

Input Device

FabAcademy 2015

Assignment

- Design a board
- Add a sensor
- Measure something

CLOCK

- RC -> 10%, not accurated

This is the solution used in the the input sensor boards from Niel.

If you see strange comunication, there are two solutions:

1 – Software: Adjust the timing comunication.

2 – Hardware: More accurated clock with resonator.

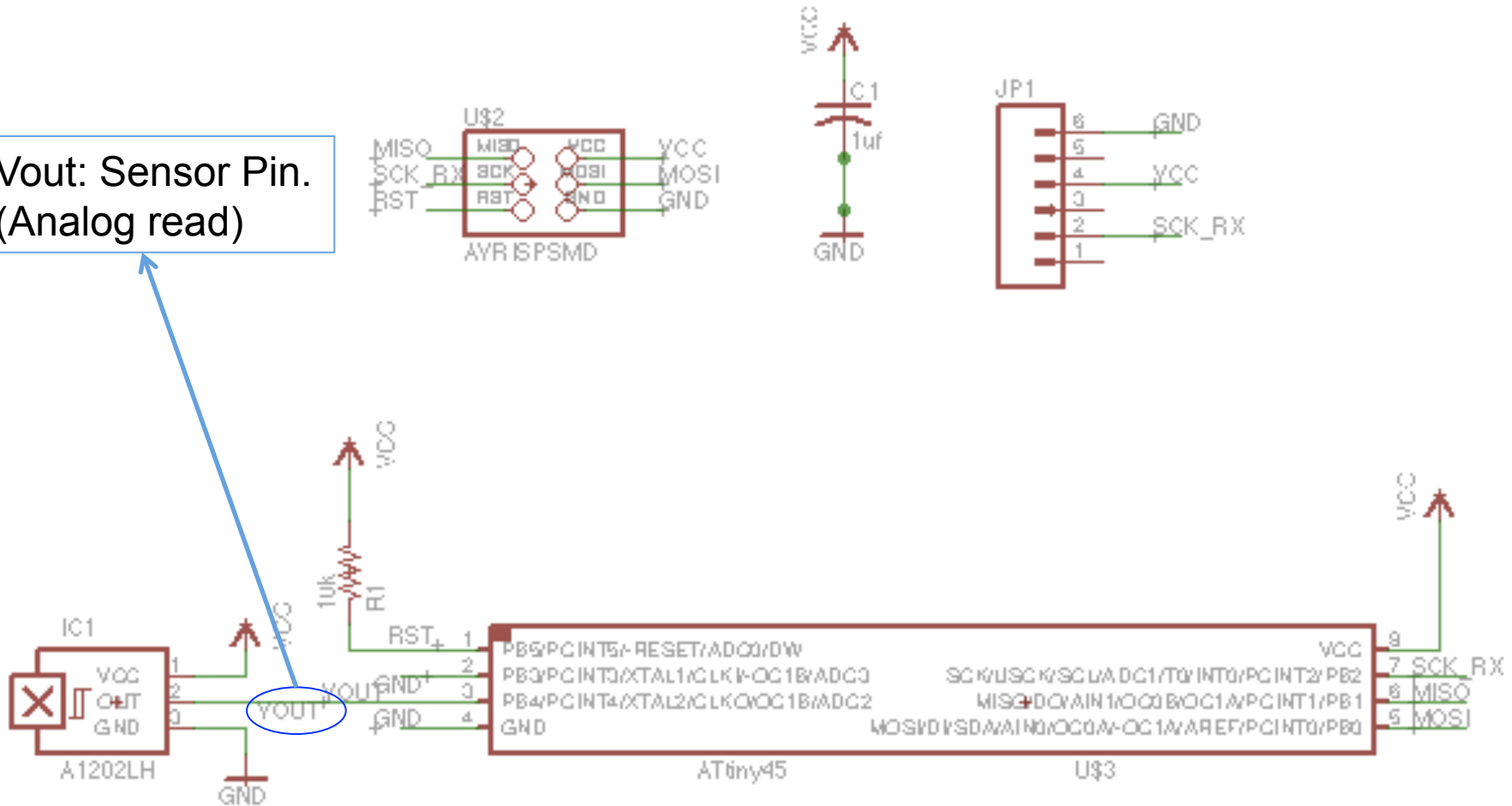
- Resonator -> 0.5%

MAGNET FIELD

- Application: Magnetic field / proximity (you place a magnet in the area you want to monitor)
- Sensor: Hall Effect Sensor
- It provides an Analog Output that is proportional to the magnetic field.

Schematic

Vout: Sensor Pin.
(Analog read)

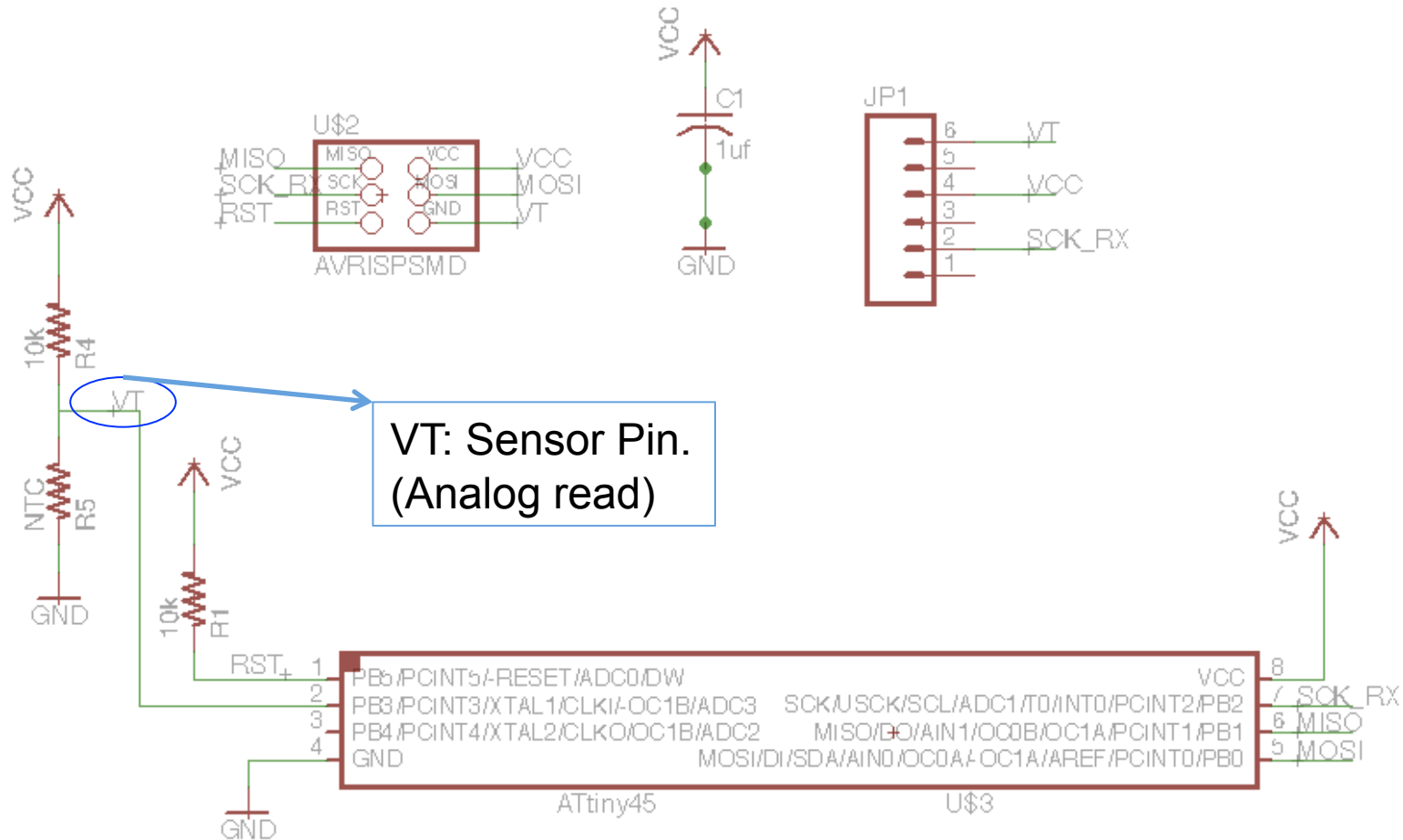


TEMPERATURE

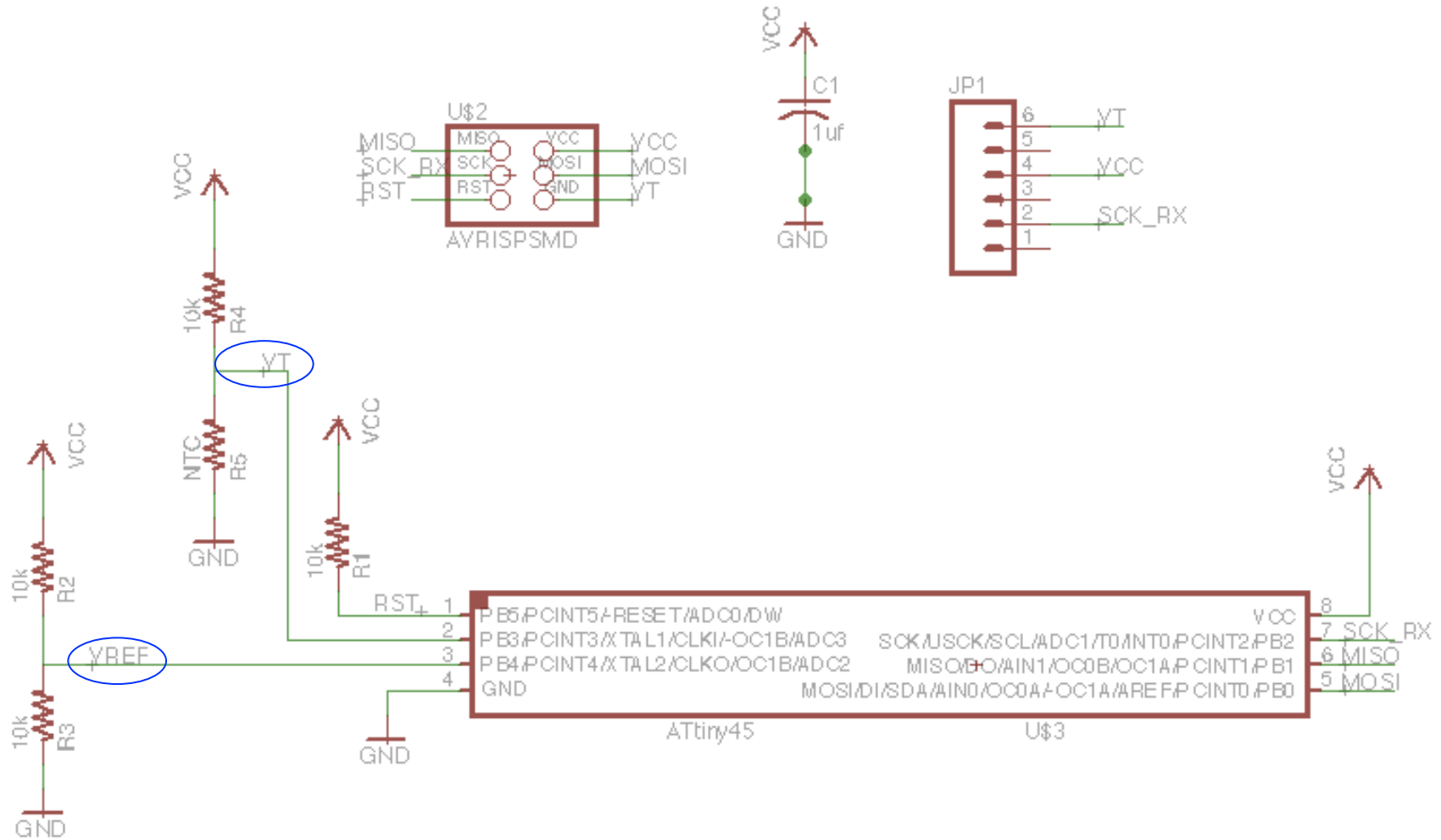
- Application: Temperature
- Sensors:
 - NTC
Temp down -> Res down -> Vt up
 - RTD
Temp down -> Res up -> Vt down

They are resistors which are sensitive to the Temperature

Simplest Schematic (no Niel)



Niel Schematic



TEMPERATURE

Code

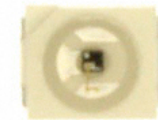
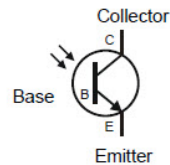
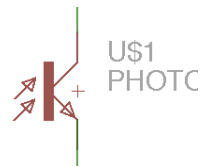
1) Simplest Way: Measure only V_T

2) Niel's way: It makes the difference between two pins and doing gain (x20).

Measures the difference between $V_{ref} - V_T$

LIGHT 1

- Application: Light / Proximity
- Sensor: PhotoTransistor.
It has orientation: Collector + Emitter.



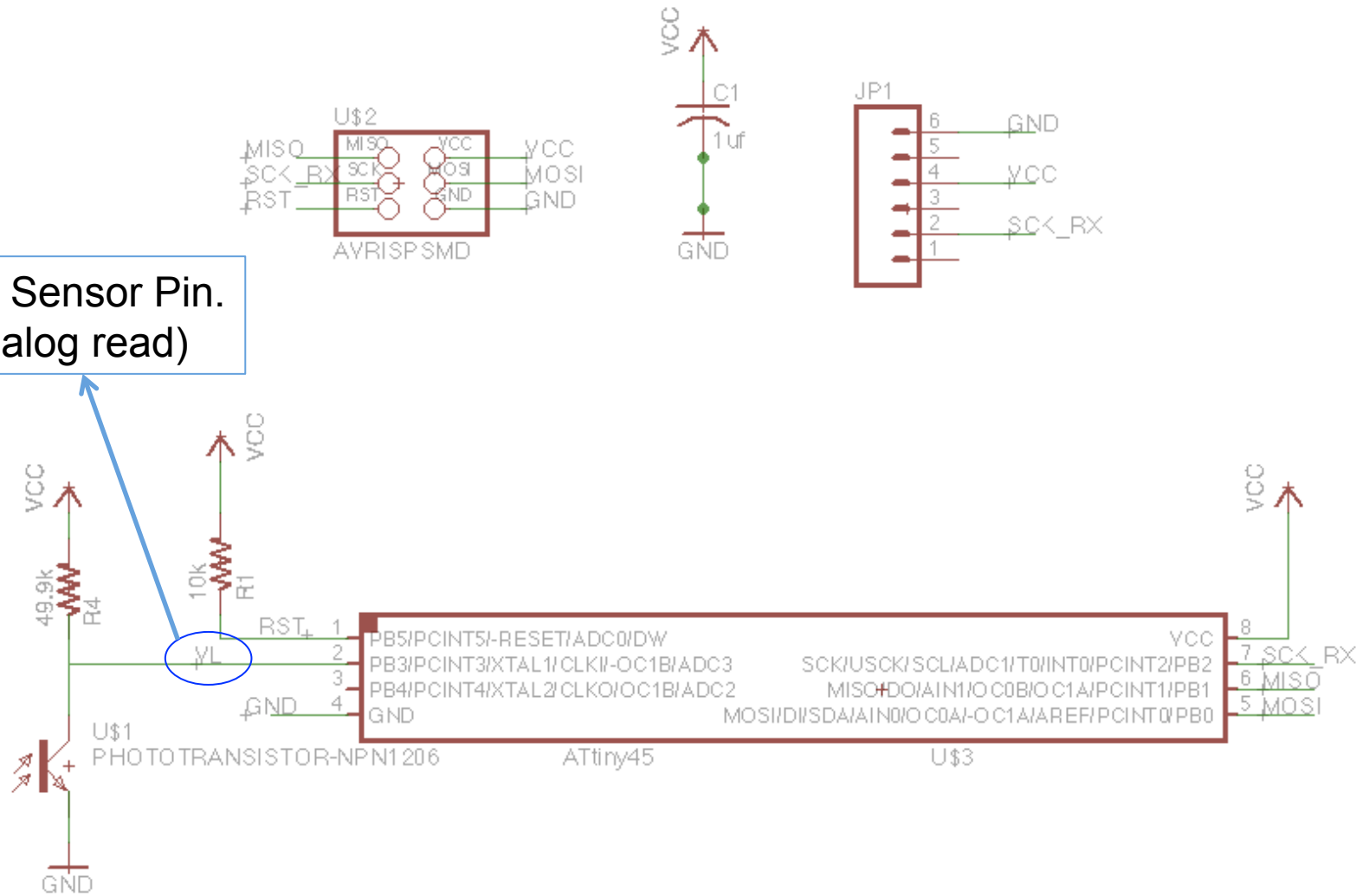
- When there is light -> current -> voltage

Code

I read VL

Schematic

VL: Sensor Pin.
(Analog read)



LIGHT 2

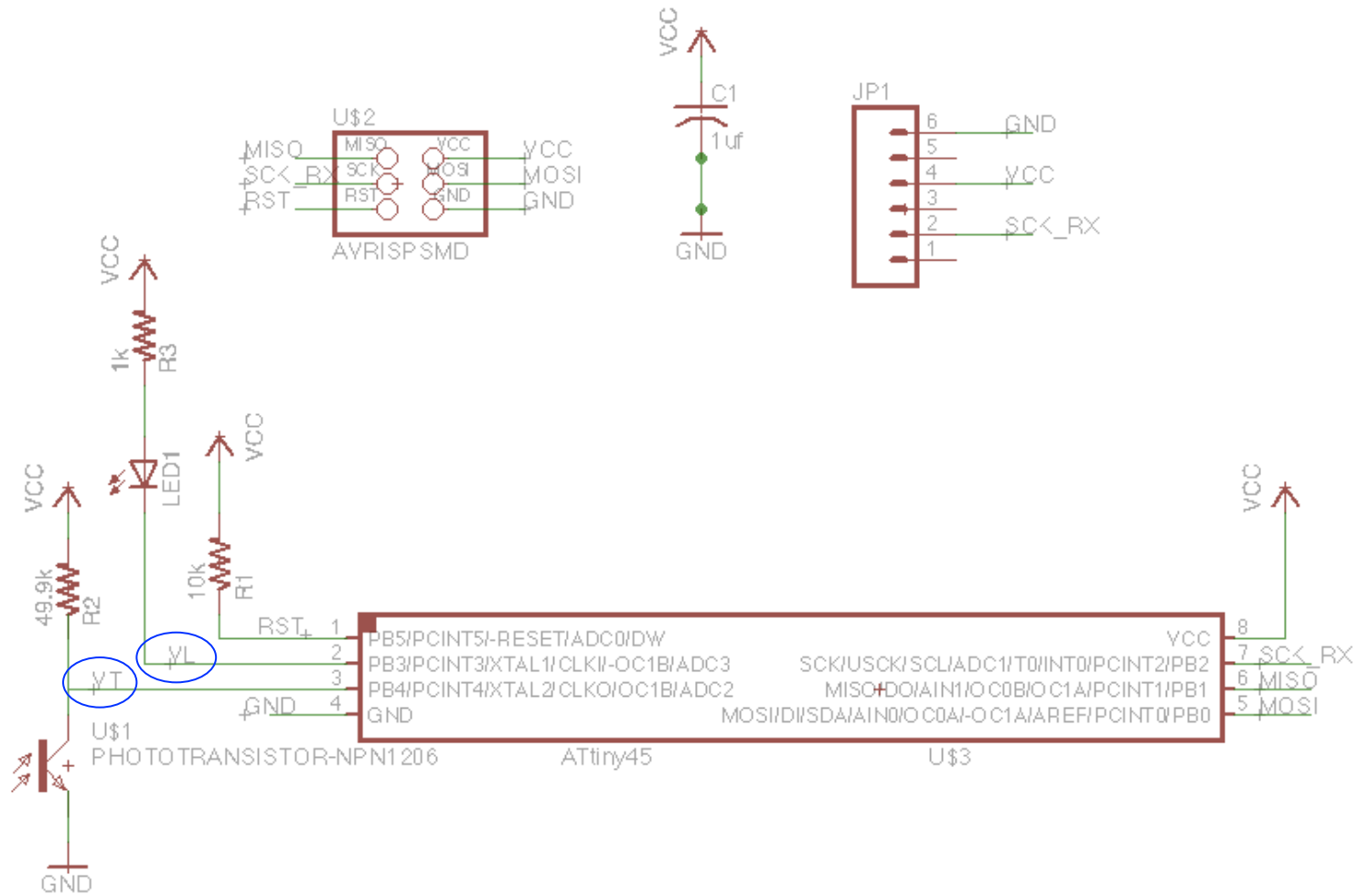
- Application: Light / Proximity
- It has orientation: Collector + Emitter
- Reflective light: the light that I'm producing.

Code

I measure the difference between the generated light of the led and the sensed light from the photodiode.

It makes the difference between $V_L - V_T$.

Schematic



STEP RESPONSE 1

- Application: resistance, capacitance, inductance, position, pressure, proximity, tilt, acceleration, humidity, touchpad, multitouch..loading
- Funny Part: Go wild with the PAD you can make with the Vinyl cutter!!!!!!!!!!!!

Code

Read V_SEN

C Code from Niel.....watch the lesson.

STEP RESPONSE 2

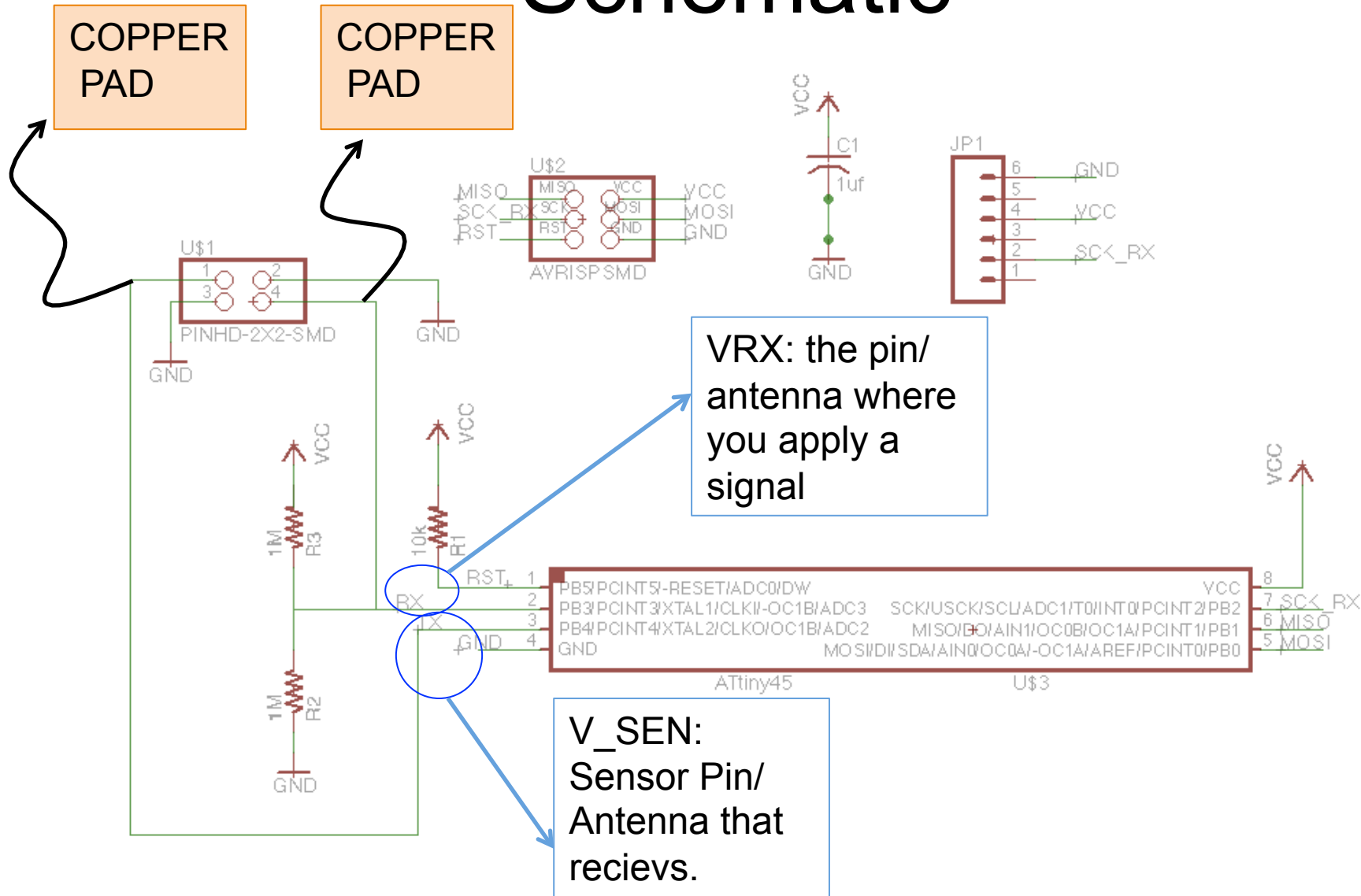
- Application: button that sense proximity, liquid presence, force sensor, position (sliding or coaxial)

Code

Read V_SEN

C Code from Niel.....watch the lesson.

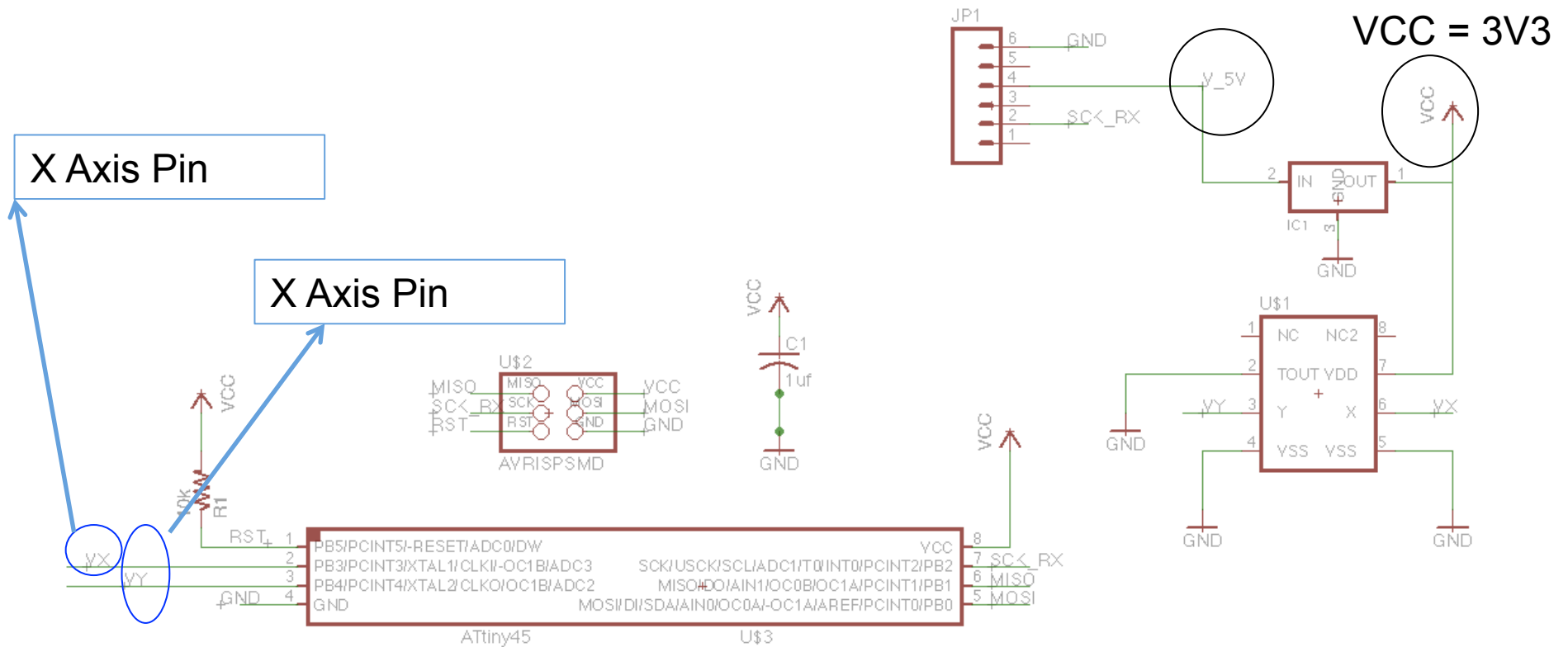
Schematic



ACCELEROMETER

- Application: rotation, acceleration
- Sensor: accelerometer

Schematic



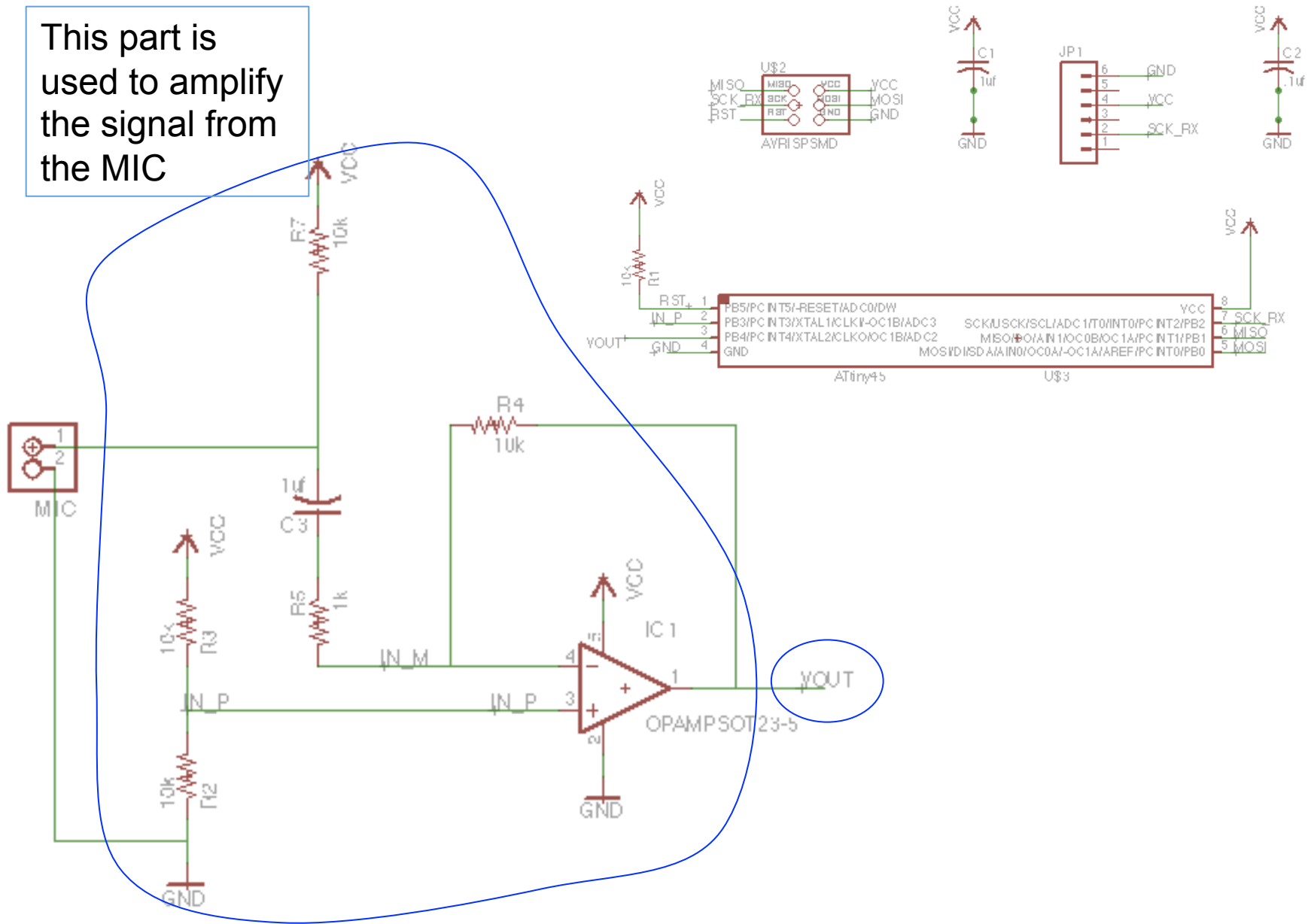
SOUND

- Application: Sound
- Sensor: MIC

Code: Measure the difference between the two pins of the MIC and it amplifies it through the OP-AMP.

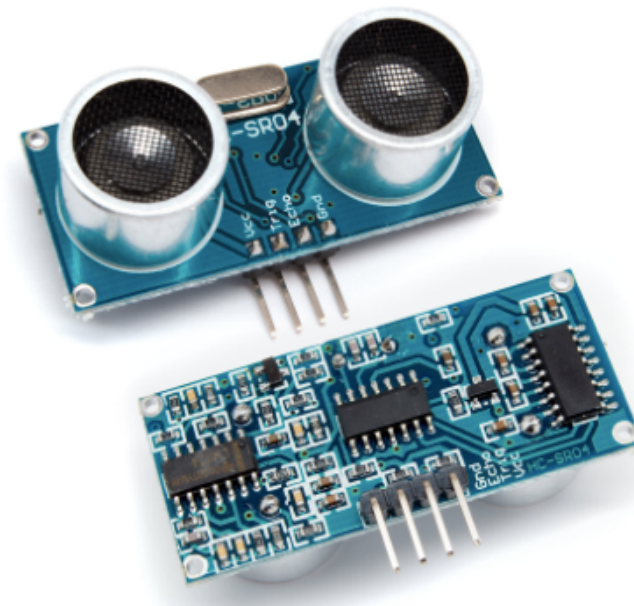
Schematic

This part is used to amplify the signal from the MIC



DISTANCE

- Application: Distance
- Sensor: UltraSonic
- 4 Pins:
 - VCC
 - GND
 - OutPut pin
 - Input pin



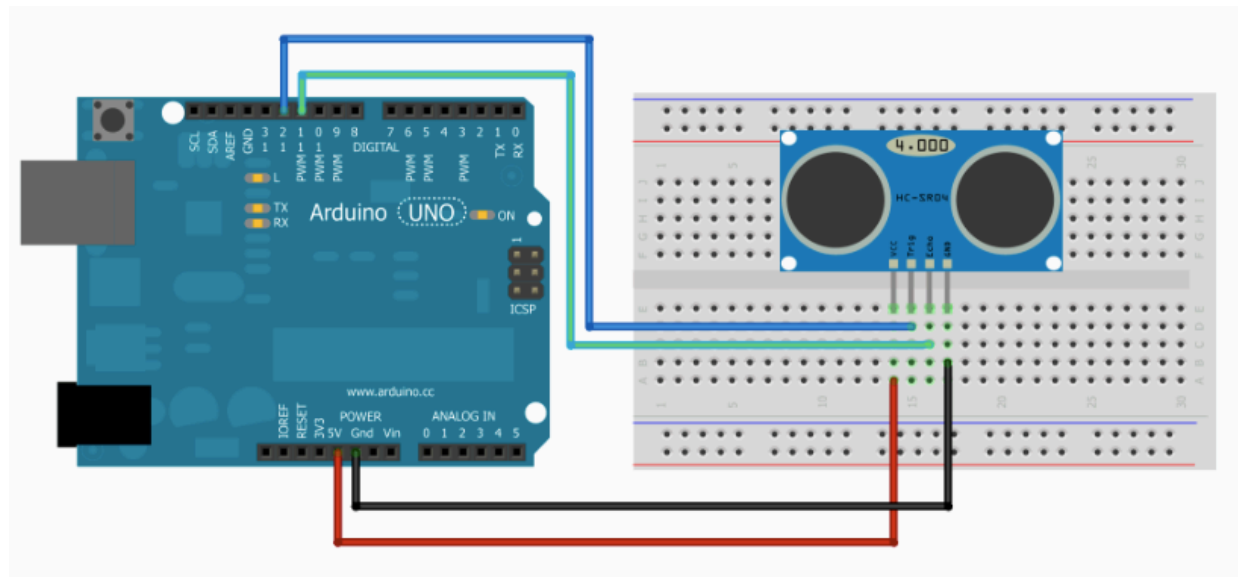
Code

Arduino Libray:

- <https://code.google.com/p/arduino-new-ping/>
- <http://www.instructables.com/id/Hc-sr04-Ultrasonic-Distance-Sensor/>

DISTANCE - Example

https://code.google.com/p/arduino-new-ping/wiki/Simple_NewPing_Example



VIBRATION

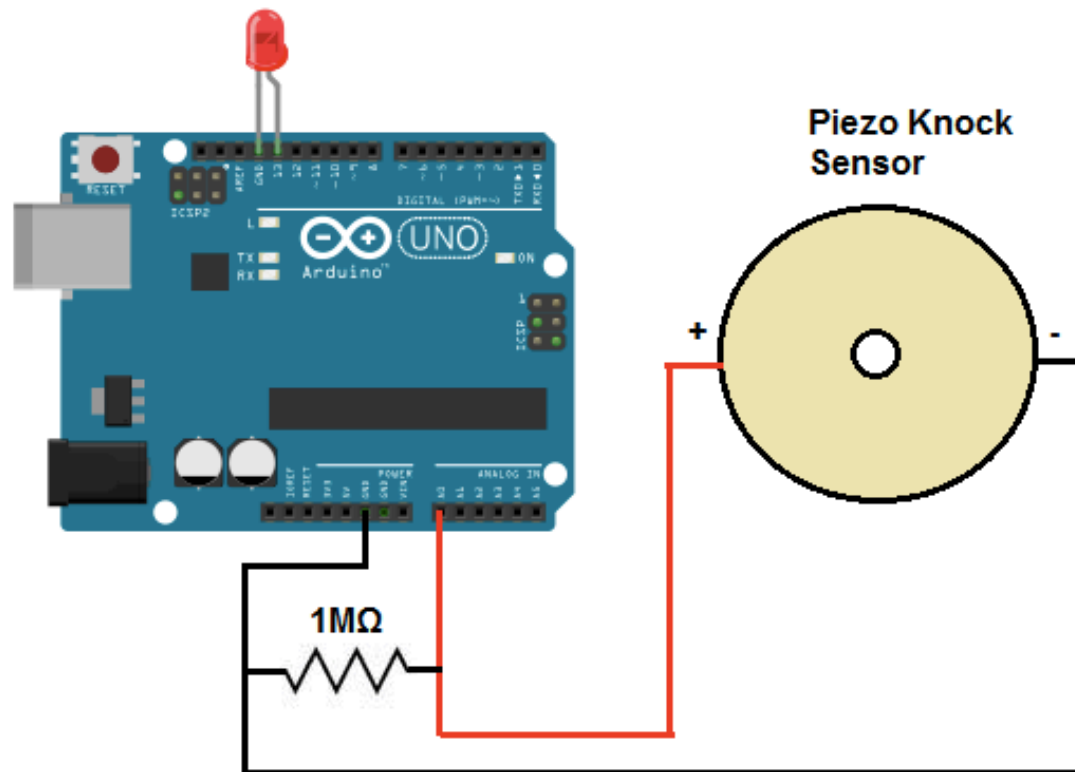
- Application: Vibration
- Sensor: Piezo
- 4 Pins:
 - VCC
 - Input pin

Code

Arduino Libray: <http://arduino.cc/en/tutorial/knock>

VIBRATION - Example

<http://www.learningaboutelectronics.com/Articles/Piezo-knock-sensor-circuit.php>



MOTION

- Application: Motion
- Sensor: PIR
- 3 Pins:
 - VCC
 - GND
 - Digital Output
- Arduino Libray:
 - <https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/using-a-pir>

MOTION Example

<https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/using-a-pir>

