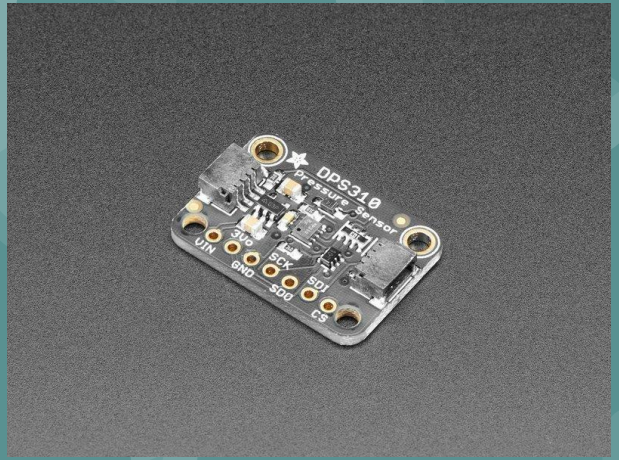
DPS 310
(Digital Pressure Sensor)



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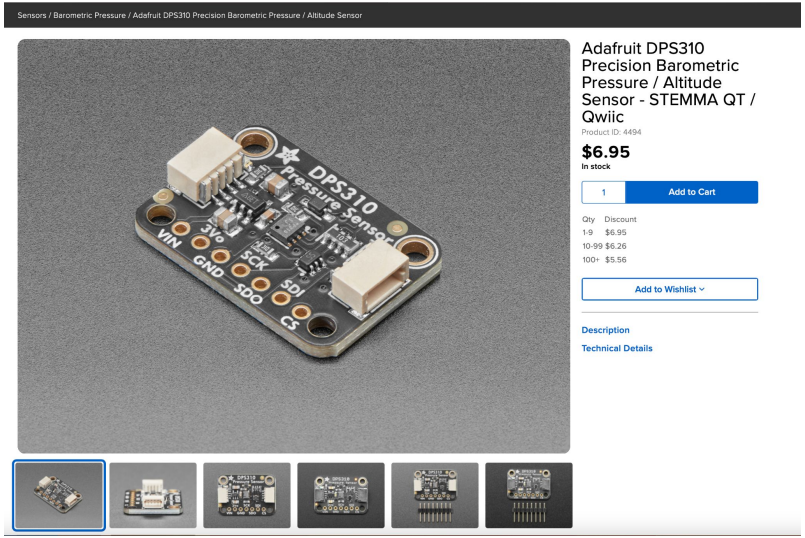
What is DPS310?

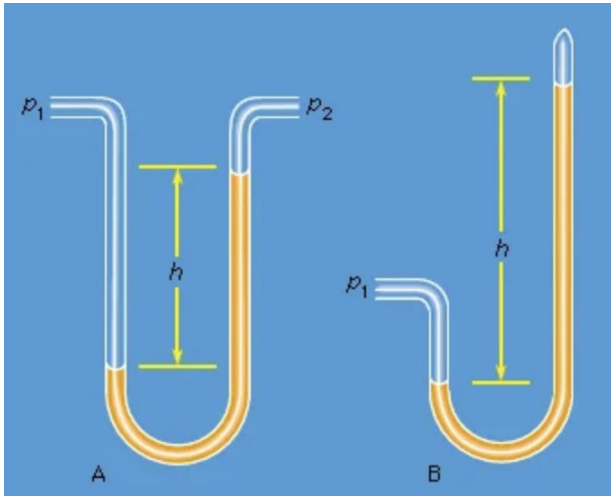
- A high-precision digital barometric pressure sensor
- Designed to measure barometric pressure and temperature with very high accuracy
- That means you can know your absolute altitude with 1 meter accuracy when you set the sea-level pressure, and measure changes in altitude with up to 2 cm precision



Specification

- I2C and SPI compatible
- High-precision barometric sensor,
  - with ±0.002 hPa precision
  - ± 1 hPa absolute accuracy
- The temperature built in has a ± 0.5°C accuracy
- 300 to 1200 hPa
- Temperature range: -40 to 85 °C

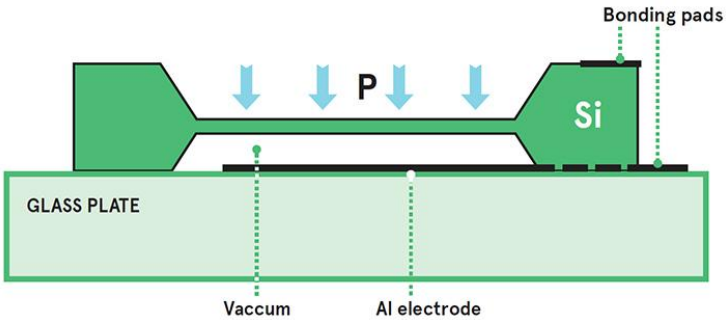
How does a barometric pressure sensor work?



Works through balancing a column of mercury and measures the height of the mercury column (mmHG)

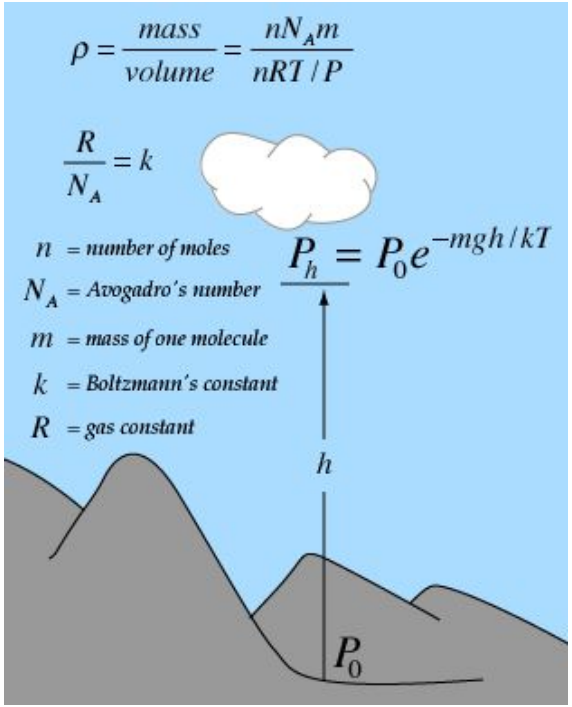
Modern-day barometric pressure sensors

- No longer require liquid for sensing, resulting in better accuracy
- Contains a diaphragm that’s formed through one capacitive plate that’s in contact with the atmosphere
- Atmospheric pressure is detected through how much the diaphragm is deformed due to resulting pressure



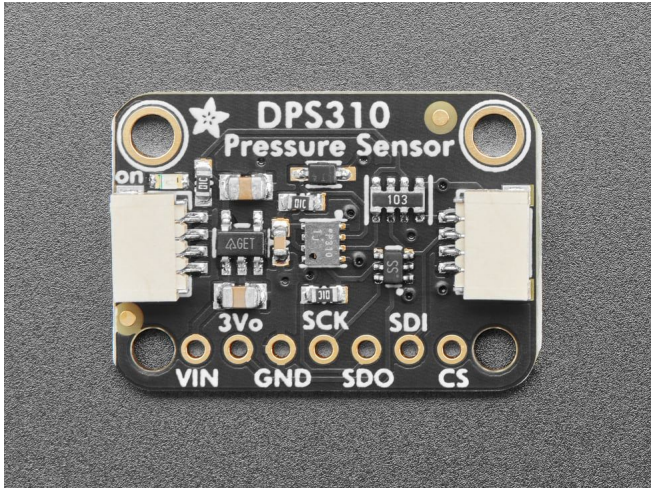
How DPS310 can be used as altimeter?

- The barometric equation shows that as altitude increases, atmospheric pressure decreases exponentially. This is because there is less air above a given point as you move higher in the atmosphere, and therefore less weight pressing down on that point.
- The DPS310 in our lab would help us identify the altitude difference compare to each sensor and get to know their relative position.



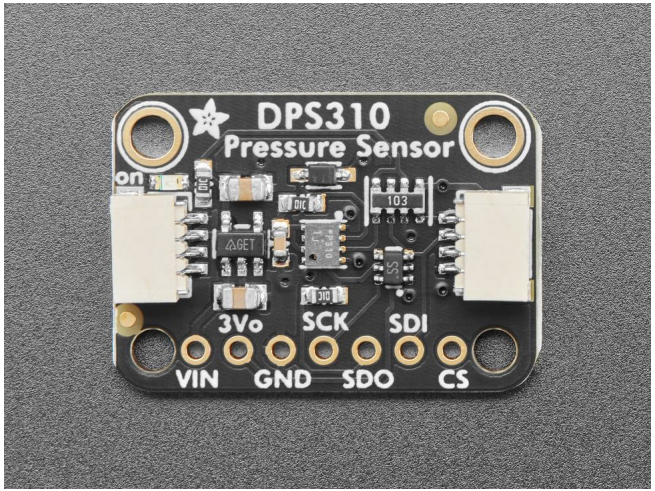
Power pins

- **Vin** - Power pin. Since the sensor chip uses 3 VDC, we have included a voltage regulator on board that will take 3-5VDC and safely convert it down.
- **3Vo** - 3.3V output from the voltage regulator
- **GND** - Common ground for power and logic



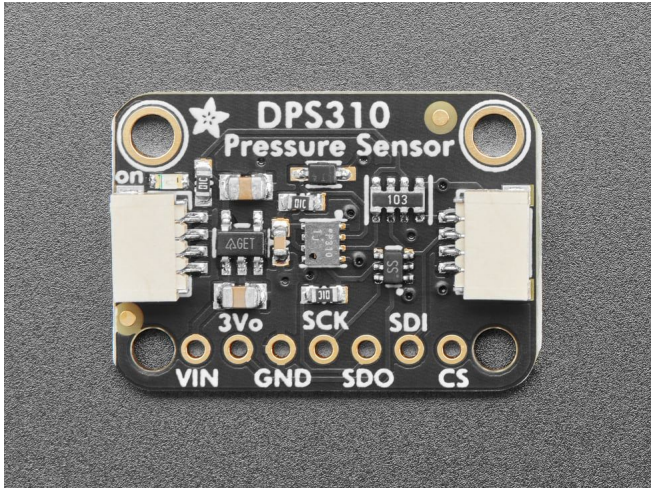
I2C Logic Pins:

- **SCK** - Also the I2C clock pin SCL, connect to your microcontroller I2C clock line. This pin is level shifted, and has a 10K pullup.
- **SDI** - Also the I2C data pin SDA, connect to your microcontroller I2C data line. This pin is level shifted, and has a 10K pullup.
- **SDO** - Also the I2C address pin ADR. Pulling this pin low to GND or bridging the solder jumper on the back will change the I2C address from 0x77 to 0x76
- **STEMMA QT** - These connectors allow you to connect to dev boards with STEMMA QT connectors or to other things with various associated accessories



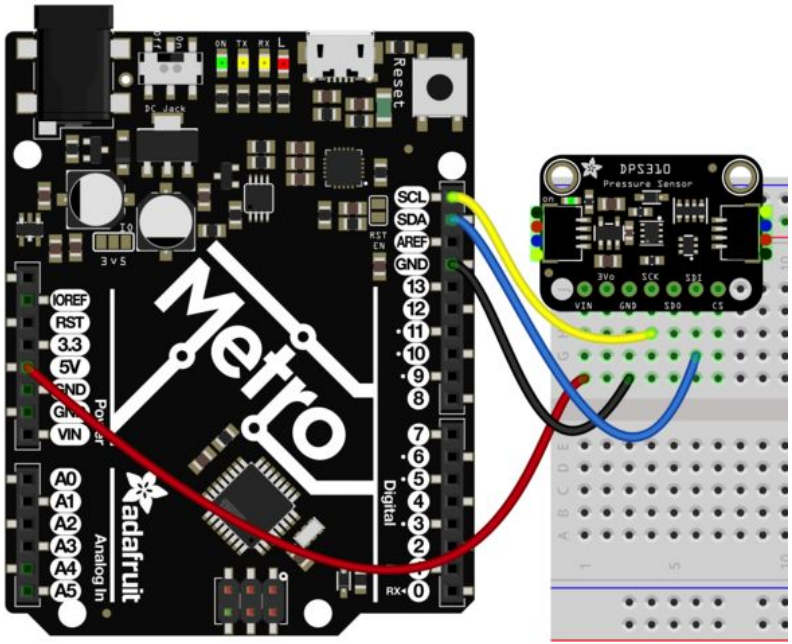
SPI Logic pins:

- **SCK** - SPI Clock pin, an input to the chip
- **SDO** - Serial Data Out / Microcontroller In Sensor Out, for data sent from the DPS310 to processor.
- **SDI** - Serial Data In / Microcontroller Out Sensor In pin, for data sent from processor to the DPS310
- **CS** - Chip Select pin, drop it low to start an SPI transaction.



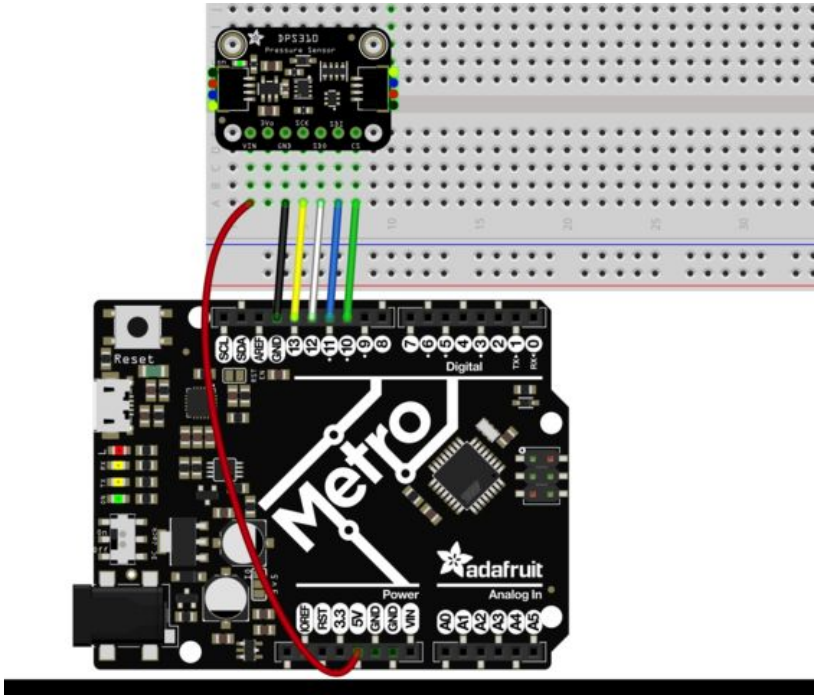
Arduino connection-I2C

- **Vin** -> 3V or 5V
- **GND** -> Arduino GND
- **SCL** -> Arduino SCL
- **SDA** -> Arduino SDA



Arduino connection-SPI

- **Vin** -> 3V or 5V
- **GND** -> common power/data ground
- **SCK** -> Digital #13
- **SDO** -> Digital #12
- **SDI** -> Digital #11
- **CS** -> Digital #10



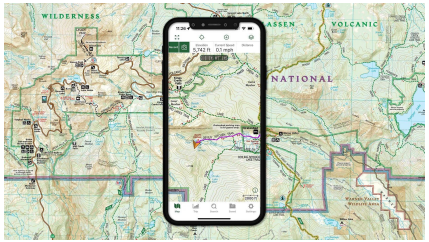
Code setup

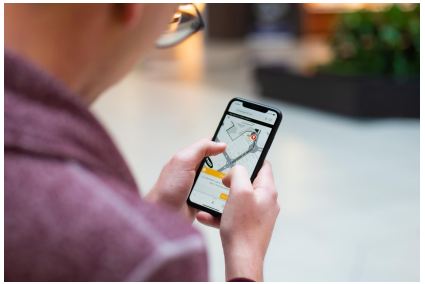
```
// This example shows how to read temperature/pressure

#include <Adafruit_DPS310.h>

Adafruit_DPS310 dps;

// Can also use SPI!
#define DPS310_CS 10

void setup() {
  Serial.begin(115200);
  while (!Serial) delay(10);

  Serial.println("DPS310");
  if (! dps.begin_I2C()) {             // Can pass in I2C address here
  //if (! dps.begin_SPI(DPS310_CS)) {  // If you want to use SPI
    Serial.println("Failed to find DPS");
    while (1) yield();
  }
  Serial.println("DPS OK!");

  dps.configurePressure(DPS310_64HZ, DPS310_64SAMPLES);
  dps.configureTemperature(DPS310_64HZ, DPS310_64SAMPLES);
}
```

```
void loop() {
  sensors_event_t temp_event, pressure_event;

  while (!dps.temperatureAvailable() || !dps.pressureAvailable()) {
    return; // wait until there's something to read
  }

  dps.getEvents(&temp_event, &pressure_event);
  Serial.print(F("Temperature = "));
  Serial.print(temp_event.temperature);
  Serial.println(" *C");

  Serial.print(F("Pressure = "));
  Serial.print(pressure_event.pressure);
  Serial.println(" hPa");

  Serial.println();
}
```

Application of the sensor

- **Drone**
  - flight stability and height control)
- **Indoor Navigation**
  - Floor detection e.g. in shopping malls, parking garages
- **Outdoor Navigation**
  - GPS start-up time and accuracy improvement, dead-reckoning e.g. in tunnels
- **Weather Station**
  - 'Micro-weather' and local forecasts
- **HVAC control**
  - DPS310 can be used in heating, ventilation, and air conditioning (HVAC) systems to measure atmospheric pressure and adjust fan speeds and airflows accordingly.





References

- https://www.adafruit.com/product/4494?gclid=CjwKCAiA9NGfBhBvEiwAq5vSy7aS-sZqBM9g-cNzFGRkETt9xYmWUqa3dwV9sk-SLbsWZgvTXMaMZhoC5ywQAvD_BwE
- https://learn.adafruit.com/adafruit-dps310-precision-barometric-pressure-sensor/pinouts
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