also learned that the size of a PCB affects its amperage rating as the smaller a PCB is the less current it can handle.