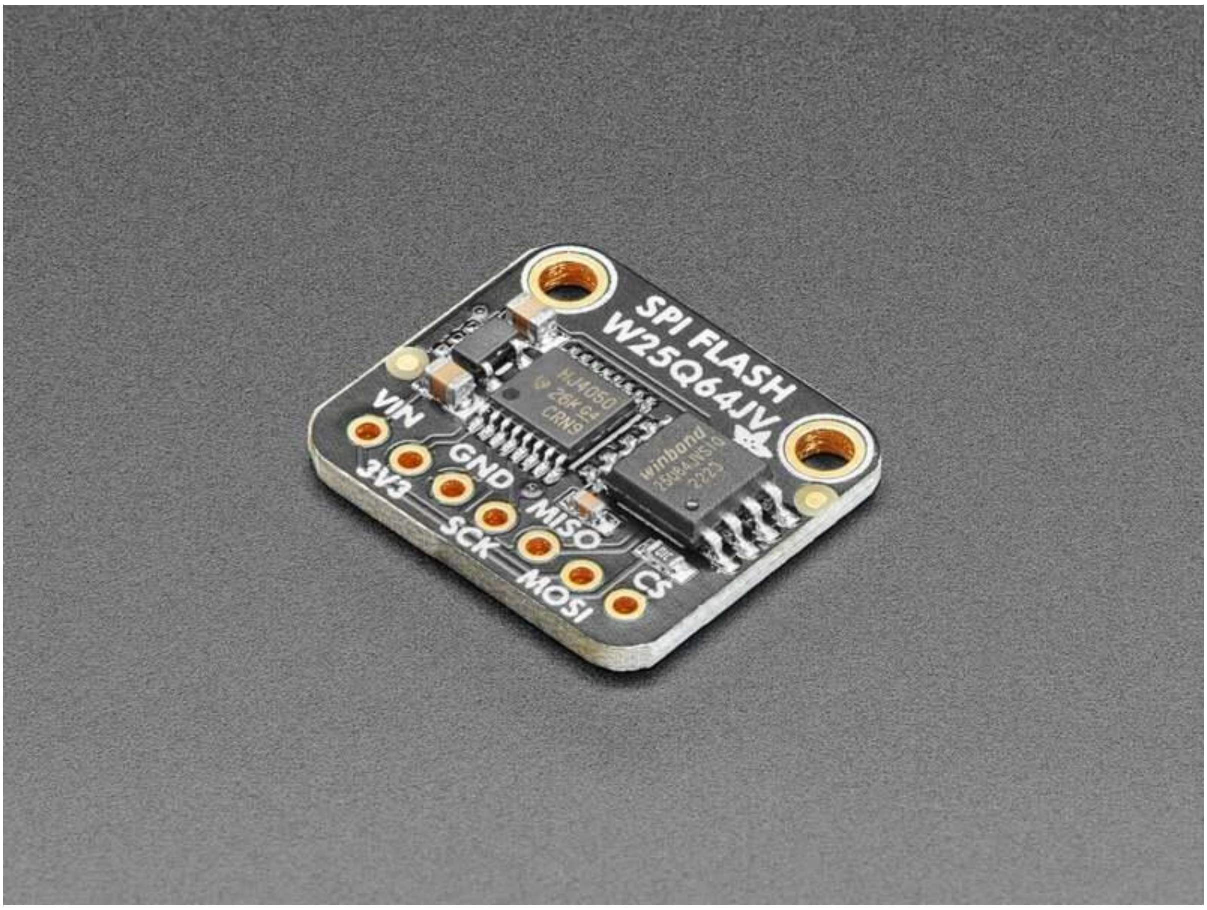
Adafruit SPI FLASH Breakouts

Created by Liz Clark

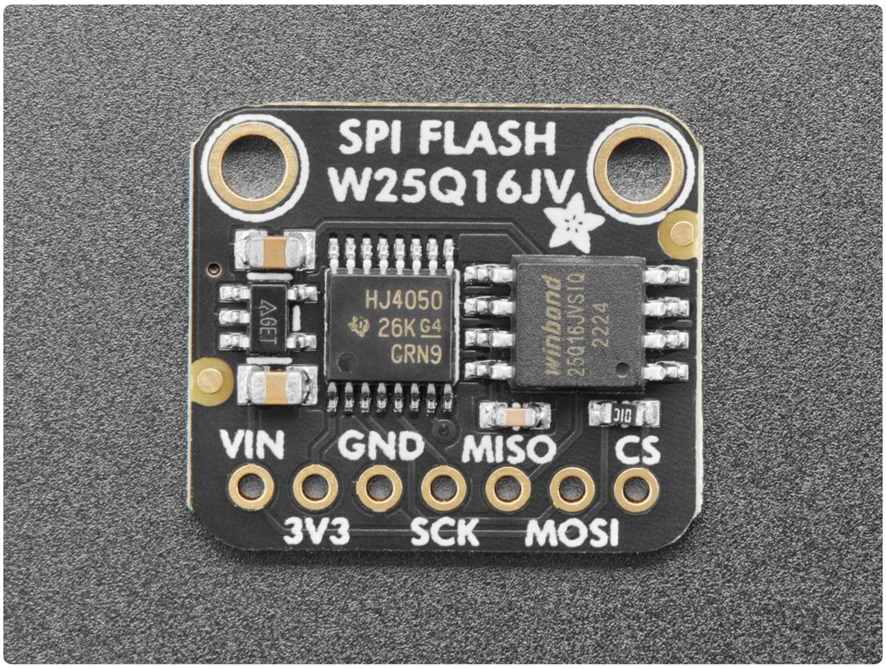


https://learn.adafruit.com/adafruit-spi-flash-breakouts

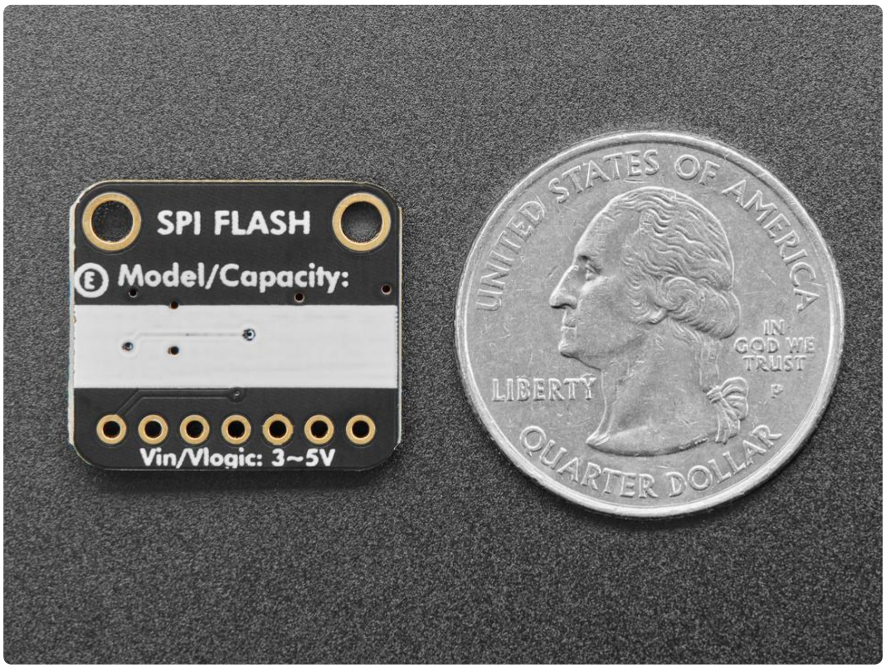
Last updated on 2022-12-01 04:14:50 PM EST

Table of Contents

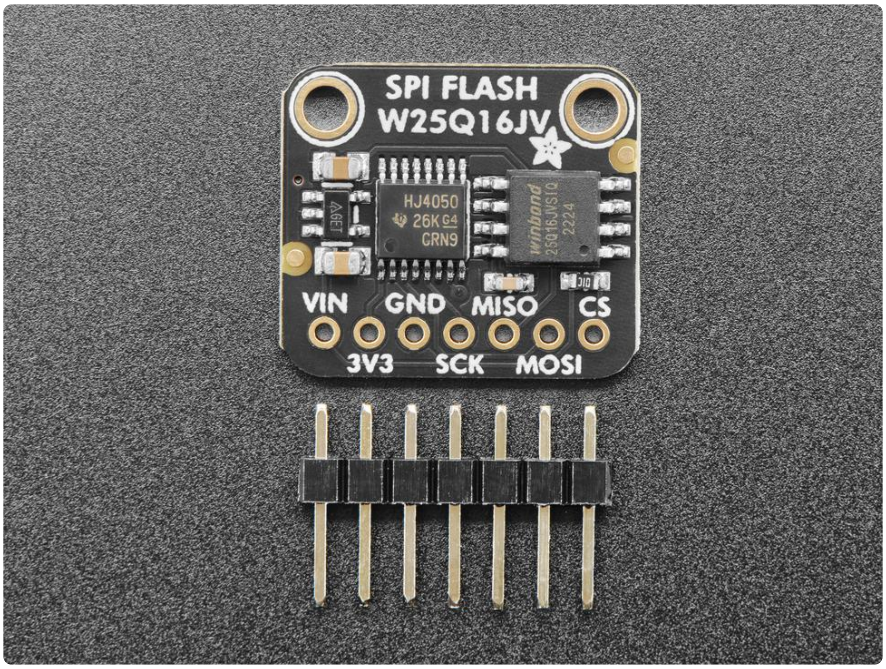
Overview



Sometimes you need a little extra storage for your microcontroller projects: for files, images, fonts, audio clips, etc. If you need lots of space, like in the gigabytes, we always recommend an SD card () because you can easily plug it into a computer to edit files. But sometimes you don't need whole gigabytes, you just need a megabyte or two, with the lower cost and power usage that comes with it. That's when we recommend an Adafruit SPI FLASH Breakout in one of three variants: W25Q16 - 16 Mbit / 2 MByte (), W25Q64 - 64 Mbit / 8 MByte () or W25Q128 - 128 Mbit / 16 MByte () c hip.



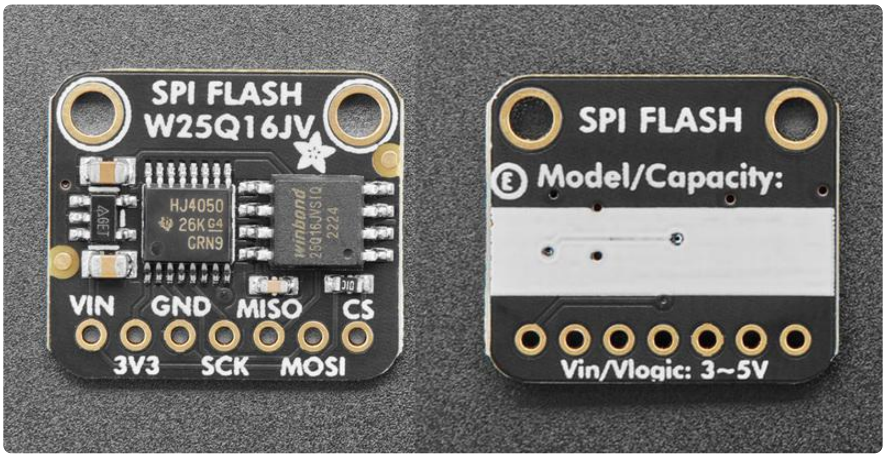
Compared to our QSPI breakouts (), this one is single-channel SPI only...BUT it comes with level shifting so it can be used safely with 3V or 5V power and logic. Since we needed to add level shifting, the chip is pre-wired into single channel "SPI" mode, with a level shifters so you can use it with 3V or 5V logic easily. You also get a 3.3V regulator and a pullup on CS.



Note that the chips come blank, and do not have a wear-leveling subsystem. You can address them as a flat memory space or, if you like, format them with a filesystem like littleFS or FAT. Great for use with data-logging or storage needs where you are OK with doing the management yourself - or if you are adding external memory to an older chip that would like 5V-compatibility.

In Arduino, we have the Adafruit_SPIFlash library () that can be used to interface with this chip. Comes with a bit of header that can be used to solder in and plug into a breadboard if desired.

Pinouts



Power Pins

- VIN - this is the power pin. Since the flash chip may use 3 VDC, we have included a level shifter on board 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 microcontroller like Arduino, use 5V.
- 3V3 - this is the 3.3V output from the level shifter, you can grab up to 100mA from this if you like.
- GND - common ground for power and logic.

SPI Logic Pins

- SCK - This is the SPI Clock pin / SCK Serial Clock, it's an input to the flash chip.
- MISO - this is the Serial Out / Microcontroller In Serial Out pin, for data sent from the flash chip to your processor.
- MOSI - this is the Serial In / Microcontroller Out Serial In pin, for data sent from your processor to the flash chip. It's an input to the chip.
- CS - this is the Chip Select pin, drop it low to start an SPI transaction. It's an input to the flash chip and has a pullup.

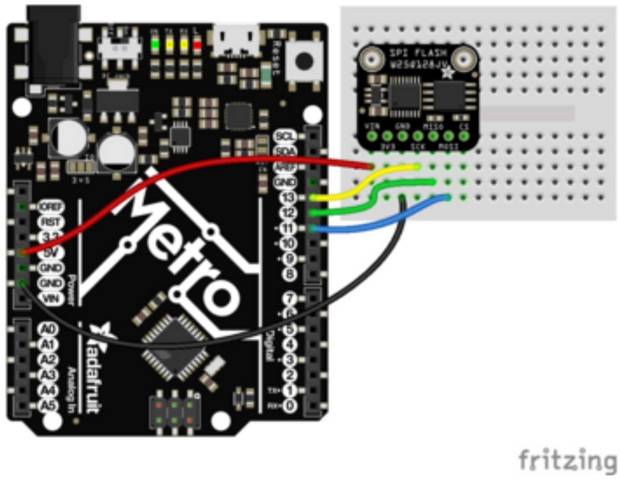
Arduino

Using a SPI flash breakout board with Arduino involves wiring up the flash chip to your Arduino-compatible microcontroller, installing the Adafruit_SPIFlash () library and running the provided example code.

Wiring

Wire as shown for a 5V board like an Uno. If you are using a 3V board, like an Adafruit Feather, wire the board's 3V pin to the flash breakout VIN.

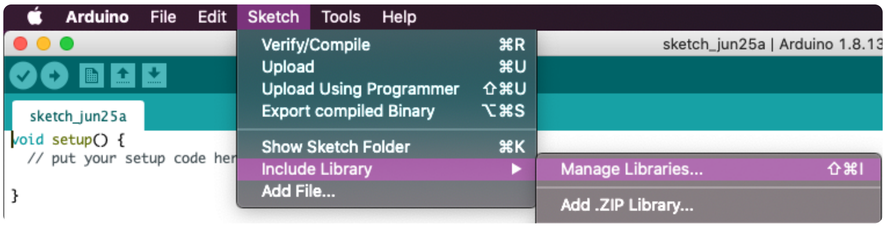
Here is an Adafruit Metro wired up to the flash breakout using a solderless breadboard.



Board 5V to breakout VIN (red wire)
Board GND to breakout GND (black wire)
Board pin 11 to breakout MOSI (blue wire)
Board pin 12 to breakout MISO (green wire)
Board pin 13 to breakout SCK (yellow wire)

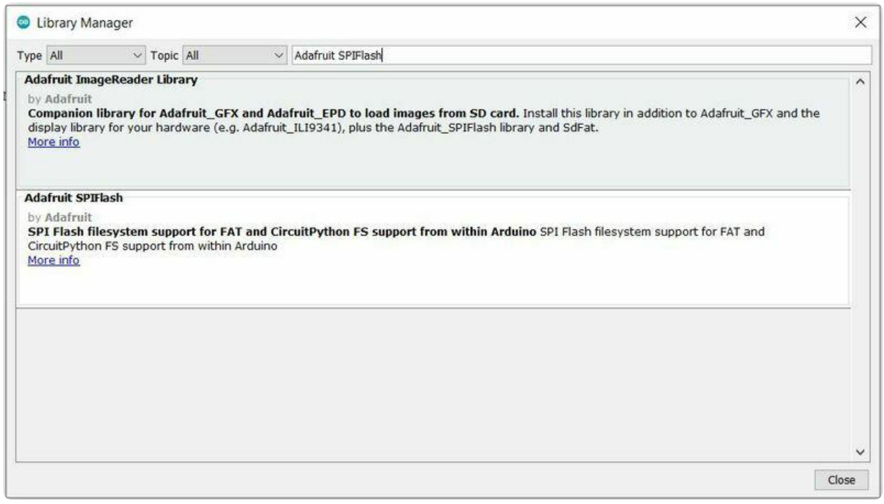
Library Installation

You can install the Adafruit SPIFlash library for Arduino using the Library Manager in the Arduino IDE.



```
void setup() {
  // put your setup code her
}
```

Click the Manage Libraries ... menu item, search for Adafruit SPIFlash, and select the Adafruit SPIFlash library:



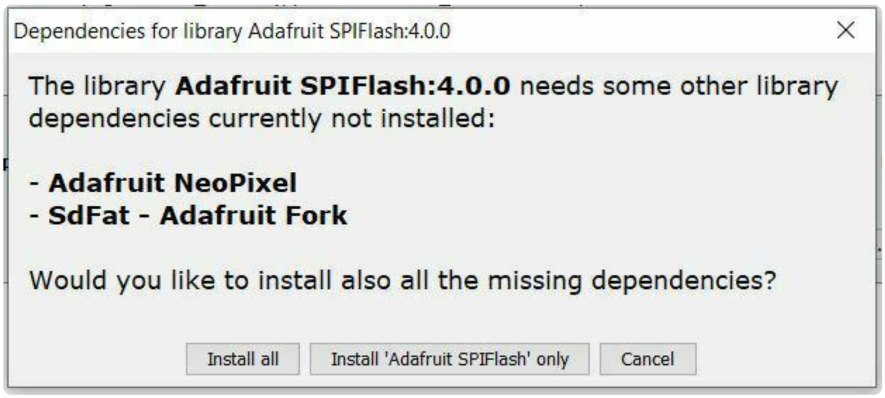
Library Manager

Type All Topic All Adafruit SPIFlash

Adafruit ImageReader Library
by Adafruit
Companion library for Adafruit_GFX and Adafruit_EPD to load images from SD card. Install this library in addition to Adafruit_GFX and the display library for your hardware (e.g. Adafruit_ILI9341), plus the Adafruit_SPIFlash library and SdFat.
More info

Adafruit SPIFlash
by Adafruit
SPI Flash filesystem support for FAT and CircuitPython FS support from within Arduino SPI Flash filesystem support for FAT and CircuitPython FS support from within Arduino
More info

If asked about dependencies, click "Install all".



Dependencies for library Adafruit SPIFlash:4.0.0

The library **Adafruit SPIFlash:4.0.0** needs some other library dependencies currently not installed:

- **Adafruit NeoPixel**
- **SdFat - Adafruit Fork**

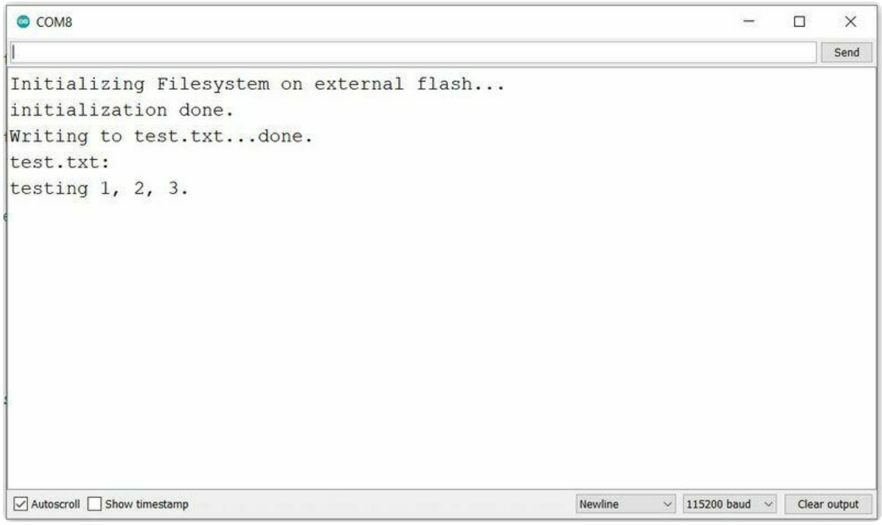
Would you like to install also all the missing dependencies?

If the "Dependencies" window does not come up, then you already have the dependencies installed.

If the dependencies are already installed, you must make sure you update them through the Arduino Library Manager before loading the example!

Example Code

```
/*
  SD card read/write

 This example shows how to read and write data to and from an SD card file
 The circuit:
 * SD card attached to SPI bus as follows:
 ** MOSI - pin 11
 ** MISO - pin 12
 ** CLK - pin 13

 created   Nov 2010
 by David A. Mellis
 modified 9 Apr 2012
 by Tom Igoe
 This example code is in the public domain.

 */

#include <SPI.h>
#include "SdFat.h"
#include "Adafruit_SPIFlash.h"

// for flashTransport definition
#include "flash_config.h"

Adafruit_SPIFlash flash(&flashTransport);

// file system object from SdFat
FatVolume fatfs;
File32 myFile;

void setup() {
  // Open serial communications and wait for port to open:
  Serial.begin(115200);
  while (!Serial) {
    delay(10); // wait for serial port to connect. Needed for native USB port only
  }

  Serial.println("Initializing Filesystem on external flash...");

  // Init external flash
  flash.begin();

  // Open file system on the flash
  if ( !fatfs.begin(&flash) ) {
    Serial.println("Error: filesystem is not existed. Please try SdFat_format 
example to make one.");
    while(1)
    {
      yield();
      delay(1);
    }
  }

  Serial.println("initialization done.");

  // open the file. note that only one file can be open at a time,
  // so you have to close this one before opening another.
  myFile = fatfs.open("test.txt", FILE_WRITE);

  // if the file opened okay, write to it:
  if (myFile) {
    Serial.print("Writing to test.txt...");
    myFile.println("testing 1, 2, 3.");
    // close the file:
    myFile.close();
    Serial.println("done.");
  } else {
    // if the file didn't open, print an error:
    Serial.println("error opening test.txt");
  }

  // re-open the file for reading:
  myFile = fatfs.open("test.txt");
  if (myFile) {
    Serial.println("test.txt:");

    // read from the file until there's nothing else in it:
    while (myFile.available()) {
      Serial.write(myFile.read());
    }
    // close the file:
    myFile.close();
  } else {
    // if the file didn't open, print an error:
    Serial.println("error opening test.txt");
  }
}

void loop() {
  // nothing happens after setup
}
```



```
Initializing Filesystem on external flash...
initialization done.
Writing to test.txt...done.
test.txt:
testing 1, 2, 3.
```

Upload the read/write sketch to your board and open up the Serial Monitor (Tools -> Serial Monitor) at 115200 baud. You'll see the initialization of the flash chip over SPI. Then, a `text.txt` file is written to the flash chip. Finally, the contents of the `text.txt` file are read back and printed to the Serial Monitor.

Arduino Docs

Arduino Docs ()

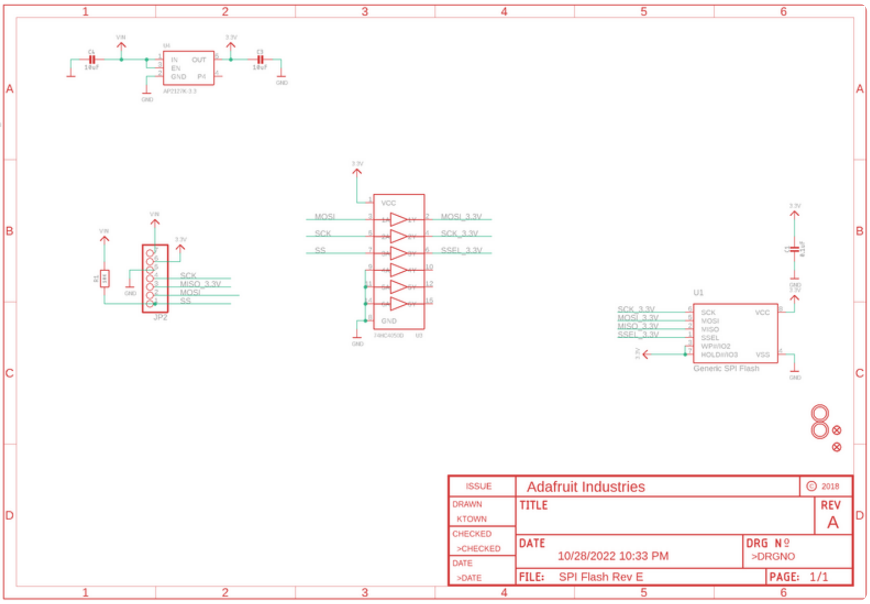
Downloads

Files

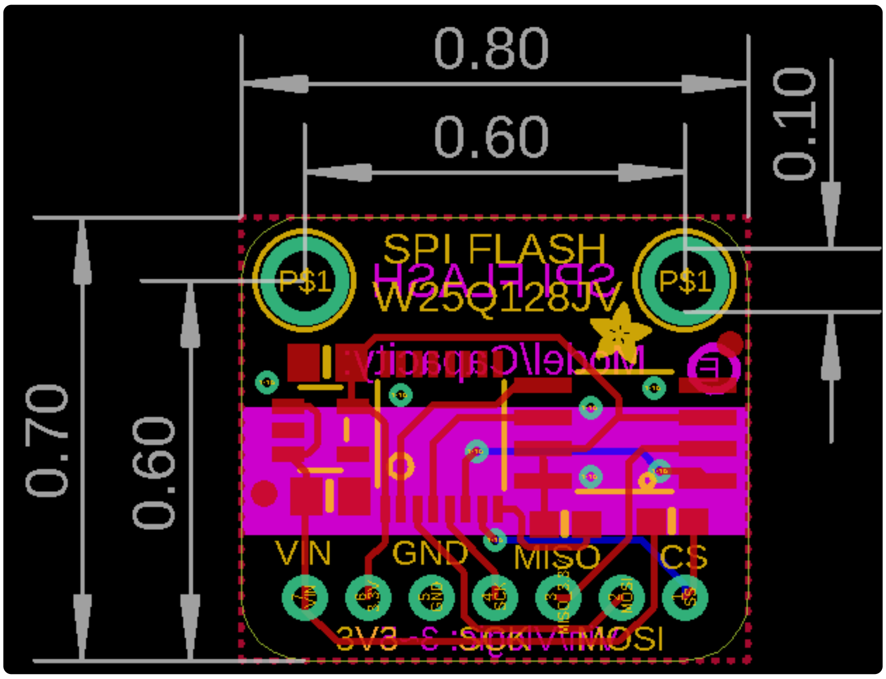
- Flash Module Datasheet ()
- W25Q16 Technical Documentation ()
- W25Q64 Technical Documentation ()
- W25Q128 Technical Documentation ()
- EagleCAD PCB files on GitHub ()
- Fritzing object in the Adafruit Fritzing Library ()

Schematic and Fab Print

These apply to all versions of the board.



ISSUE
Adafruit Industries
2018
DRAWN
KTOWN
CHECKED
>CHECKED
DATE
>DATE
TITLE
REV
A
DATE
10/28/2022 10:33 PM
DRG Nº
>DRGNO
FILE:
SPI Flash Rev E
PAGE:
1/1
JP2
U1
Generic SPI Flash
SCK
MOSI
MISO
SS
SCK_3.3V
MOSI_3.3V
MISO_3.3V
SSEL_3.3V
VCC
VSS
GND
VIN
3.3V



0.80
0.60
0.10
0.70
0.60
SPI FLASH
W25Q128JV
P$1
P$1
VIN
GND
MISO
CS
3V3
S:SCK
MOSI