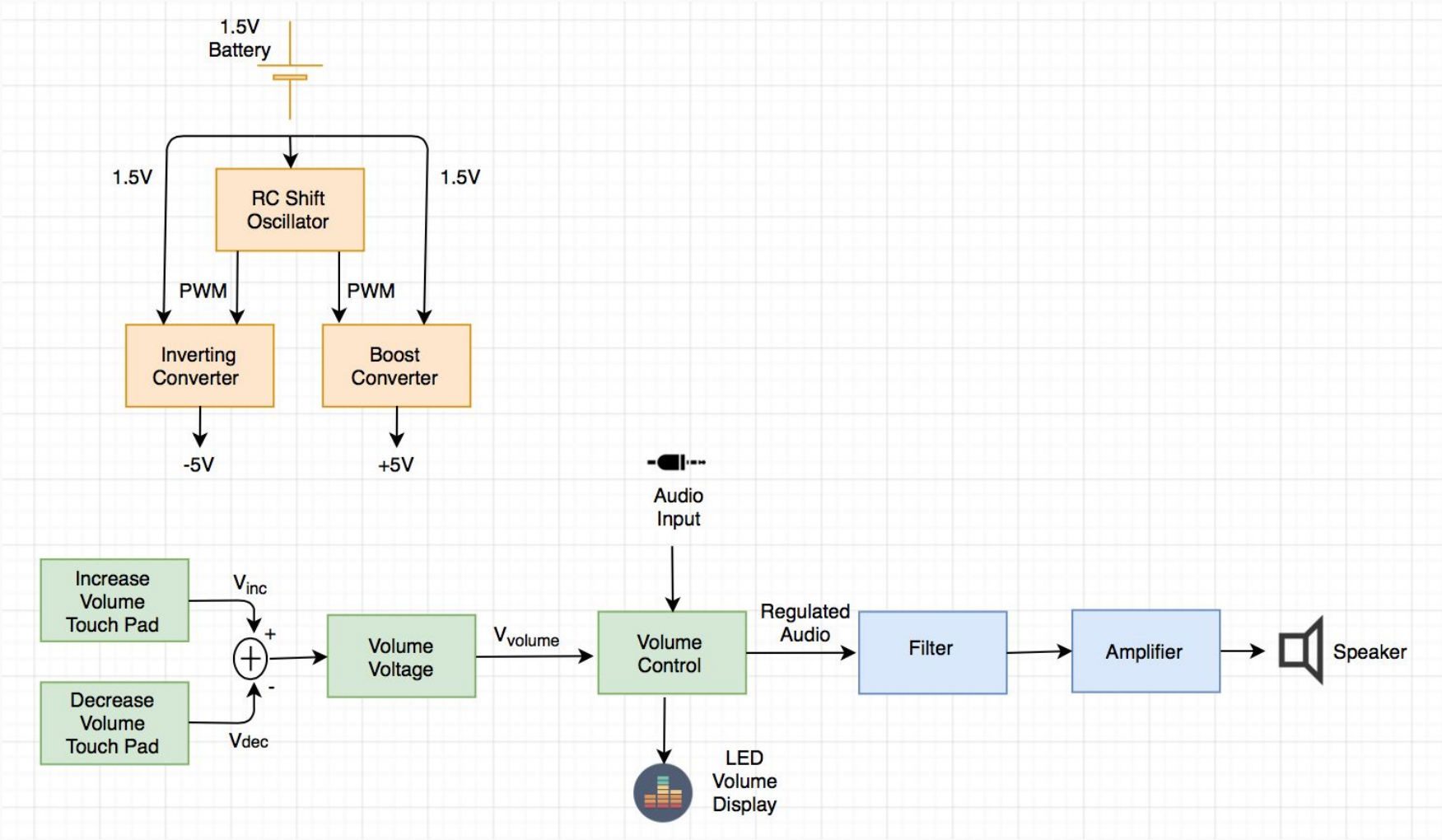
Speaker in a Box

Battery Powered with Tactile Input

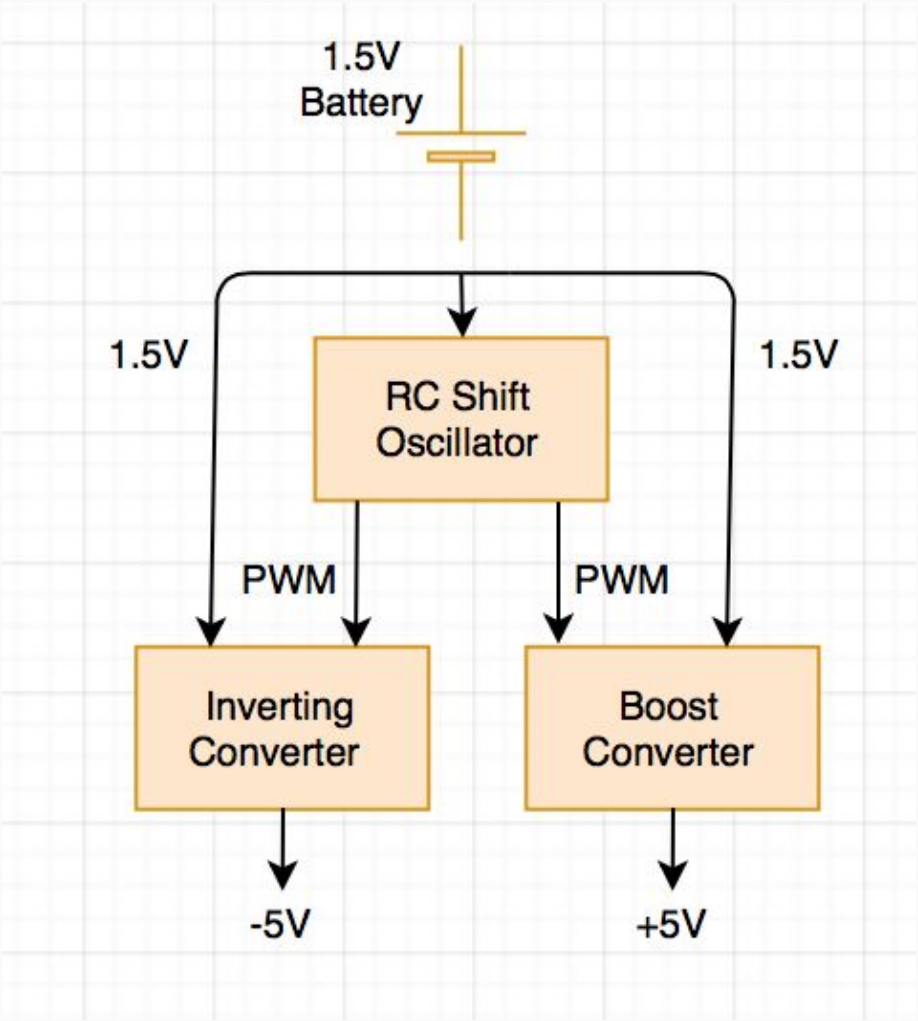
Natalie Mionis, Lorenzo Vigano, Madeleine Waller

Functional Requirements

- Small, portable speaker
- Powered from 1.5V battery
- Controlled via touch
- LED display


1.5V
Battery
1.5V
RC Shift
Oscillator
1.5V
PWM
PWM
Inverting
Converter
Boost
Converter
-5V
+5V
Audio
Input
Increase
Volume
Touch Pad
Vinc
+
Volume
Voltage
Vvolume
Volume
Control
Regulated
Audio
Filter
Amplifier
Speaker
Decrease
Volume
Touch Pad
Vdec
-
LED
Volume
Display

Power Module


1.5V
Battery
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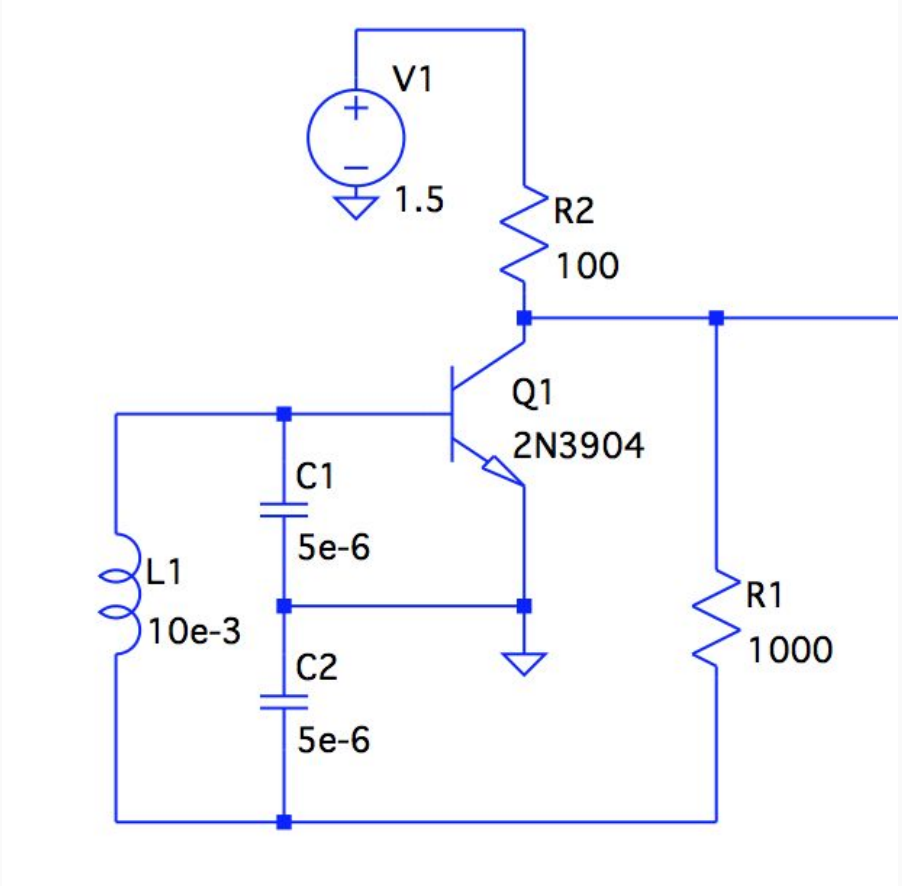
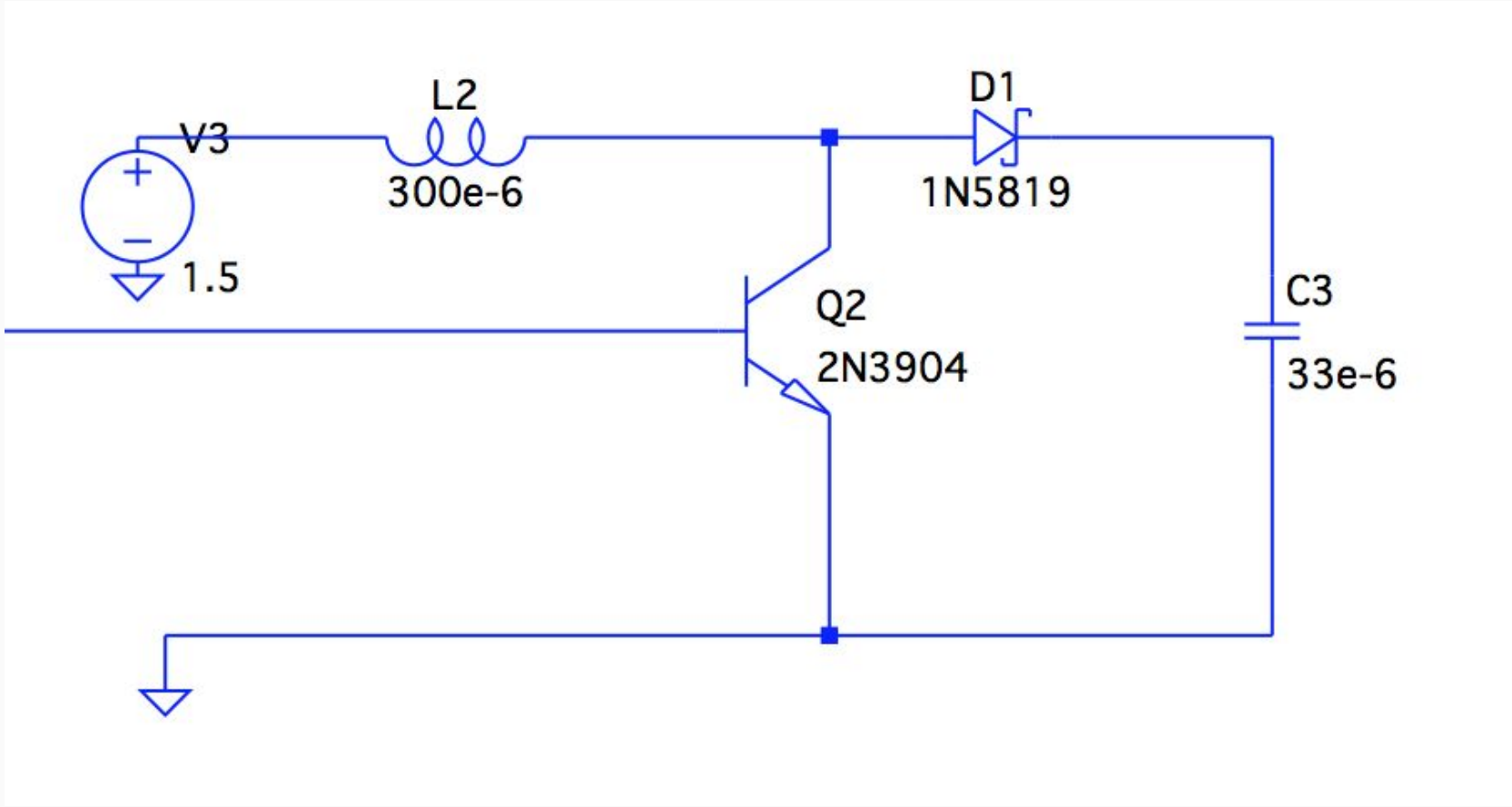
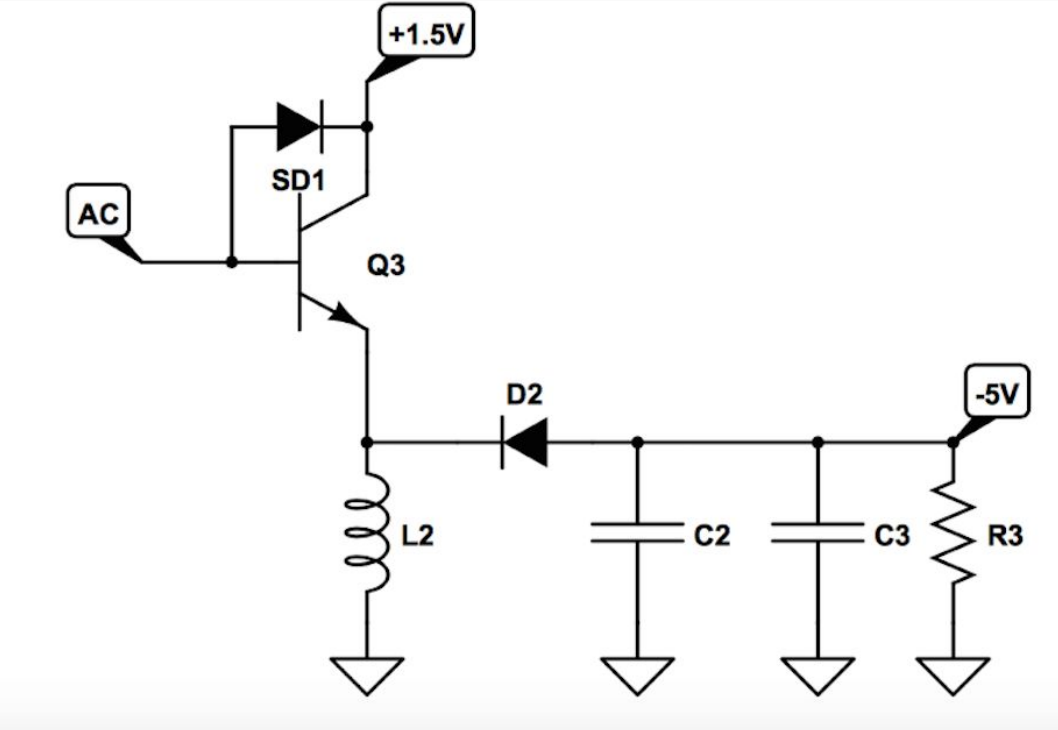
Colpitts Oscillator



Boost Converter



Inverting Converter



Goals and Challenges

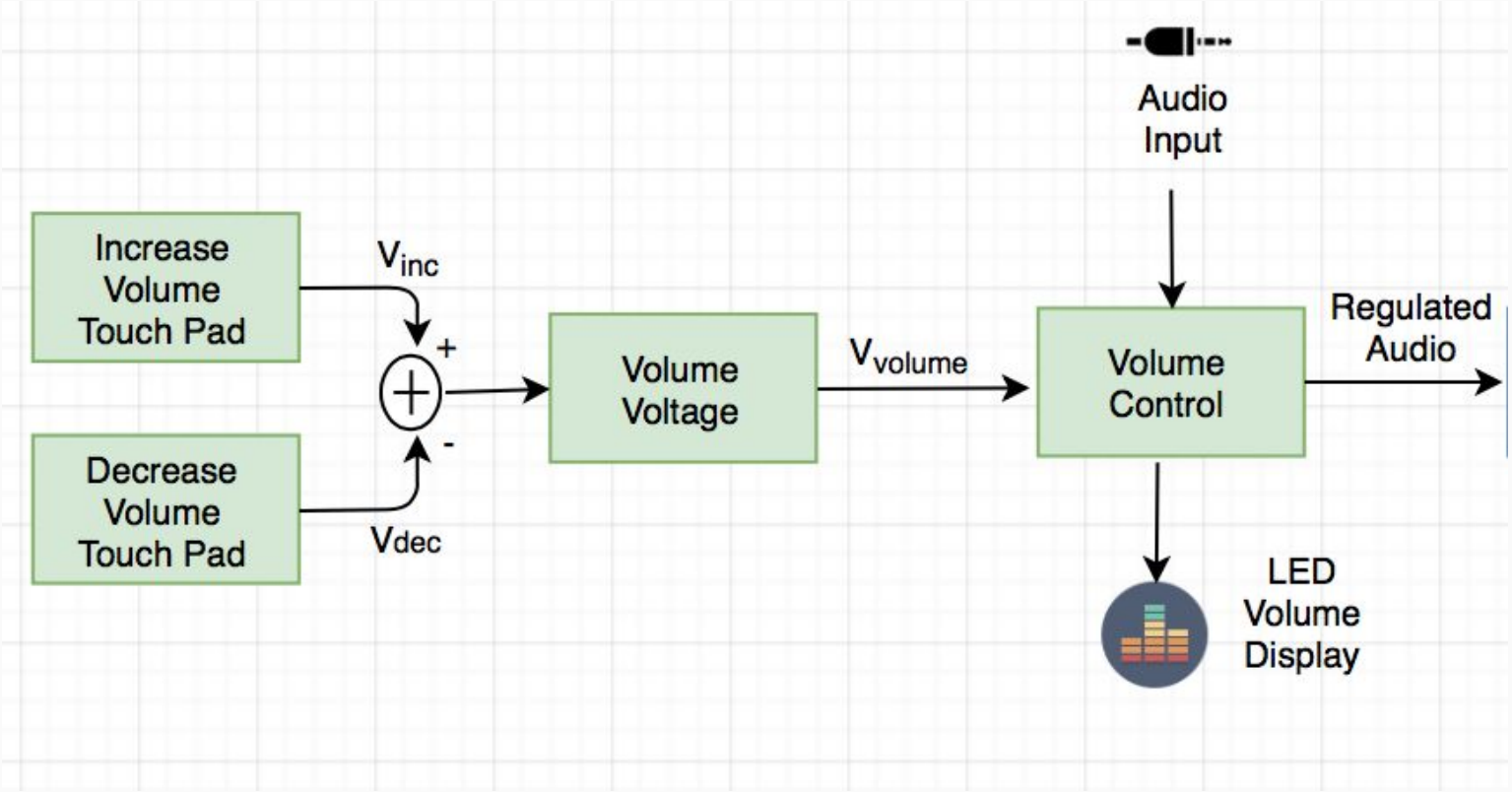
Goal 1: Achieve ±5V from a 1.5V battery

Goal 2: Improve efficiency for longer battery life

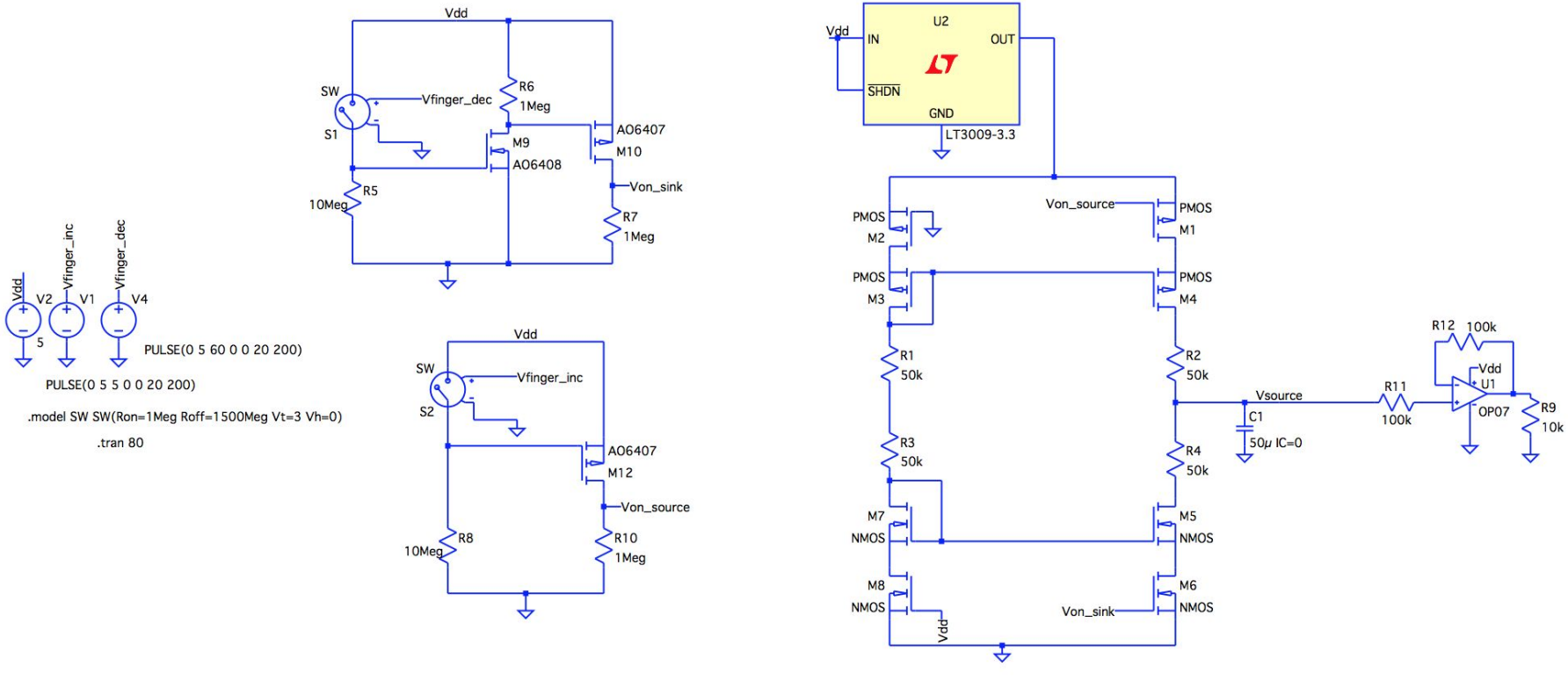
Challenges:

- 1.5V supply limits MOSFET use and IC use
- Must be conscious of current draw

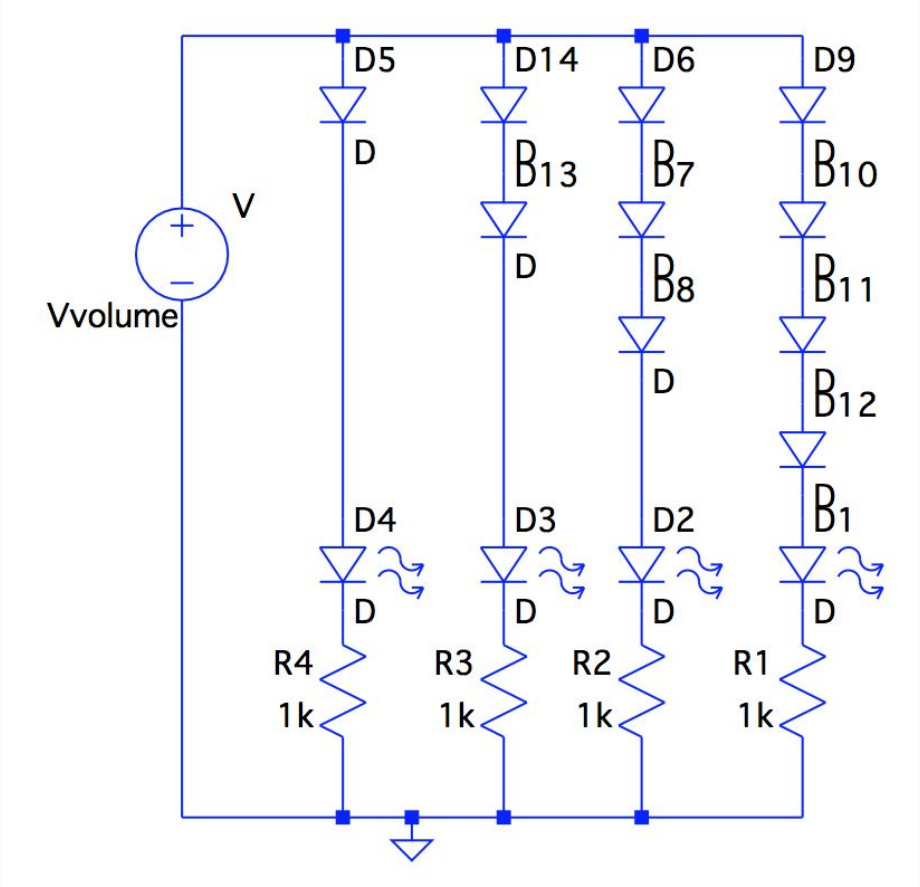
Tactile Volume Control


Audio
Input
Increase
Volume
Touch Pad
V_{inc}
+
Volume
Voltage
V_{volume}
Volume
Control
Regulated
Audio
Decrease
Volume
Touch Pad
V_{dec}
-
LED
Volume
Display

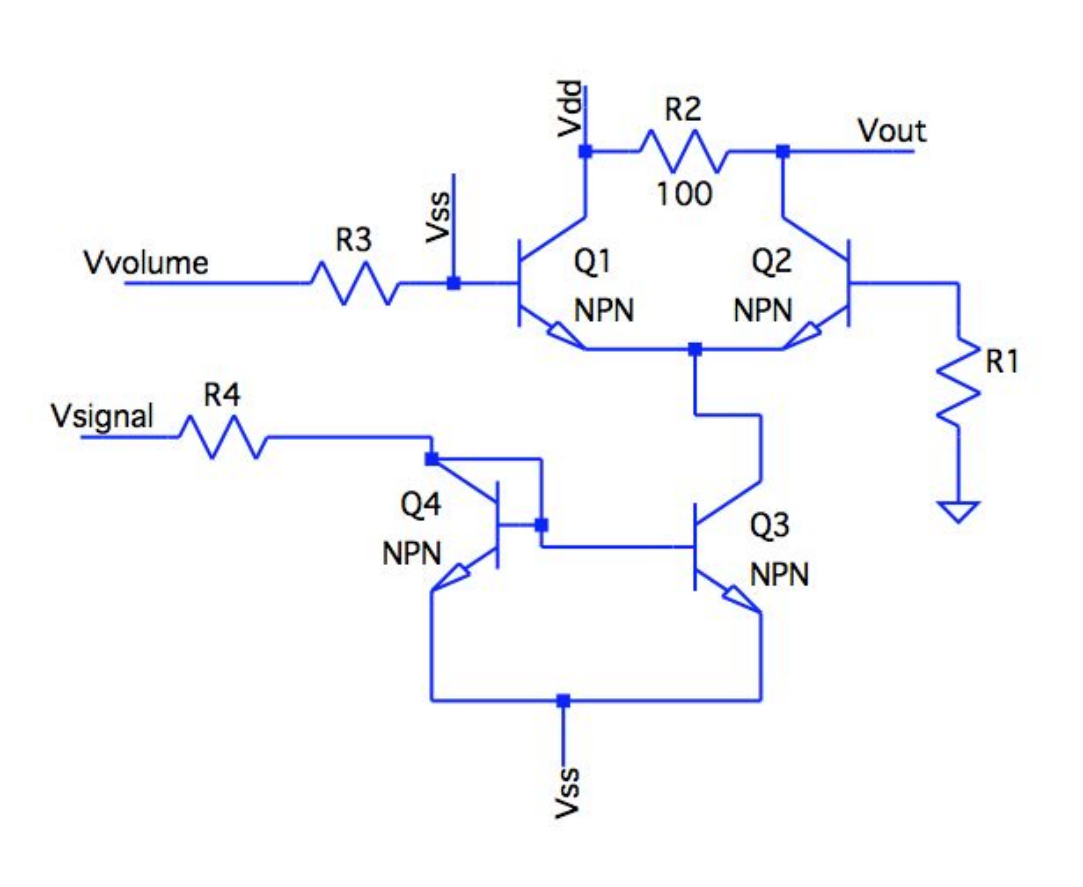
Volume Control Voltage



Volume LED Display



Voltage Regulated Audio Signal



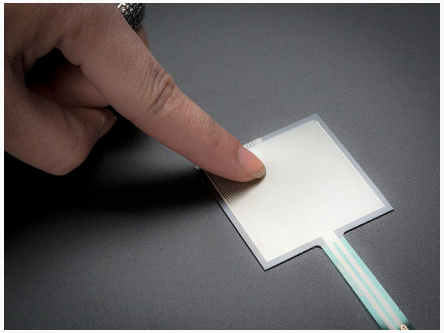
Tactile Volume Control Goals and Challenges

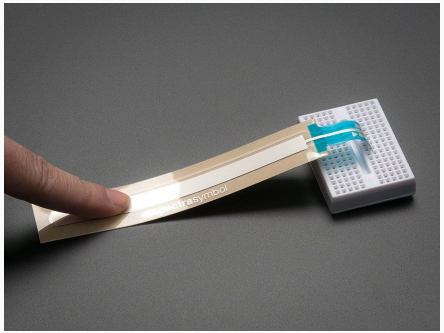
Goal 1: increase/decrease volume by touch

Goal 2: LED volume display bank

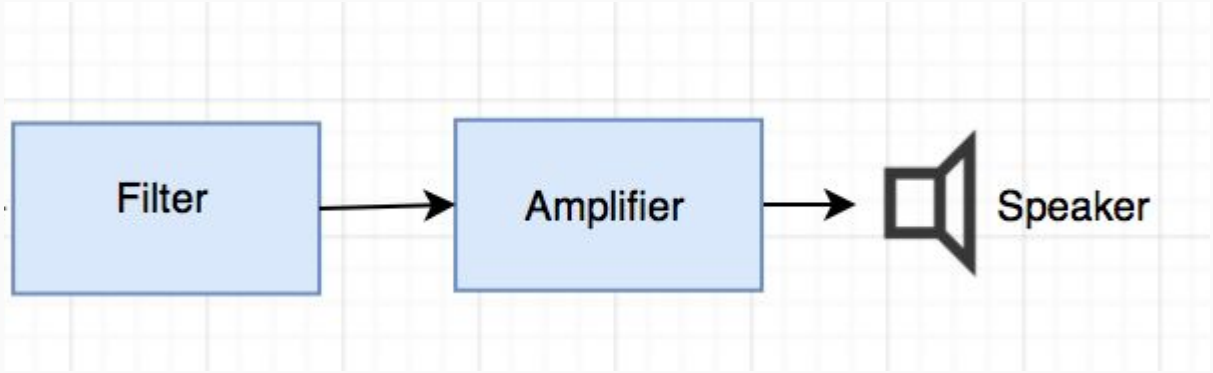
Stretch goal: add a linear soft pot to allow user to select volume directly

Primary challenge: maintain stable memory of current volume that responds quickly to user input

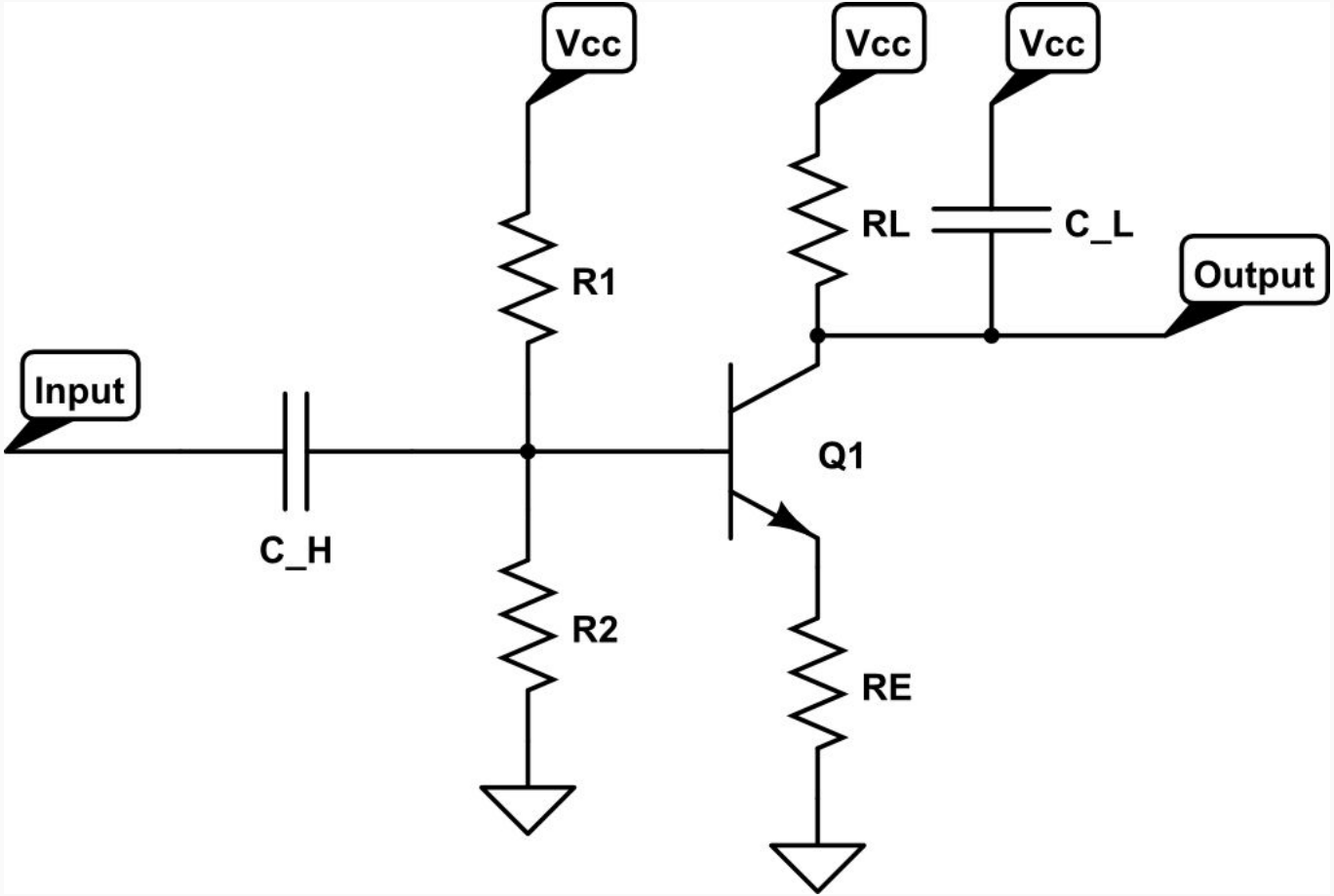




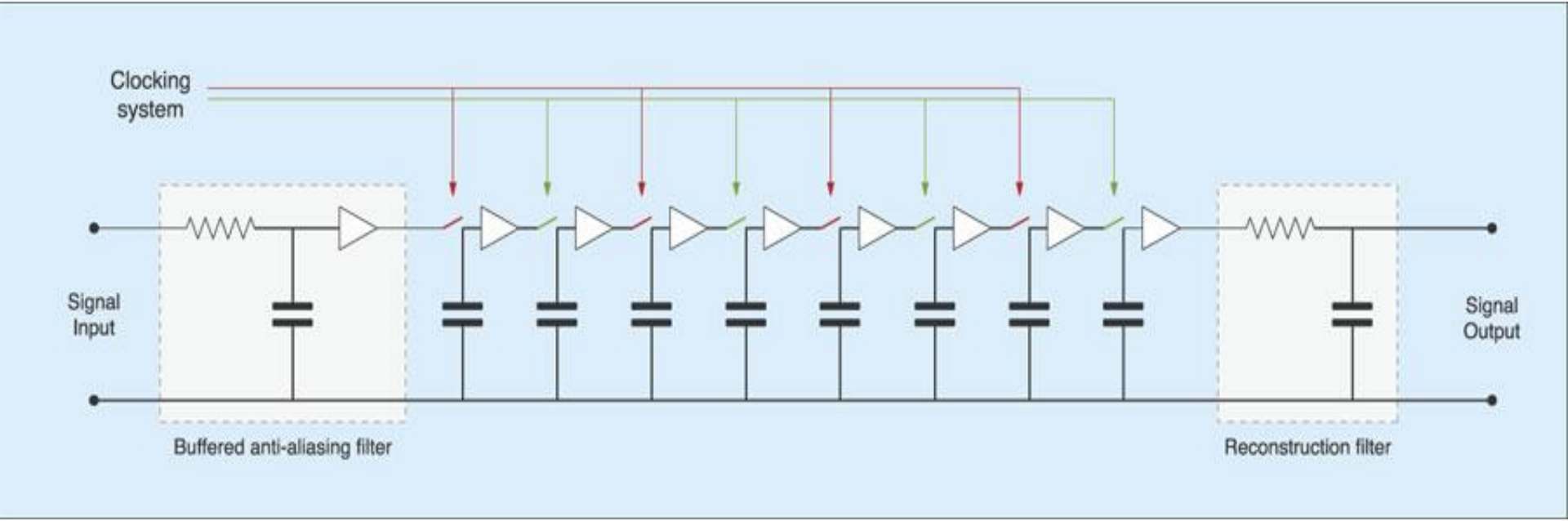
Audio, Filter, and Lights Module


Filter
Amplifier
Speaker

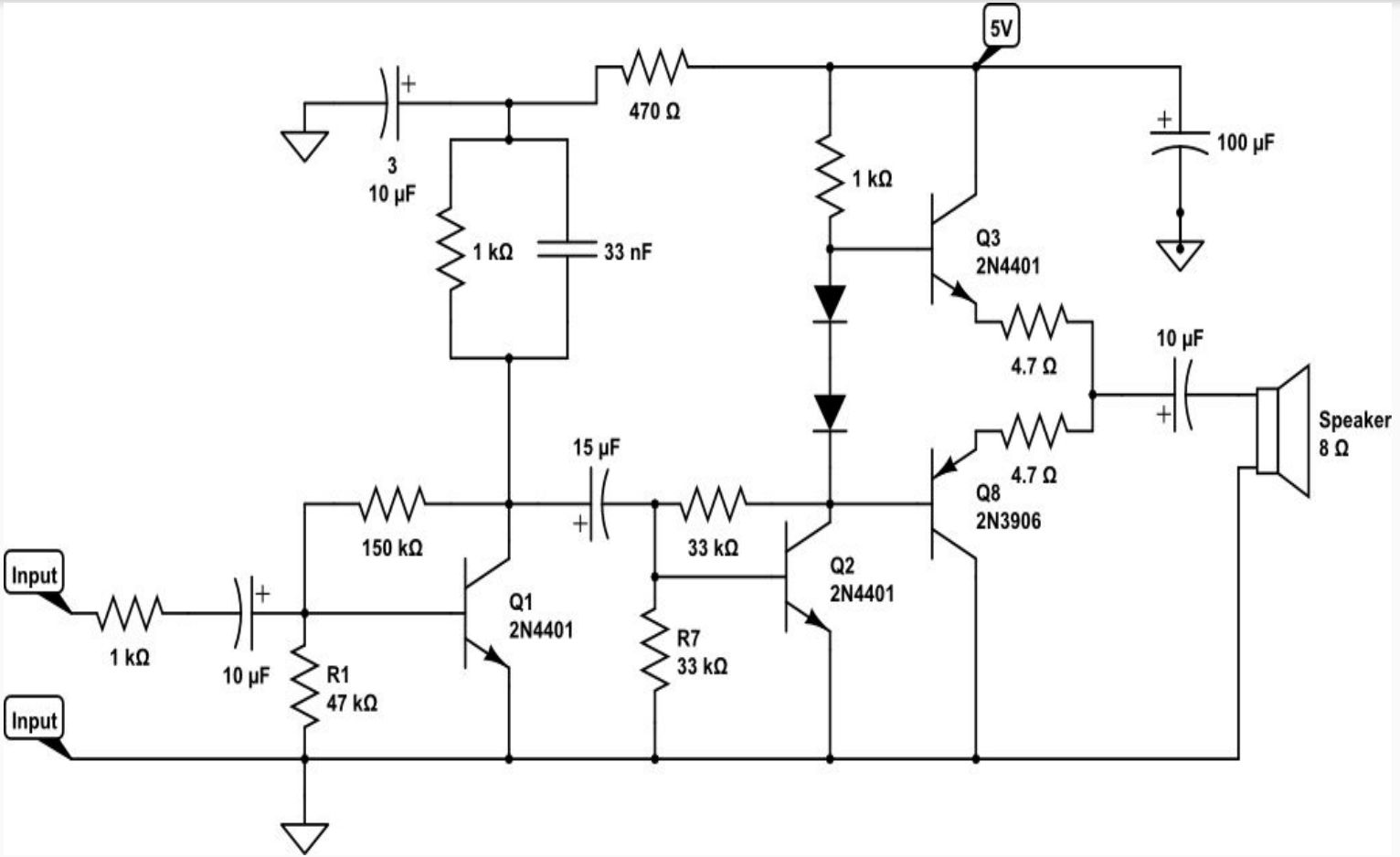
Passband Filter



Fun with Filters



Audio Amplifier



Audio and Lights Goals and Challenges

Goal 1: Achieve acceptable sound quality with limited distortion.

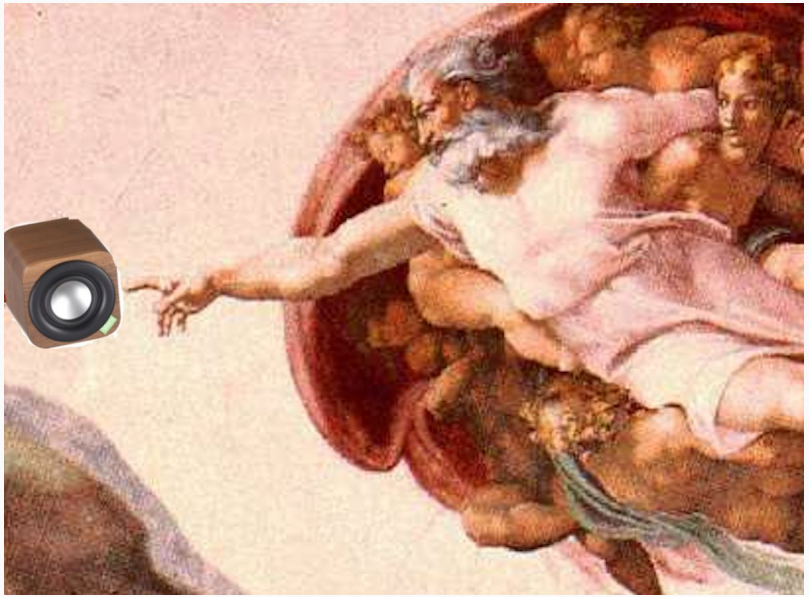
Goal 2: Improve efficiency for longer battery life.

Goal 3: LED display to show current volume of song.

Challenges:

- Power limitations
- Echo

COOL PARTS OF PROJECT



Special Materials

- Winding own inductors
- Speaker
- Machining the box
- Force sensing resistors (x2)
- Linear soft potentiometer
- Large ceramic capacitors

Timeline

	Week of 4/9	Week of 4/16	Week of 4/23	Week of 4/30	Week of 5/7	Group Effort
Research Techniques						Natalie
Order Special Parts						Madeleine
Spice Modeling: Power Supply						Lorenzo
Spice Modeling: Volume Control						
Spice Modeling: Amplifier & LED display						
Build Volume Control Circuit						
Build LED Volume Display						
Build Power Module						
Build Volume Control						
Build Amplifier and Filter						
Integrate						
Stretch Goals						
Final Debugging						
Final Report						

Questions?