thingSoC

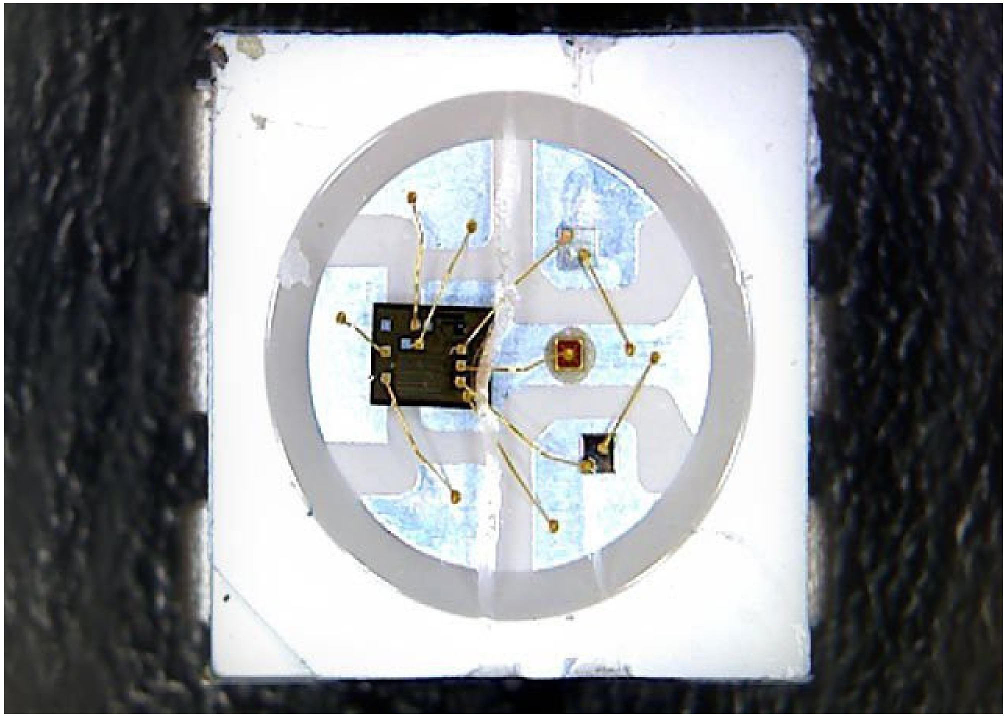
NEOLED Overview:

An Introduction to WS2812 LEDs

By
@PatternAgents

Addressable LEDs

- WS2810/WS2812 (a.k.a. NEOPixels by Adafruit)
  Integrates an LED driver chip with Red, Green, Blue LED's



@Pattern Agents

- PatternAgents supplies Open Source Design Patterns for Hardware, Firmware, Software, and Applications.

- A tailor or dressmaker is very familiar with the concept of a "pattern"; they select a “pattern” for the style of garment that they want to make, and then size that “pattern” for the customers individual measurements.

- PatternAgents is doing the same thing for electronics, in embedded systems for communications, robotics, metering and automation.

WS2812 (SK6812) Color LEDs

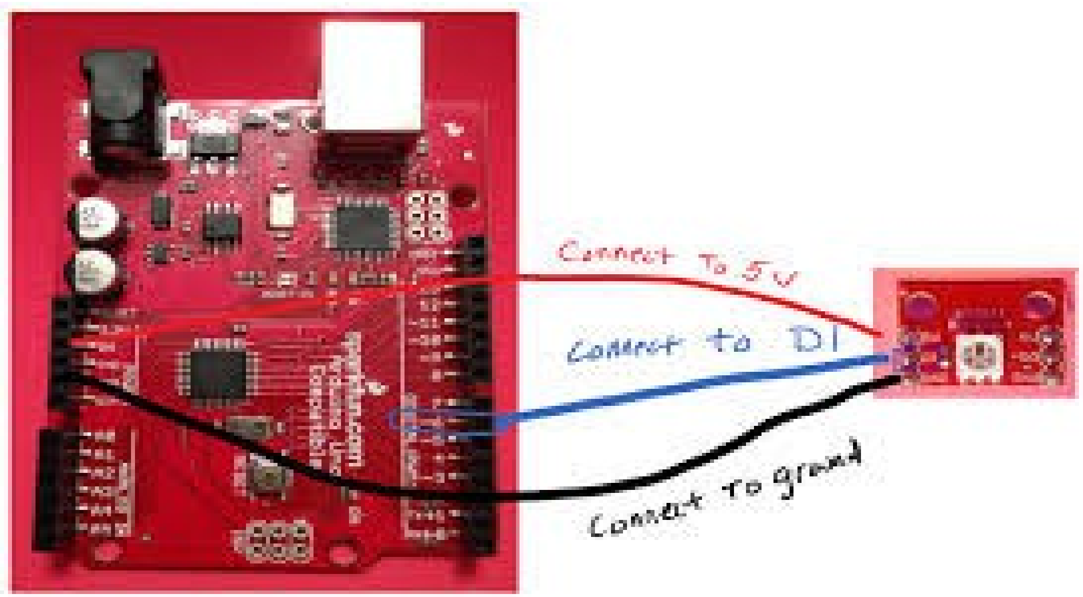
- Likely the most common addressable LED you'll find (called NEOPixels when you buy them at Adafruit!)

- They use a serial bit stream (UART like) protocol that can be difficult for some microcontrollers or Linux single board computers (SBC) to drive directly (tight timing…)

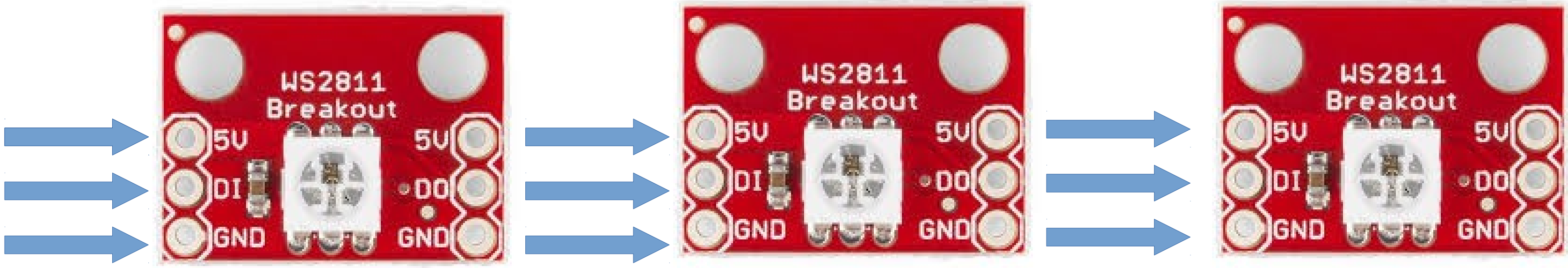
- It can also be difficult to drive and synchronize hundreds of WS2812 LEDs in multiple strings without hardware acceleration of some kind (special circuit, DMA, etc.)

Source : @PatternAgents

WS2812 Wiring



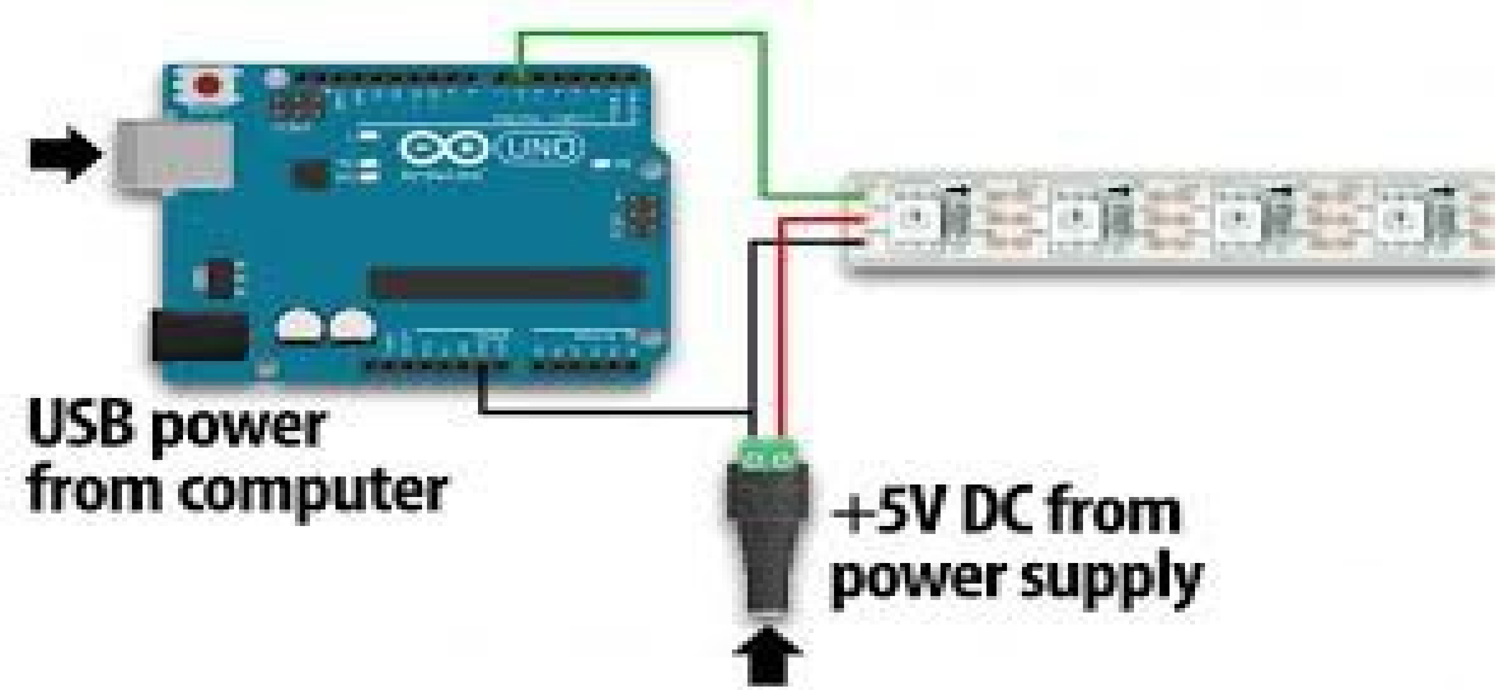
- Needs 5.0 Volt Power
- Needs 5.0 Volt Signal
- Can draw AMPS of Power with many LEDs
- Do NOT do this with more than a few LEDs, it can fry your Arduino boards…



Source : Sparkfun

WS2812 Wiring

- Best Practice is to power the LED strings separately:

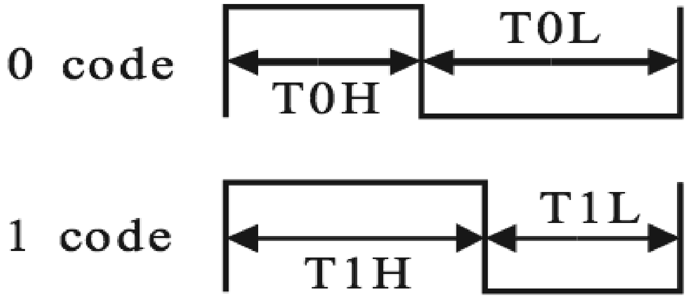


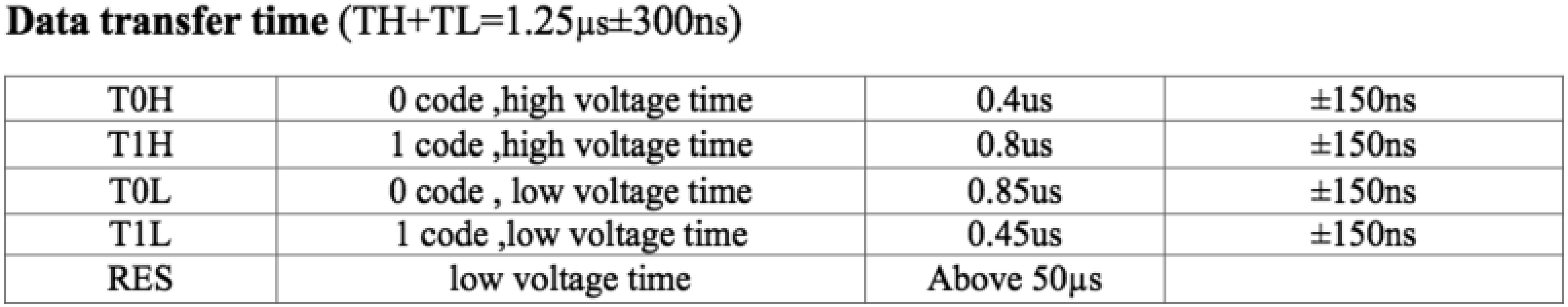
USB power from computer

+5V DC from power supply

WS2812 Timing

- The older WS2810 was a 400KHz serial data signal
- The newer WS2811/WS2812 are now 800KHz data signals



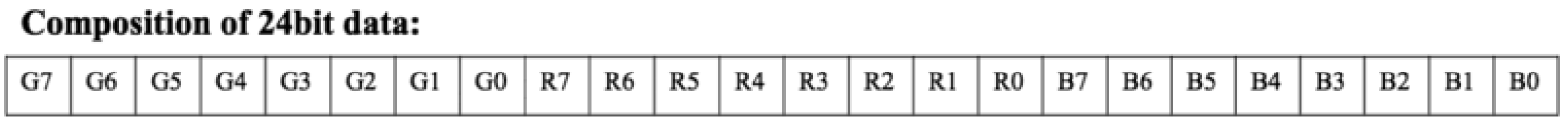


Data transfer time (TH+TL=1.25µs±300ns)

T0H	0 code ,high voltage time	0.4us	±150ns
T1H	1 code ,high voltage time	0.8us	±150ns
T0L	0 code , low voltage time	0.85us	±150ns
T1L	1 code ,low voltage time	0.45us	±150ns
RES	low voltage time	Above 50µs	

Source : Adafruit

WS2812 LED Color Order



Composition of 24bit data:

G7	G6	G5	G4	G3	G2	G1	G0	R7	R6	R5	R4	R3	R2	R1	R0	B7	B6	B5	B4	B3	B2	B1	B0

- Eight (8) bits each for Green, Red, Blue
- Different chips can use different color orders (beware!)
- Some add White or Yellow LEDs for a 32 bit color pixel

Source : Adafruit

Arduino Libraries

- Adafruit NeoPixel Library :
  Well written, supports AVR, ESP8266, SAMD, etc.

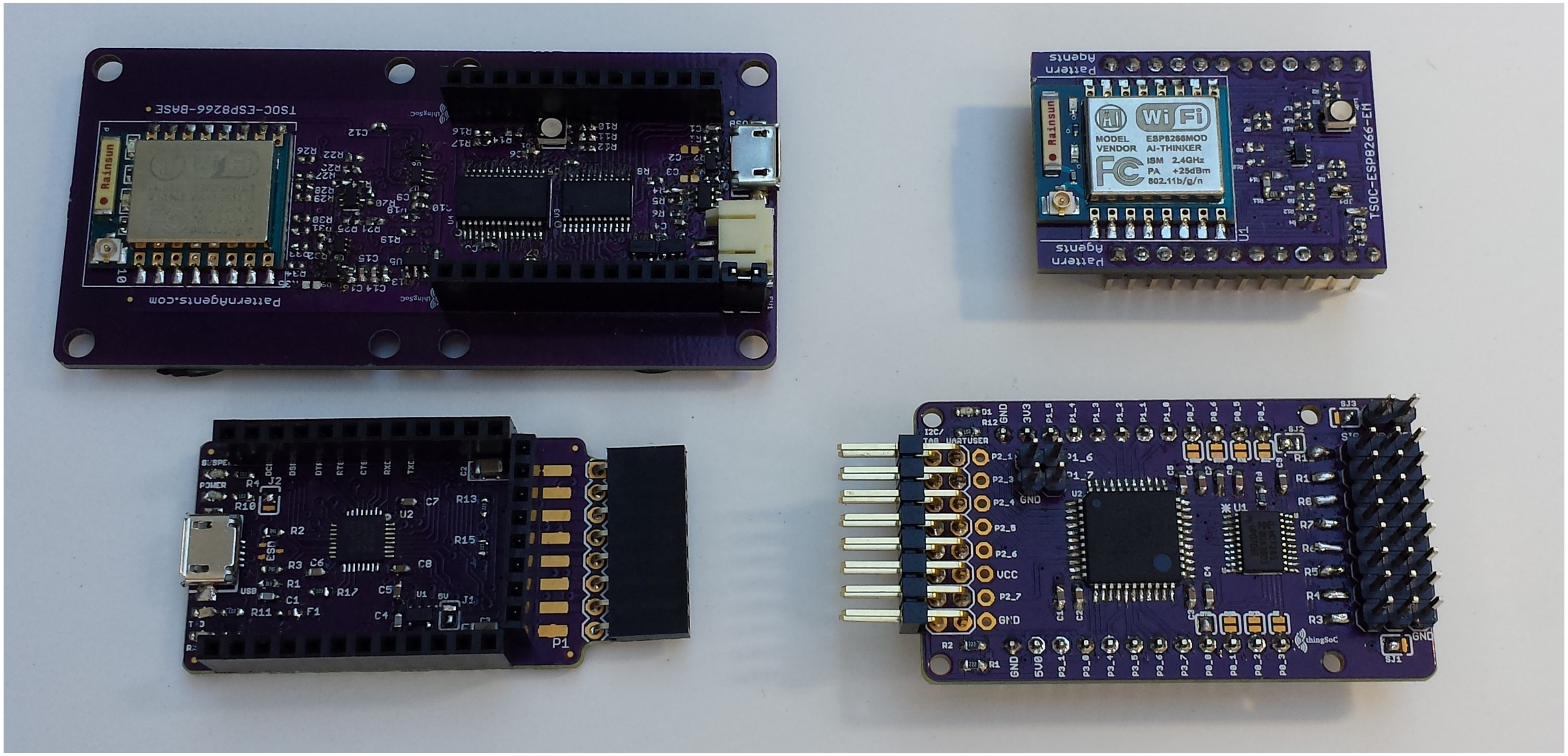
- FastLeds Library :
  Optimized, with higher performance and update rates

- Problems :
  1) Can interfere with other functions, like audio, servos, etc.
  2) Can use up a lot of the “scarce” memory resource
  3) Doesn't work well with the Edison, Currie, Galileo, etc.

Source : Adafruit

thingSoC is a OSHW Standard

Growing into a family of inter-operable products:



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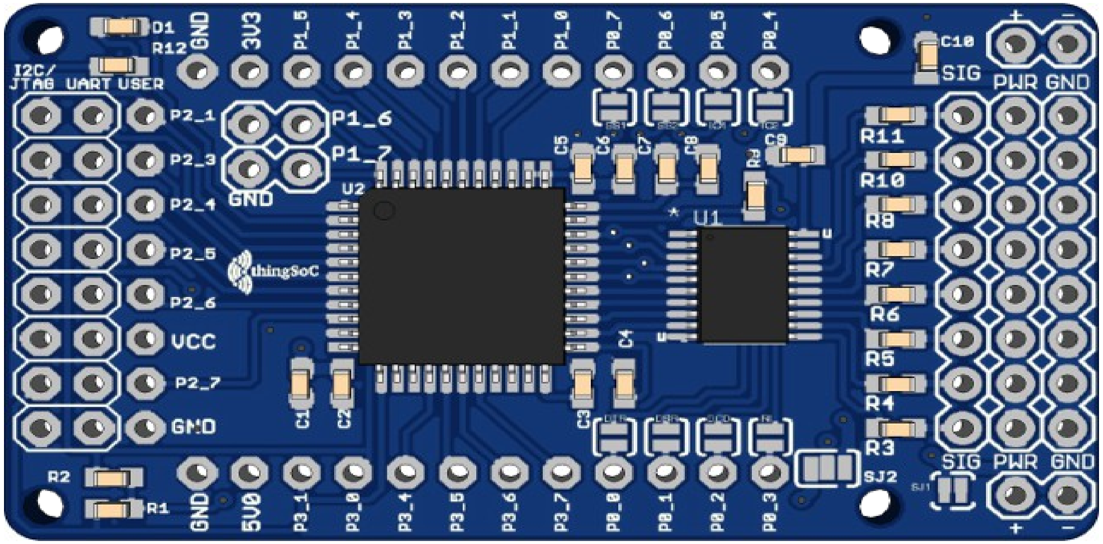
TSOC_NEOLED_EM

- Eight (8) Channel RBG(Y) LED Driver Board (Embeddable Module)
  Makes driving LED arrays as easy as writing to an I2C memory
- Reprogrammable for other functions (servo motors, etc.)
- Works with other thingSoC products
- Coming soon to Crowd Supply here in Portland!



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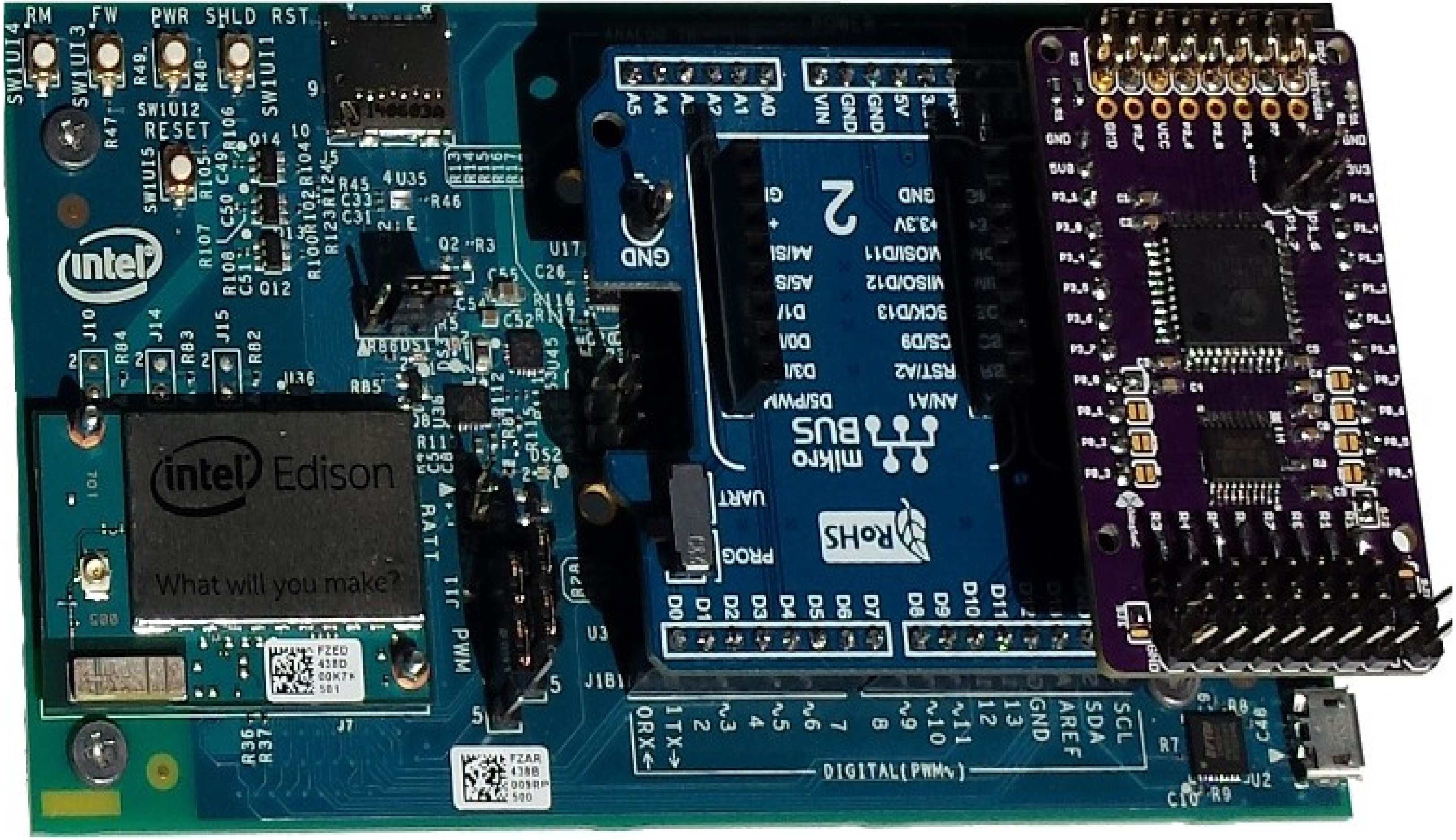
Driving WS2812 with Edison



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Driving WS2812 with Edison

- While there are ways to drive WS2812 LEDs directly from the Edison (MRAA), they are not easy and have other problems.
- Using the TSOC_NEOLED board eliminates the timing and voltage level translation issues for you.
- The TSOC_NEOLED board looks like a simple I2C memory device to the Edison, simplifying your code.

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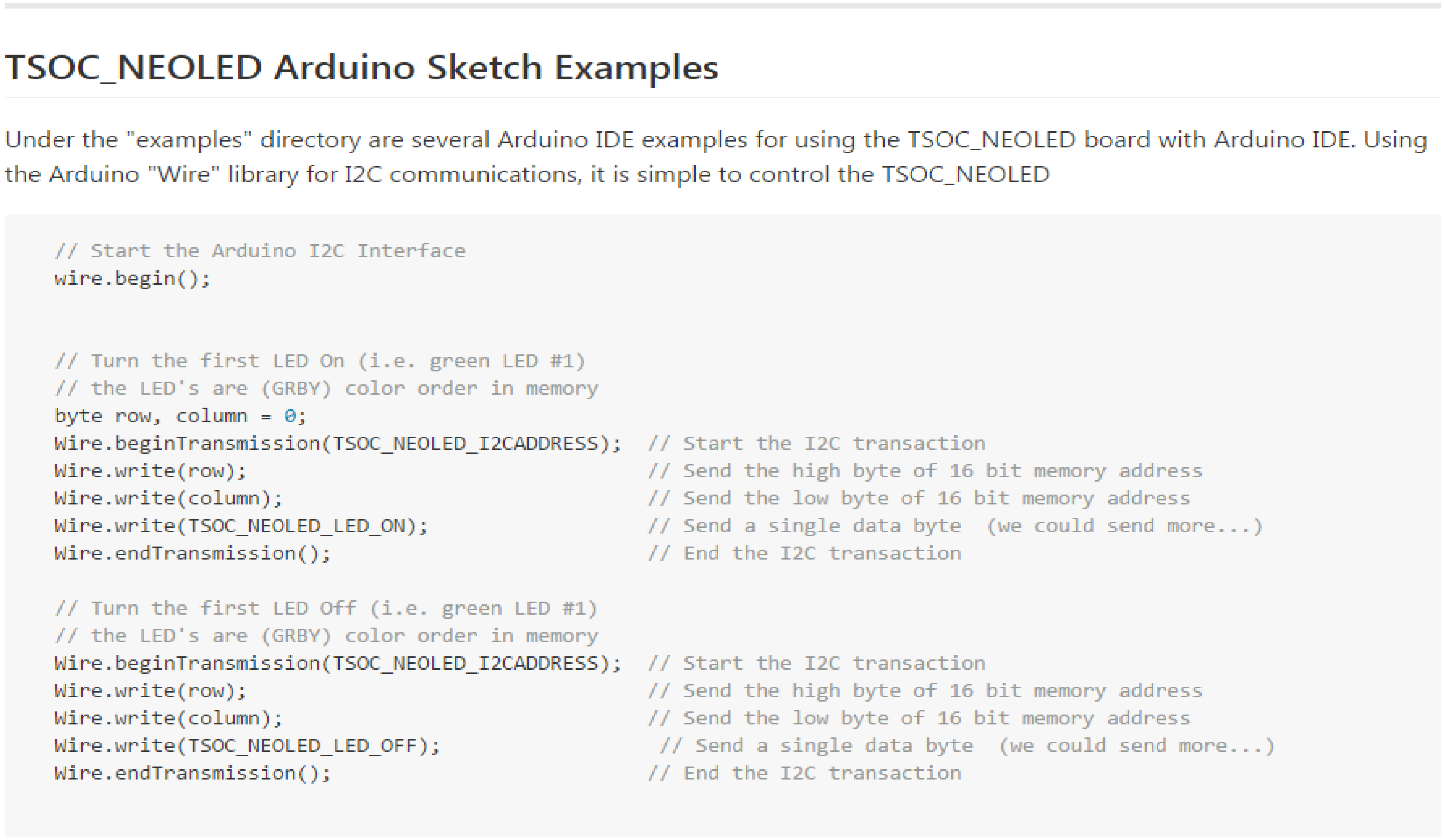

TSOC_NEOLED Arduino Sketch Examples

Under the "examples" directory are several Arduino IDE examples for using the TSOC_NEOLED board with Arduino IDE. Using the Arduino "Wire" library for I2C communications, it is simple to control the TSOC_NEOLED

```
// Start the Arduino I2C Interface
wire.begin();


// Turn the first LED On (i.e. green LED #1)
// the LED's are (GRBY) color order in memory
byte row, column = 0;
Wire.beginTransmission(TSOC_NEOLED_I2CADDRESS);  // Start the I2C transaction
Wire.write(row);                                  // Send the high byte of 16 bit memory address
Wire.write(column);                               // Send the low byte of 16 bit memory address
Wire.write(TSOC_NEOLED_LED_ON);                   // Send a single data byte  (we could send more...)
Wire.endTransmission();                           // End the I2C transaction

// Turn the first LED Off (i.e. green LED #1)
// the LED's are (GRBY) color order in memory
Wire.beginTransmission(TSOC_NEOLED_I2CADDRESS);  // Start the I2C transaction
Wire.write(row);                                  // Send the high byte of 16 bit memory address
Wire.write(column);                               // Send the low byte of 16 bit memory address
Wire.write(TSOC_NEOLED_LED_OFF);                   // Send a single data byte  (we could send more...)
Wire.endTransmission();                           // End the I2C transaction
```

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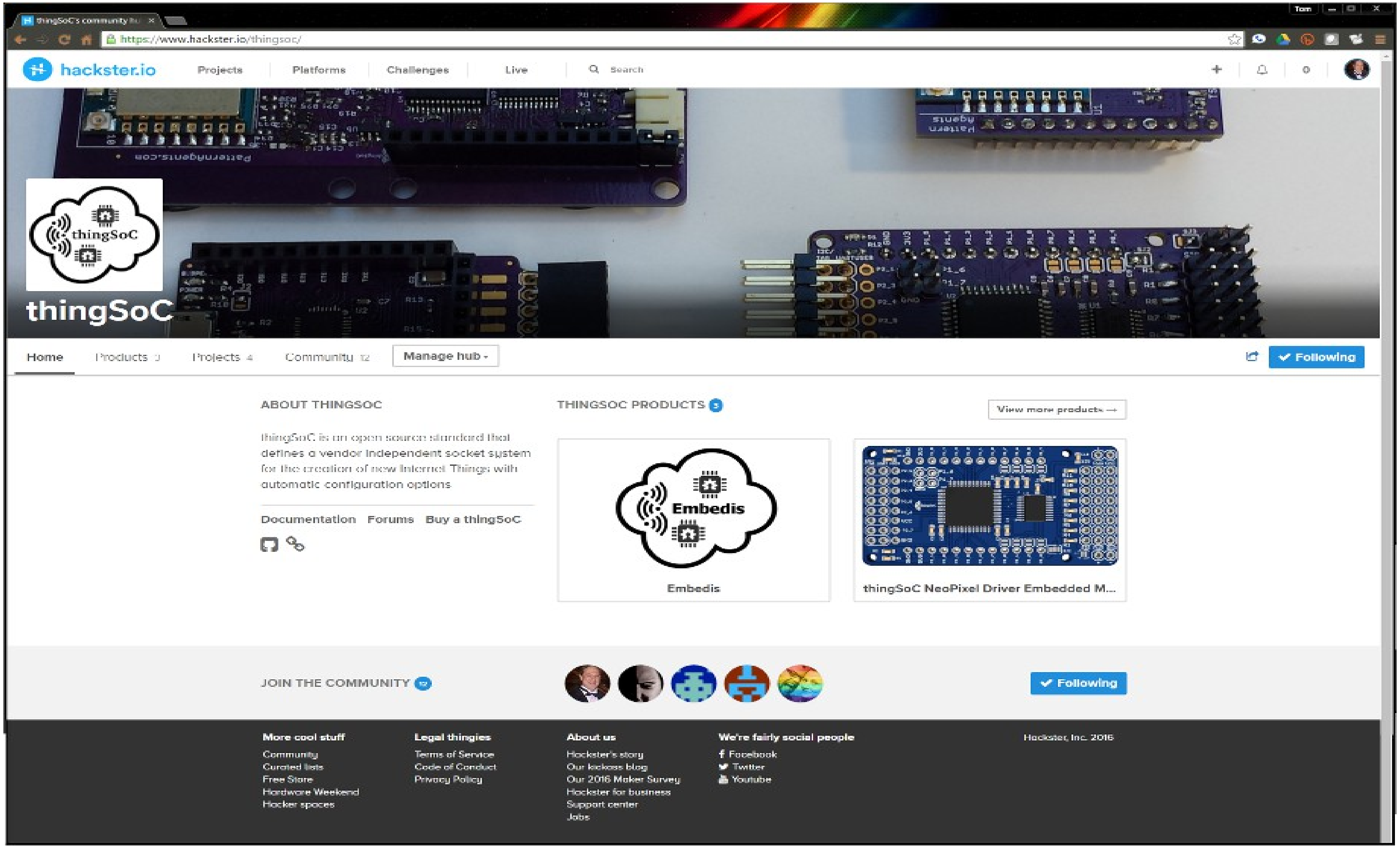
Hackster.io Platform



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ABOUT THINGSOC

thingSoC is an open source standard that defines a vendor independent socket system for the creation of new Internet Things with automatic configuration options

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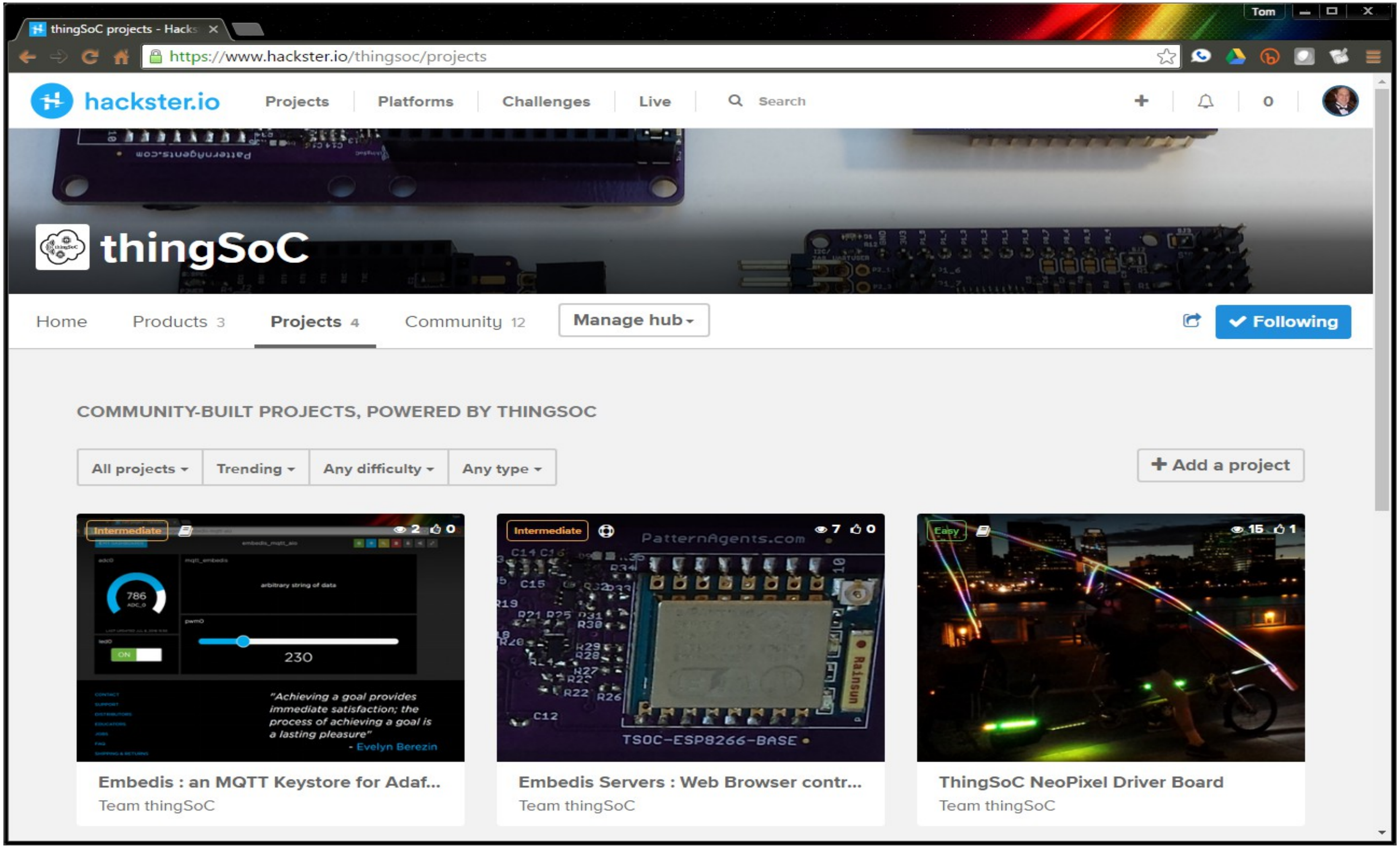
Hackster.io Projects



thingSoC projects - Hacks

https://www.hackster.io/thingsoc/projects

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COMMUNITY-BUILT PROJECTS, POWERED BY THINGSOC

"Achieving a goal provides immediate satisfaction; the process of achieving a goal is a lasting pleasure"
- Evelyn Berezin

Embedis : an MQTT Keystore for Adaf...
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ThingSoC NeoPixel Driver Board
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- Please go to :
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  and "Click" on the blue "Following" button

- Look for our Crowd Supply campaign
  coming soon!

Thank You !

Thank You!

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