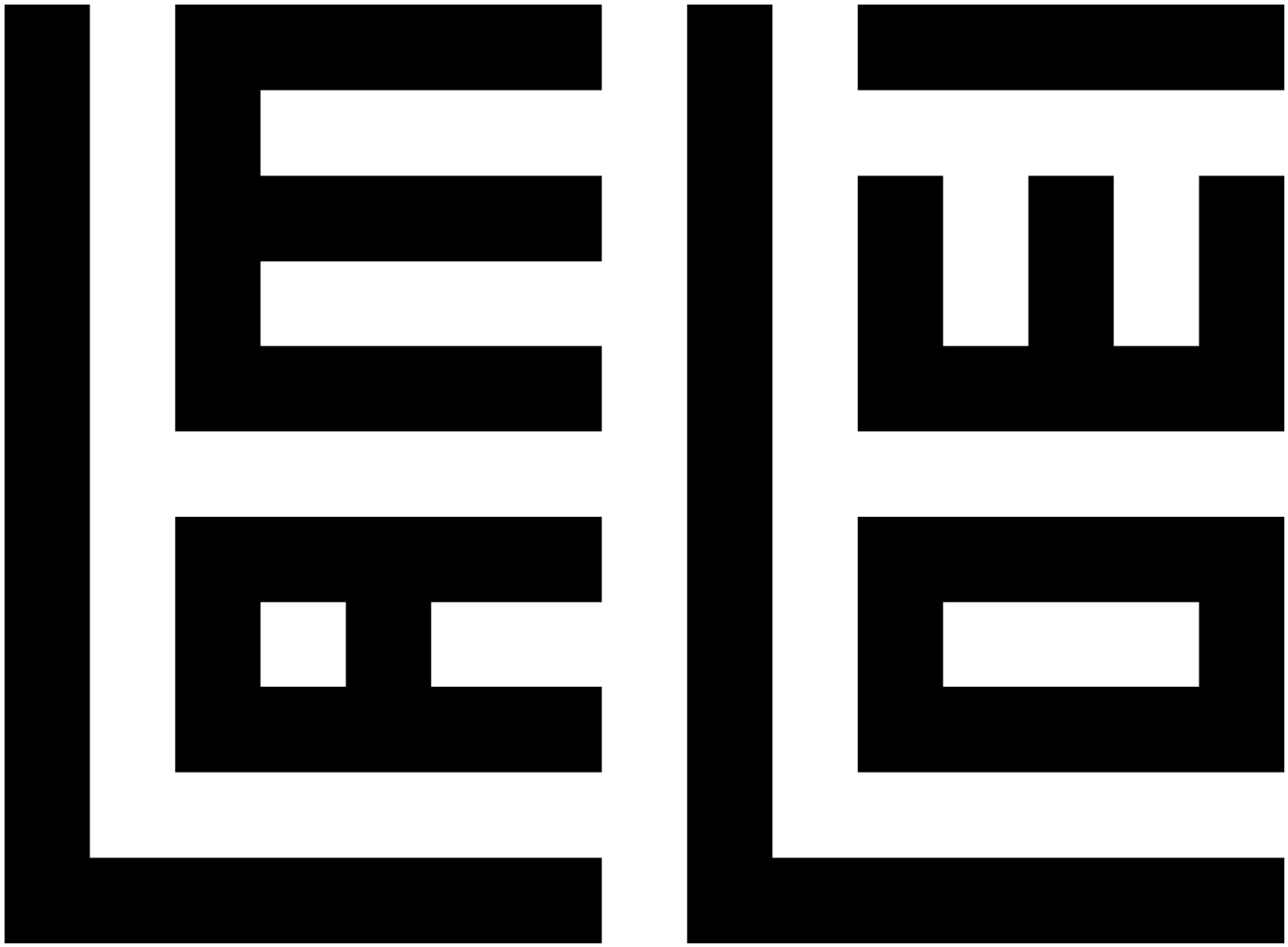

LAMLOE
https://www.facebook.com/lamloeicom

คอร์สอบรม

Node32Lite

Arduino IDE Basic

ขั้นพื้นฐาน

จุดประสงค์

- ผู้เข้าอบรมสามารถเขียน Arduino IDE ลงบน Node32Lite
- สามารถสร้างระบบนำมาใช้งานได้

เอกสารคอร์สอบรมนี้ สามารถดาวน์โหลดได้ที่

- https://github.com/lamloei/present2

*** คอร์สอบรมนี้เหมาะสมกับผู้เริ่มต้น ***

กำหนดการ

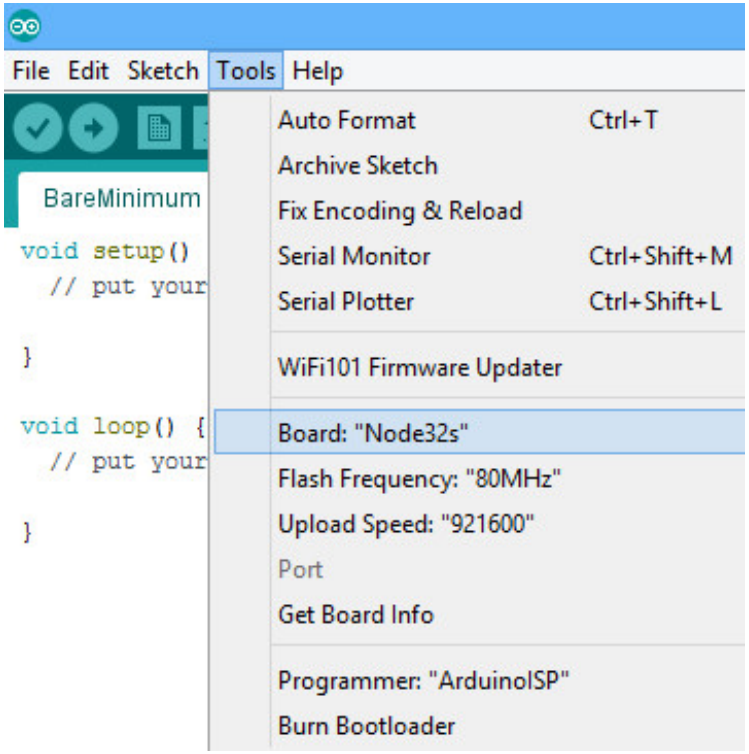
- 28 กพ, 1, 2 มีค พื้นฐาน Arduino IDE Node32Lite

อุปกรณ์ และเครื่องมือ

- Node32Lite
- Micro USB Cable
- BreadBoard 830
- Blue LED
- Resistor
- Tact Switch
- Volume หรือ Potentiometer
- SHT30 เซ็นเซอร์วัดอุณหภูมิความชื้น
- สายต่อ

พื้นฐาน

Tools > Board: “Node32s”

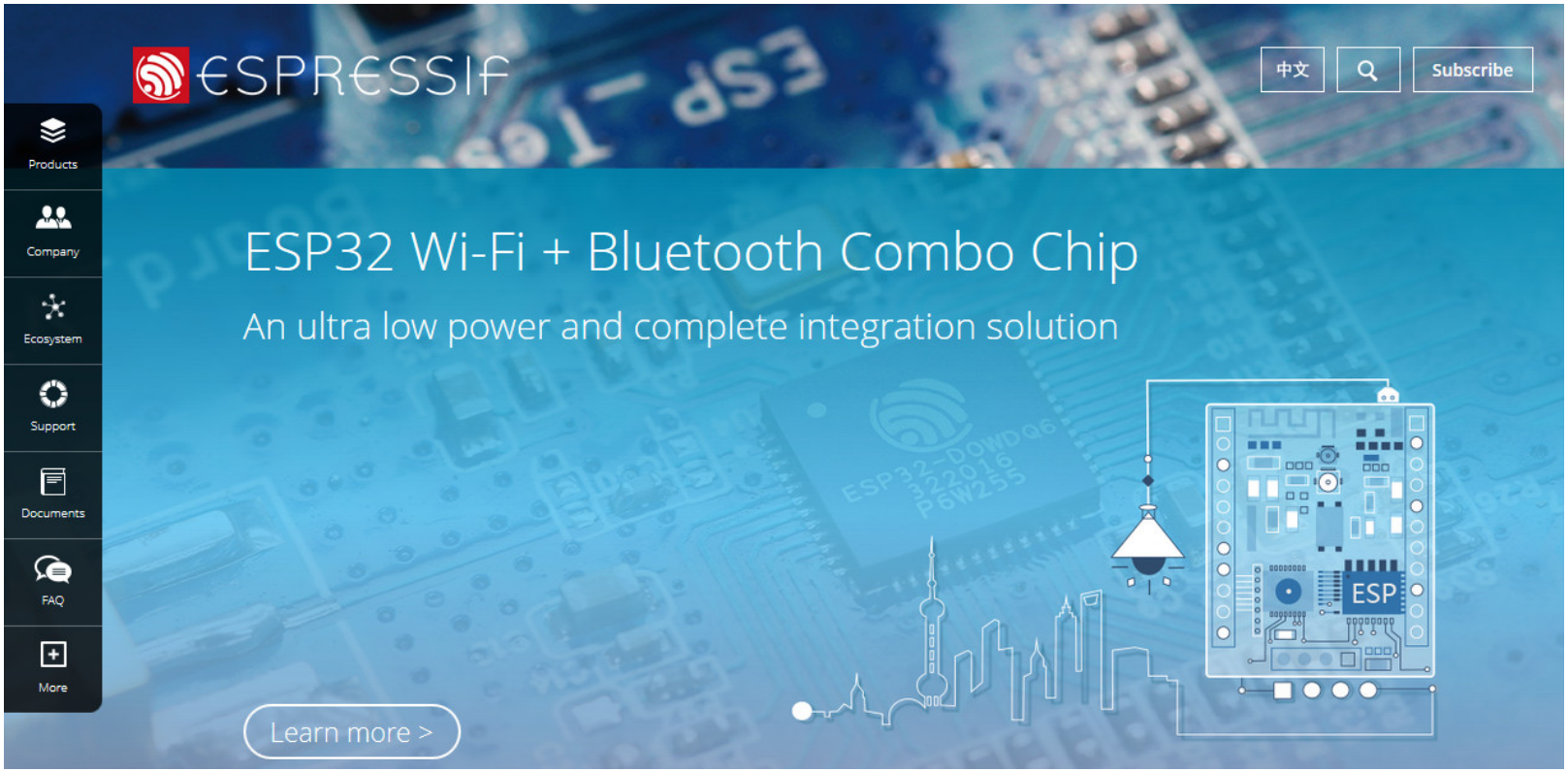


1. * ต้องถอดโฟมดำ
2. เสียบสาย usb บอร์ด แล้วต่อเข้าคอม
3. ต้องเห็น COM port ของบอร์ด
4. ถ้ายังไม่ได้ติดตั้งโปรแกรมให้ข้ามไปติดตั้ง
5. ที่ Arduino IDE ไปที่เมนู Tools

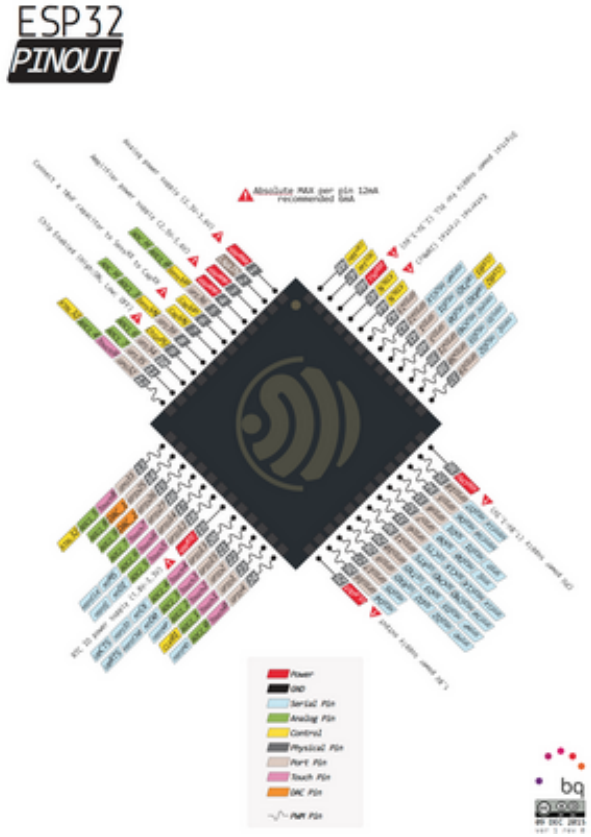
*จะต้องเห็น Board กับ Port

* Node32Lite ใช้ profile เดียวกับ Node32s

https://espressif.com/

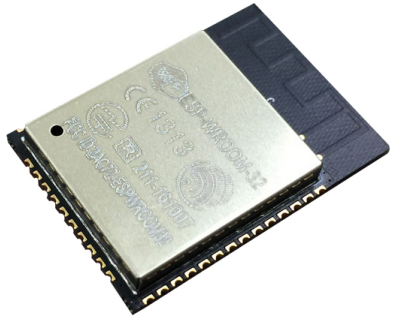



ESP-01
ESP-02
ESP-03
ESP-04
ESP-05
ESP-06
ESP-07
ESP-08
ESP-09
ESP-10
ESP-11
ESP-12
ESP-12E
ESP-12F
ESP-13
ESP-14
ESP-01S
ESP-07S
ESP-08S
ESP-12S



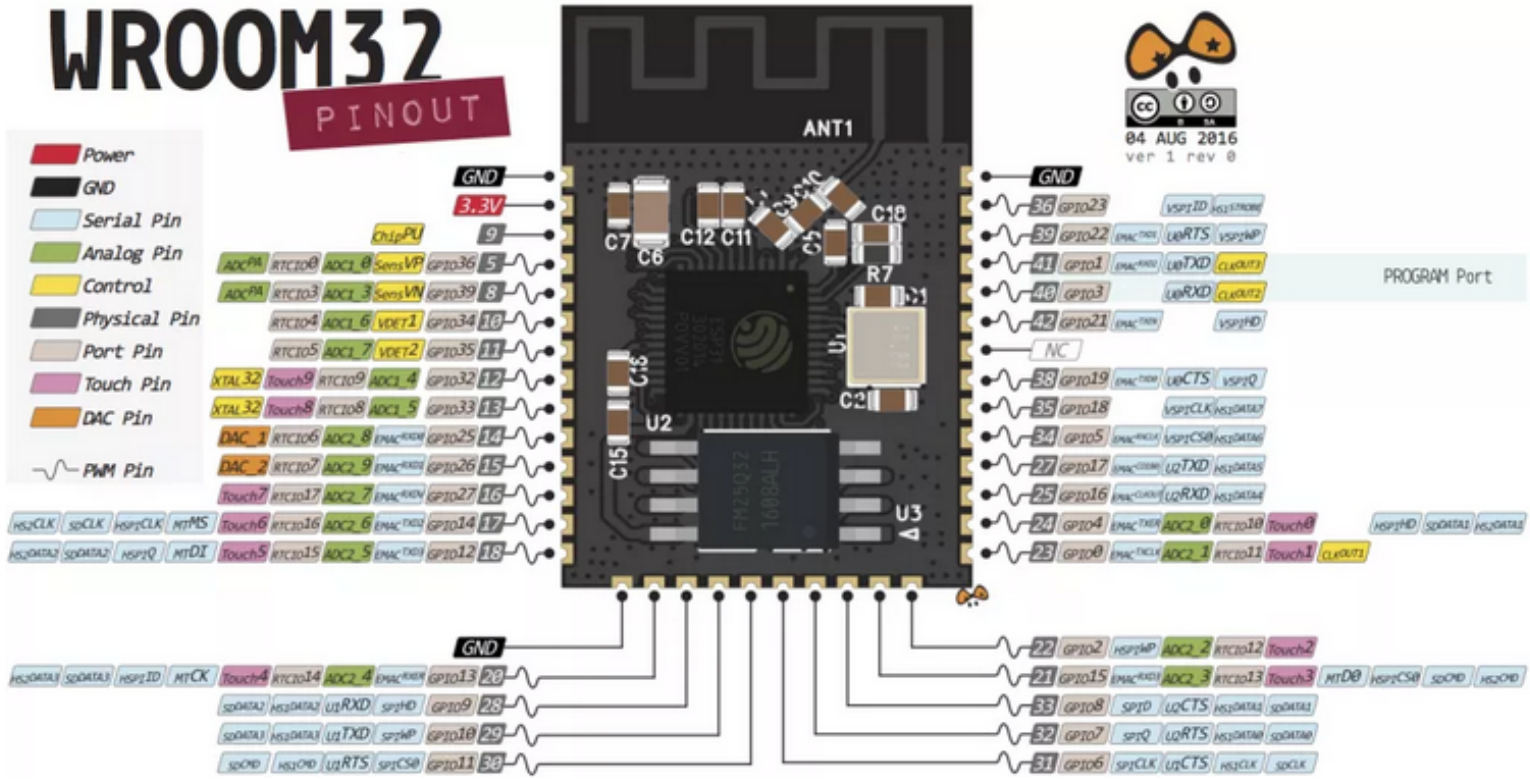
โมดูล ESP-32s

โมดูล ESP-WROOM32

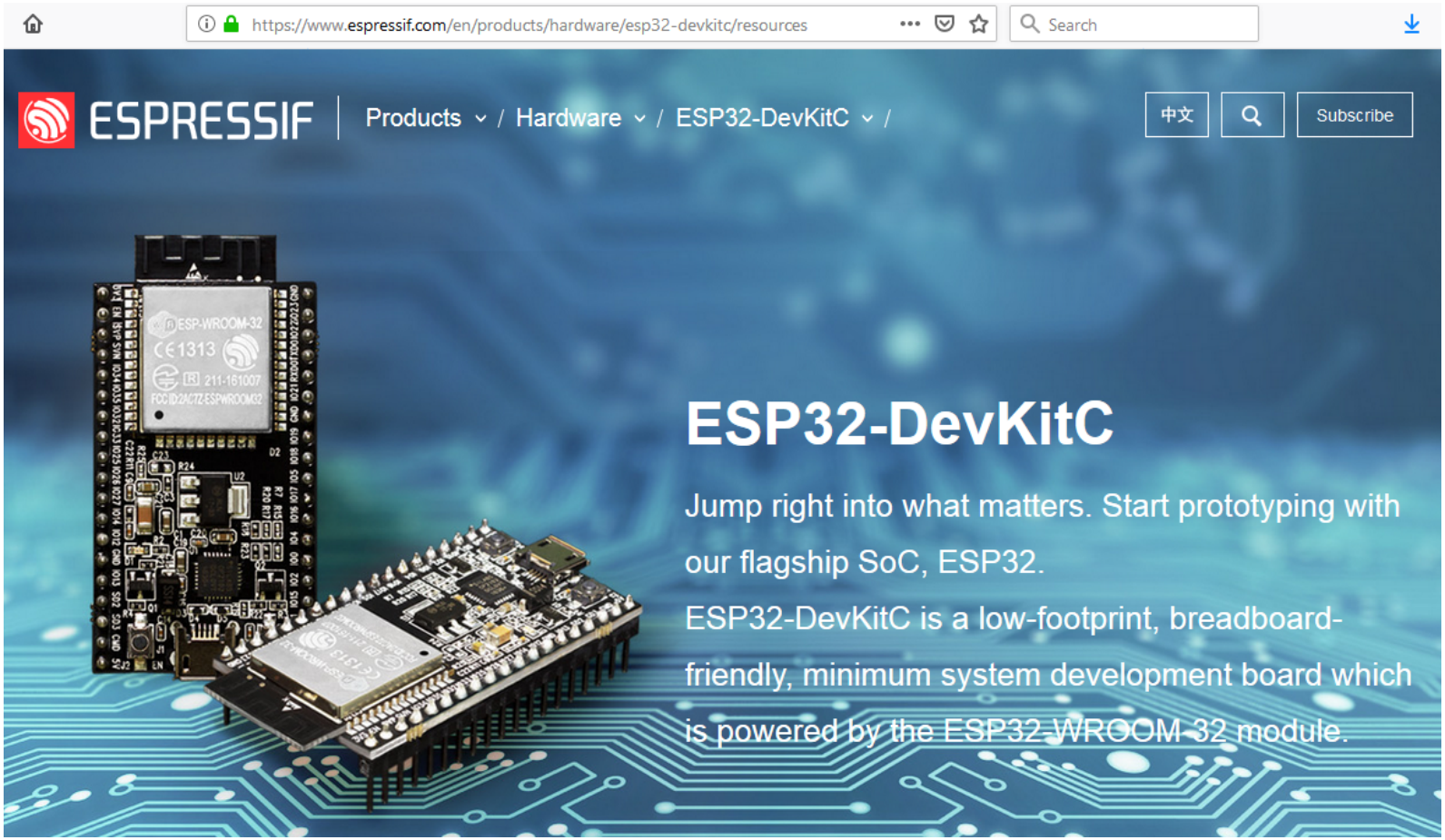


esp8266 > esp8285 > esp32

https://randomnerdtutorials.com/esp32-pinout-reference-gpios/



ESP32-DevKitC



100 million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longevity commitment

ESP8266 Series

ESP8266EX - 12 years from January 1st, 2014

ESP8266 modules - 12 years from January 1st, 2014

ESP8266 dev kits - 12 years from January 1st, 2014

ESP8285 - 10 years from January 1st, 2016

ESP8089 series

ESP8089 - 12 years from January 1st, 2014

ESP32 Series

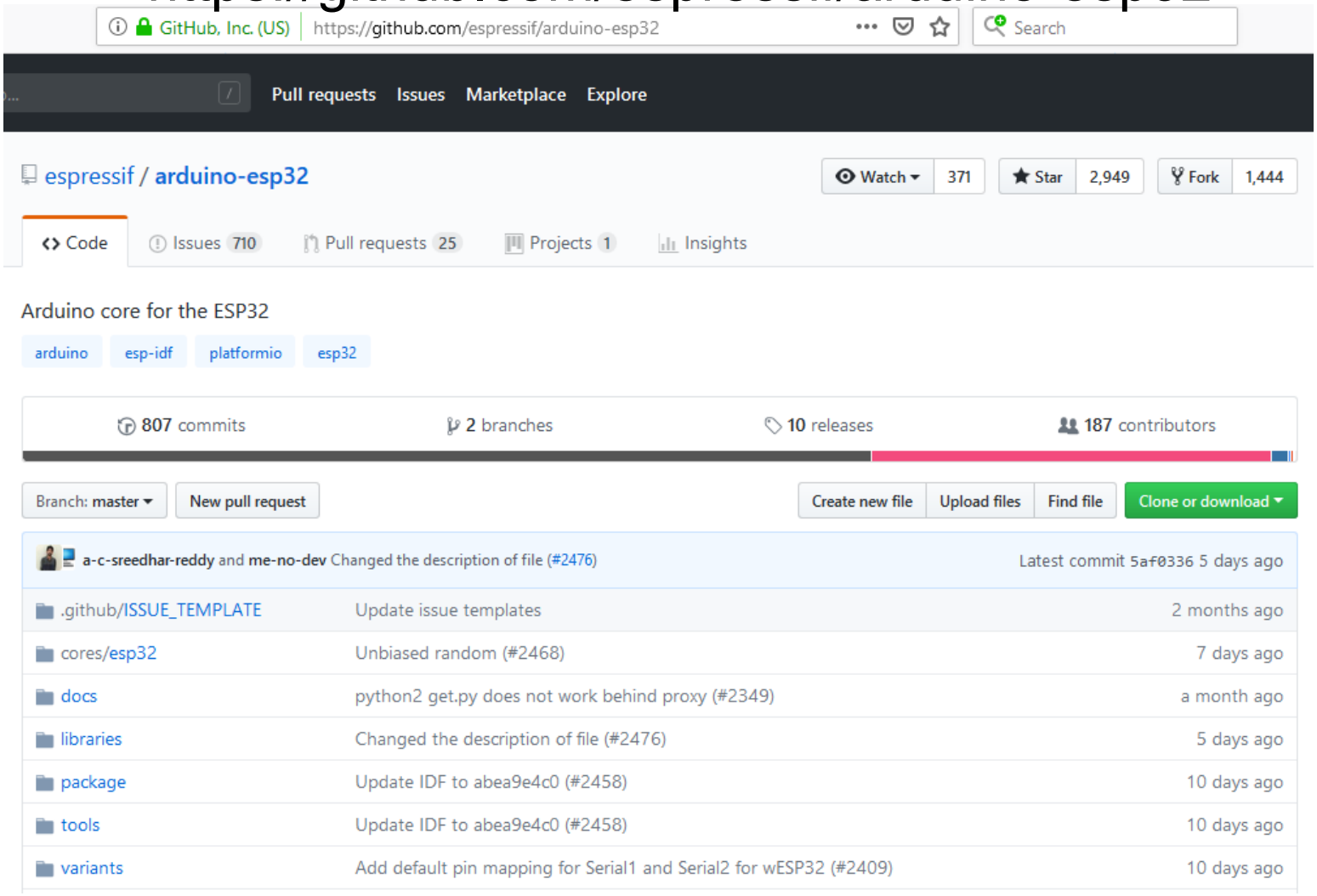
ESP32 - 12 years from January 1st, 2016

ESP32 modules - 12 years from January 1st, 2016

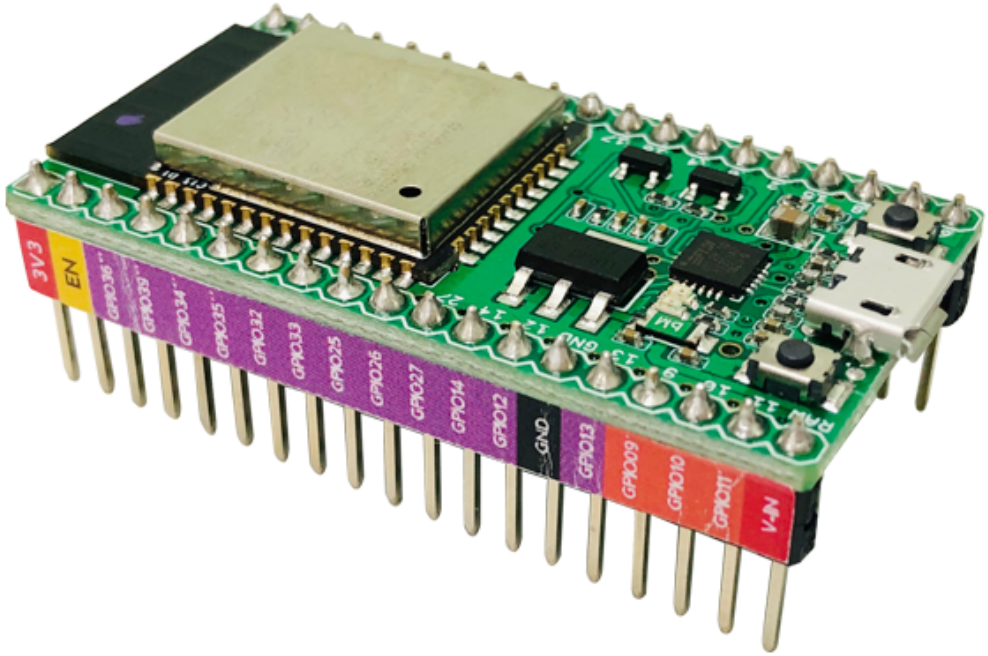
ESP32 dev kits - 12 years from January 1st, 2016

https://www.espressif.com/en/products/longevity-commitment

https://github.com/espressif/arduino-esp32



Node32Lite



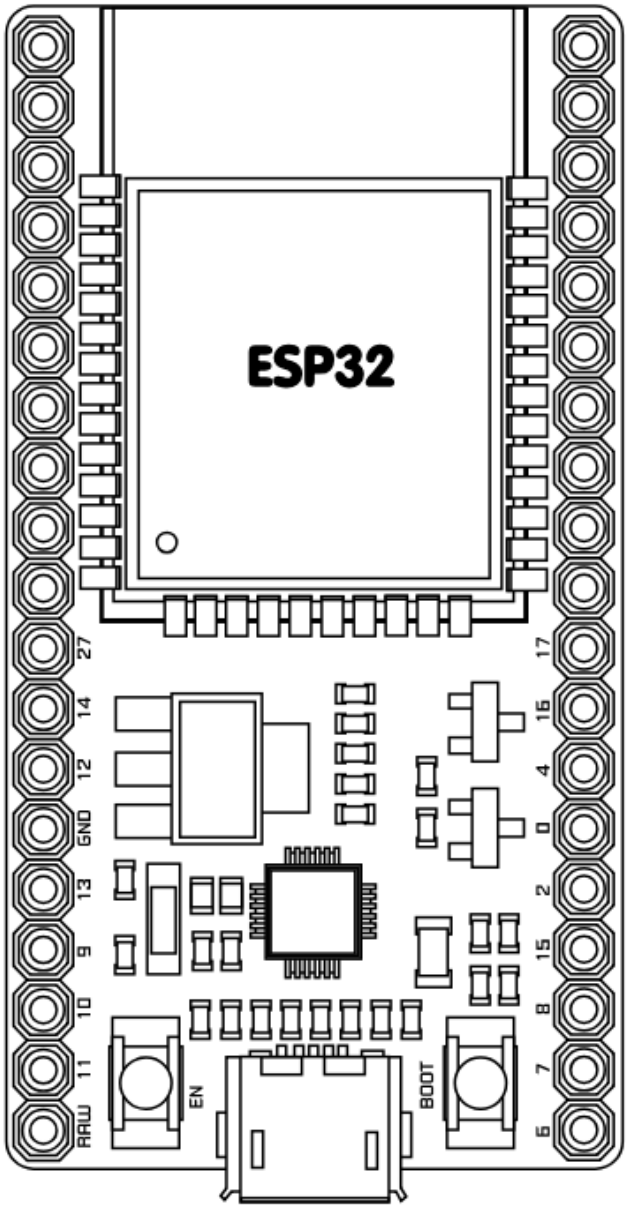
https://www.gravitechthai.com/product_detail.php?d=3318

https://www.cytron.io/p-node32-lite-wifi-and-amp;-bluetooth-development-kit

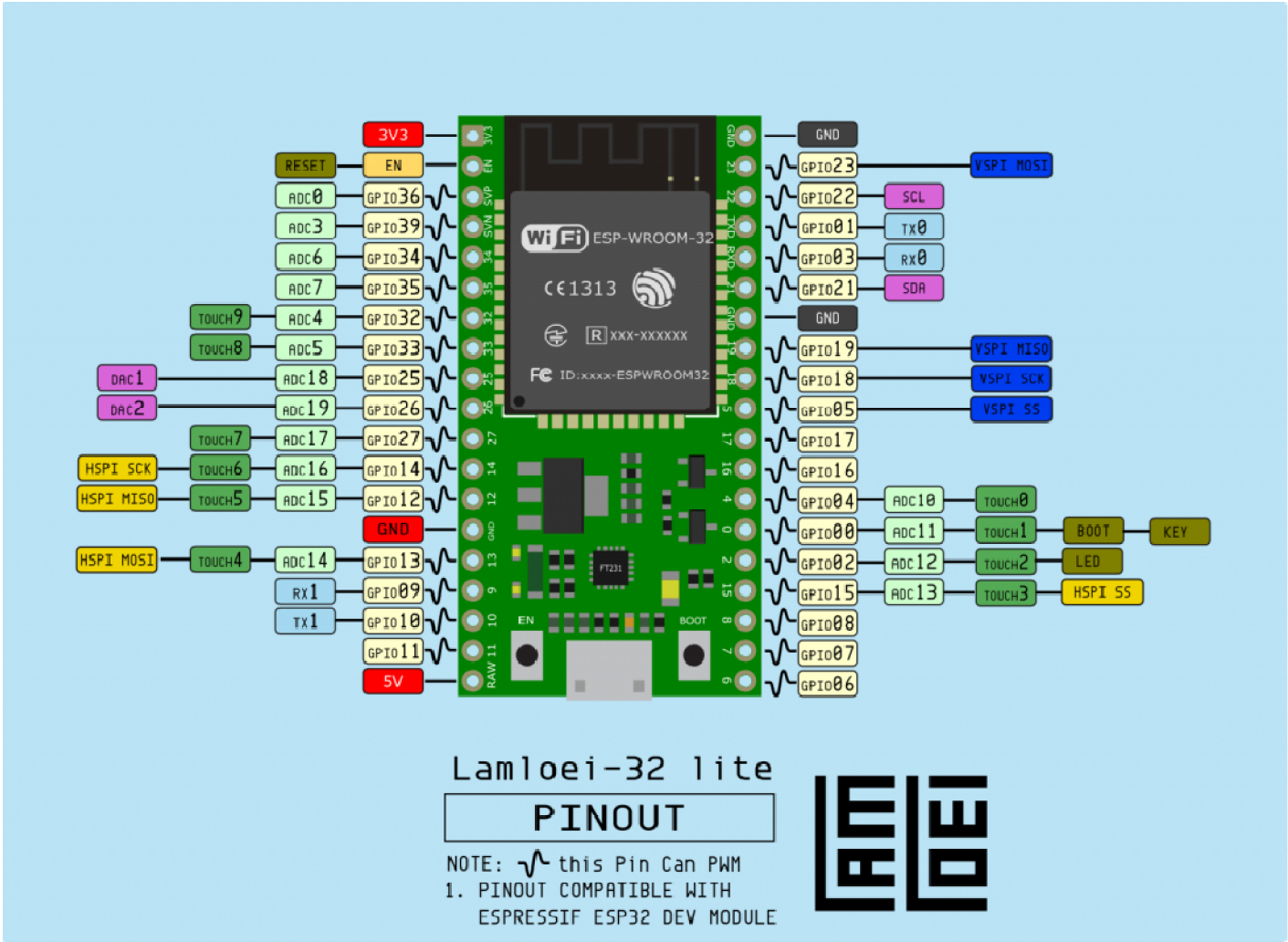
Node32Lite

Feature

1. ESP32-WROOM-32
2. FT231XQ-R
3. PTC FUSE 500mA
4. LM1117MPX-3.3
5. Micro USB
6. 0.9” * 19P Pin Header
7. Switch EN & BOOT
8. Led Blue Power
9. Led Yellow IO2



Node32Lite Pinout



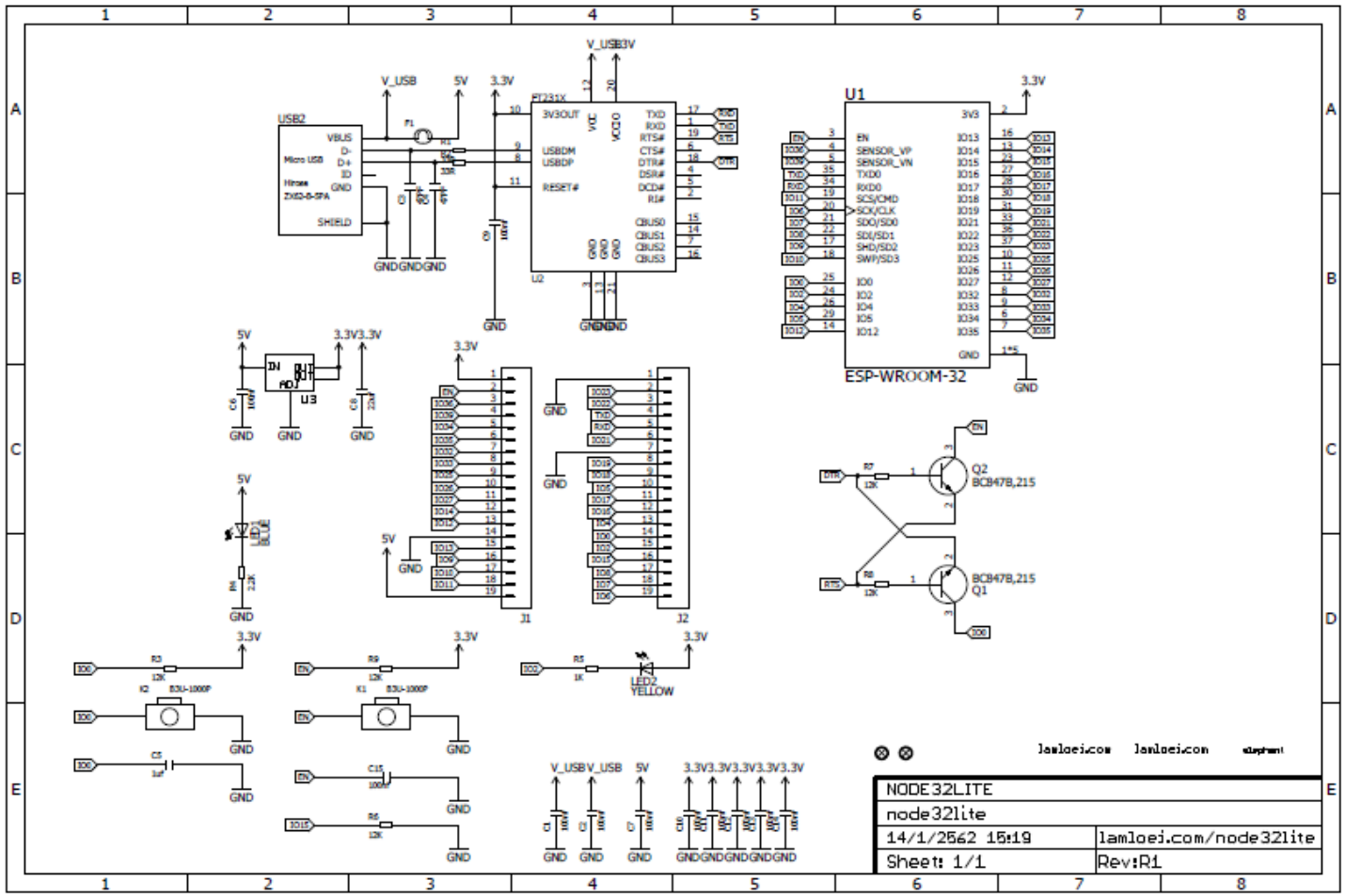
Reverse Pin

- Input only – 36, 39, 34, 35
- Not Used – 6, 7, 8, 9, 10, 11
- IO Special – 0, 2, 5, 12, 15

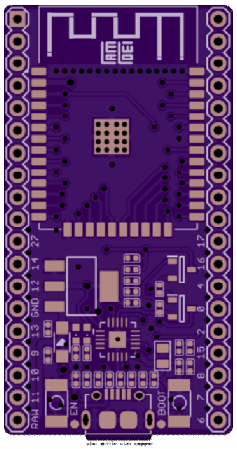
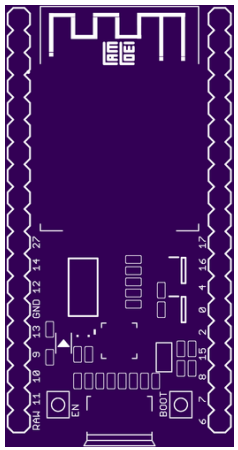
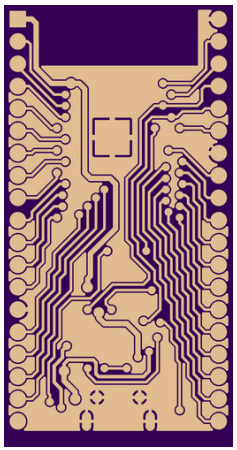
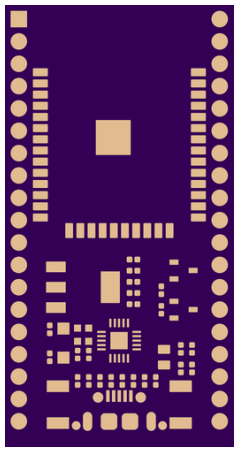
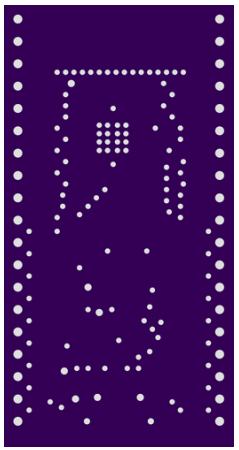
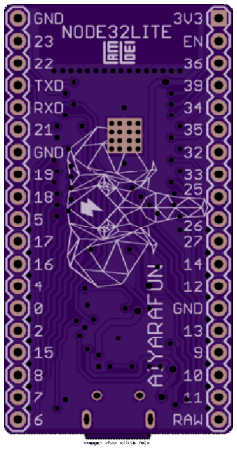
กรณีเสียบไฟแล้วไม่ทำงานเลย

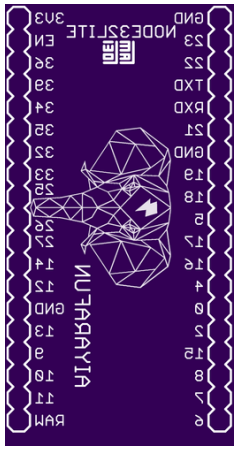
1. กดปุ่ม Reset 1 ครั้ง
2. หรือ ต่อ io0 เข้ากับ 3v3
3. หรือ ต่อ Capacitor 1uF หรือมากกว่า ระหว่าง EN กับ GND

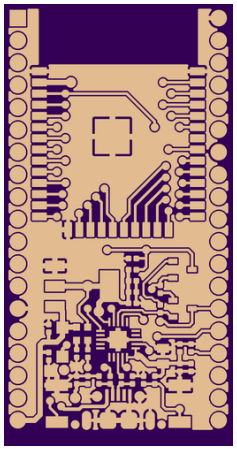
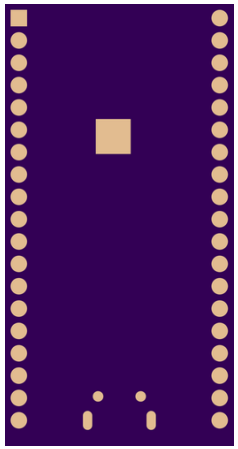
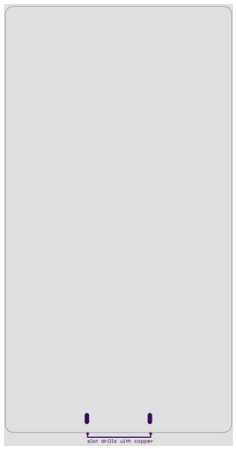
Node32Lite Schematic



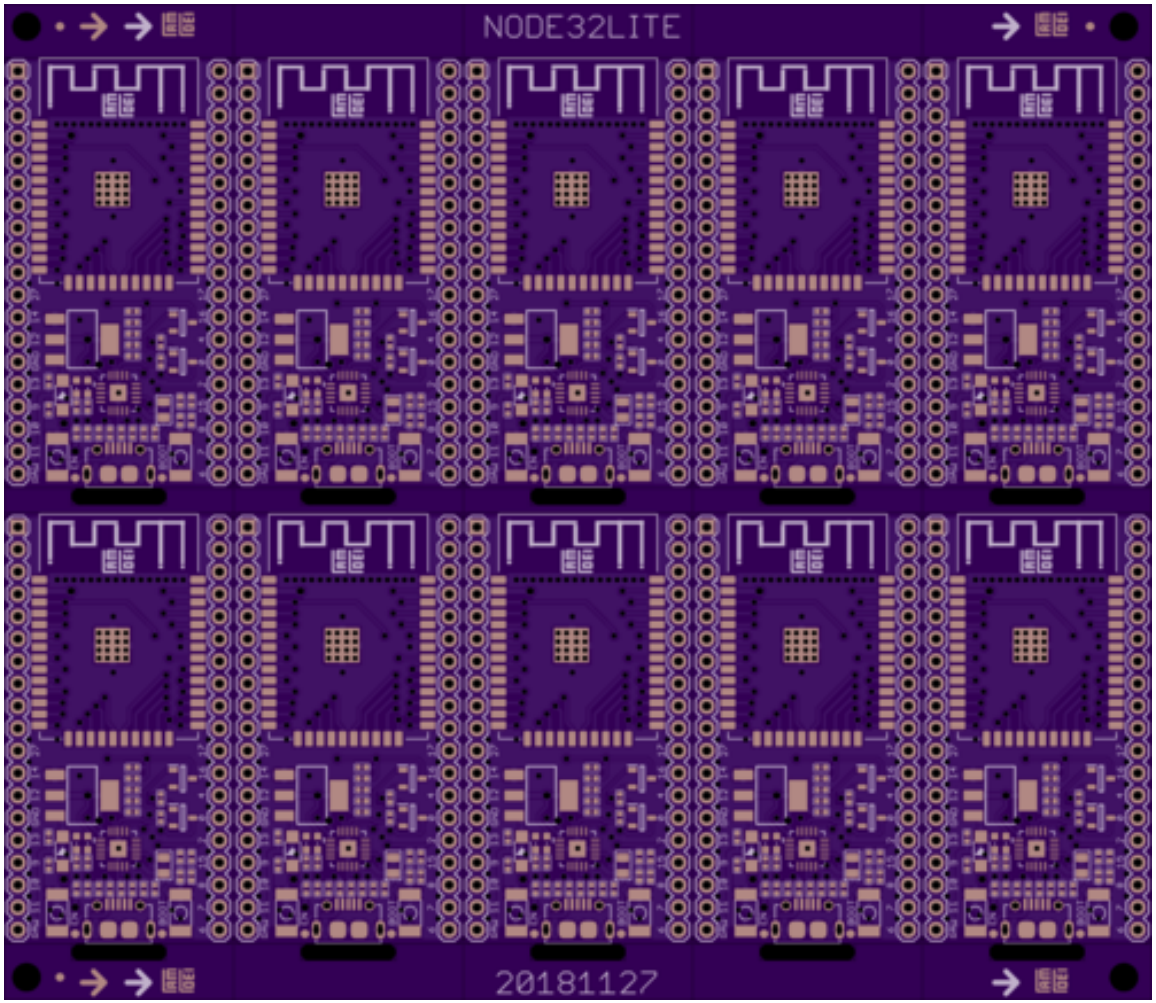
Node32Lite Gerber



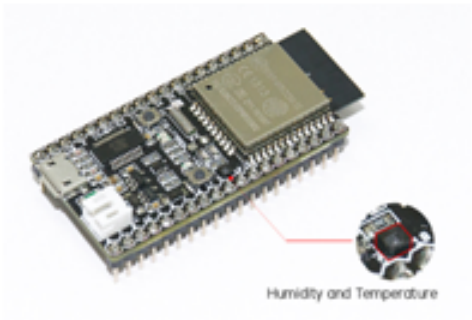




Node32Lite Gerber Panel



Node32 Family

Node32Pico

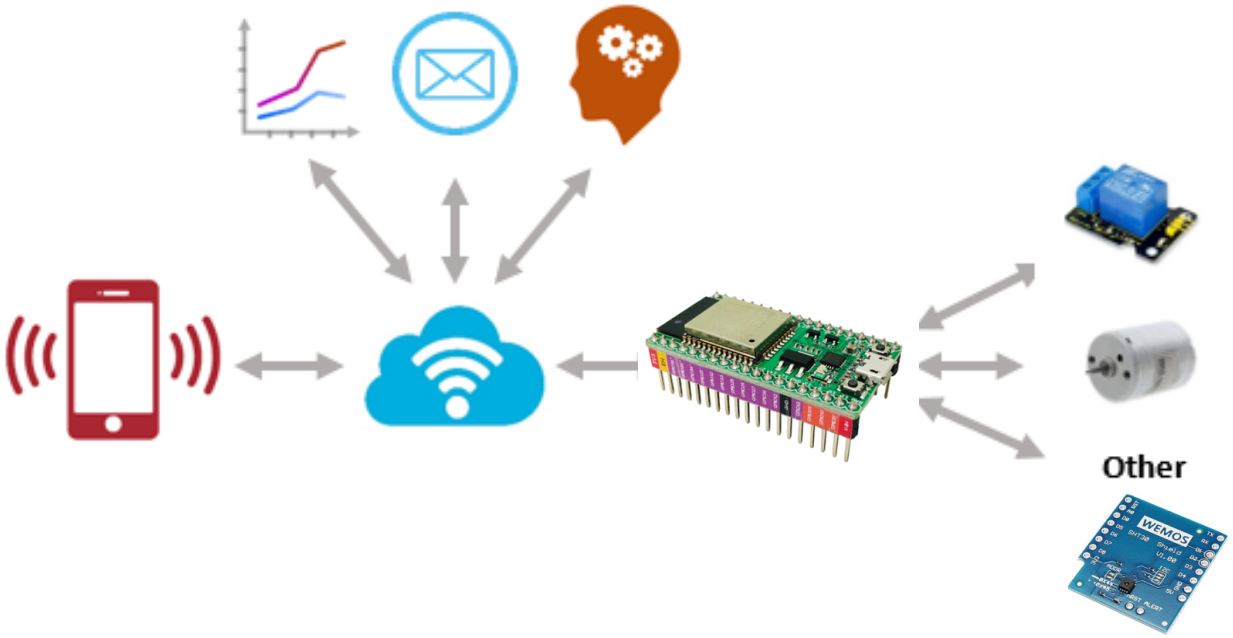


Node32s Plus

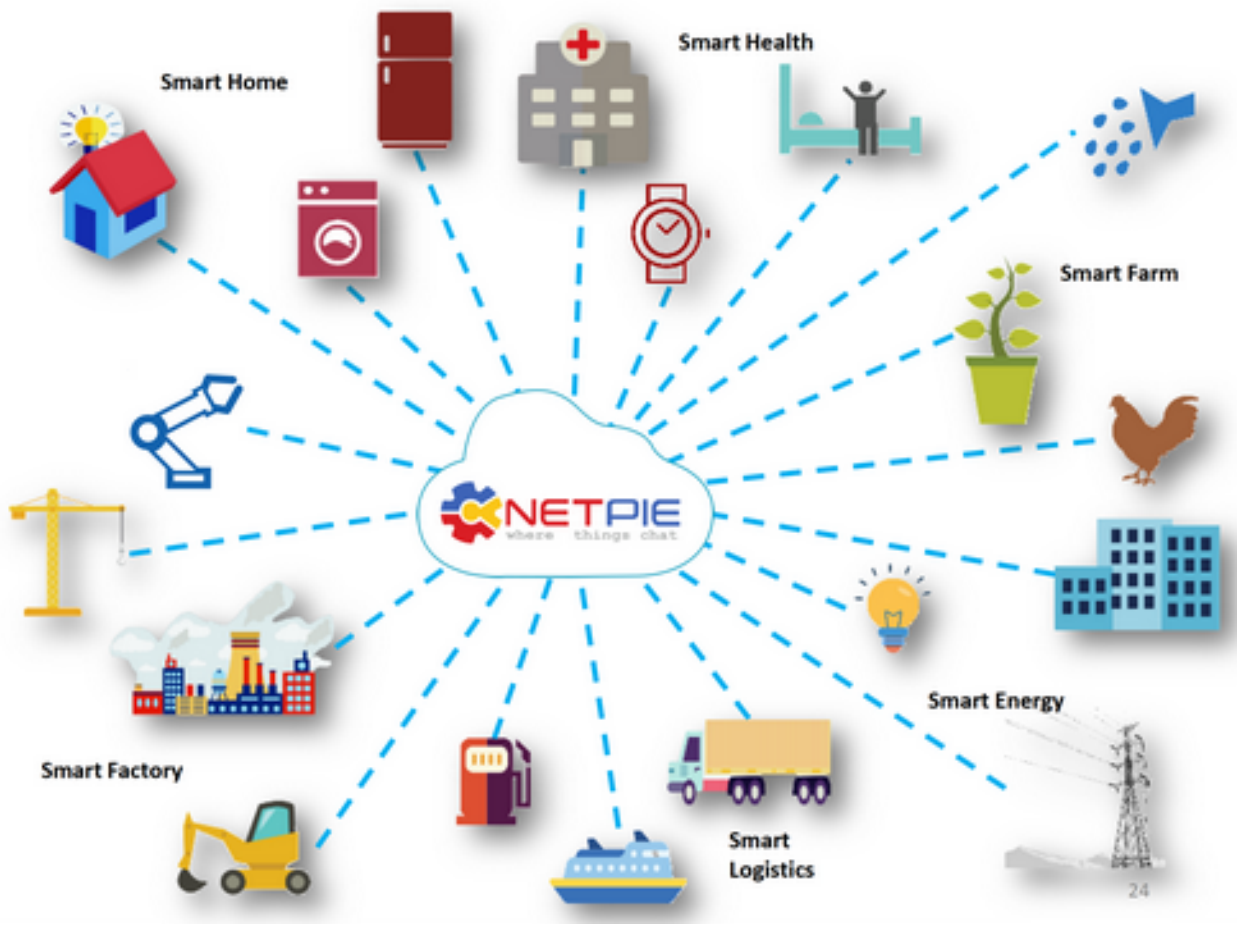
Node32s

NodeWiFi

เปลี่ยน ค่ากายภาพ > ตัวเลข > สร้างกราฟ อีเมล แจ้งเตือน วิเคราะห์ ผ่านมือถือ



Smart System



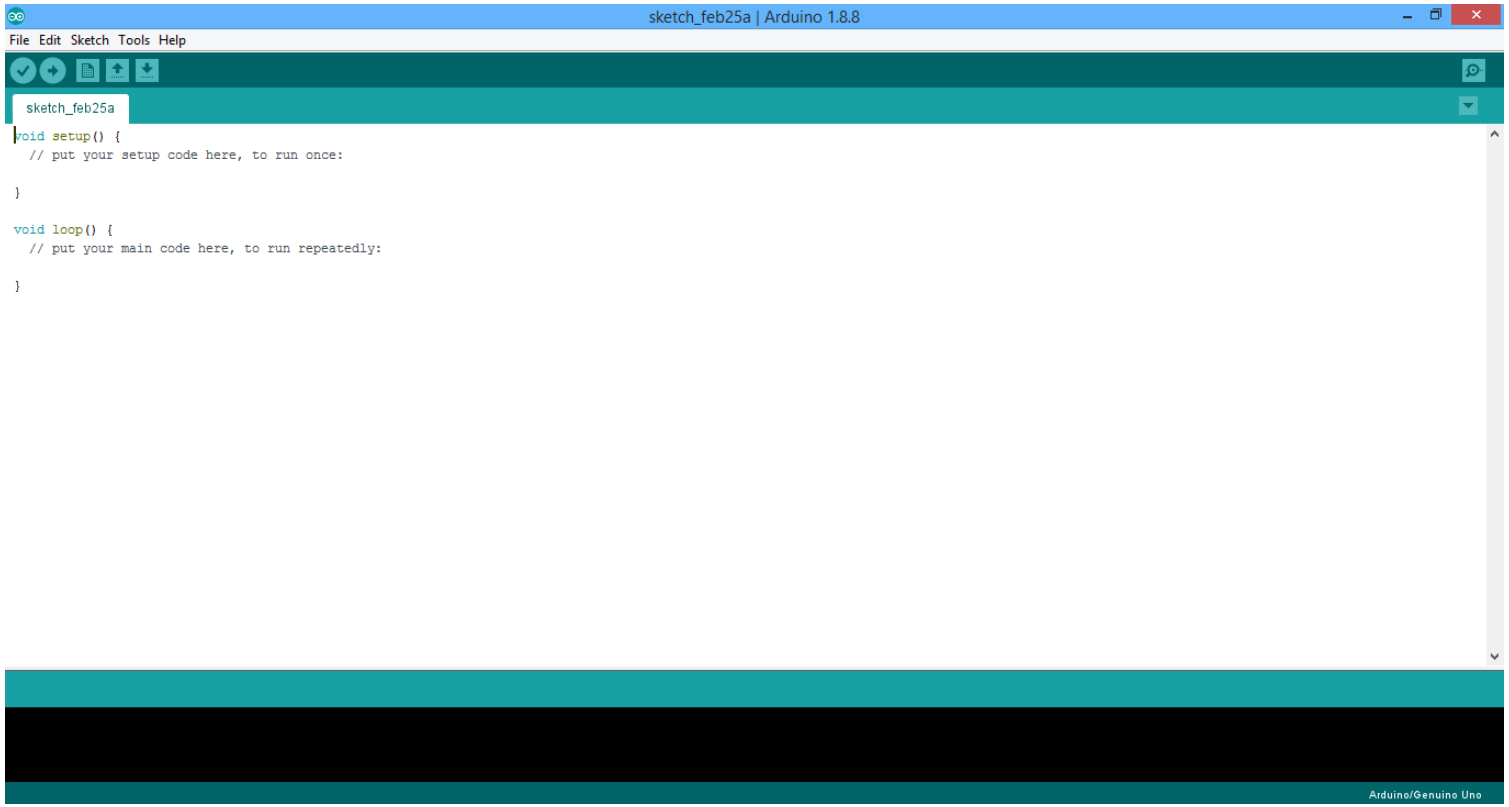
แบบฝึกหัดที่ 1 - Smart System

1. ชื่อระบบ
2. อธิบายระบบ
3. ค่าที่ต้องการวัด – ควบคุม

ดาวน์โหลดและติดตั้งไฟล์ที่

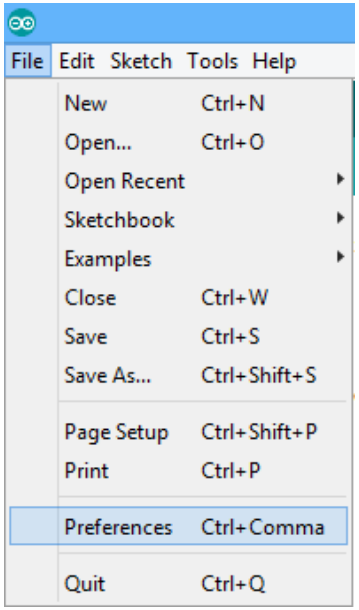
https://www.arduino.cc/en/Main/Software

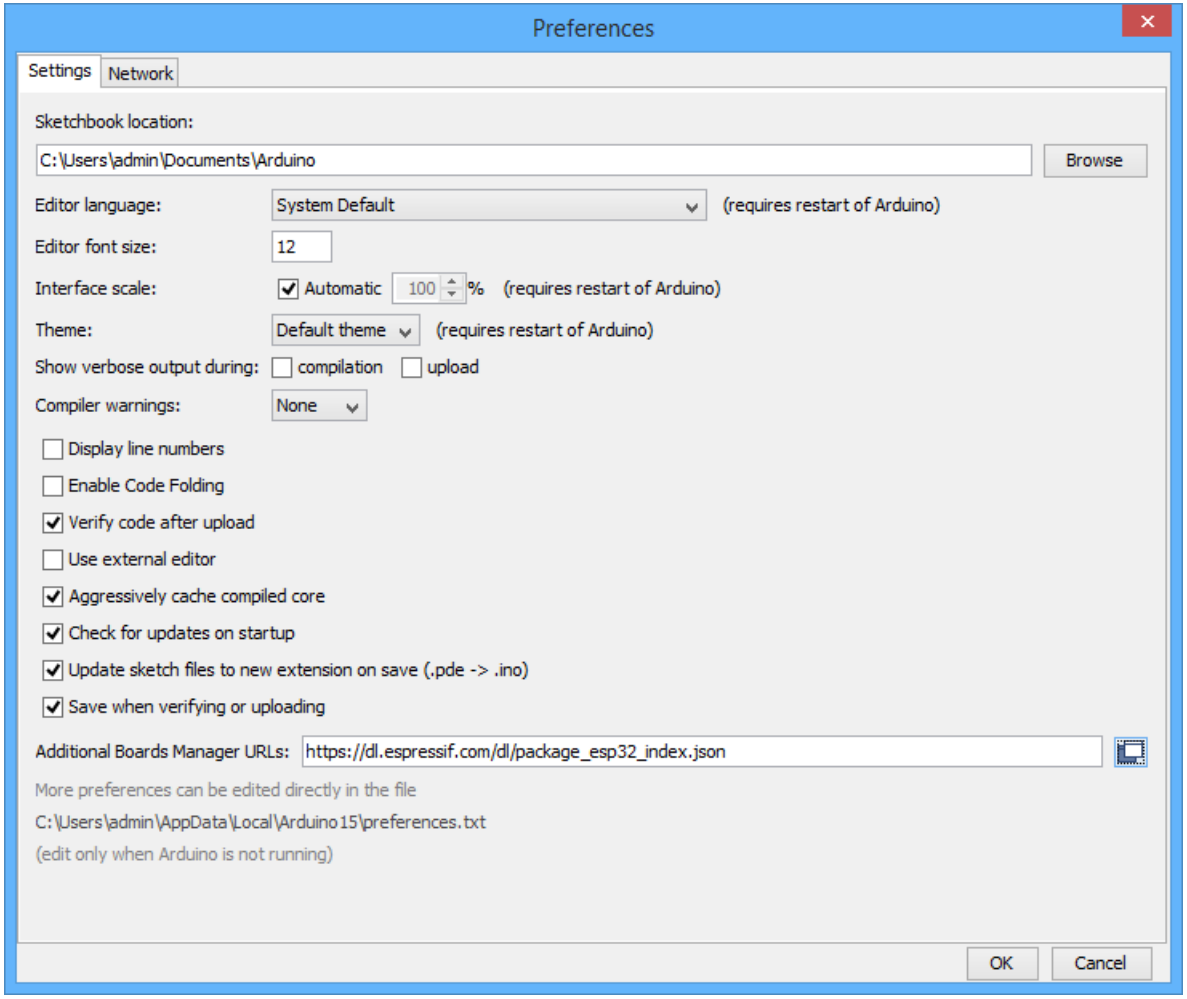
Arduino IDE


sketch_feb25a | Arduino 1.8.8
File Edit Sketch Tools Help
sketch_feb25a
void setup() {
// put your setup code here, to run once:
}
void loop() {
// put your main code here, to run repeatedly:
}
Arduino/Genuino Uno

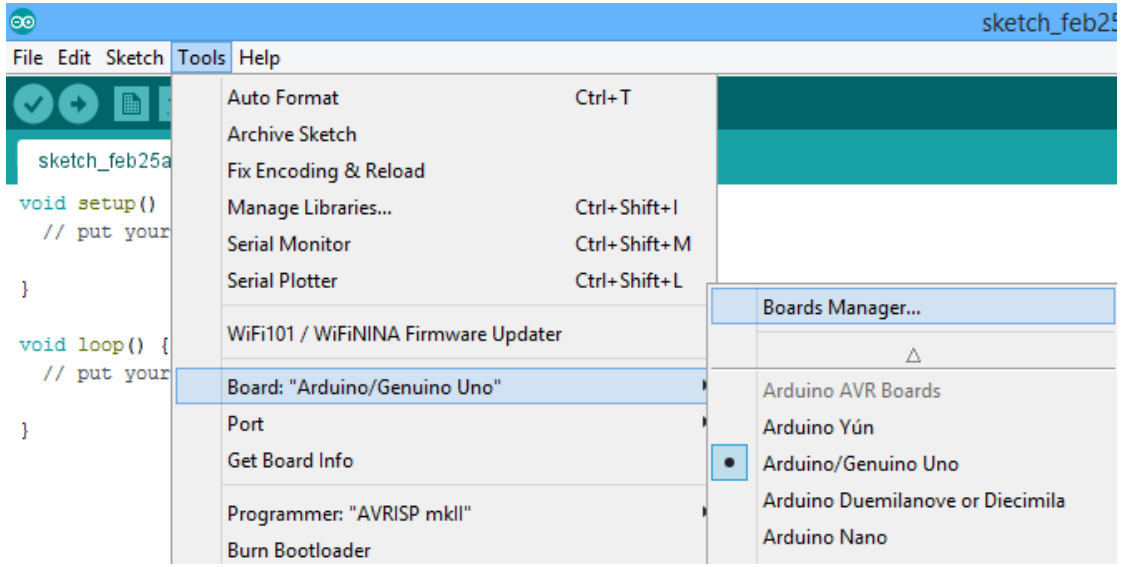
File > Preferences

https://dl.espressif.com/dl/package_esp32_index.json

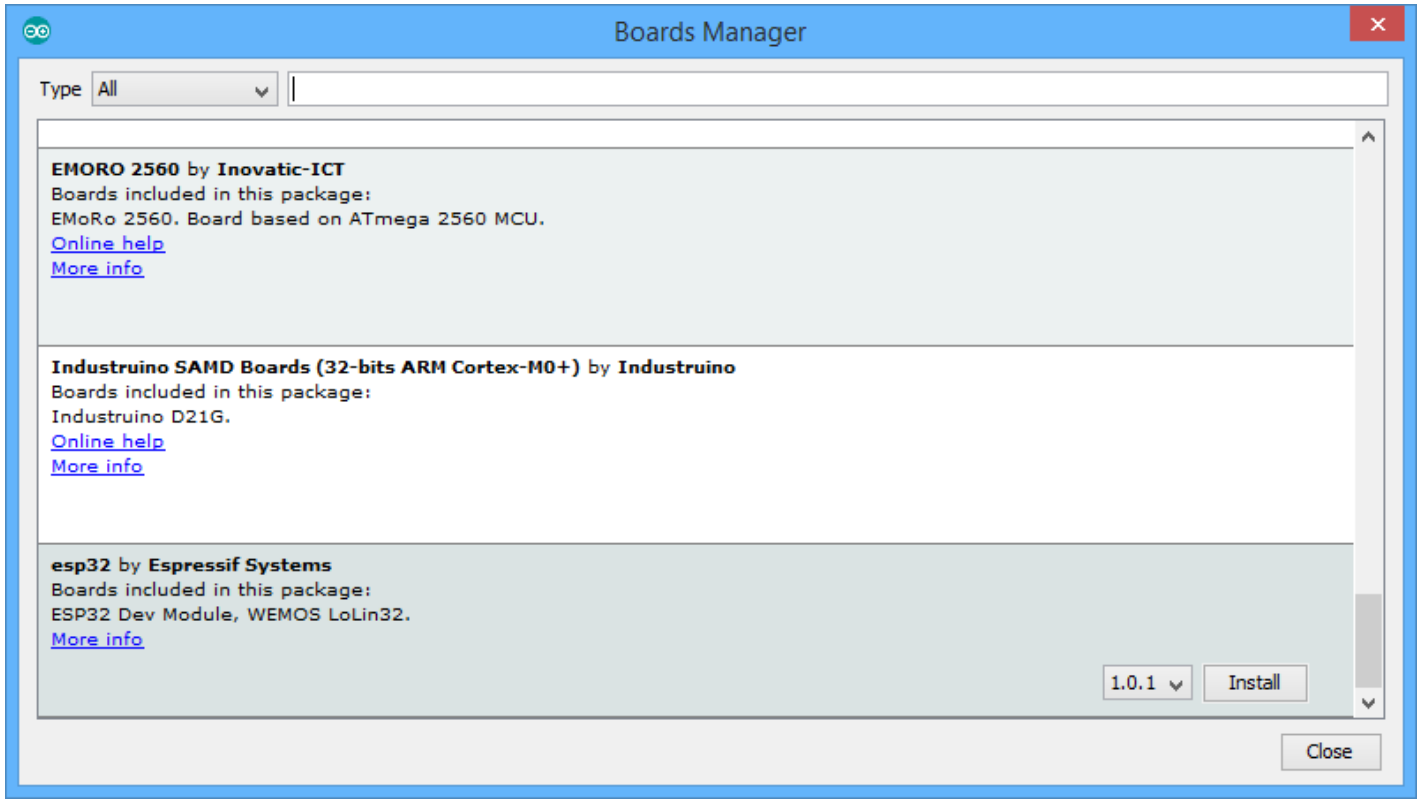




Tools > Board > Board Manager…



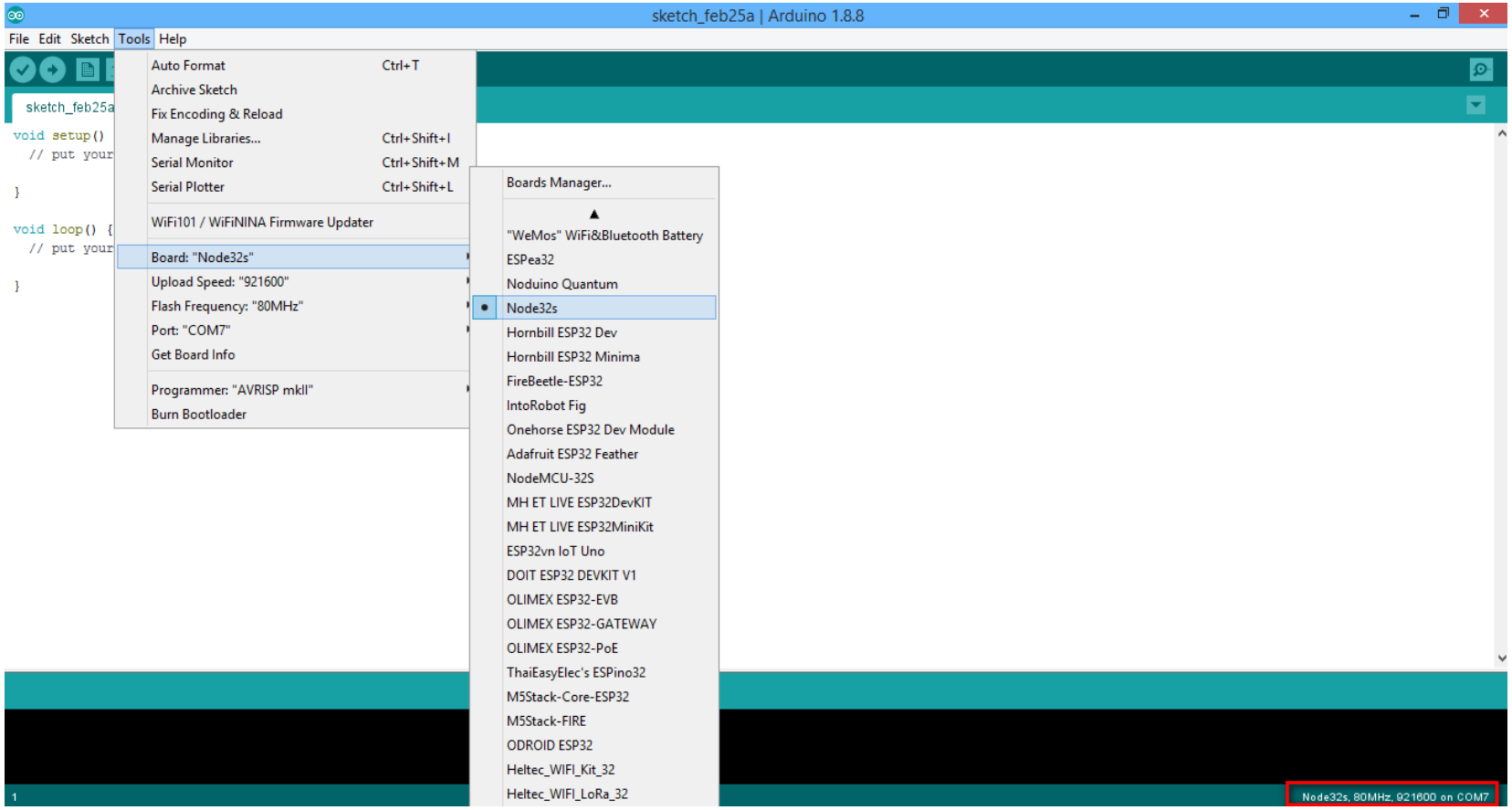
คลิก Install ที่ esp32



เสียบบอร์ด Node32Lite

Tools > Board > Node32s

เลือก Port



โฟลเดอร์

- โค้ด Arduino

C:\Users \[YOUR_USER_NAME]\Documents\Arduino

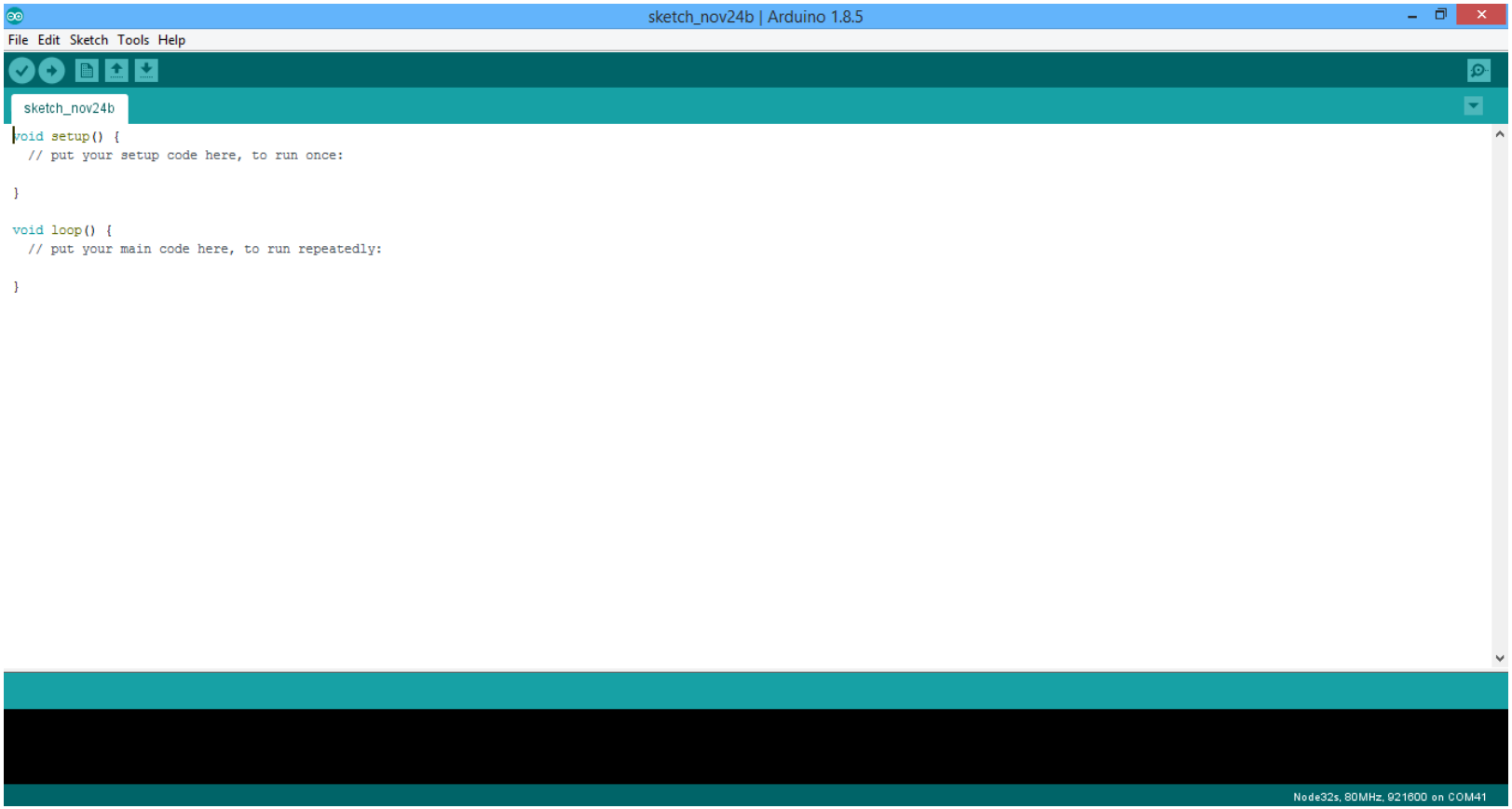
- โฟลเดอร์ Arduino IDE

C:\Program Files (x86)\Arduino

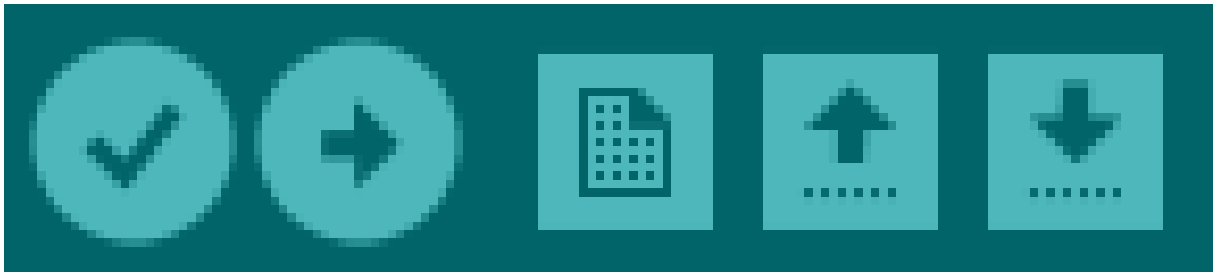
C:\Users\[YOUR_USER_NAME]\AppData\Local\Arduino15

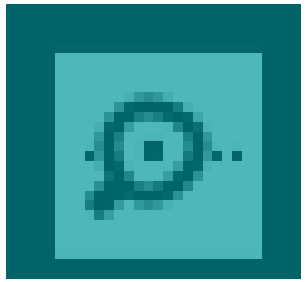
หน้าจอ Arduino IDE

เปิดโปรแกรม Arduino IDE



เมนูลัด





Verify

Upload

New

Open

Save

Serial Monitor

เมนูต่าง ๆ

File Edit Sketch Tools Help

New	Ctrl+N
Open...	Ctrl+O
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Sketchbook	▸
Examples	▸
Close	Ctrl+W
Save	Ctrl+S
Save As...	Ctrl+Shift+S
Page Setup	Ctrl+Shift+P
Print	Ctrl+P
Preferences	Ctrl+Comma
Quit	Ctrl+Q

Edit Sketch Tools Help

Undo	Ctrl+Z
Redo	Ctrl+Y
Cut	Ctrl+X
Copy	Ctrl+C
Copy for Forum	Ctrl+Shift+C
Copy as HTML	Ctrl+Alt+C
Paste	Ctrl+V
Select All	Ctrl+A
Go to line...	Ctrl+L
Comment/Uncomment	Ctrl+Slash
Increase Indent	Tab
Decrease Indent	Shift+Tab
Increase Font Size	Ctrl+Unknown keyCode: 0x2b
Decrease Font Size	Ctrl+Minus
Find...	Ctrl+F
Find Next	Ctrl+G
Find Previous	Ctrl+Shift+G

Sketch Tools Help

Verify/Compile	Ctrl+R
Upload	Ctrl+U
Upload Using Programmer	Ctrl+Shift+U
Export compiled Binary	Ctrl+Alt+S
Show Sketch Folder	Ctrl+K
Include Library	▸
Add File...	

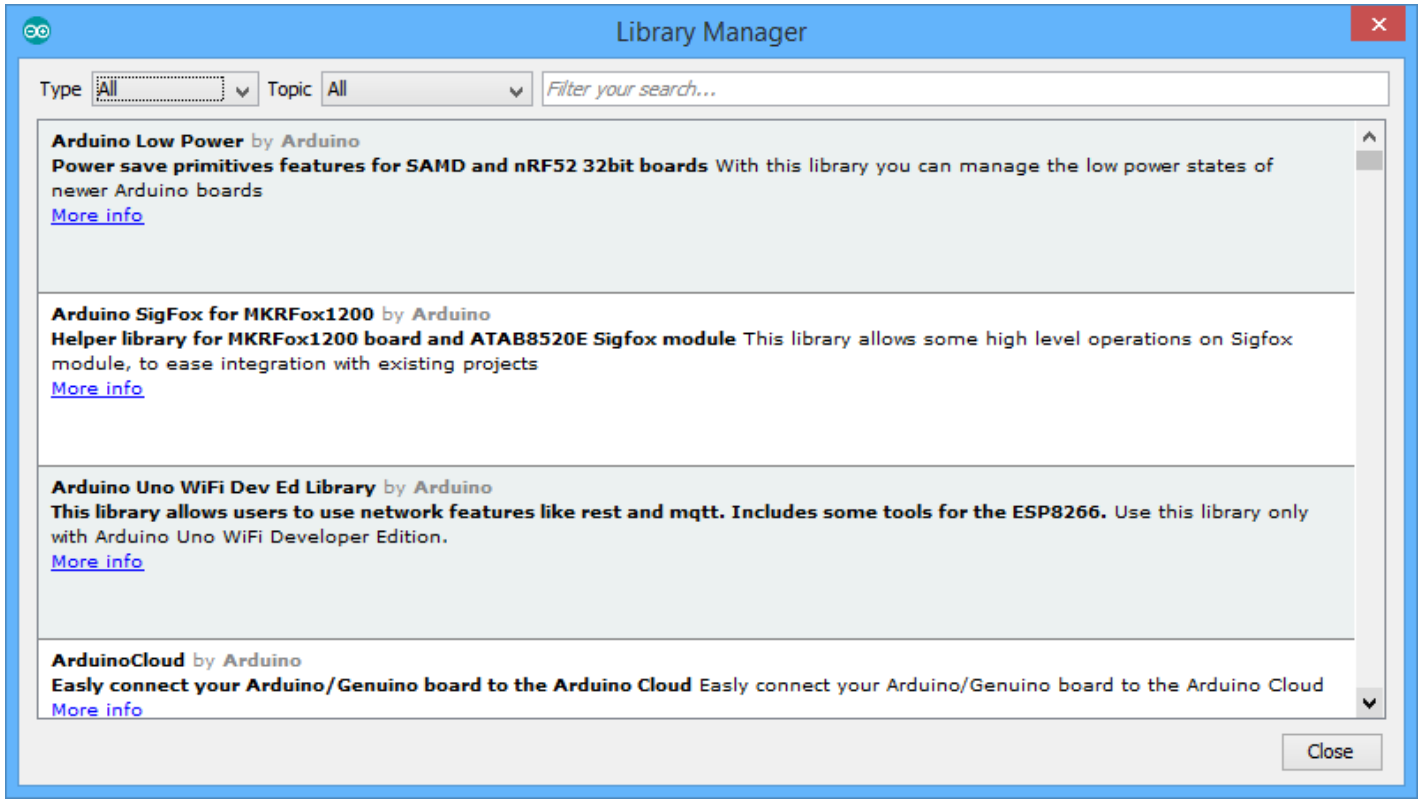
Tools Help

Auto Format	Ctrl+T
Archive Sketch	
Fix Encoding & Reload	
Serial Monitor	Ctrl+Shift+M
Serial Plotter	Ctrl+Shift+L
WiFi101 Firmware Updater	
Board: "Node32s"	▸
Flash Frequency: "80MHz"	▸
Upload Speed: "921600"	▸
Port: "COM41"	▸
Get Board Info	
Programmer: "AVRISP mkII"	▸
Burn Bootloader	

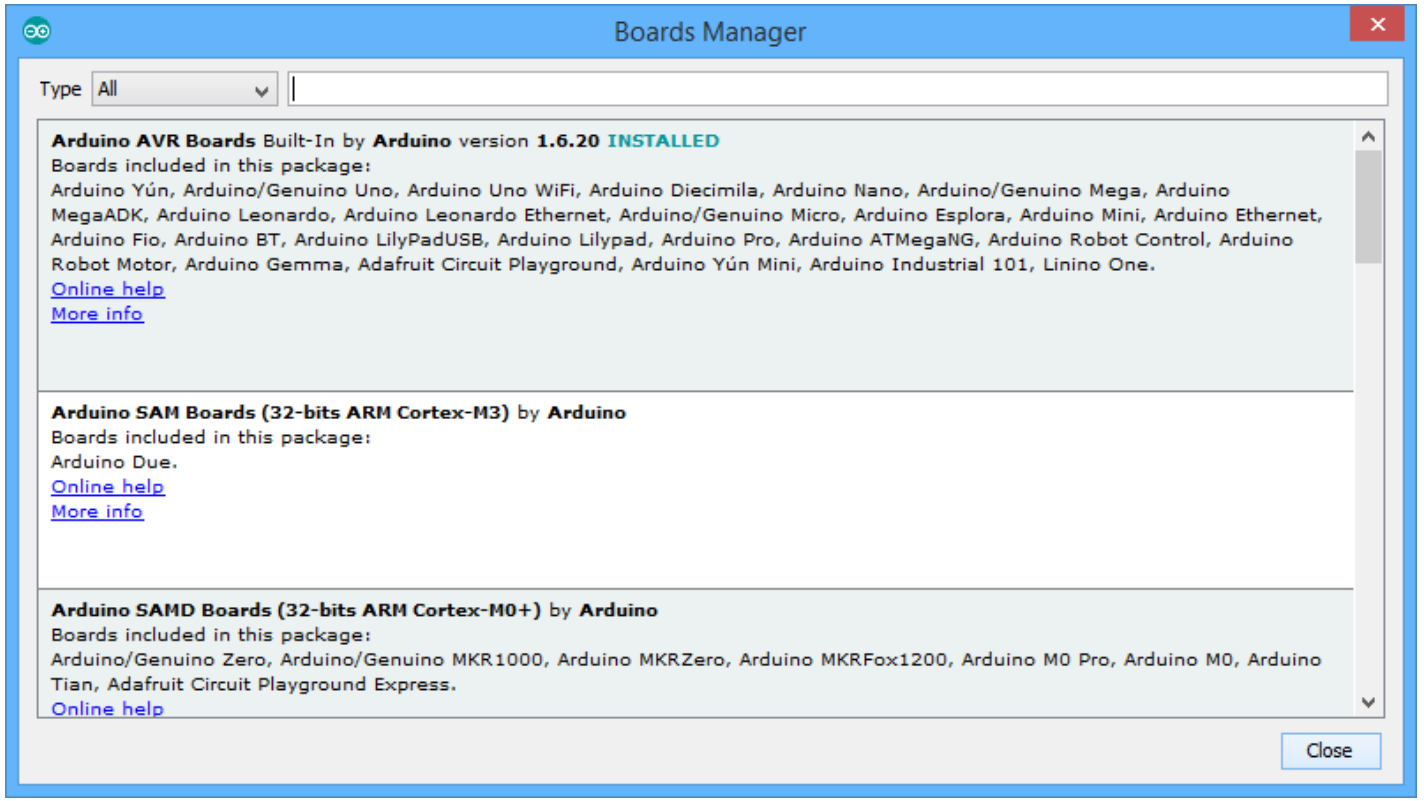
Help

- Getting Started
- Environment
- Troubleshooting
- Reference
- Galileo Help
- Getting Started
- Troubleshooting
- Edison Help
- Getting Started
- Troubleshooting
- Find in Reference Ctrl+Shift+F
- Frequently Asked Questions
- Visit Arduino.cc
- About Arduino

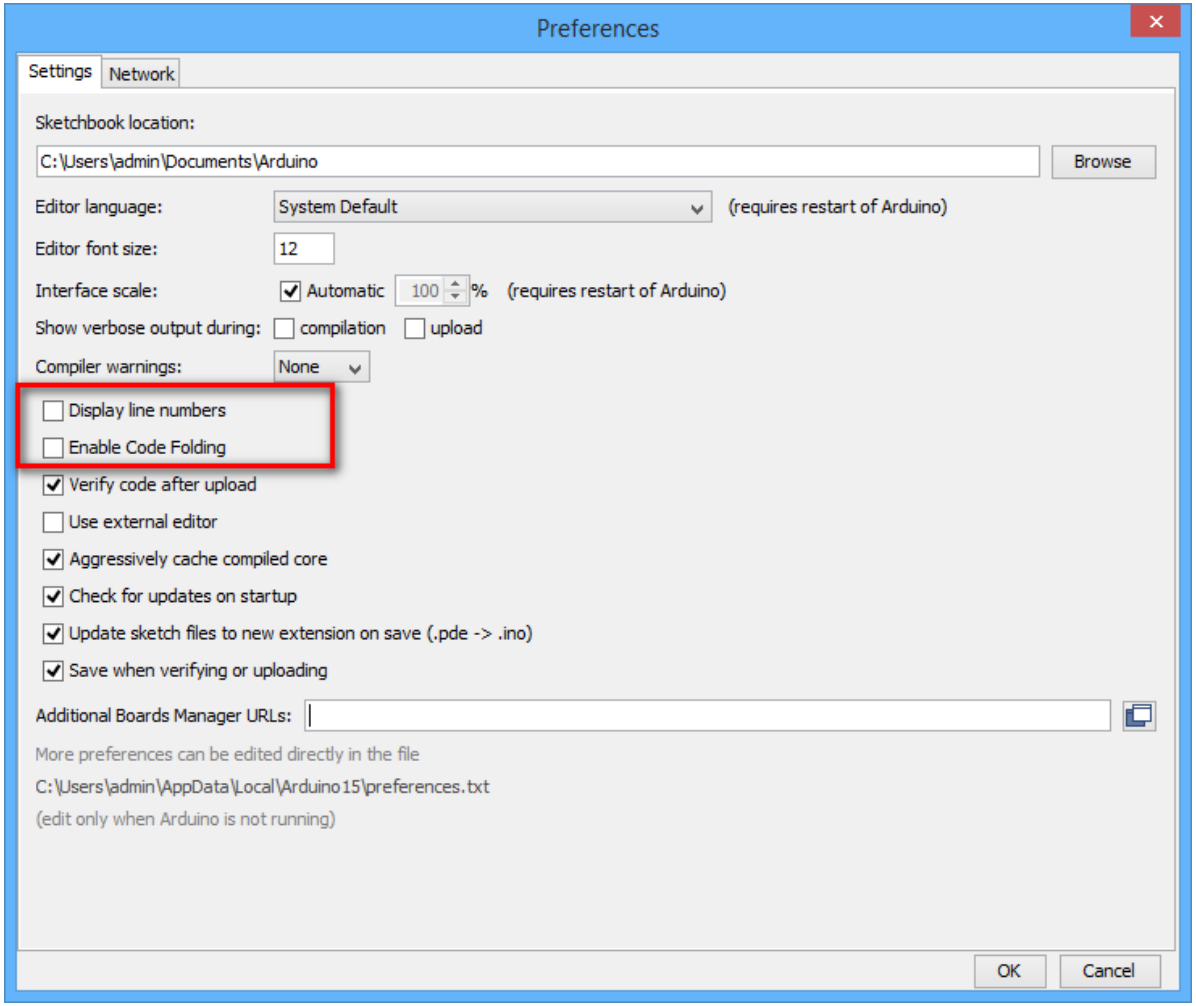
Sketch > Include Library > Manage Libraries…



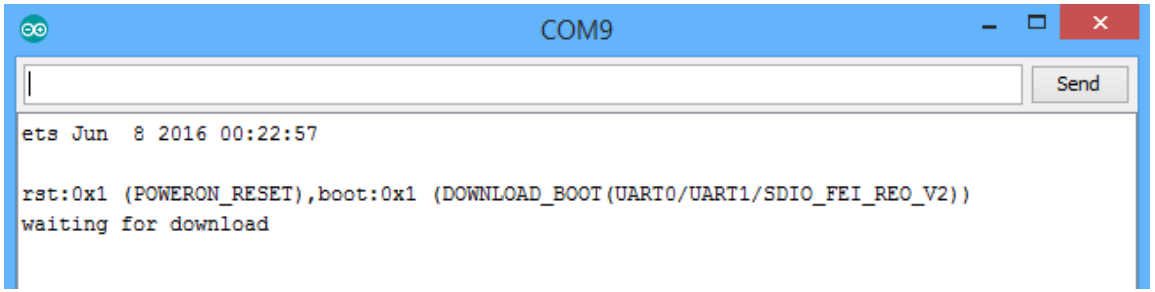
Tools > Board: > Board Manager…



File > Preferences



waiting for download



เปิด Serial Monitor

กดปุ่ม EN ค้างไว้

กดปุ่ม BOOT ค้างไว้

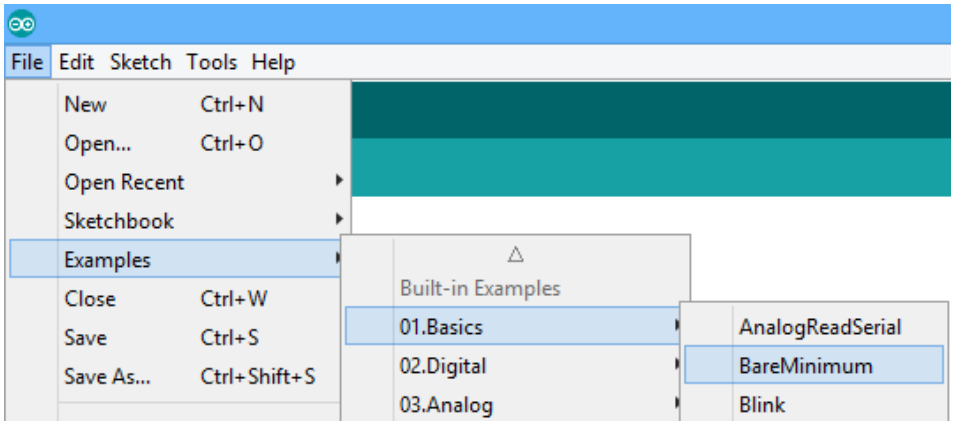
ปล่อยปุ่ม EN

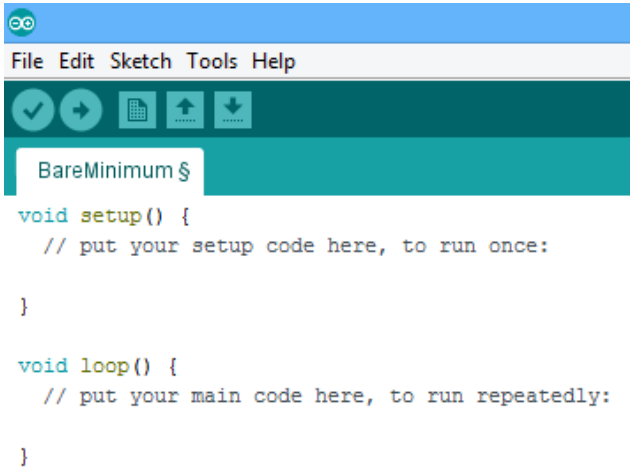
ปล่อยปุ่ม BOOT

...ขึ้นข้อความ waiting for download

กดแล้วปล่อยปุ่ม EN

File > Examples > 01.Basics > BareMinimum

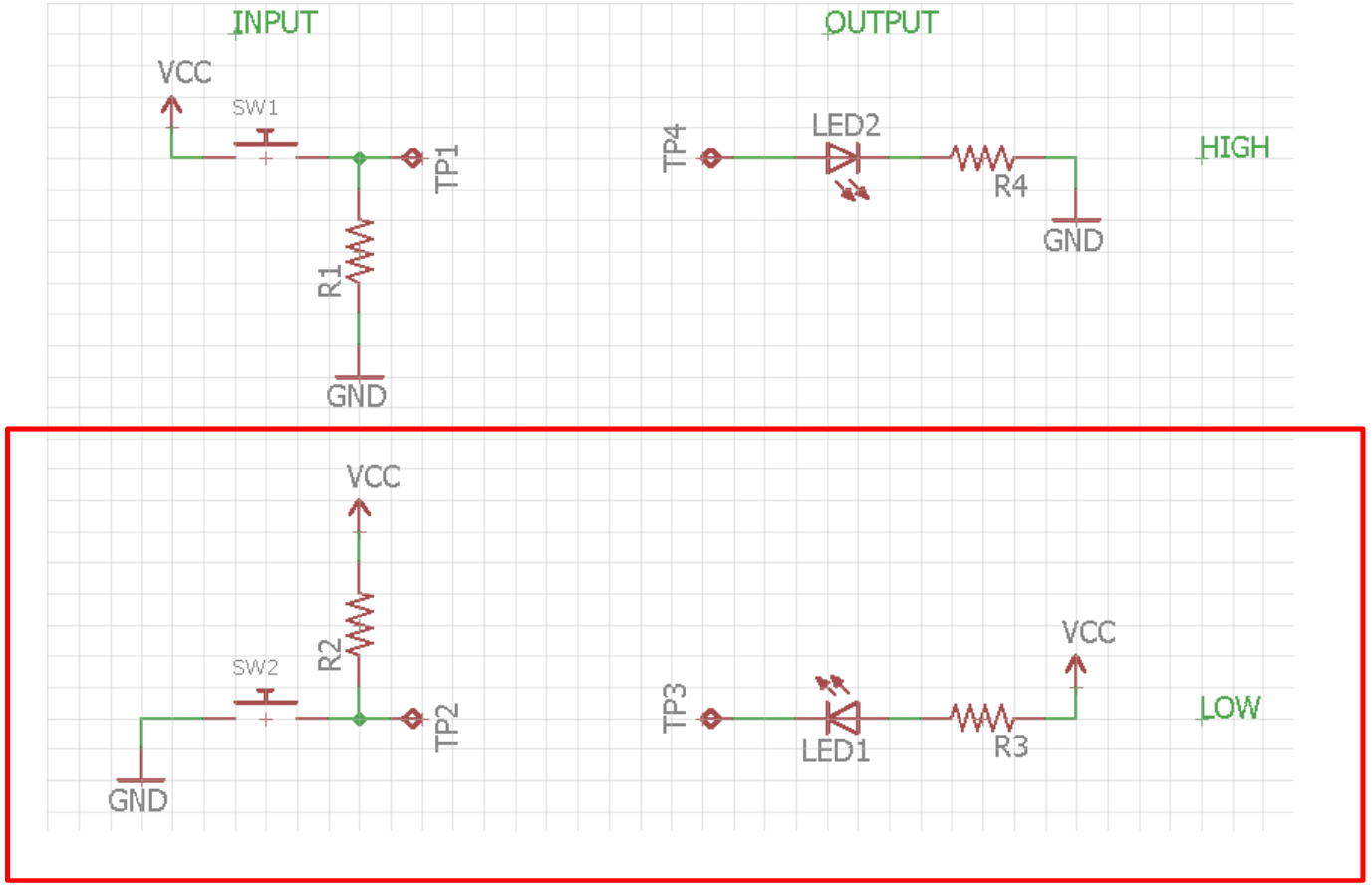




void setup() {} - ทำงานครั้งเดียว

void loop() {} - ทำงานวนลูป

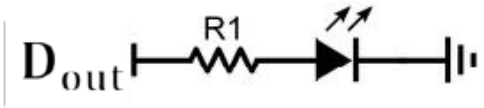
Active High Active Low

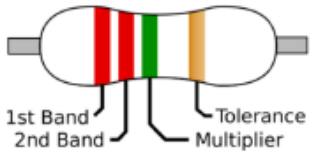


Active Low จะใช้แหล่งจ่ายภายนอก ทำให้ไม่เป็นภาระของ MCU

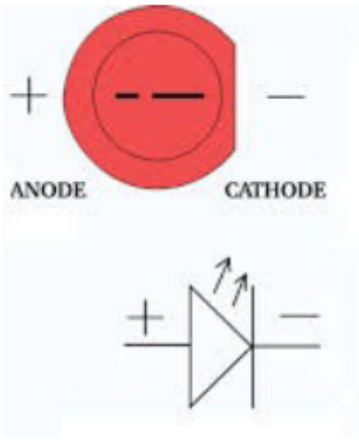
LED & Resistor

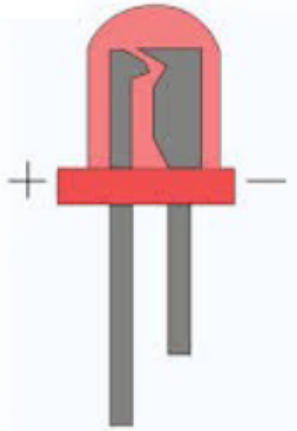
LED & resistor



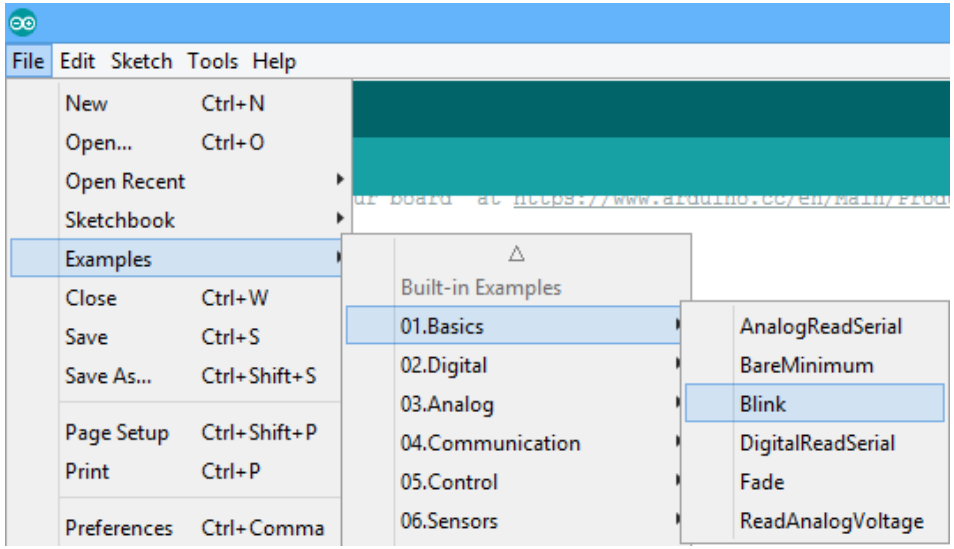


	1st/2nd Band	Multiplier	Tolerance
Black	0	0	-
Brown	1	$\times 10^1$	±1%
Red	2	$\times 10^2$	±2%
Orange	3	$\times 10^3$	-
Yellow	4	$\times 10^4$	-
Green	5	$\times 10^5$	±0.5%
Blue	6	$\times 10^6$	±0.25%
Violet	7	$\times 10^7$	±0.1%
Grey	8	$\times 10^8$	±0.05%
White	9	$\times 10^9$	-
Gold	-	$\times 10^{-1}$	±5%
Silver	-	$\times 10^{-2}$	±10%
None	-	-	±20%





File > Examples > 01.Basics > Blink



LED_BUILTIN = 2

ลองเปลี่ยนค่า delay

Upload

ดูความเปลี่ยนแปลง

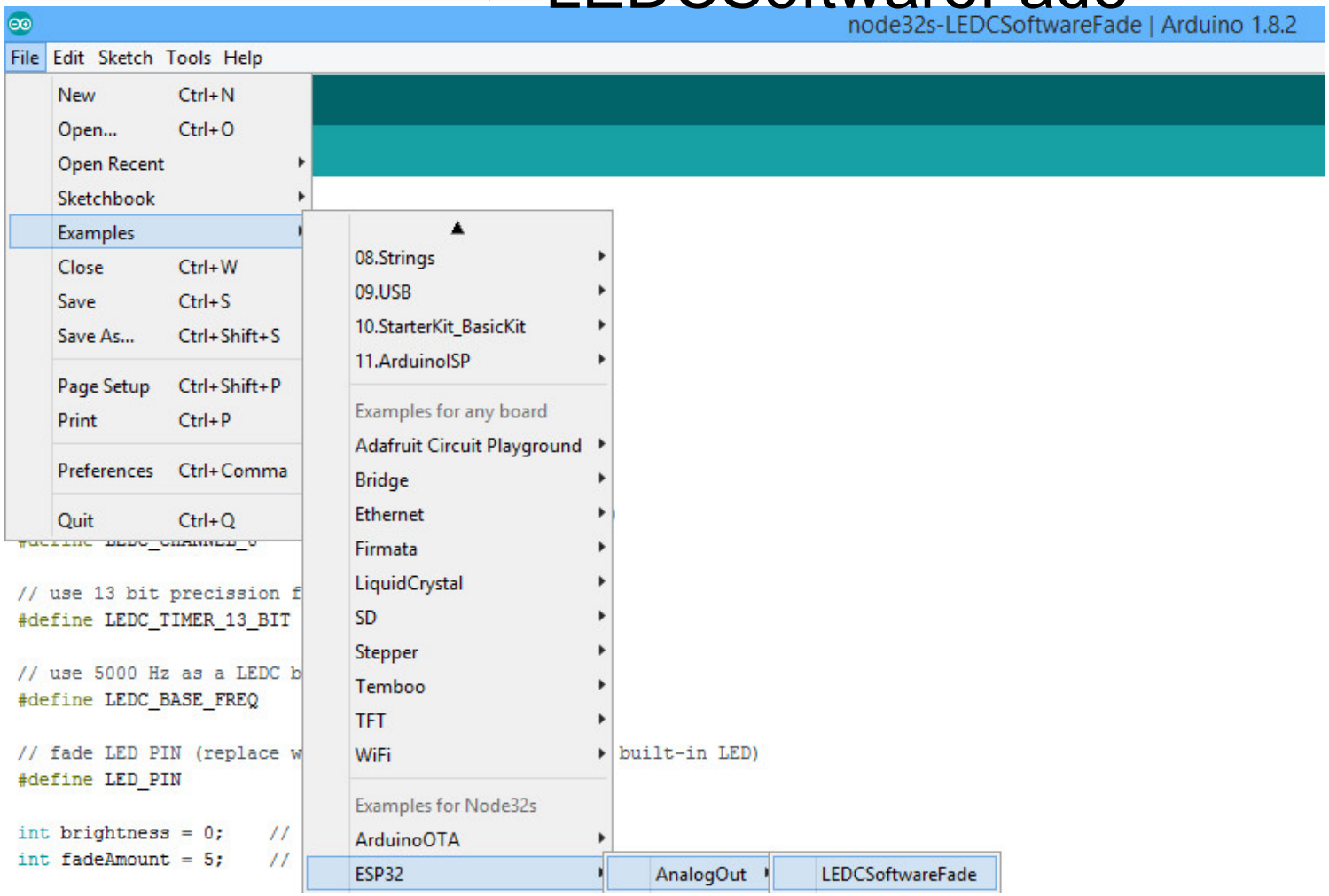
```
// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);                       // wait for a second
  digitalWrite(LED_BUILTIN, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
}
```

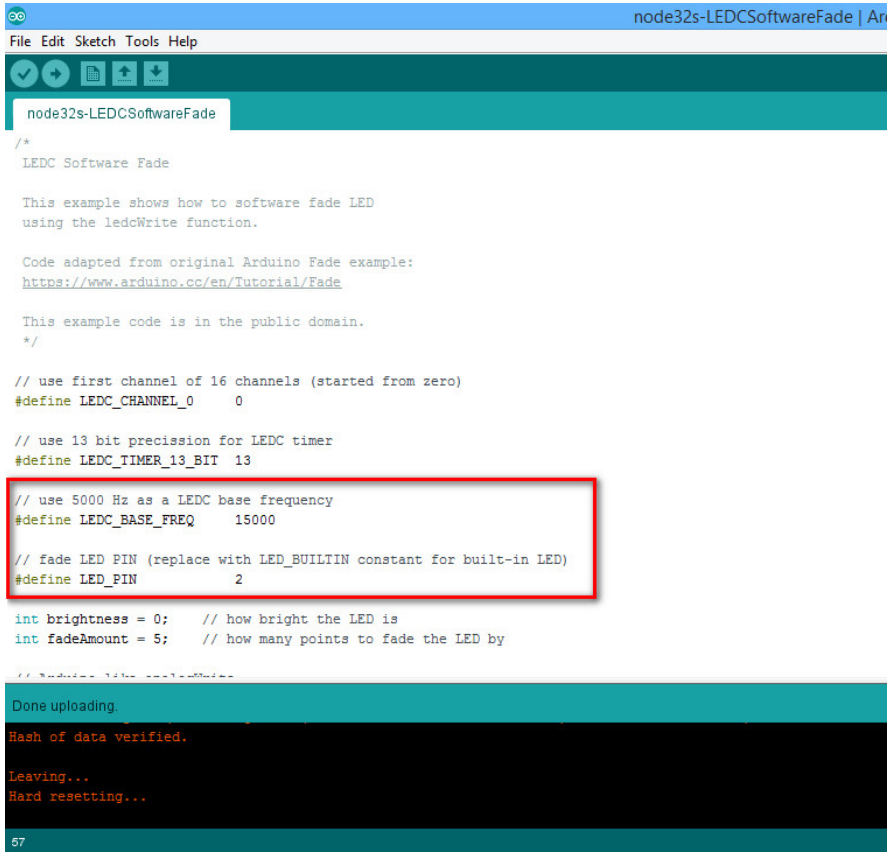
Documents\Arduino\hardware\espressif\esp32\variants\node32s\pins_arduino.h

pins_arduino.h

```
#ifndef Pins_Arduino_h
#define Pins_Arduino_h

#include <stdint.h>

#define EXTERNAL_NUM_INTERRUPTS 16
#define NUM_DIGITAL_PINS        40
#define NUM_ANALOG_INPUTS       16

#define analogInputToDigitalPin(p)   (((p)<20)?(esp32_adc2gpio[(p)]):-1)
#define digitalPinToInterrupt(p)     (((p)<40)?(p):-1)
#define digitalPinHasPWM(p)          (p < 34)

static const uint8_t LED_BUILTIN = 2;
#define BUILTIN_LED  LED_BUILTIN // backward compatibility

static const uint8_t KEY_BUILTIN = 0;

static const uint8_t TX = 1;
static const uint8_t RX = 3;

static const uint8_t SDA = 21;
static const uint8_t SCL = 22;

static const uint8_t SS    = 5;
static const uint8_t MOSI  = 23;
static const uint8_t MISO  = 19;
static const uint8_t SCK   = 18;

static const uint8_t A0 = 36;
static const uint8_t A3 = 39;
static const uint8_t A4 = 32;
static const uint8_t A5 = 33;
static const uint8_t A6 = 34;
static const uint8_t A7 = 35;
static const uint8_t A10 = 4;
static const uint8_t A11 = 0;
```

File > Examples > ESP32 > AnalogOut > LEDCSoftwareFade





#define LEDC_BASE_FREQ 15000

#define LED_PIN 2

File > Examples > 02.Digital > BlinkWithoutDelay

แบบฝึกหัดที่ 2 – ลองต่อ LED

1. ต่อ LED ที่ขาของ Node32Lite ให้ LED สว่าง ดับ ตามลำดับ

ARDUINO CHEAT SHEET

JEROEN DOGGEN, AP UNIVERSITY COLLEGE ANTWERP

Structure

void **setup**()
void **loop**()

Control Structures

```
if(x<5){}
for(int i = 0; i < 255; i++ ){}
while((x < 6 ){}
```

Further Syntax

// Single line comment
/* .. */ Multi line comment
#define ANSWER 42
#include <myLib.h>

General Operators

= assignment
+, − addition, substraction
*, / multiplication, division
% modulo
== equal to
!= not equal to
< less than
<= less than or equal to

Pointer Access

& reference operator
* dereference operator

Bitwise Operators

& bitwise AND
| bitwise OR
^ bitwise XOR
~ bitwise NOT

Compound Operators

++ Increment
−− Decrement
+= Compound addition
&= Compound bitwise AND

Constants

```
HIGH, LOW
INPUT, OUTPUT
true, false
```

53 : Decimal
B110101101 : Binary
0x5BA4 : Hexadecimal

Data Types

void	
boolean	0, 1, false, true
char	e.g. 'a' -128 → 127
unsigned char	0 → 255
int	-32.768 → 32.767
unsigned int	0 → 65535
long	-2.147.483.648 → 2.147.483.647
float	-3,4028235E+38 → 3.402835E+38
sizeof (myint)	returns 2 bytes

Arrays

int myInts[6];
int myPins[]=2,4,8,5,6;
int myVals[6]=2,-4,9,3,5;

Strings

char S1[15];
char S2[8]='A','r','d','u','i','n','o';
char S3[8]='A','r','d','u','i','n','o','\0';
char S4[]="Arduino";
char S5[8] = "Arduino";
char S6[15] = "Arduino";

Conversion

char() **int()** **long()**
byte() **word()** **float()**

Qualifiers

static	Persist between calls
volatile	Use RAM (nice for ISR)
const	Mark read-only
PROGMEM	Use flash memory

Interrupts

attachInterrupt(interrupt, function, type)
detachInterrupt(interrupt)
boolean(interrupt)
interrupts()
noInterrupts()

Advanced I/O

tone(pin, freqhz)
tone(pin, freqhz, duration_ms)
noTone(pin)
shiftOut (dataPin, clockPin, how, value)
unsigned long **pulseIn**(pin, [HIGH,LOW])

Time

unsigned long **millis()** 50 days overflow
unsigned long **micros()** 70 min overflow
delay(ms)
delayMicroseconds(us)

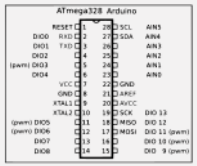
Math

min(x,y) **max**(x,y) **abs**(x)
sin(rad) **cos**(rad) **tan**(rad)
pow(base, exponent)
map(val, fromL, fromH, toL, toH)
constrain(val, fromL, toH)

Pseudo Random Numbers

randomSeed(seed)
long **random**(max)
long **random**(min, max)

ATmega328 Pinout



I/O Pins

	Uno	Mega
# of IO	14 + 6	54 + 11
Serial Pins 3	0 - RX, 1 -TX	RX1 → RX4
Interrupts	2,3	2,3,18,19,20,21
PWM Pins	5,6 - 9,10 - 3,11	0 → 13
SPI (SS, MOSI, MISO, SCK)	10→ 13	50→ 53
I2C (SDA, SCK)	A4, A5	20,21

Analog I/O

```
analogReference(EXTERNAL, INTERNAL)
analogRead(pin)
analogWrite(pin, value)
```

Digital I/O

```
pinMode(pin,[INPUT,OUTPUT])
digitalRead(pin)
digitalWrite(pin, value)
```

Serial Communication

Serial.begin(speed)
Serial.print("Text")
Serial.println("Text")

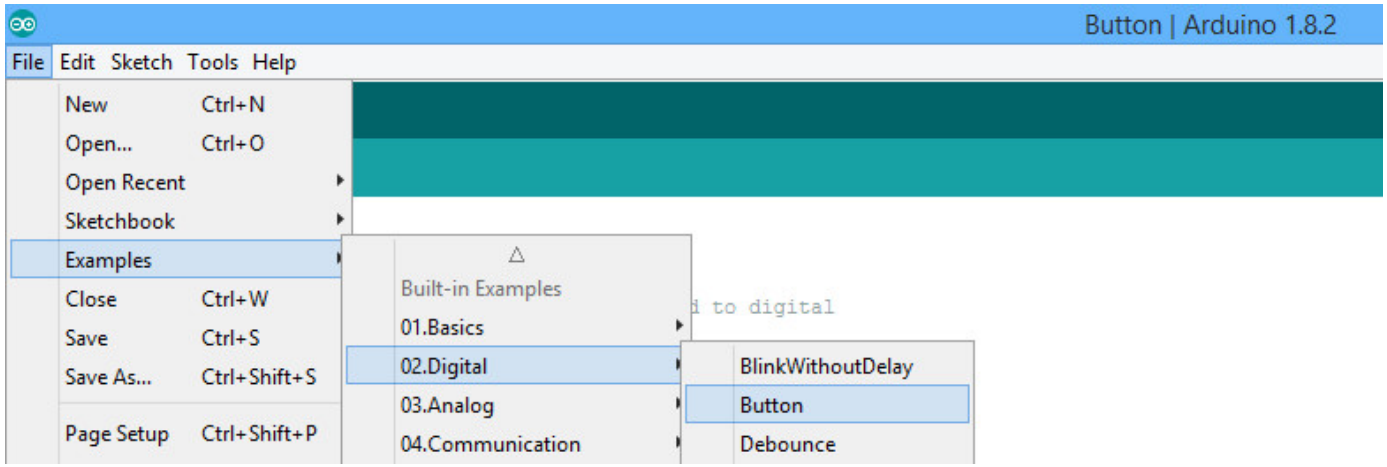
Websites

```
forum.arduino.cc
playground.arduino.cc
arduino.cc/en/Reference
```

Arduino Uno Board

https://forum.arduino.cc/index.php?topic=173843.0

File > Examples > 02.Digital > Button

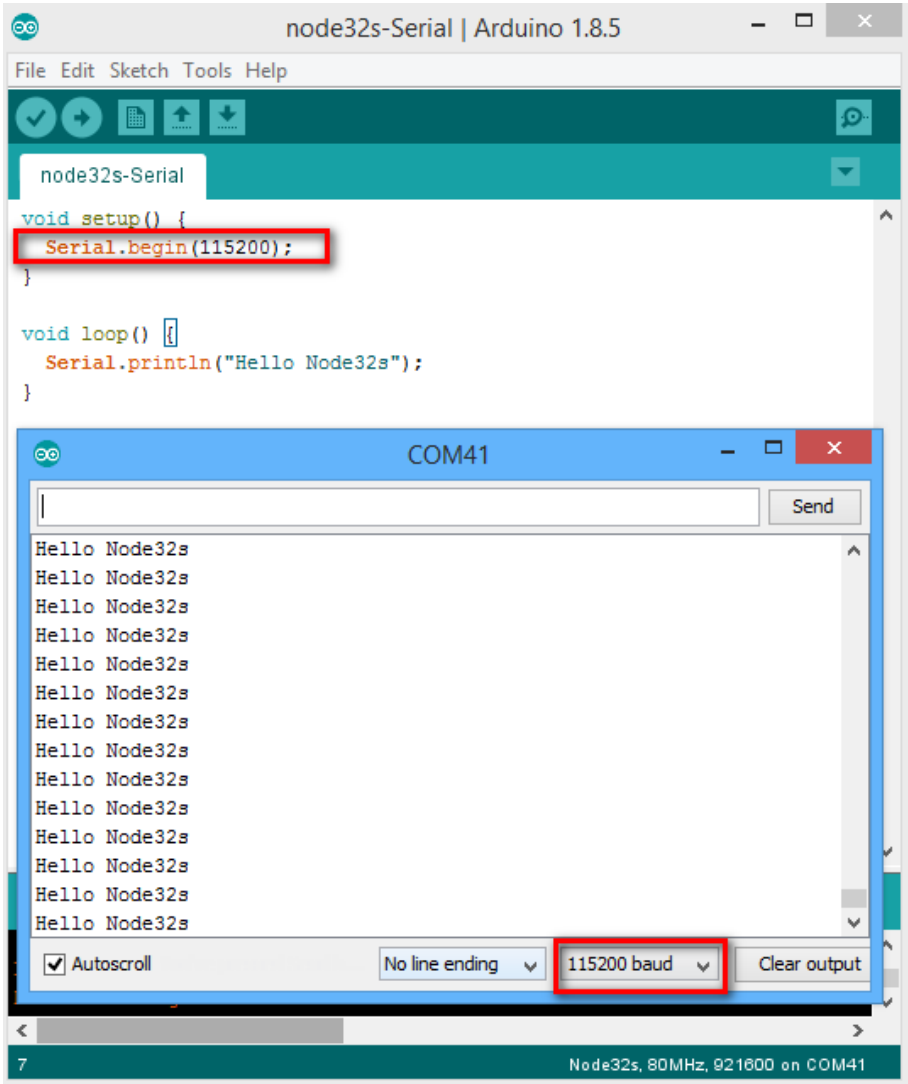



```
const int buttonPin = 0;

const int ledPin =  2;
```

กดปุ่มไฟสว่าง ปล่อยปุ่มไฟดับ

แบบฝึกหัดที่ 3

- ให้ กดปุ่มไฟดับ ปล่อยปุ่มไฟสว่าง
- กดปุ่มไฟดับ กดปุ่มไฟสว่าง กดปุ่มไฟดับ กดปุ่มไฟสว่าง



พิมพ์คำสั่ง

ปรับค่า **Serial** 115200 ให้ตรงกัน

แบบฝึกหัดที่ 4

ให้แสดงที่ Serail Monitor

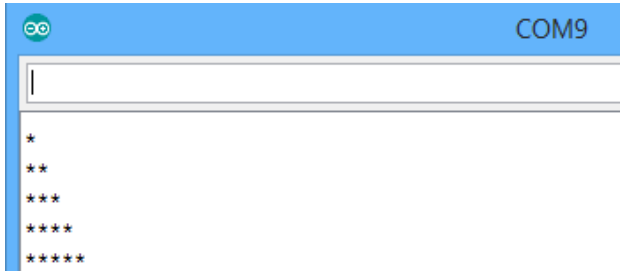
*

**

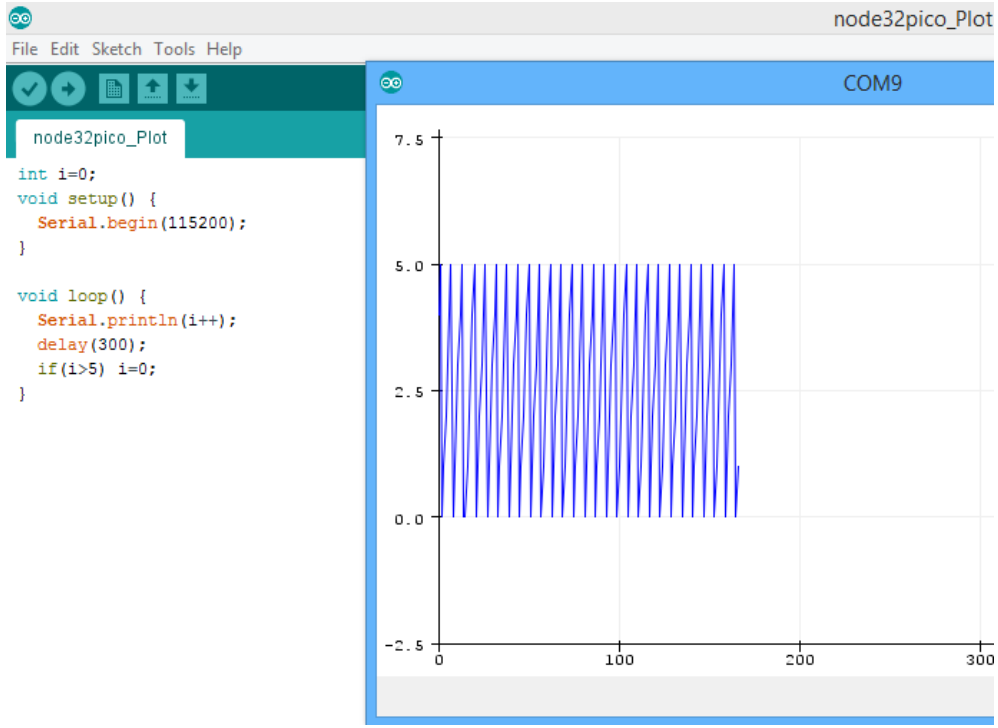
***

****

*****



Tools > Serial Plotter



พิมพ์คำสั่ง

เมนู Tools > Serial Plotter

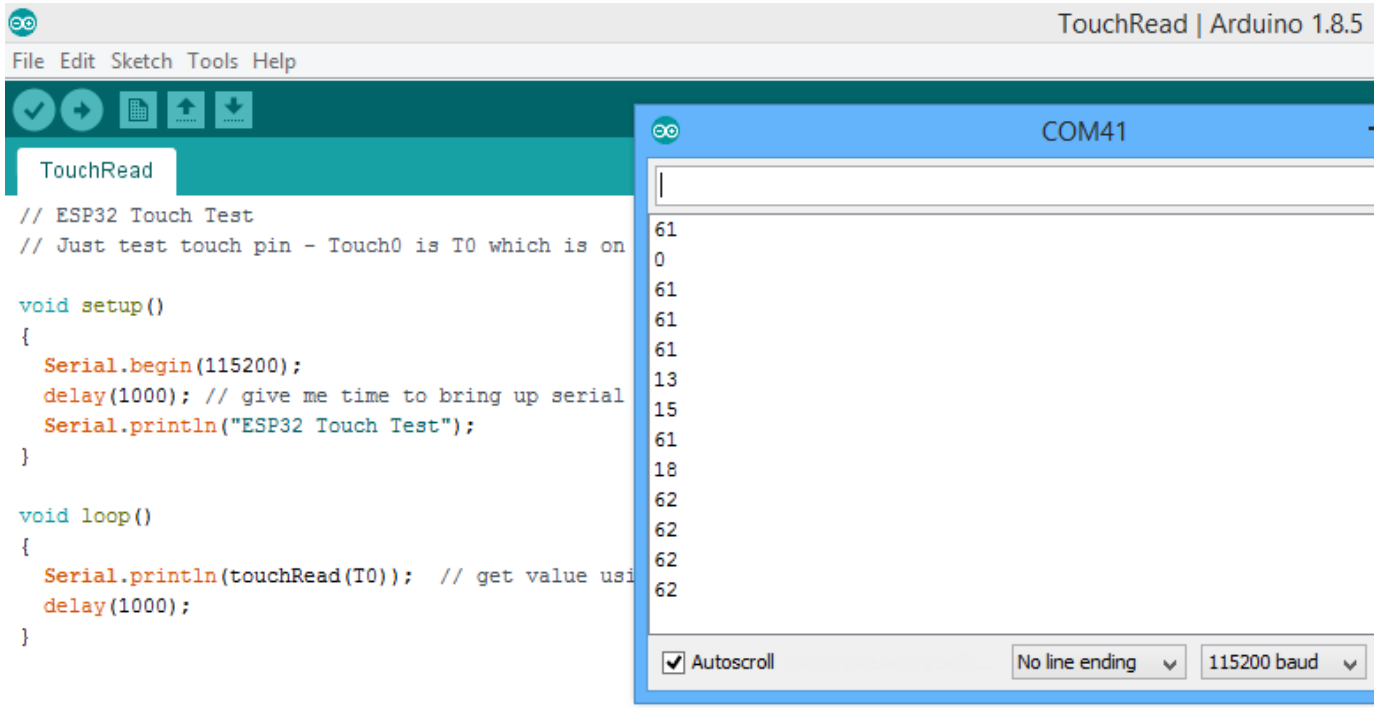
ปรับค่า Serial 115200 ให้ตรงกัน

สรุปขั้นตอน

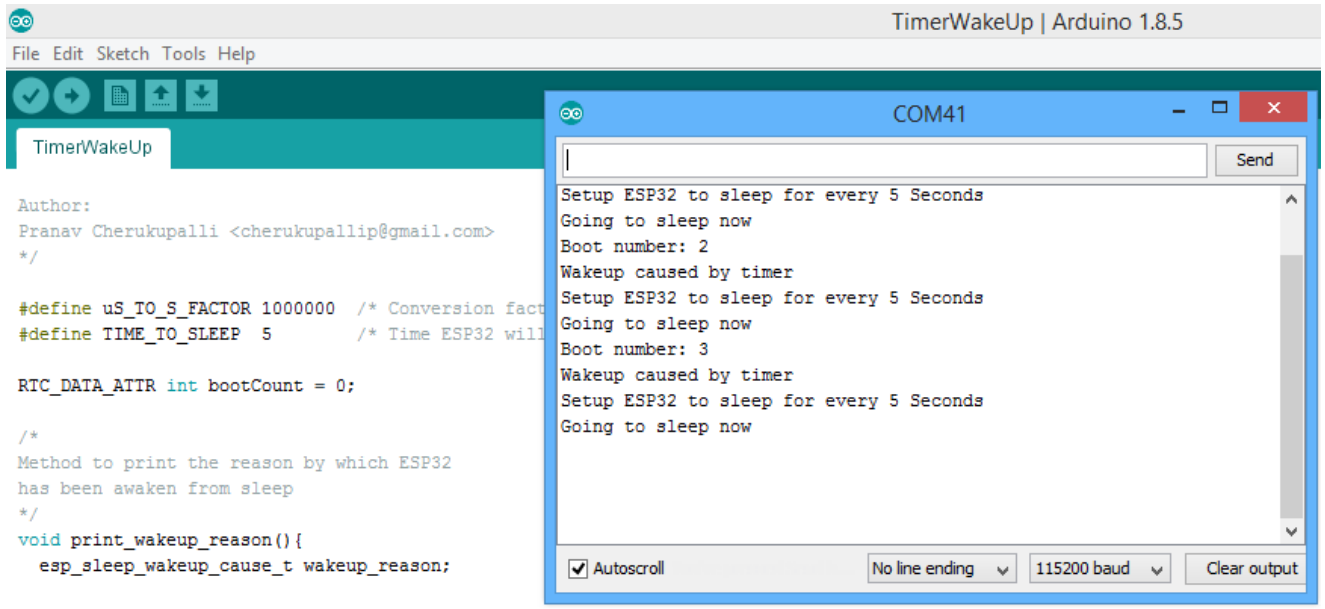
- File > Examples
- ปรับค่า
- Upload Program
- สังเกตความเปลี่ยนแปลง

File > Examples > ESP32 > ChipID > GetChipID

File > Examples > ESP32 > Touch > TouchRead

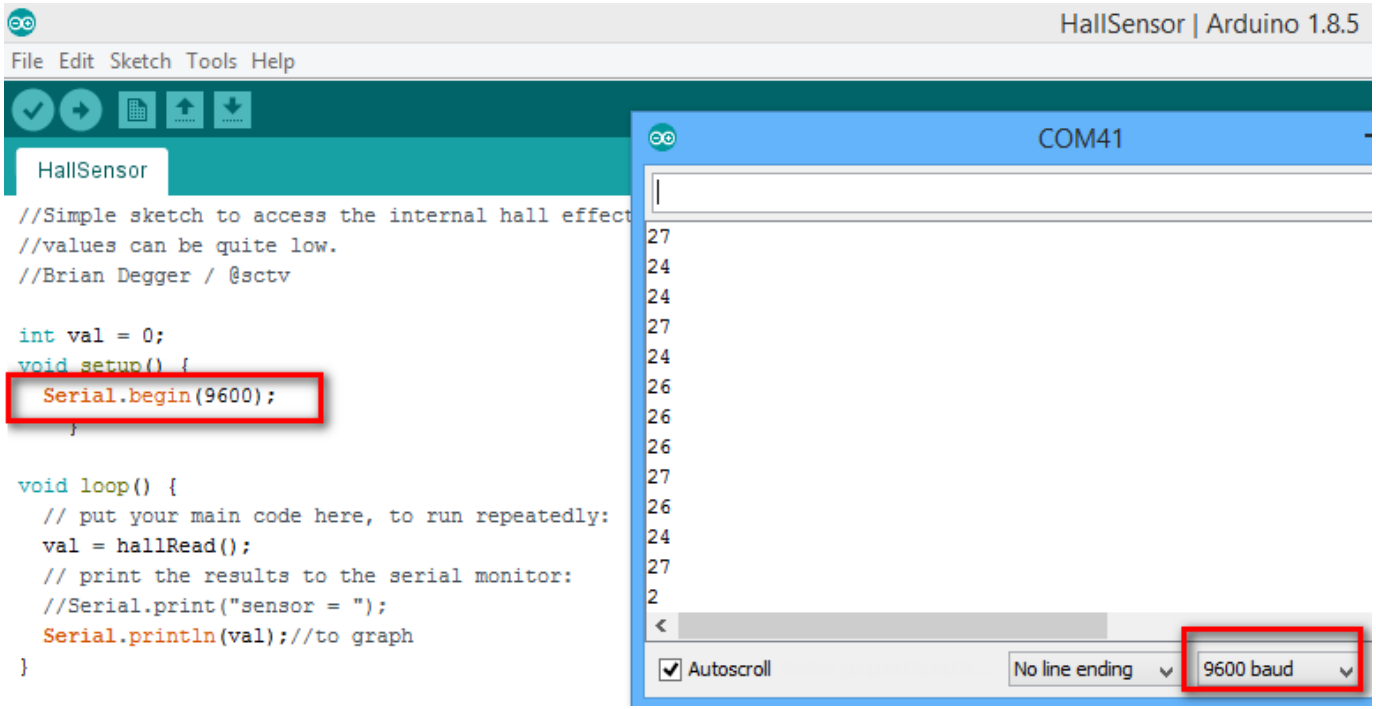


File > Examples > ESP32 > DeepSleep > TimerWakeUp



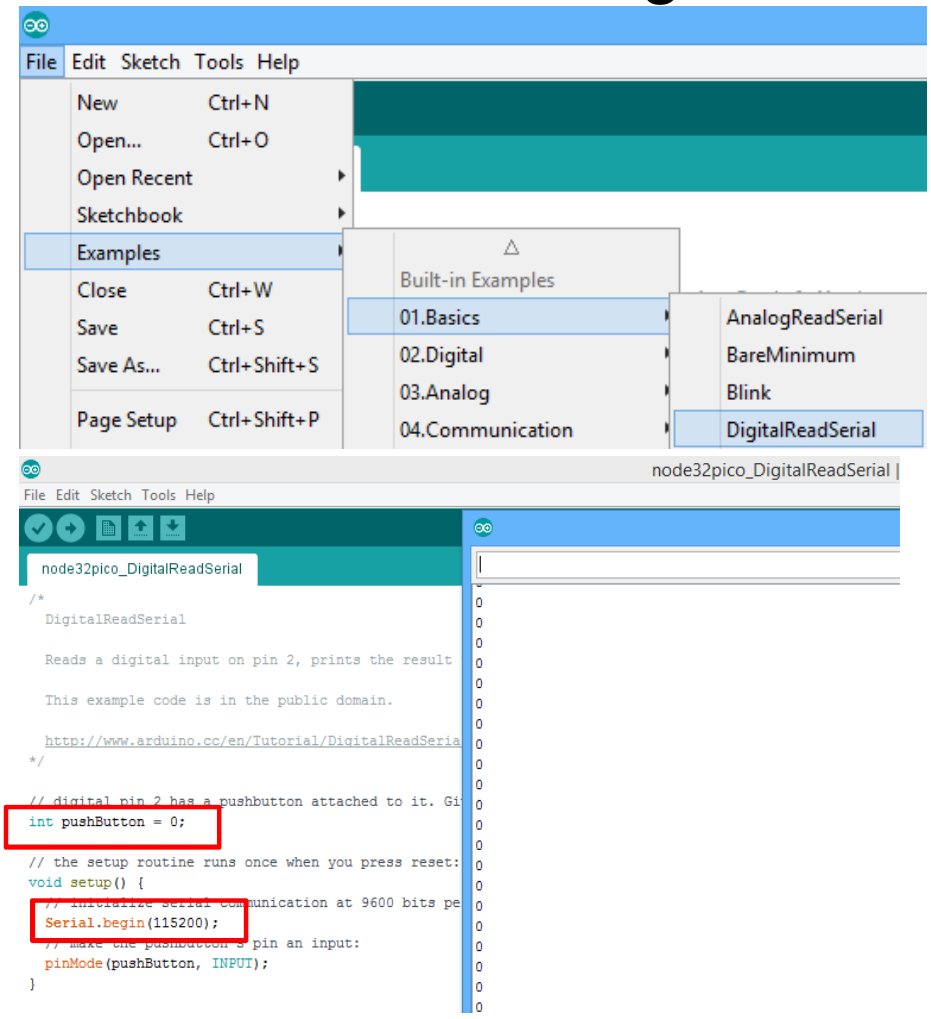

```
Author:
Pranav Cherukupalli <cherukupallip@gmail.com>
*/

#define uS_TO_S_FACTOR 1000000  /* Conversion fact
#define TIME_TO_SLEEP  5        /* Time ESP32 will

RTC_DATA_ATTR int bootCount = 0;

/*
Method to print the reason by which ESP32
has been awaken from sleep
*/
void print_wakeup_reason(){
  esp_sleep_wakeup_cause_t wakeup_reason;

  wakeup_reason = esp_sleep_get_wakeup_cause();

  switch(wakeup_reason)
  {
    case 1  : Serial.println("Wakeup caused by external signal using RTC_IO"); break;
    case 2  : Serial.println("Wakeup caused by external signal using RTC_CNTL"); break;
    case 3  : Serial.println("Wakeup caused by timer"); break;
    case 4  : Serial.println("Wakeup caused by touchpad"); break;
    case 5  : Serial.println("Wakeup caused by ULP program"); break;
    default : Serial.println("Wakeup was not caused by deep sleep"); break;
  }
}
```

File > Example > ESP32 > HallSensor



ปรับ Serial 9600

File > Examples > 01.Basics > DigitalReadSerial

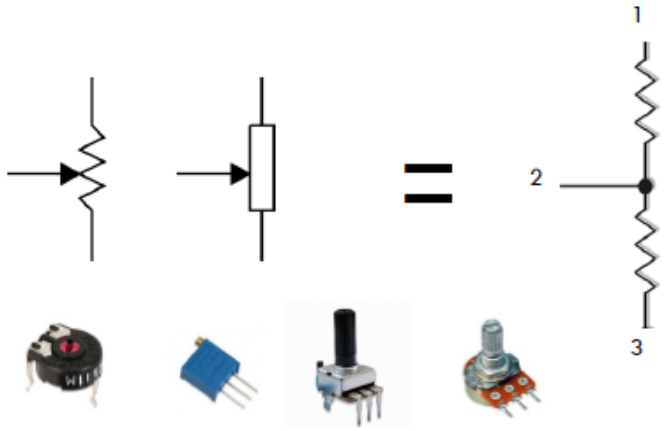



```
int pushButton = 0;
Serial.begin(115200);
```

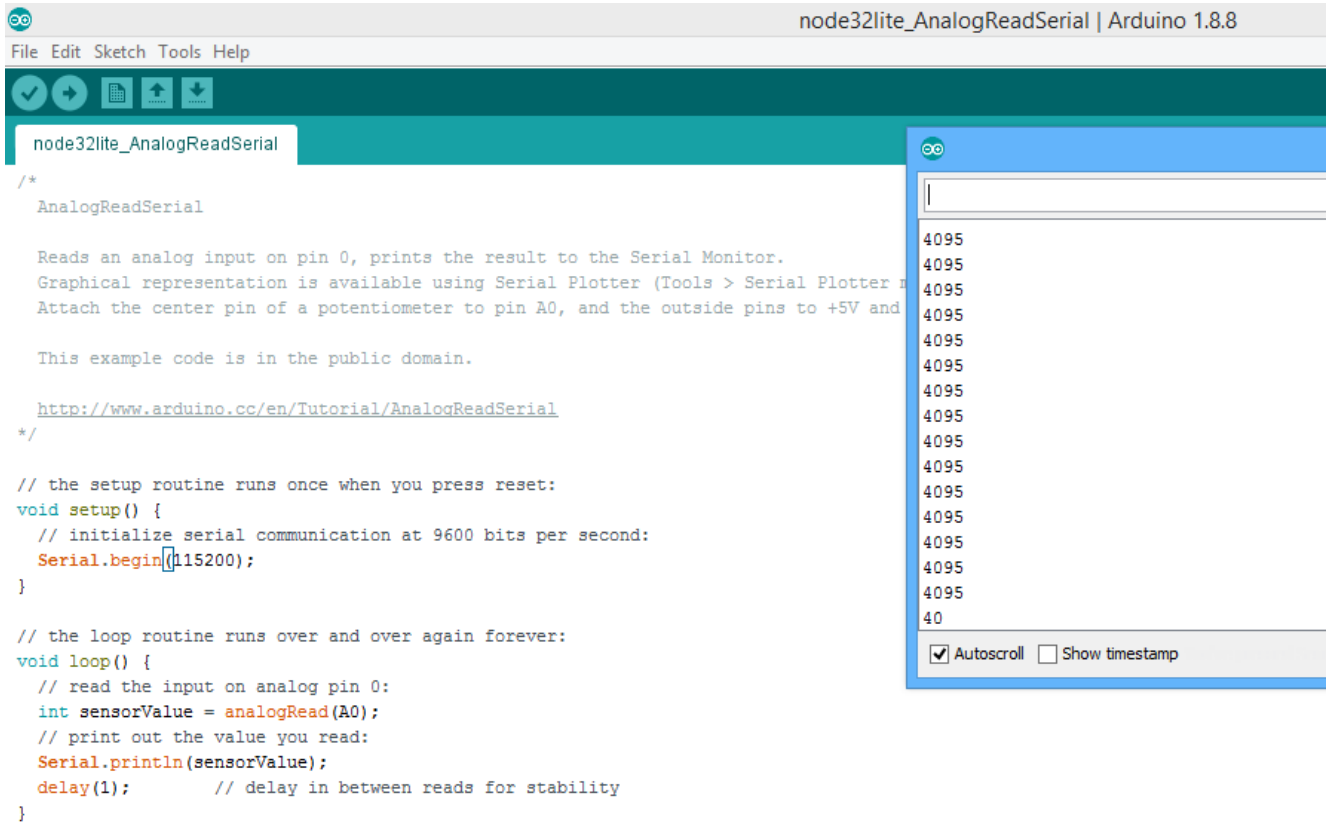
กดปุ่ม BOOT
ดูความเปลี่ยนแปลง

Volume

Potentiometer

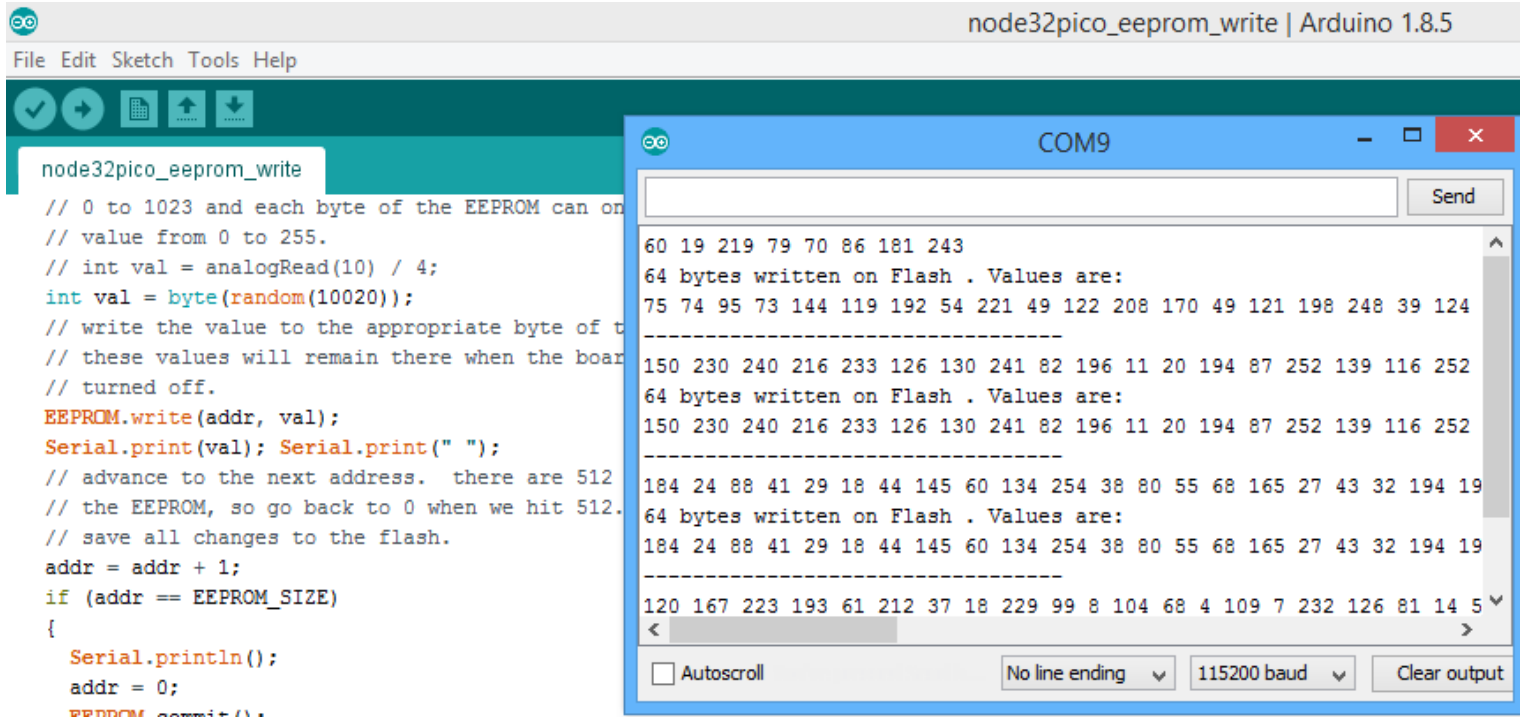


File > Examples > 01.Basics > AnalogReadSerial

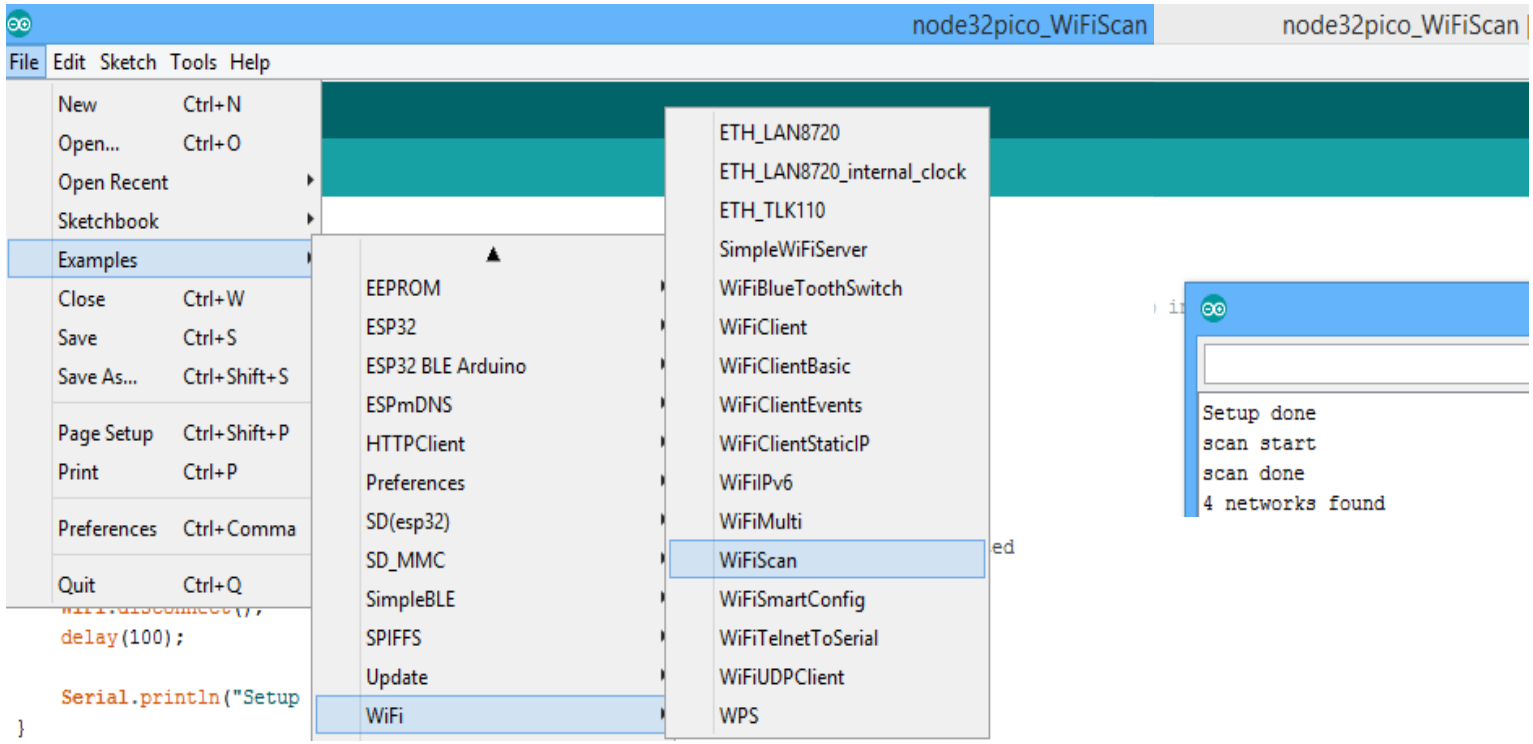


ต่อ Volume เข้ากับขา A0 (io36)

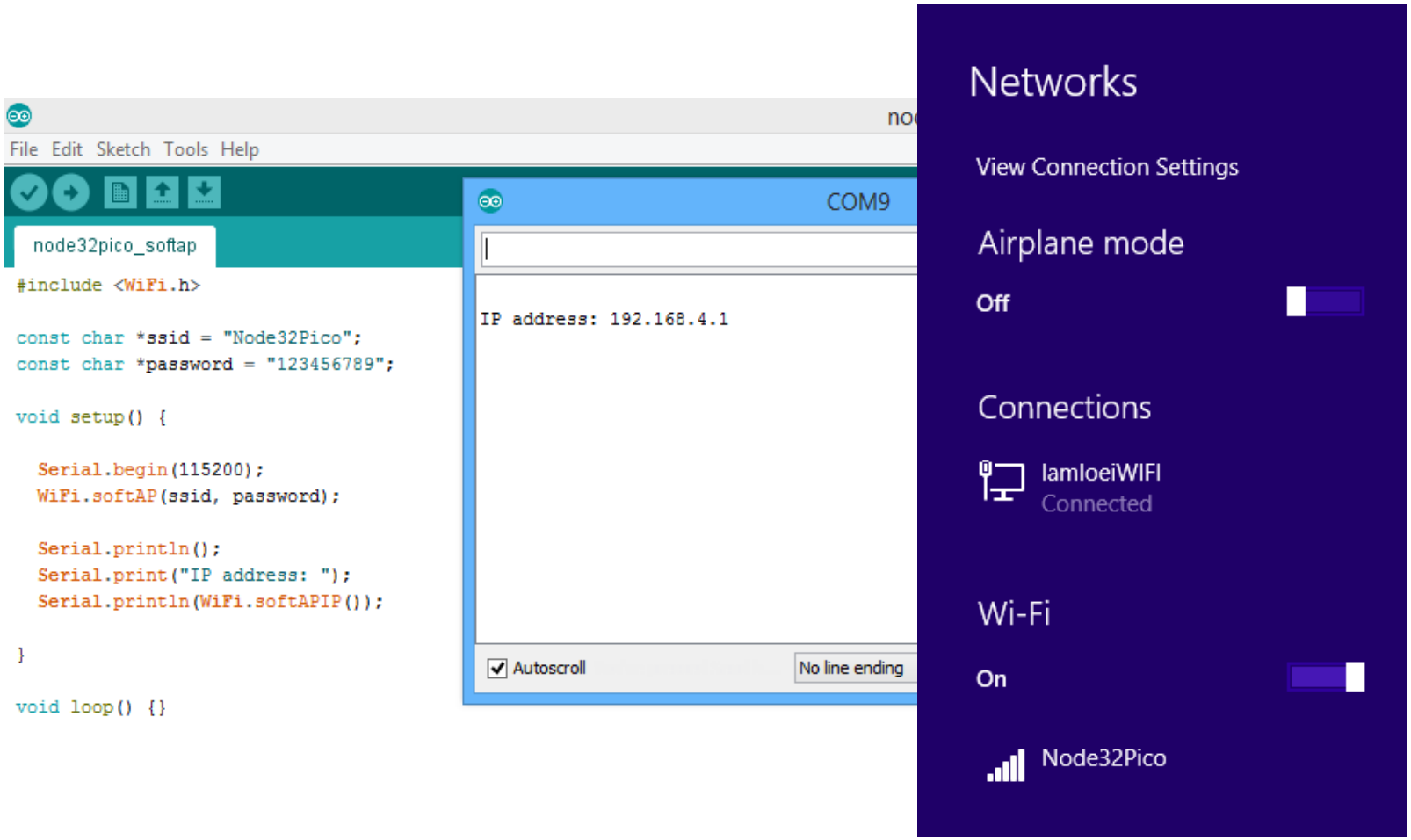
File > Examples > EEPROM > eeprom_write



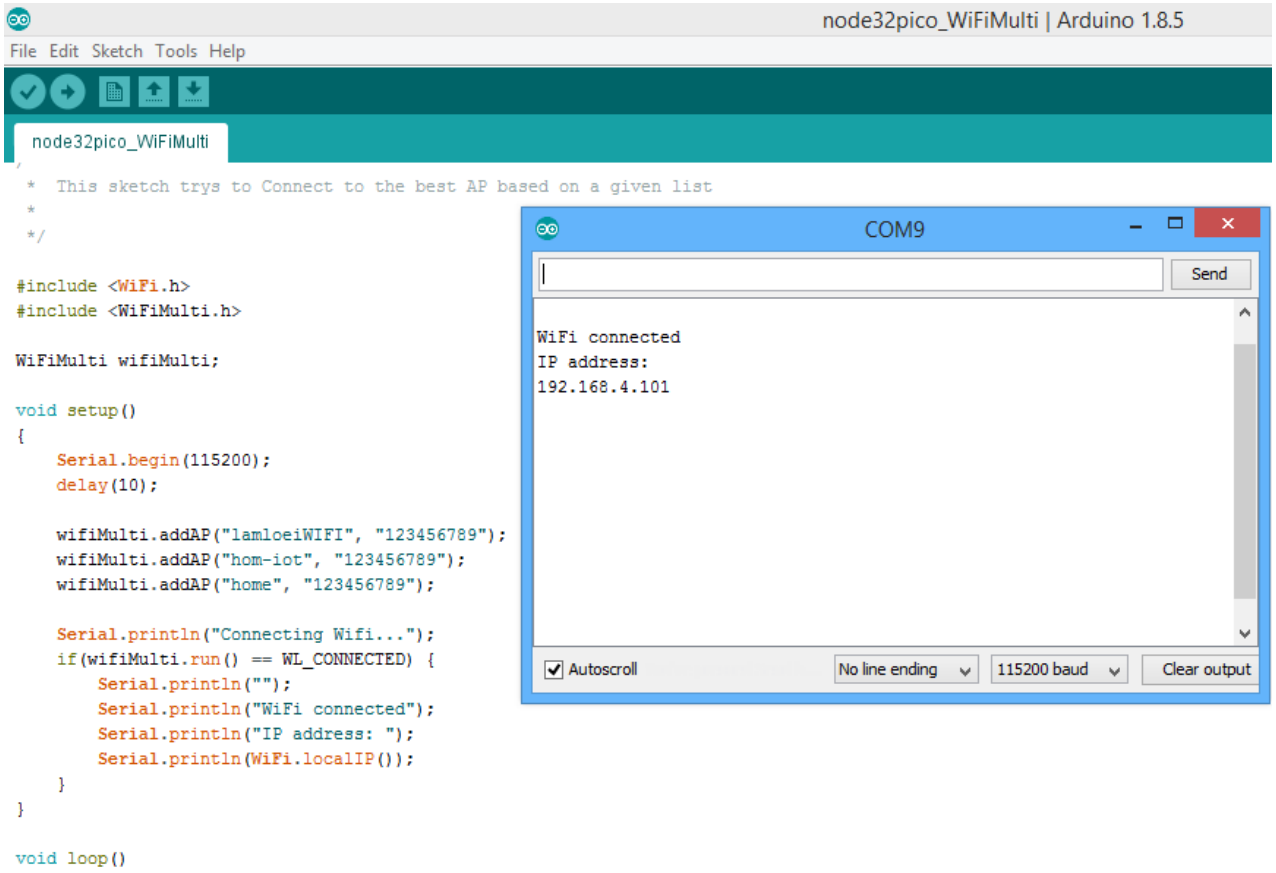
File > Examples > WiFi > WiFiScan



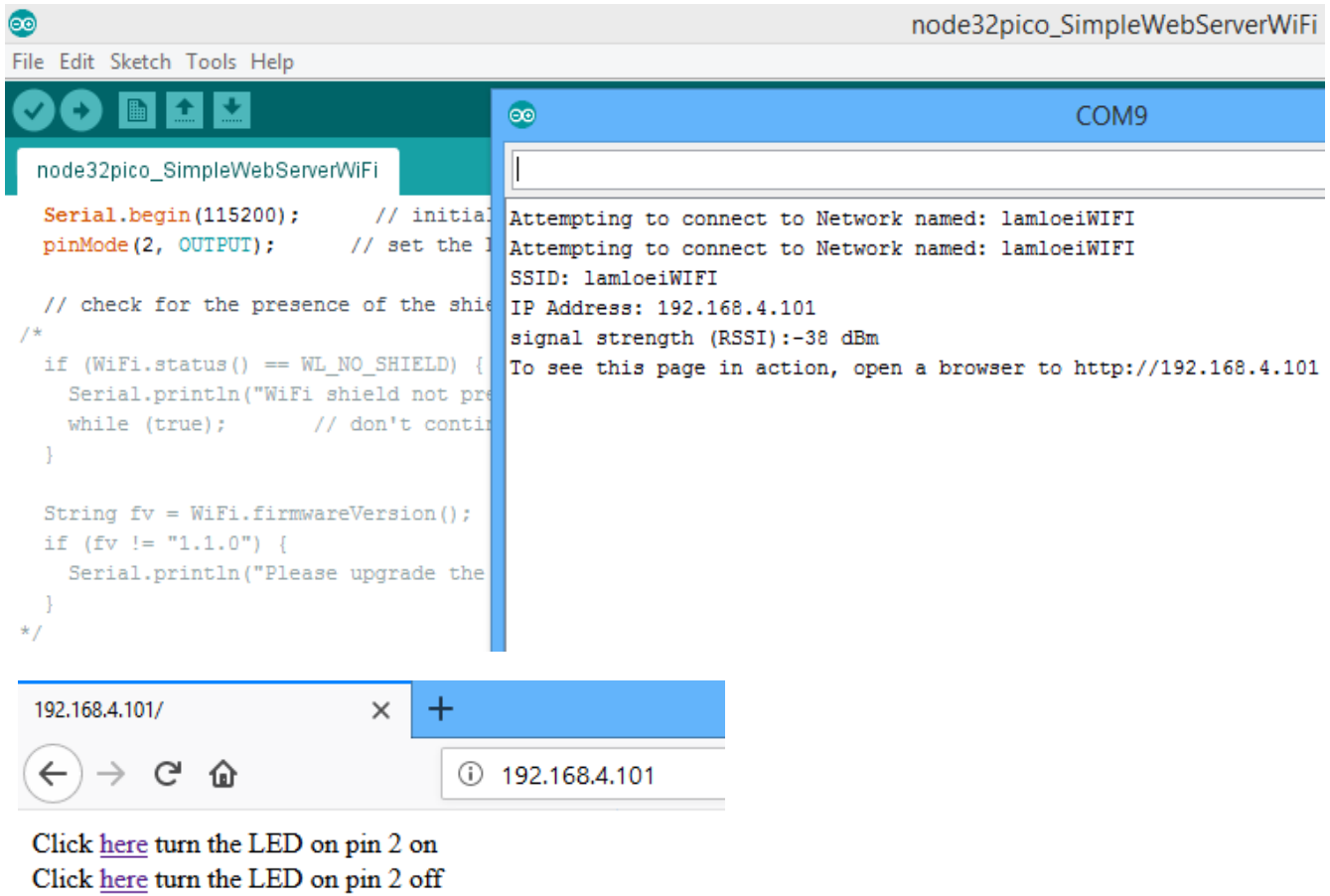
Node32Pico SoftAP



File > Examples > WiFi > WiFiMulti



File > Examples > WiFi > SimpleWebServerWiFi

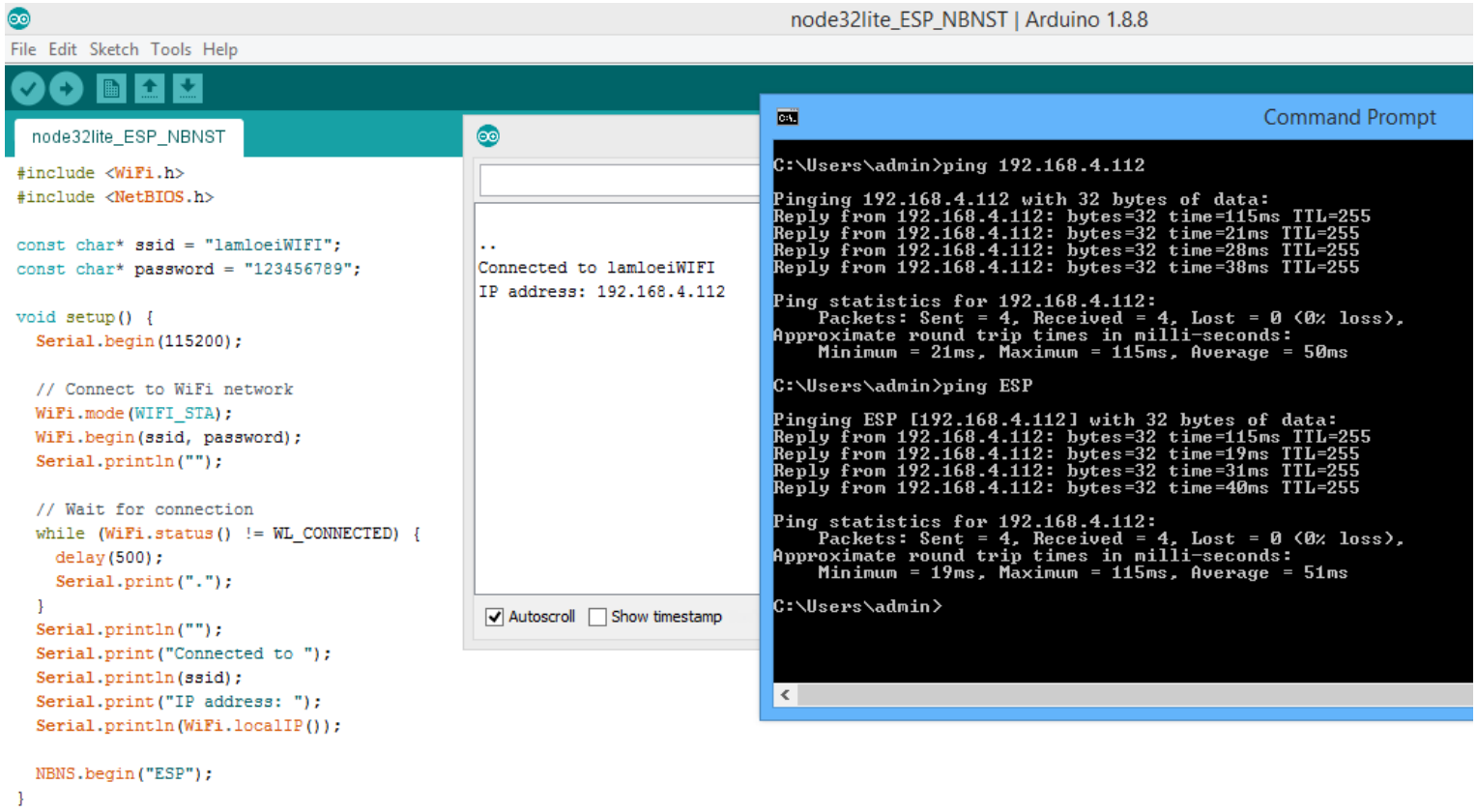


ปรับ

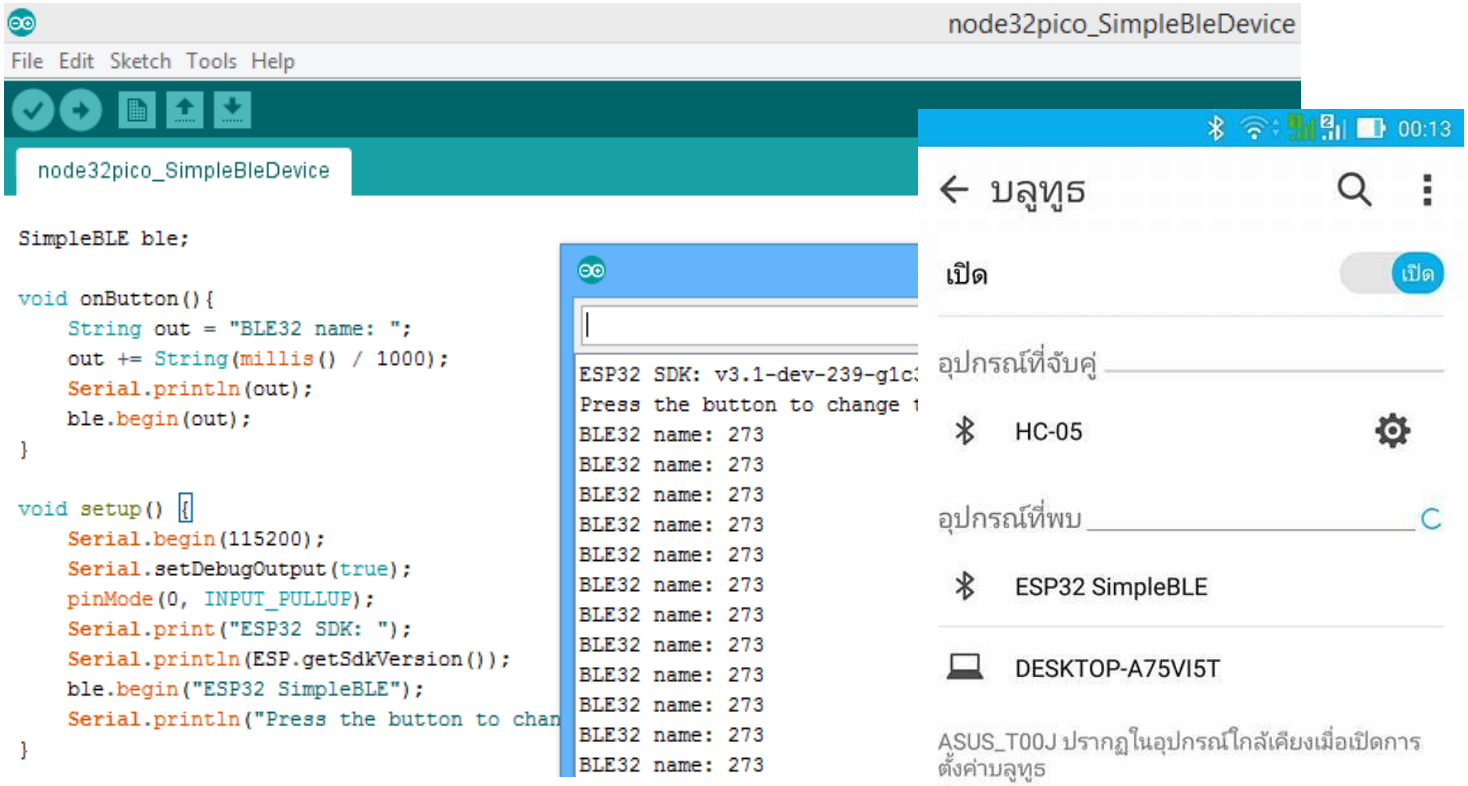
```
const char* ssid     = "IamloeiWIFI";
const char* password = "123456789";
Serial.begin(115200);
pinMode(2, OUTPUT);
/*
  if (WiFi.status() == WL_NO_SHIELD) {
    Serial.println("WiFi shield not present");
    while (true);       // don't continue
  }
  String fv = WiFi.firmwareVersion();
  if (fv != "1.1.0") {
    Serial.println("Please upgrade the firmware");
  }
*/
```

```
client.print("Click <a href=\"/H\">here</a> turn the LED on pin 2 on<br>");
client.print("Click <a href=\"/L\">here</a> turn the LED on pin 2 off<br>");

if (currentLine.endsWith("GET /H")) {
  digitalWrite(2, LOW);               // GET /H turns the LED on
}
if (currentLine.endsWith("GET /L")) {
  digitalWrite(2, HIGH);              // GET /L turns the LED off
}
```

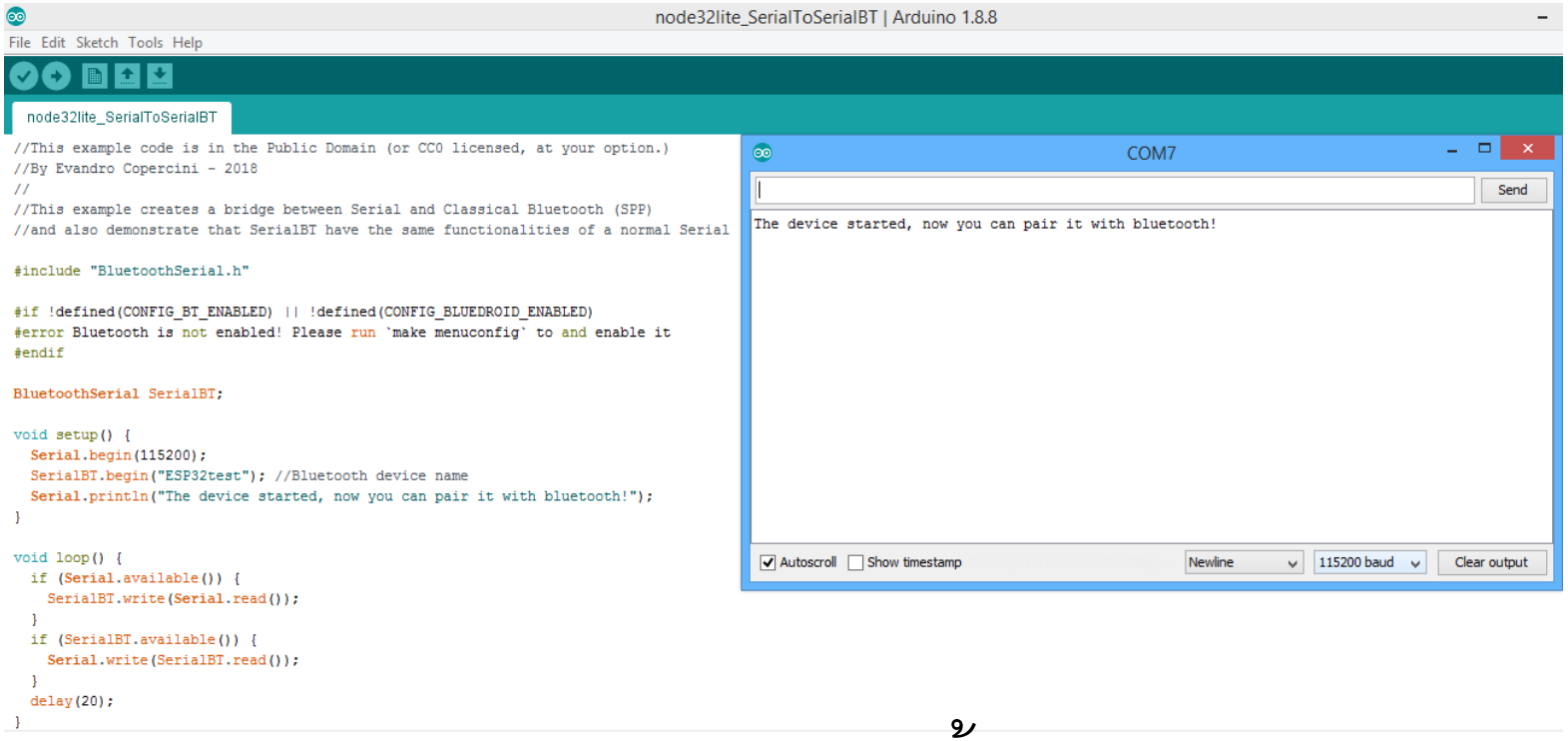
File > Examples > NetBIOS > ESP_NBNST



File > Examples > SimpleBLE > SimpleBleDevice



File > Examples > BluetoothSerial > SerialToSerialBT



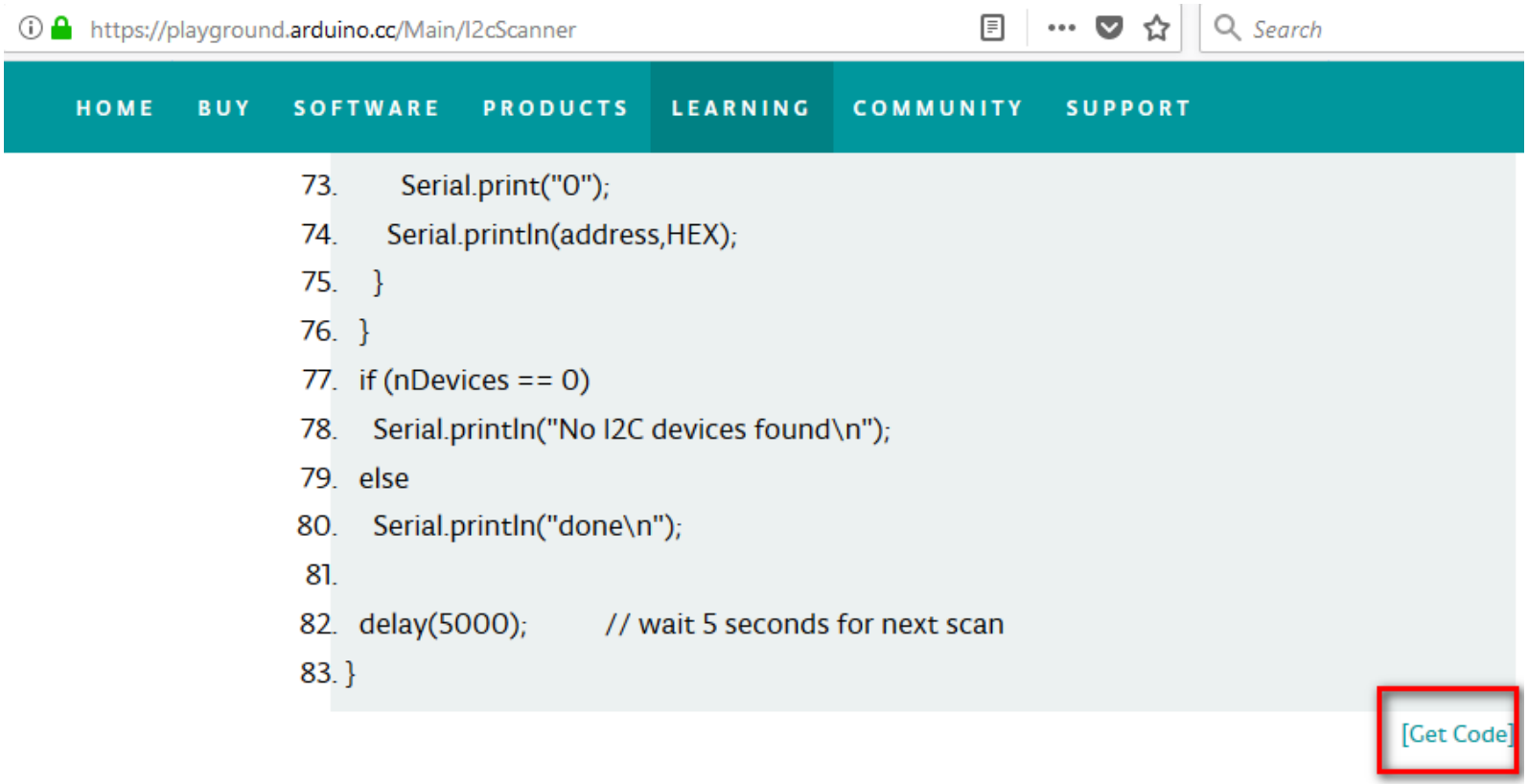
-Upload เสร็จให้กดปุ่ม EN 1 ครั้ง

โหลดโปรแกรม Android Bluetooth Serial ที่มือถือ

เพิ่ม Code จากภายนอก

เปิดเบราเซอร์ไปที่ https://playground.arduino.cc/Main/I2cScanner

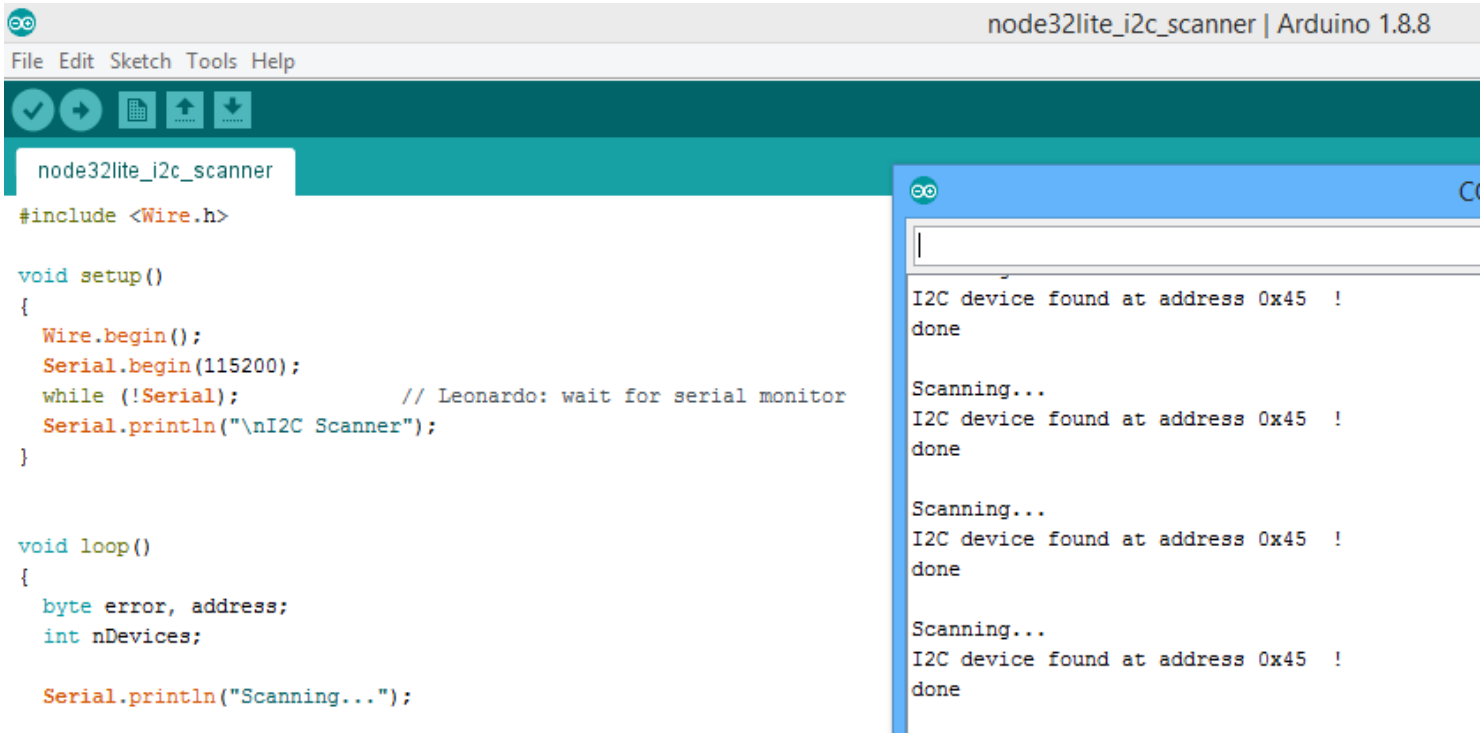
คลิก Get Code



ต่อ SHT30 เข้ากับ Node32Lite

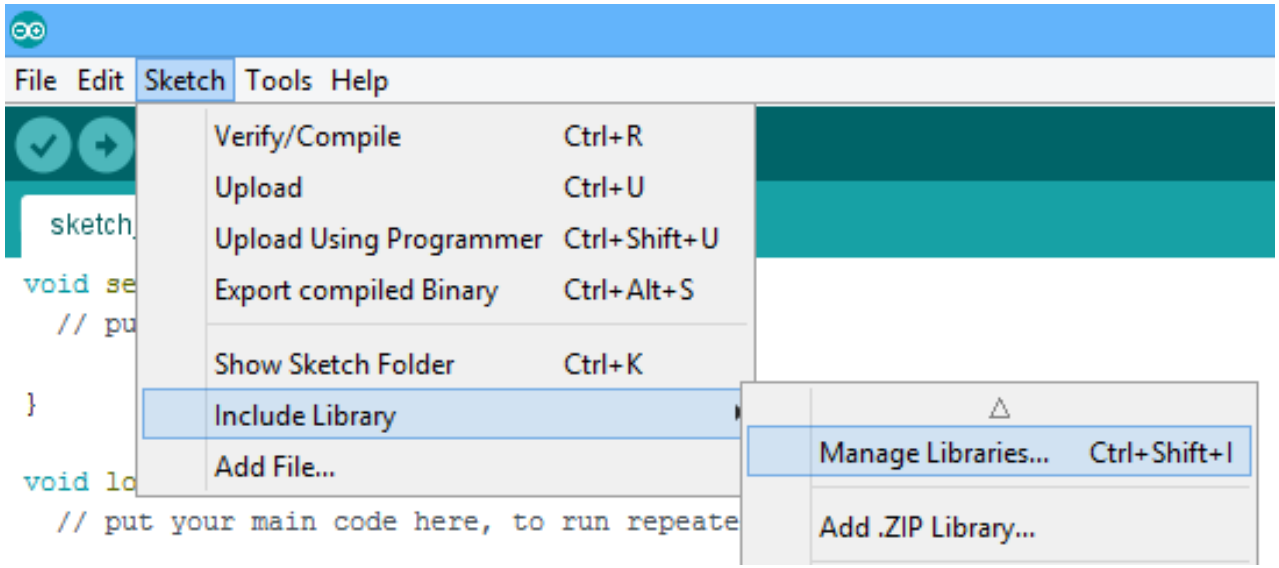
Node32Lite	SHT30
1. GND	GND
2. 3V3	3V3
3. IO22	D1
4. IO21	D2

แสดง Address ของ SHT30 ที่ 0x45



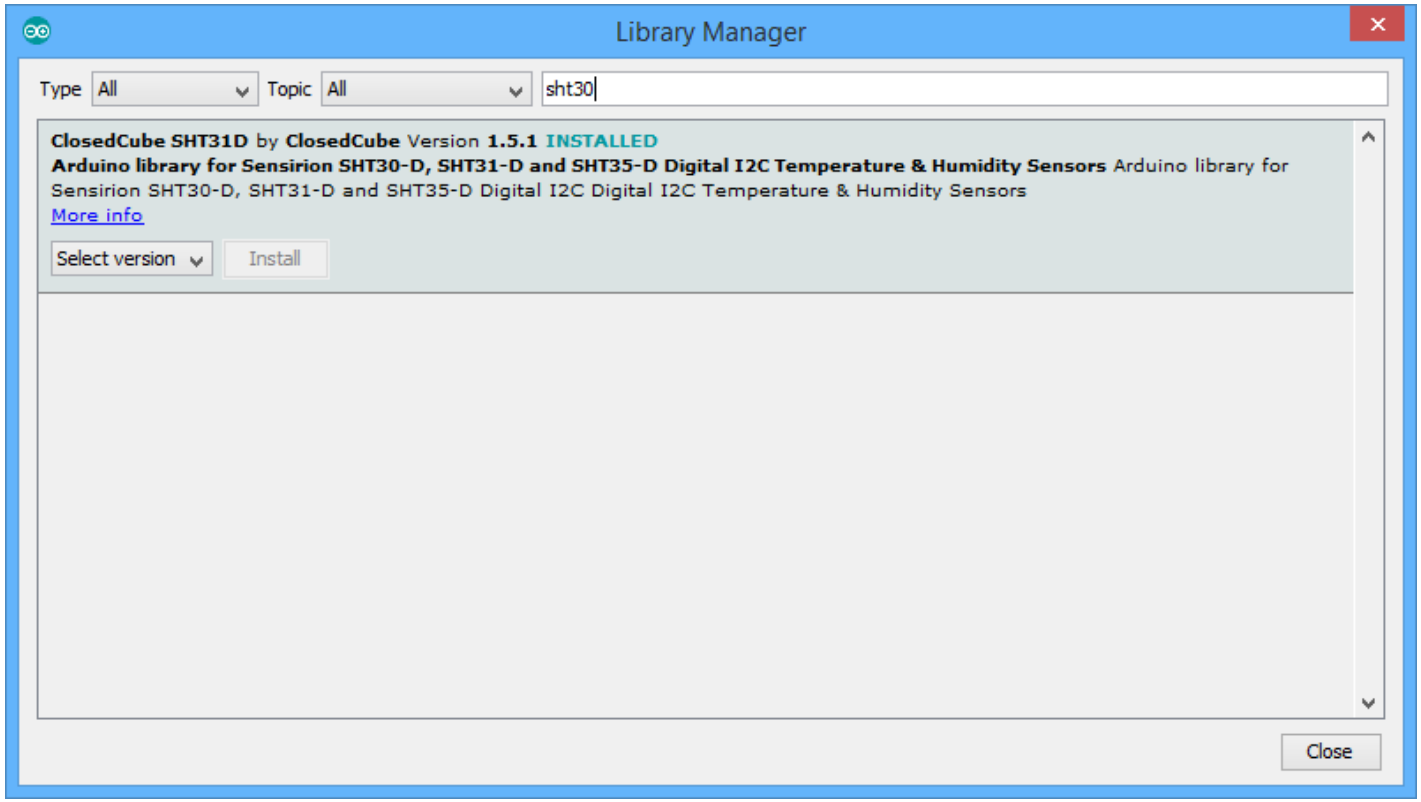
อ่านค่า อุณหภูมิ ความชื้น เพิ่ม library

Sketch > Include Library > Manage Libraries…



พิมพ์ SHT30 ในช่อง Search

Install ClosedCube SHT31D



File > Examples > ClosedCube SHT31D > periodicmode

periodicmode | Arduino 1.8.8

File Edit Sketch Tools Help

periodicmode §

```
void setup()
{
  Wire.begin();

  Serial.begin(115200);
  Serial.println("ClosedCube SHT3X-D Periodic Mode Example");
  Serial.println("supports SHT30-D, SHT31-D and SHT35-D");

  sht3xd.begin(0x45); // I2C address: 0x44 or 0x45

  Serial.print("Serial #");
  Serial.println(sht3xd.readSerialNumber());

  if (sht3xd.periodicStart(SHT3XD_REPEATABILITY_HIGH, SHT3XD_FREQUENCY_
    Serial.println("[ERROR] Cannot start periodic mode");

}

void loop()
{
  printResult("Periodic Mode", sht3xd.periodicFetchData());
  delay(250);
}
```

```
Periodic Mode: T=24.37C, RH=37.78%
Periodic Mode: T=24.38C, RH=37.75%
Periodic Mode: T=24.37C, RH=37.81%
Periodic Mode: T=24.40C, RH=37.78%
Periodic Mode: T=24.38C, RH=37.76%
Periodic Mode: T=24.38C, RH=37.76%
Periodic Mode: T=24.38C, RH=37.75%
Periodic Mode: T=24.37C, RH=37.72%
Periodic Mode: T=24.38C, RH=37.70%
Periodic Mode: T=24.37C, RH=37.70%
Periodic Mode: T=24.37C, RH=37.70%
Periodic Mode: T=24.36C, RH=37.65%
```

Autoscroll Show timestamp

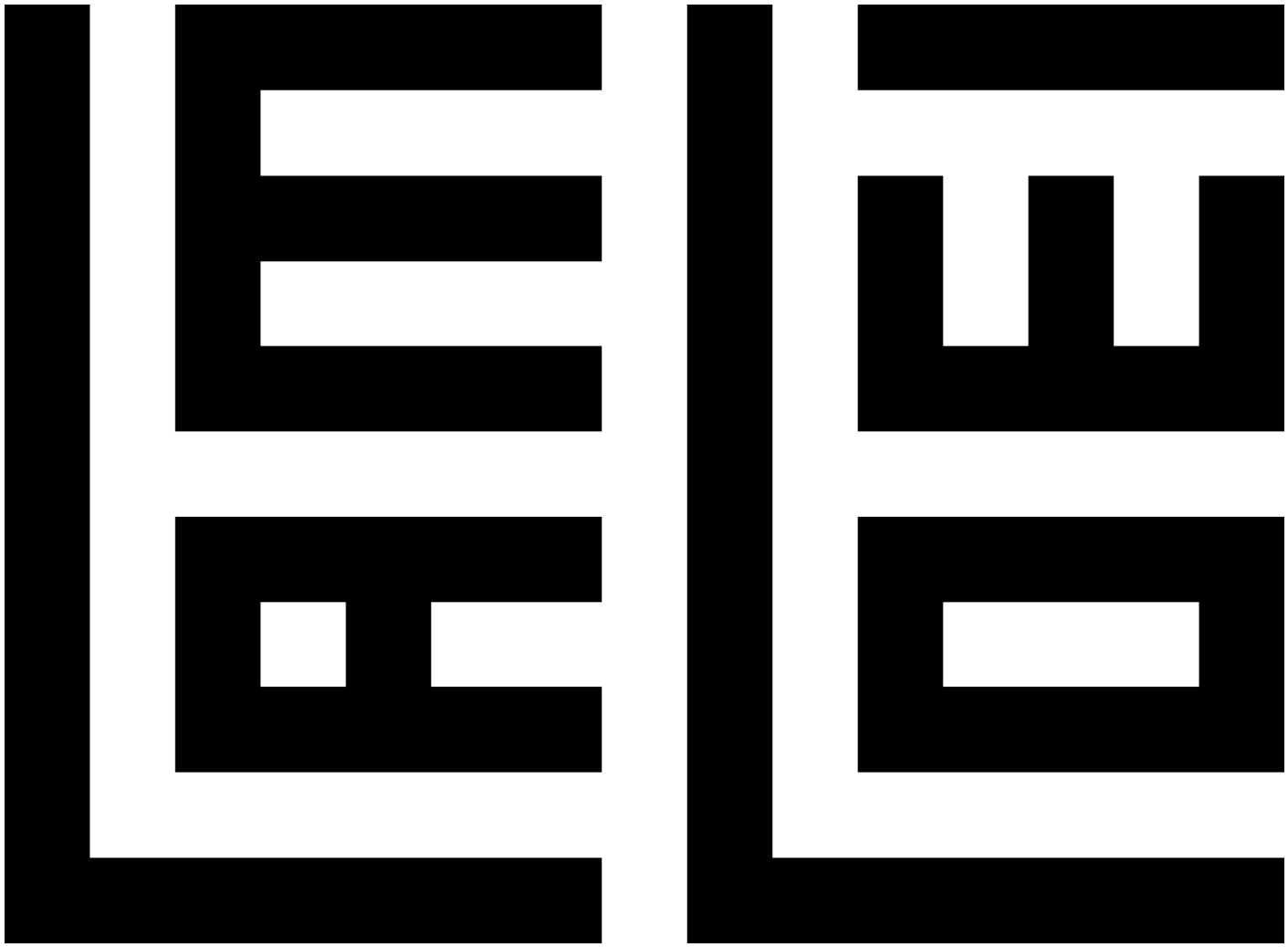
แบบฝึกหัดที่ 5

ให้เลือกตัวอย่าง File > Example แล้วอธิบาย

แบบฝึกหัดที่ 6

สร้างระบบด้วย

1. เซ็นเซอร์ (ค่ากายภาพ เป็นตัวเลข)
2. LED (Digital Output)
3. Tact Switch (Digital Input)
4. Volume (Analog Input)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