



## Adafruit 8x16 LED Matrix FeatherWing

Created by lady ada

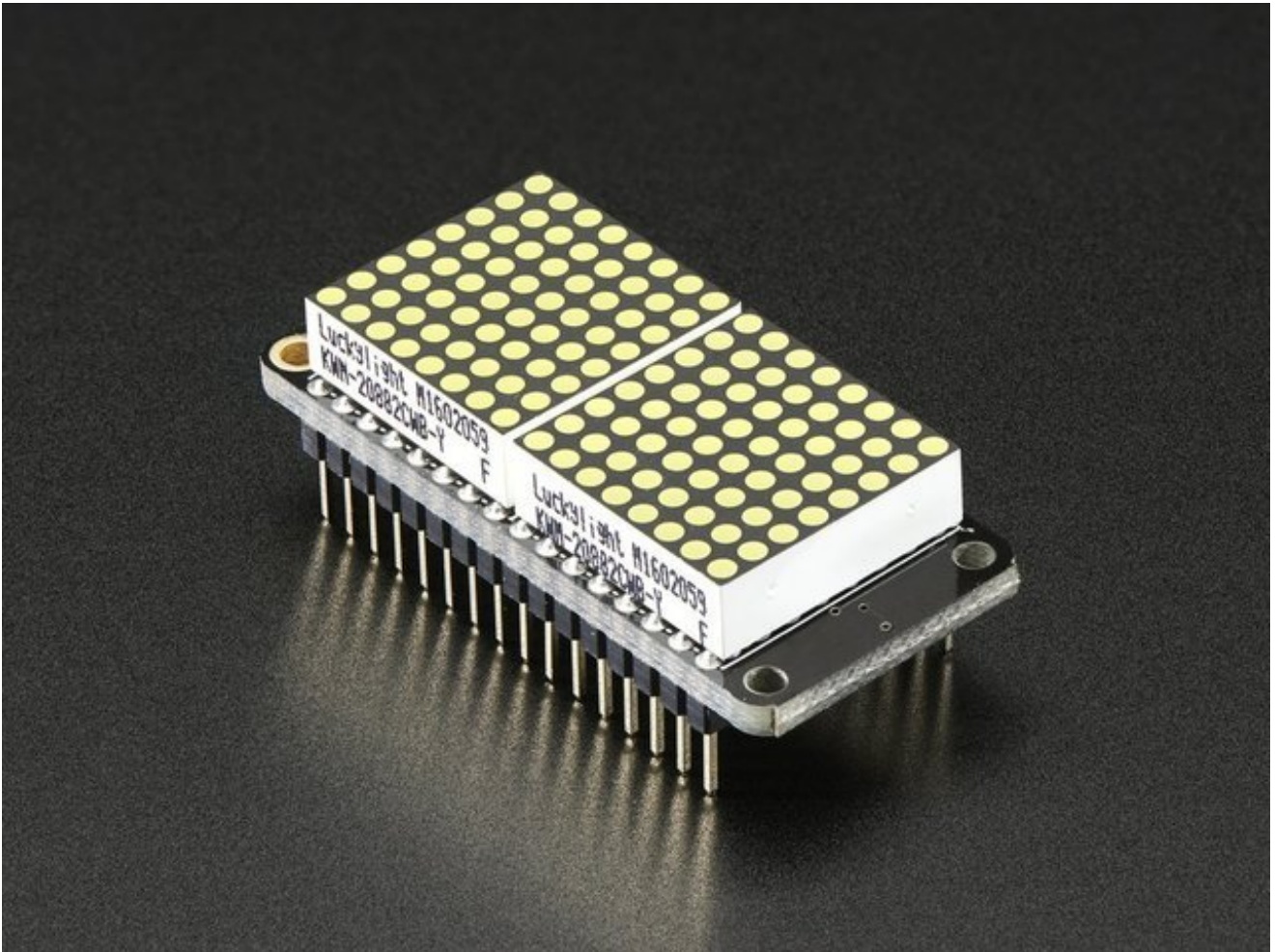


Last updated on 2016-05-20 01:58:38 PM EDT

## Guide Contents

Guide Contents	2
Overview	3
Pinouts	7
Power Pins	7
I2C pins	8
Address Jumpers	9
Changing Addresses	9
Assembly	10
Prepare the header strips:	10
Add the FeatherWing PCB:	10
And Solder!	10
Usage	13
Install Adafruit GFX	14
Run Test!	14
Library Reference	15
Setup	15
Drawing with Adafruit GFX	15
Writing Data	16
Other things!	16
Downloads	17
Schematic	17
Fabrication Print	17

# Overview

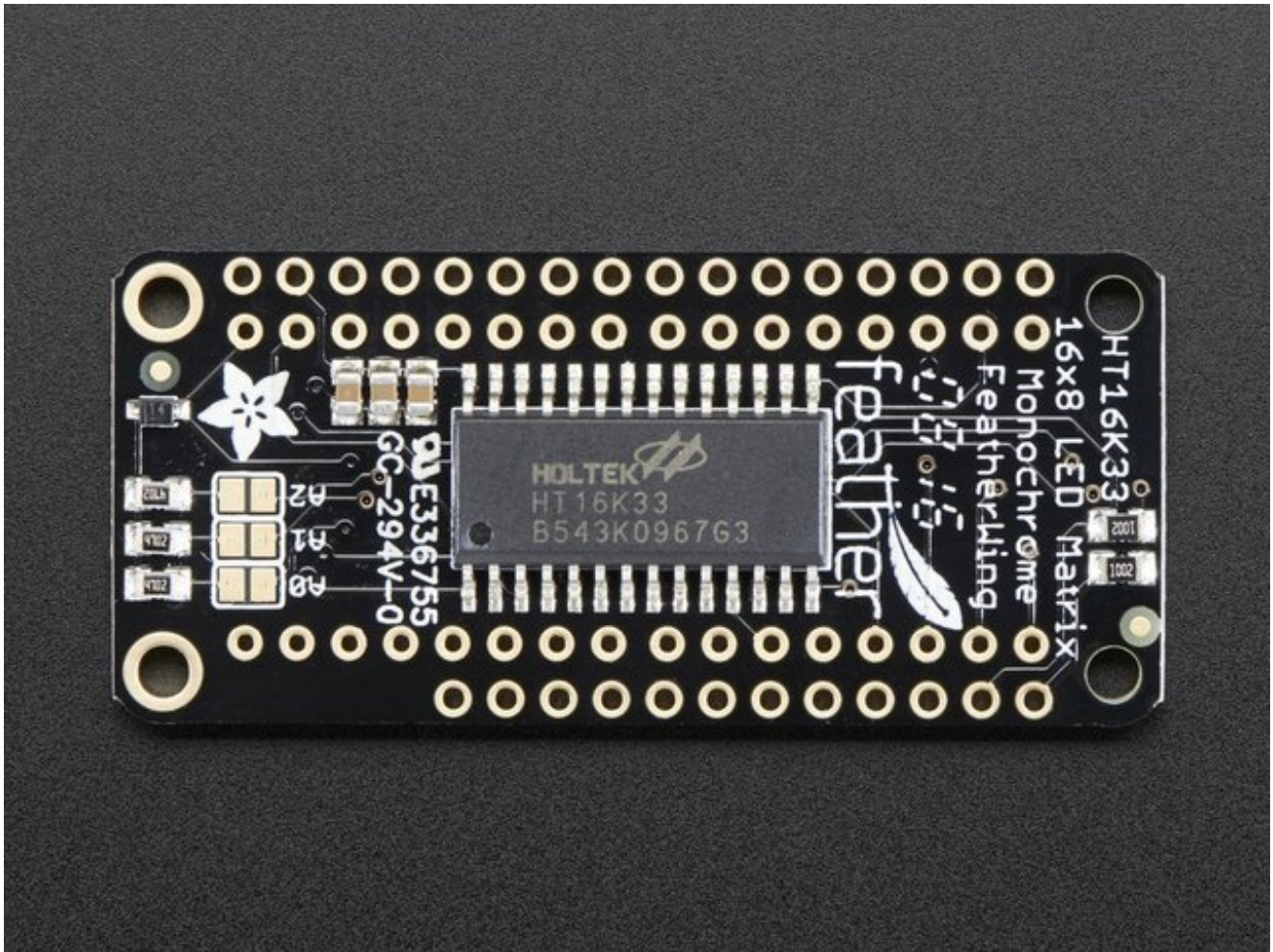


You will chirp with delight when you see how easy it is to make your very own 8x16 LED matrix display for any Feather. This kit combines two of our adorable miniature LED matrices with a FeatherWing driver board. At 0.8" square, these little 8x8 matrices have got everything a big LED matrix has, but bite sized! Double them up for 128 total bright LEDs.

We have these combo packs in [White \(http://adafru.it/3149\)](http://adafru.it/3149), [Blue \(http://adafru.it/nE2\)](http://adafru.it/nE2), [Green \(http://adafru.it/nE3\)](http://adafru.it/nE3), [Red \(http://adafru.it/nE4\)](http://adafru.it/nE4), [Yellow \(http://adafru.it/nE5\)](http://adafru.it/nE5), and [Yellow-Green \(http://adafru.it/nE6\)](http://adafru.it/nE6).

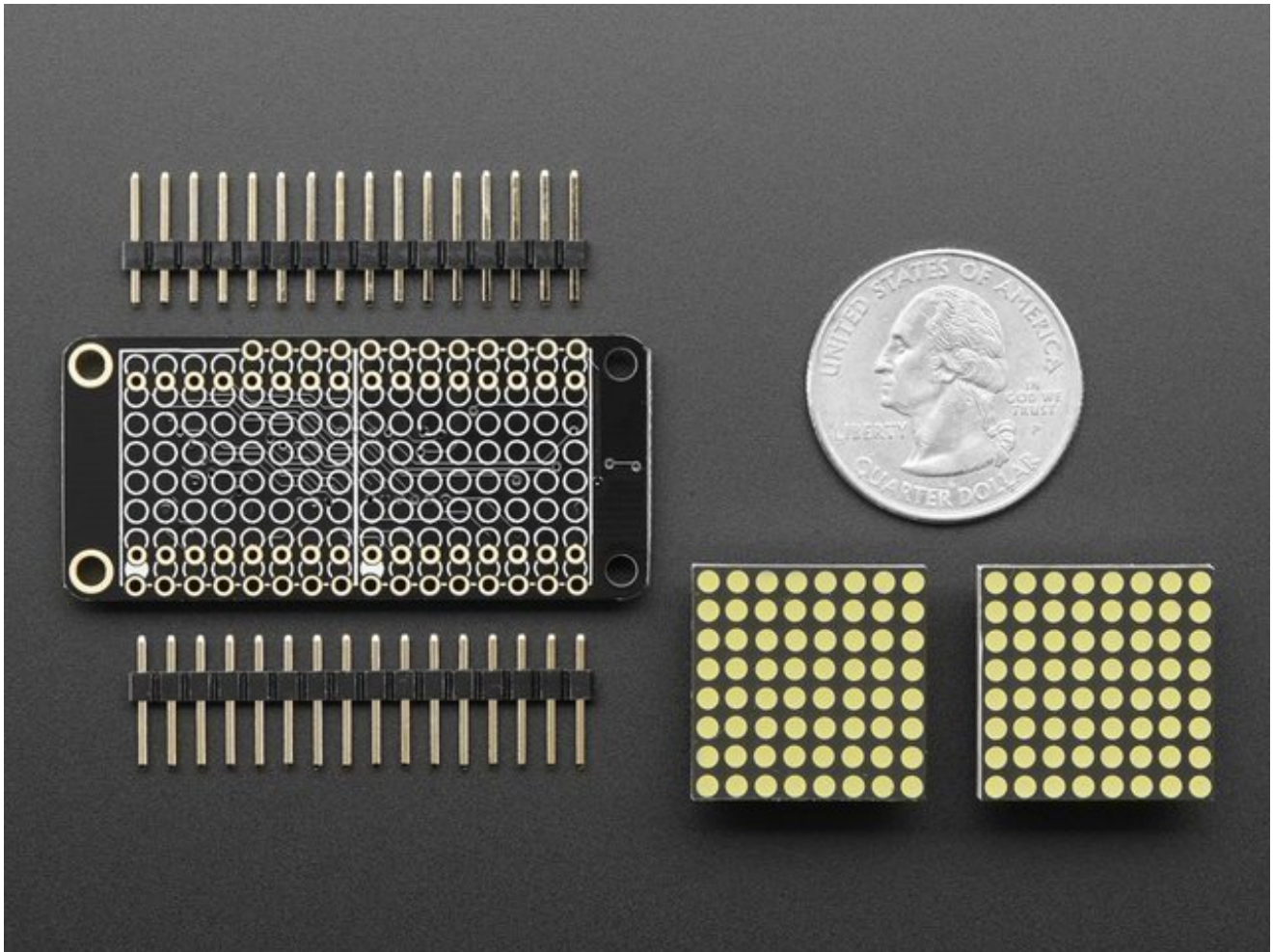


Normally, wiring up 8x16 matrices would require a breath-taking 24 GPIO pins, which is way too many pins. That's where this lovely 16x8 LED matrix backpack PCB comes in. It contains a HT16K33 I2C LED matrix driver that does all the multiplexing work for you, and is controlled over the two I2C pins. It's easy to use, has a portable library that runs on any of our Feathers to turn on/off each LED.



The 16x8 backpack is also great for making scrolling displays or small video displays. In our example, we set it up to display small bitmap emoticons but you can also display text that moves - kind of like a sign in front of a miniature car dealership.



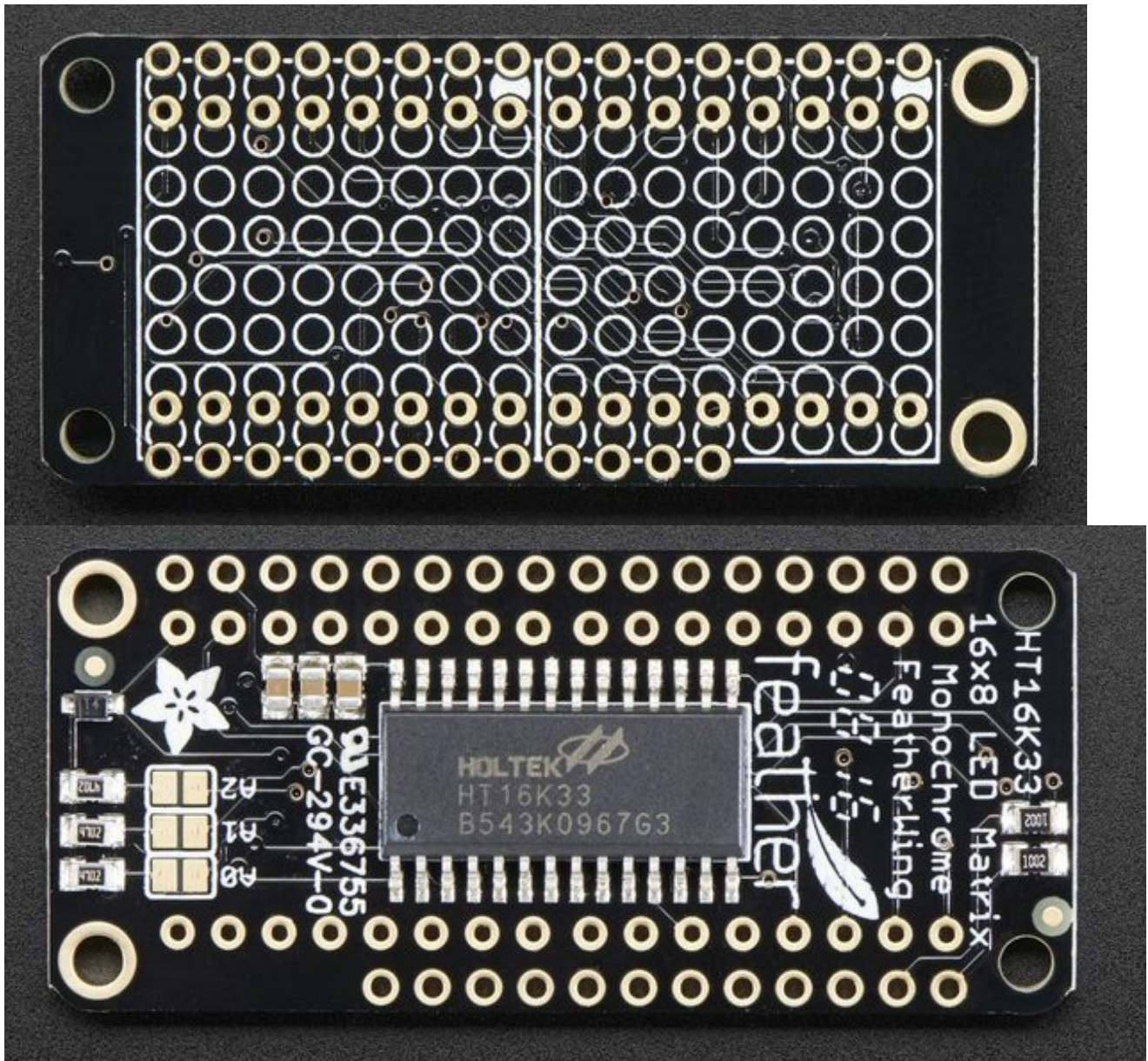


This kit comes with:

- A fully tested and assembled 16x8 0.8" LED FeatherWing
- 2 x ultra-bright square 8x8 matrices
- 2 x 16-pin header

A bit of soldering is required to attach the two matrices onto the FeatherWing but its very easy to do and only takes about 15 minutes.

# Pinouts

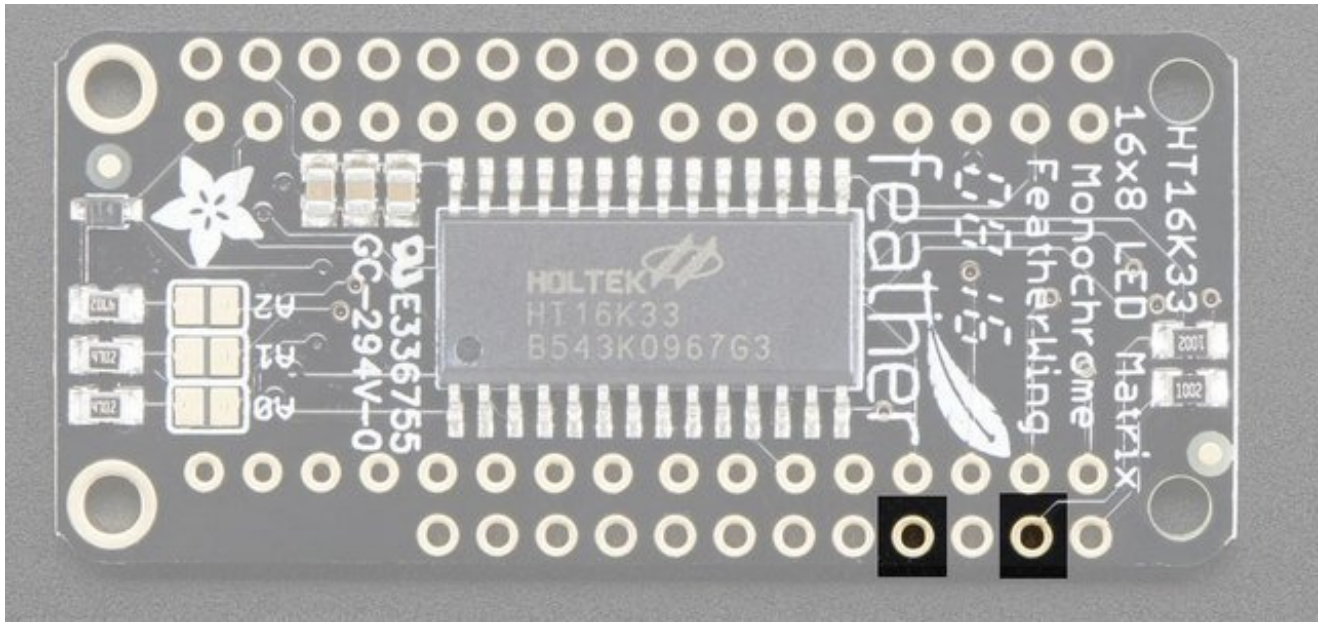


The 8x16 backpack makes it really easy to add a 128-LED display

The LEDs themselves do not connect to the Feather. Instead, a matrix driver chip (HT16K33) does the multiplexing for you. The Feather simply sends i2c commands to the chip to tell it what LEDs to light up and it is handled for you. This takes a lot of the work and pin-requirements off the Feather. Since it uses only I2C for control, it works with any Feather and can share the I2C pins for other sensors or displays.

## Power Pins

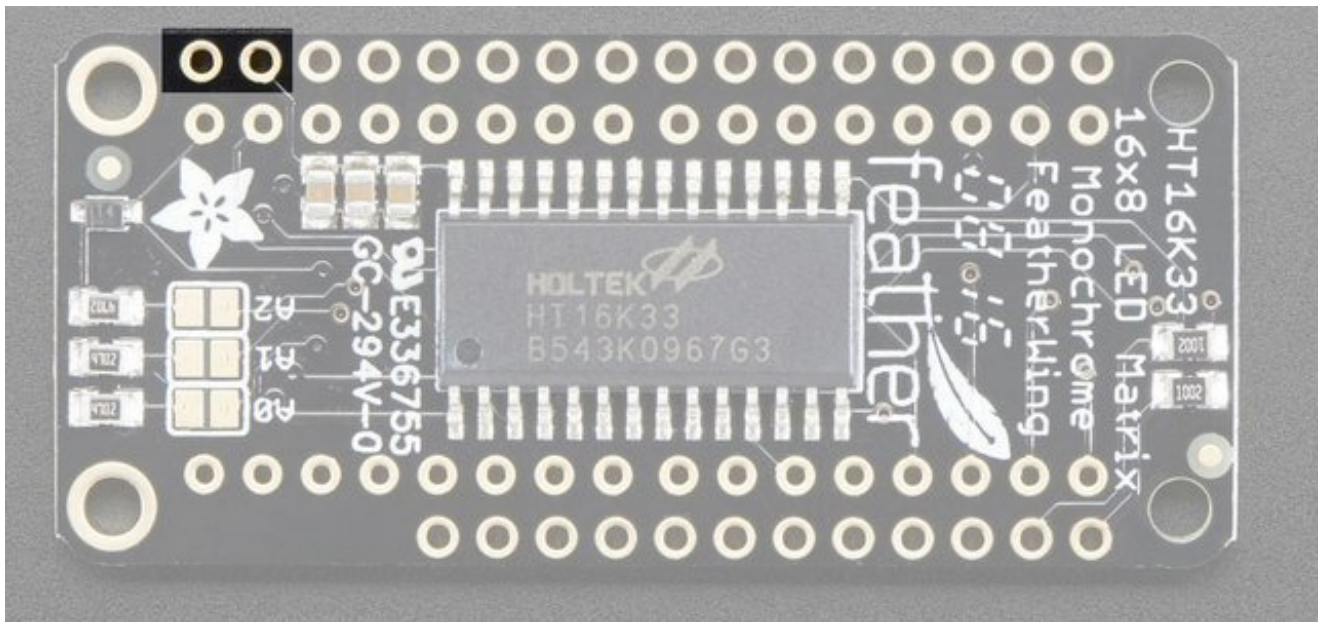




The LED matrix uses only the **3V** and **GND** pins for power and logic. Current draw depends on how many LEDs are lit but you can approximate it as about 120mA for most uses.

Note that the 3.3V power supply is a tiny bit lower than the forward voltage for the pure green, blue and white LED matrices but we didn't find any significant degradation in brightness. Really, they're still very bright.

## I2C pins

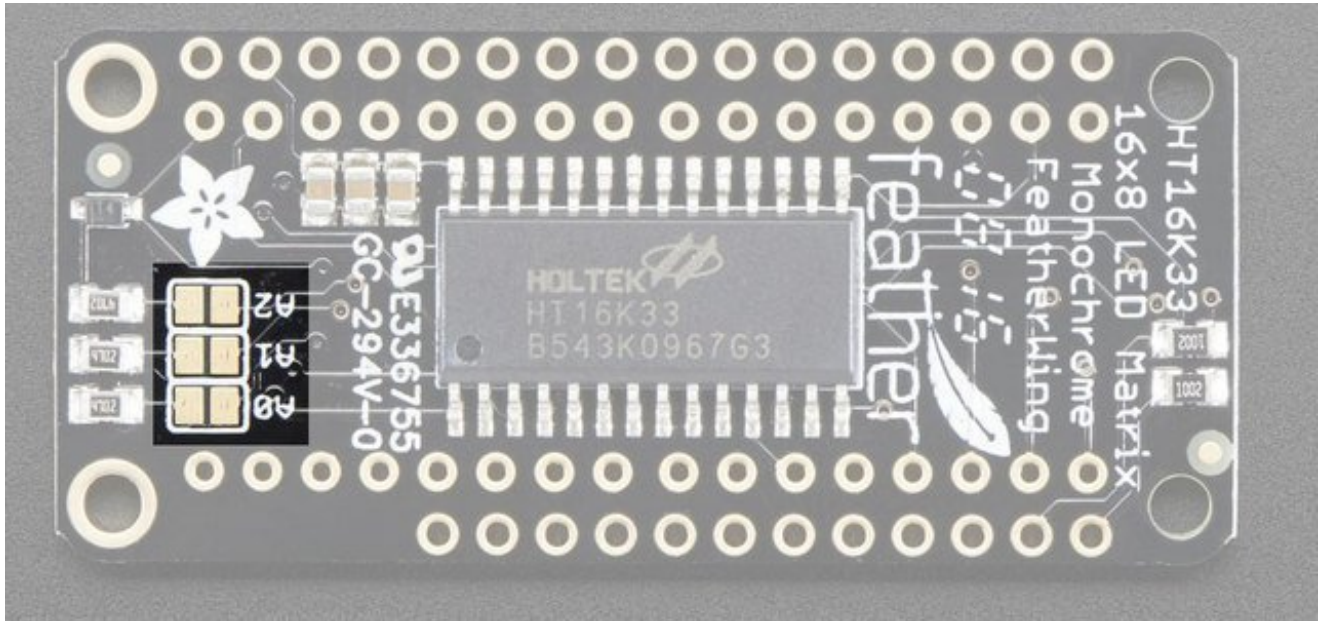


All LED control is done over I2C using the HT16K33 interface library. This means SDA and SCL must be connected, see above for those pins.

The default address is **0x70** but you can change the address to **0x71-0x77** by bridging solder onto the address pins.



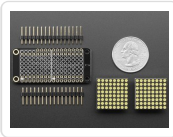
# Address Jumpers



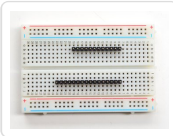
## Changing Addresses

You can change the address of a backpack very easily. Look on the back to find the two or three **A0**, **A1** or **A2** solder jumpers. Each one of these is used to hardcode in the address. If a jumper is shorted with solder, that sets the address. **A0** sets the lowest bit with a value of **1**, **A1** sets the middle bit with a value of **2** and **A2** sets the high bit with a value of **4**. The final address is **0x70 + A2 + A1 + A0**. So for example if **A2** is shorted and **A0** is shorted, the address is **0x70 + 4 + 1 = 0x75**. If only A1 is shorted, the address is **0x70 + 2 = 0x72**

# Assembly

- 

When you buy a pack from Adafruit, it comes with the fully tested and assembled backpack as well as a two 8x8 dual displays in one of the colors we provide (say, red, yellow, blue or green). You'll need to solder the matrix onto the backpack but it's an easy task.

- 

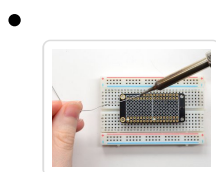
## Prepare the header strips:

You'll need three 7-pin and a 3-pin strip of header to attach the Featherwing to your Feather. Cut the header strip to length if necessary. It will be easier to solder if you insert it into a breadboard - **long pins down**

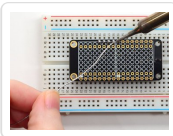
- 

## Add the FeatherWing PCB:

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

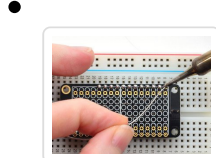


- ## And Solder!

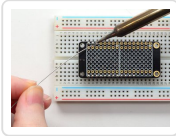


Be sure to solder all pins for reliable electrical contact.

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

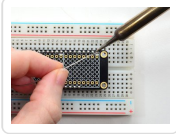


- 

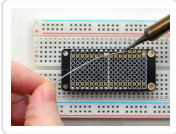


Do both header strips, all pins!

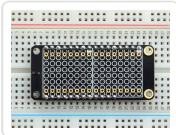
- 



- 

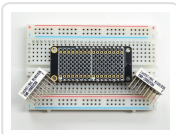


- 



Check your solder joints visually and continue onto the next step

- 

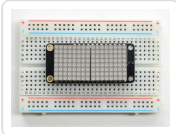


Next we'll attach the LED matrices

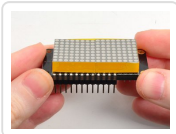
Check the Matrices and line it up next to the FeatherWing

- 

Look for the text on the matrices. This is the 'pin 1' side, and lines up with the same side as the side with the filled in white dot on the PCB silkscreen.

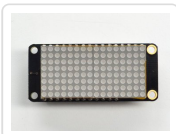


- 



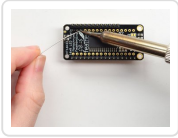
There's a little 'play' in the LED matrices to make it easy to solder them in place. It isn't noticeable when they're lit but if you want to make sure there's no gap between the matrices, use some tape to bind them together while soldering

- 

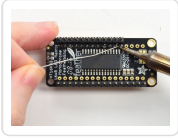




•



•

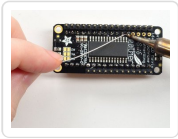


•



Solder the matrix in place. Note this will be a little tougher because there's not as much space. Go slow, do one pin at a time and you can clip it after each point if you need!

•

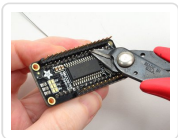


•



Check your solder joints visually and continue onto the next step

•



Once soldered, clip each matrix wire short

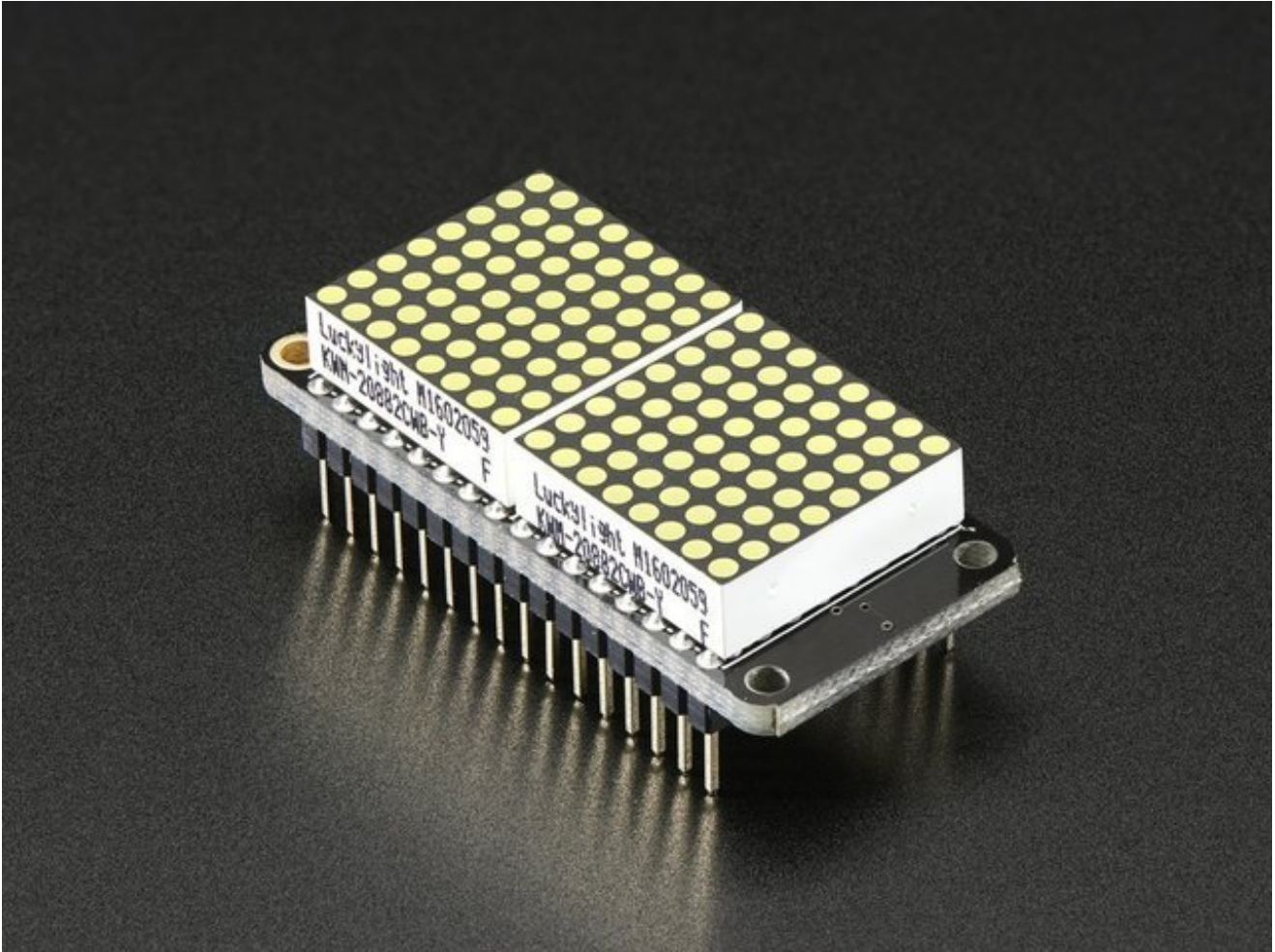
•



You're done! You can now install software and get blinking



# Usage



To talk to the LED helper chip you'll need to use our Arduino [Adafruit LED Backpack library from github](http://adafru.it/aLI) (<http://adafru.it/aLI>).

To download you can visit the repository, or simply click on this button:

[Download Adafruit LED Backpack Library](#)

<http://adafru.it/ncm>

Rename the uncompressed folder **Adafruit\_LEDBackpack**. Check that the **Adafruit\_LEDBackpack** folder contains **Adafruit\_LEDBackpack.cpp** and **Adafruit\_LEDBackpack.h**. Place the **Adafruit\_LEDBackpack** library folder your *arduinofolder/libraries/* folder.

You may need to create the *libraries* subfolder if it's your first library. We also have a great tutorial on Arduino library installation at:

<http://learn.adafruit.com/adafruit-all-about-arduino-libraries-install-use> (<http://adafru.it/aYM>)



# Install Adafruit GFX

You will need to do the same for the Adafruit\_GFX library available here (<http://adafru.it/aJa>)

Download Adafruit GFX Library

<http://adafru.it/cBB>

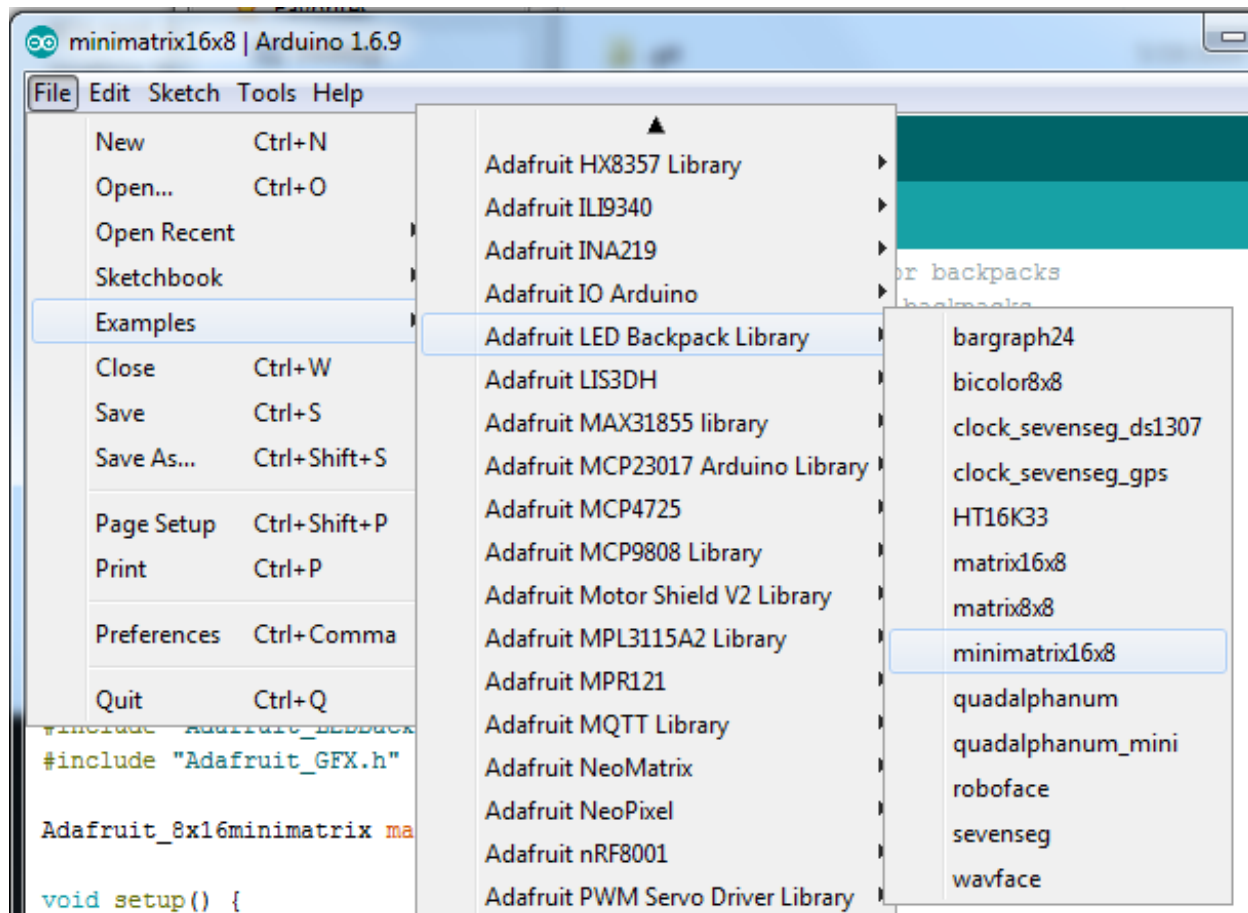
Rename the uncompressed folder **Adafruit\_GFX** and check that the **Adafruit\_GFX** folder contains **Adafruit\_GFX.cpp** and **Adafruit\_GFX.h**

Place the **Adafruit\_GFX** library folder your **arduinowsketchfolder/libraries/** folder like you did with the LED Backpack library

It's not actually used for the 7-segment display, it's only for the matrix backpacks but it's still required by the library so please install it to avoid errors! Restart the IDE.

## Run Test!

Once you've restarted you should be able to select the **File->Examples->Adafruit\_LEDBackpack->minimatrix16x8** example sketch. Upload it to your Feather as usual. You should see a basic test program that goes through a bunch of different routines.



Note that the normal "matrix16x8" demo wont work the way you want because the matrix alignment is different on the Feather!

Upload to your Arduino, and open up the Serial console at 9600 baud speed. You'll see a little light show demonstrating bitmaps, drawing lines, circles and squares, text scrolling and more!

## Library Reference

For the 16x8 displays, our library essentially treats it like a graphical display with 128 pixels

## Setup

You can create the object with

```
Adafruit_GFX *matrix = new Adafruit_GFX(128, 32);
```

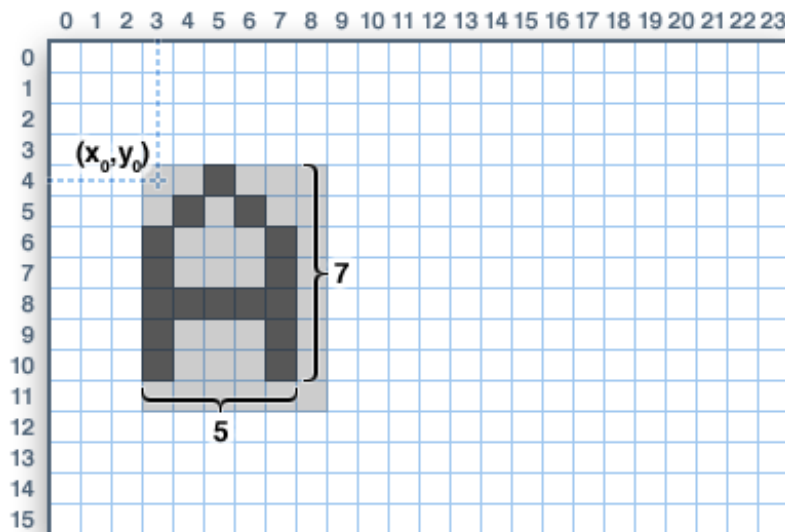
There's no arguments or pins because the backpacks use the fixed I2C pins.

By default, the address is 0x70, but you can pass in the I2C address used when you initialize the display with **begin**

```
Adafruit_GFX *matrix = new Adafruit_GFX(128, 32, 0x70);
```

## Drawing with Adafruit GFX

Once you're happy that the matrix works, you can write your own sketches. The 16x8 matrix supports everything the Adafruit GFX library - drawing pixels, lines, rectangles, circles, triangles, roundrects, and small bitmaps. [For more details check out the GFX page which will detail all of the GFX routines \(http://adafru.it/aPx\).](http://adafru.it/aPx)



## Writing Data

Don't forget to 'write' the data to the display with

```
display.writeDataBuffer(leds, ledsCount);
```

That's what actually 'sets' the data onto the LEDs!

## Other things!

- **setBrightness(*brightness*)**- will let you change the overall brightness of the entire display. 0 is least bright, 15 is brightest and is what is initialized by the display when you start
- **blinkRate(*rate*)** - You can blink the entire display. 0 is no blinking. 1, 2 or 3 is for display blinking.

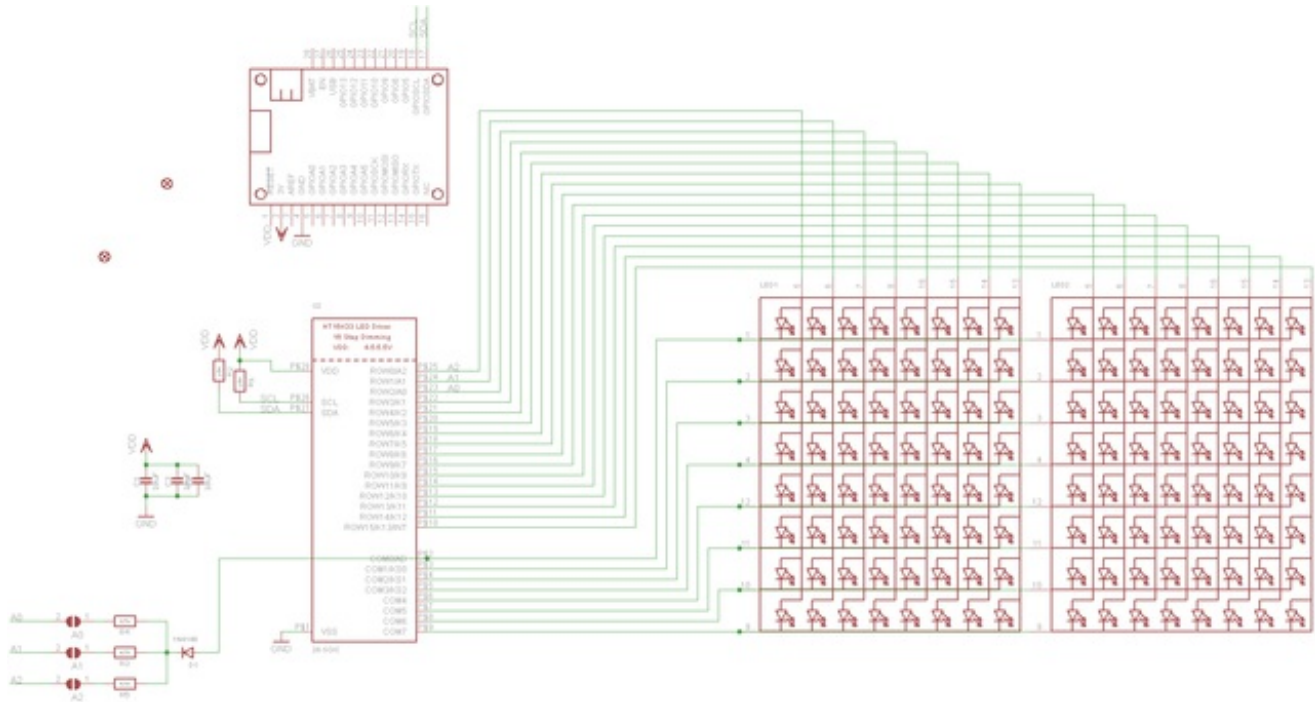


# Downloads

- [Arduino LED Backpack Library \(http://adafru.it/mau\)](http://adafru.it/mau)
- [Featherwing PCB files \(http://adafru.it/nco\)](http://adafru.it/nco)

# Schematic

Click to embiggen



# Fabrication Print

Dimensions in Inches

