ANALOG KICKDRUM
EW2: PROJECT 2

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STAGES

01 Gate-to-Trigger Converter

02 Envelope Pass

03 Pitch Control (Attack & Base)

04 Decay

05 Tone & Distortion

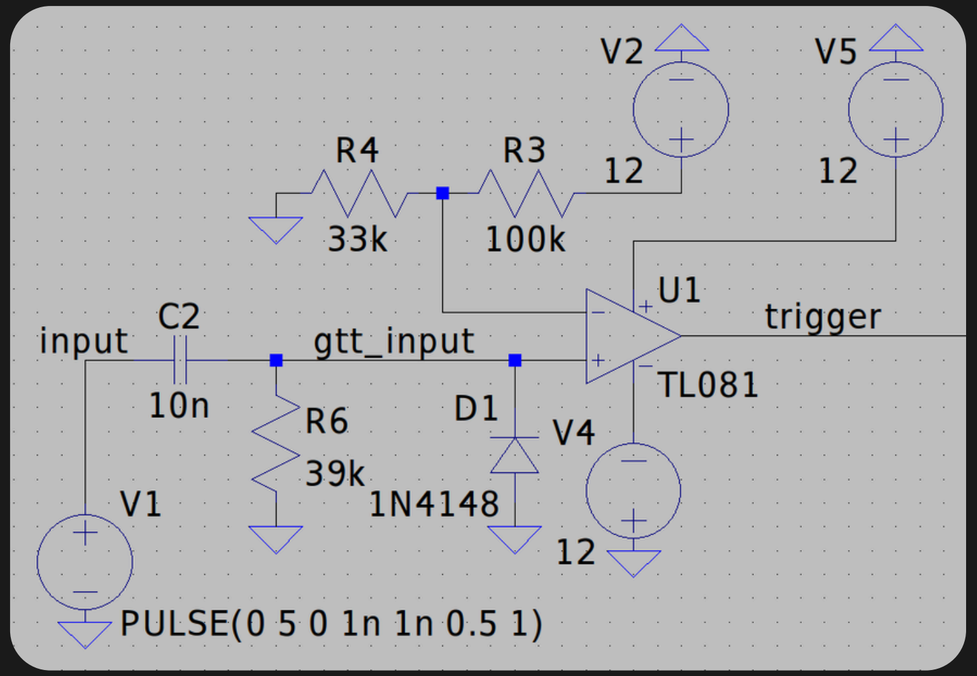
06 Pre-Speaker Adjustments

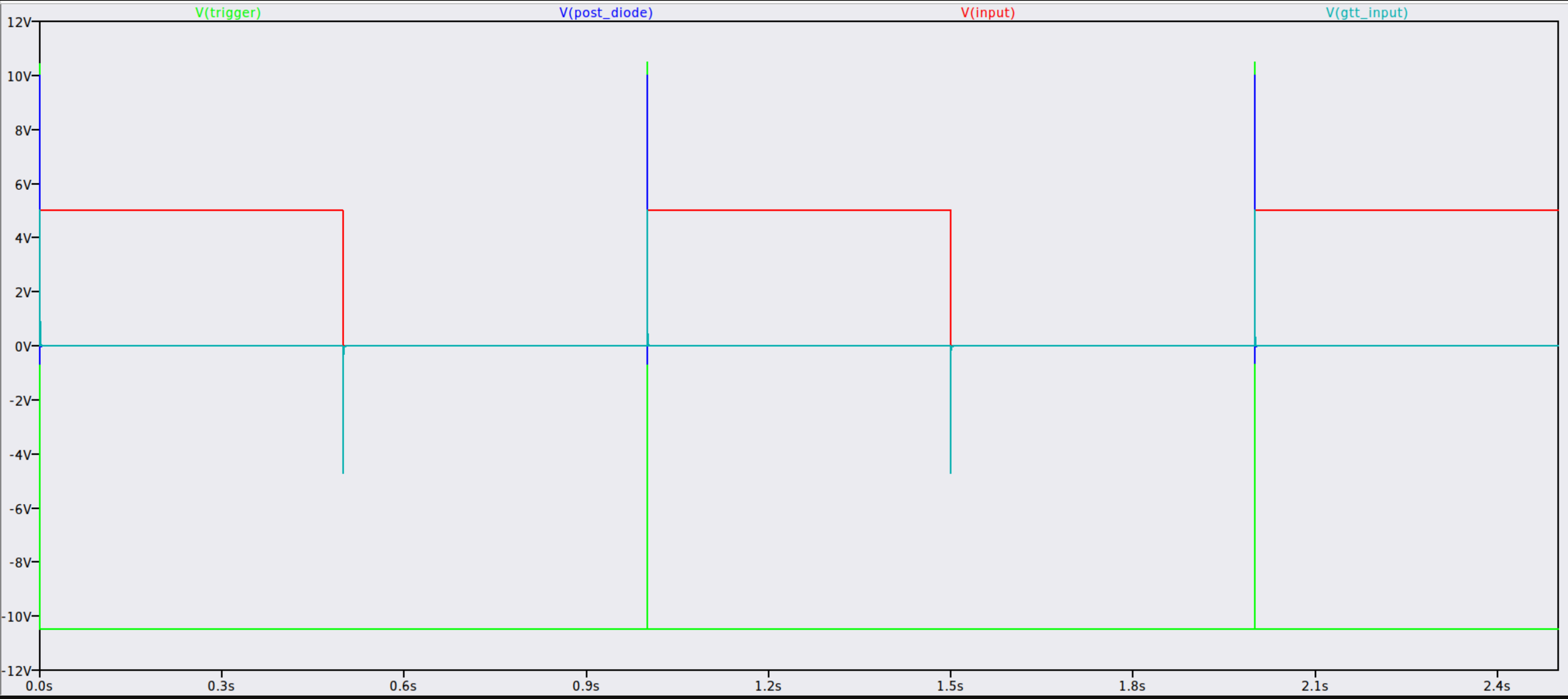
GATE TO TRIGGER CONVERTER

An initial square wave is used to create a sharp impulse, which will trigger a decaying sinusoid wave for our kickdrum.

To only consider the positive impulses formed, we use a comparator which eliminates negative impulses.

As the base voltage of positive impulses is set at -12V, a diode is used to bring it back to set the favourable base voltage of 0V.



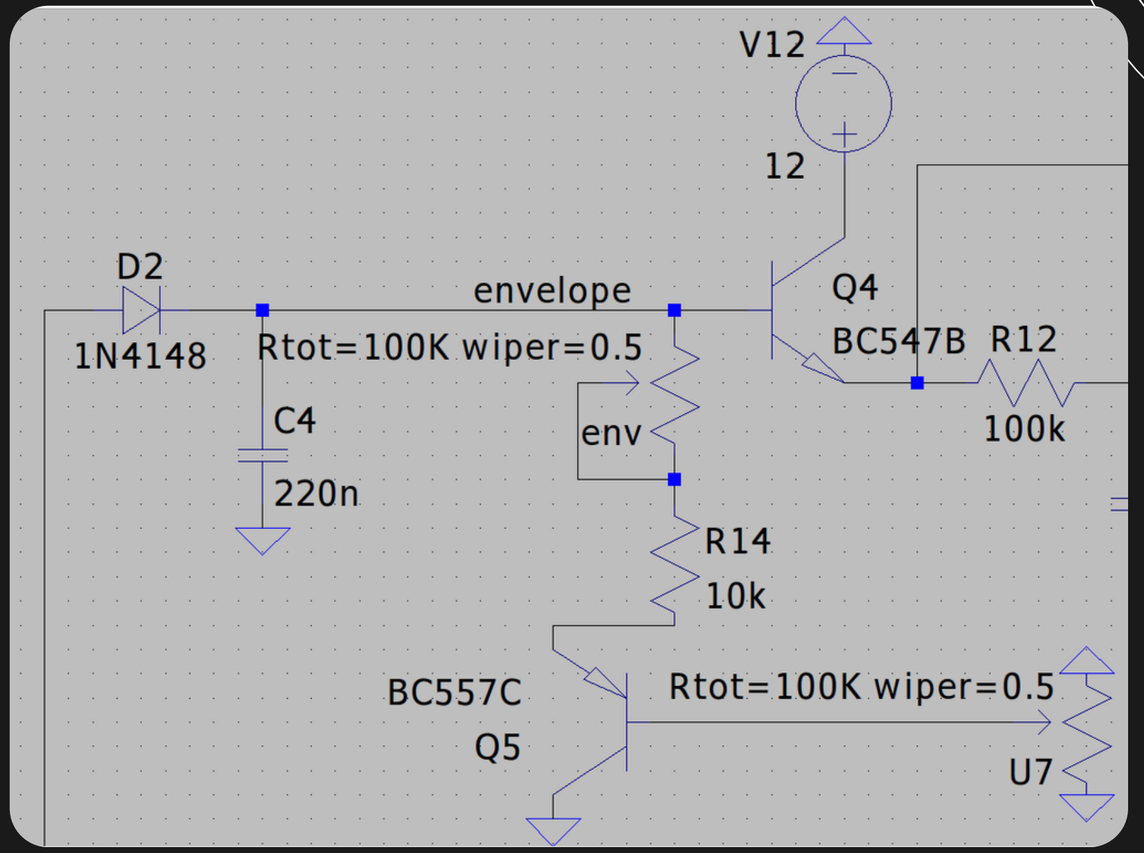

V(trigger)
V(post_diode)
V(input)
V(gtt_input)
12V
10V
8V
6V
4V
2V
0V
-2V
-4V
-6V
-8V
-10V
-12V
0.0s
0.3s
0.6s
0.9s
1.2s
1.5s
1.8s
2.1s
2.4s

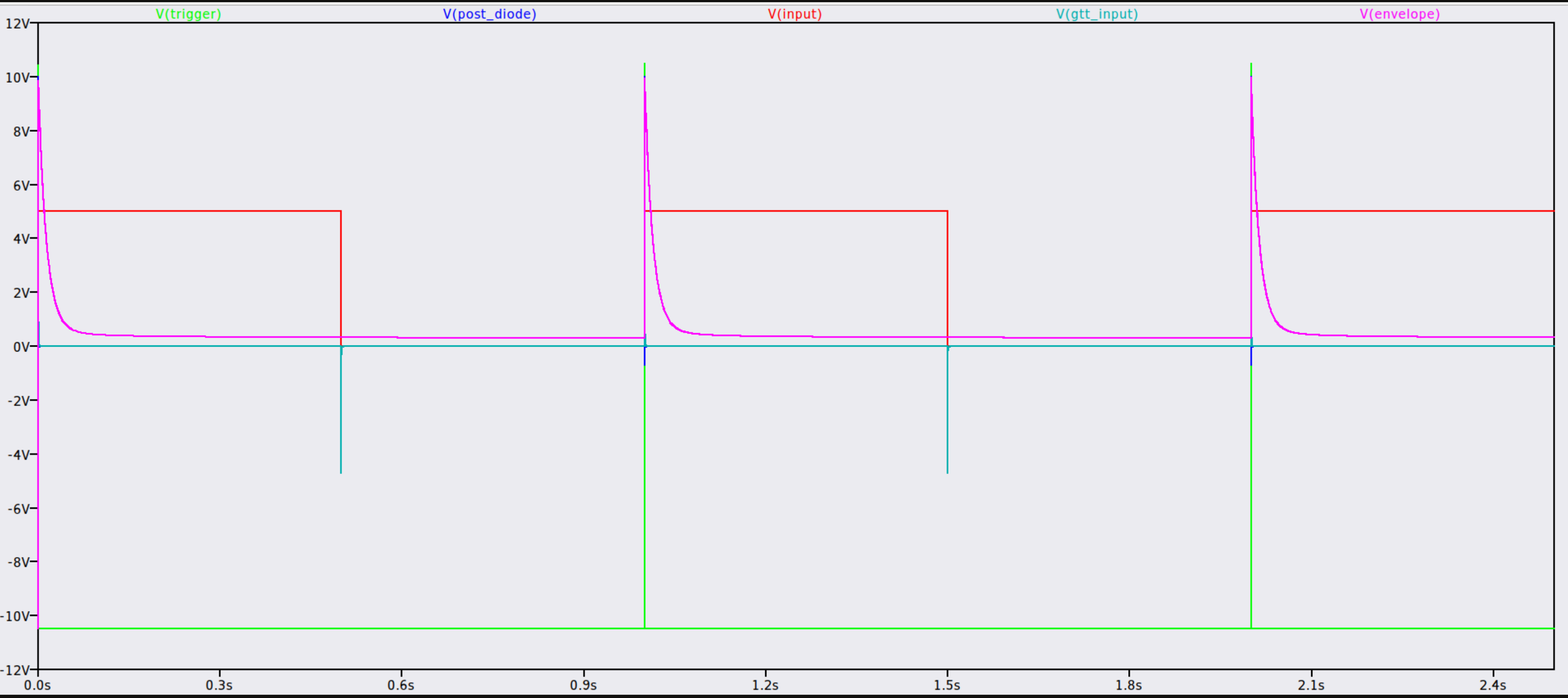
ENVELOPE STAGE

The envelope controls initial amplitude of our beat wave. This is also used to manipulate attack pitch in later stages.

We induce voltage discharge through a grounded capacitor, and allow rate control using a potentiometer and voltage (grounded and buffered currently).

An NPN BJT is used as a makeshift buffer instead of a bulky op-amp based buffer to prevent discharge path into other stages.



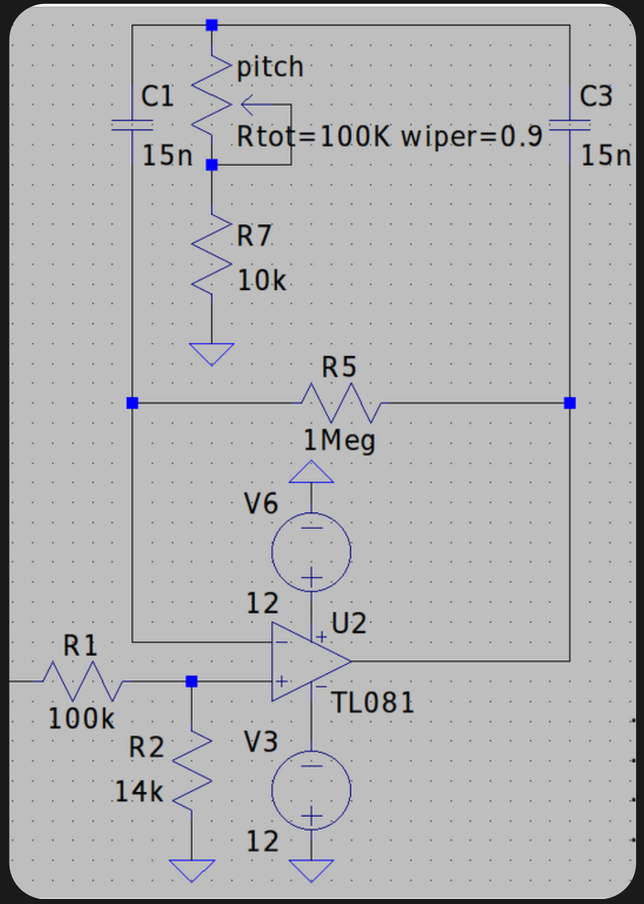

V(trigger)
V(post_diode)
V(input)
V(gtt_input)
V(envelope)
12V
10V
8V
6V
4V
2V
0V
-2V
-4V
-6V
-8V
-10V
-12V
0.0s
0.3s
0.6s
0.9s
1.2s
1.5s
1.8s
2.1s
2.4s

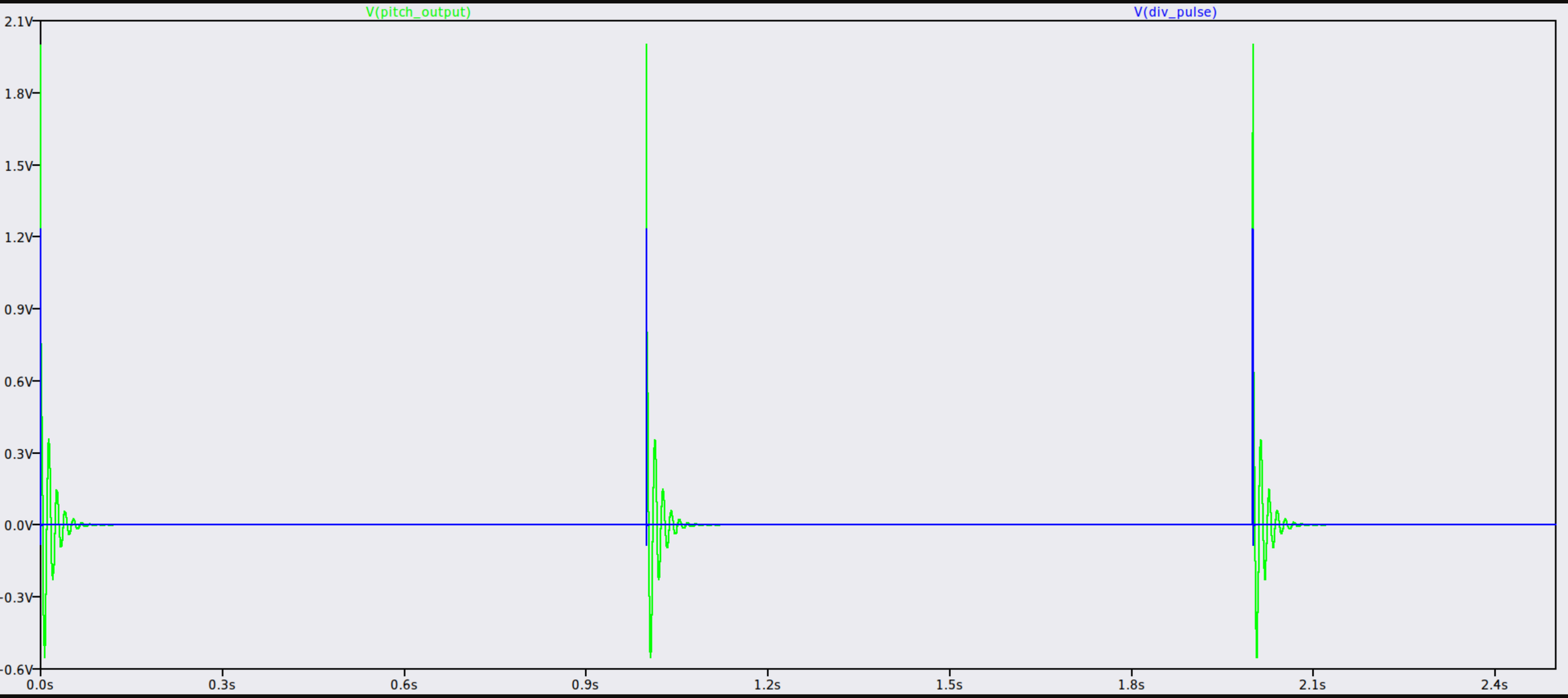
PITCH: BRIDGED-T OSCILLATOR

Pitch affects the frequency of our wave. We get control over base pitch (f_{base}) and attack pitch ($f_{initial}$).

Initial Voltage Divider drops voltage level for op-amp reception, while potentiometer gives control over capacitor discharge rate.

The Bridge Resistor provides reverse current to the op-amp's negative feedback for proper amplification, giving a decaying sinusoid.



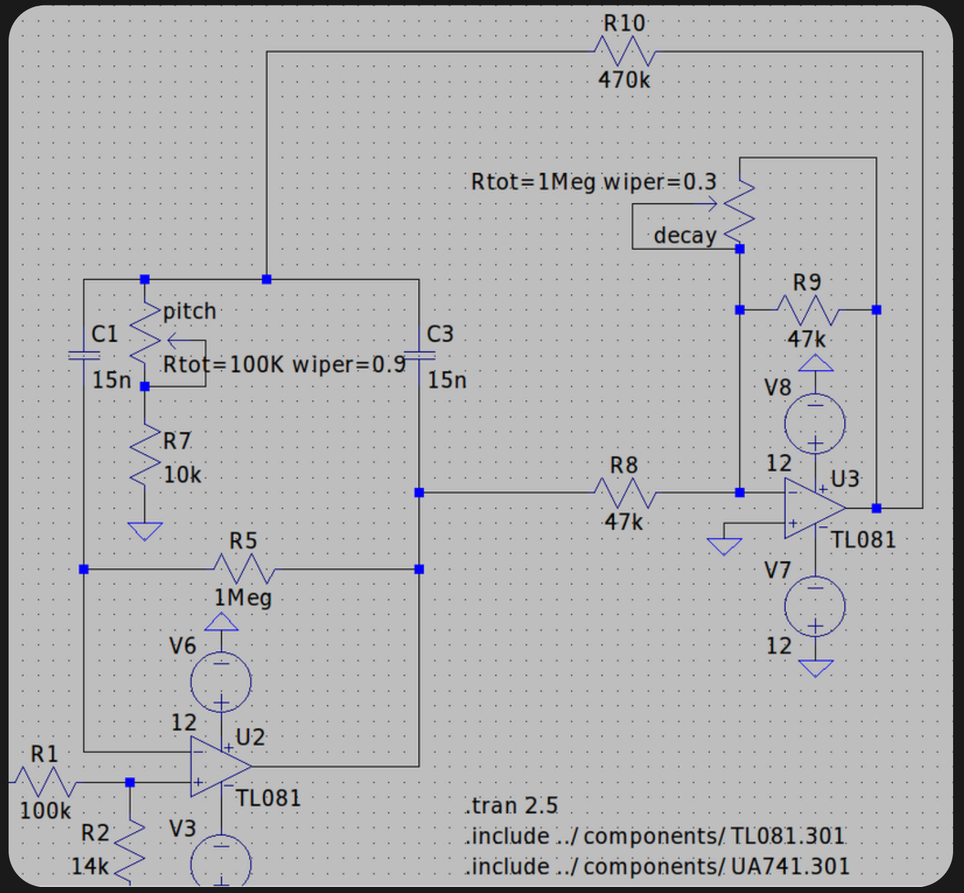

V(pitch_output)
V(div_pulse)
2.1V
1.8V
1.5V
1.2V
0.9V
0.6V
0.3V
0.0V
-0.3V
-0.6V
0.0s
0.3s
0.6s
0.9s
1.2s
1.5s
1.8s
2.1s
2.4s

DECAY STAGE

Decay controls the rate at which our sinusoid dies out.

Initial Voltage Divider drops voltage level for op-amp reception, while potentiometer gives control over capacitor discharge rate.

The Bridge Resistor provides reverse current to the op-amp’s negative feedback for proper amplification, giving a decaying sinuoid.

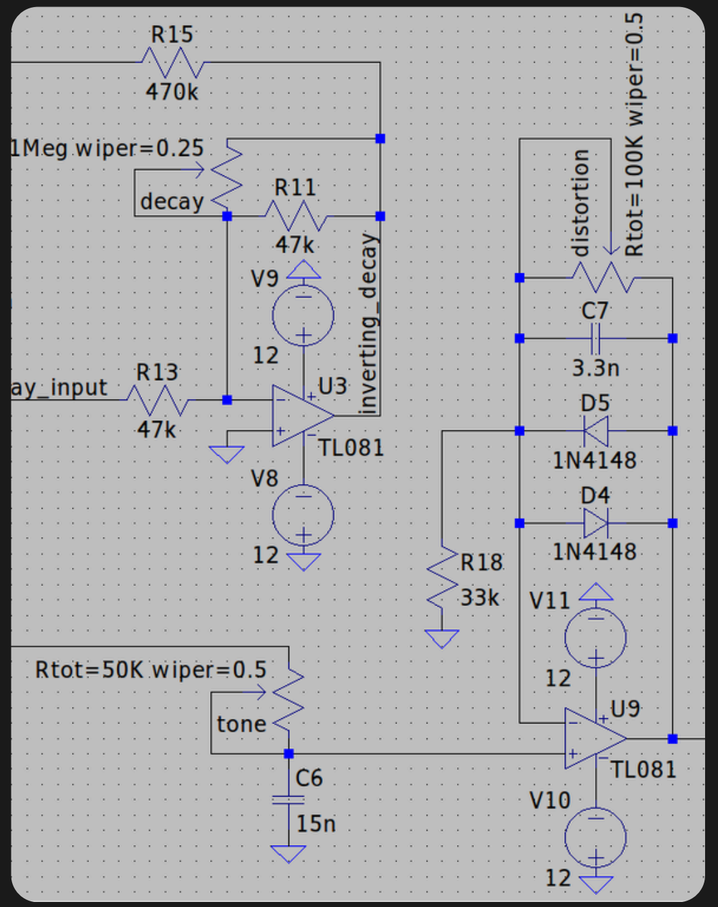


TONE & DISTORTION

Tone manipulates the initial amplitude of our waveform, while distortion induces clipping & imperfection in the sinusoid.

Amplitude is controlled using a potentiometer as a variable RC filter.

An active distortion is induced by pairing 2 diodes, causing clipping and discharging to be controlled by a 100K potentiometer.

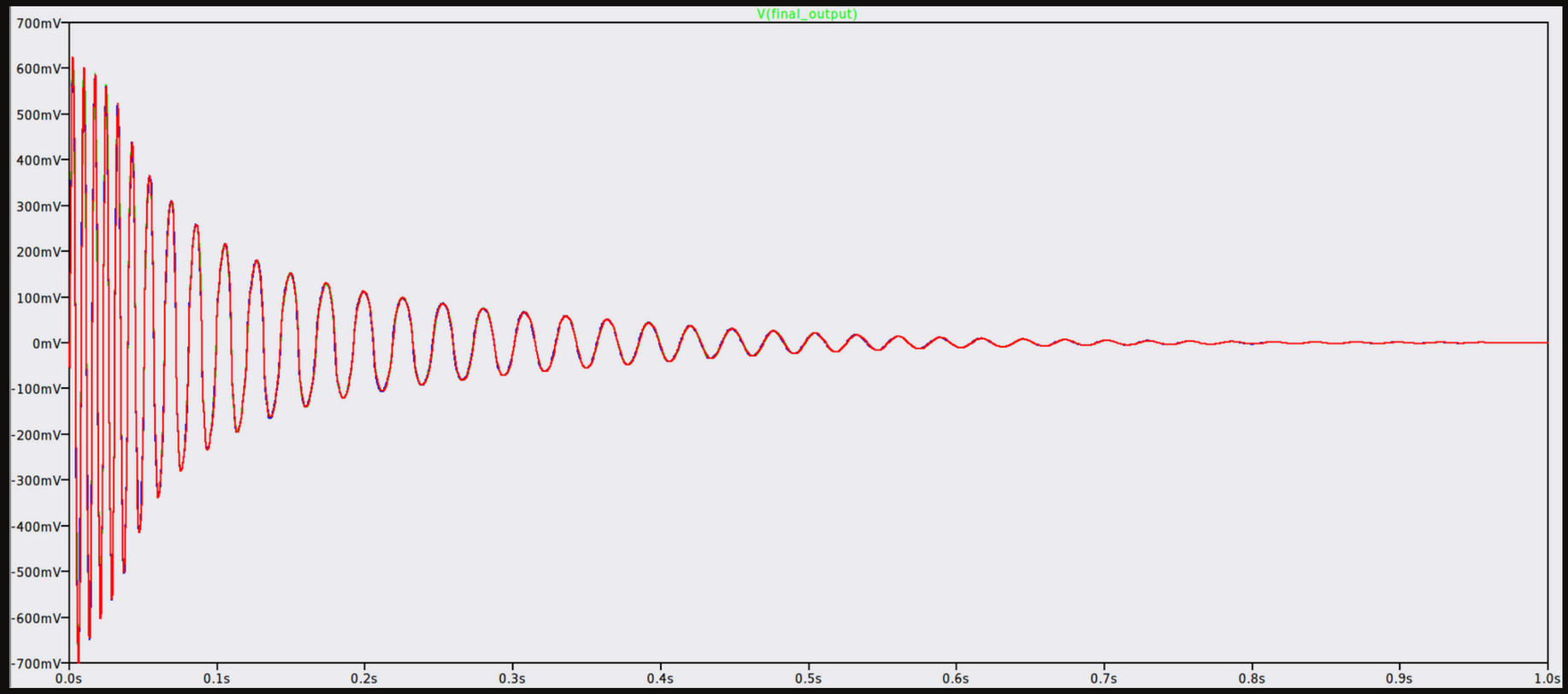


FINAL STAGE; LM386 & SPEAKER

Using an LM386N to power our 4Ω speaker, we use a basic op-amp amplifier to attenuate our signal for working around the ±1V cutoff input voltage.

The gain achieved by LM386N is around 20, but the speaker’s impedance reduces voltage peak to favourable levels.

THANK YOU



ALL READINGS AND ANALYSIS INCLUDED IN REPORT.