

2~3 주차 강의 내용

- Fritzing 다운로드 및 설치
- NodeMCU 프로그래밍 환경 설정
- Hello World! 출력하기
- 디지털 입출력 함수, 아날로그 입출력 함수
- LED 제어 기초
- Fritzing으로 회로도 그리기
- 연습문제
 1. 2 LED blink
 2. ADC(Analog Digital Converter) : A0 아날로그 핀
 3. PWM을 이용한 LED 밝기 제어
 4. 포토 레지스터(빛 센서)를 이용한 LED 밝기 제어

Fritzing 프로그램 설치 방법

<https://fritzing.org/>

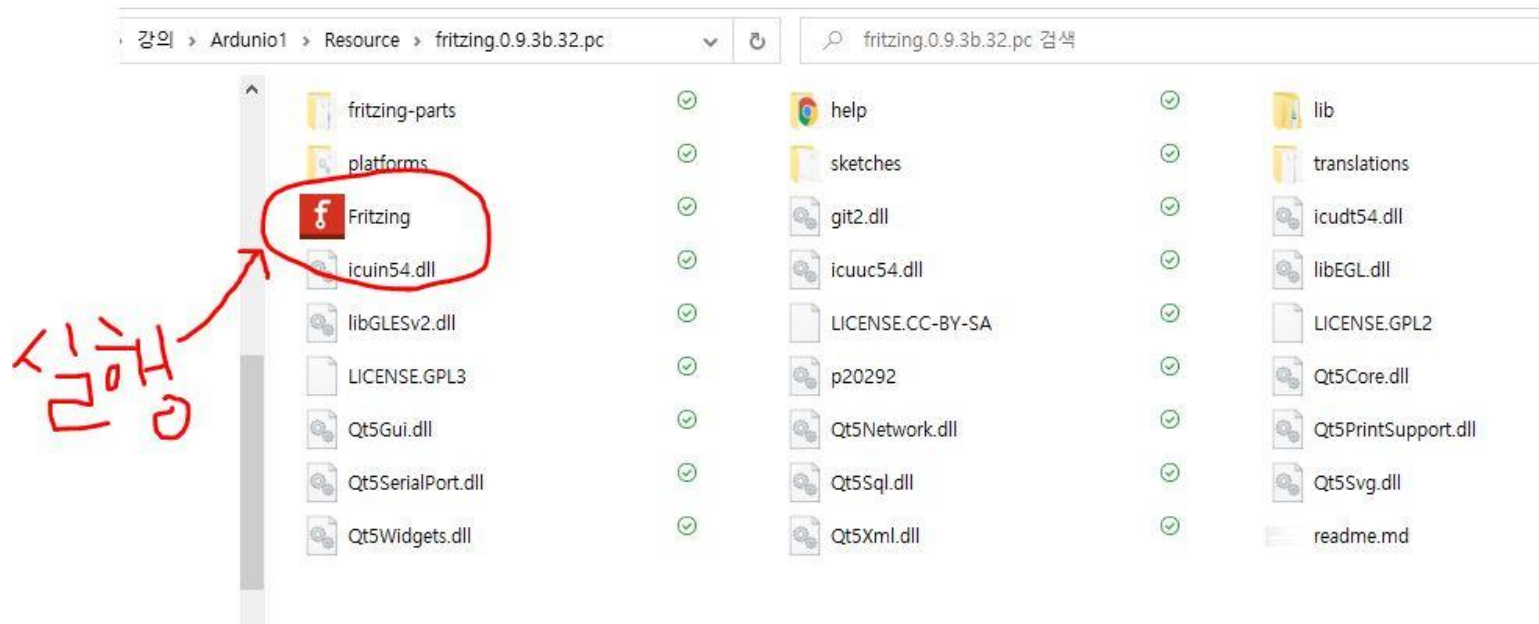
The logo for Fritzing, featuring the word "fritzing" in a white, lowercase, sans-serif font. The letters are slightly rounded and have a small dot above the 'i' and 'n'. The text is centered within a solid red rectangular background.

- 아래 주소로 압축화일(fritzing.0.9.3b.32.pc.zip)을 자신의 PC에 다운로드 한다.

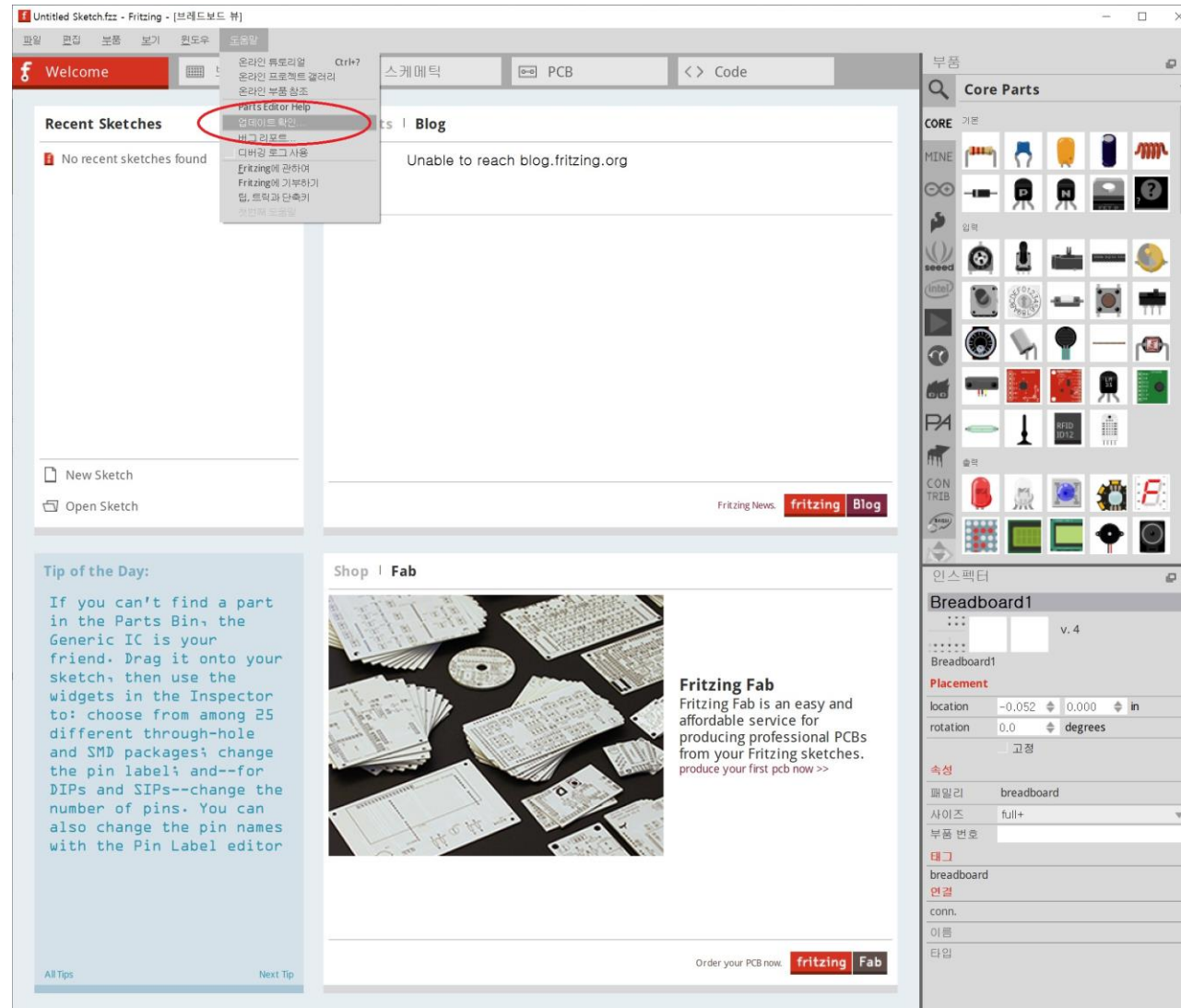
- 다운로드 주소 :

<https://drive.google.com/file/d/17LOUZwC9tMltZsXq3iPjxOAR5wLOBriG/view?usp=sharing>

- 압축화일을 풀고, 실행 화일(Firtzing)을 실행한다.

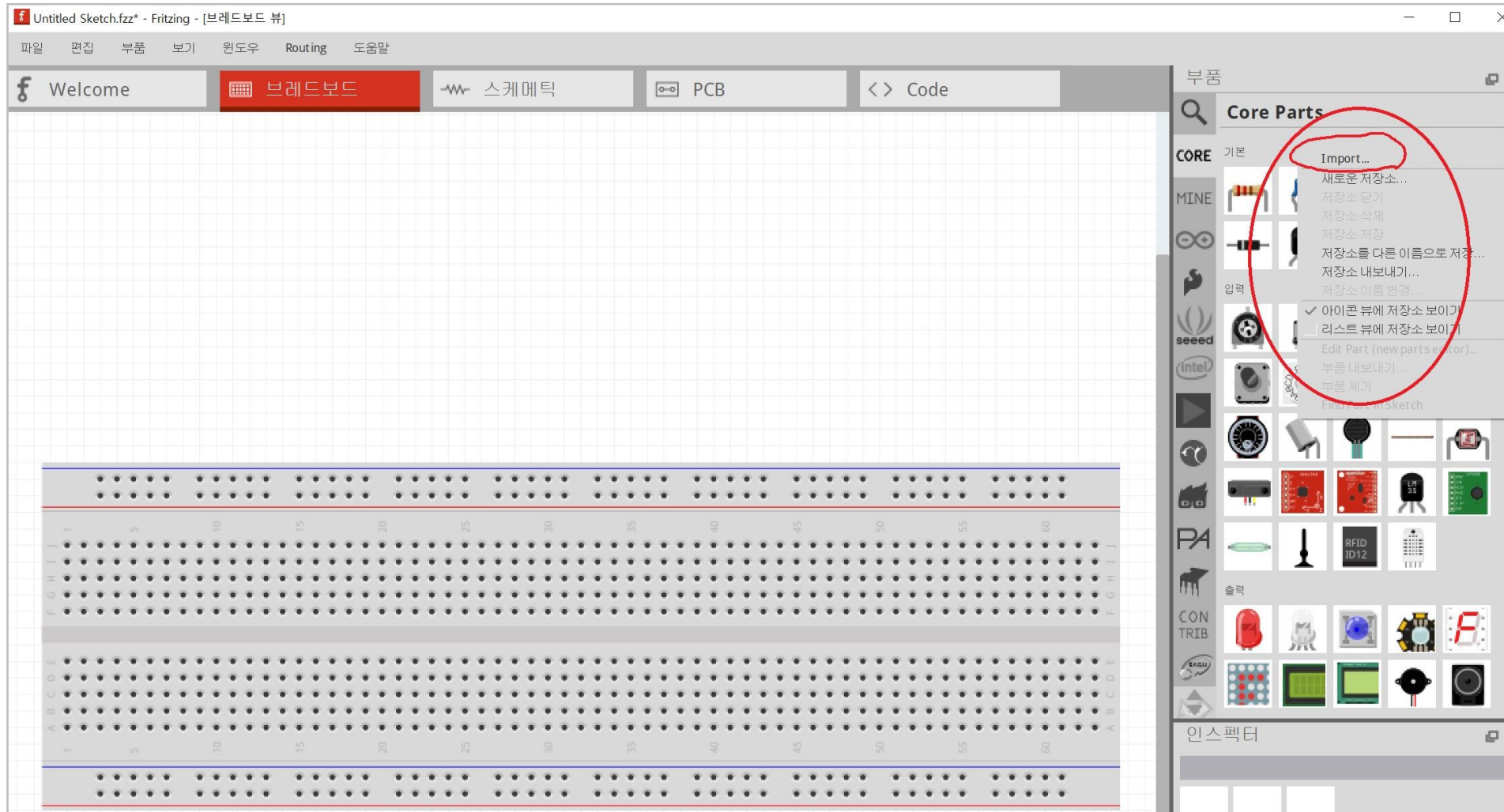


- 메인 메뉴의 상단 [도움말] -> [업데이트 확인]를 클릭하여, 최신 프로그램으로 업데이트 한다.



• NodeMCU Custom 부품 가져오기

- 오른쪽 메뉴 -> import 클릭



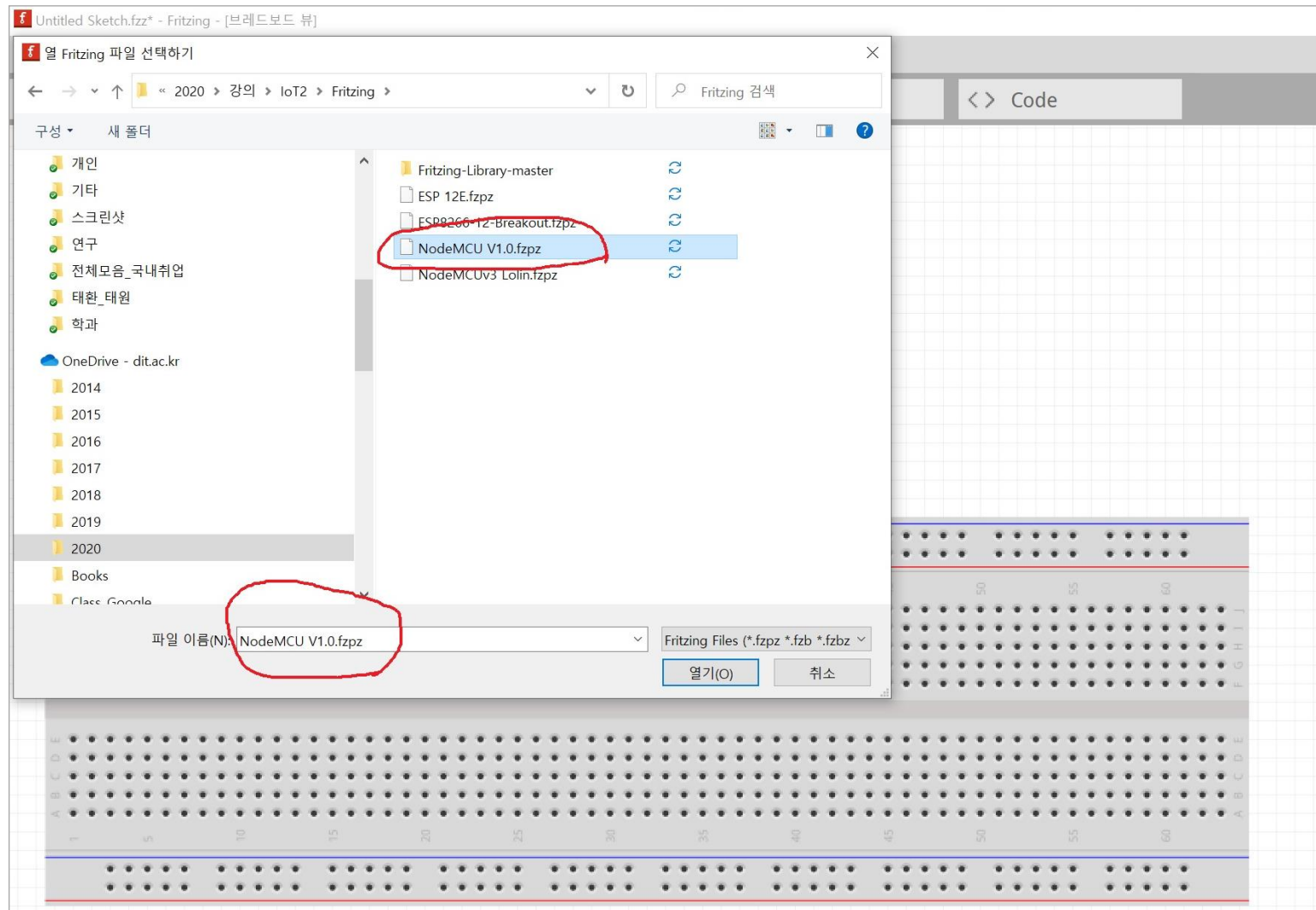
• NodeMCU Fritzing 부품 파일 다운로드

- 부품 다운로드 : <https://github.com/squix78/esp8266-fritzing-parts/tree/master/nodemcu-v1.0>

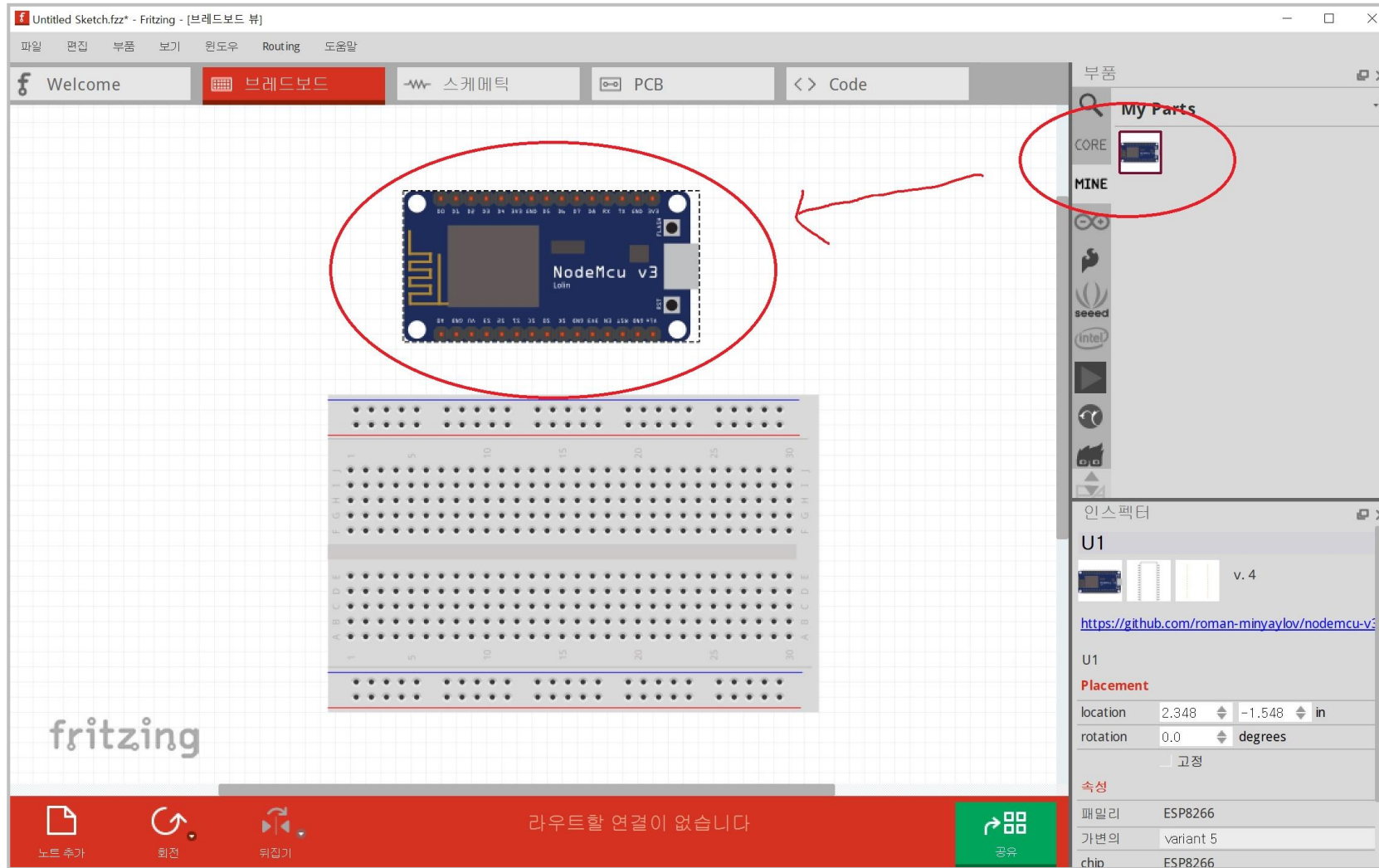


- NodeMCU Fritzing 부품 설치

- NodeMCU V1.0fpz 선택

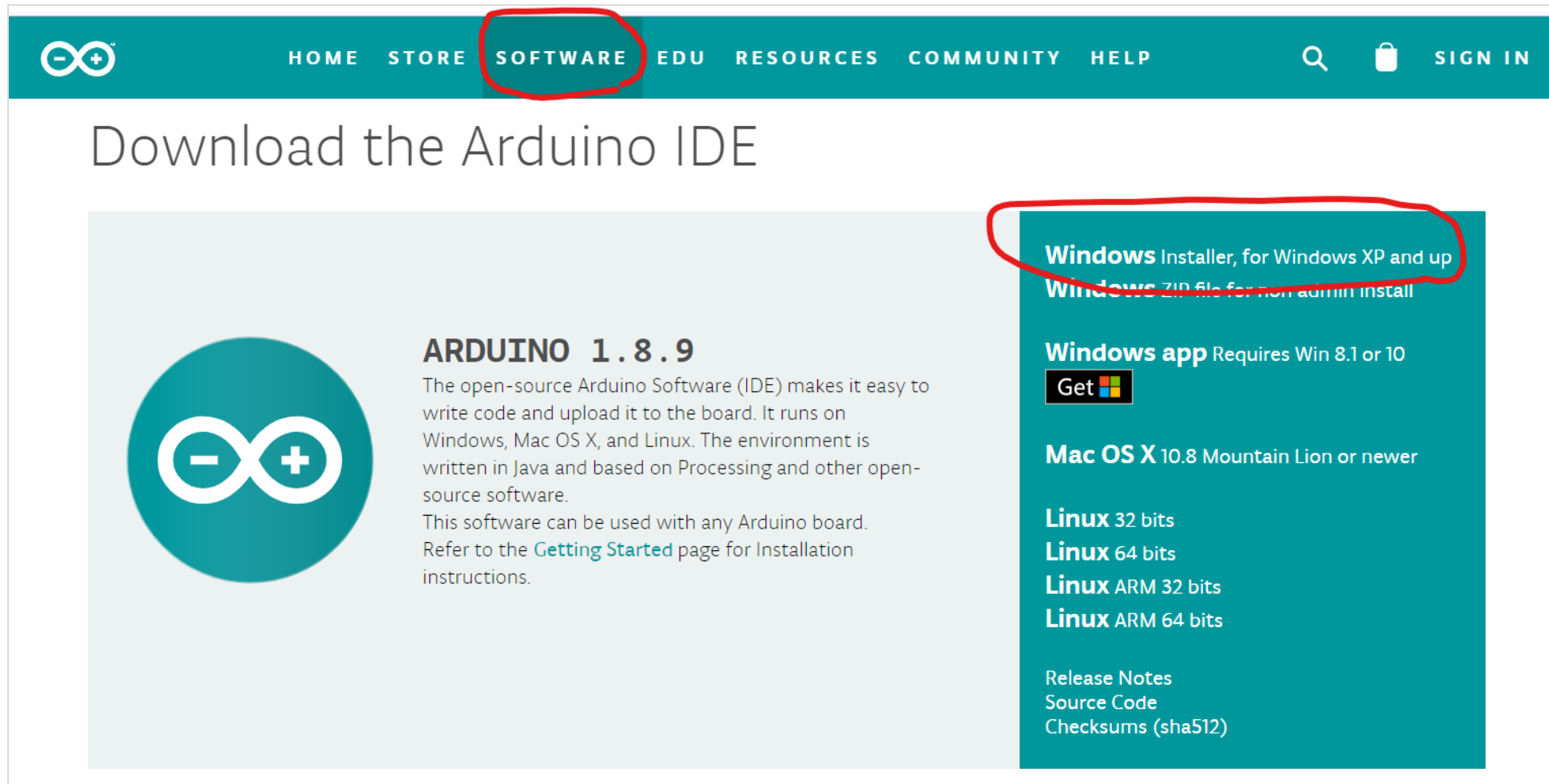


- NodeMCU Fritzing 부품 사용



NodeMCU 아두이노 프로그래밍 환경 설정

- <https://www.arduino.cc/>



The screenshot shows the Arduino website's 'Download the Arduino IDE' page. The navigation bar at the top has a teal background with white text for 'HOME', 'STORE', 'SOFTWARE', 'EDU', 'RESOURCES', 'COMMUNITY', and 'HELP'. The 'SOFTWARE' link is circled in red. Below the navigation bar, the heading 'Download the Arduino IDE' is displayed. On the left, there is a large teal circle containing the white Arduino infinity logo. To its right, the text 'ARDUINO 1.8.9' is shown in bold, followed by a paragraph describing the IDE as open-source software written in Java, compatible with Windows, Mac OS X, and Linux. Below this, it states the software can be used with any Arduino board and refers to the 'Getting Started' page for installation instructions. On the right side of the page, a teal sidebar lists various download options. The first option, 'Windows Installer, for Windows XP and up', is circled in red. Below it are links for 'Windows ZIP file for non-admin install', 'Windows app' (with a 'Get' button), 'Mac OS X 10.8 Mountain Lion or newer', and several Linux options (32 bits, 64 bits, ARM 32 bits, ARM 64 bits). At the bottom of the sidebar are links for 'Release Notes', 'Source Code', and 'Checksums (sha512)'.

HOME STORE **SOFTWARE** EDU RESOURCES COMMUNITY HELP

Download the Arduino IDE

ARDUINO 1.8.9

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.

This software can be used with any Arduino board. Refer to the [Getting Started](#) page for Installation instructions.

Windows Installer, for Windows XP and up
Windows ZIP file for non-admin install

Windows app Requires Win 8.1 or 10
[Get](#)

Mac OS X 10.8 Mountain Lion or newer

Linux 32 bits
Linux 64 bits
Linux ARM 32 bits
Linux ARM 64 bits

[Release Notes](#)
[Source Code](#)
[Checksums \(sha512\)](#)

NodeMCU 드라이브 다운로드 및 설치


- NodeMCU USB to UART Bridge 칩
 - CP210 용 : 우리가 사용하는 칩
 - CH340 용
- CP201x 드라이브 다운로드
 - <https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers#windows>
 - 압축화일(zip)을 풀고, PC 메모리가 4GB 이상이면 x64 선택, 이하이면 x86을 선택하여 실행
- CH340 칩 용 NodeMCU의 경우도 관련 드라이브를 다운 받아 설치 한다.
 - http://www.wch.cn/download/CH341SER_ZIP.html

NodeMCU CP102 드라이버 다운로드 및 설치

Download for Windows 10 Universal (v10.1.3)

Platform	Software	Release Notes
 Windows 10 Universal	Download VCP (2.3 MB)	Download VCP Revision History

Download for Windows 7/8/8.1 (v6.7.6)

Platform	Software	Release Notes
 Windows 7/8/8.1	Download VCP (5.3 MB) (Default)	Download VCP Revision History
 Windows 7/8/8.1	Download VCP with Serial Enumeration (5.3 MB) Learn More »	Download VCP Revision History

Download for Windows XP/Server 2003/Vista/7/8/8.1 (v6.7)

Platform	Software	Release Notes
 Windows XP/Server 2003/Vista/7/8/8.1	Download VCP (3.66 MB)	Download VCP Revision History

Download for Windows 2K (v6.3a)

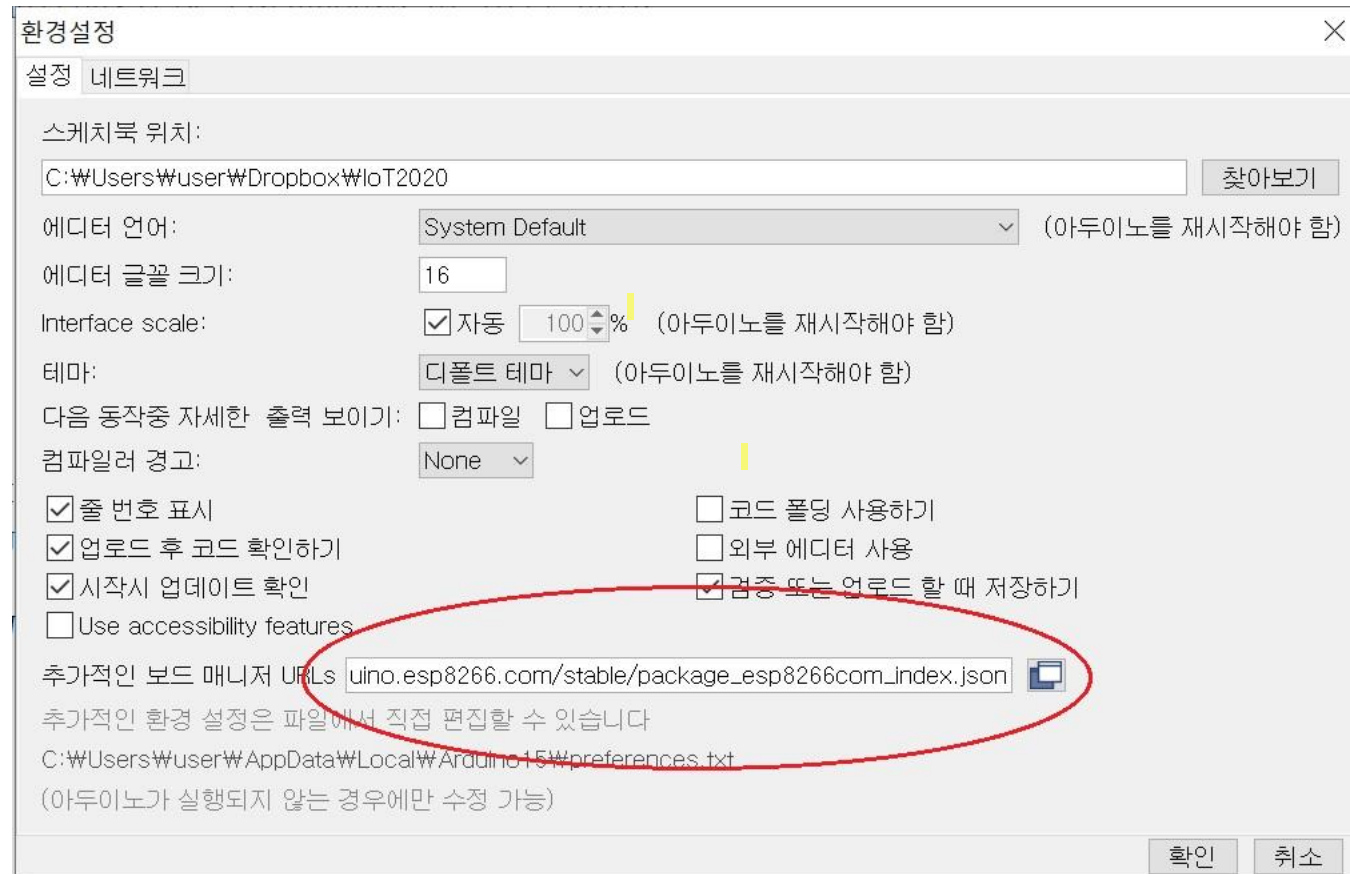
Important information regarding the Silicon Labs website: this site uses cookies to improve user experience and stores information on your computer. By continuing to use our site, you consent to our [Cookie Policy](#). If you do not want to enable cookies, review our policy and learn how they can be disabled. Note that disabling cookies will disable some features of the site.

Accept

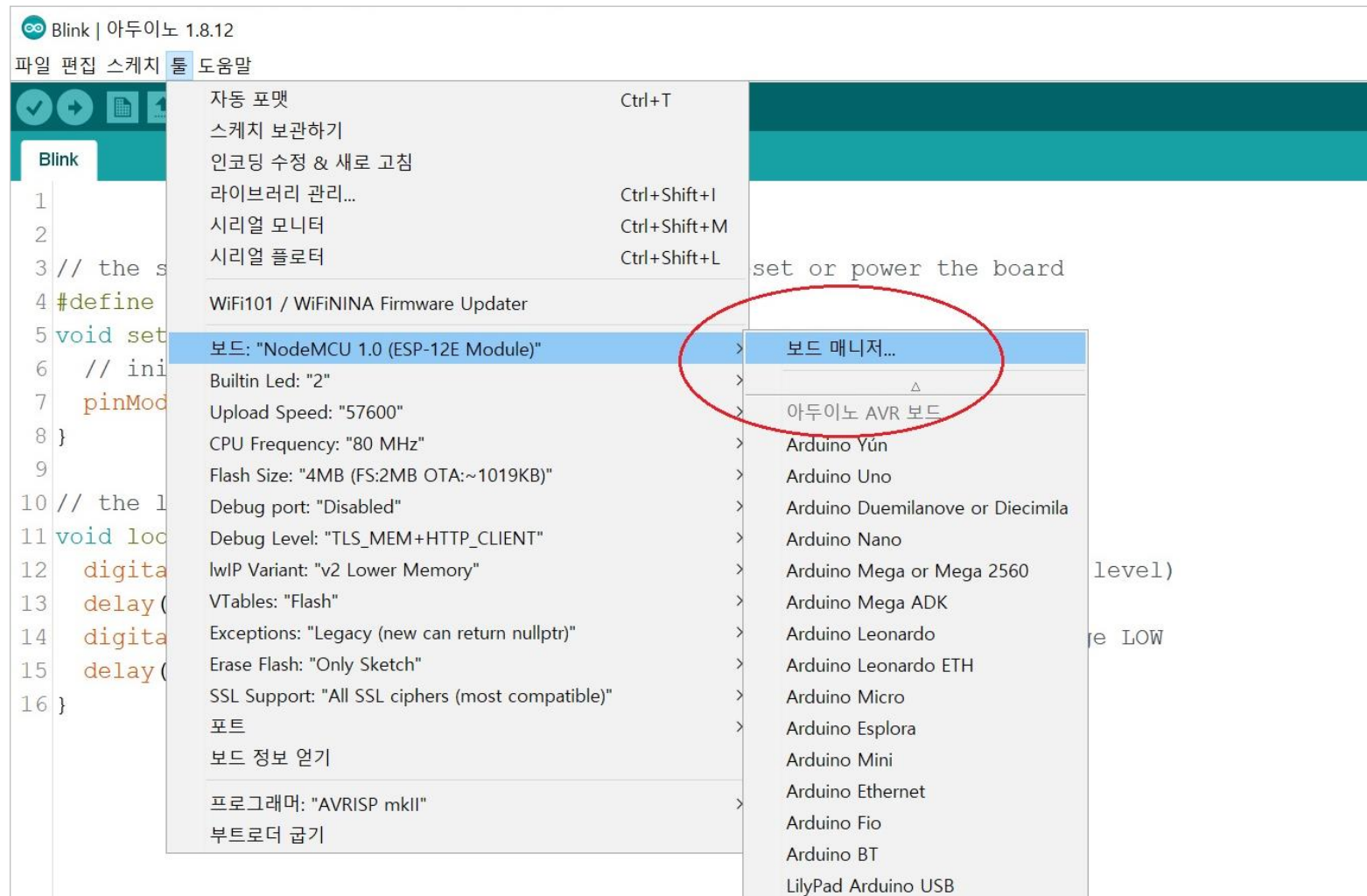
보드 관리자 URLs 설정

- 환경설정 -> 추가적인 보드 매니저 URLs에 추가

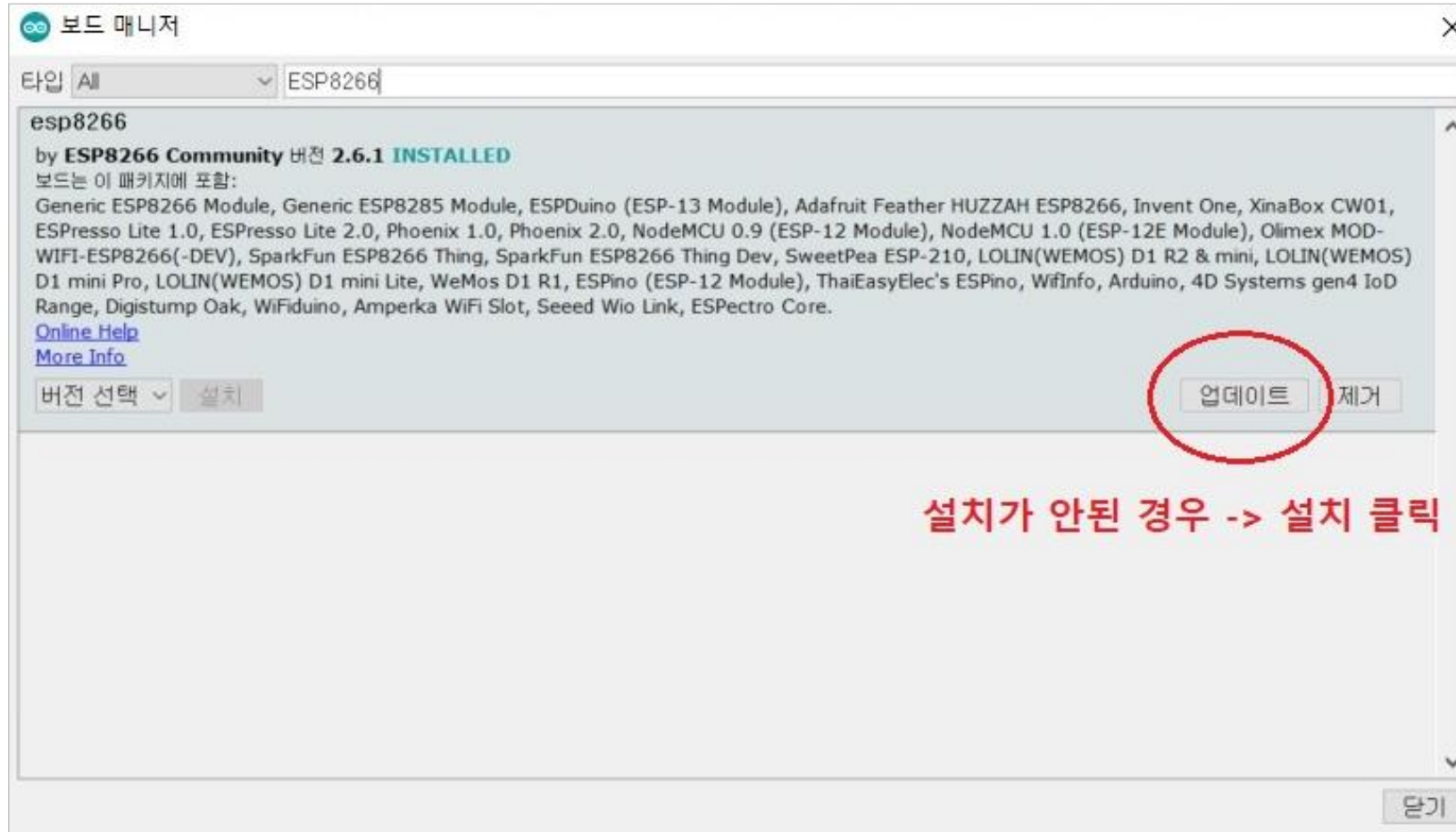
"http://arduino.esp8266.com/stable/package_esp8266com_index.json"



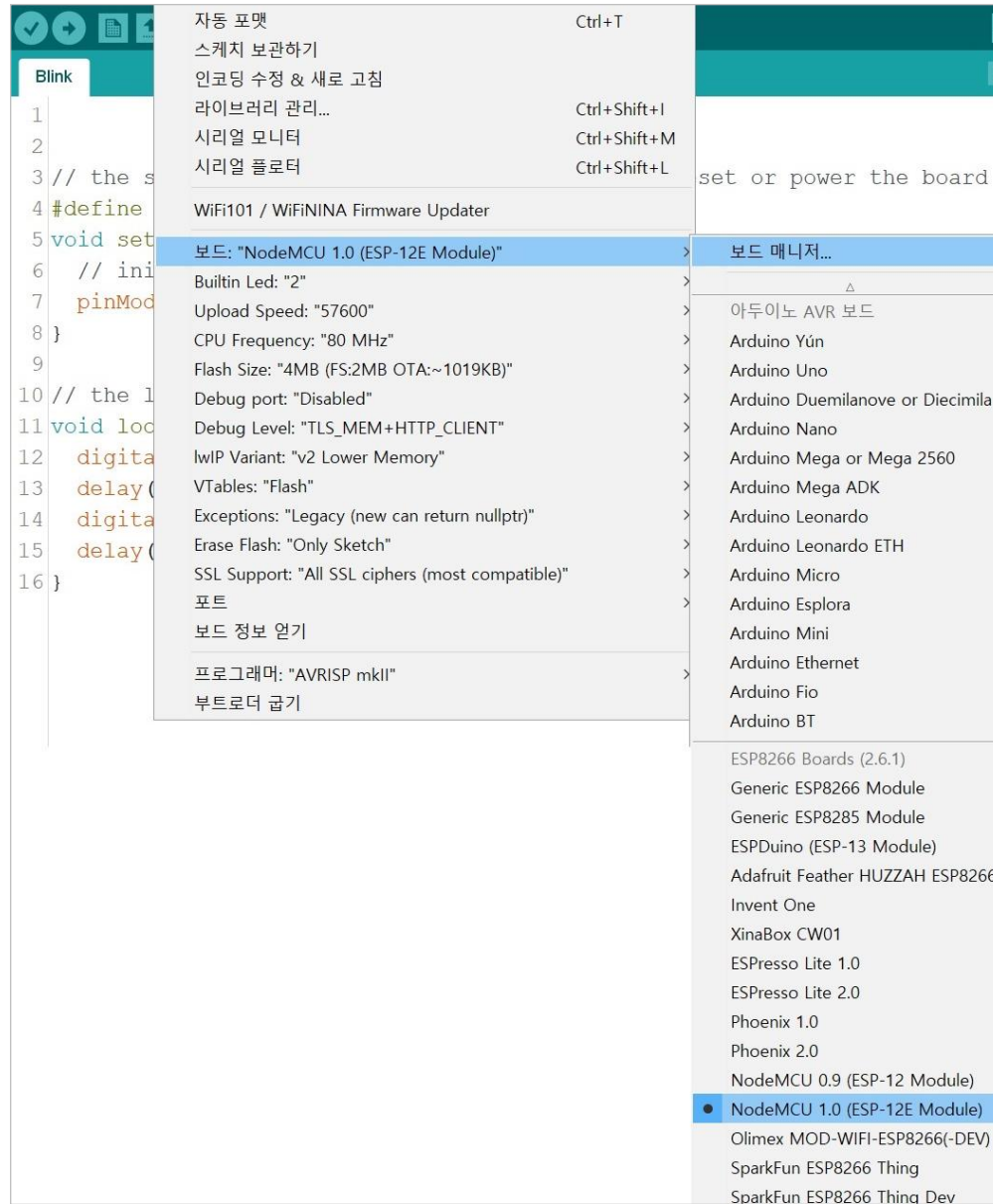
보드 관리자 설정 : ESP8266 검색



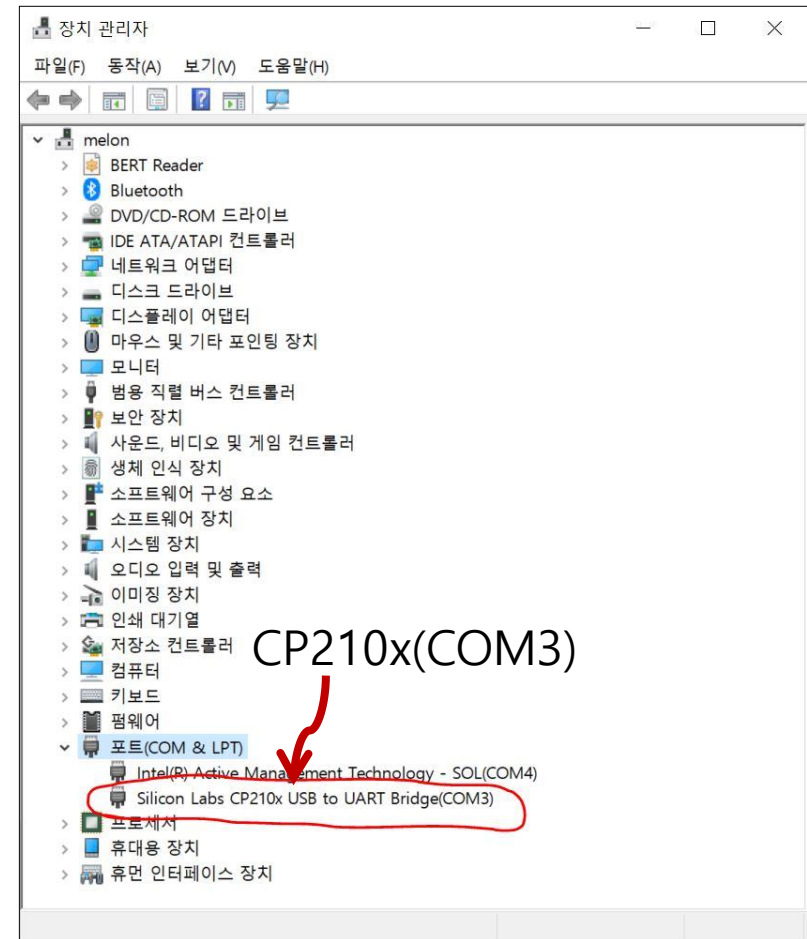
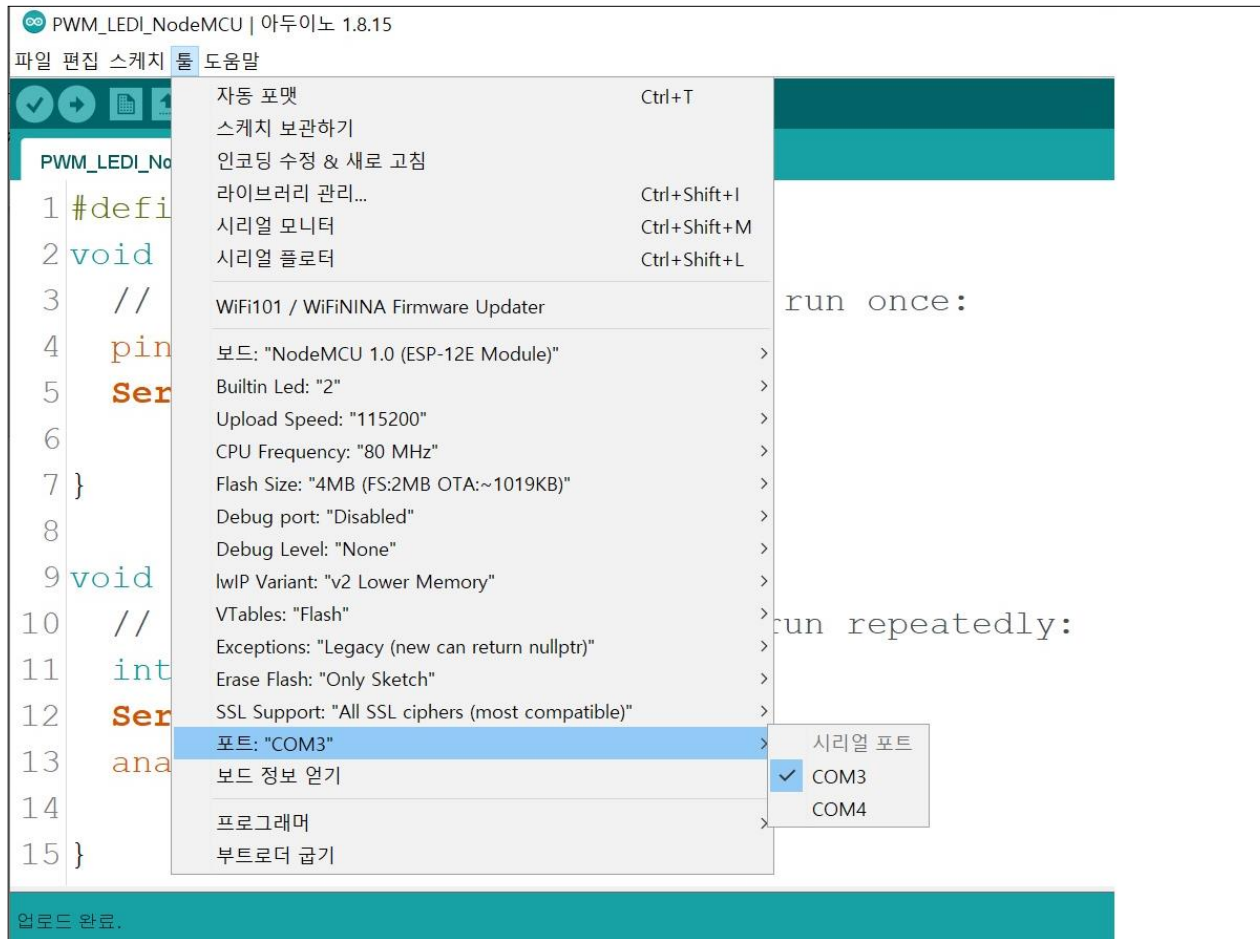
보드 관리자 설정 : ESP8266 검색



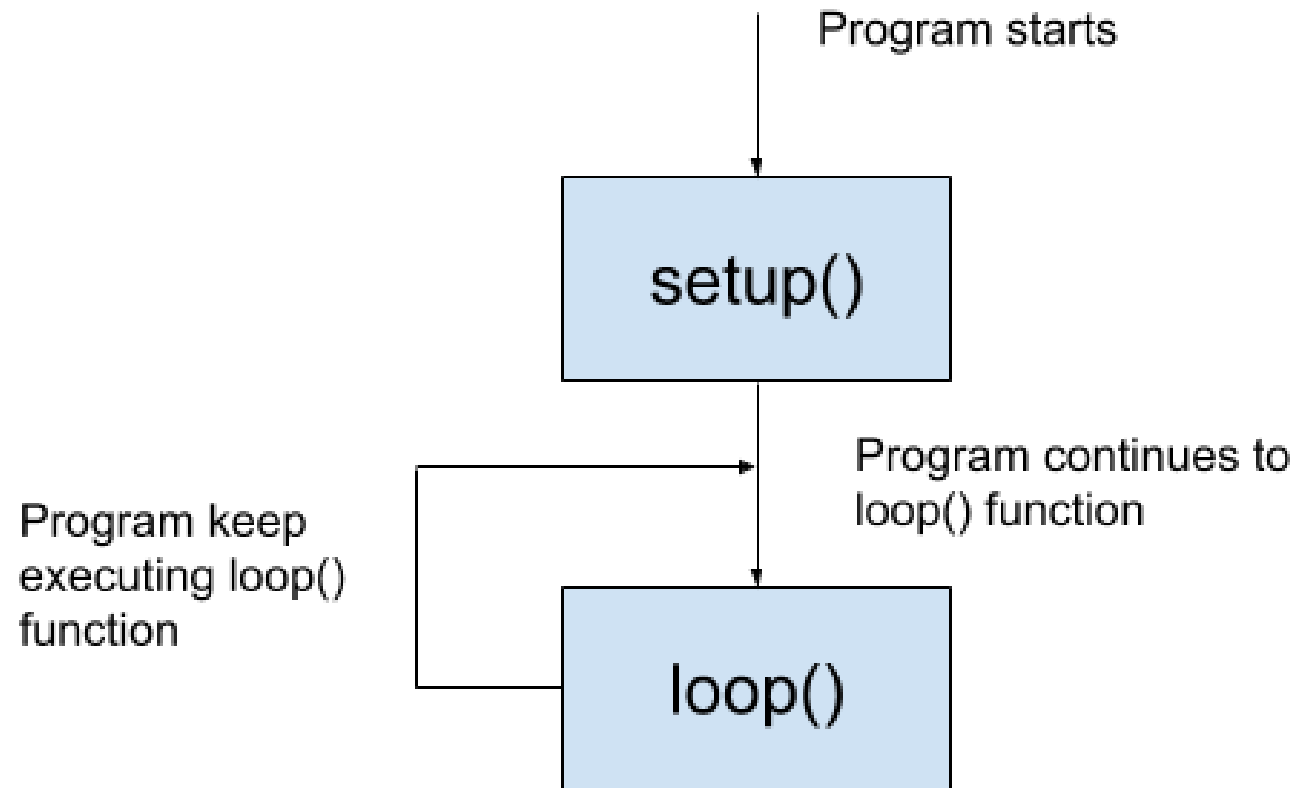
보드 관리자 설정 : NodeMCU 1.0(ESP-12E 모듈) 선택



시리얼 포트, USB to UART 설정

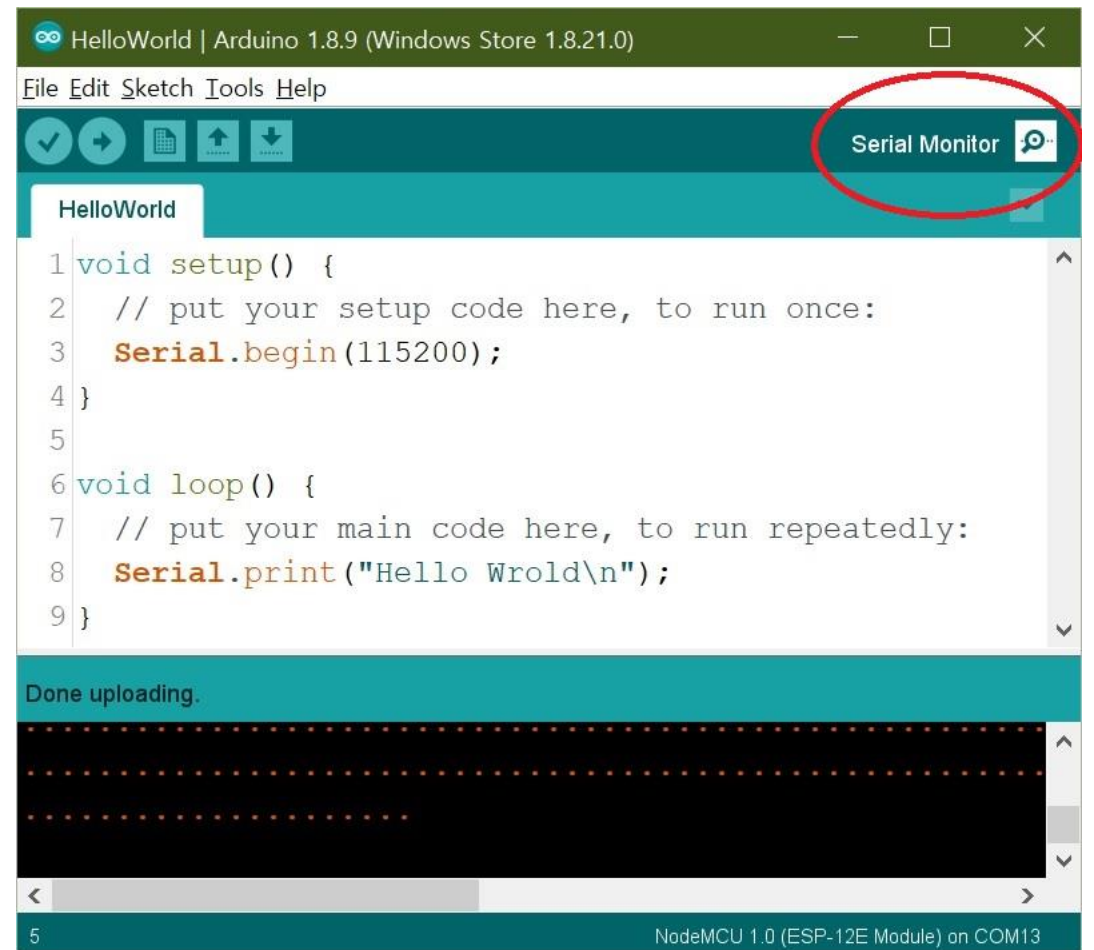


아두이노 프로그래밍 구조



Hello World!

```
void setup() {  
    // put your setup code here, to run  
    once:  
    Serial.begin(115200);  
}  
  
void loop() {  
    // put your main code here, to run  
    repeatedly:  
    Serial.print("Hello World\n");  
}
```



디지털 입출력 함수

- **pinMode(pin, mode)**

- 지정된 핀 번호(**pin**)를 입력 혹은 출력(**mode**)으로 구성
- **pin** : GPIO 핀 번호
- **mode** : INPUT, OUTPUT, INPUT_PULLUP, INPUT_PULLDOWN

- **digitalWrite(pin, value)**

- 지정된 디지털 핀에 **HIGH**(5V or 3.3V) 혹은 **LOW**(0V or ground) 값 쓰기

- **delay(ms)**

- 프로그램의 지연 시간(milliseconds) 지정

- 아두이노 함수 참고 : <https://www.arduino.cc/reference/en/>

아날로그 입출력 함수

- **pinMode(pin, mode)**

- 지정된 핀 번호(**pin**)를 입력 혹은 출력(**mode**)으로 구성 output.

- **analogRead(pin)**

- 아날로그 핀으로 **아날로그 값(0~1023)** 읽기
- 10 bit ADC : $2^{10} = 1024$

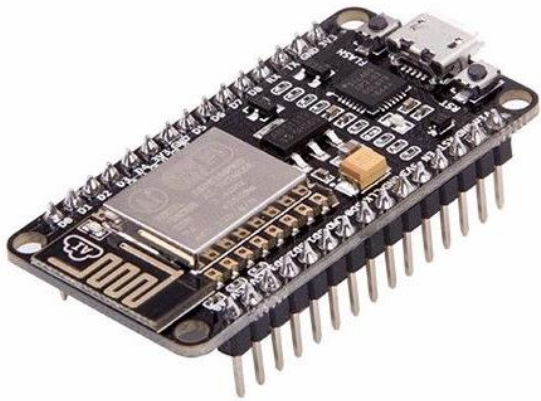
- **analogWrite(pin, value)**

- NodeMCU의 아날로그 핀은 **A0**로 한 개 있음

- 아두이노 함수 참고 : <https://www.arduino.cc/reference/en/>

NodeMCU LED 제어 기초

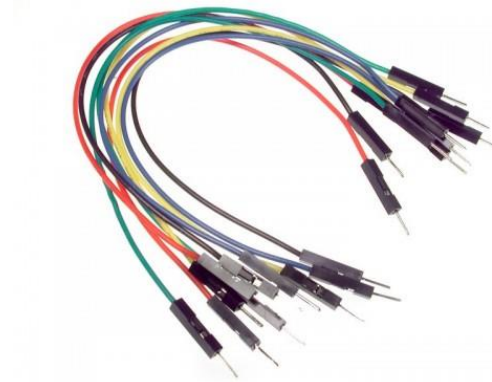
- 준비물



NodeMCU



Micro USB 5 pin 케이블



점프 케이블



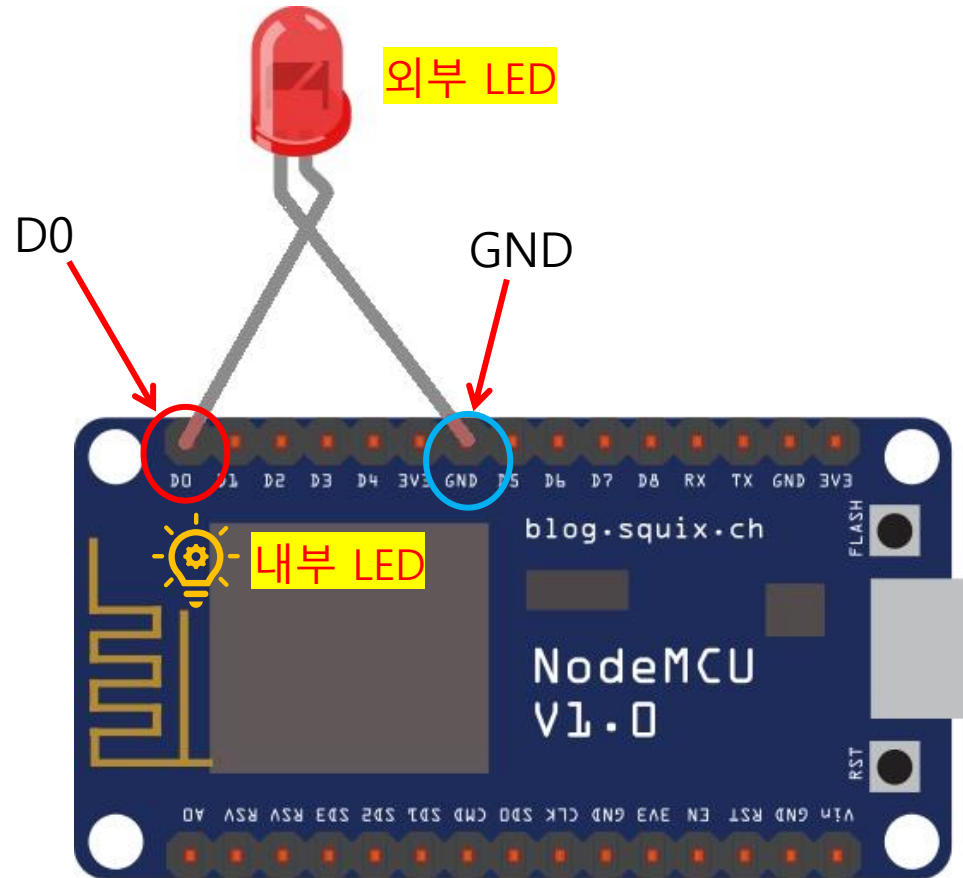
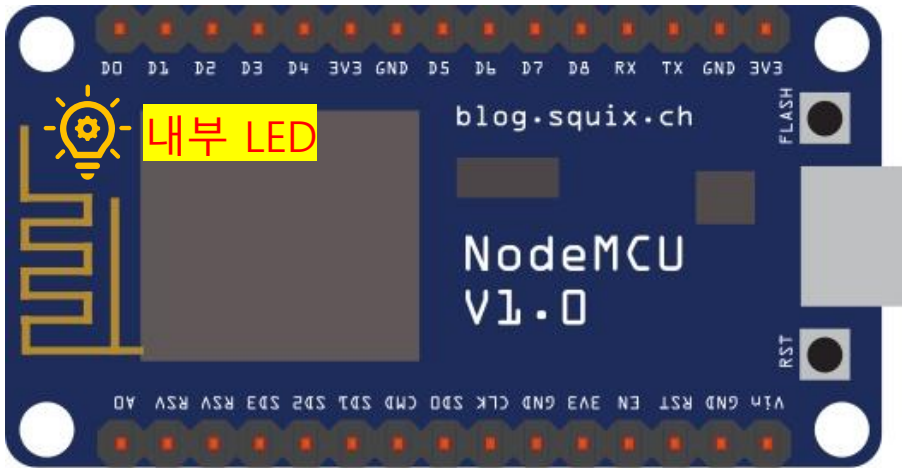
LED



저항(220 Ω)

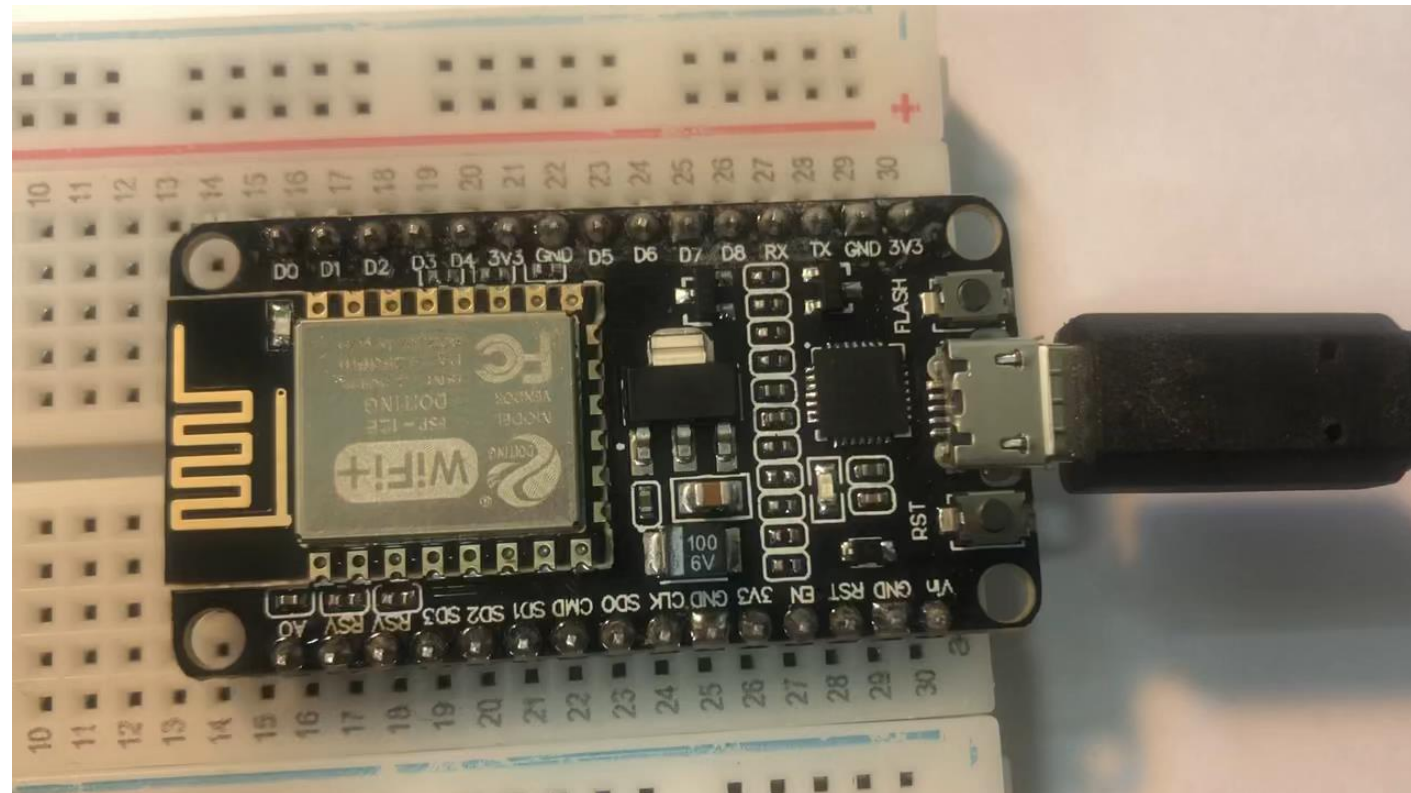
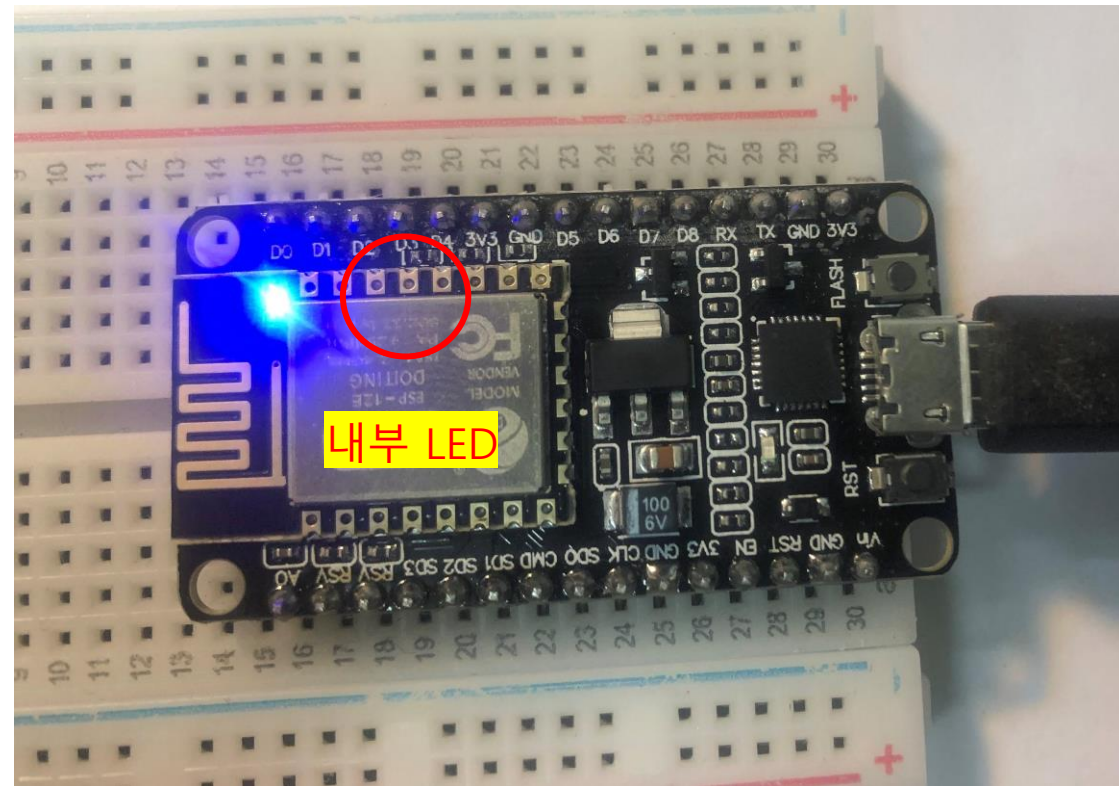
회로도 그리기 : Fritzing

- 내부 LED(LED_BUILTIN)
- D0

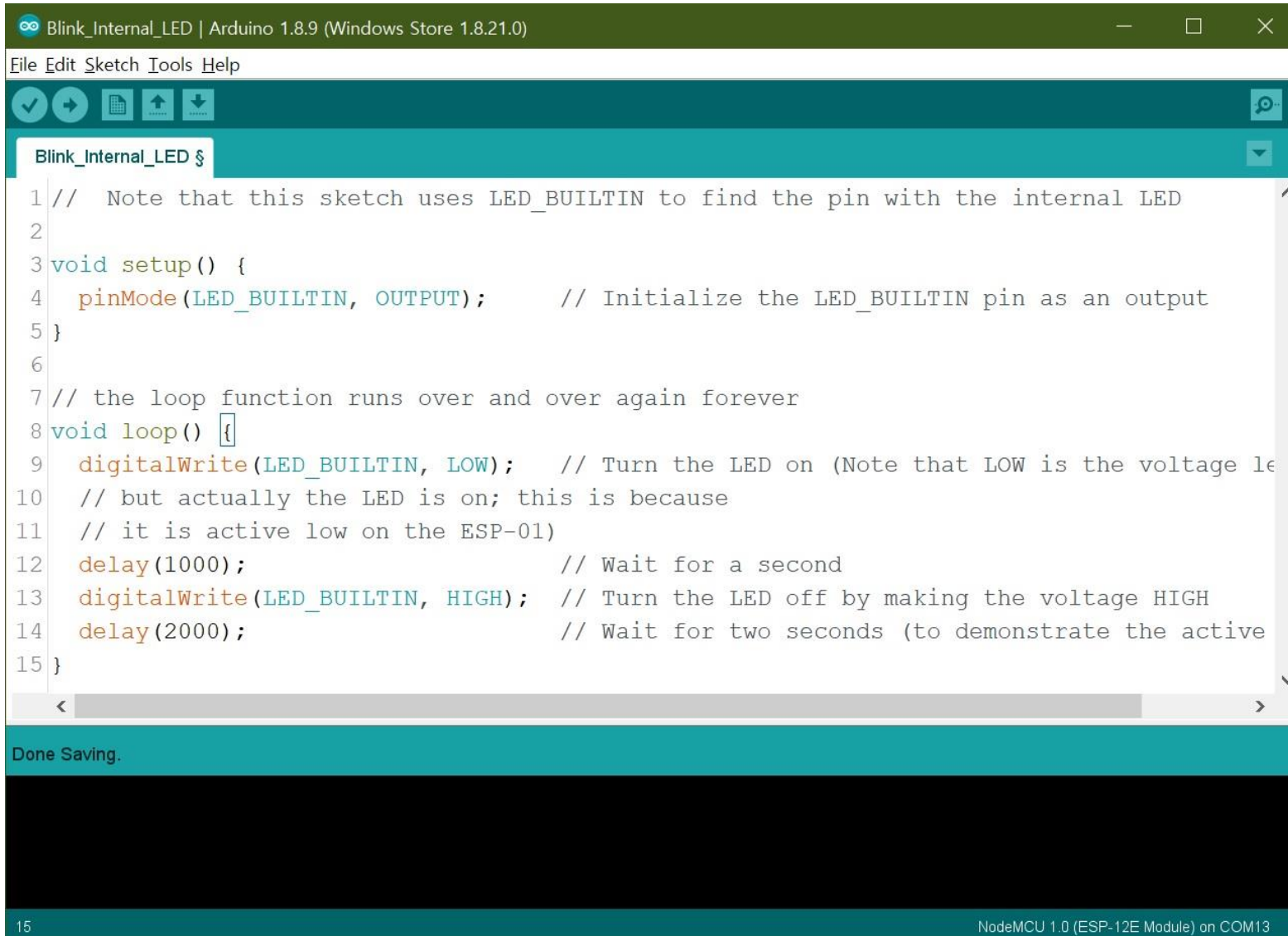


내부 LED 작동 확인 : LED_BUILTIN 상수

- LED_BUILTIN 보조 상수(Pin이 아님)



내부 LED ON/OFF : LED_BUILTIN



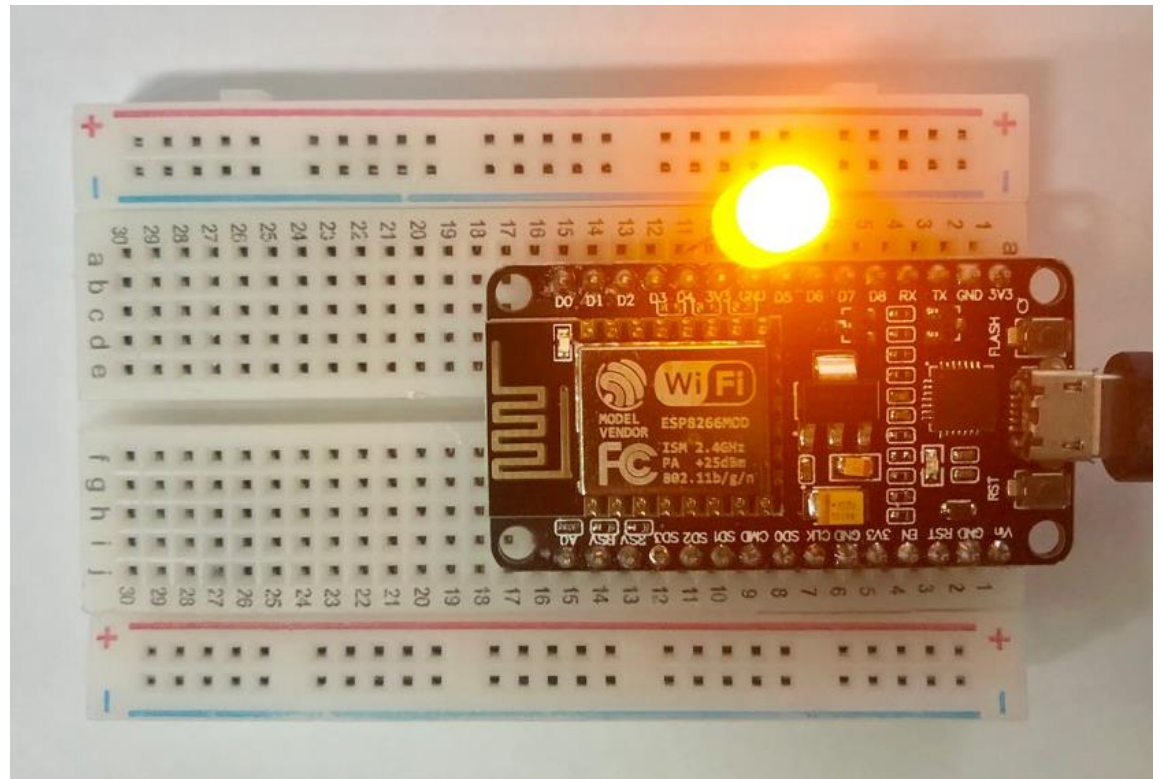
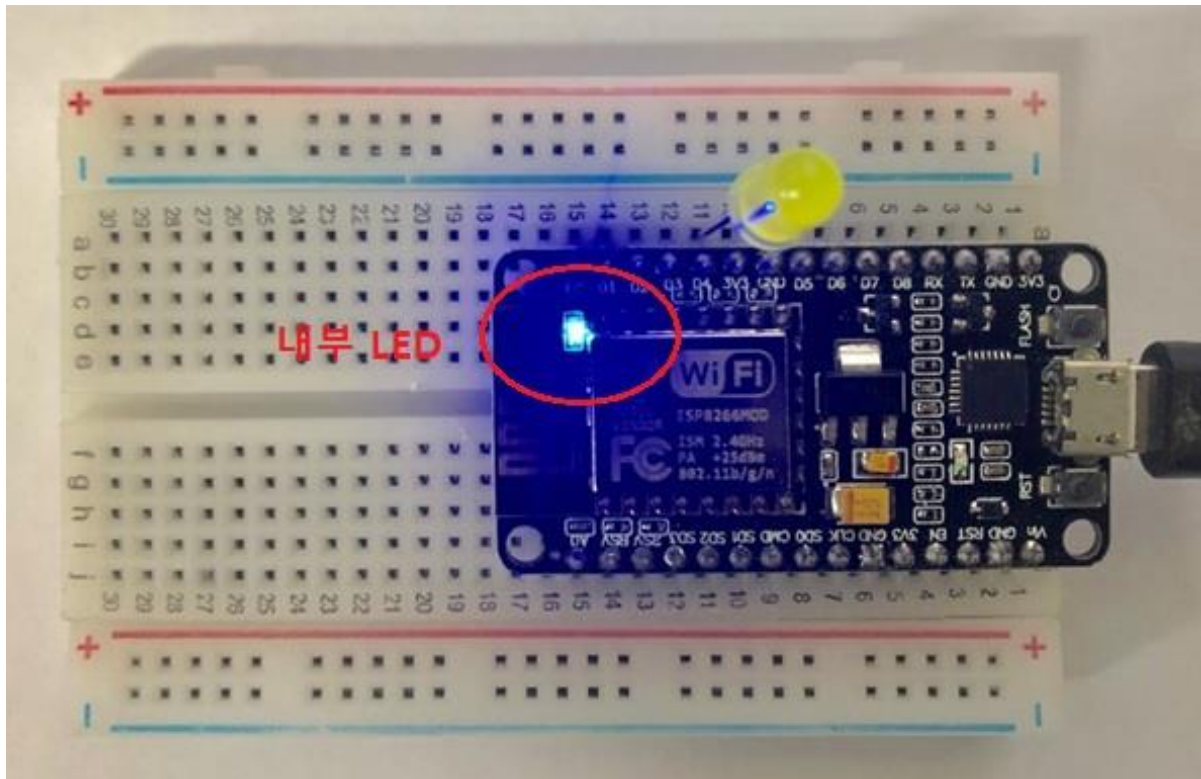
The screenshot shows the Arduino IDE interface. The title bar reads "Blink_Internal_LED | Arduino 1.8.9 (Windows Store 1.8.21.0)". The menu bar includes "File", "Edit", "Sketch", "Tools", and "Help". Below the menu bar is a toolbar with icons for saving, running, and uploading. The main text area shows the following code:

```
Blink_Internal_LED $
1 // Note that this sketch uses LED_BUILTIN to find the pin with the internal LED
2
3 void setup() {
4   pinMode(LED_BUILTIN, OUTPUT);    // Initialize the LED_BUILTIN pin as an output
5 }
6
7 // the loop function runs over and over again forever
8 void loop() {
9   digitalWrite(LED_BUILTIN, LOW);  // Turn the LED on (Note that LOW is the voltage level
10  // but actually the LED is on; this is because
11  // it is active low on the ESP-01)
12   delay(1000);                     // Wait for a second
13   digitalWrite(LED_BUILTIN, HIGH); // Turn the LED off by making the voltage HIGH
14   delay(2000);                     // Wait for two seconds (to demonstrate the active
15 }
```

Below the code editor, a status bar shows "Done Saving." and "NodeMCU 1.0 (ESP-12E Module) on COM13". The page number "15" is visible in the bottom left corner.

내부 LED 작동 확인 : D0(GPIO4) 핀

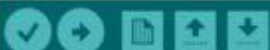
- 현재 저항(220 Ω)이 없기 때문에 오래 켜두면 과부하로 LED가 뜨거워짐(주의!!!)



내부 LED ON/OFF : D0

Blink_D0 | 아두이노 1.8.15

파일 편집 스케치 툴 도움말

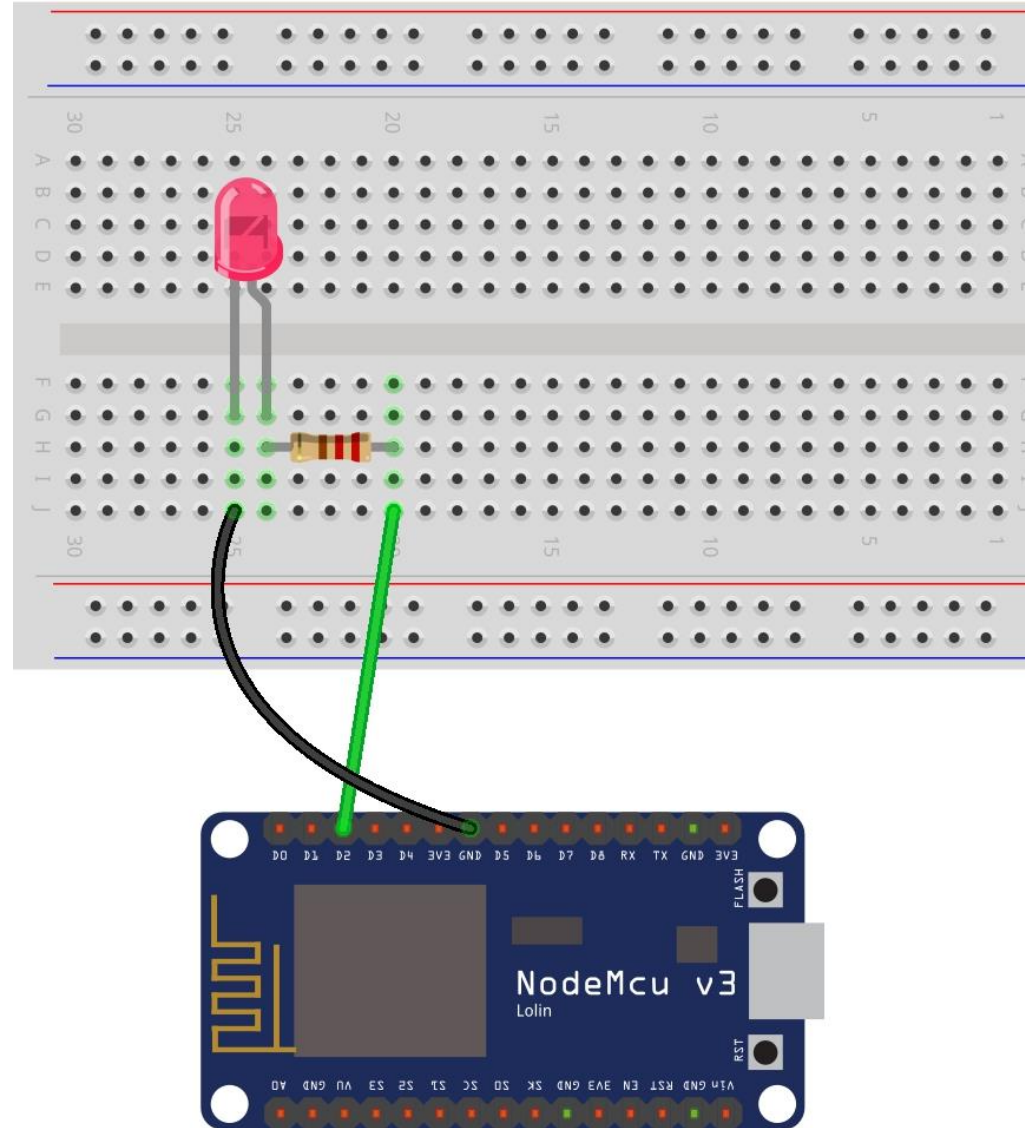


Blink_D0

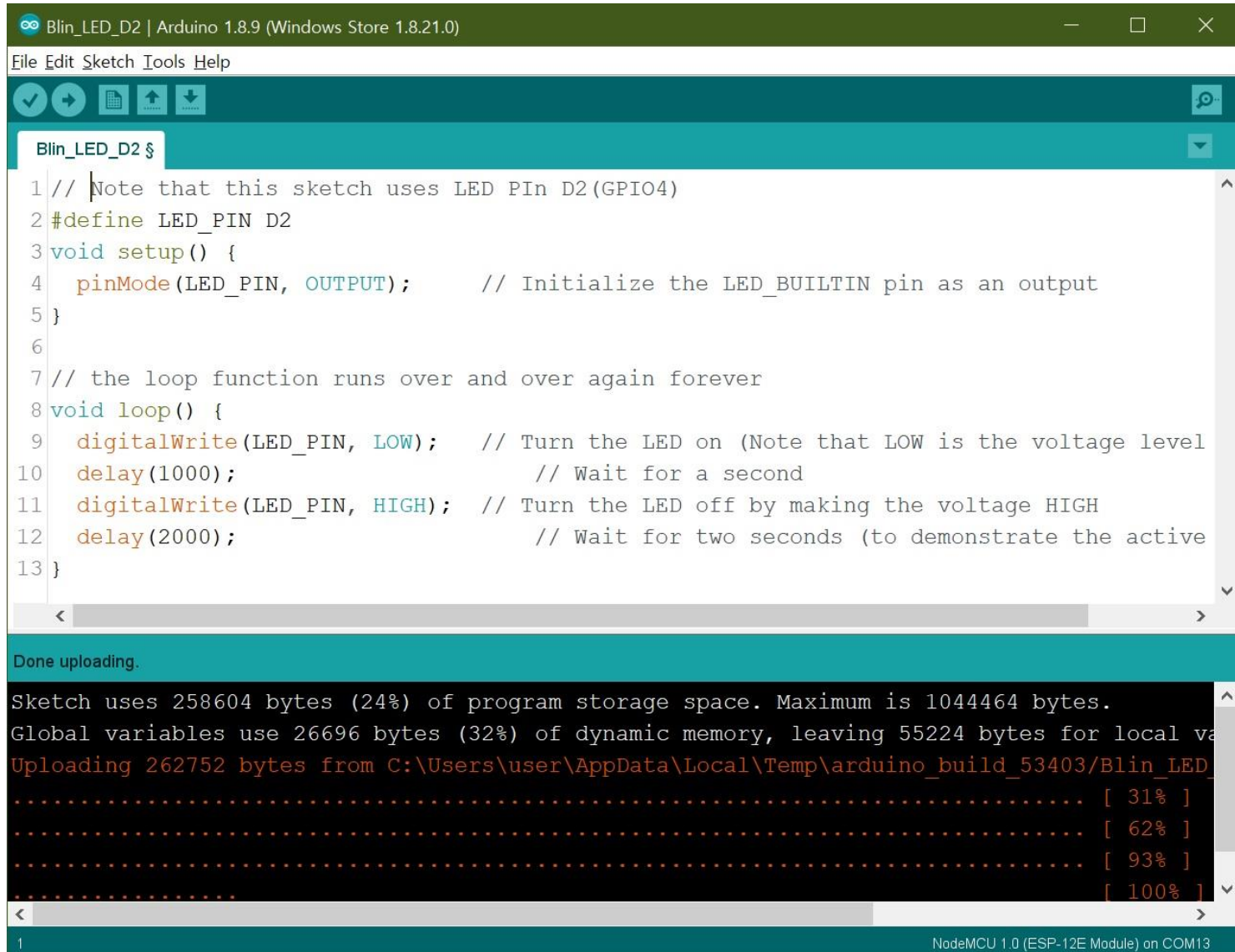
```
1 #define LED_PIN D0
2
3 void setup() {
4   pinMode(LED_PIN, OUTPUT);    // Initialize the LED_BUILTIN pin as an output
5 }
6
7 // the loop function runs over and over again forever
8 void loop() {
9   digitalWrite(LED_PIN, LOW);  // Turn the LED on (Note that LOW is the voltage level
10  delay(1000);                  // Wait for a second
11  digitalWrite(LED_PIN, HIGH);  // Turn the LED off by making the voltage HIGH
12  delay(2000);                  // Wait for two seconds (to demonstrate the ac
13 }
```

컴파일 완료.

LED 제어 : D2(GPIO4) 핀



스케치 : D2(GPIO4) 핀



```
Blin_LED_D2 | Arduino 1.8.9 (Windows Store 1.8.21.0)
File Edit Sketch Tools Help

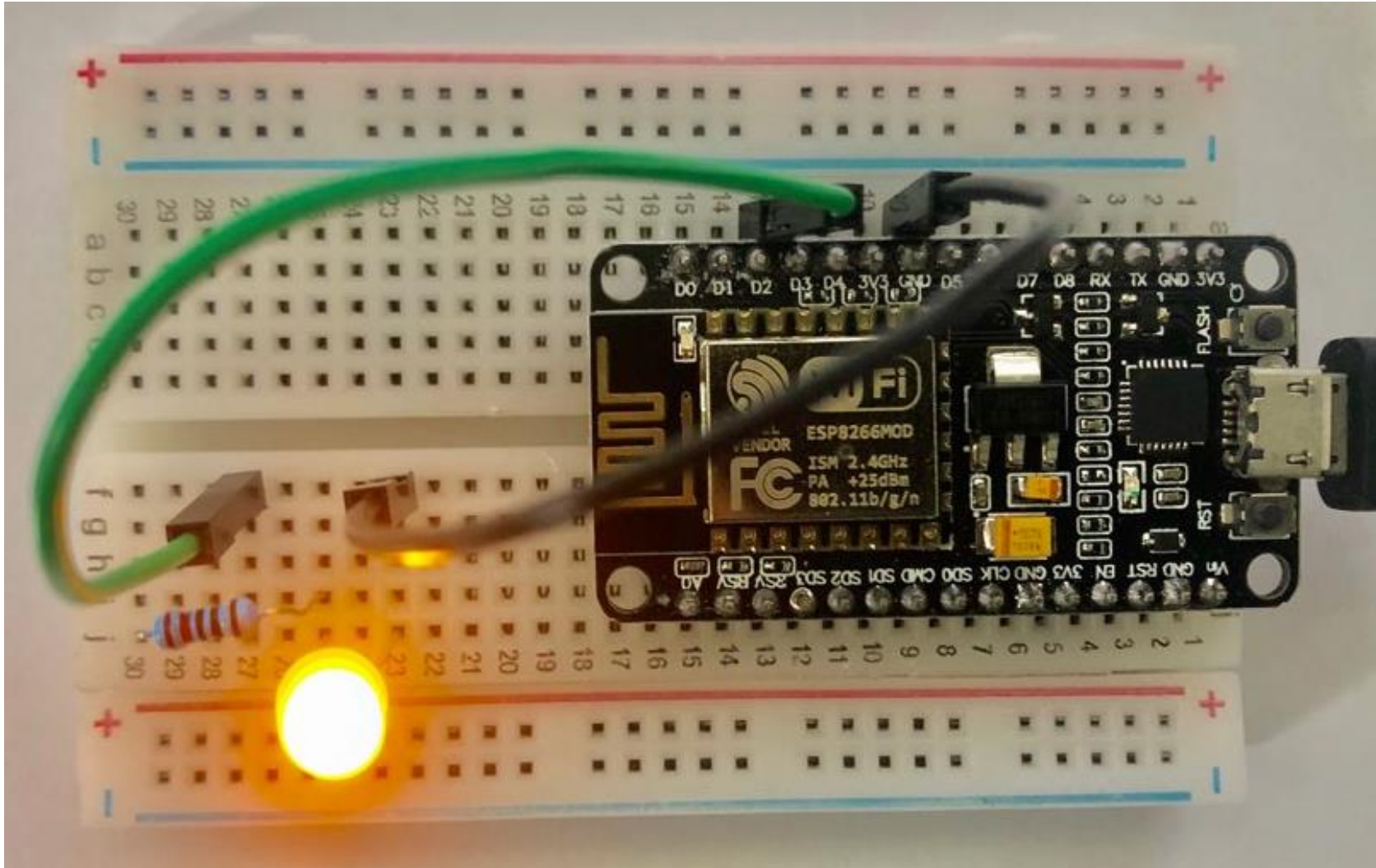
Blin_LED_D2 $
1 // Note that this sketch uses LED PIN D2 (GPIO4)
2 #define LED_PIN D2
3 void setup() {
4   pinMode(LED_PIN, OUTPUT);    // Initialize the LED_BUILTIN pin as an output
5 }
6
7 // the loop function runs over and over again forever
8 void loop() {
9   digitalWrite(LED_PIN, LOW);  // Turn the LED on (Note that LOW is the voltage level
10  delay(1000);                  // Wait for a second
11  digitalWrite(LED_PIN, HIGH); // Turn the LED off by making the voltage HIGH
12  delay(2000);                  // Wait for two seconds (to demonstrate the active
13 }
```

Done uploading.

Sketch uses 258604 bytes (24%) of program storage space. Maximum is 1044464 bytes.
Global variables use 26696 bytes (32%) of dynamic memory, leaving 55224 bytes for local variables.
Uploading 262752 bytes from C:\Users\user\AppData\Local\Temp\arduino_build_53403\Blin_LED_D2 to COM13
..... [31%]
..... [62%]
..... [93%]
..... [100%]

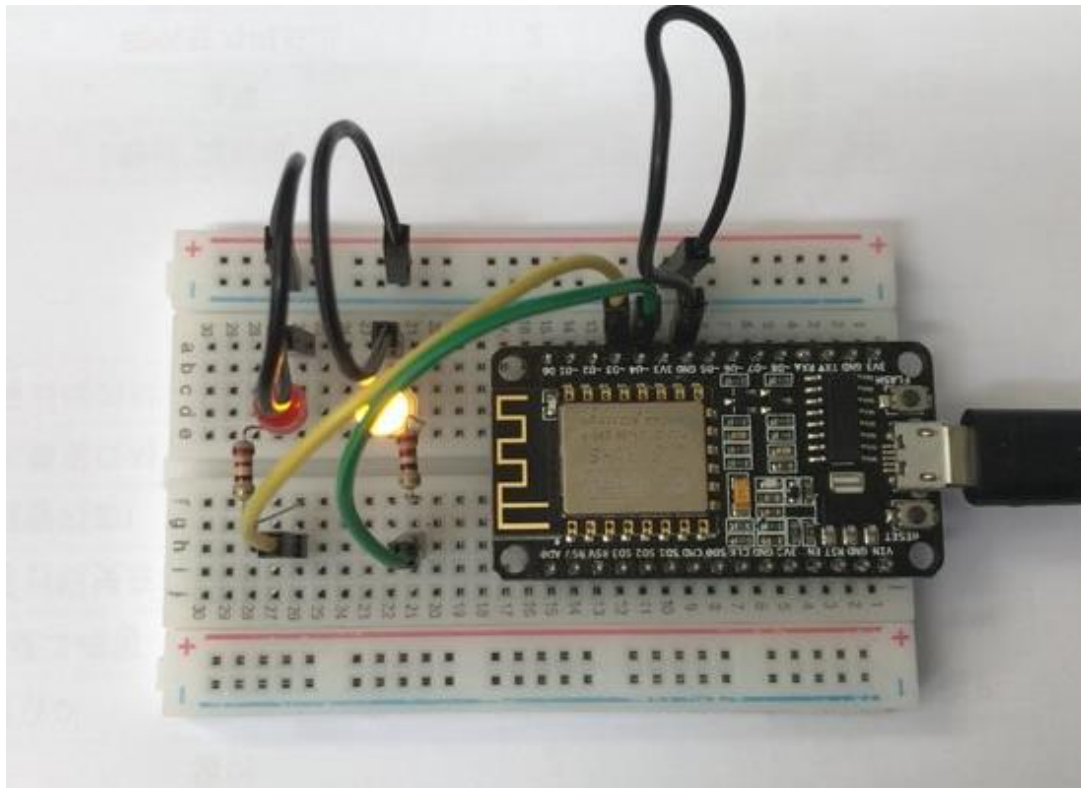
1 NodeMCU 1.0 (ESP-12E Module) on COM13

LED 작동 : D2 핀, 220 Ω 저항

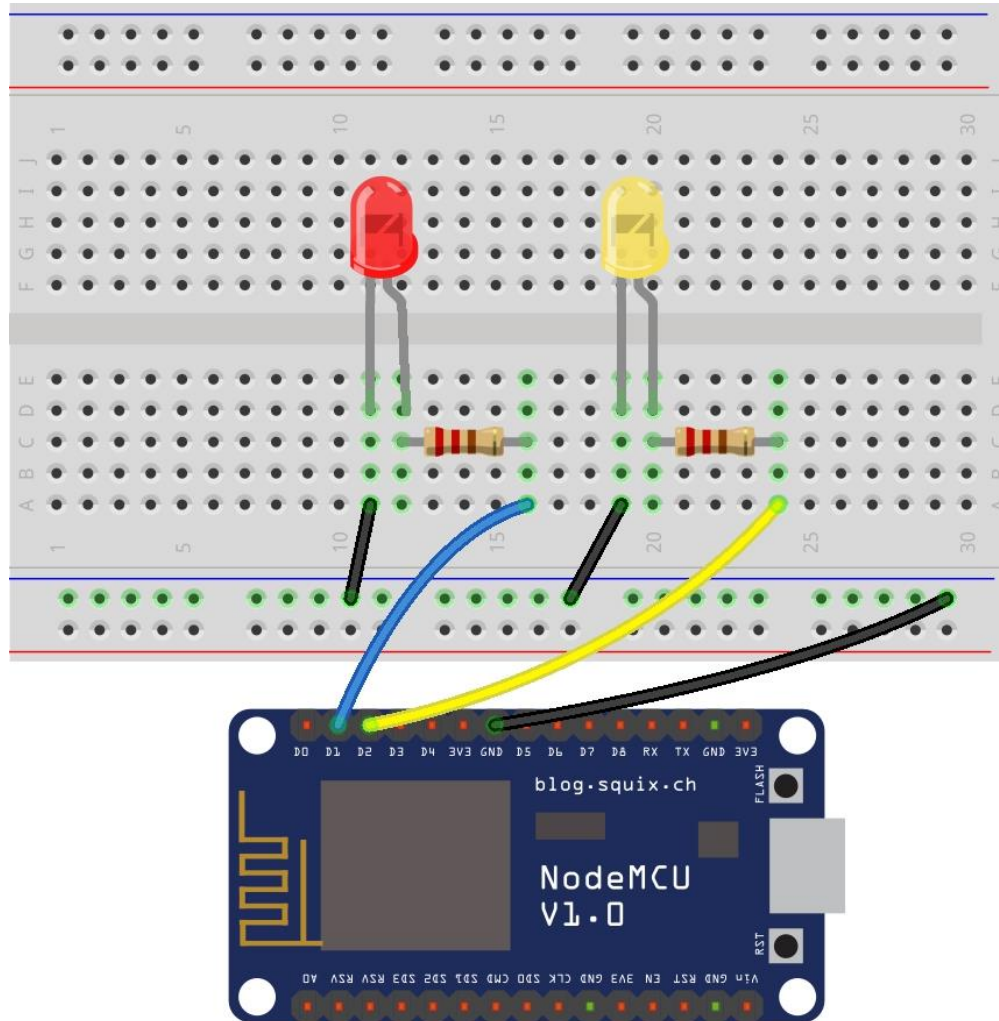


실습 문제 01

- 2개의 LED를 사용하여 0.5초 간격으로 blink 하기(빨강->노랑->빨강->노랑....)
- digitalWrite(), 220 Ω 저항

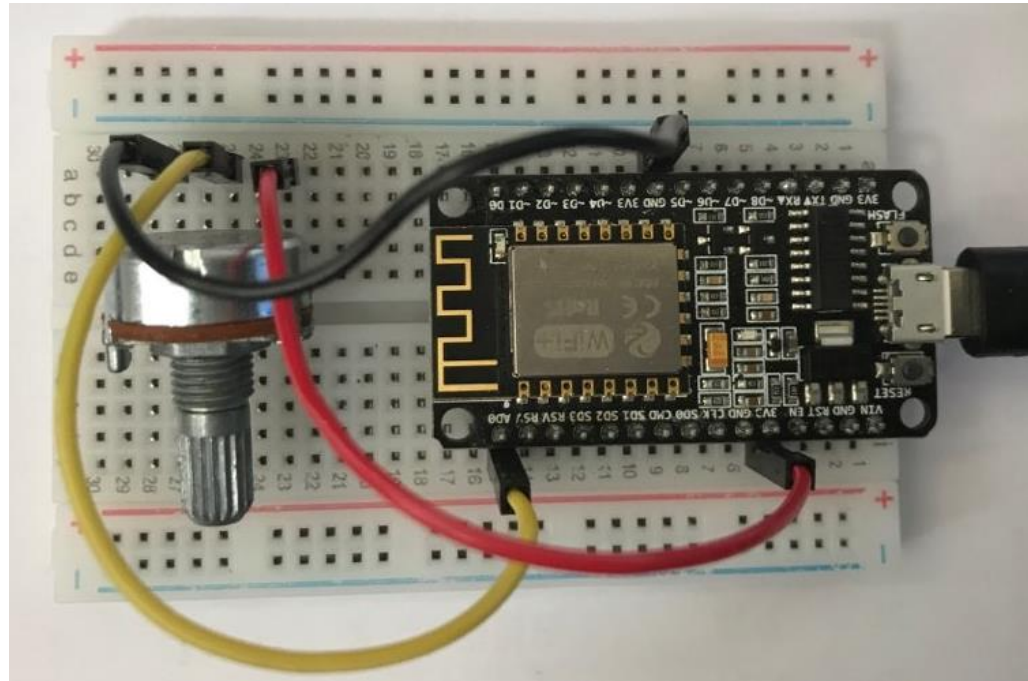


실습 문제 01 : Circuit Wiring

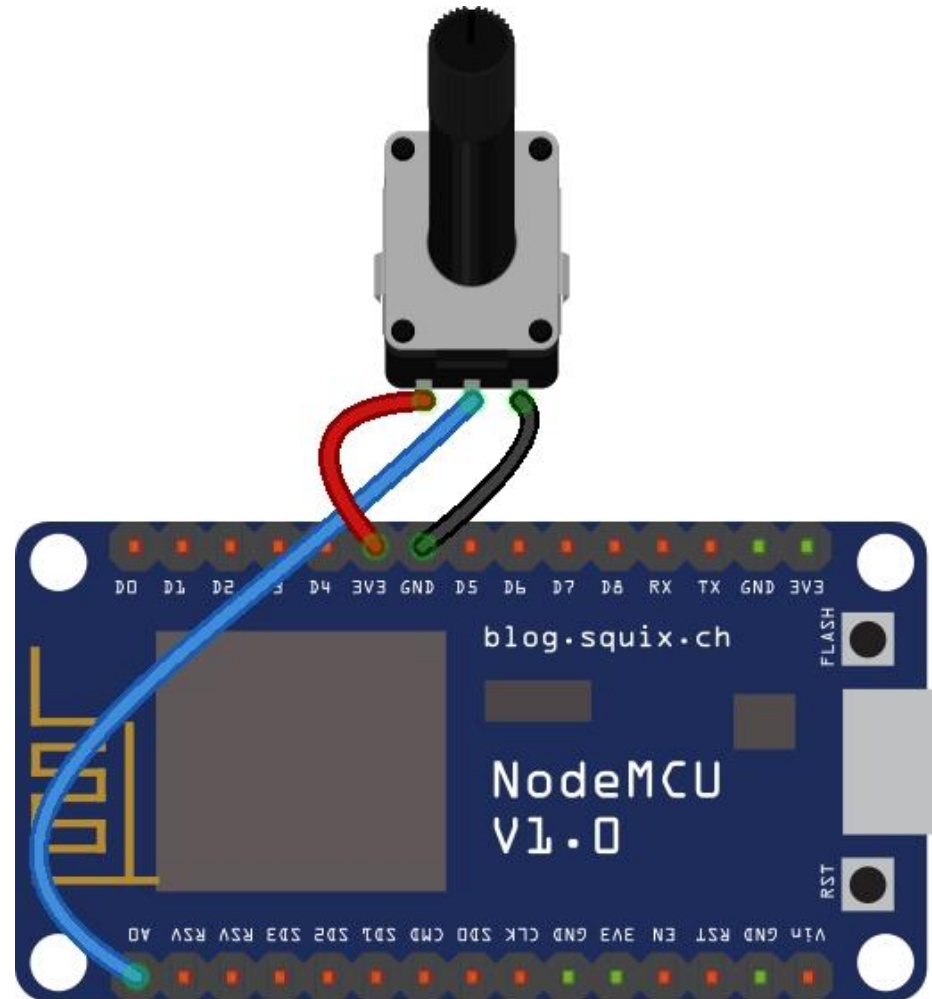


실습 문제 02

- ADC : Analog Digital Converter
 - 가변저항의 외부전원 값(아날로그 값)을 디지털 값(0 ~ 1023)으로 변환하여 출력하기
 - 아날로그 핀(A0), analogRead()

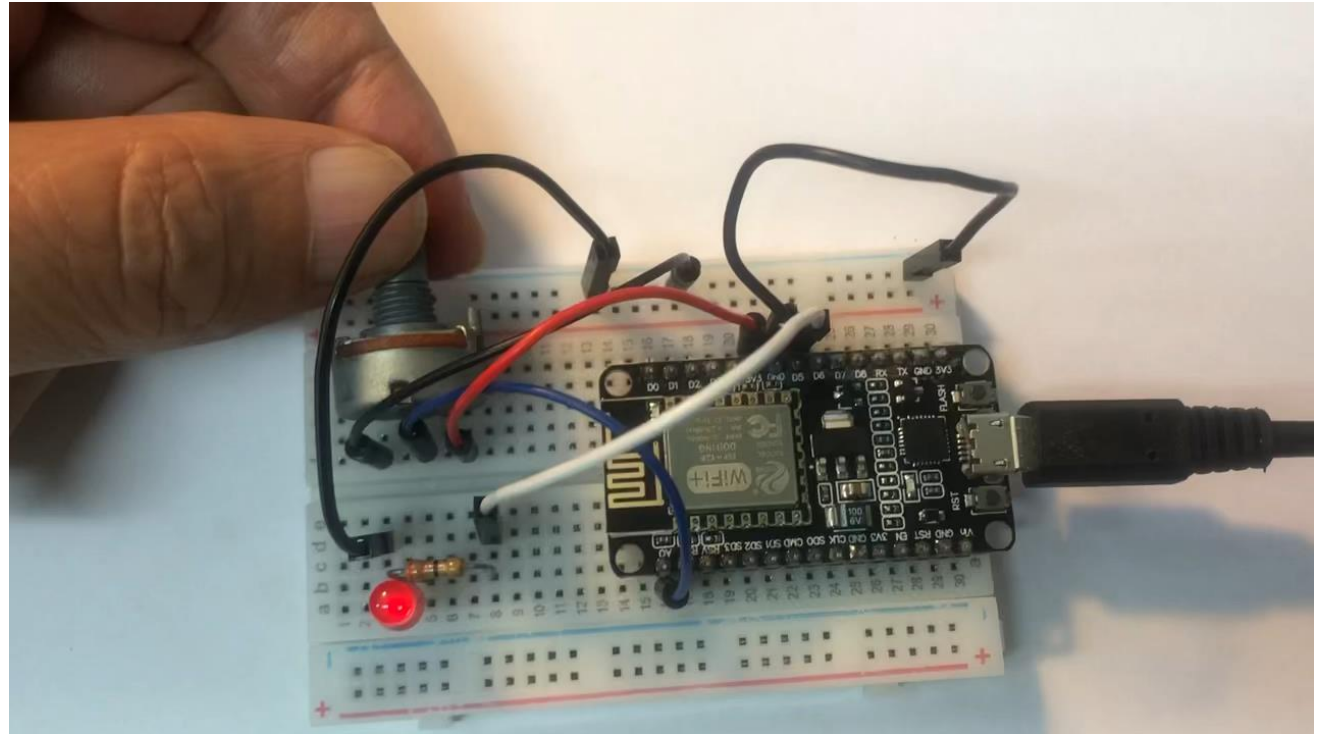
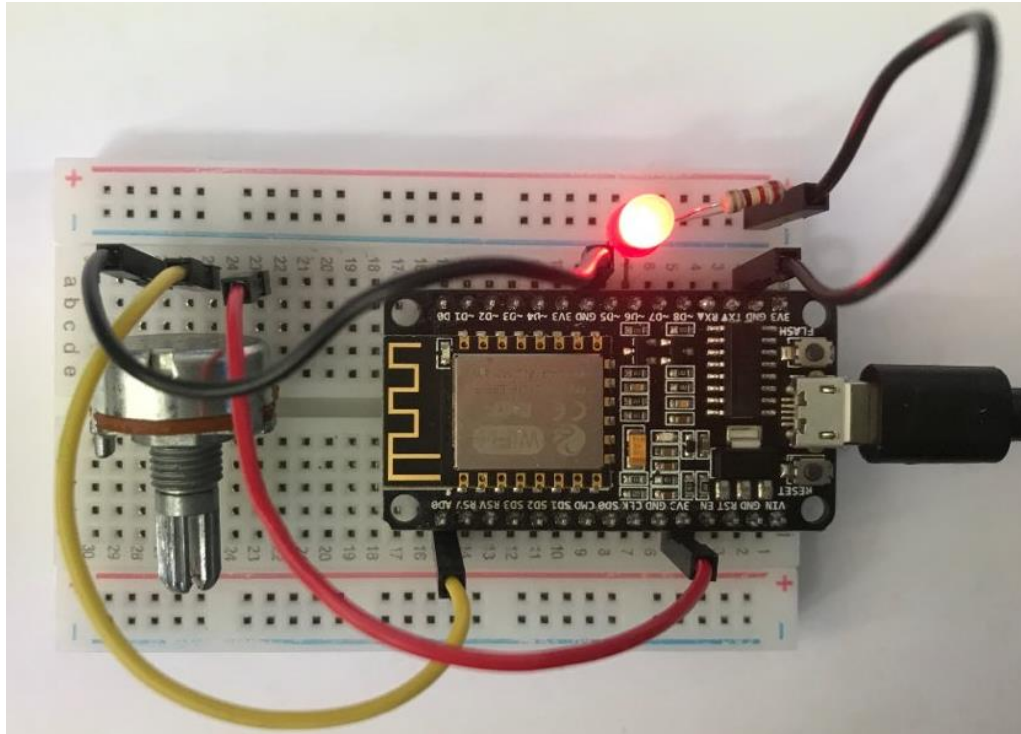


실습 문제 02 : CircuitWiring



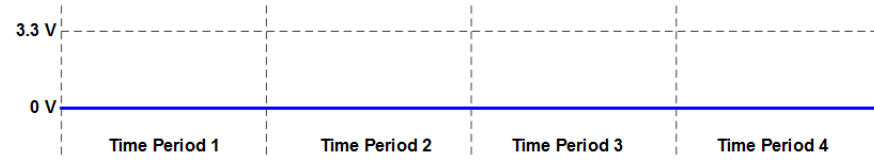
실습 문제 03

- PWM(Pulse Width Modulation), 가변저항을 이용한 LED 밝기 조절하기
 - 아날로그(A0) 핀, analogRead(), analogWrite()

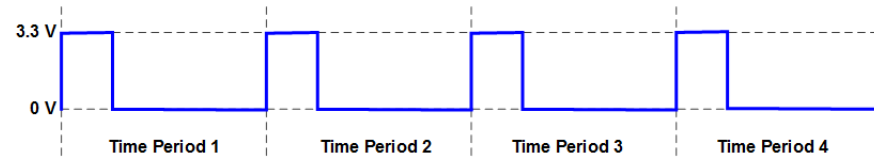


PWM(Pulse Width Modulation)

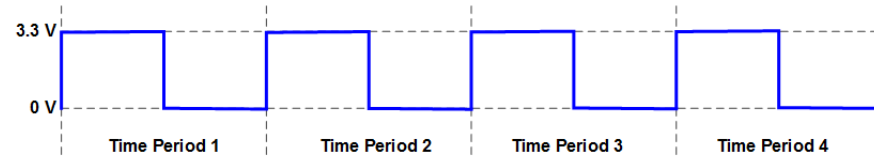
```
analogWrite(LedPin, 0);
```



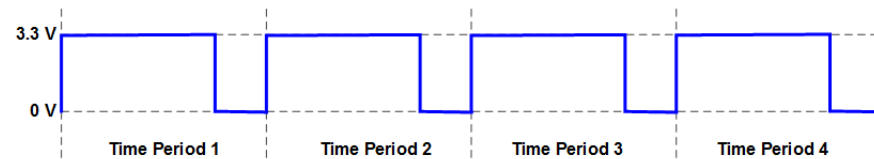
```
analogWrite(LedPin, 255);
```



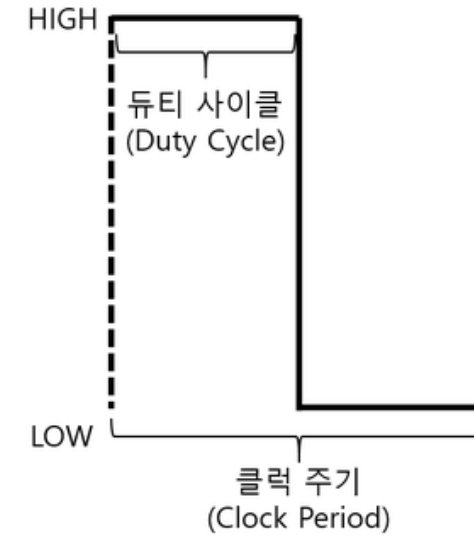
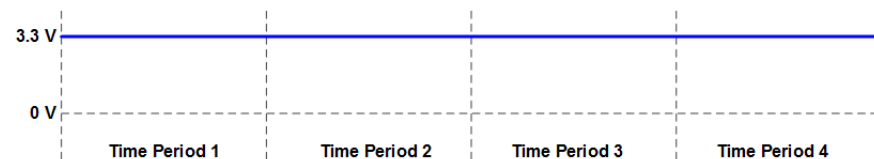
```
analogWrite(LedPin, 512);
```



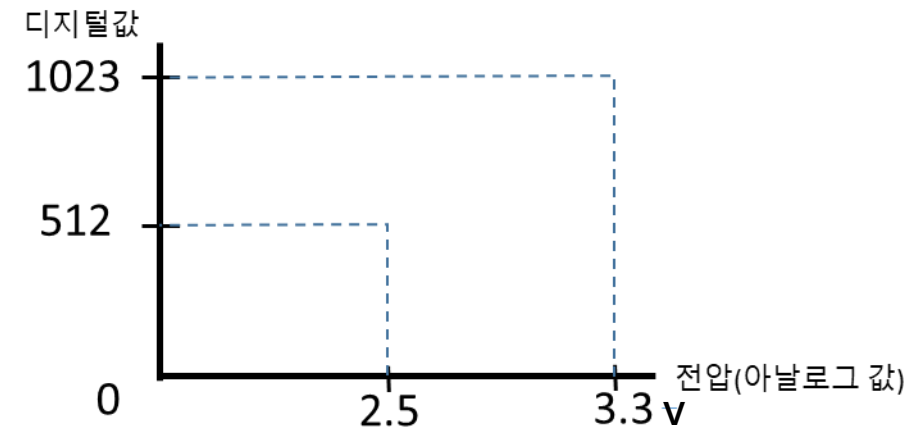
```
analogWrite(LedPin, 767);
```



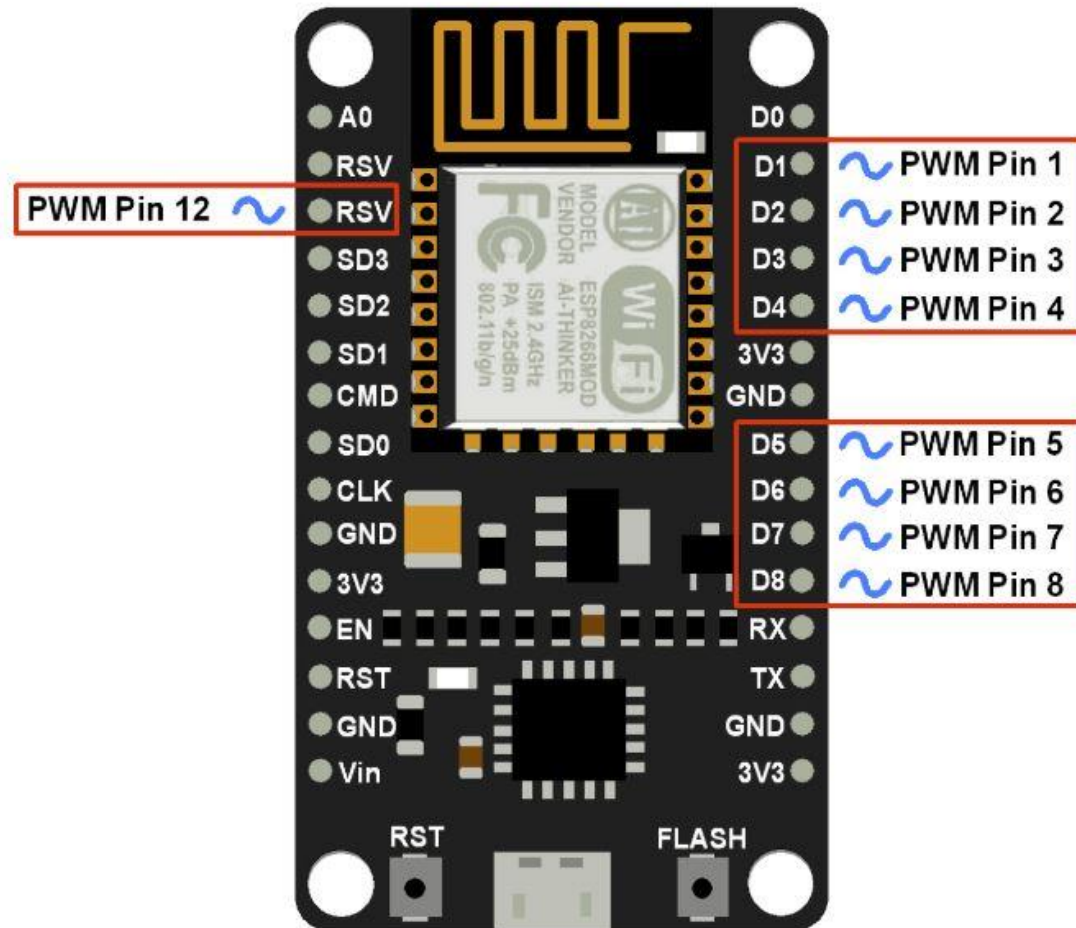
```
analogWrite(LedPin, 1023);
```



$$\text{디지털 값} = \frac{3.3}{1023} \times \text{아날로그 핀 값 (Duty Cycle)}$$

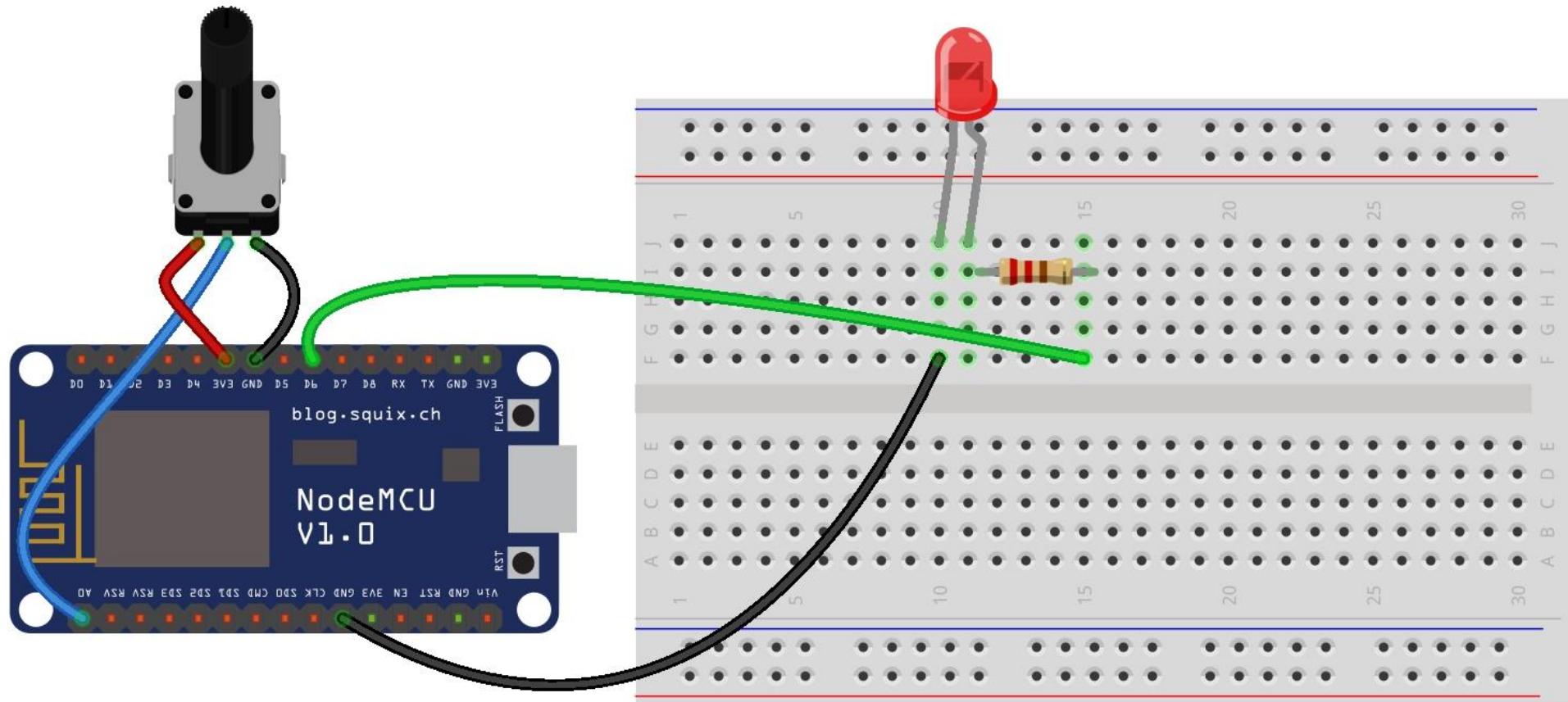


Node MCU PWM 핀



실습 문제 03 : Circuit Wiring

- A0 : 아날로그 핀
- D6(GPIO12) : PWM



실습 문제 04 : 빛의 세기에 따라 LED 밝기 조절하기

- 아래의 Fritzing(Ardunio UNO)을 NodeMCU로 설계하시오
 - 포토 레지스터, LED, 저항 2개

참고 동영상

- NodeMCU 개발 환경 구축
 - <https://youtu.be/YNOSQTK29DE>
- NodeMCU 제어하기
 - <https://youtu.be/nBc-2Wb49wl>
 - <https://developer.ibm.com/kr/cloud/internet-of-things/2017/07/30/esp8266-iot-arduino-ide-nodemcu-basic/>
 - <https://www.instructables.com/id/NodeMCU-Basic-Project-Blink-a-LED/>