

INTERACTION DESIGN

PROTOCOLS

Physical Computing HS22

Communication Protocols

UART

I2C

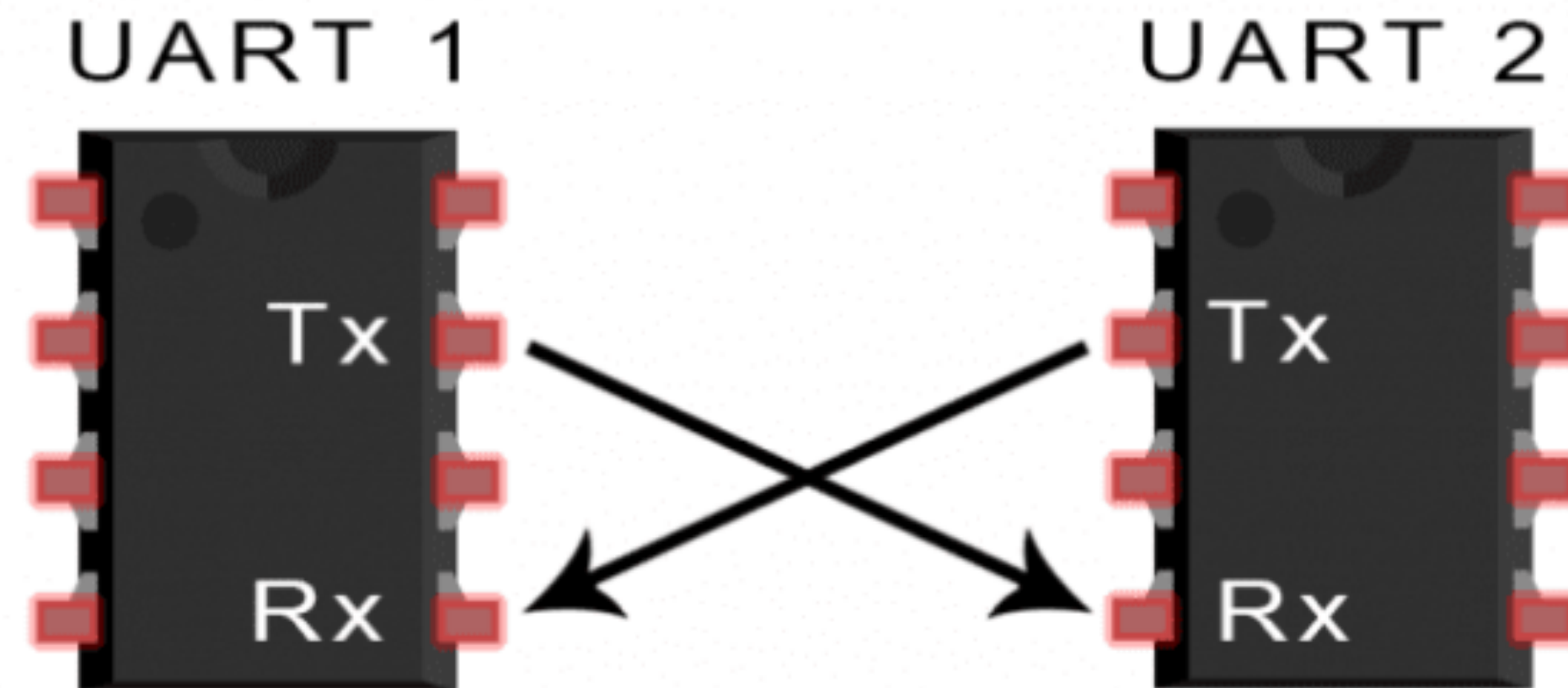
SPI

Communication protocols are formal descriptions of digital message formats and rules.

They are required to exchange messages in or between computing systems e.x. microcontrollers, peripherals, sensors, etc..

Watch at home

UART (Universal Asynchronous Receiver/Transmitter)



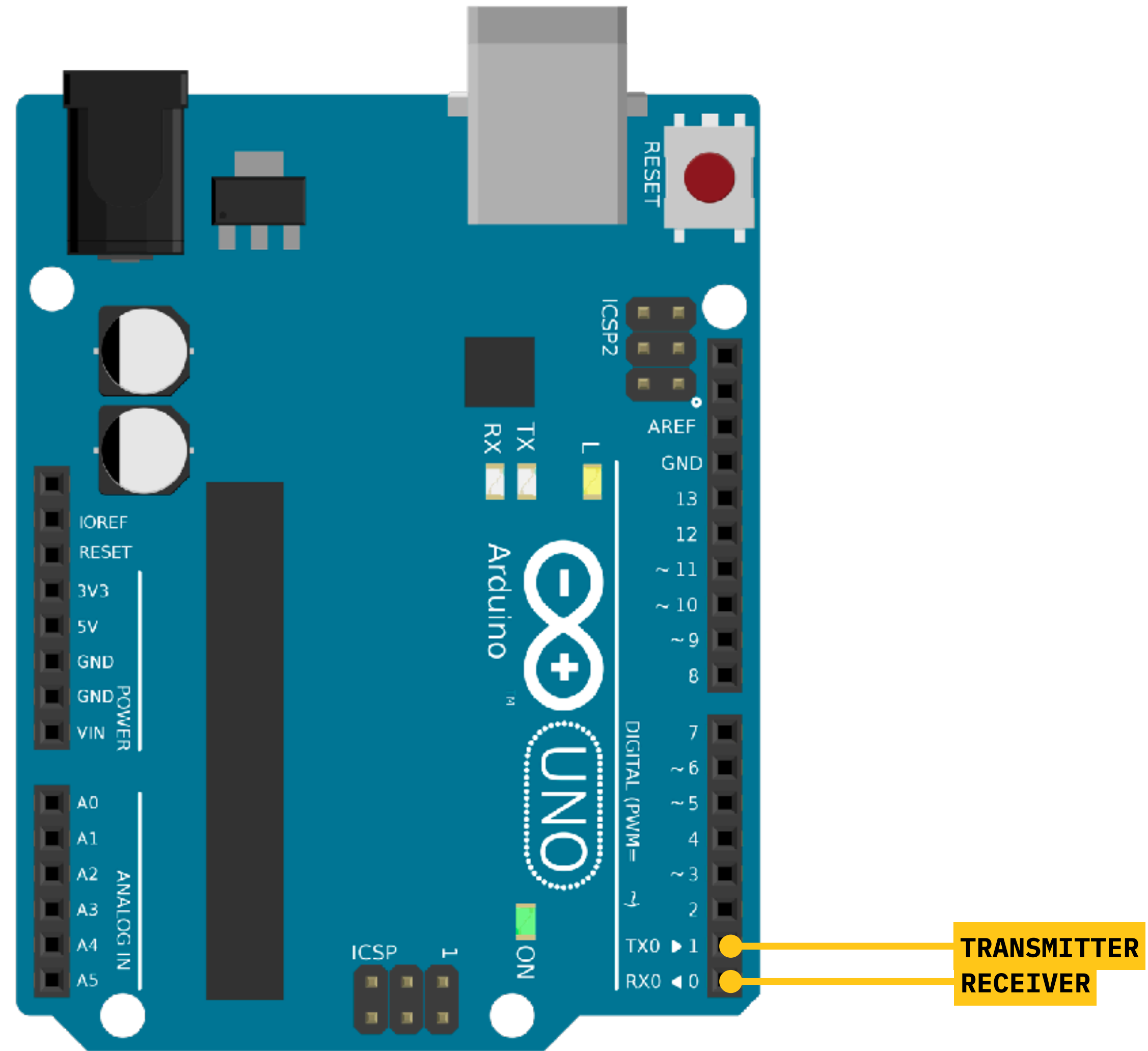
Uses:

- For communication between the Arduino board and a computer or other devices.
- Software addressing not required

Limitations:

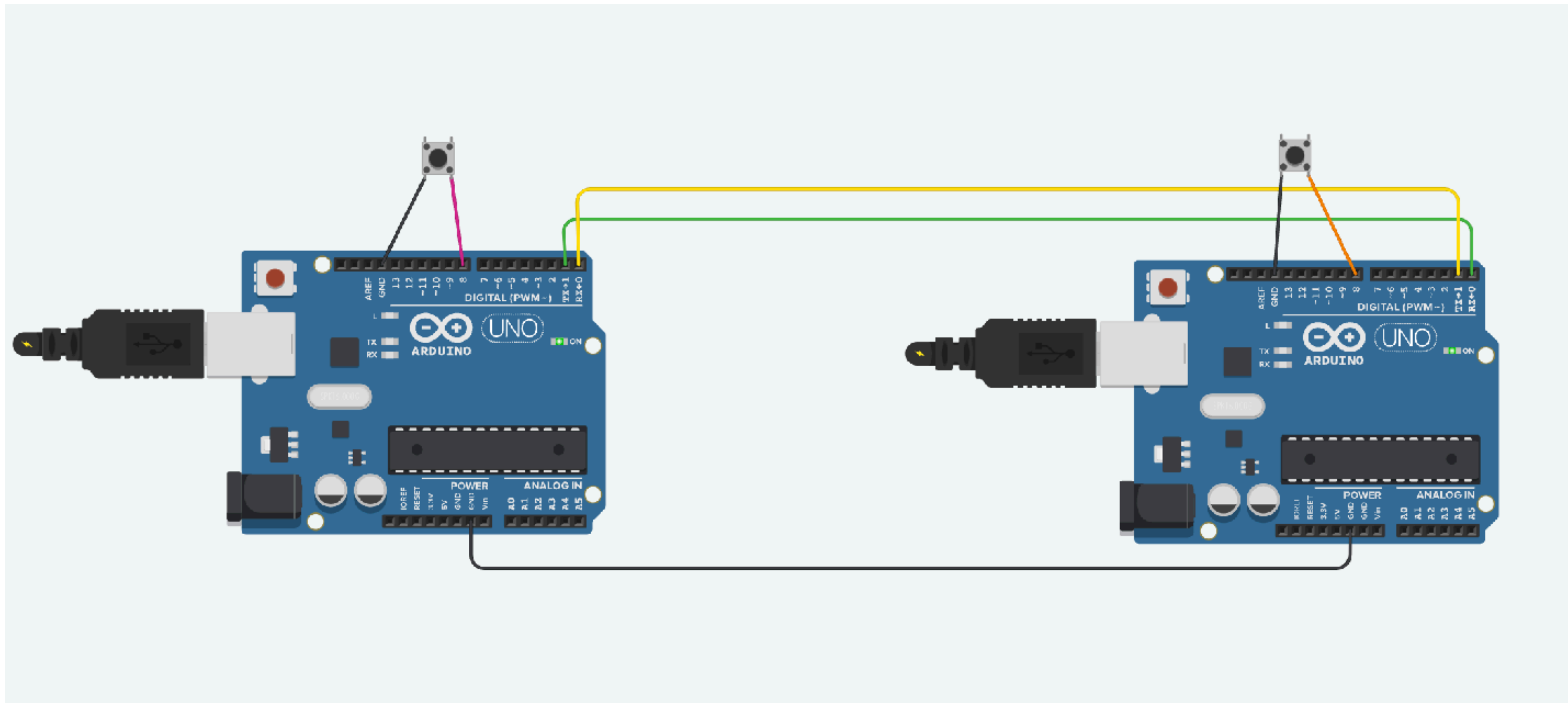
- Only for two devices
- Requires fixed data rate

UART (Universal Asynchronous Receiver/Transmitter)



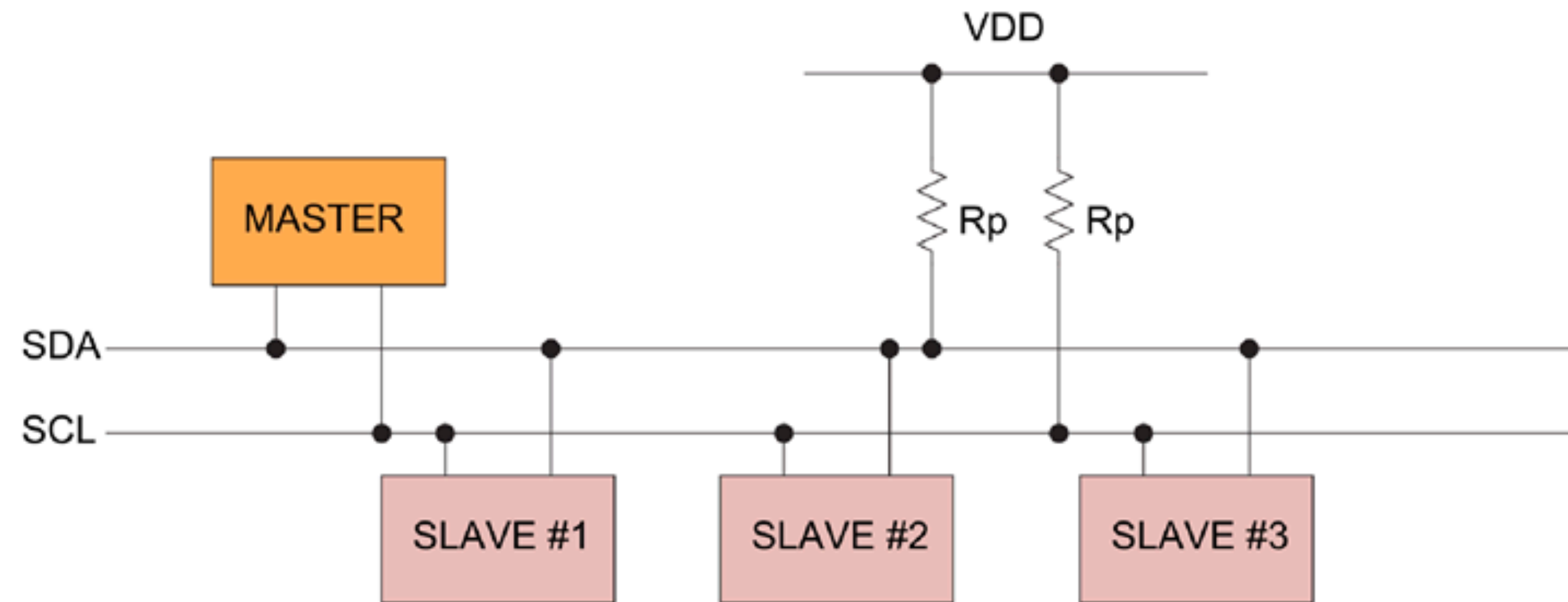
EXERCISE 1 in Groups (20min)

Connect Arduino together and send button signal to control inbuilt LEDs. Use the code found in Github to control the devices.



Physical-Computing/UART Arduino Communication/uart_code/uart_code.ino

I²C (Inter Integrated Circuit)



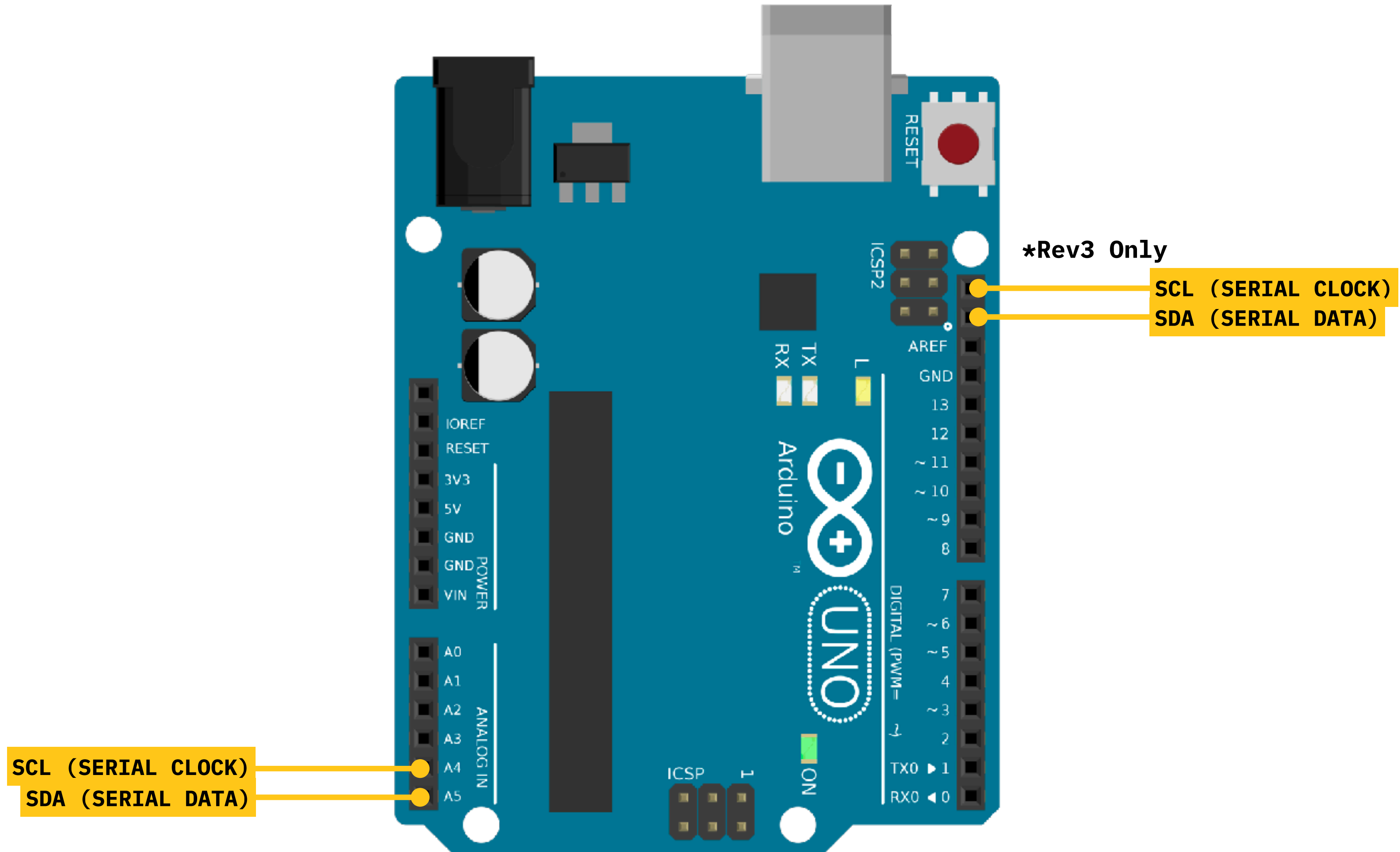
Uses:

- Easy communication between multiple devices
- Requires only two pins
- Can have multiple master/slave devices

Limitations:

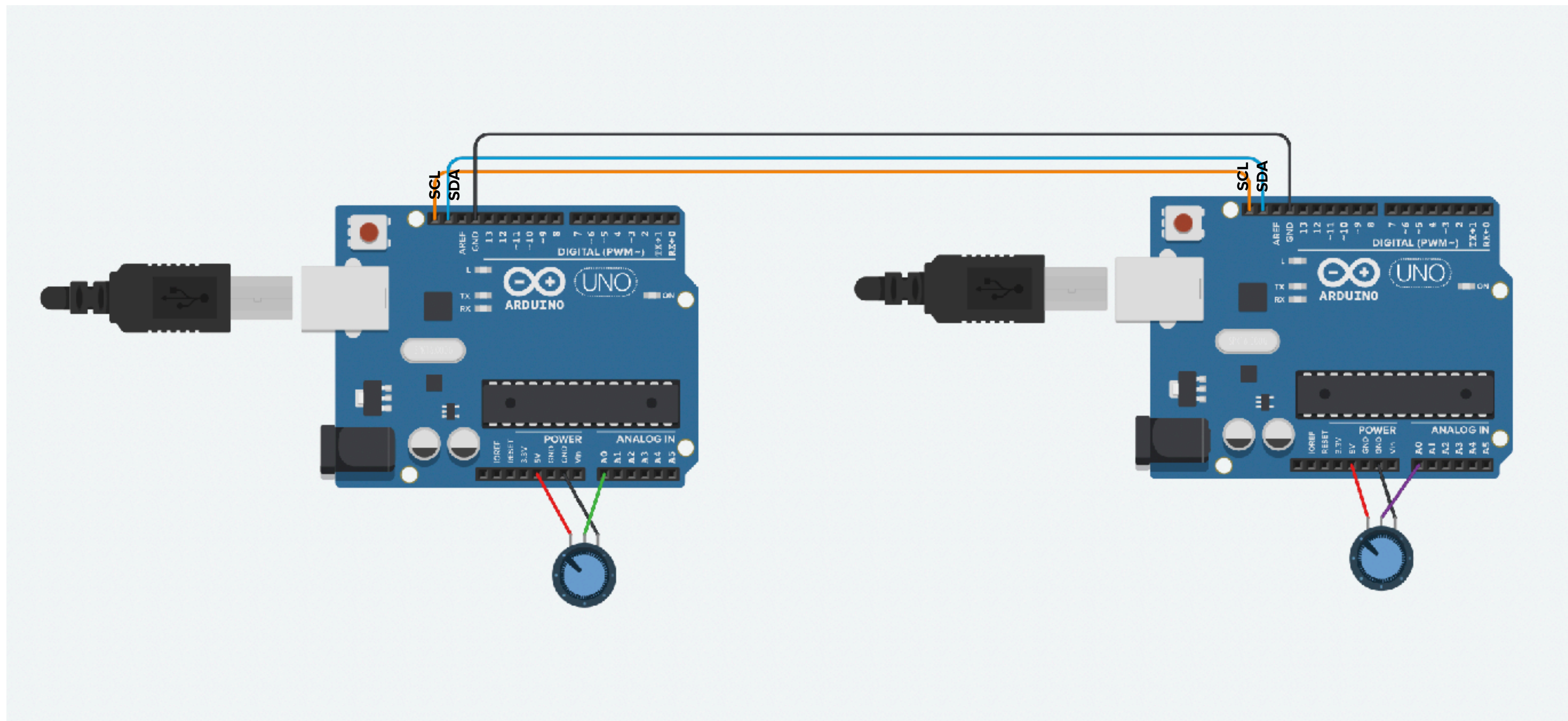
- Slower than SPI
- Works only

I²C (Inter Integrated Circuit)

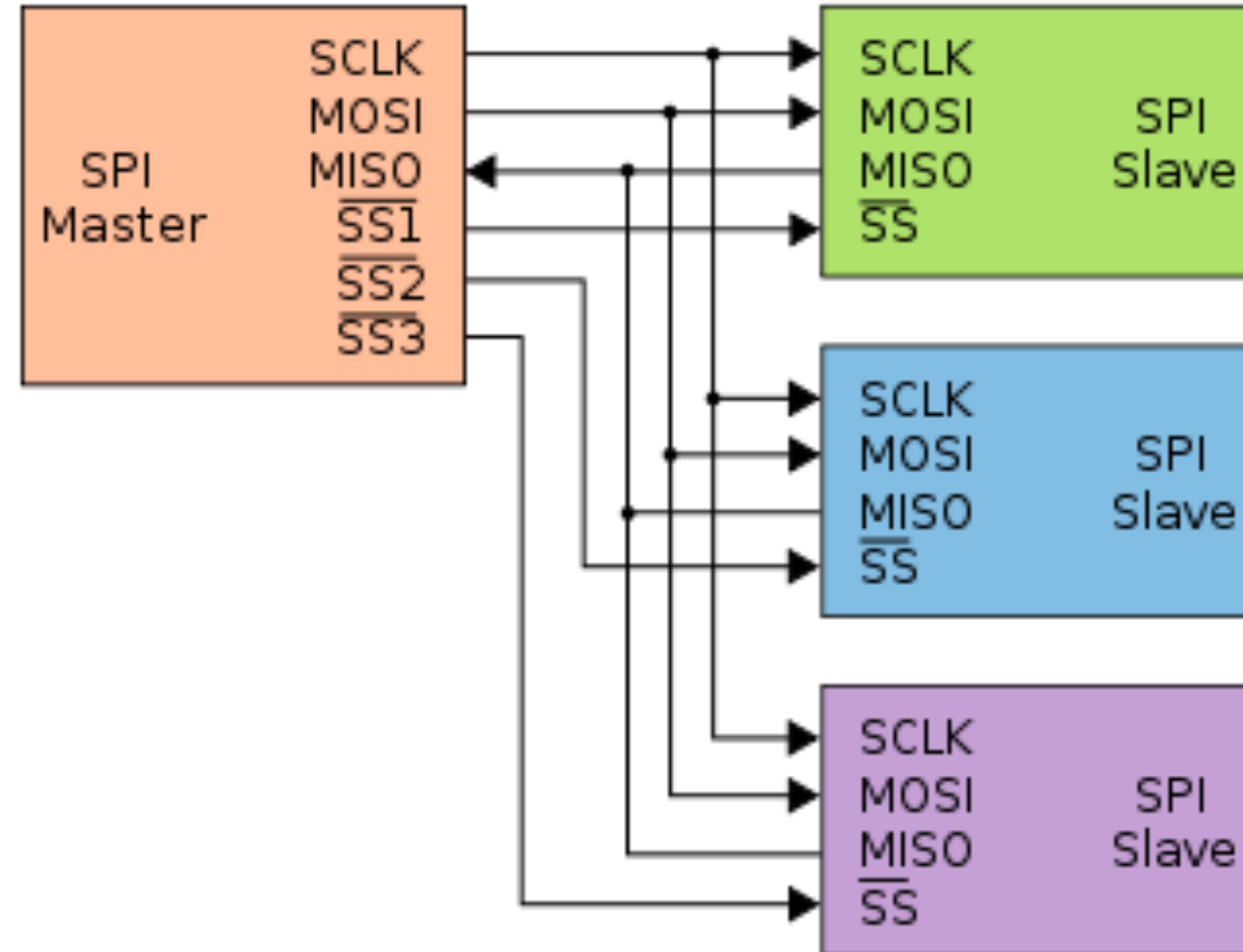


EXERCISE 2 in Groups (20min)

Connect Arduino together and send potentiometer signal to control inbuilt LEDs. Use the code found in Github to control the devices.



SPI (Serial Peripheral Interface)



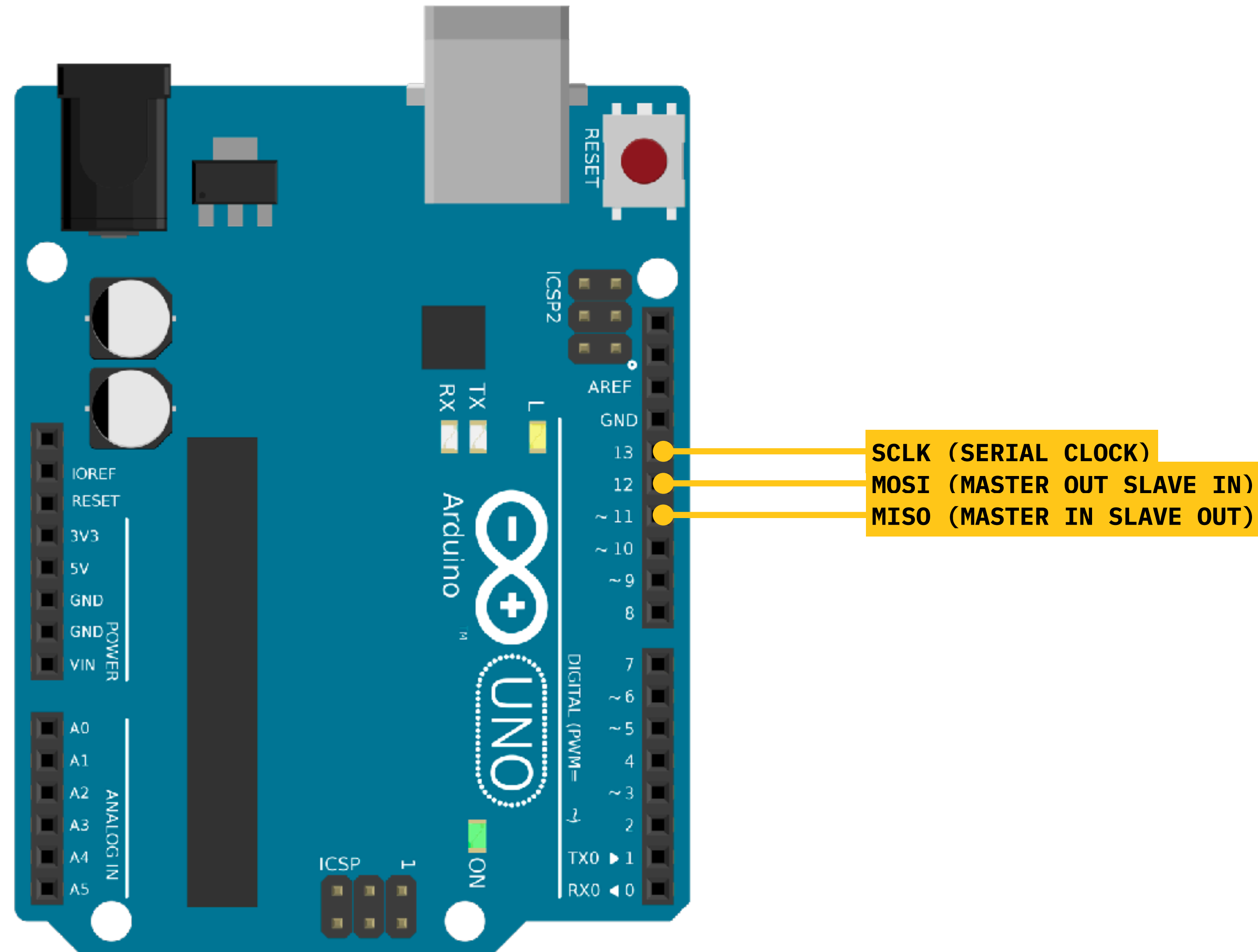
Uses:

- Fast communication
- Data can be send and received at the same time

Limitations:

- Requires a lot of pins

SPI (Serial Peripheral Interface)

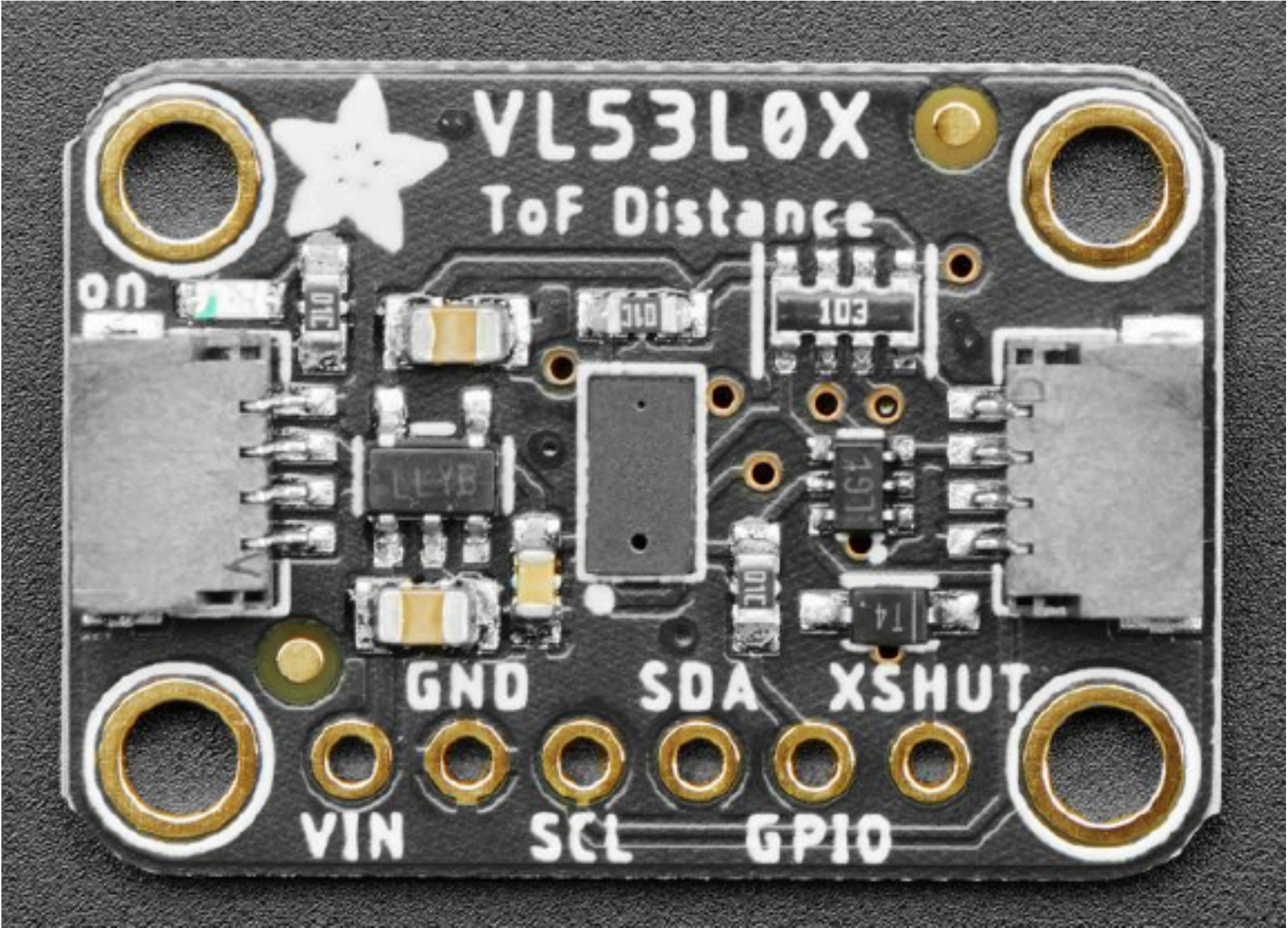


INTERACTION DESIGN

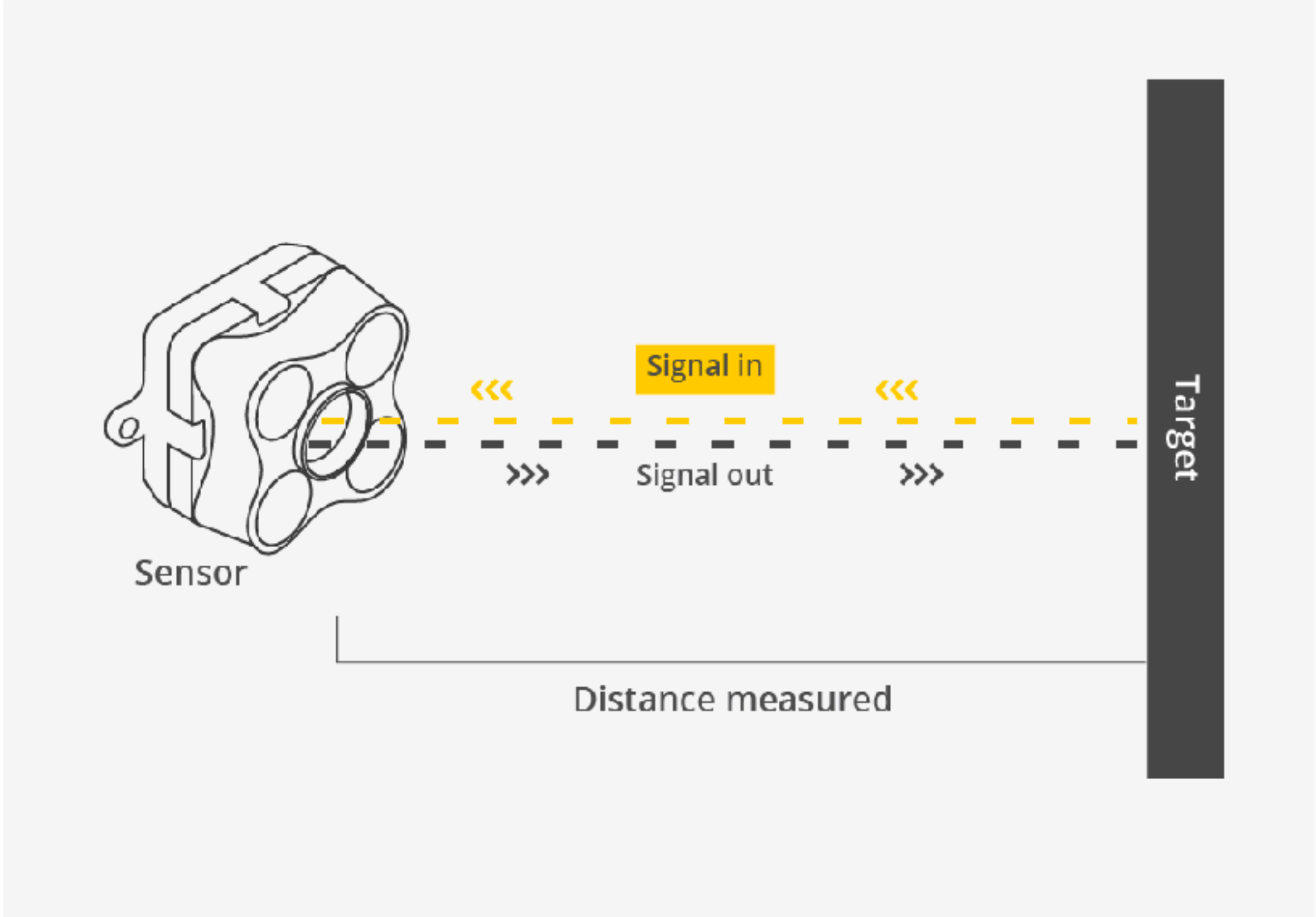
DIGITAL SENSORS

Physical Computing HS22

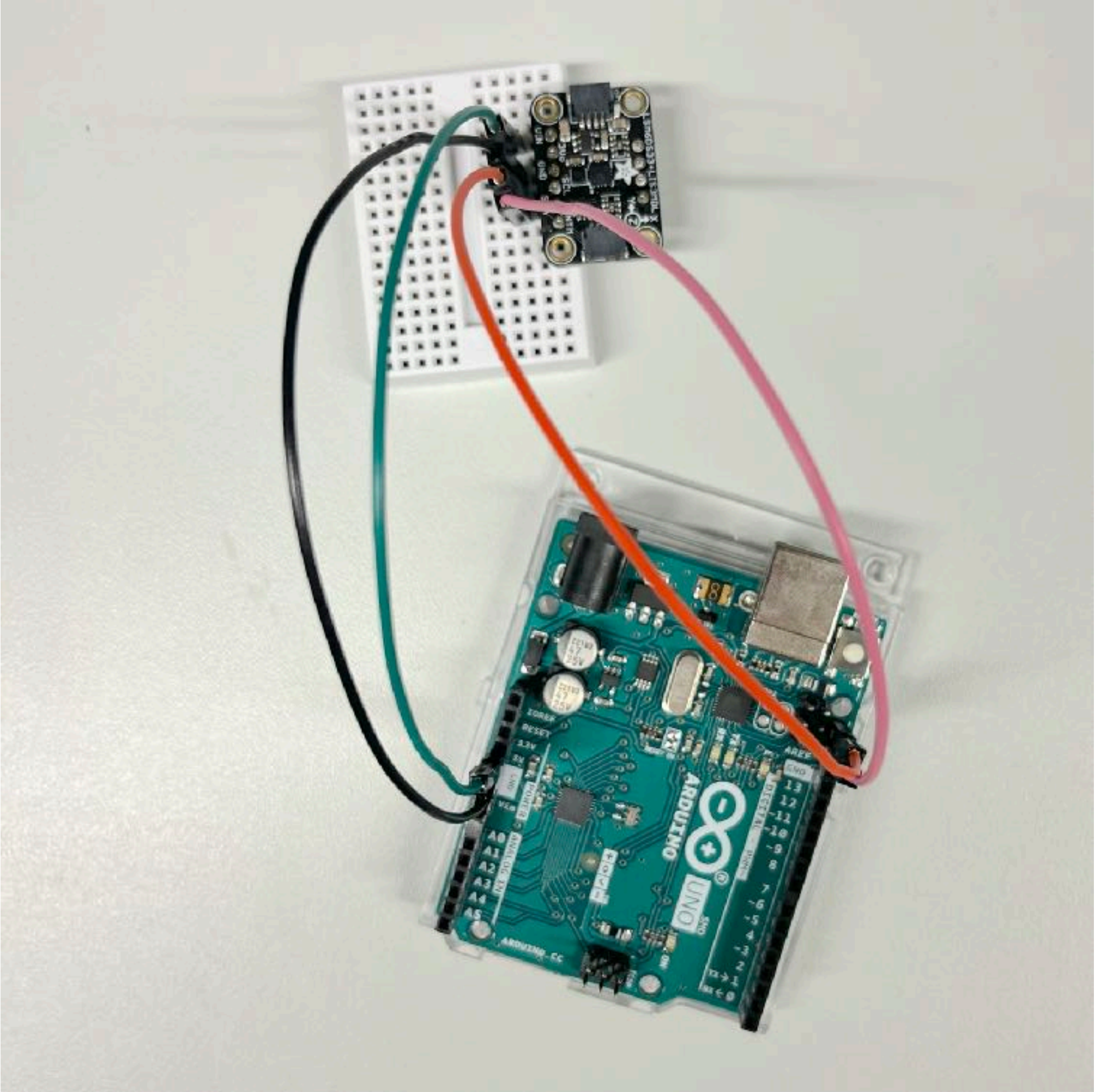
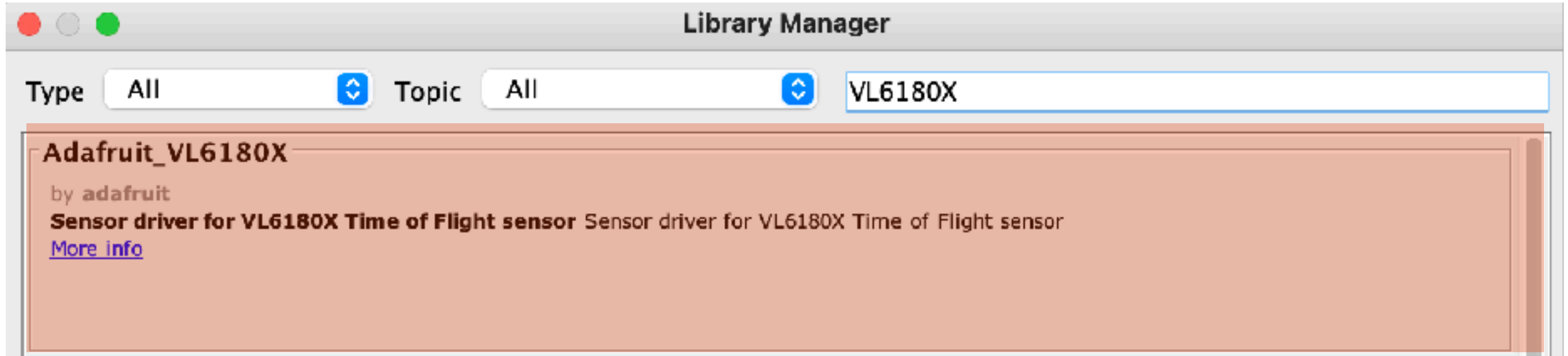
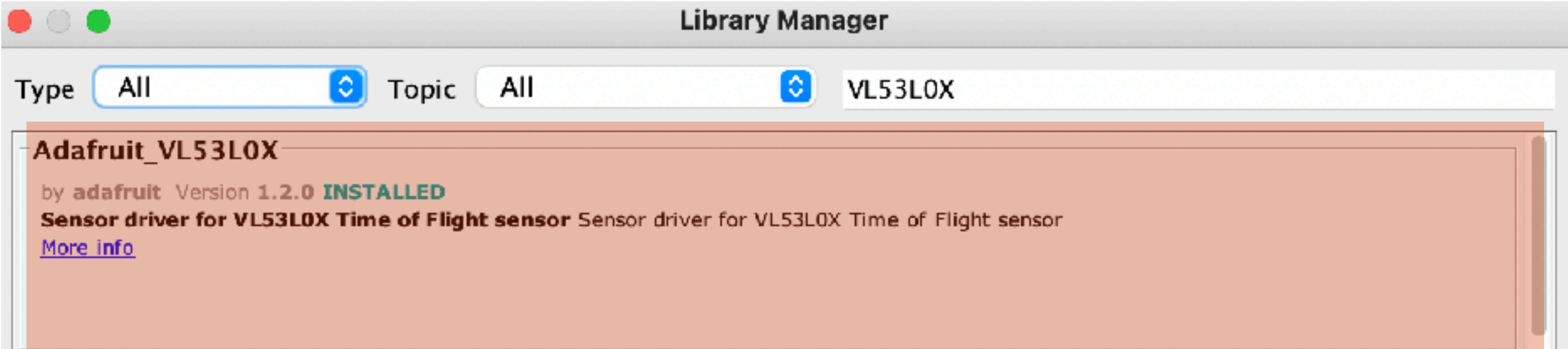
DISTANCE SENSOR



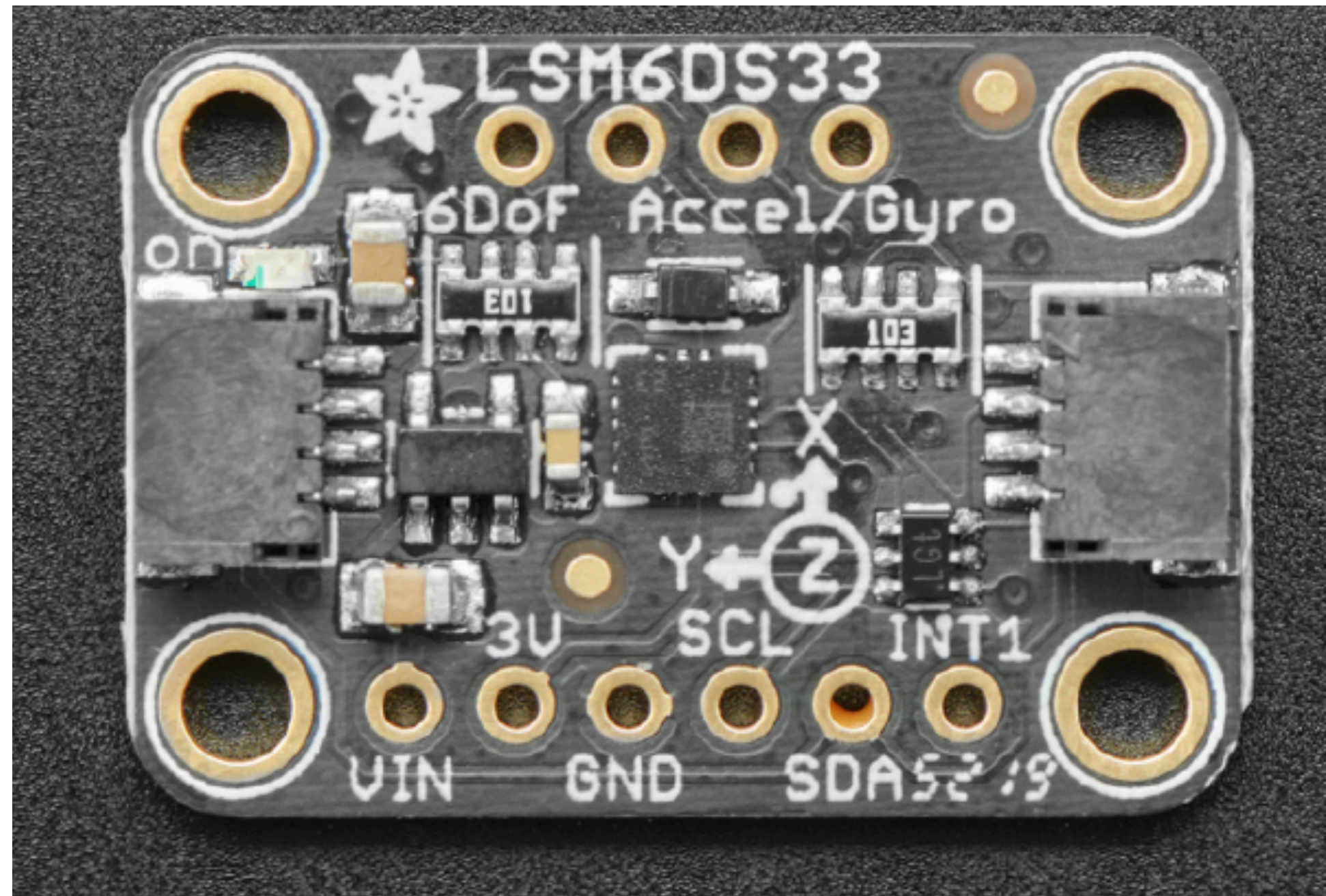
**VL53L0X OR VL6180X
TOF DISTANCE SENSOR**



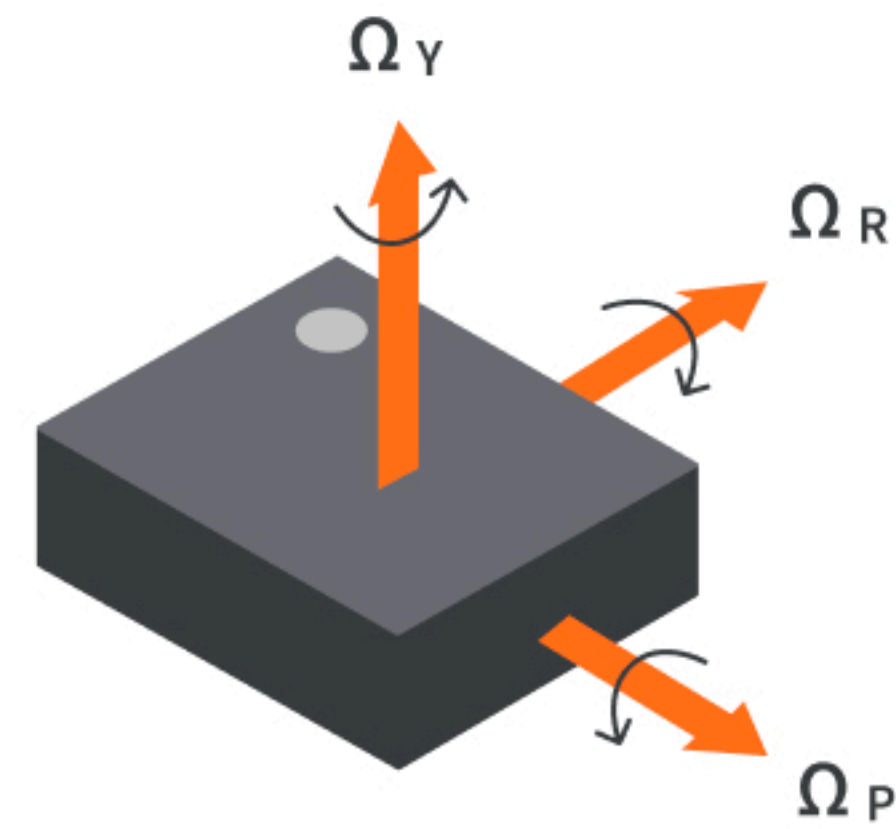
DISTANCE SENSOR



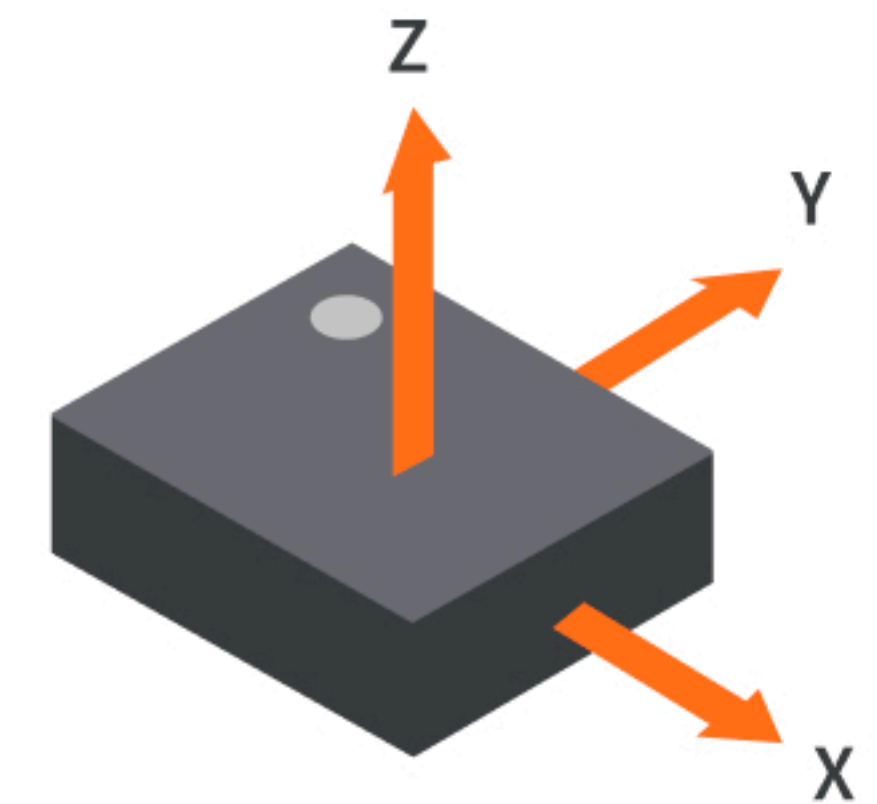
IMU (INERTIAL MEASUREMENT UNIT) SENSOR



LSM6DS33
IMU

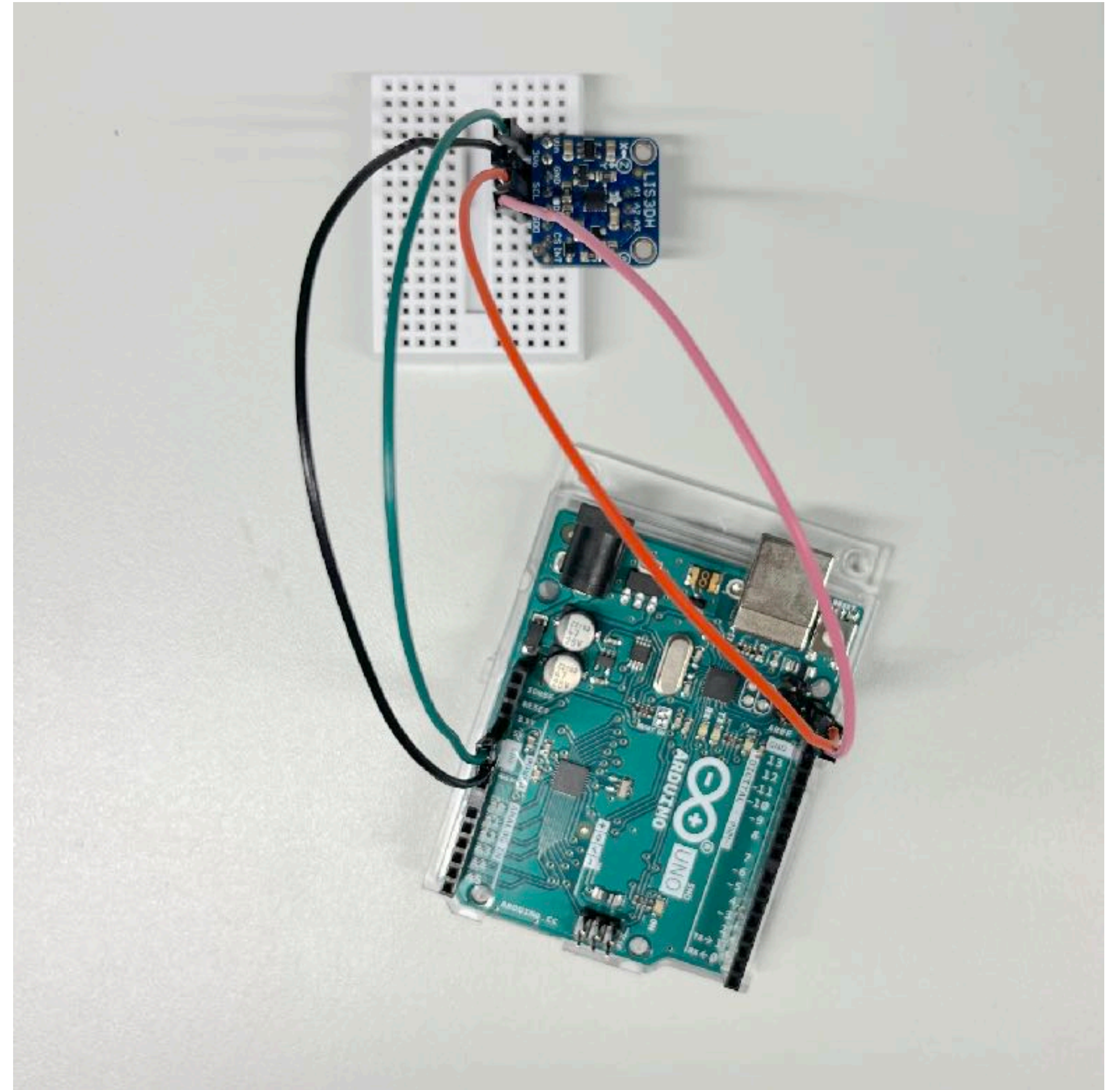
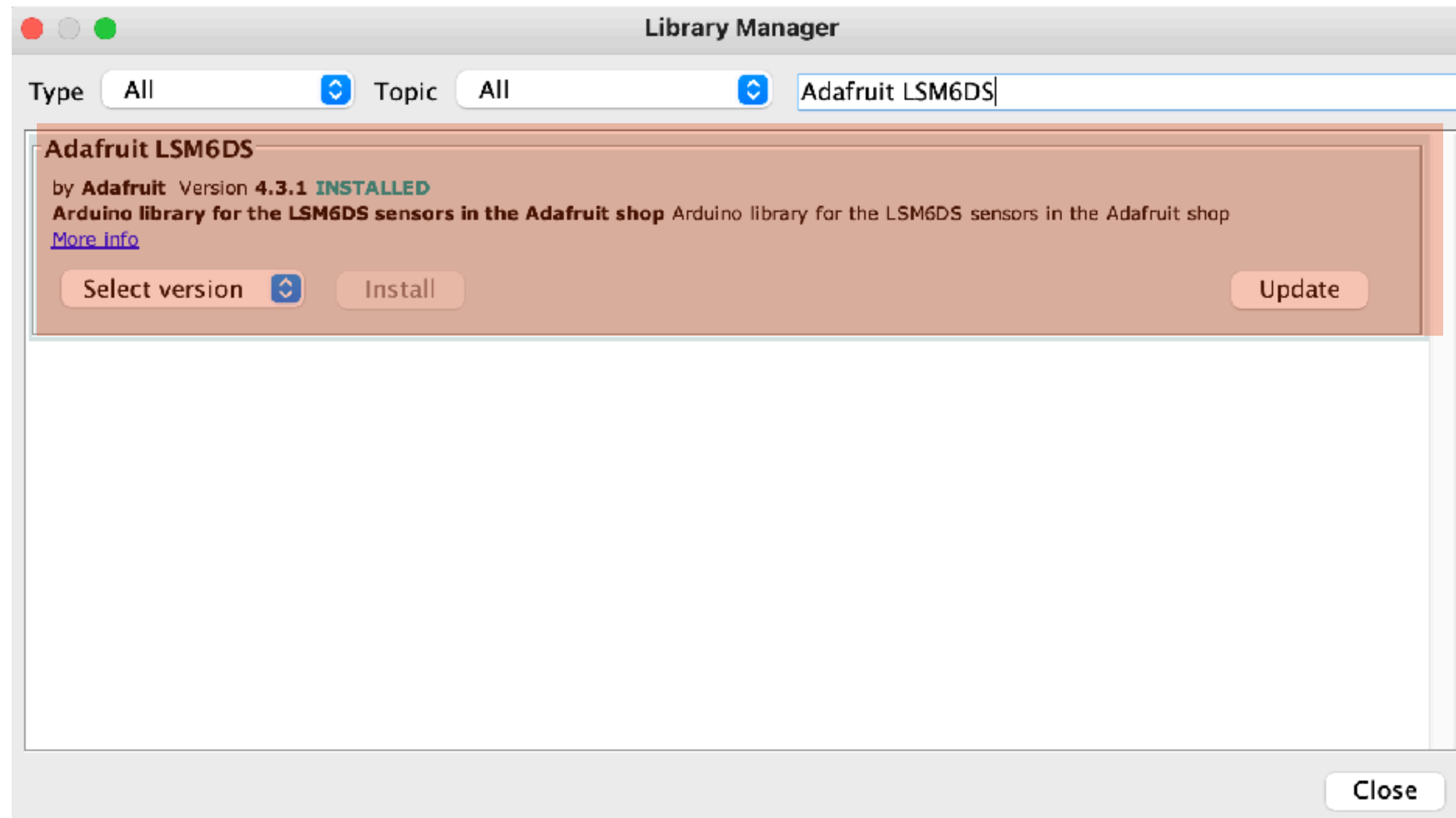


Gyroscope sensing
Angular orientation

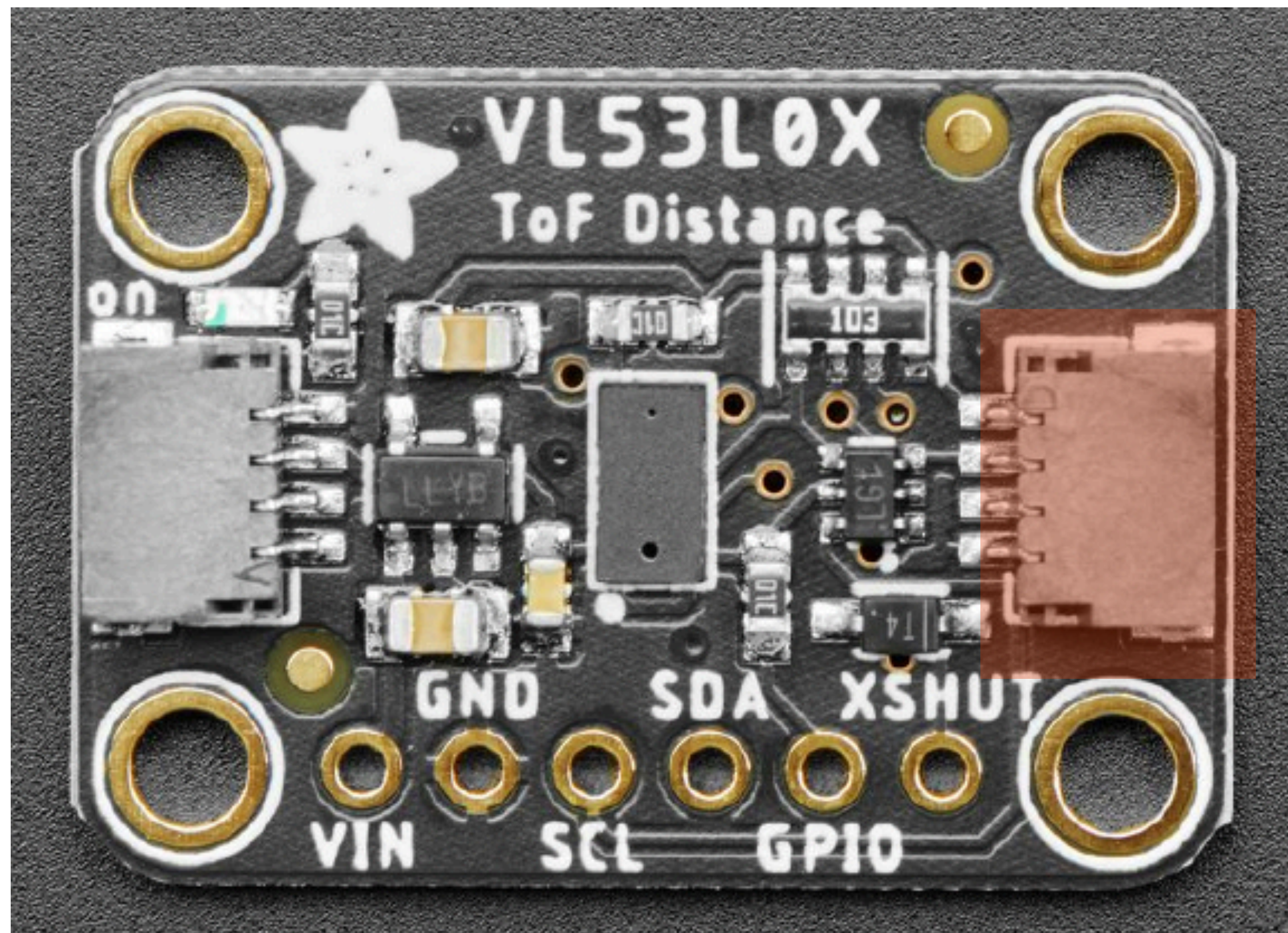


Accelerometer sensing
axis orientation

IMU (INERTIAL MEASUREMENT UNIT) SENSOR



STEMMA



STEMMA connectors were developed by Adafruit in 2018. There are 3 and 4 pin JST connectors.

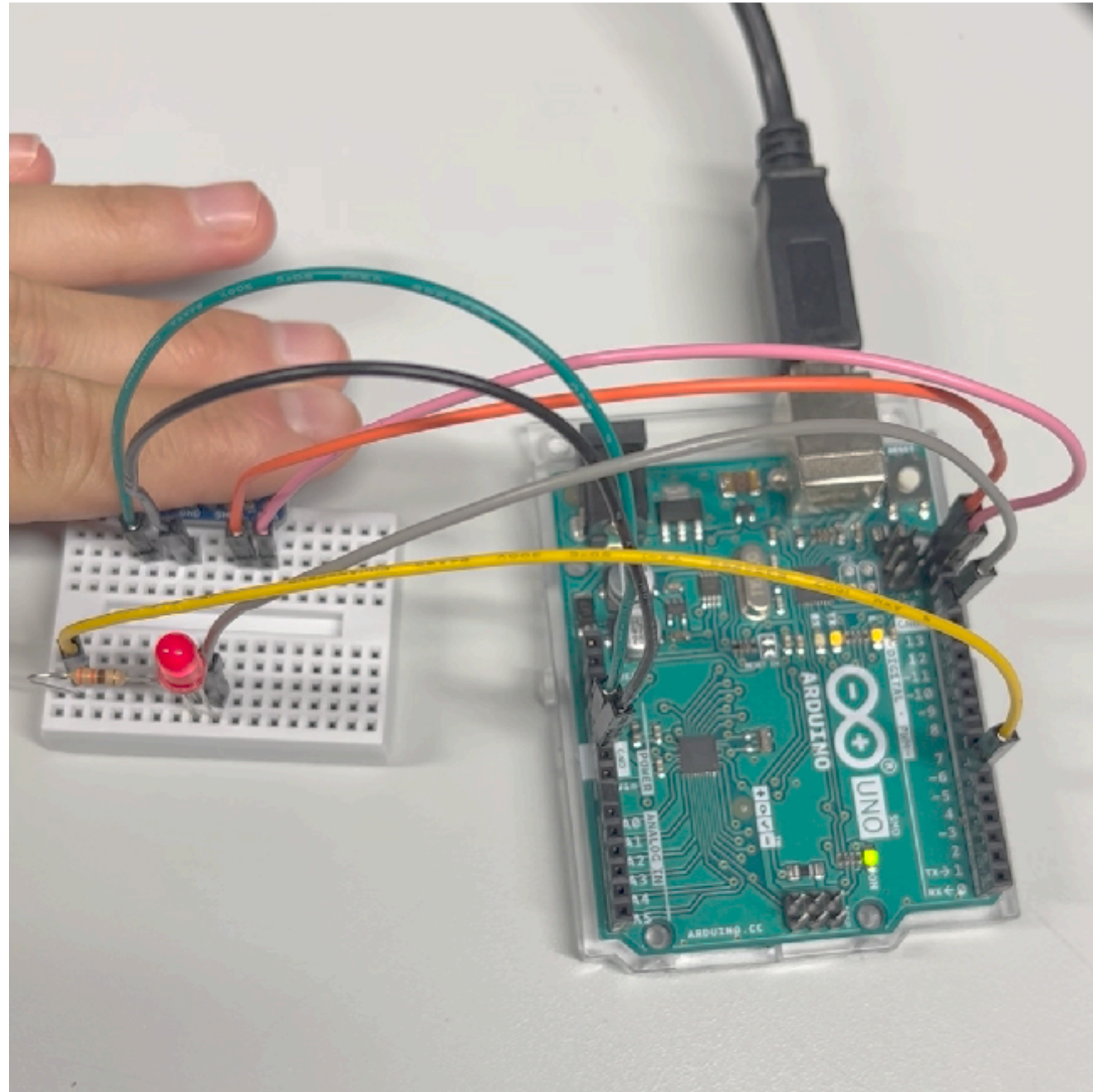
The make it easy to plug-n-play various sensors and devices without a lot of wiring.

EXERCISE 3 (10min)

Using a reference page of your sensor (found on its Adafruit page under "Pinouts") plug it to the Arduino and run a test sketch from the installed library. Open Serial Monitor to check the incoming data.

IMPORTANT! Check the baud rate in Serial Monitor so it matches the baud rate in `Serial.begin()`;

EXERCISE 4 (30min)



Using either TOF or IMU sensor, control the brightness of LED lightbulb with incoming data.