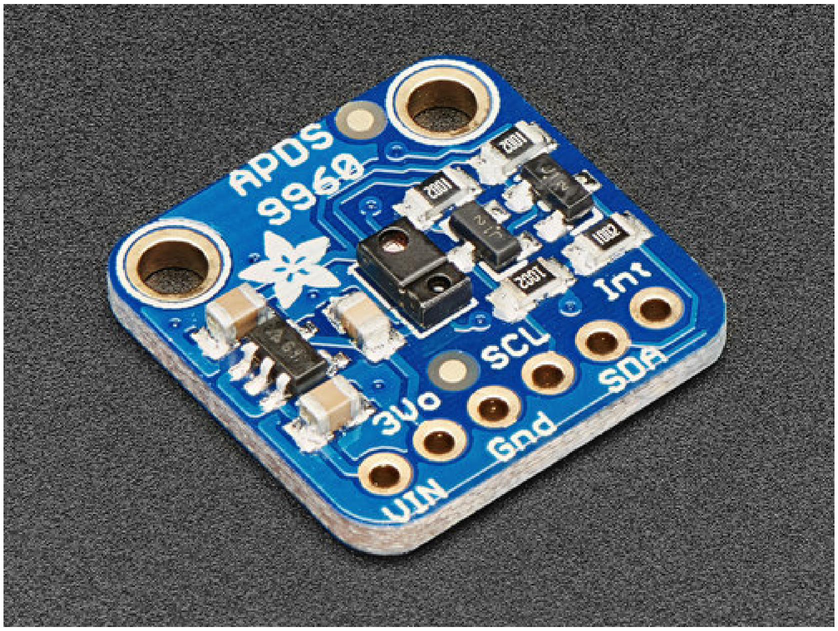
adafruit learning system

Adafruit APDS9960 breakout

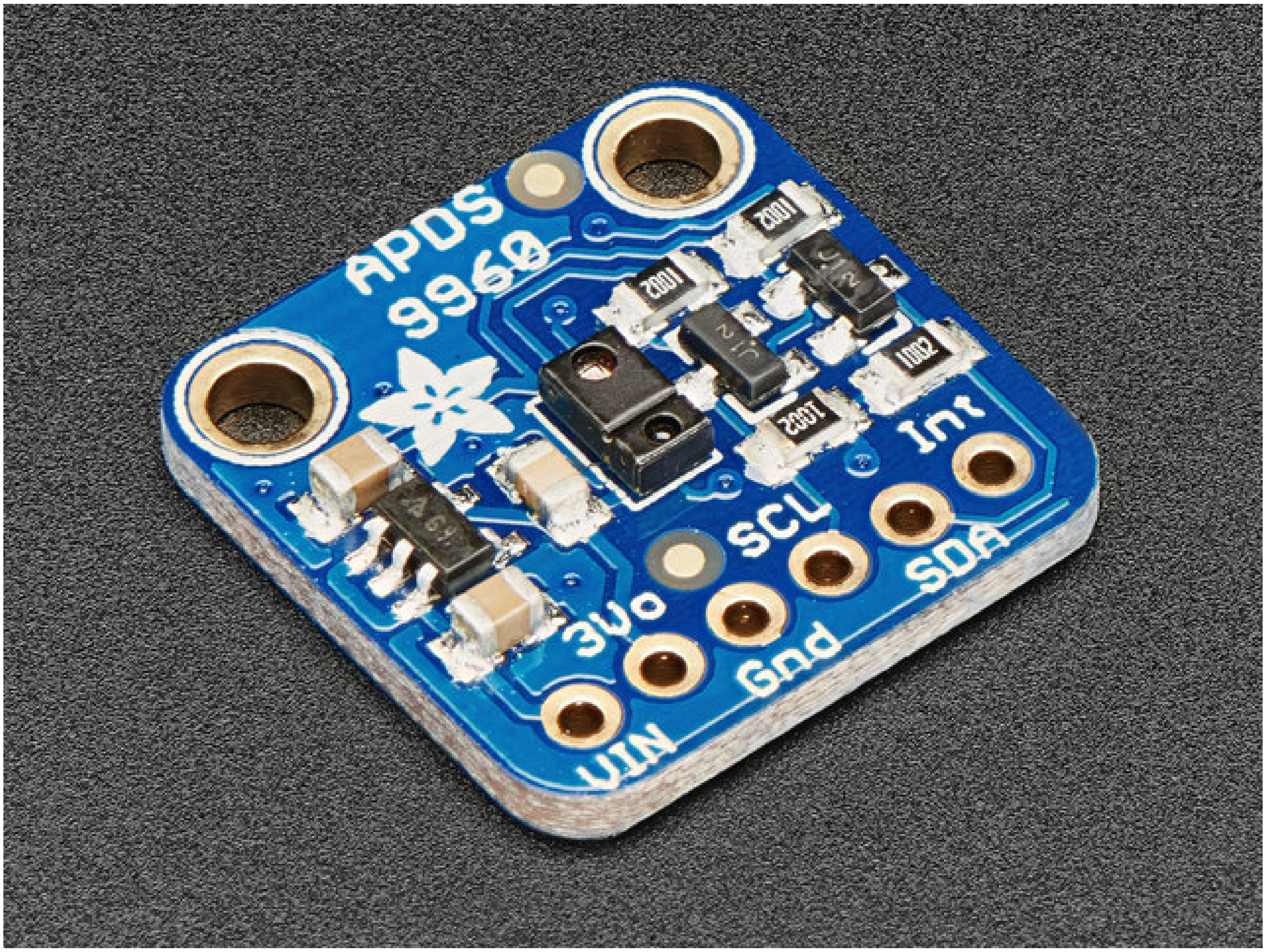
Created by Dean Miller



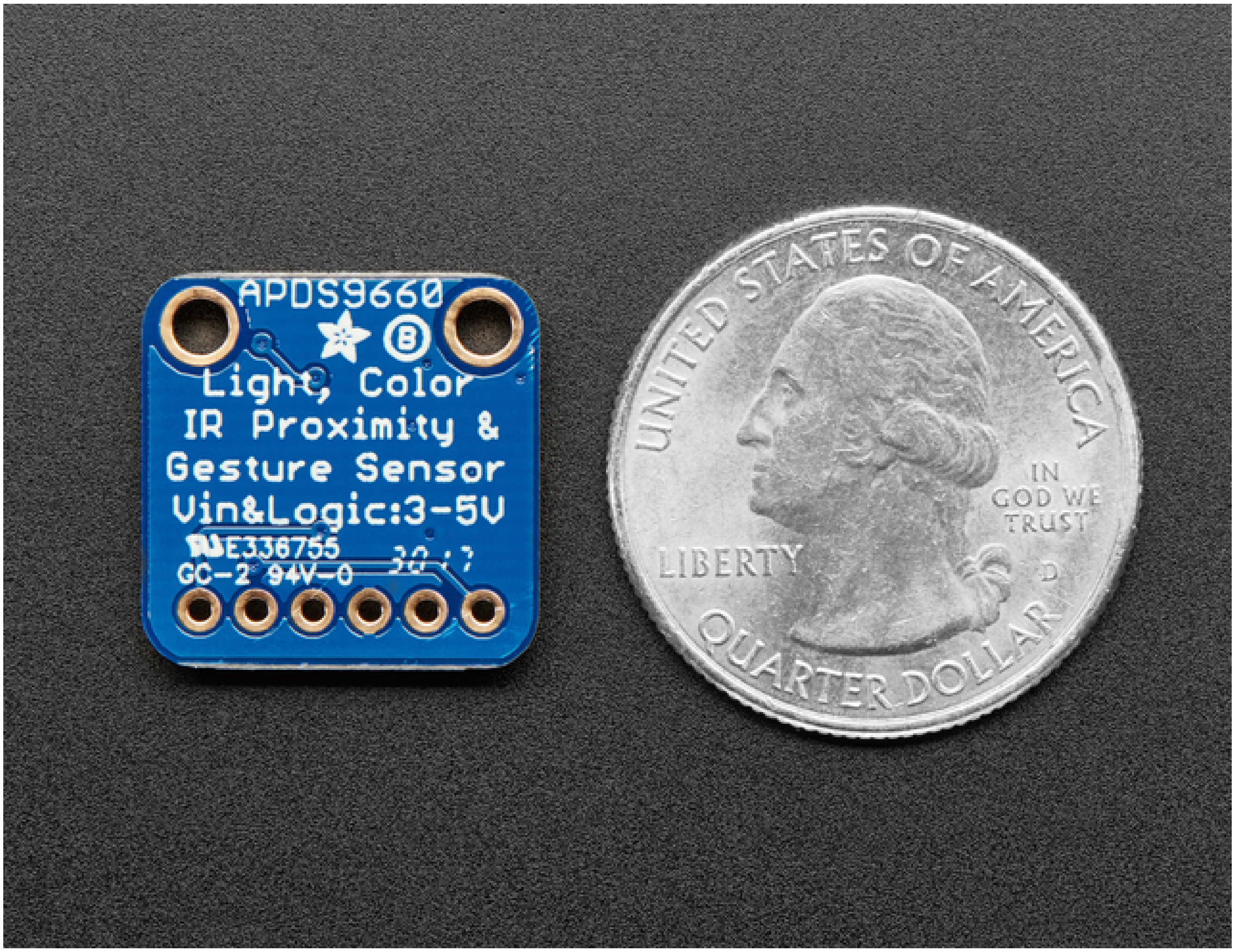
Last updated on 2017-09-21 04:30:56 PM UTC

Guide Contents

Overview



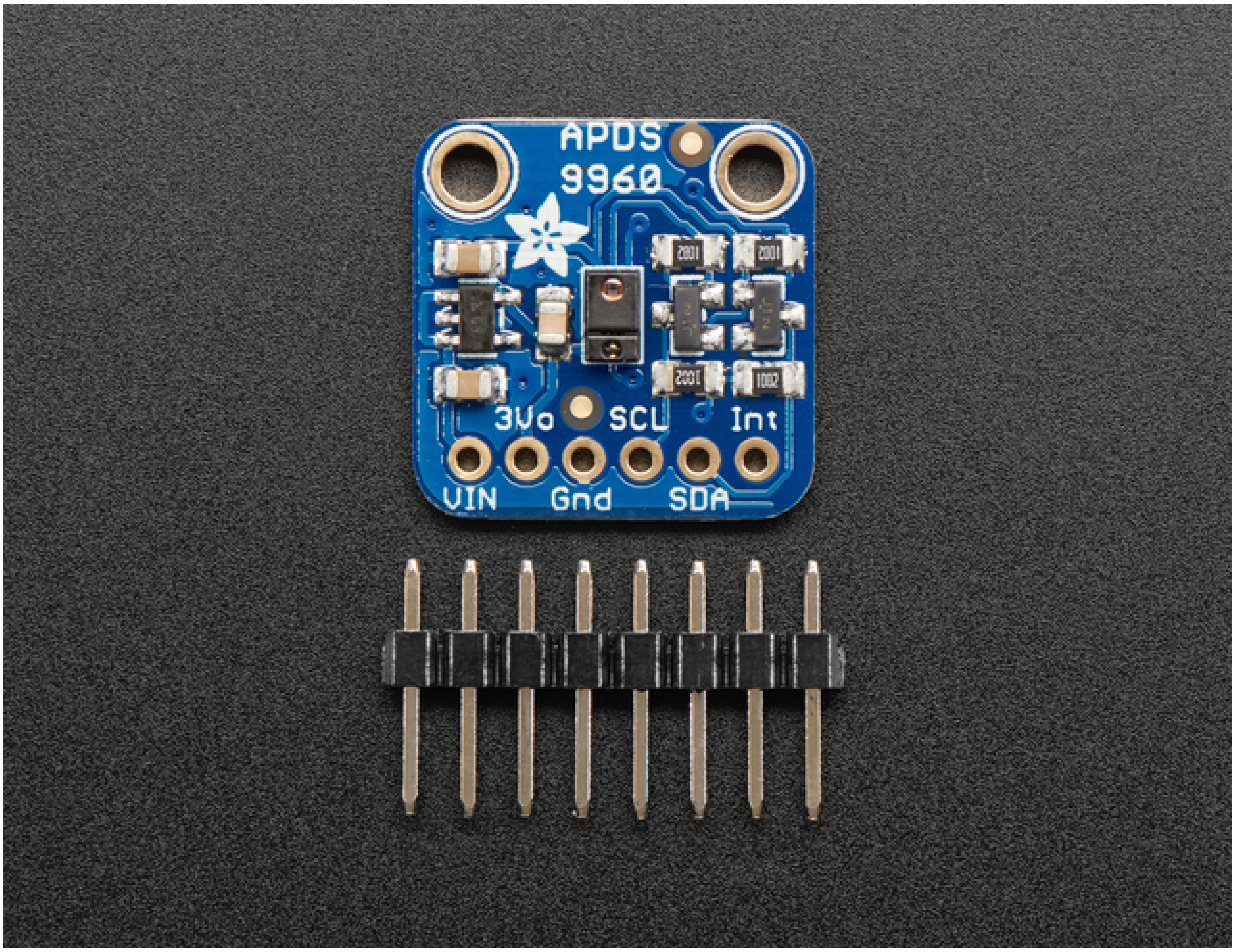
This handy sensor is full of features! Add basic gesture sensing, RGB color sensing, proximity sensing, or ambient light sensing to your project with the **Adafruit APDS9960 Proximity, Light, RGB and Gesture Sensor**. When connected to your microcontroller (running our library code) it can detect simple gestures (left to right, right to left, up to down, down to up are currently supported), return the amount of red, blue, green, and clear light, or return how close an object is to the front of the sensor. This device uses an I2C interface so it's easy to wire up and use.



The APDS9960 from Avago Technologies has an integrated IR LED and driver, along with four directional photodiodes that sense reflected IR energy from the LED. It's proximity detection feature allows it to measure the distance an object is from the front of the sensor (up to a few centimeters) with 8 bit resolution.

Since there are four IR sensors, you can measure the changes in light reflectance at each of the cardinal locations over time and turn those changes into gestures. Our interface library can detect directional gestures (left to right, right to left, up to down, down to up), but in theory more complicated gestures like zig-zag, clockwise or counterclockwise circle, near to far, etc. could also be detected with additional code.

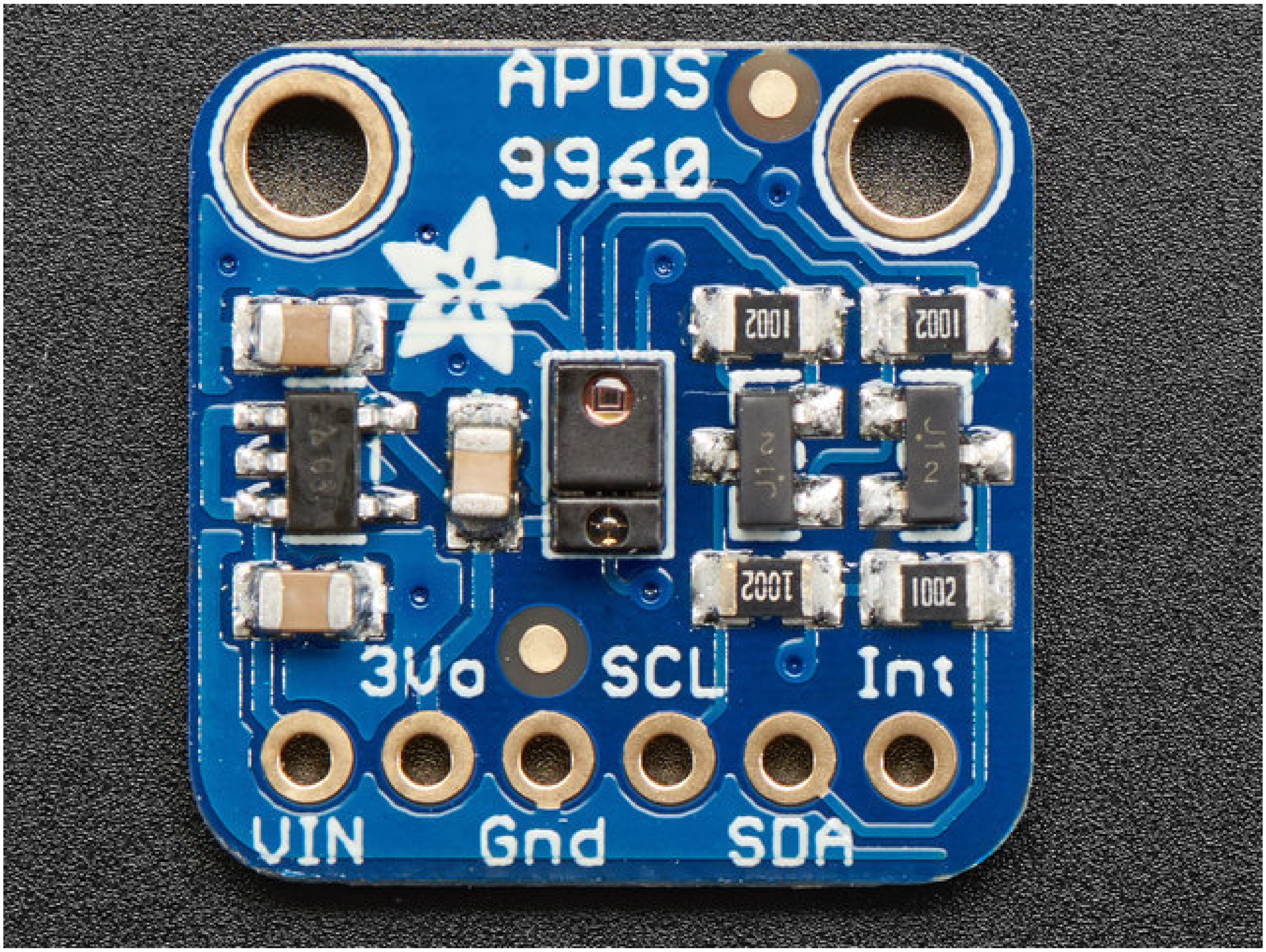
The APDS9960 has a configurable interrupt that can fire when a certain proximity threshold is broken, or when a color sensor breaks a certain threshold.



For your convenience we've pick-and-placed the sensor on a PCB with a 3.3V regulator and some level shifting so it can be easily used with your favorite 3.3V or 5V microcontroller.

We've also prepared software libraries to get you up and running in Arduino with just a few lines of code!

Pinouts



This sensor has 2 mounting holes and one header breakout strip.

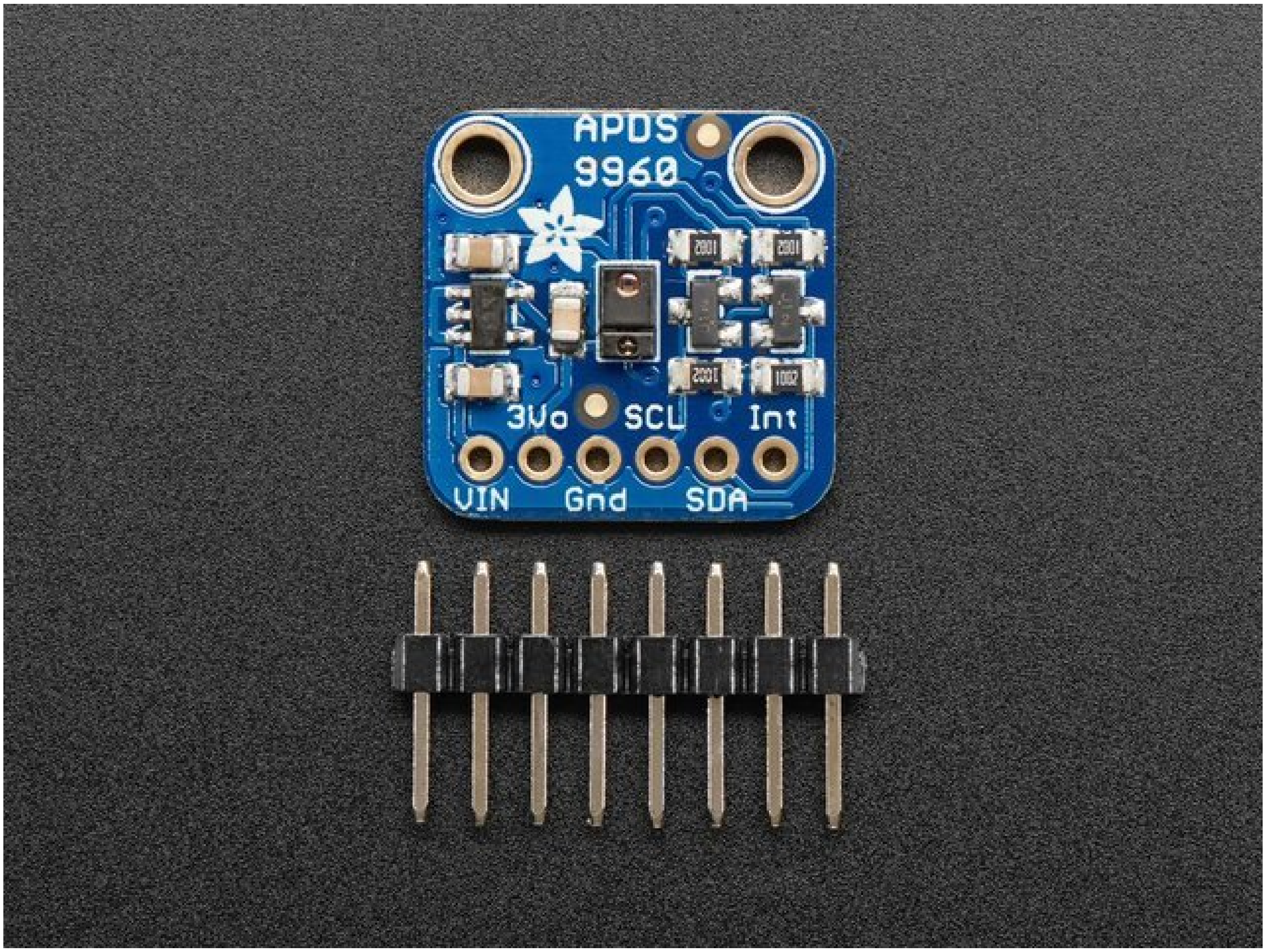
Power Pins:

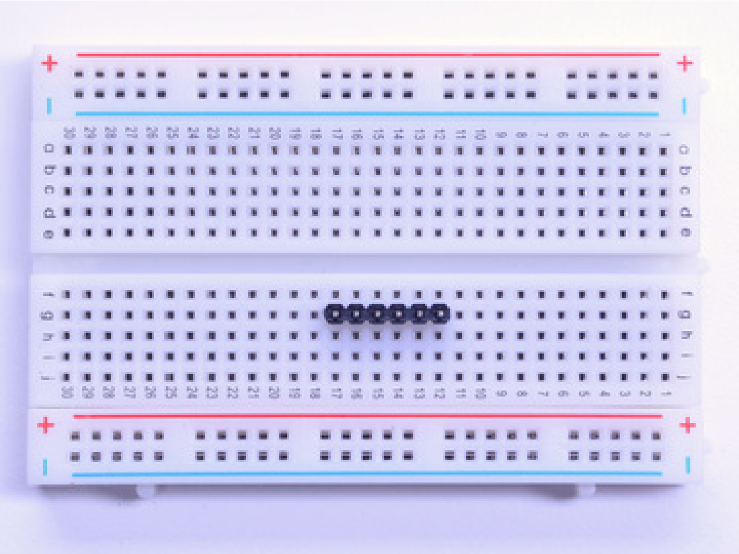
- **Vin** - this is the power pin. Since the sensor uses 3.3V, we have included an onboard voltage regulator that will take 3-5VDC and safely convert it down. To power the board, give it the same power as the logic level of your microcontroller - e.g. for a 5V micro like Arduino, use 5V
- **3Vo** - this is the 3.3V output from the voltage regulator, you can grab up to 100mA from this if you like
- **GND** - common ground for power and logic

Logic pins:

- **SCL** - this is the I2C clock pin, connect to your microcontrollers I2C clock line. There is a 10K pullup on this pin and it is level shifted so you can use 3 - 5VDC.
- **SDA** - this is the I2C data pin, connect to your microcontrollers I2C data line. There is a 10K pullup on this pin and it is level shifted so you can use 3 - 5VDC.
- **INT** - this is the interrupt-output pin. It is 3V logic and you can use it to detect when a new reading is ready or when a reading gets too high or too low.

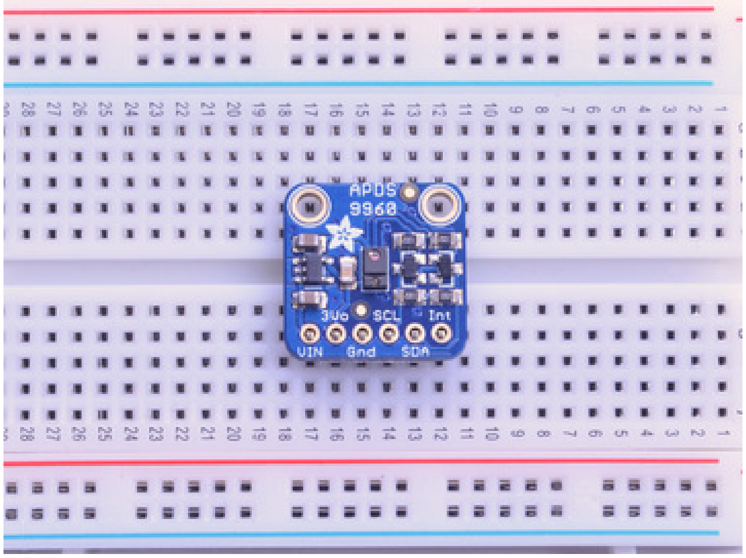
Assembly



- 

Prepare the header strip:

Cut the strip to length if necessary. It will be easier to solder if you insert it into a breadboard - **long pins down**

- 

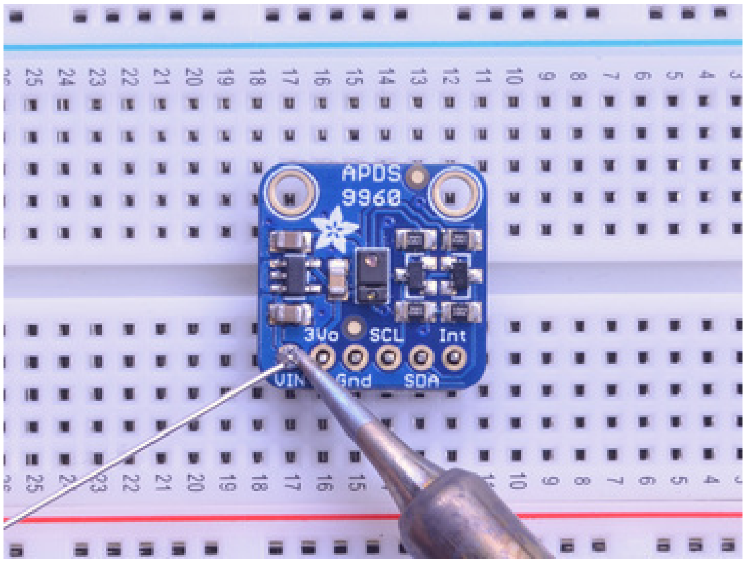
Add the breakout board:

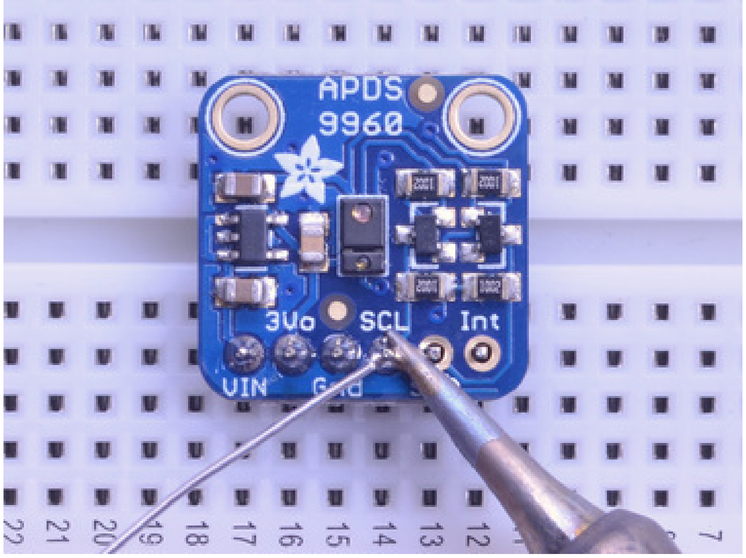
Place the breakout board over the pins so that the short pins poke through the breakout pads

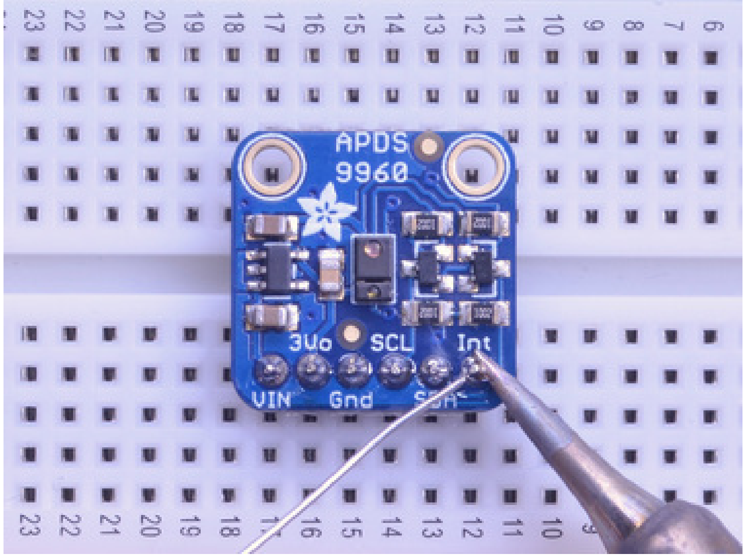
And Solder!

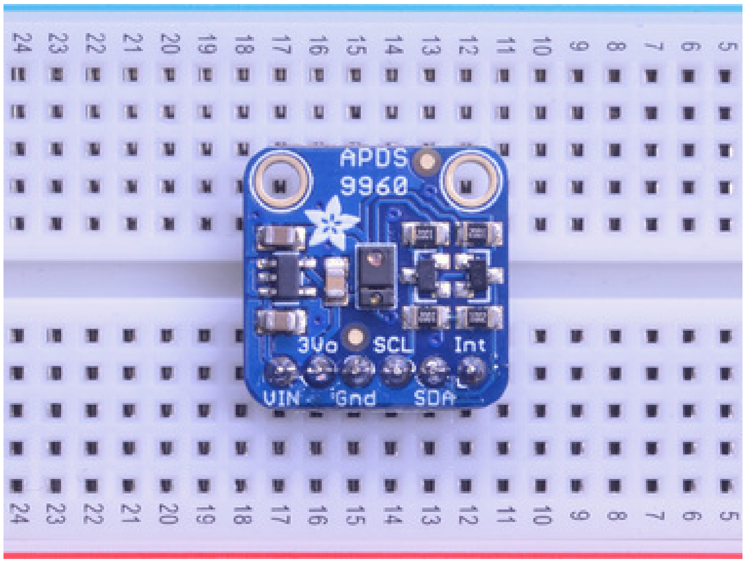
Be sure to solder all 6 pins for reliable electrical contact.

(For tips on soldering, be sure to check out our [Guide to Excellent Soldering](https://adafru.it/aTk) (https://adafru.it/aTk)).

- 

- 

- 

- 

You're done! Check your solder joints visually and continue onto the next steps

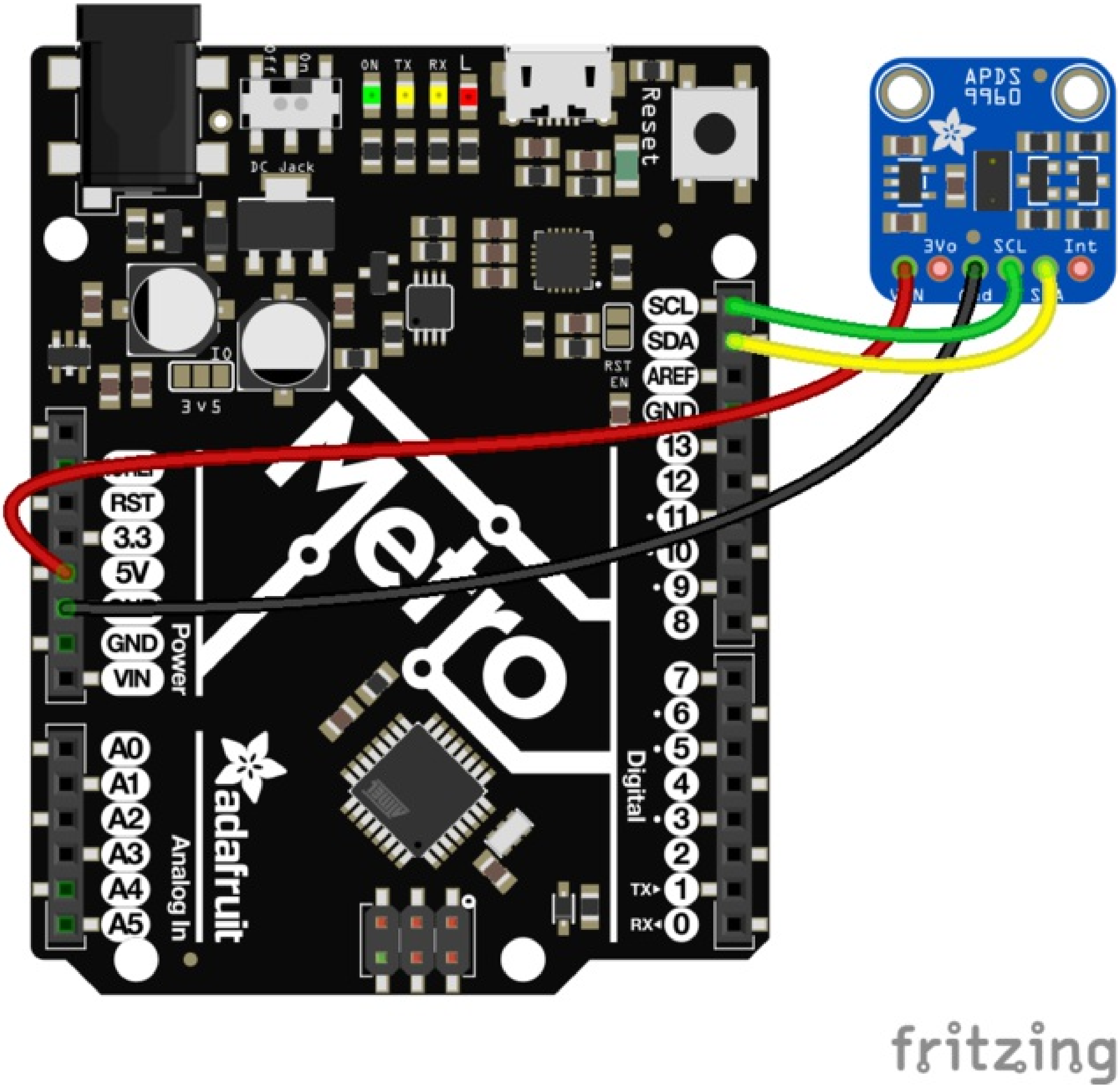
Arduino Wiring & Test

You can easily wire this breakout to any microcontroller, we'll be using an Adafruit Metro (Arduino compatible) with the Arduino IDE. But, you can use any other kind of microcontroller as well as long as it has I2C clock and I2C data lines.

Note this chip uses address **0x39** and that you cannot change addresses!

I2C Wiring

- Connect **Vin** to the power supply, 3-5V is fine. Use the same voltage that the microcontroller logic is based off of. For most Arduinos, that is 5V
- Connect **GND** to common power/data ground
- Connect the **SCL** pin to the I2C clock **SCL** pin on your Arduino.
  On an UNO & '328 based Arduino, this is also known as **A5**, on a Mega it is also known as **digital 21** and on a Leonardo/Micro, **digital 3**
- Connect the **SDA** pin to the I2C data **SDA** pin on your Arduino.
  On an UNO & '328 based Arduino, this is also known as **A4**, on a Mega it is also known as **digital 20** and on a Leonardo/Micro, **digital 2**



[Fritzing File](https://adafru.it/z0f)
https://adafru.it/z0f

Download Adafruit_APDS9960 library

To begin reading sensor data, you will need to download Adafruit_APDS9960 from our github repository. [You can do that by visiting the github repo](https://adafru.it/z0d) (https://adafru.it/z0d) and manually downloading or, easier, just click this button to download the zip:

[Download Adafruit APDS9960 Library](https://adafru.it/z0A)
https://adafru.it/z0A

Rename the uncompressed folder **Adafruit_APDS9960** and check that the **Adafruit_APDS9960** folder contains **Adafruit_APDS9960 .cpp** and **Adafruit_APDS9960 .h**

Place the **Adafruit_APDS9960** library folder your **arduinosketchfolder**/**libraries**/ folder. You may need to create the **libraries** subfolder if its your first library. Restart the IDE.

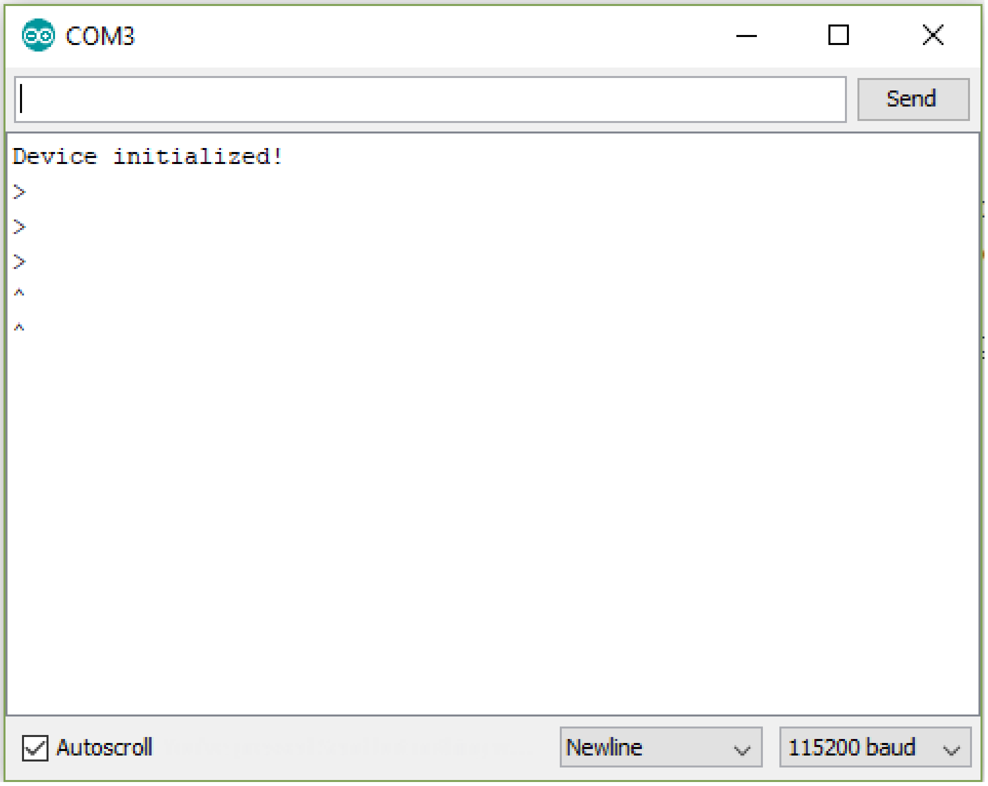
We also have a great tutorial on Arduino library installation at:
http://learn.adafruit.com/adafruit-all-about-arduino-libraries-install-use (https://adafru.it/aYM)

Load Gesture Sensor Example

Open up **File->Examples->Adafruit_APDS9960->gesture_sensor** and upload the code to your microcontroller wired up to the sensor. This example connects to the sensor and starts interpreting gestures.

Once uploaded to your Adruino, open up the serial console at 115200 baud speed. Put your hand close to the front of the sensor to activate gesture mode. Then make your directional gestures 3 or 4 inches from the sensor. You should see directional arrows appear in the serial console corresponding to the gesture you've made.

make sure to put your hand close (a few centimeters) to the sensor first to enable gesture mode before making gestures.



```
Device initialized!
>
>
>
^
^
```

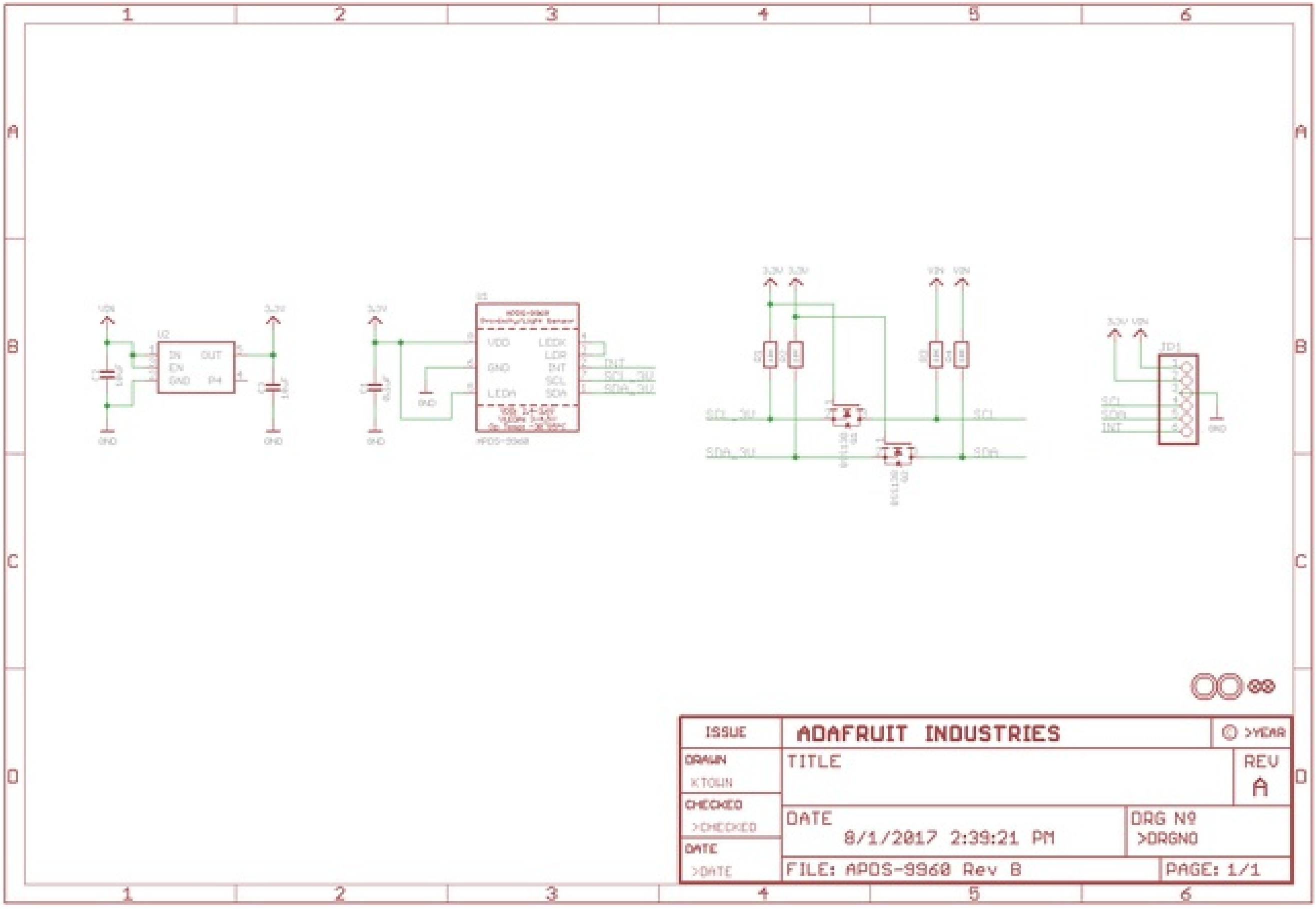
Downloads

Documents

- APDS9960 datasheet (https://adafru.it/z0c)
- Adafruit APDS9960 Arduino Library Driver (https://adafru.it/z0d)
- Fritzing object in the Adafruit Fritzing library (https://adafru.it/aP3)
- APDS9960 breakout PCB files (EAGLE format) (https://adafru.it/z0e)

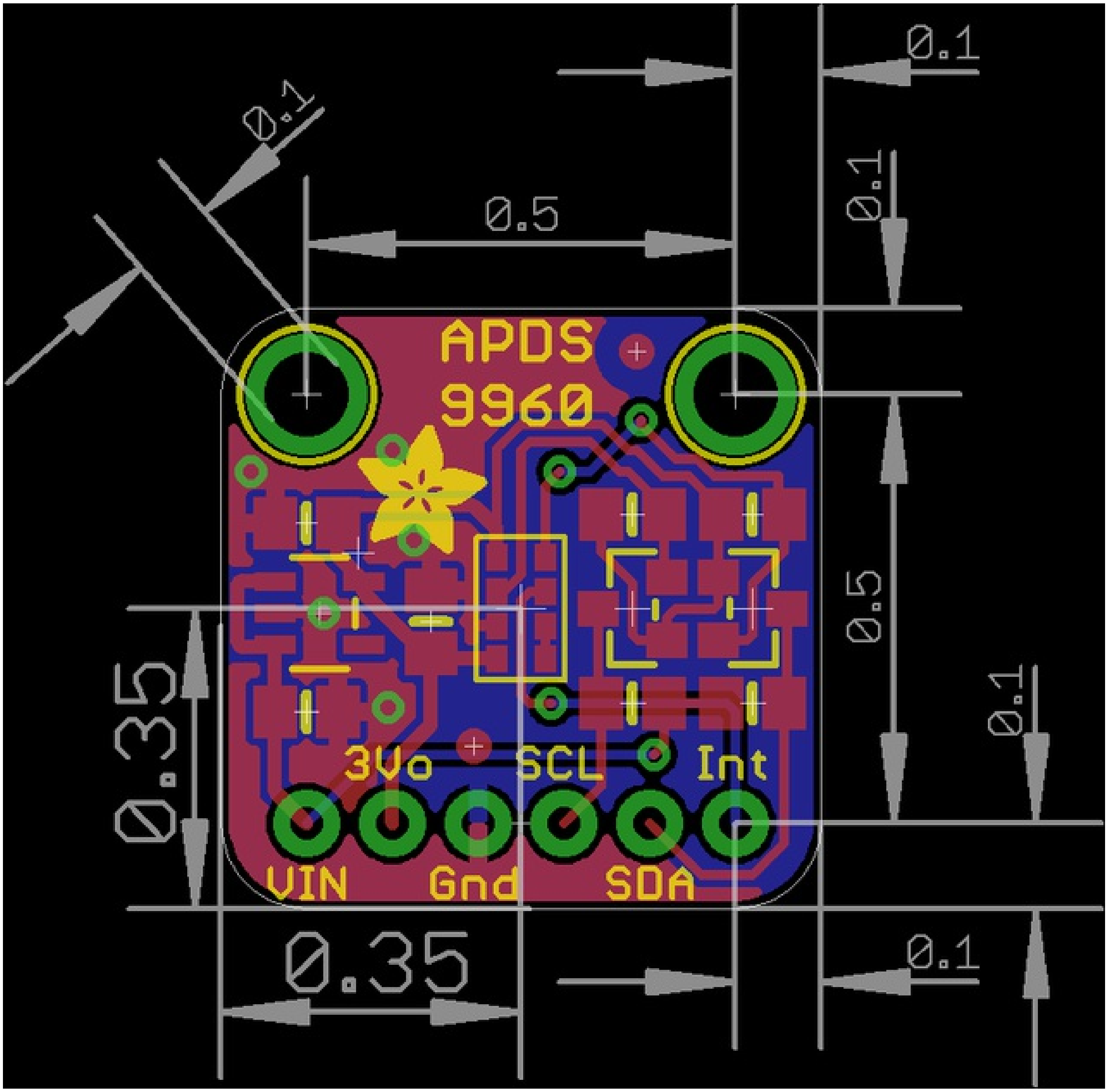
Schematic

click to enlarge



Dimensions

in inches. Click to enlarge


0.1
0.1
0.5
0.1
APDS
9960
0.5
0.35
0.1
3Vo
SCL
Int
VIN
Gnd
SDA
0.35
0.1