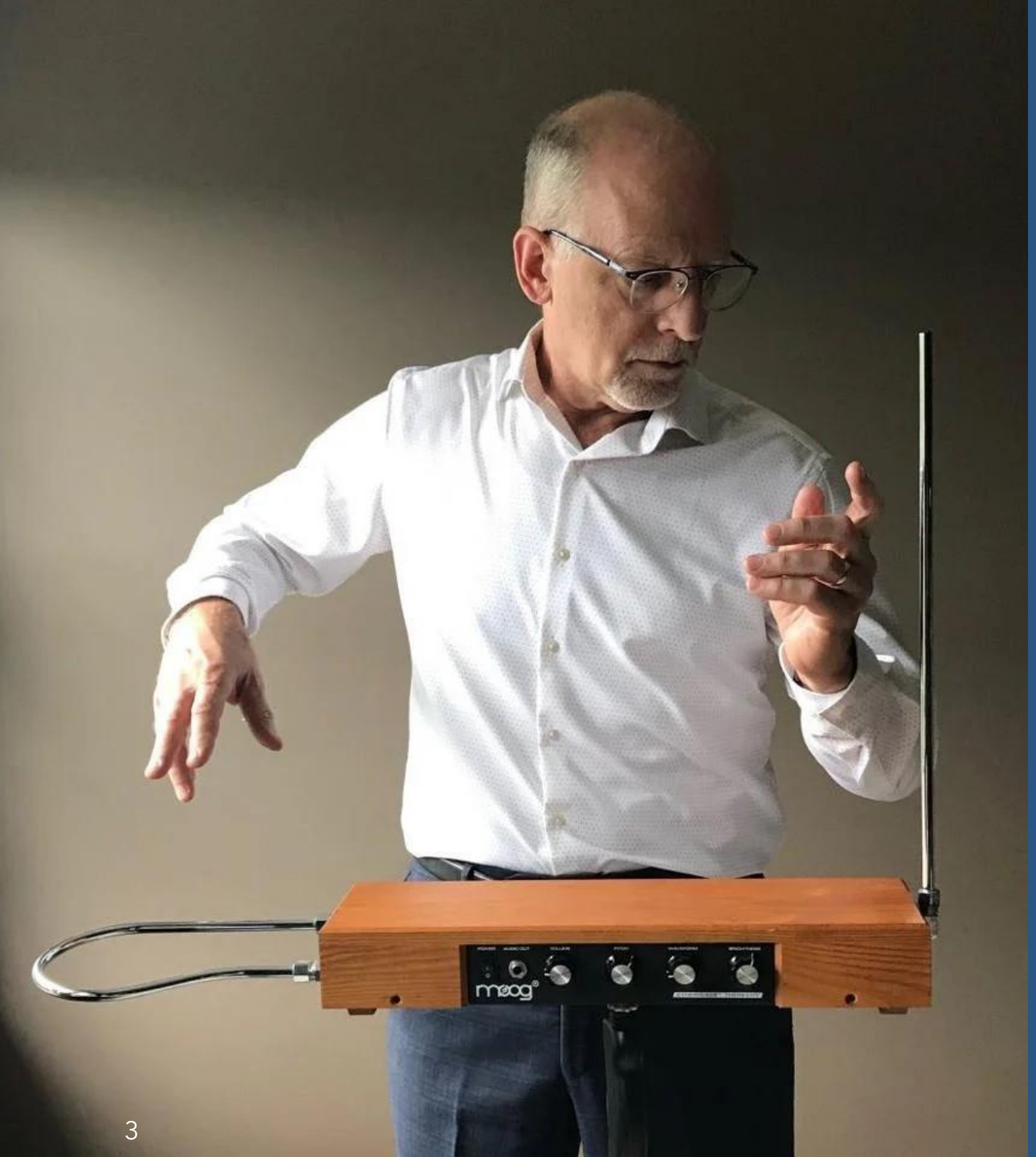
Theremin

By ELECTRO MAZE

Theremin

BY ELECTROMAZE



What is Theremin

A theremin is an electronic musical instrument controlled without physical contact. It produces sound based on the movement of the player's hands near two antennas, one for pitch and one for volume.

Working Principle

Electromagnetic Interaction

Two antennas one for pitch controlling and the other one for volume controlling

Players hands interacts with the electromagnetic fields around the antenna

Oscillator circuits

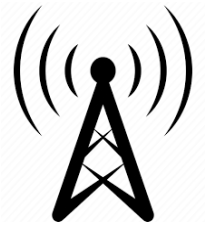
Theremin has mainly two oscillators.

One is fixed oscillator and the other one changes based on hand proximity.

Pitch and volume

Moving hand closer to the pitch antenna increases the frequency (Higher pitch).

Moving hand closer to the volume antenna reduces the volume (Lower Volume).



Volume antenna

Volume Oscillator

Envelope detector

Varying offs et

Speaker

Variable Signal Amplifier

Audio port

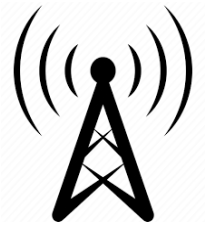
Fixed Oscillator

Wave Adder

RC Lowpass Filter

Varying signal

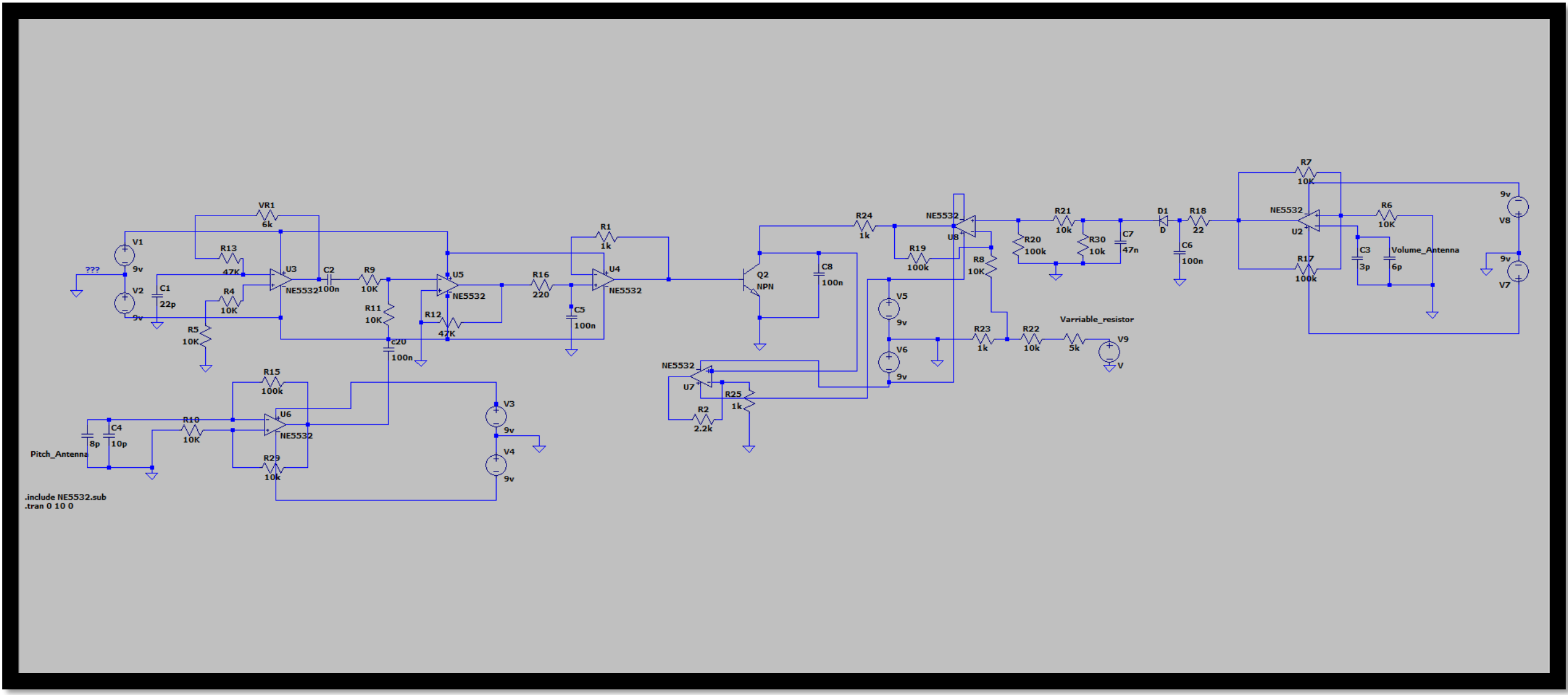
Pitch antenna

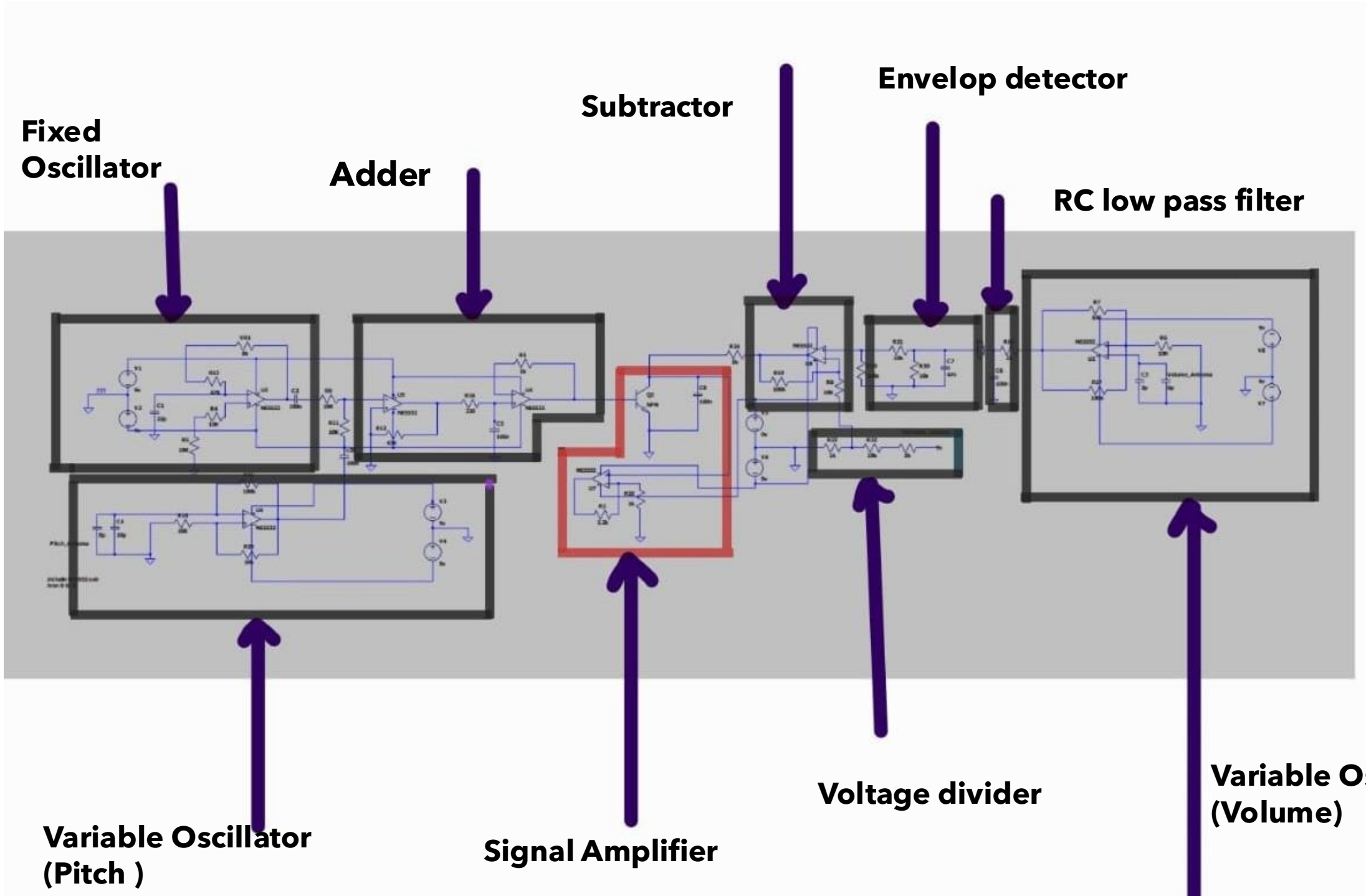


Pitch Oscillator

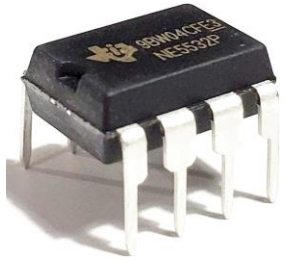
Block Diagram

Simulated Circuit




Fixed Oscillator
Adder
Subtractor
Envelop detector
RC low pass filter
Variable Oscillator (Pitch)
Signal Amplifier
Voltage divider
Variable Oscillator (Volume)

Main Components Used

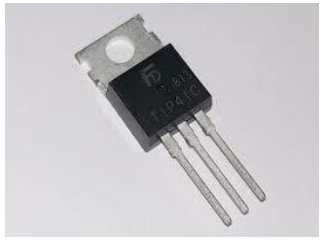


NE5532P Opamp

Low noise , High frequency

2N2222 Transistor

To power amplify the output sound

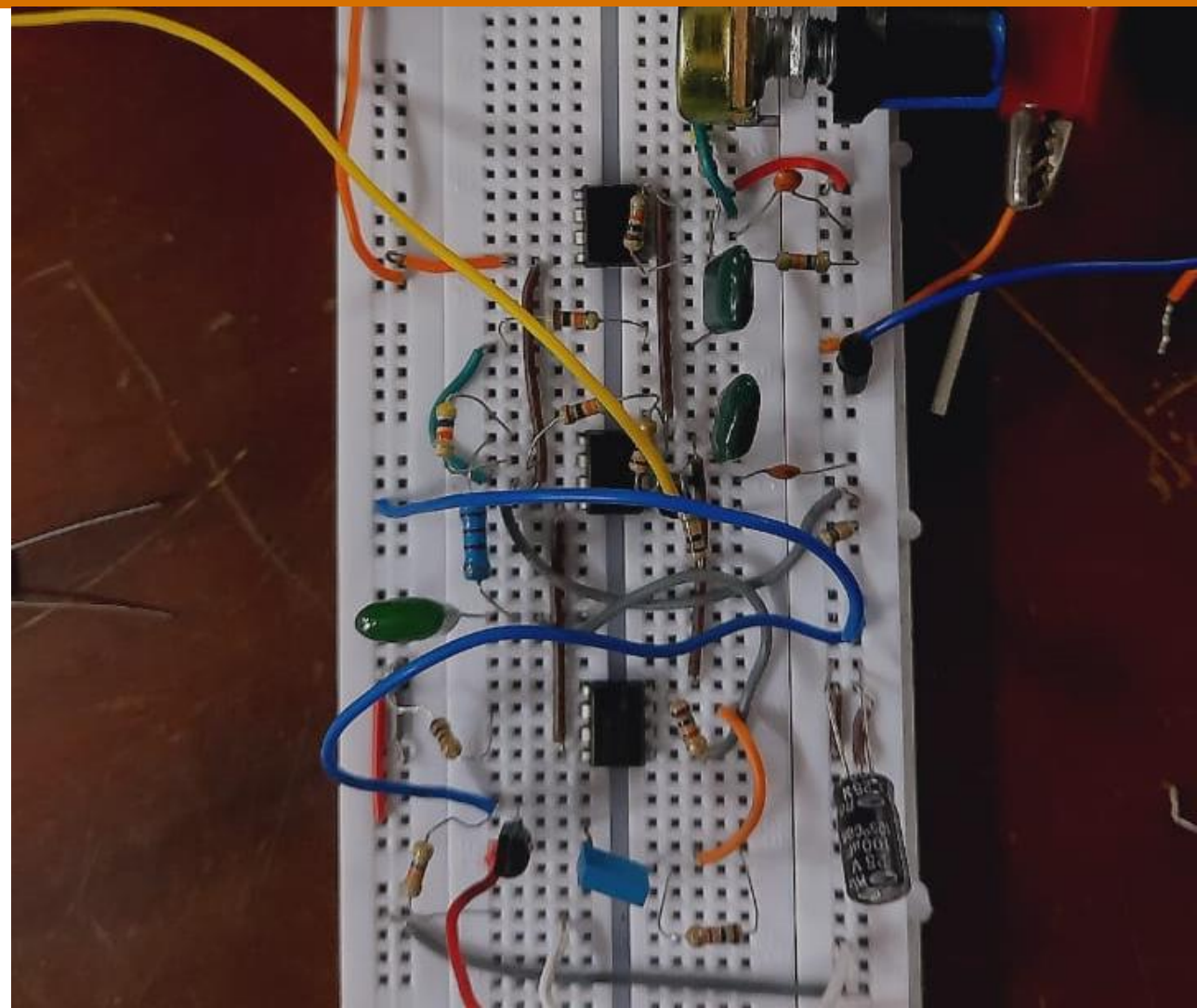


Antenna

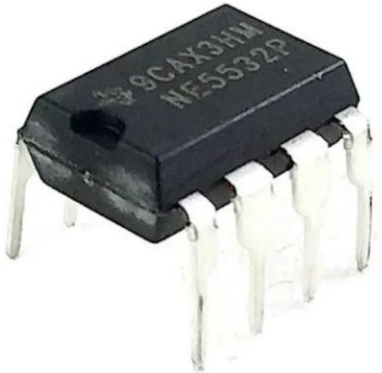
To take the hand proximity to control the volume and the pitch

Other components

Resistors ,capacitors ,potentiometers



Why NE5532P ?



- Low noise
- Moderate slew rate
- Availability
- Low cost

Alternatives and their drawbacks

TL072

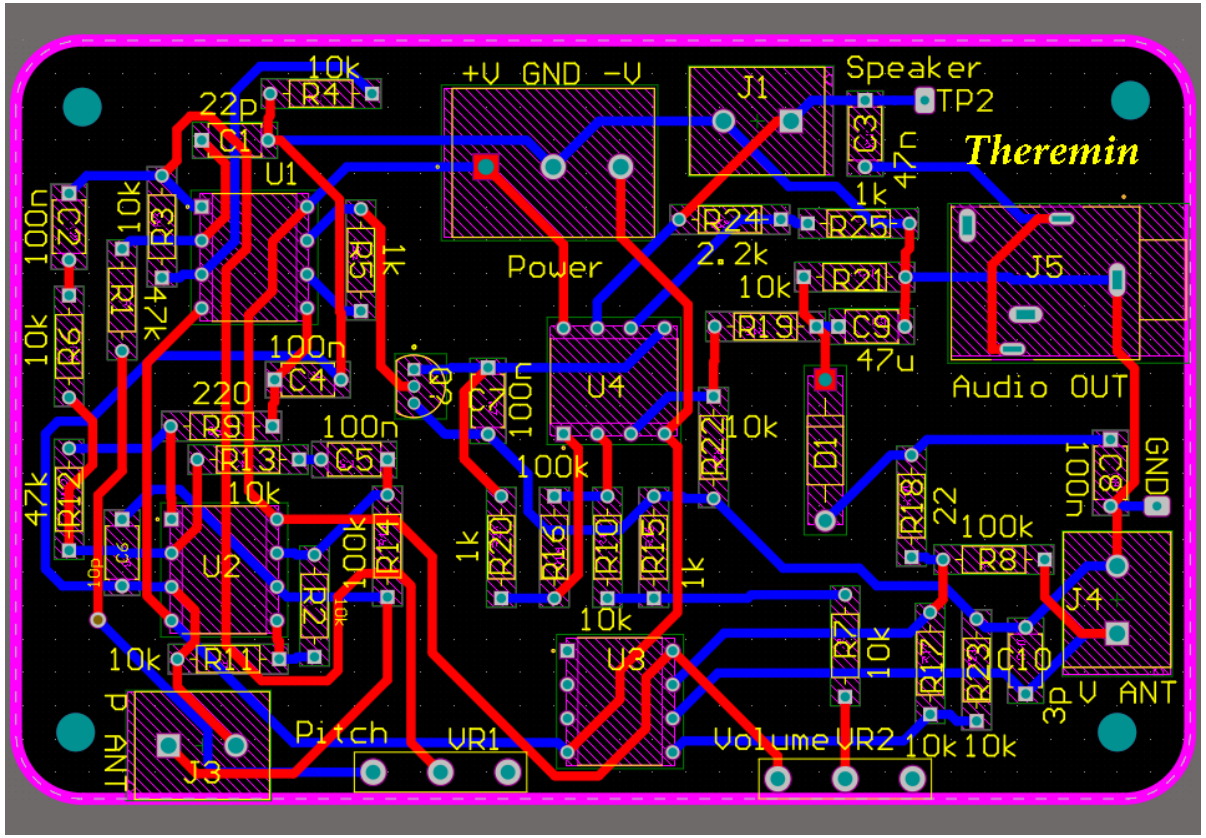
- Compare to NE5532 Slightly higher noise level and not handle low impedance load

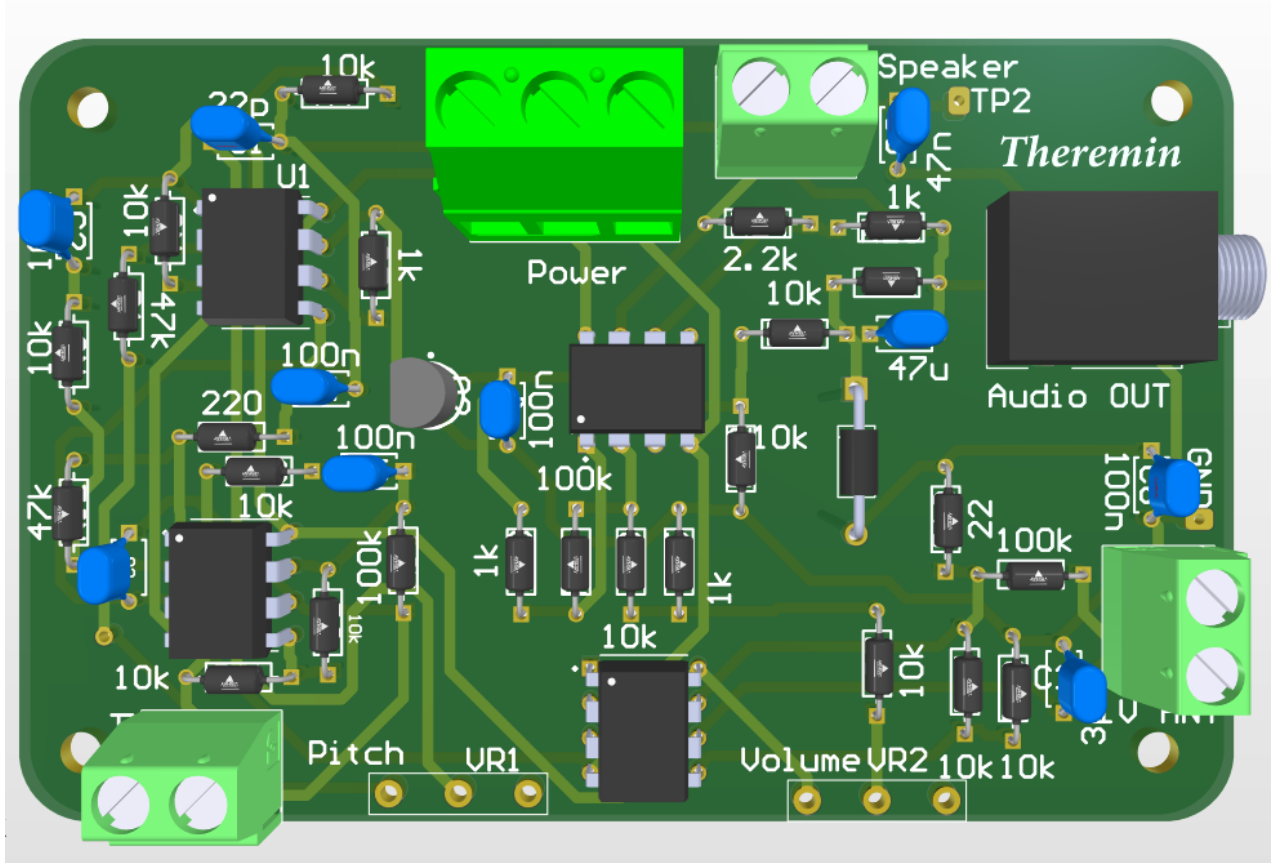
LM358

- Limited bandwidth and slew rate
- Higher noise levels

LM741

- Significantly higher noise and distortion
- Compare to NE5532 limited bandwidth and slew rate


Theremin
Speaker
TP2
Power
Audio OUT
Pitch
VR1
Volume
VR2
+V GND -V
GND
V ANT
U1
U2
U3
U4
J1
J3
J5
10k
22p
100n
47n
1k
2.2k
220
100k
47k
47u
22
3p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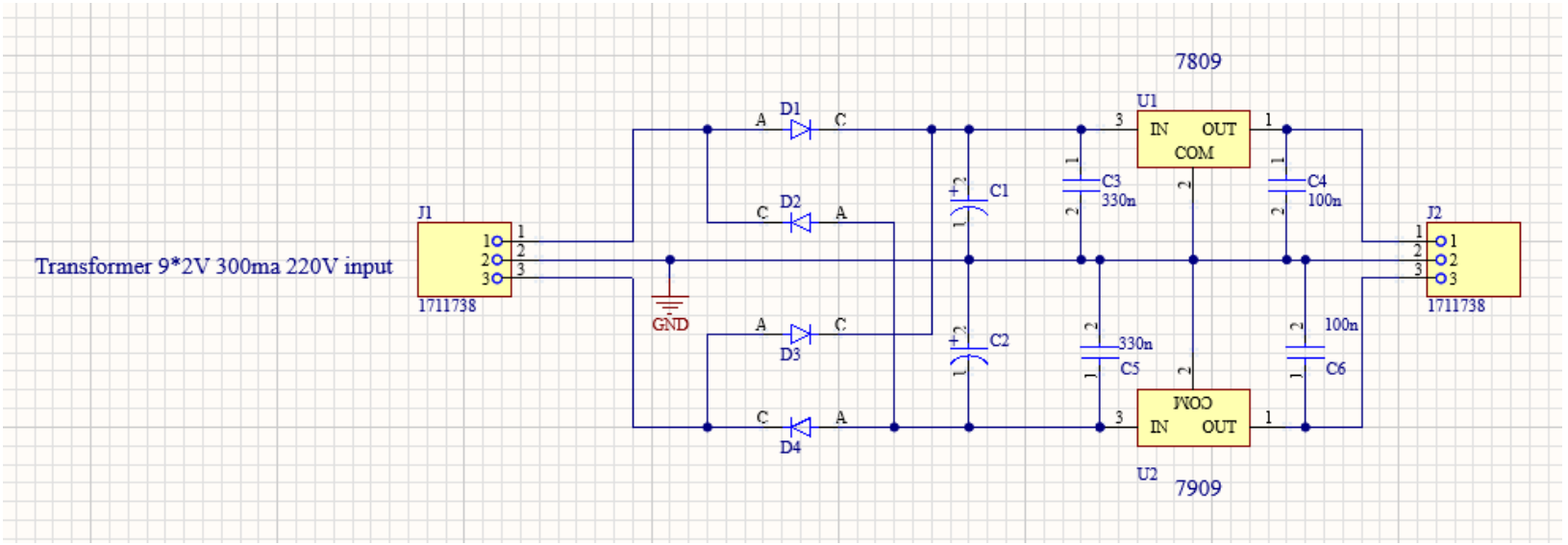
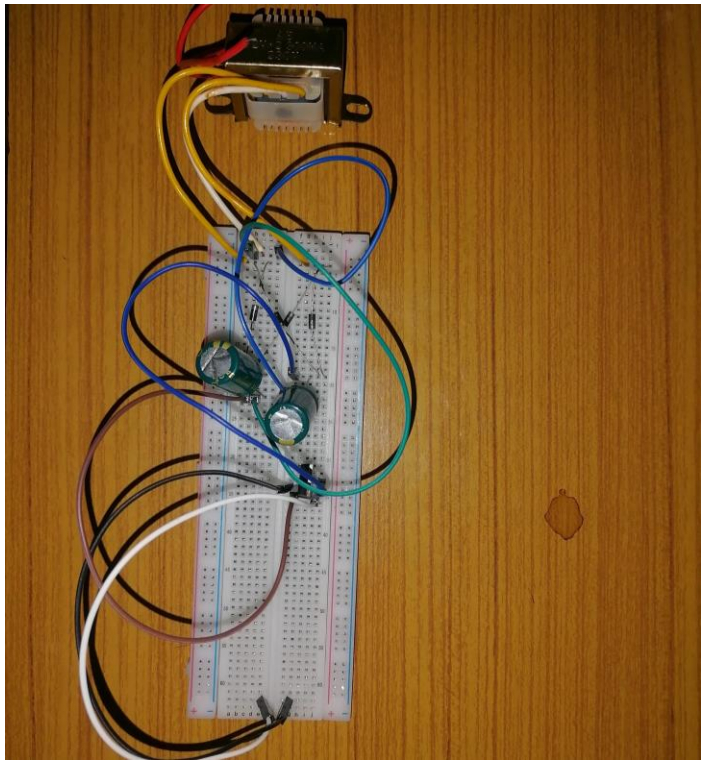
PCB DESIGN

Dual Power Supply





Power Consumption

Maximum - **0.62W**

0.62W= 9V*(44+25)mA

Average – **0.47W**

0.47W = 9V*(32+22)mA

Minimum – **0.46W**

0.46W = 9V*(30+22)mA

Thank You !