



EN2091 – Laboratory Practice and Projects

# Analog Function Generator

Vanguard Silicon

# Project Objectives



## Waveform Generation

capable of producing sine, square, sawtooth, and triangular waveforms



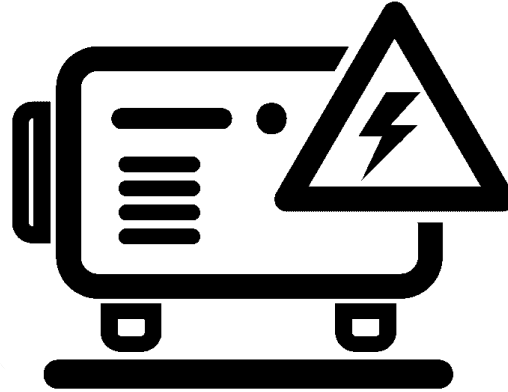
## Variable Amplitude

to offer variable output amplitudes ranging from 0V to 10V



## Frequency Control

can output waveforms with frequencies adjustable between 20 Hz and 20,000 Hz



## Load Compatibility

can drive at least a  $50\Omega$  load without significant waveform distortion



## Clean and Noise-Free Waveforms

to deliver clean, noise-free waveforms for sensitive applications



## Pulse Width Control

Enable variable pulse width control for square waveforms, with a range from 1% to 99%



# Project Achievements

## Load compatibility test

Could successfully go lower than 50Ω load



## Power management

Designed a power supply circuit converting unipolar to bipolar



## Minimal controls

Could minimize amount of controls



## Waveform generation

Discovered ways to generate 4 waveforms



## Frequency range

Could go beyond 20kHz for some waveforms

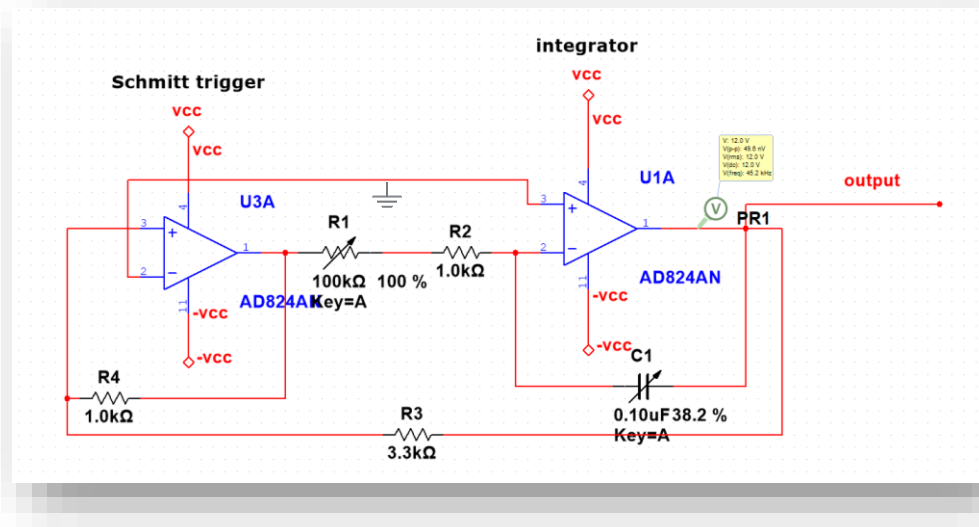


## Noise- free signals

Could tweak circuits for minimal noise waveforms



# Triangular Wave Generation



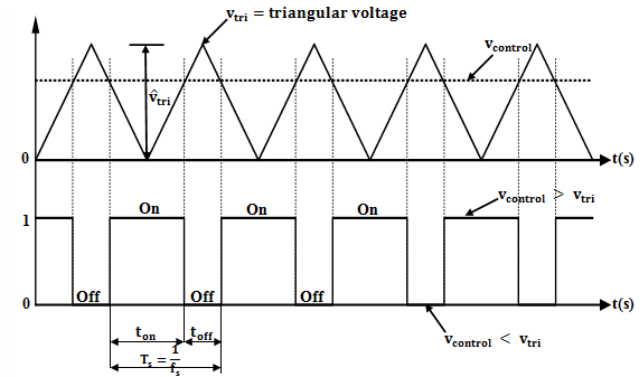
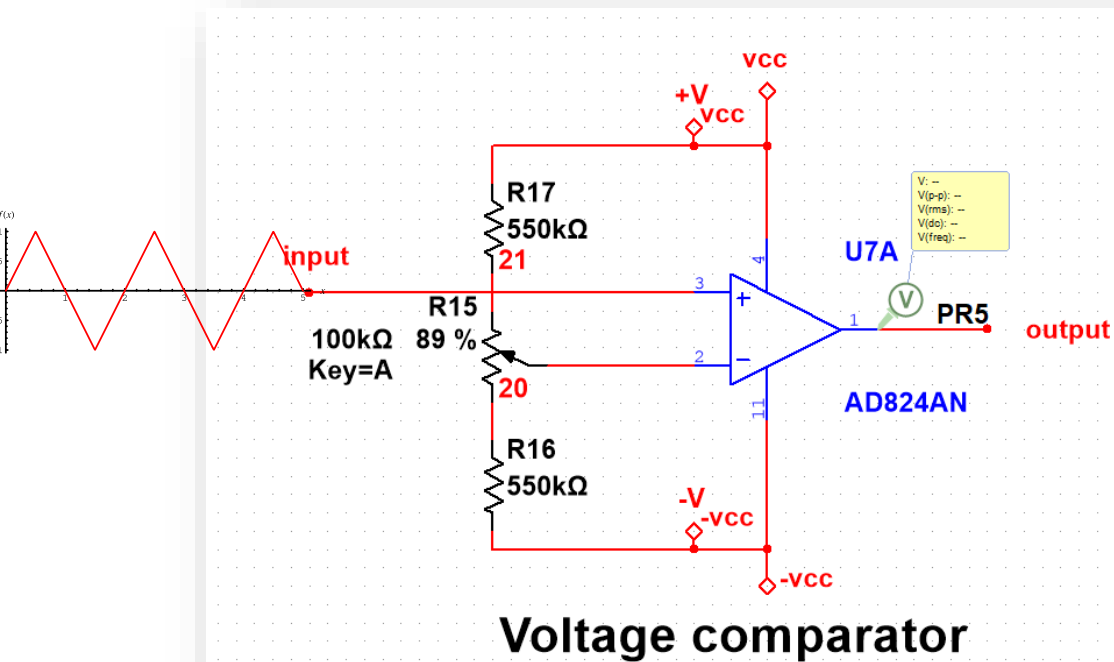
Stable waveform  
Well aligned  
peaks

High frequency  
range

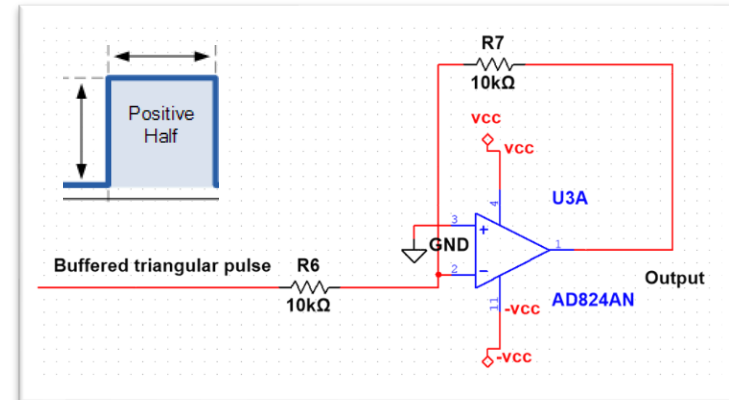
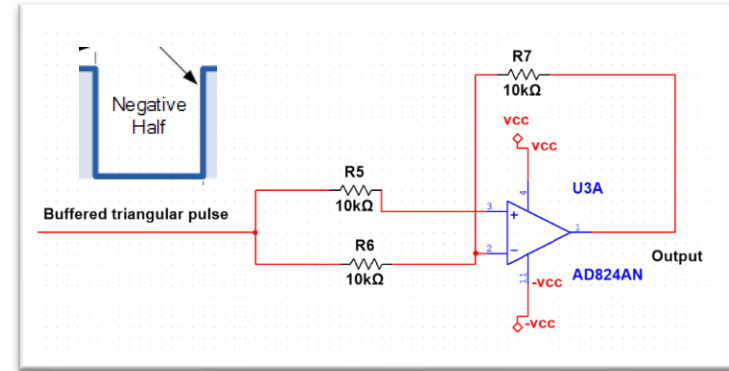
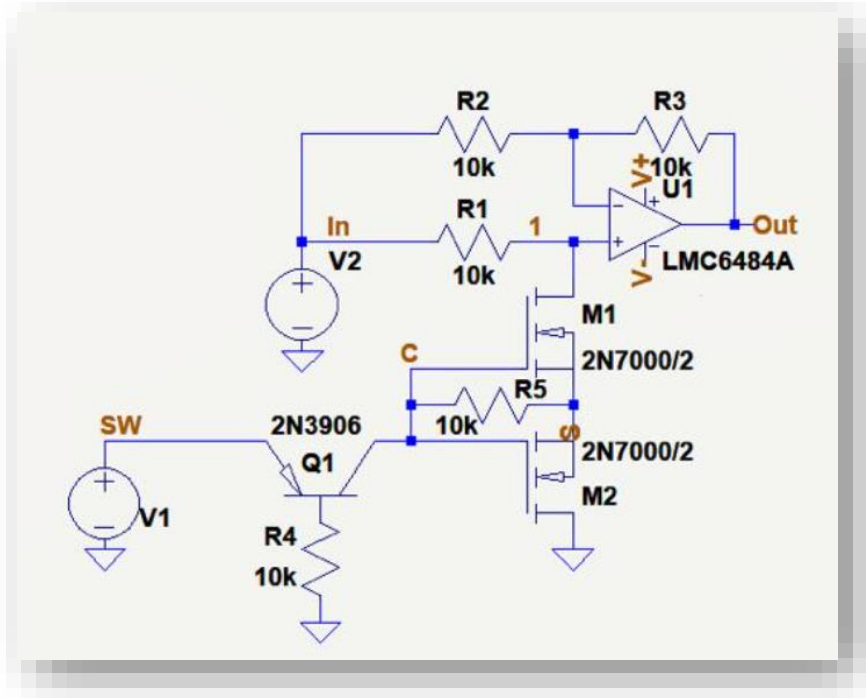
Easy tunability

Low noise

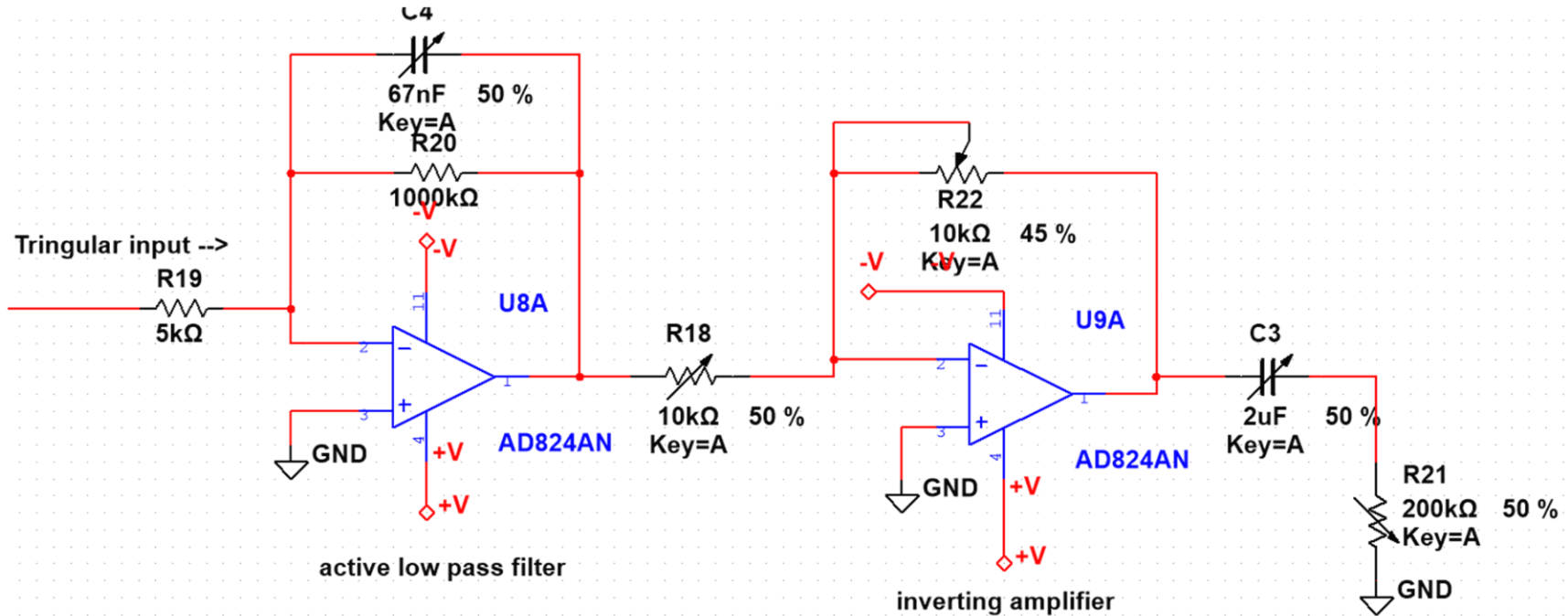
# PWM Wave Generation



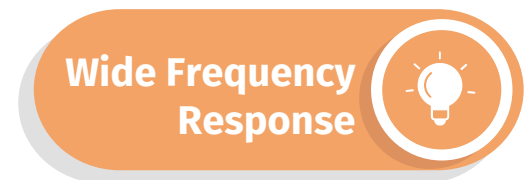
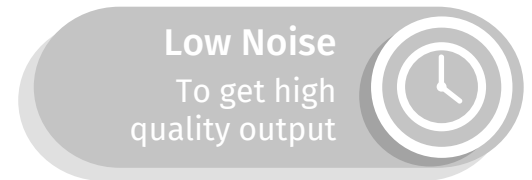
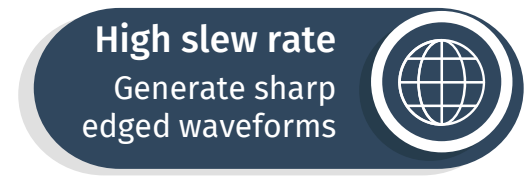
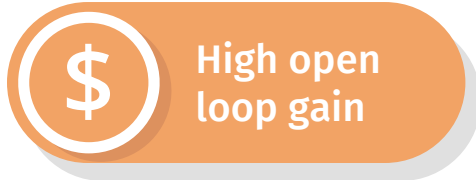
# Sawtooth Wave Generation



# Sine Wave Generation



# NE5532P Op Amp





# 2N3906 NPN Transistor



SMALL LOAD SWITCH  
TRANSISTOR WITH HIGH  
GAIN AND LOW  
SATURATION VOLTAGE



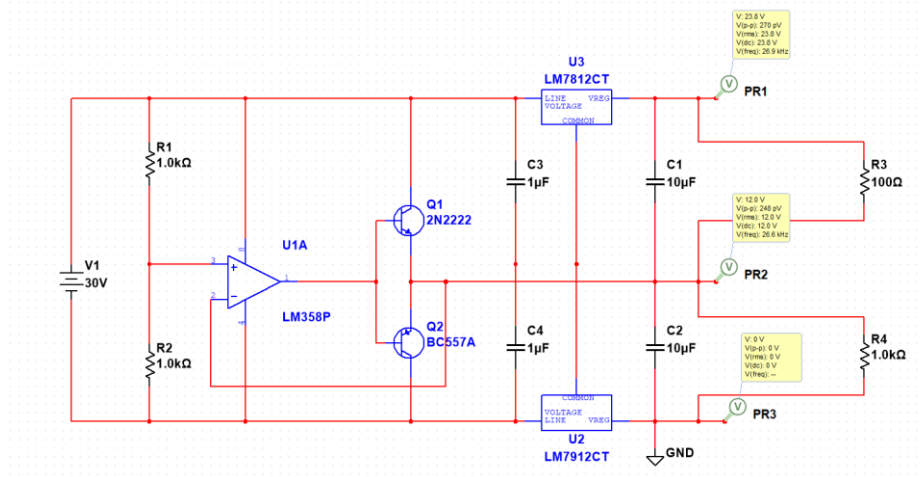
Availability



# Power Supply Design

Unipolar to bipolar  
design

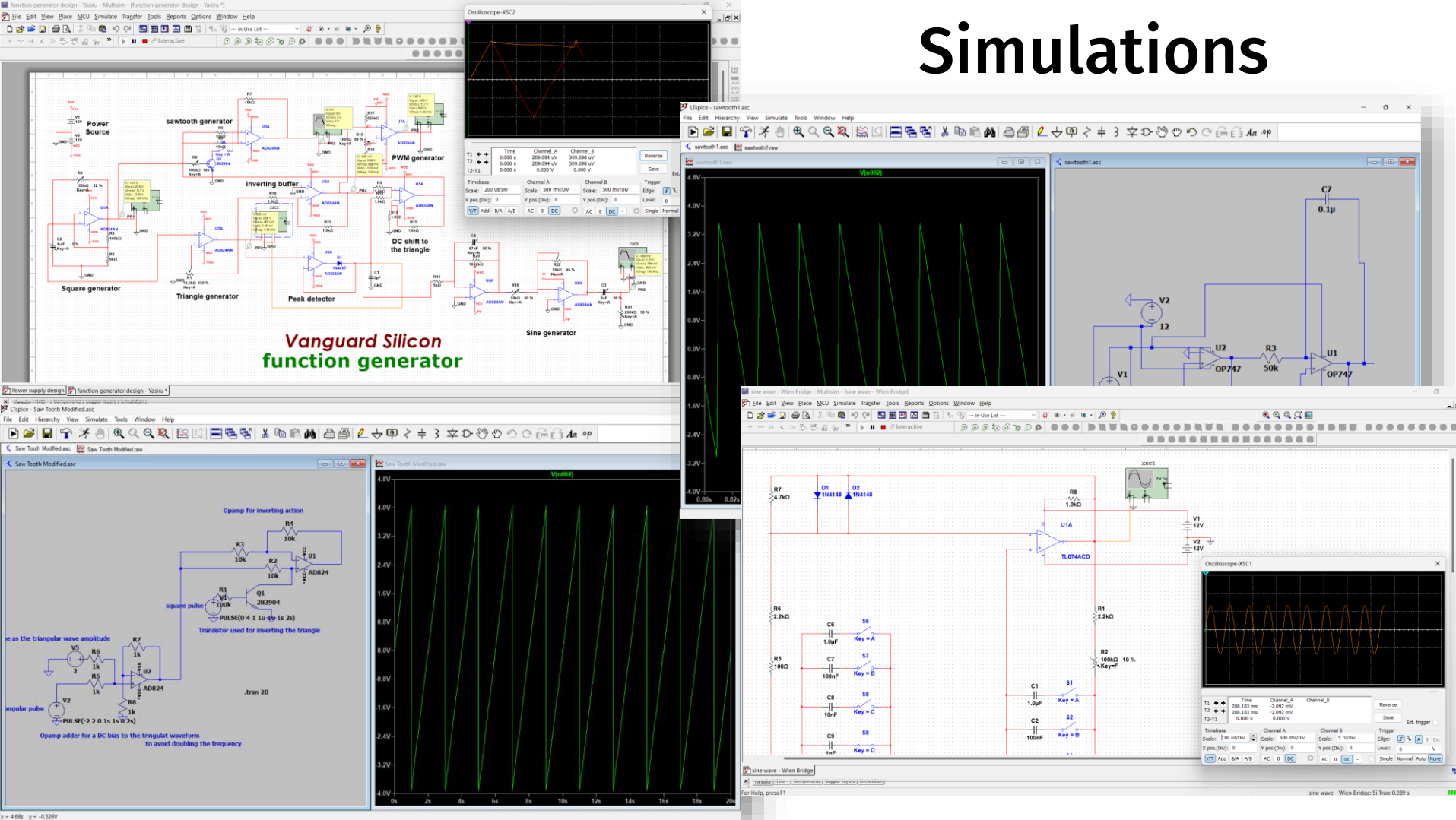
Low noise and  
minimal cost



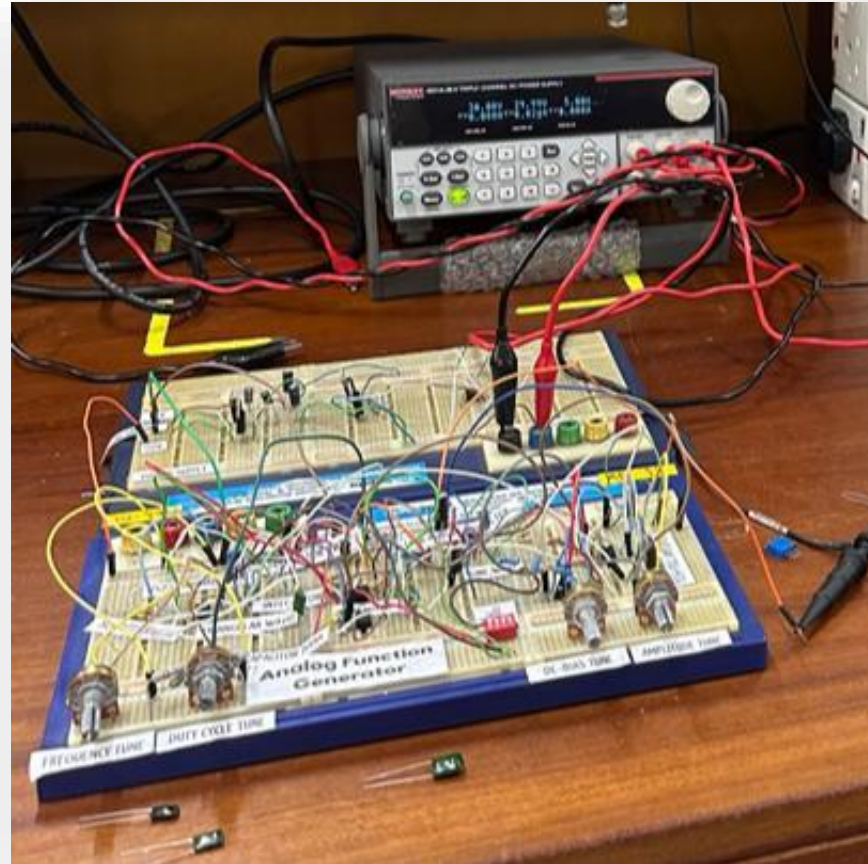
Could drive lower  
than 50Ω load

Stable  $\pm 12$  V voltage

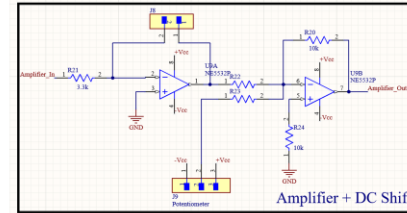
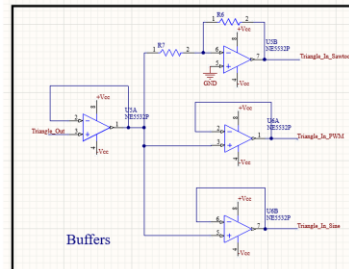
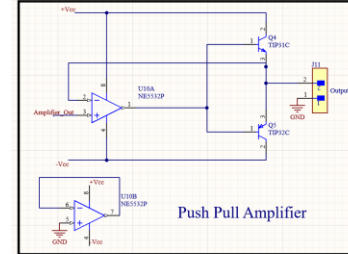
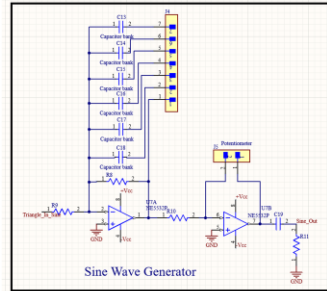
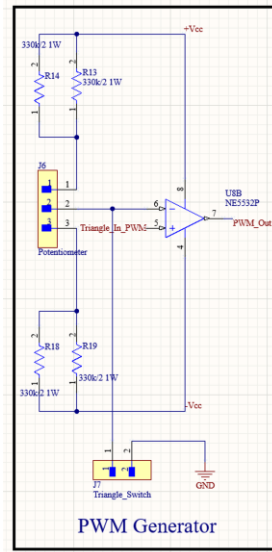
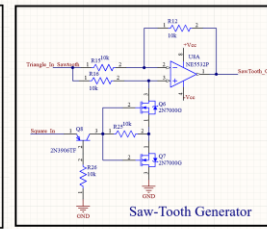
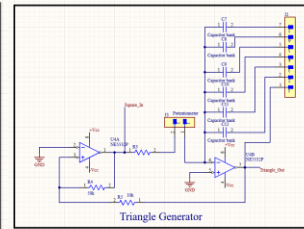
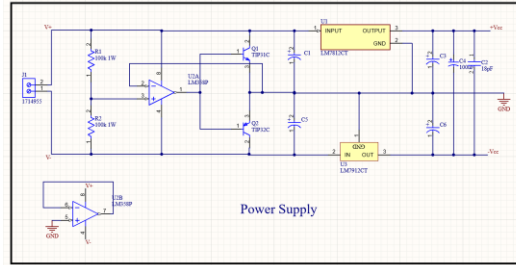
# Simulations



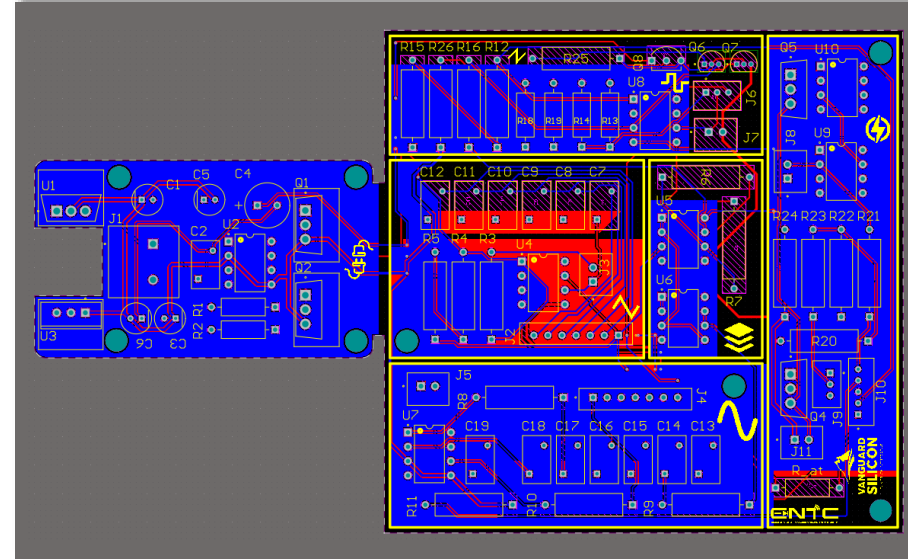
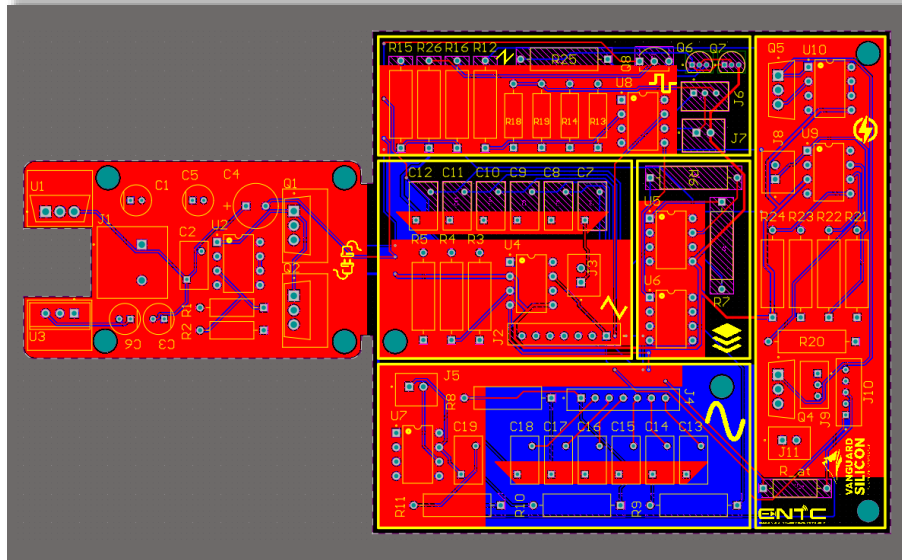
# Breadboard Implementation



# Schematic Design

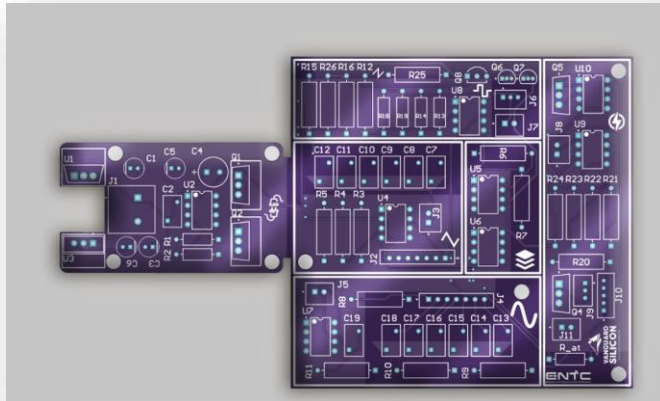


# PCB Design

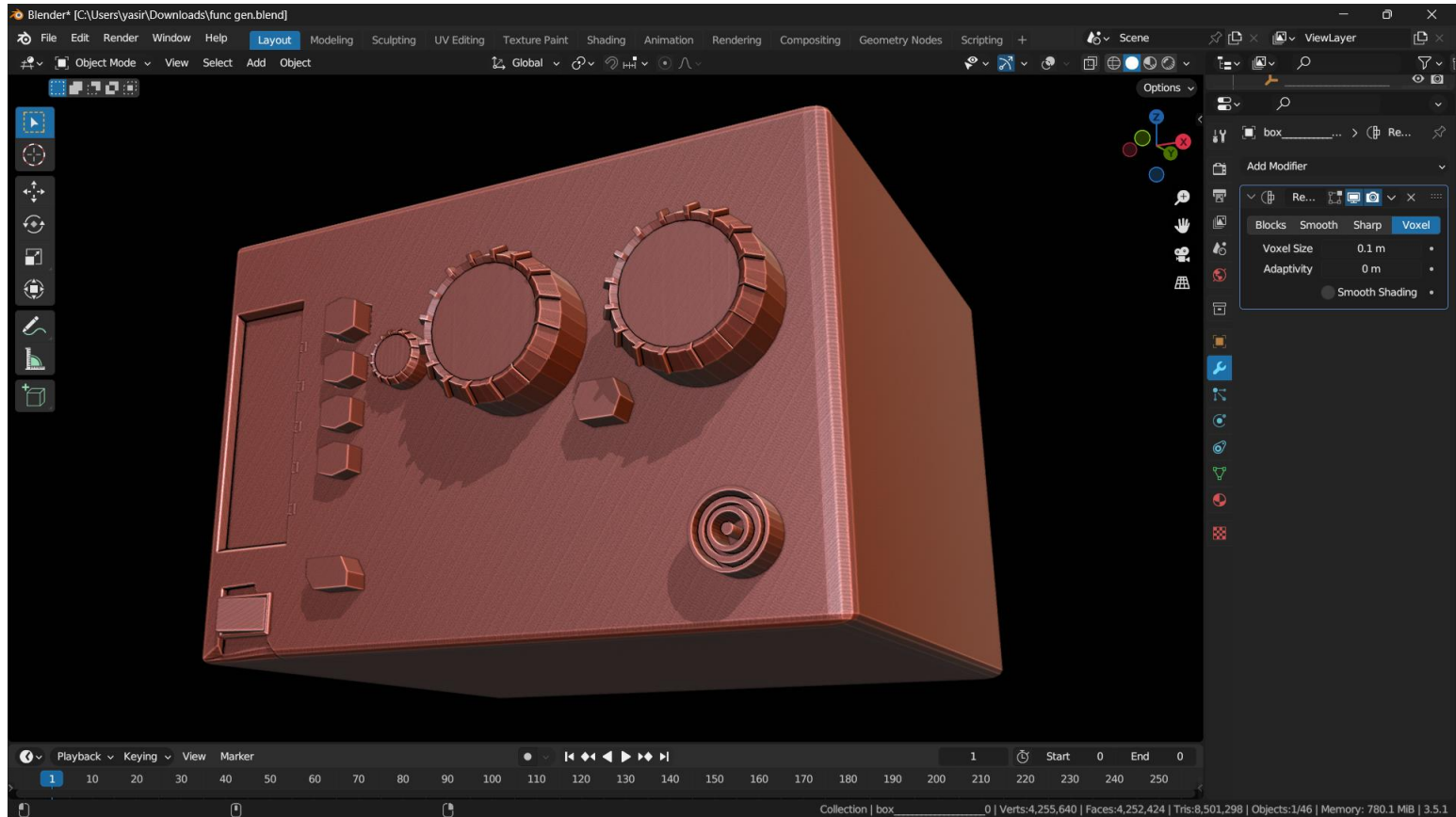




# PCB Design (Final Looking)

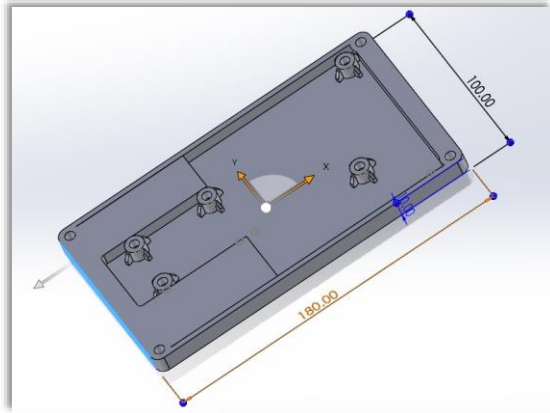
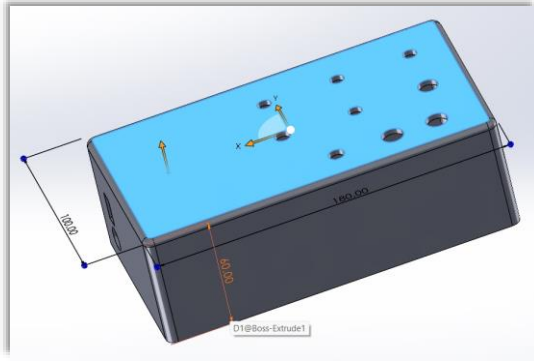


# 3D Design (Initial Sketch)





# Final Enclosure Design



# BOQ

## Components

Rs. 3400

## PCB

Rs 4400

## Enclosure

Rs 2300

## Miscellaneous

Rs 3000±1000

**Total BOQ**  
~Rs 13,500

# Our Achievements



# Contribution to the Project

**Yasiru**

Circuit  
Implementation,  
Simulations,  
Debugging

**Kavindu**

Circuit  
Implementation,  
Enclosure Design

**Kumuthu**

Circuit  
Implementation,  
PCB Design

**Linuka**

Circuit  
Implementation,  
PCB Design,  
Enclosure Design



Thank you