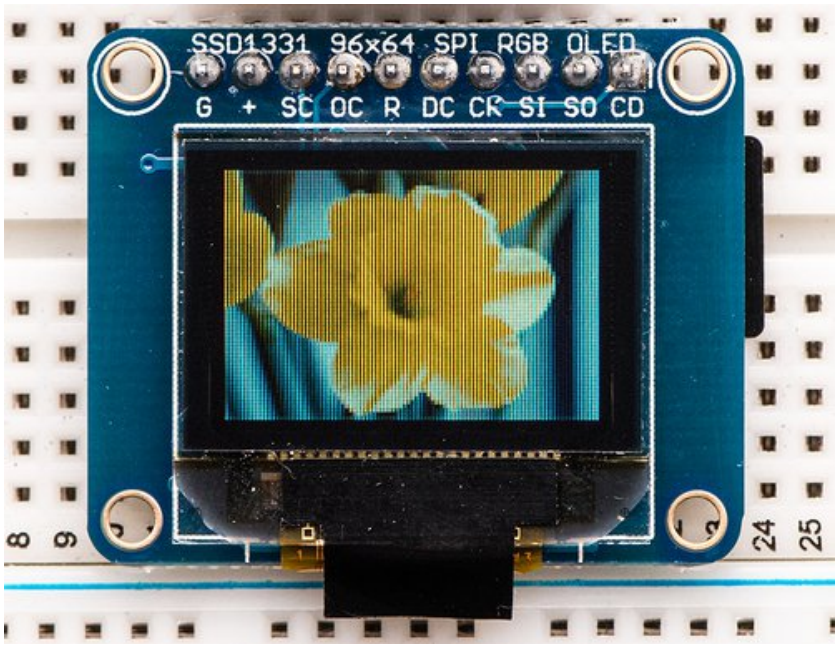
0.96" mini Color OLED

Created by lady ada



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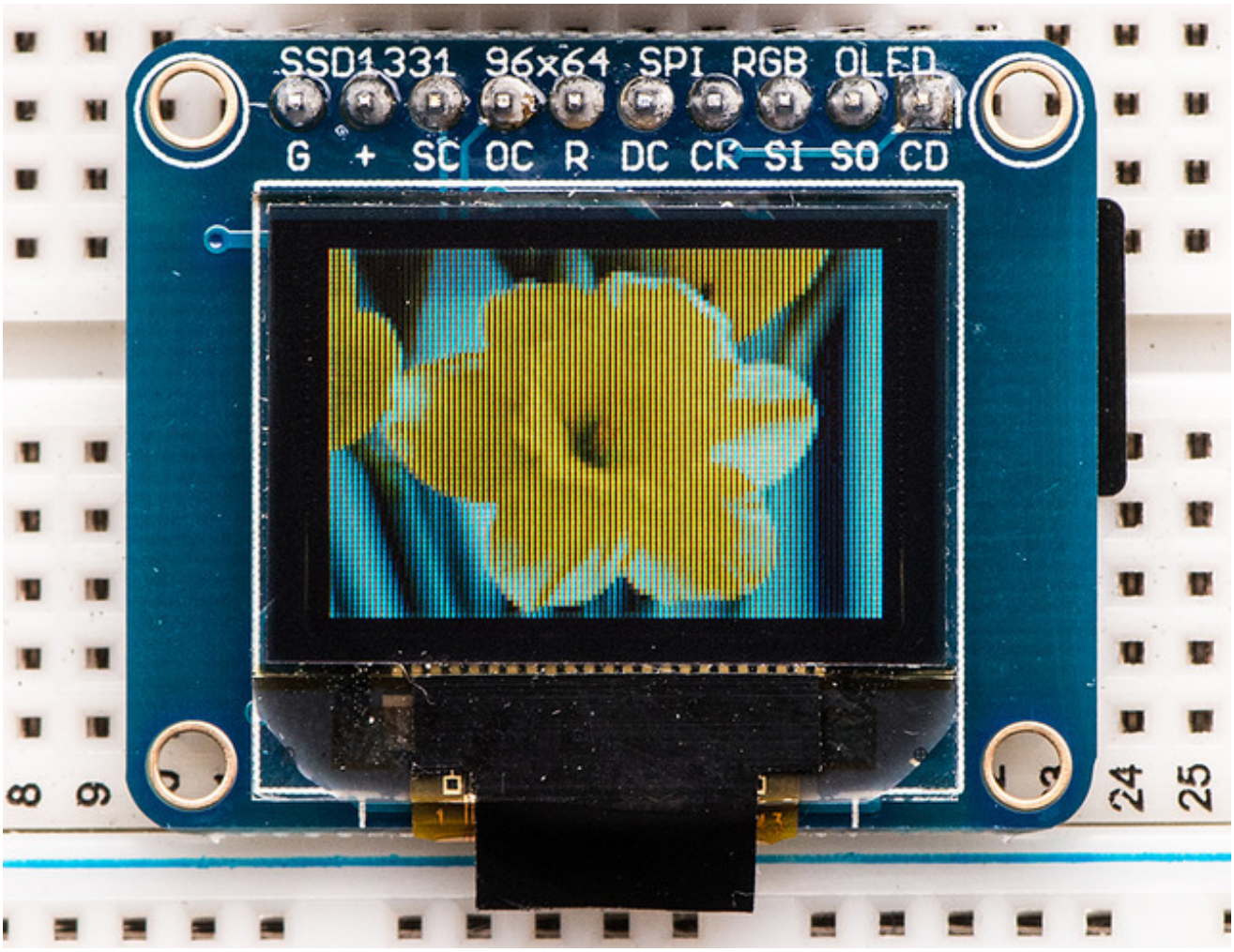
Overview

We love our black and white monochrome displays but we also like to dabble with some color now and then. Our new 0.96" color OLED displays are perfect when you need an ultra-small display with vivid, high-contrast 16-bit color. The visible portion of the OLED measures 0.96" diagonal and contains 96x64 RGB pixels, each one made of red, green and blue OLEDs. Each pixel can be set with 16-bits of resolution for a large range of colors. Because the display uses OLEDs, there is no backlight, and the contrast is very high (black is really black). We picked this display for its excellent color, this is the nicest mini OLED we could find!



This OLED uses the SSD1331 driver chip, which manages the display. You can talk to the driver chip using either 3 or 4-wire write-only SPI (clock, data, chip select, data/command and an optional reset pin) or standard 8-bit parallel 8080/6800 which also permits reading pixel data from the display. Our example code shows how to use SPI since for such a

display, its plenty fast. Inlcuded on the fully assembled breakout is the OLED display and a small boost converter (required for providing 12V to the OLED) and a microSD card holder. Our example code shows how to read a bitmap from the uSD card and display it all via SPI.

The logic levels for the microSD ard and OLED are 3.3V max. In order to make this breakout usable for bidirectional 8-bit and SPI interfaces, we left out an on-board level shifter. However, we include a DIP chip 75LVC245 8-bit level converter chip and our tutorial shows how to wire it to an Arduino so that you can use the breakout with 5V logic such as that of an Arduino. If you have a 3.3V logic level microcontroller system, you can skip the level shifter.

Of course, we wouldn't just leave you with a datasheet and a "good luck!" - we've written a full open source graphics library that can draw pixels, lines, rectangles, circles, text and bitmaps as well as example code and a wiring tutorial. The code is written for Arduino but can be easily ported to your favorite microcontroller!

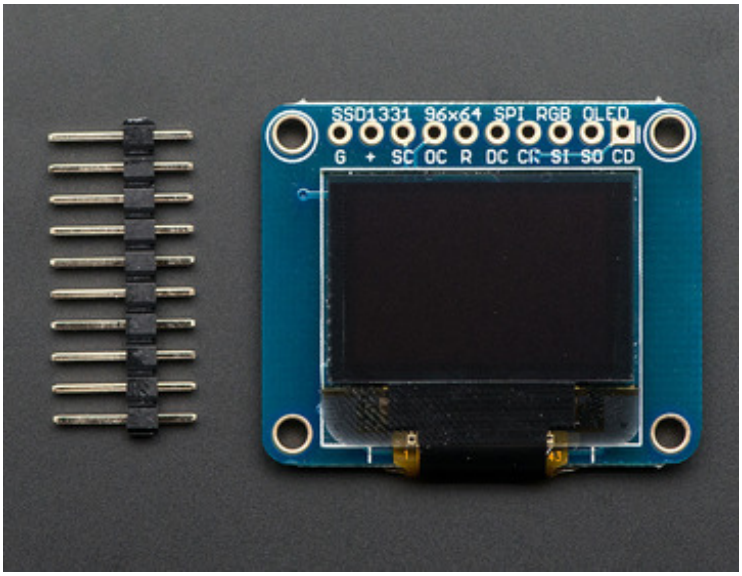
Pick one up today from the adafruit shop!(http://adafru.it/684)

Power

OLEDs tend to be fairly low power since they don't have a backlight, but they do require high voltage to drive the OLED segments. For this reason there is a boost converter on the back of the OLED. There's also a 3.3V regulator. However, we've found that it can be very sensitive to noisy 5V supplies such as that on an Arduino so try to run it off the 3.3V line which is filtered and cleaner. The power usage will vary with how many pixels are lit, the maximum is around 25mA.

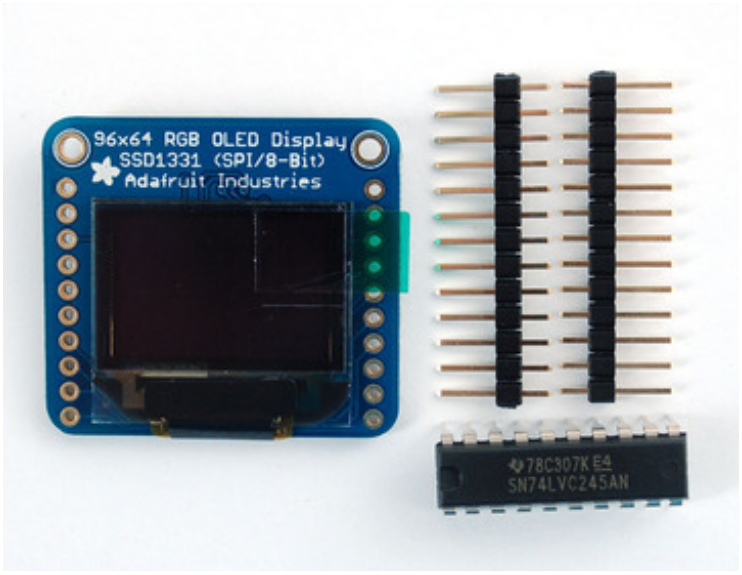
Of course, the microSD card is another matter - and may draw up to 150mA or more during writes (check the OEM document for the card to understand current usage!)

Wiring

- 

New Model

If your display has a single row header across the top, it is the newer version. For wiring instructions, skip down to "Wiring Up the Newer Version"

- 

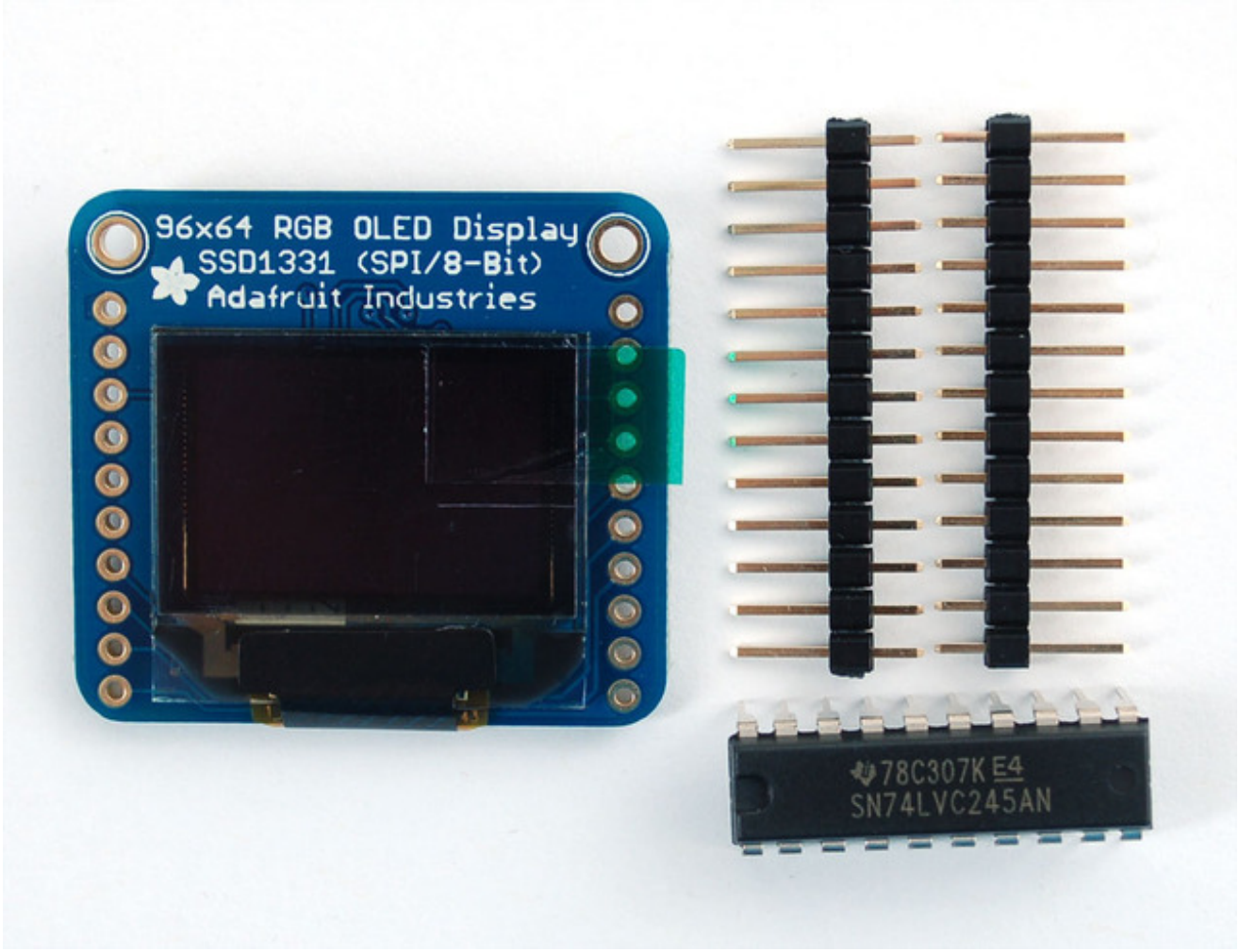
Older Model

If your display has a row of header pins down each side, it is the older model. See "Wiring the OLDER design" below.

Wiring the OLDER design (two rows of pins on either side)

The older breakout does not have a 5V level shifter on board, so its a little more complex to wire up!

The OLED module supports 3 methods of communication: 4 wire SPI, 8-bit parallel in 8080 and 6800 format. Since the display is small and we like to save pins, we'll be using the SPI protocol. Our tutorial, wiring and example code is all for SPI so if you need 8-bit, check the datasheets for details on how to wire up for 8-bit parallel.

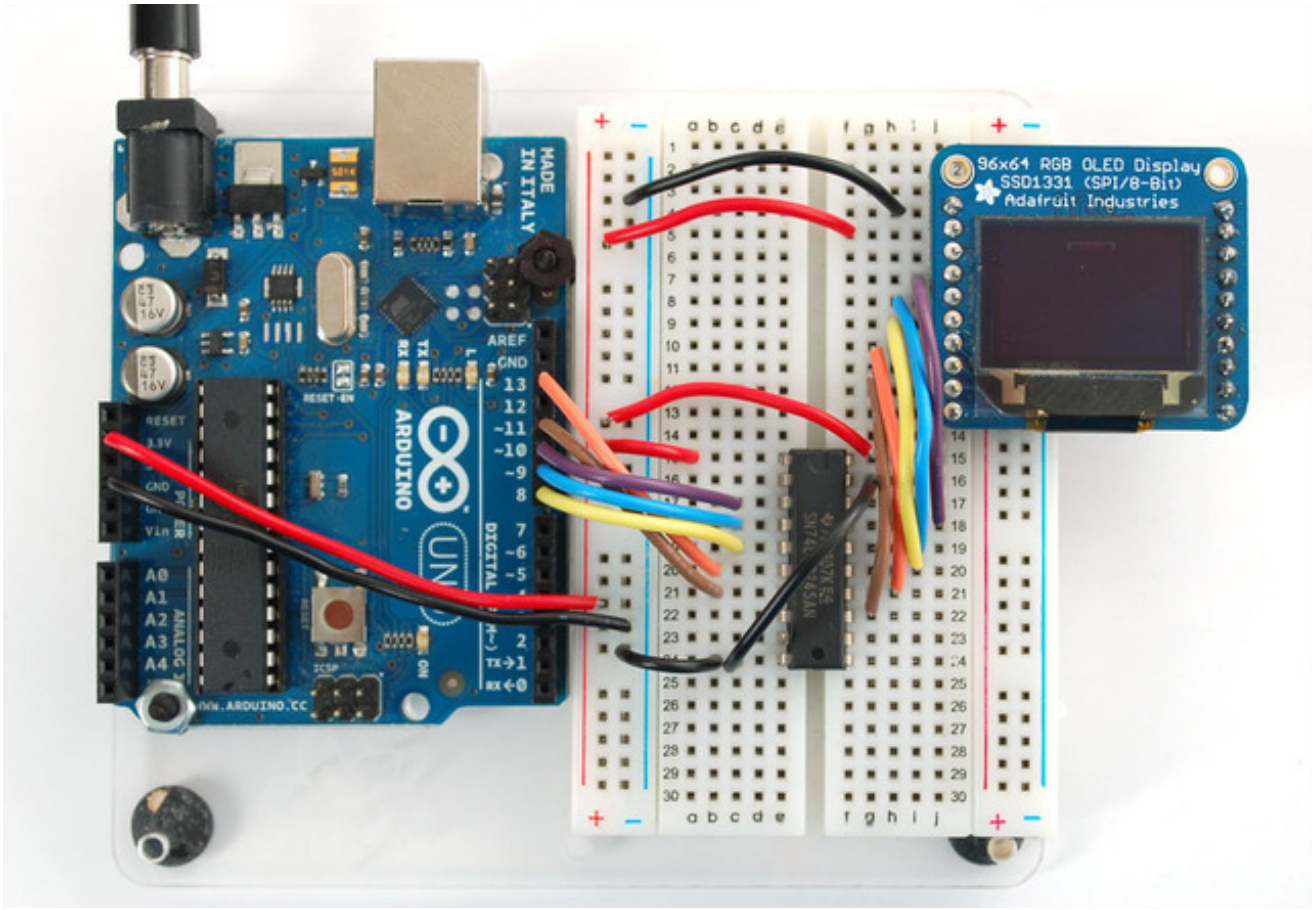


Since the OLED is 3.3V and also uses 3.3V logic, we need to use a logic shifter. We include a DIP logic shifter, the 74LVX245 with the OLED. If you're using a 3.3V logic chip, you can skip the logic shifter. Arduinos are all 5.0V so we'll be demonstrating that.
Don't forget to solder a piece of 0.1" header onto the left side of the OLED so you can plug it into a breadboard. You cannot skip this step, the header MUST be soldered in before plugging it in and wiring it up or it won't work!

Plug in the OLED and the '245 chip. The Chip has the notch closest to the OLED. Click on the image to see a large photo if you need help orienting

Starting from the top pin of the OLED (closest to the Adafruit flower) Connect the following OLED pins:

- Common ground - black wire
- 3.3V (red wires from the Arduino)
- **SD CS Pin**- don't connect (microSD card, we'll get to this later)
- **OLED CS Pin** - purple wire - 74LVC245 pin #17
- **OLED Reset Pin** - blue wire - 74LVC245 pin #16
- **OLED D/C Pin** - yellow wire - 74LVC245 pin #15
- **OLED SCLK Pin** - orange wire - 74LVC245 pin #14
- **OLED DATA Pin** - brown - 74LVC245 pin #13
- **SD Detect Pin**- not used, don't connect. Later on, if you wish, you can use this pin to detect if a card is inserted, it will be shorted to ground when a card is in the holder



Next we'll connect the remaining 74LVC245 pins to the Arduino

- Pin #1 goes to 3.3V (red wire)
- Skip
- Purple wire - goes to Digital #10
- Blue wire - goes to Digital #9
- Yellow wire - goes to Digital #8
- Orange wire - goes to Digital #13
- Brown wires - goes to Digital #11

- Skip
- Skip
- Connect to common ground

Then connect pin #20 of the 74LVC245 to 3.3V and pin #19 to Ground.

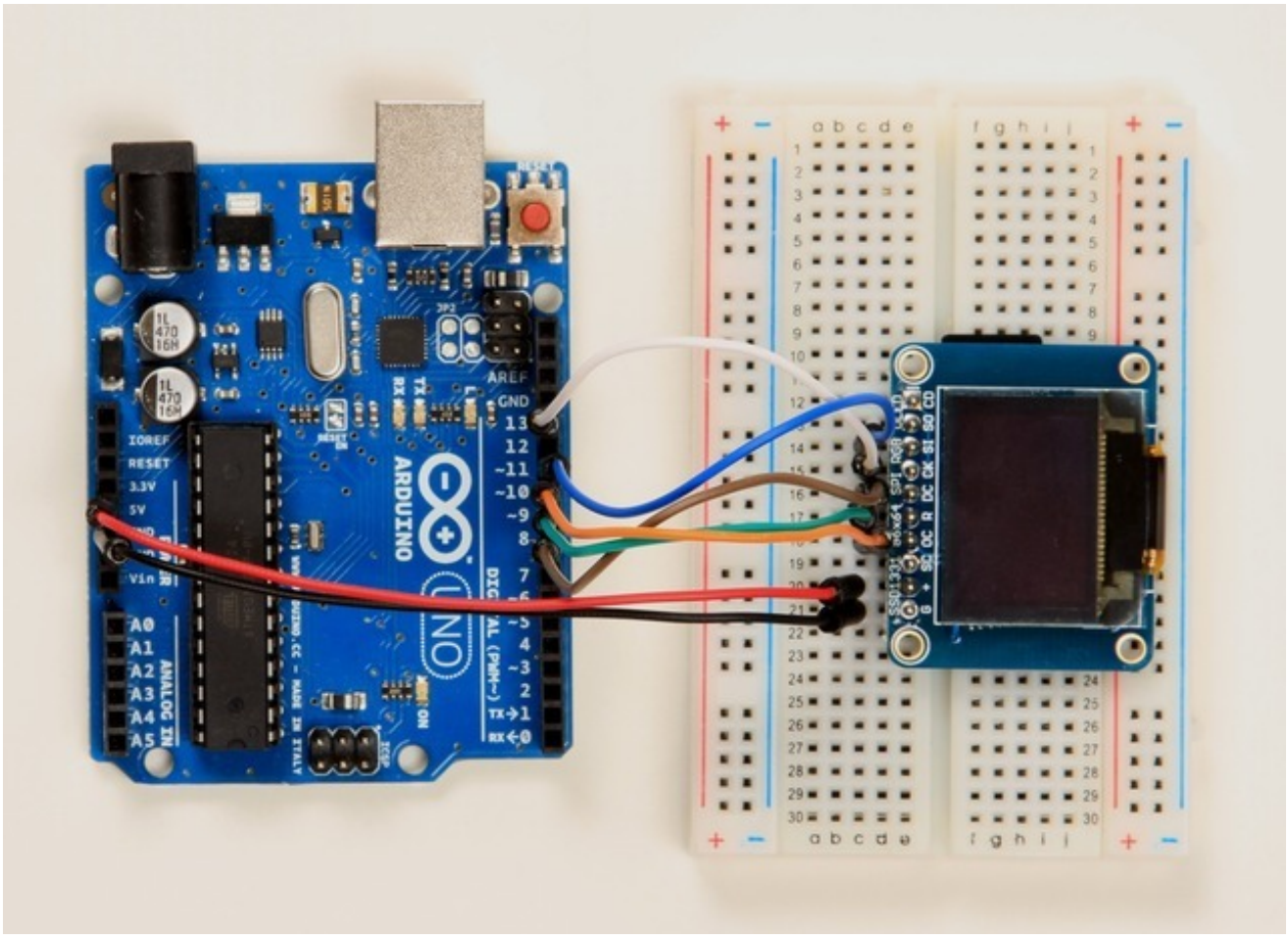
Digital #12 isn't used yet (we'll connect this to the SD card later

Wiring up the newer version (With one row of pins on top)

The updated 5v ready version of this display includes on-board level-shifting. So the 74LVC245 chip is not required and the wiring is much simpler!

The full pin names are marked on the back of the board, but there are abbreviations on the front to help identify pins when it is plugged into the breadboard. The chart below lists the full pin name, the abbreviated name (in parentheses) and the Arduino pin name to connect it to. Wire colors are as shown in the photo.

- **GND** (G) - Gnd (Black Wire)
- **VCC** (+) - 5v (Red Wire)
- **SDCS** (SC) - skip
- **OCS** (OC) - Digital #10 (Orange Wire)
- **RST** (R) - Digital #9 (Green Wire)
- **D/C** (DC) - Digital #8 (Brown Wire)
- **SCK** (CK) - Digital #13 (White Wire)
- **MOSI** (SI) - Digital #11 (Blue Wire)
- **MISO** (SO) - skip
- **CD** (CD) - skip



Installing and running Arduino software

Now we can run the test software on the Arduino. We'll need to download the library first and install it

Visit the Adafruit SSD1331 library github repository page (http://adafru.it/aHp) and click the Download Zip. Or just click the button below:

SSD 1131 OLED Driver Library
http://adafru.it/d7s

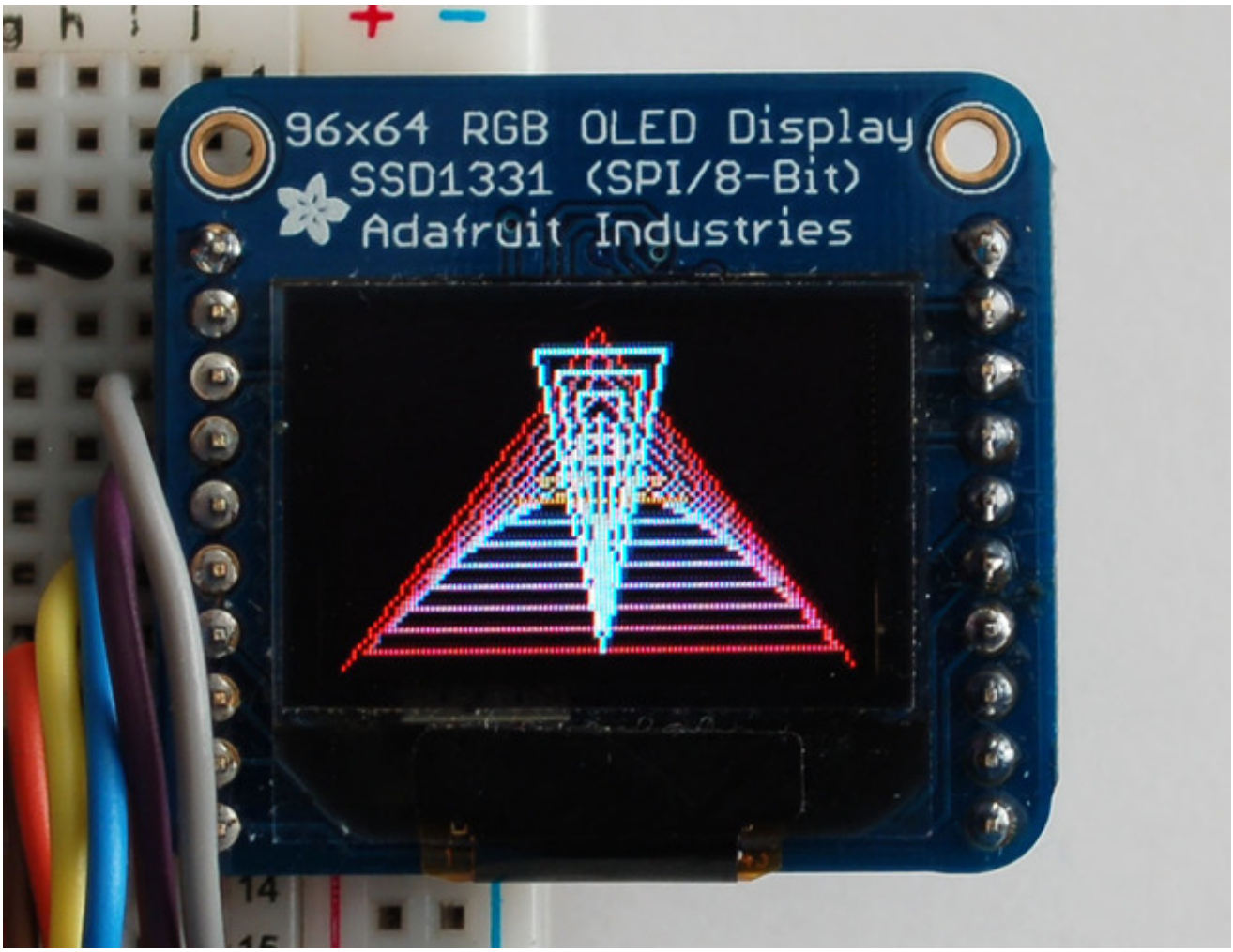
Copy the folder inside the zip file to the Libraries folder inside your Arduino Sketchbook folder and re-name it to Adafruit_SSD1131. For more details on how to install Arduino libraries, check out our detailed tutorial! http://learn.adafruit.com/adafruit-all-about-arduino-libraries-install-use (http://adafru.it/aYM)

You'll also have to install the Adafruit GFX graphics core library at this github repo (http://adafru.it/aJa). Rename it to Adafruit_GFX and install it the same way as the

OLED library.

Adafruit GFX Library
http://adafru.it/cBB

After you restart, you should be able to select **File→Examples→Adafruit_SSD1331→test** - this is the example sketch that just tests the display by drawing text and shapes. Upload the sketch and you should see the following:



If alls working, then you can start looking through the test sketch for demonstrations on how to print text, circles, lines, etc.

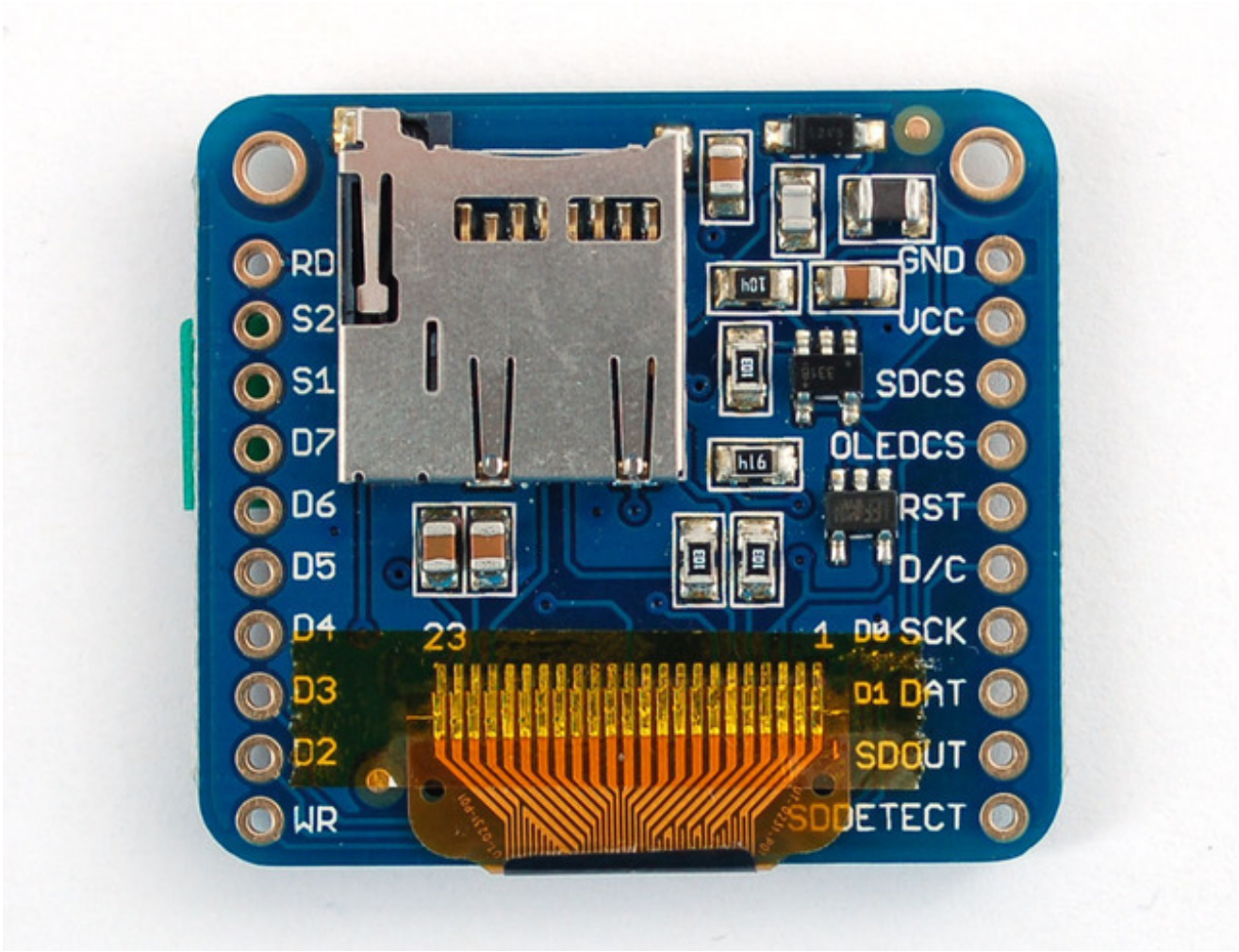
For a detailed tutorial on the Adafruit GFX library, including all the functions available please visit the GFX tutorial page (http://adafru.it/aPx)

Drawing Bitmaps

We have an example sketch in the library showing how to display full color bitmap images stored on an SD card. You'll need a microSD card such as this one . This example will only work for Arduino v1.0 and later.

You'll also need an image. We suggest starting with this bitmap of a flower If you want to later use your own image, use an image editing tool and crop your image to no larger than 64 pixels high and 96 pixels wide. Save it as a 24-bit color **BMP** file - it must be 24-bit color format to work, even if it was originally a 16-bit color image - becaue of the way BMPs are stored and displayed!

Copy the **violet.bmp** to the microSD card and insert it into the back of the breakout board.

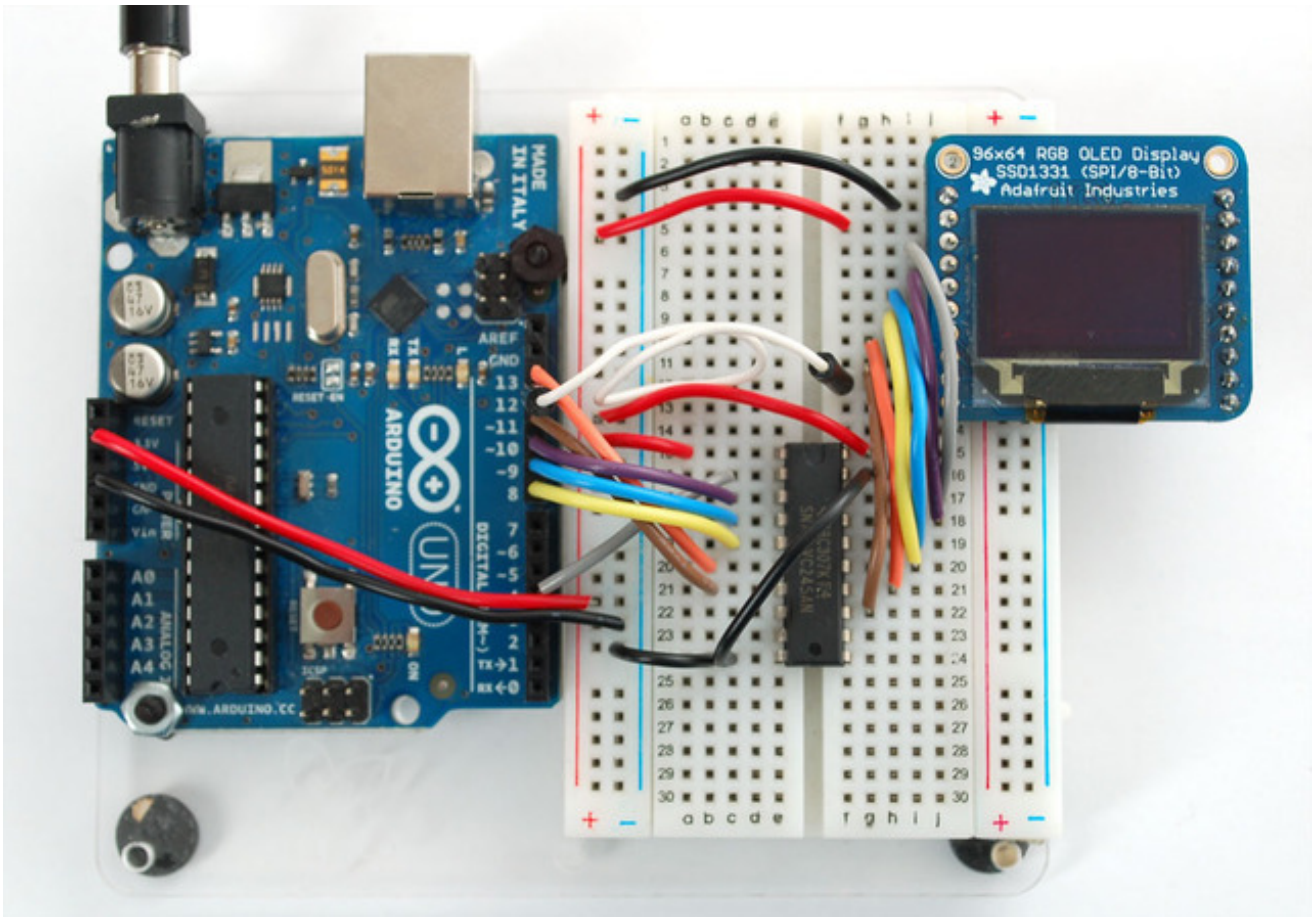


We'll have to add an extra 2 wires so we can 'select' and 'receive data' from the SD card

Old Style Board: (two rows of pins)

Connect the third pin **SD ChipSelect** of the OLED (gray wire) to pin #18 of the 74LVC245. Then connect pin #2 of the 74LVC245 to Arduino **Digital #4**. This is the pin to select that we want to talk to the microSD card.

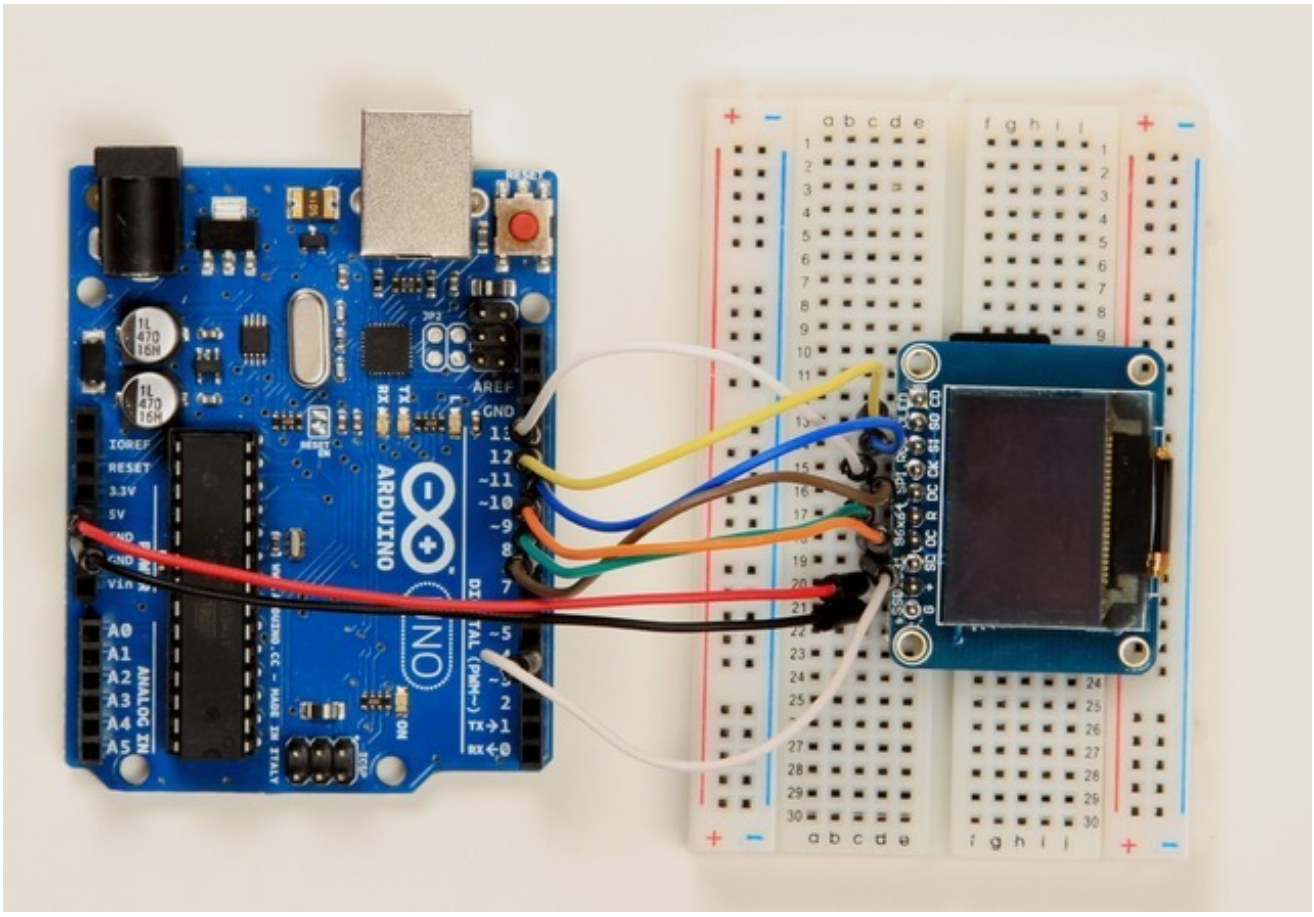
Then connect second-from-the bottom pin of the OLED -**SDOUT** - with a wire directly to **Arduino Digital #12** this is the longer white wire shown - this wire does not need to be level shifted.



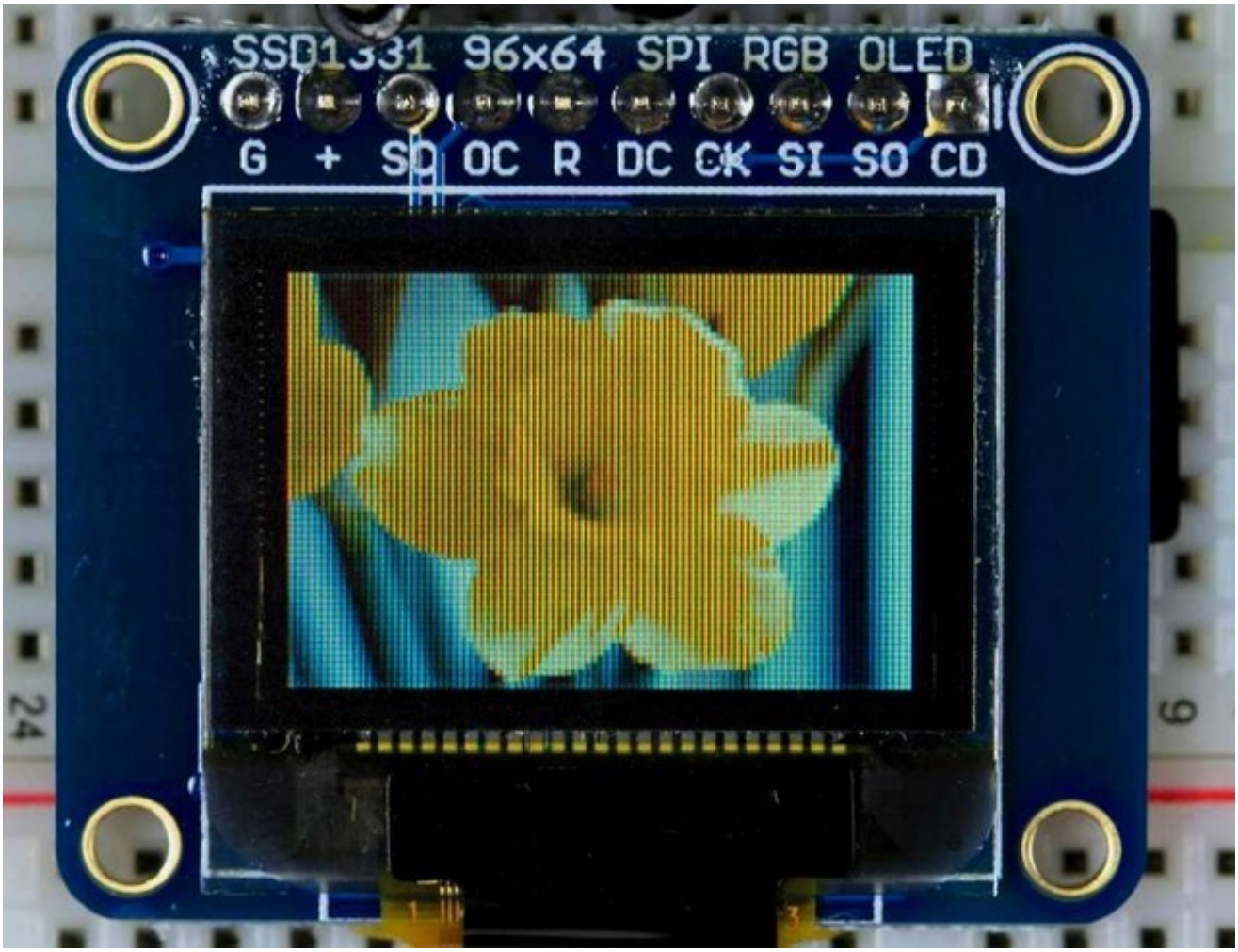
New Style Board: (Single row of pins)

Add teh following two connections between the breakout board and the Arduino:

- **SDCS** (SC) - Digital #4.(White Wire)
- **MISO** (SO) - Digital #12 (Yellow Wire)



You should see the daffodil! If you don't see it, check the Serial Monitor for hints on what might have gone wrong (maybe the microSD card had an issue).


SSD1331 96x64 SPI RGB OLED
G + SD OC R DC CK SI SO CD

Downloads

- Datasheet for the SSD1331 driver (http://adafru.it/aJb)
- Datasheet for the raw OLED module itself (http://adafru.it/aJc)
- Adafruit SSD1331 Arduino Library repository (http://adafru.it/aHp)
- You'll also have to install the Adafruit GFX graphics core library at this github repo (http://adafru.it/aJa) and install it after you've gotten the OLED driver library.
- Adafruit breakout board PCB files (http://adafru.it/aJd)
- Fritzing library (http://adafru.it/aP3)