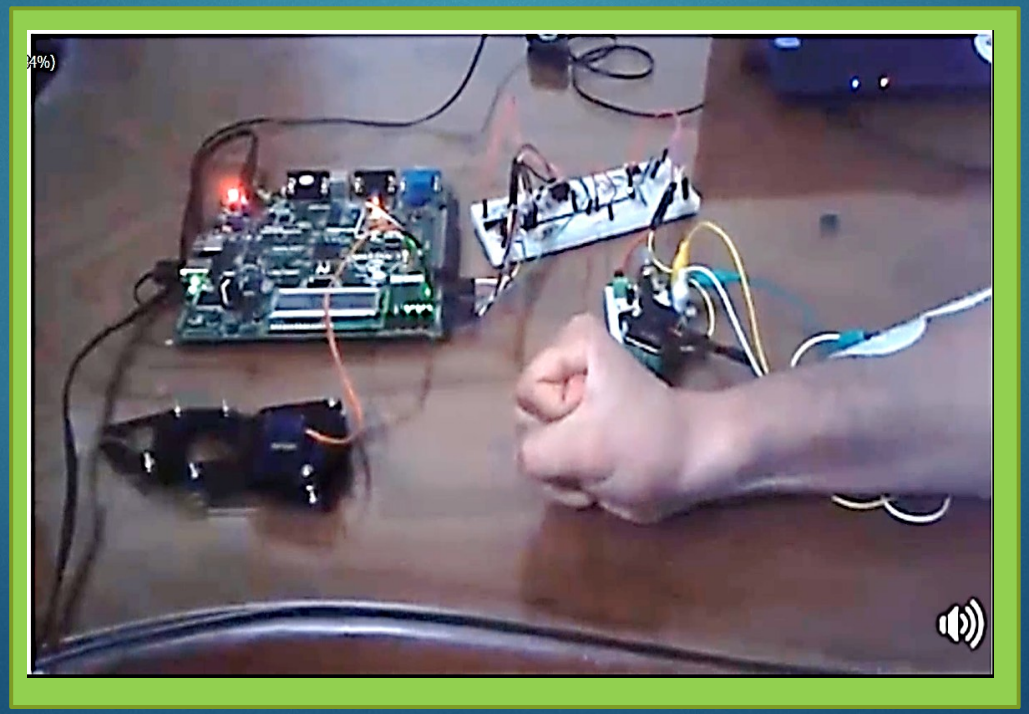
Mansoura University
Faculty of Engineering
ECE Department.

EMG Controlled Hand



Supervisor by :
Dr /Ahmed Elnakib

Done By :

- Ahmed Reda
- Ehab Abdo
- Ahmed Omar
- Mohamed AKL

The idea of our project :

- We use the signal of the muscle to control the gripper.

The benefit of the project:

- Many people like solders lose their hands or any others limbs in war so we can use this project as Prostheses.

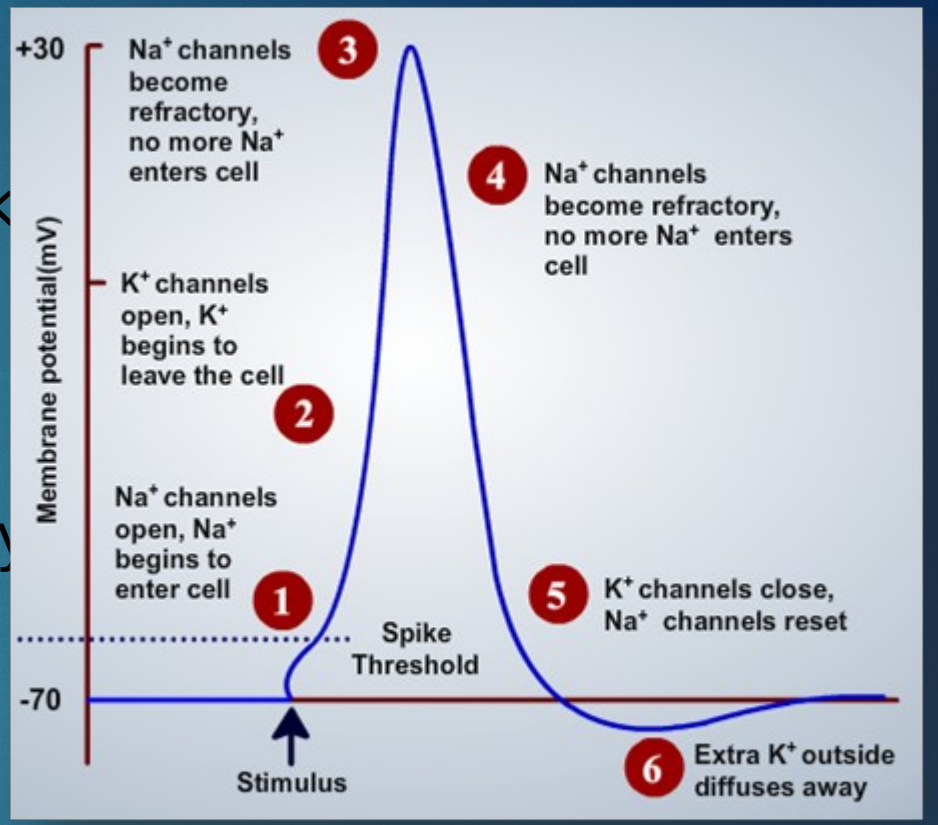
EMG electrical potential c/cs:

Amplitude:

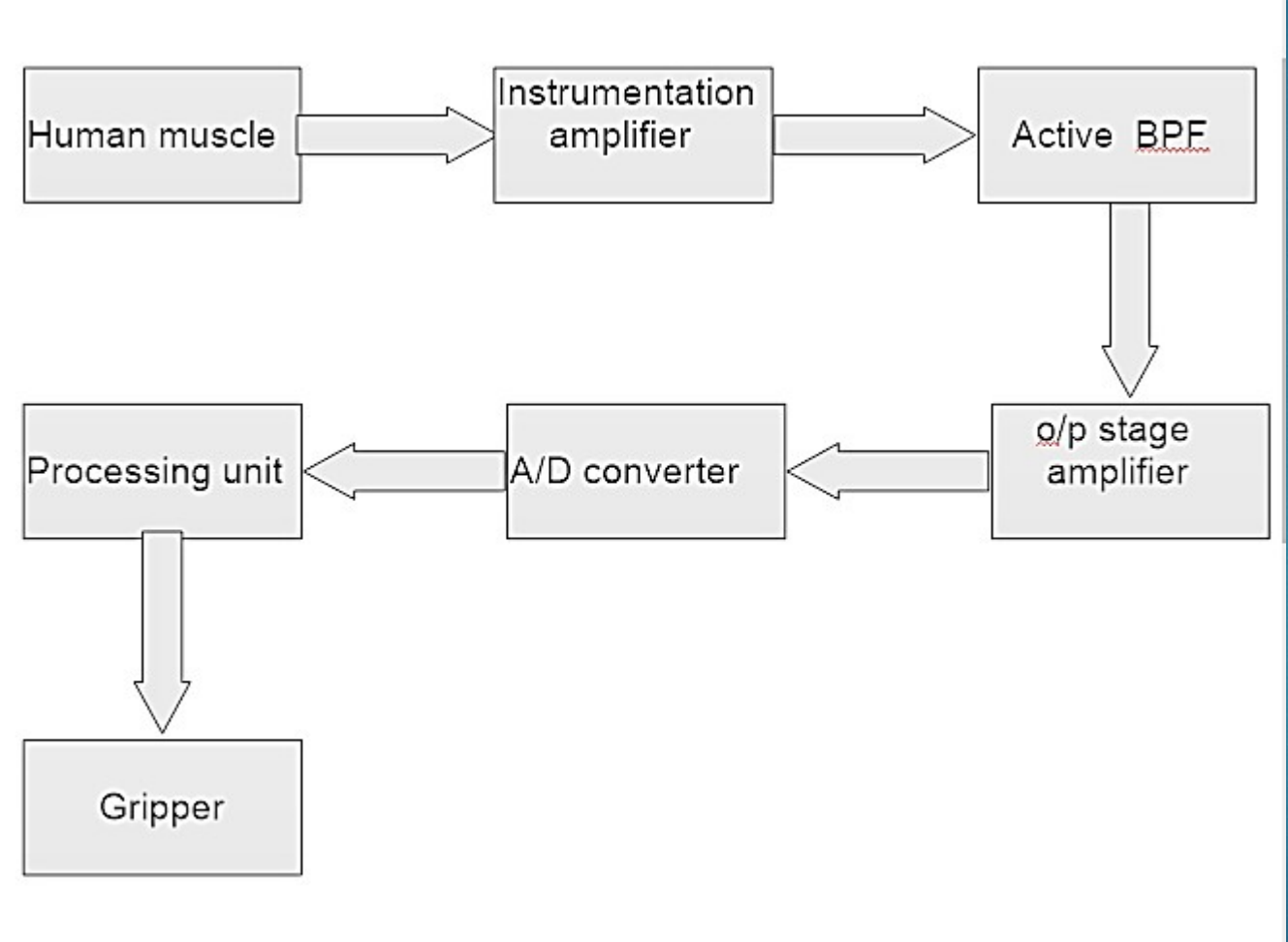
- -70 ⟶ 30 mv (peak to peak

Frequency Range:

- 10 ⟶ 450 HZ .
- 50 ⟶ 150 HZ (dominate energy



Block Diagrame:



Used hardware:

1) FPGA.
2) Instrumentation amp AD620.
3) Gripper.
4) 2 * MC33078.
5) 3 * ECG electrode.
6) ADC 0804.

ECG electrode:

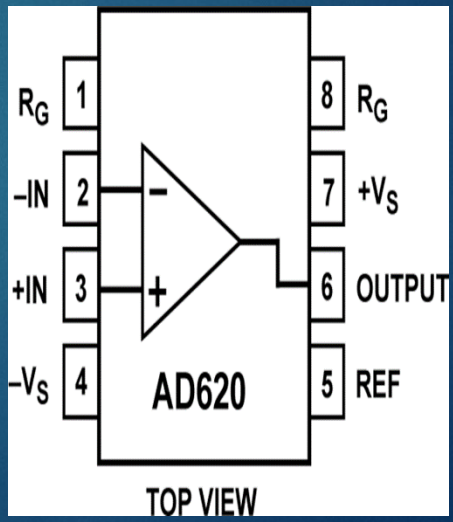
- We used it instead of EMG electrode because it was cheap and available.
- We used it to read the signal from the hand muscle.
- We used three of it two for positive and negative and one as a reference.
- It is skin surface electrode (non-invasive).

Instrumentation amp AD620 :

- Easy to use.
- Gain set with one external resistor (gain range 0 to 10000)

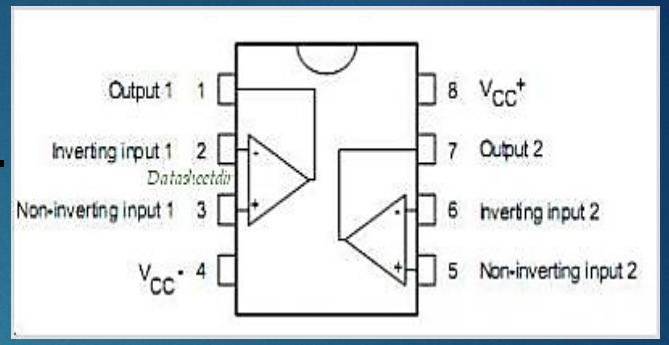
$$G=(48.4K\Omega/R_g)+1.$$

- Wide power supply range(+/- 2.3V to +/- 18v).
- 50 µV max input offset voltage.
- Higher performance.
- Excellent dc performance (B grade).



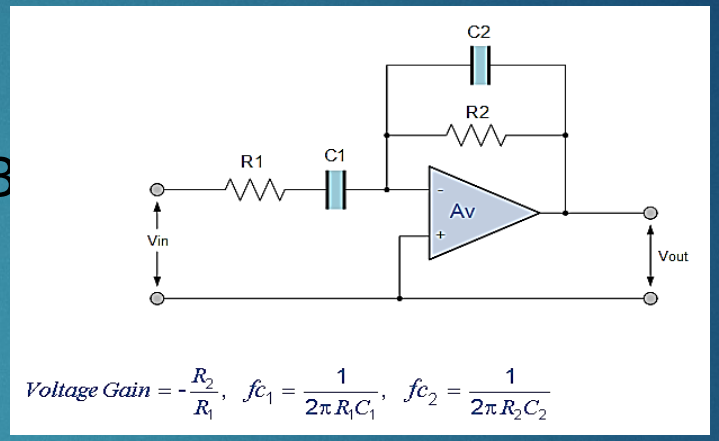
Features of MC33078:

- Wide power supply range(+/- 5V to +/- 18v).
- Low noise voltage.
- Low input offset voltage (0.15 mV).



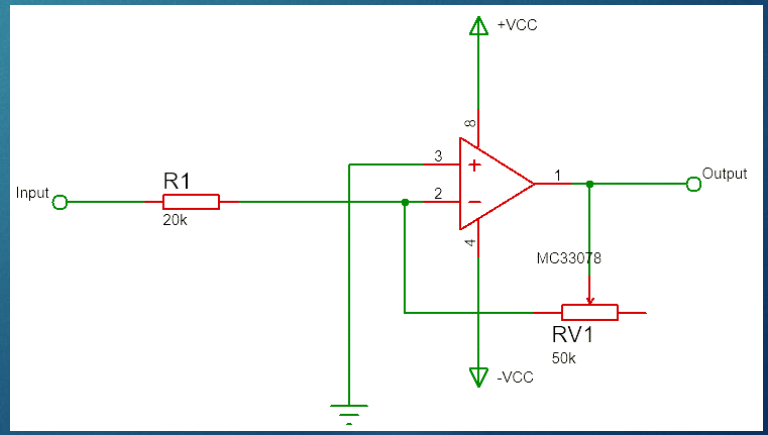
BPF using MC33078:

- We used BPF to decrease the noise.
- R1=1.6kΩ , C1=2μf , R2=200kΩ , C2=3
- F1=50 HZ and F2=265 HZ .
- Gain=125.

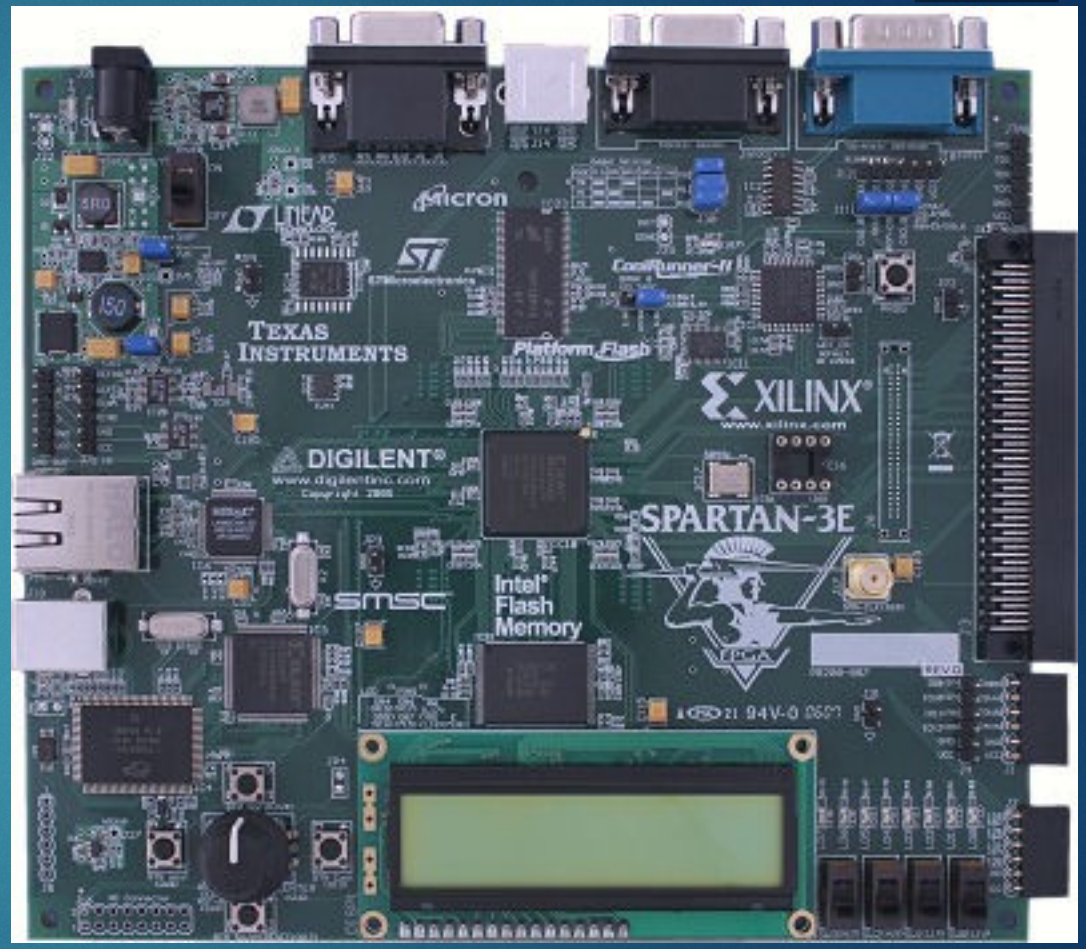


o/p stage amp using MC33078:

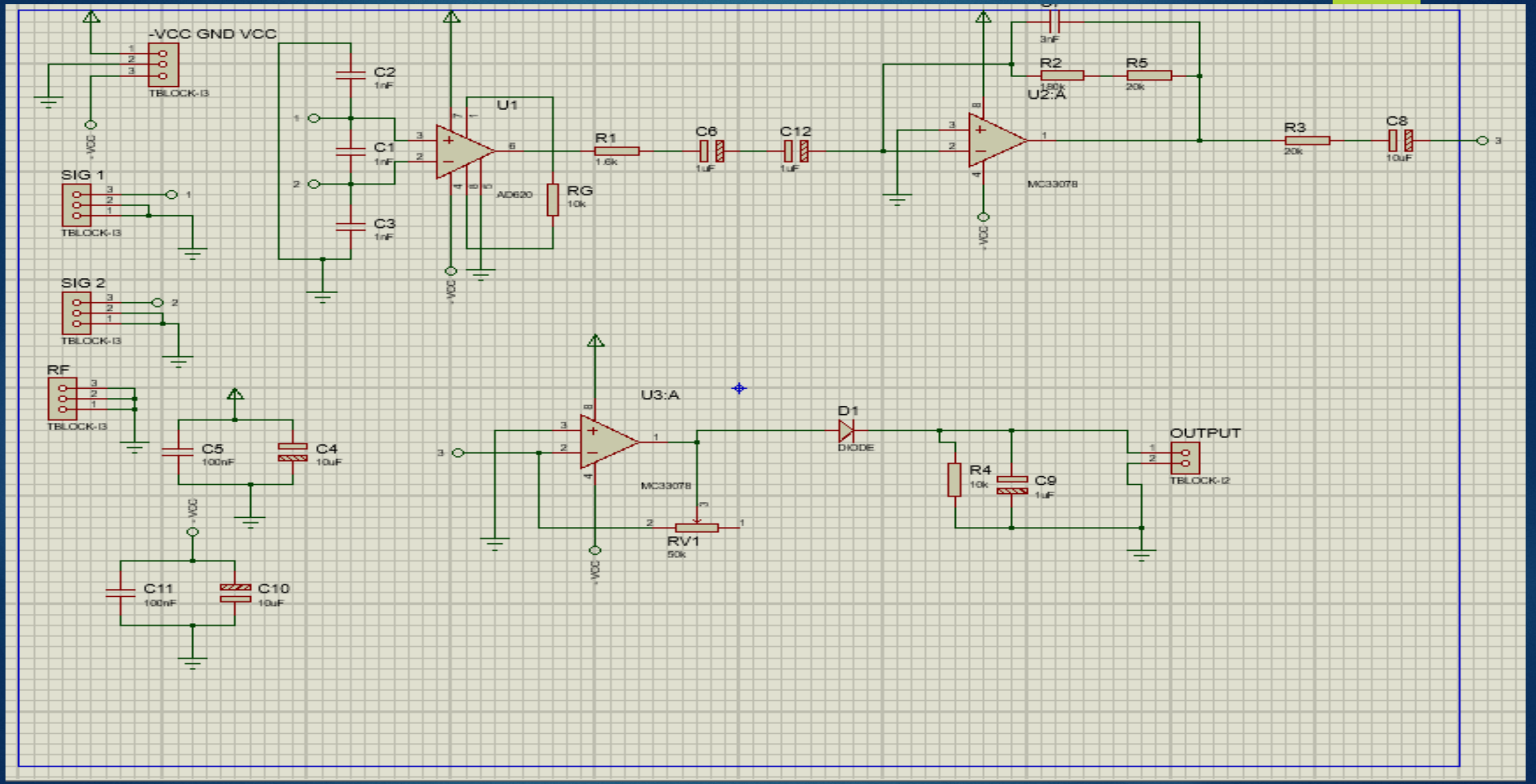
- Used to adjust the required amplification .
- We use a variable gain amplifier.
- G= -RV1/R1.
- RV1 is a variable resistor = 50kΩ.
- R1 = 20kΩ .



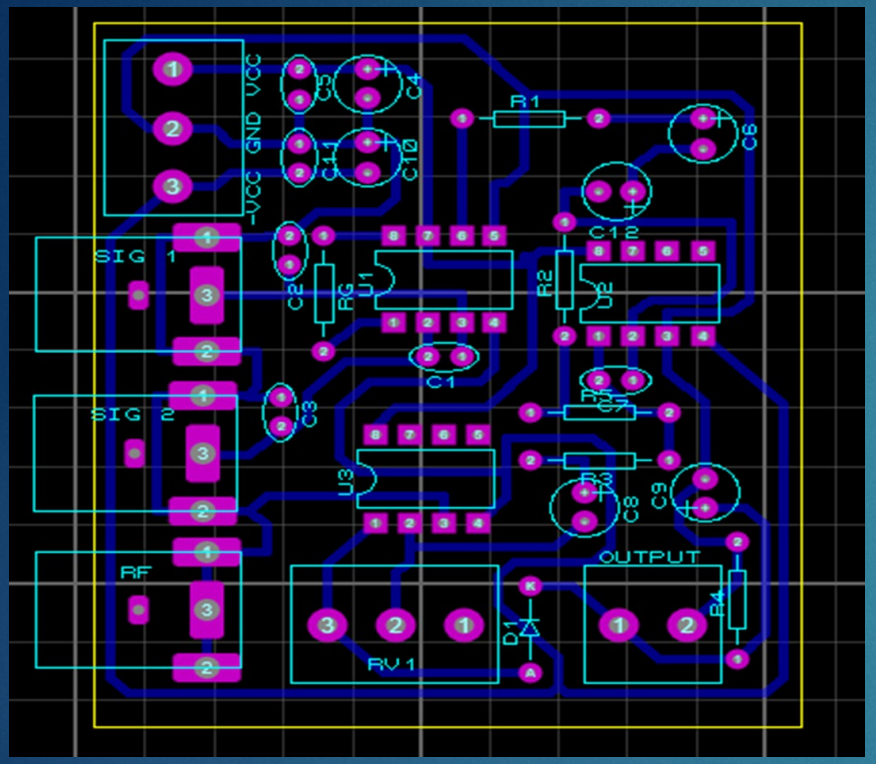
- Processing step using FPGA:
  - FPGA is the part which control when the gripper opened or closed.

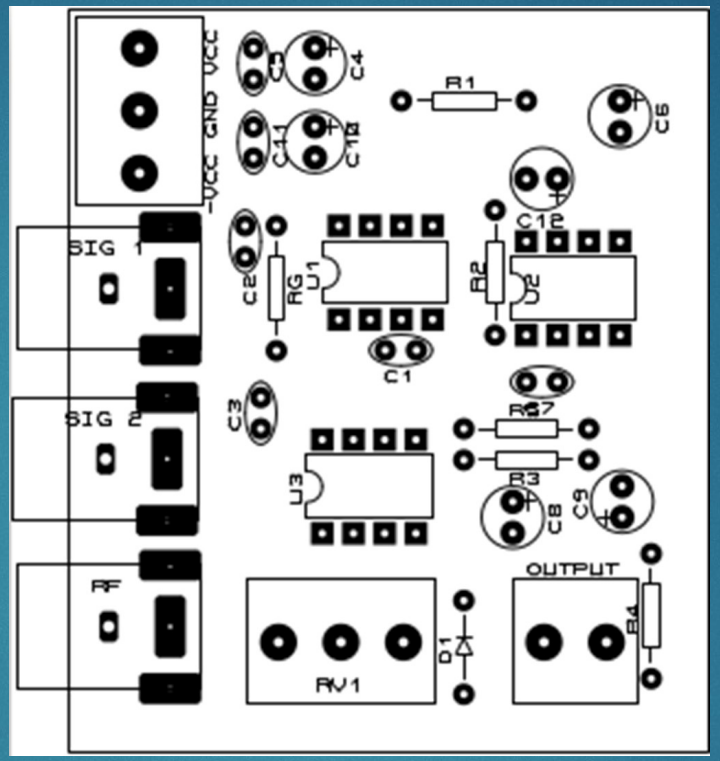


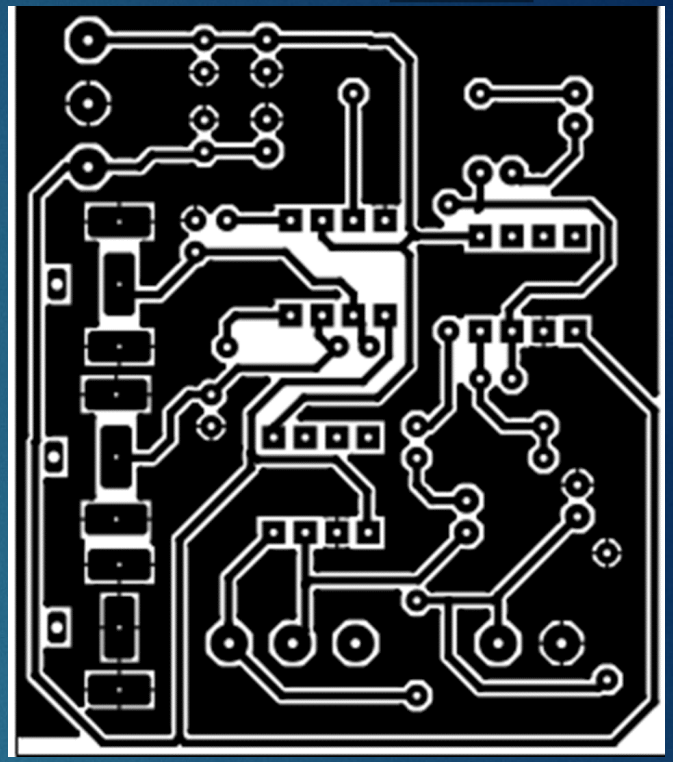
Final Amplification and filtering schematic:



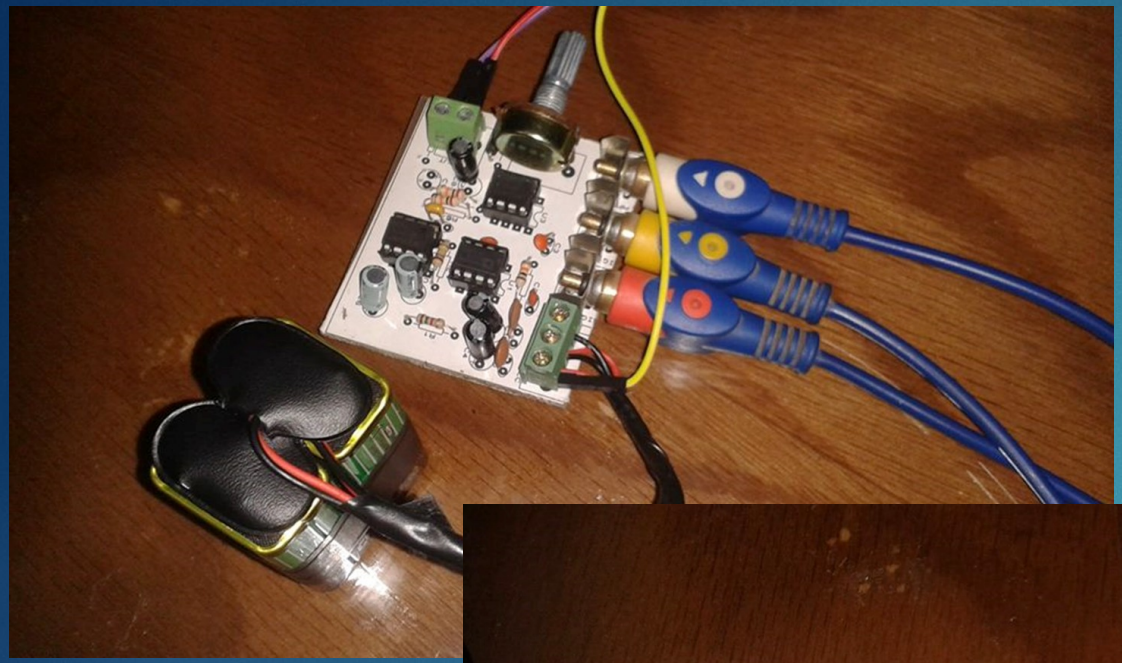
➢ PCB design:

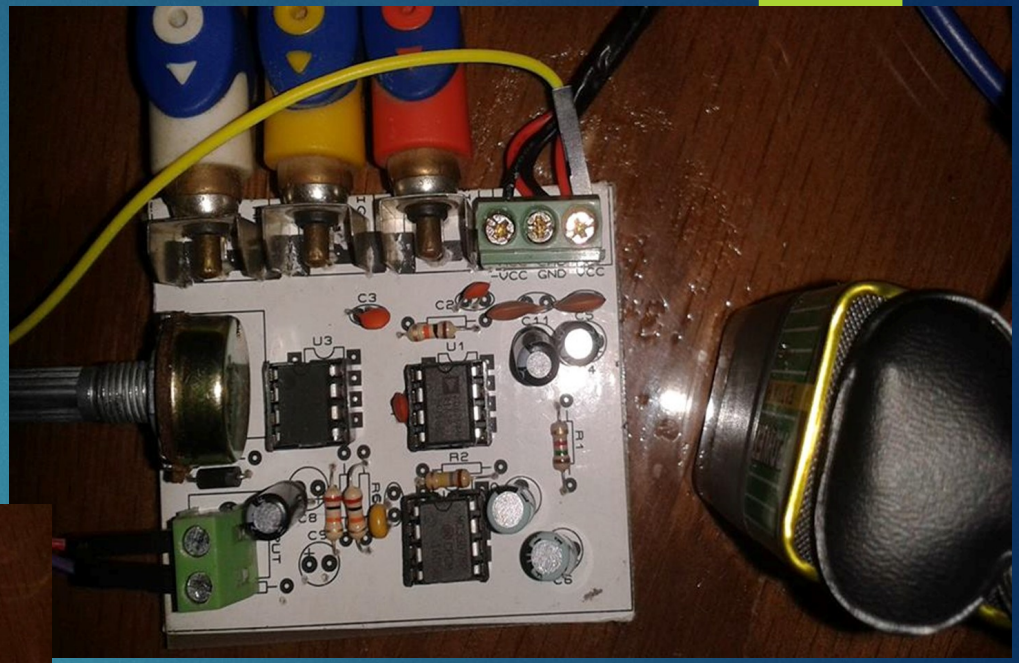

VCC GND VCC
SIG 1
SIG 2
RF
OUTPUT
RV1
R1
R2
R3
R4
R6
C1
C2
C3
C4
C6
C8
C9
C10
C11
C12
U1
U2
U3
D1

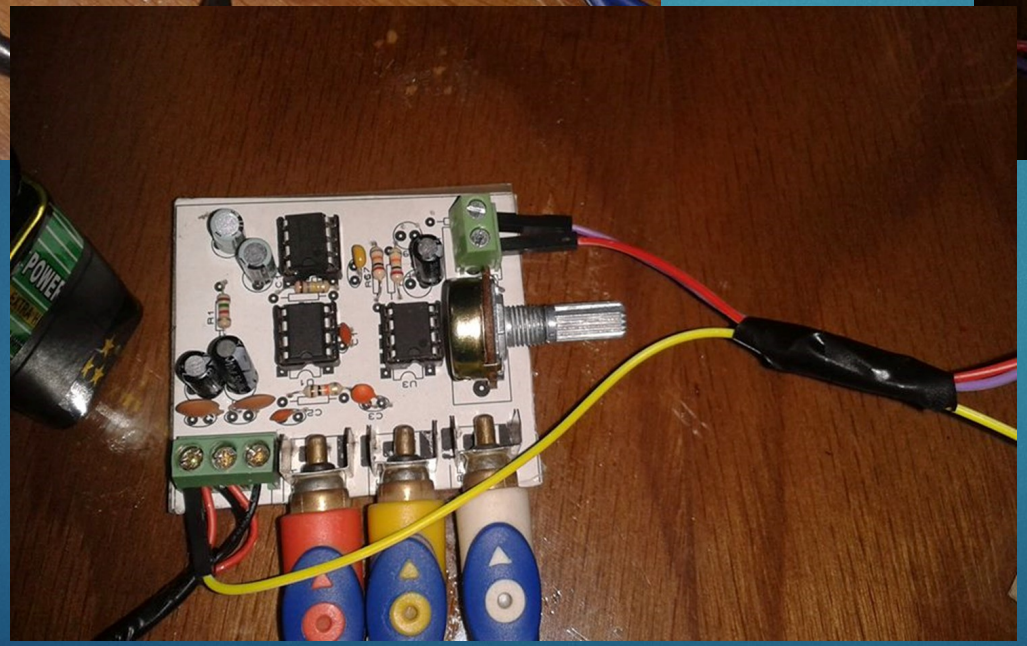

VCC GND VCC
SIG 1
SIG 2
RF
OUTPUT
RV1
R1
R2
R3
R4
R6
R7
C1
C2
C3
C4
C6
C8
C9
C10
C11
C12
U1
U2
U3
D1



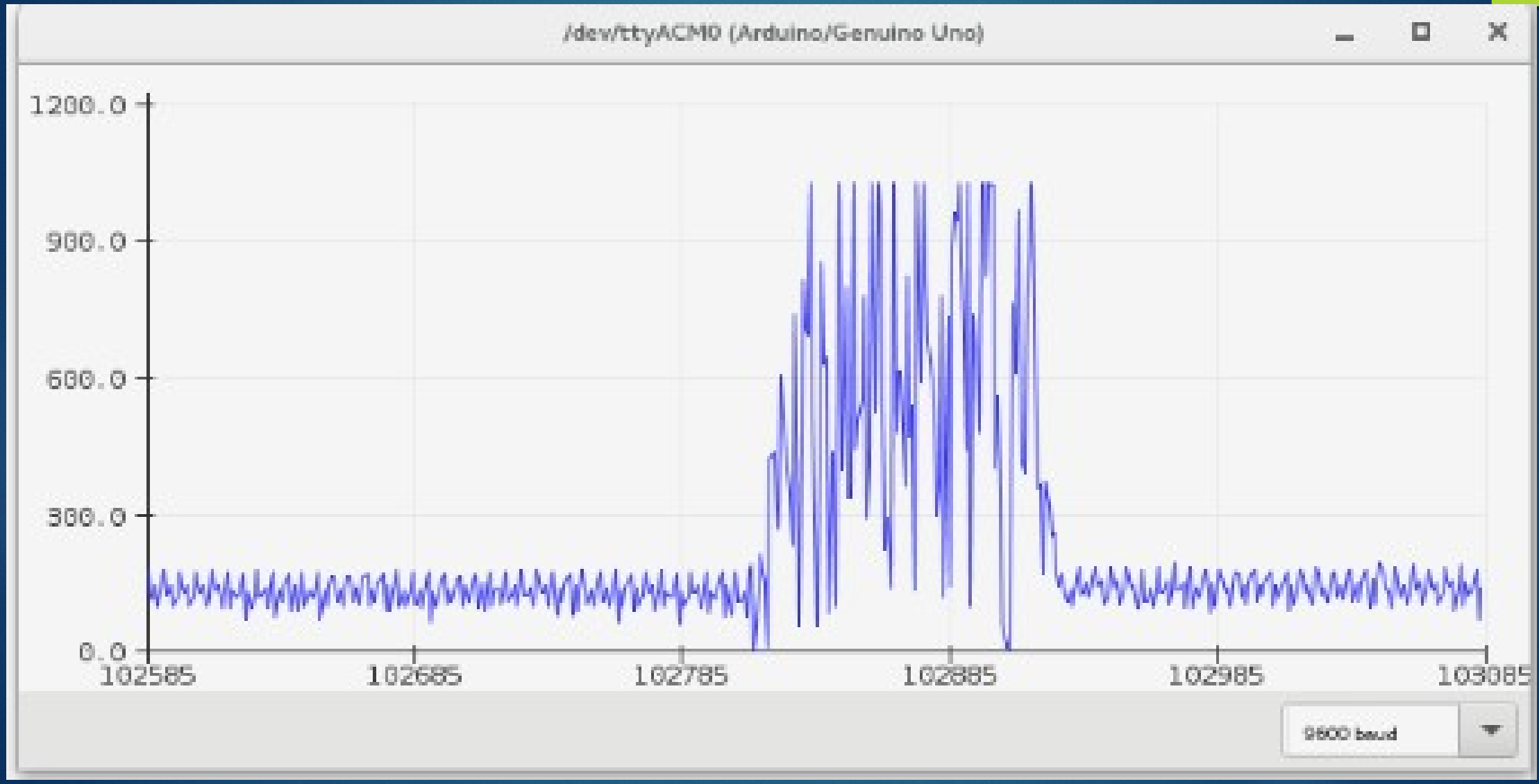
Final PCB:







Final signal:



- Video:


THANK
YOU