오픈소스 HW를 활용한 IOT 솔루션

매직에코 CTO 안진섭

안진섭 (jinniahn@magice.co) (주) 매직에코

경력:

(현) 매직에코, CTO

삼성전자, 유비쿼터스 플랫폼 미들웨어 및 스크립트 엔진/언어 개발

삼성그룹, 모바일 시스템 개발 (이메일 클라이언트 개발)

삼성, SEMP 하이브리드 플랫폼 , Android/iOS 하이브리드 엔진 개발

외부 활동:

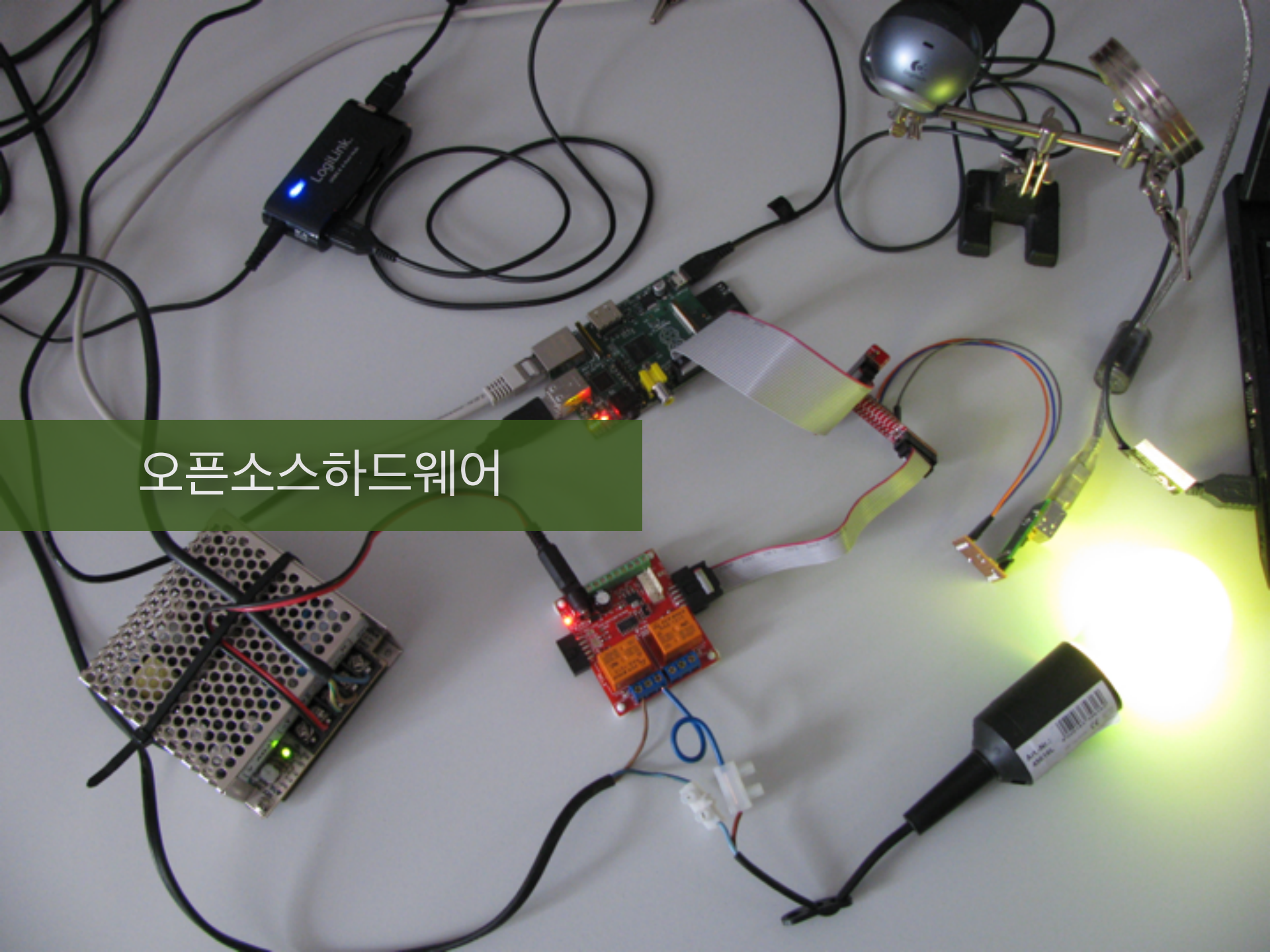
구글 개발자 모임(GDG) 운영자 (2009 ~ 2012)

KIAST 소프트 대학원 2013년 2학기 강의

마이크로 소프트웨어 전문 필진 (2010 ~)

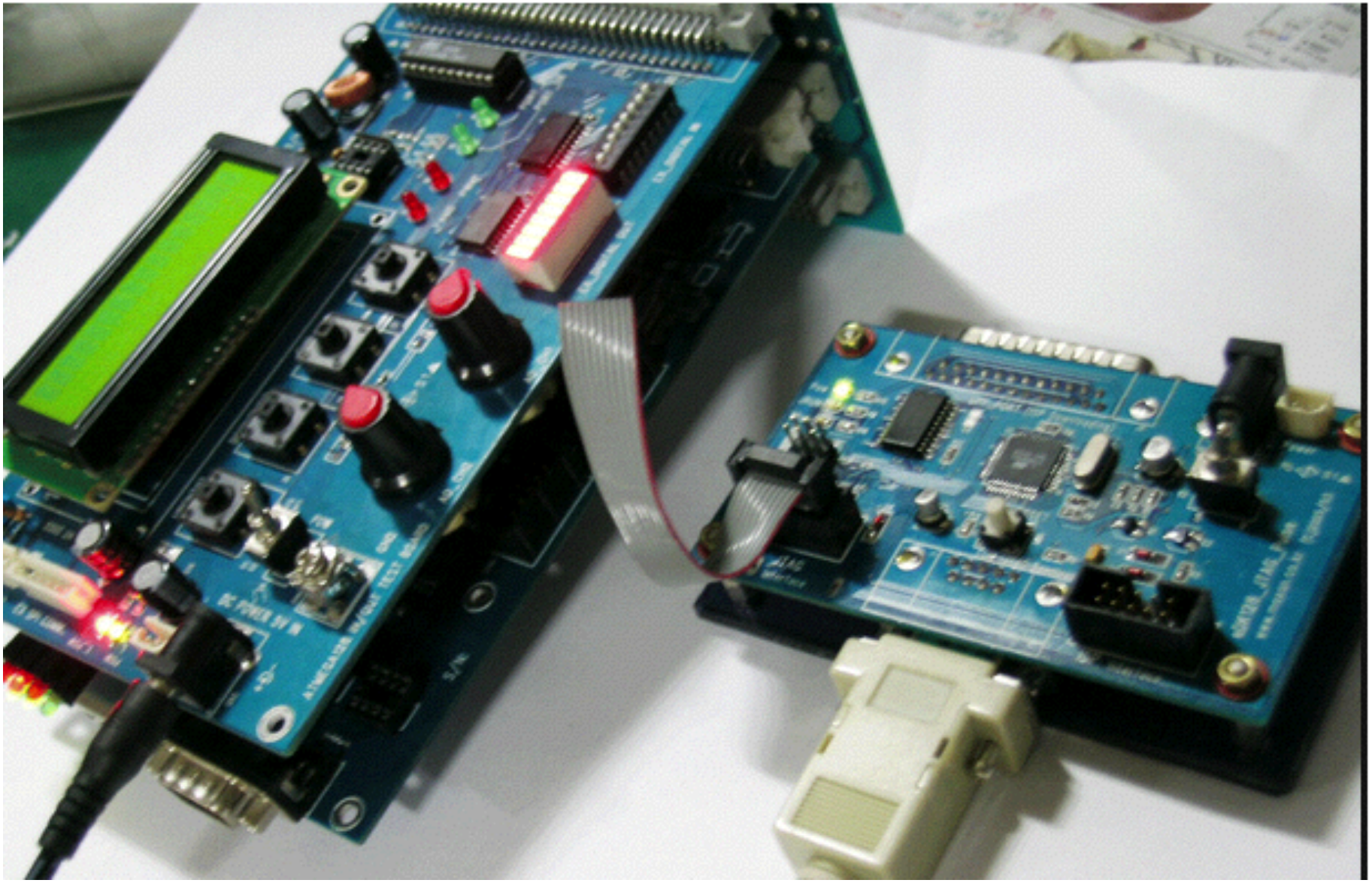
발표 순서

1. 오픈 소스 하드웨어
2. 아두이노
3. 라즈베리 파이

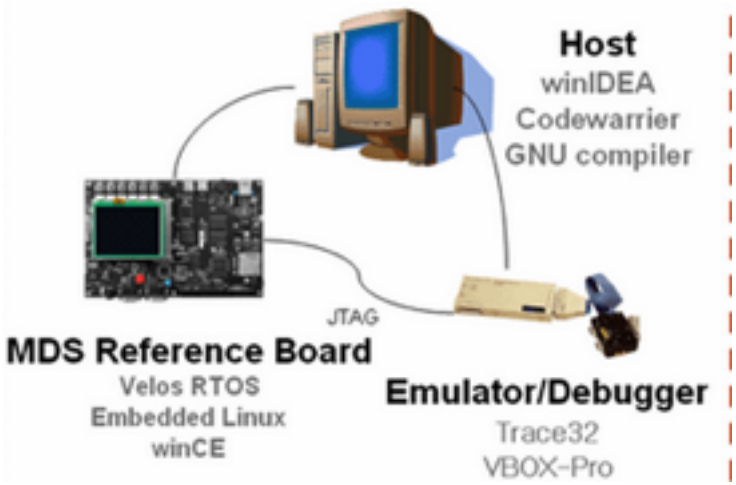


오픈소스하드웨어

임베디드



개발을 위한 최첨단의 장비들....


Host
winIDEA
Codewarrier
GNU compiler
JTAG
MDS Reference Board
Velos RTOS
Embedded Linux
winCE
Emulator/Debugger
Trace32
VBOX-Pro


Realview
ULINK2


simple.

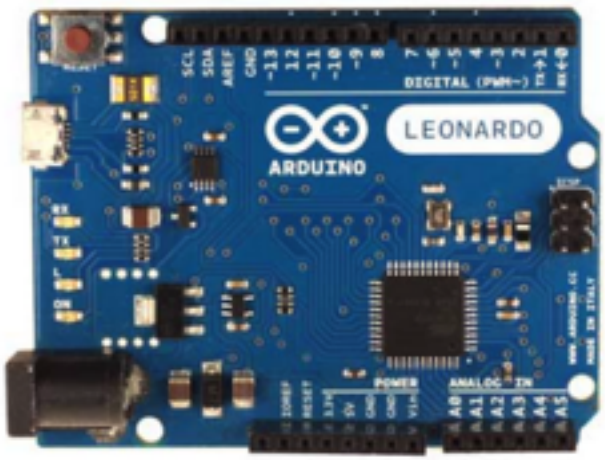
기존		현재
	Hardware	 
	Connection	
 	Dev. Tools	 
제한적공개	Resource	 

오픈하드웨어 종류

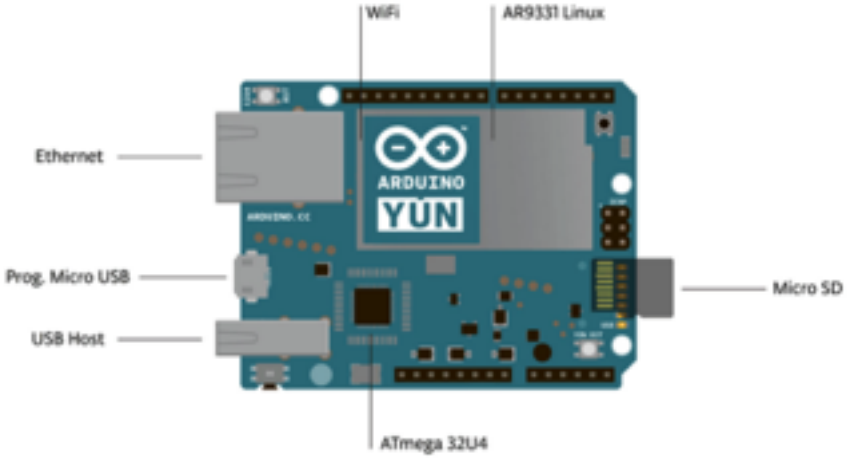
종류	아두이노(UNO)	라즈베리파이	비글본블랙
CPU	ATmega328 16MHz	ARM 700MHz	ARM Cortex-A8 1GHz
메모리	2KB	512MB	512MB
플래쉬	32KB	-	2GB eMMC
운영체제	펌웨어	리눅스, 안드로이드	리눅스, 안드로이드
네트워크	-	Ethernet	Ethernet
사용용도	센싱 및 액츄에이터	PC, 센싱 및 액츄에이터	PC, 센싱 및 액츄에이터
가격	$30	$35	$45
주요 SW 개발도구	Processing	Scratch, Python	Cloud9, Node.js
홈페이지	www.arduino.cc	www.raspberrypi.org	beagleboard.org

아두이노

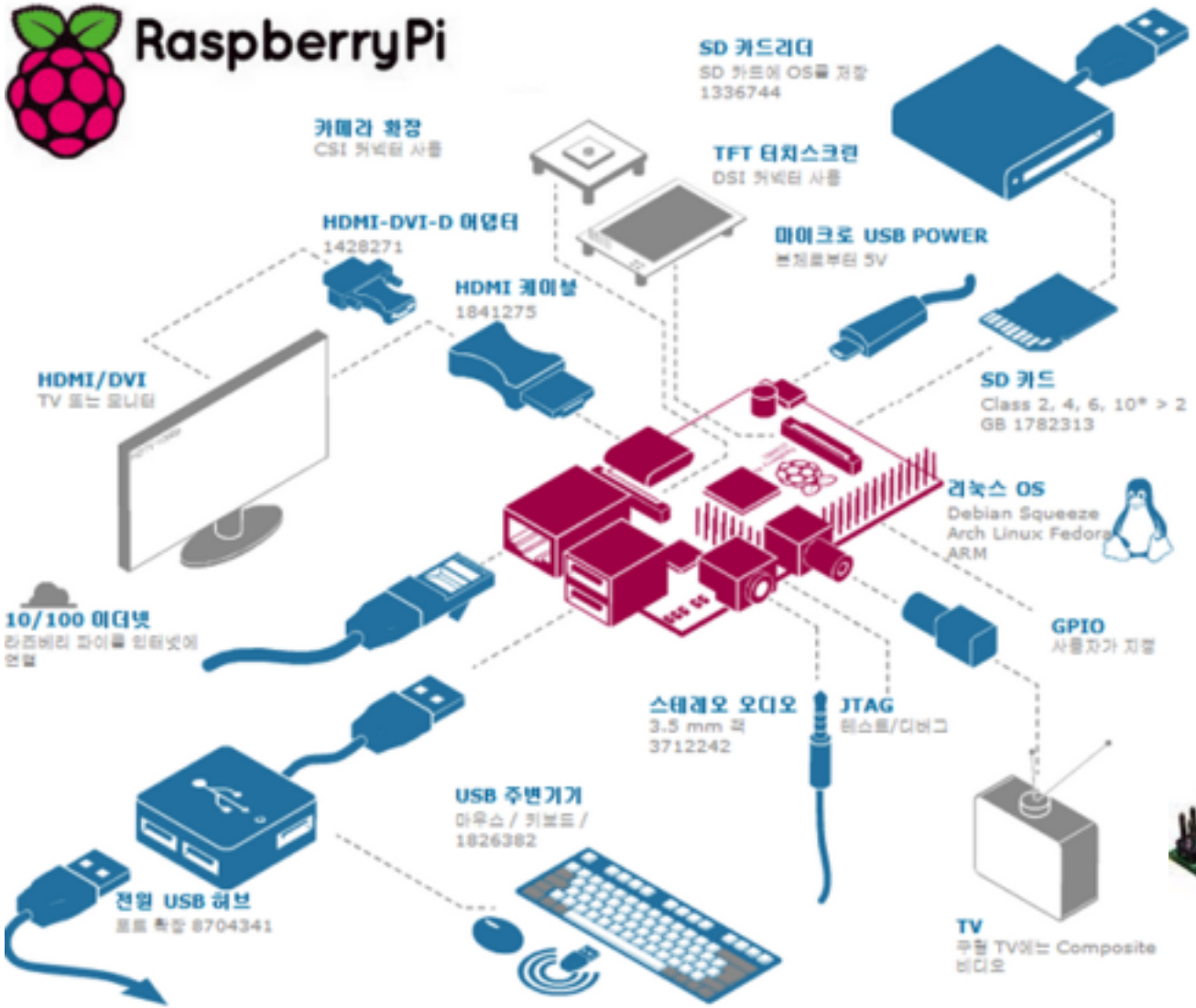

UNO
ARDUINO
DIGITAL (PWM~)
POWER
ANALOG IN


LEONARDO
ARDUINO
DIGITAL (PWM~)
POWER
ANALOG IN

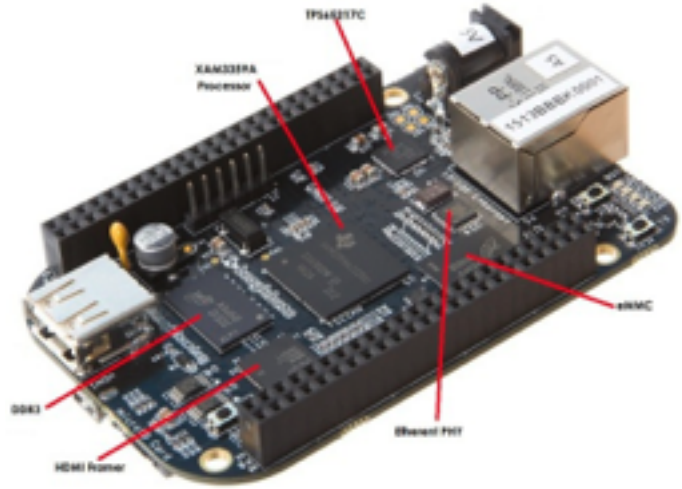

ARDUINO
YUN
ARDUINO.CC


WiFi
AR9331 Linux
Ethernet
Prog. Micro USB
USB Host
Micro SD
ATmega 32U4
ARDUINO
YUN

라즈베리파이


RaspberryPi
SD 카드리더
SD 카드에 OS를 저장
1336744
카메라 확장
CSI 커넥터 사용
TFT 터치스크린
DSI 커넥터 사용
HDMI-DVI-D 어댑터
1428271
마이크로 USB POWER
본체로부터 5V
HDMI 케이블
1841275
HDMI/DVI
TV 또는 모니터
SD 카드
Class 2, 4, 6, 10* > 2
GB 1782313
리눅스 OS
Debian Squeeze
Arch Linux Fedora
ARM
10/100 이더넷
라즈베리 파이를 인터넷에
연결
GPIO
사용자가 지정
스테레오 오디오
3.5 mm 잭
3712242
JTAG
테스트/디버그
USB 주변기기
마우스 / 키보드 /
1826382
전원 USB 허브
포트 확장 8704341
TV
구형 TV에는 Composite
비디오

비글보



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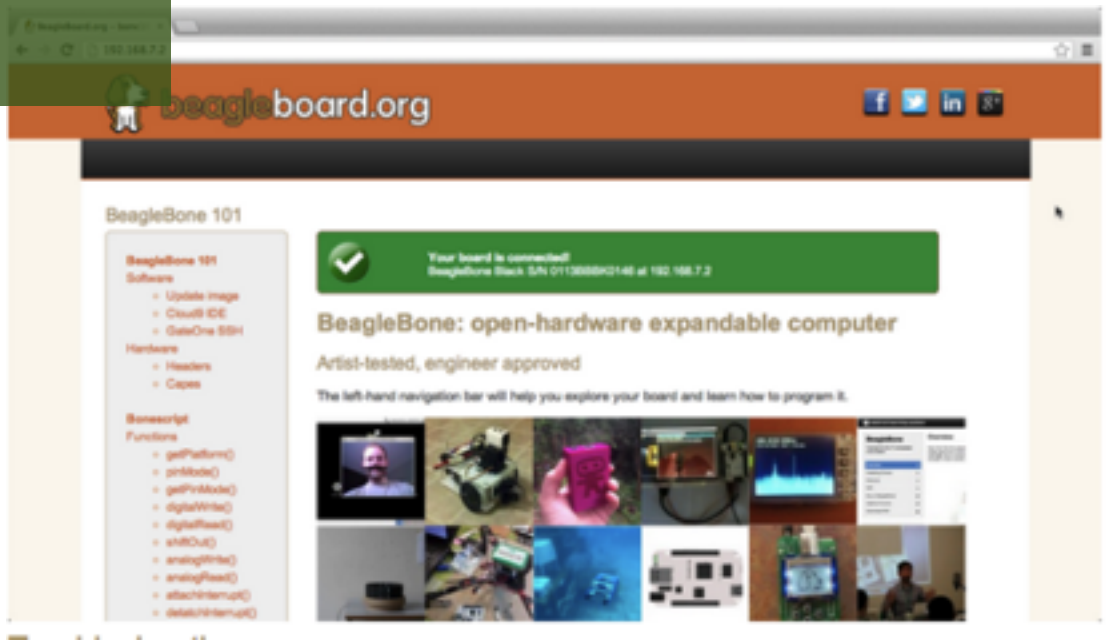
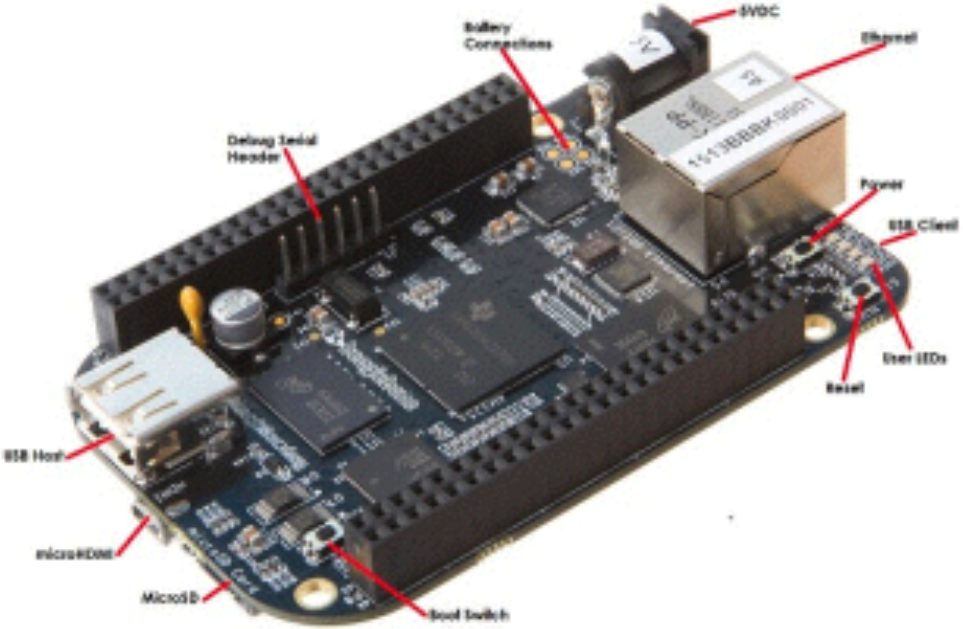




오픈 소스 HW로
아디이어에서 생산까지

blink(1), the USB RGB LED

https://www.kickstarter.com/projects/thingm/blink1-the-usb-rgb-led

Home | Updates 17 | Backers 2,655 | Comments 265 | Los Angeles, CA | Hardw

Funded! This project was successfully funded on August 13, 2012.

2,655
backers

$132,317
pledged of $29,000 goal

0
seconds to go

Project by
ThingM
Los Angeles, CA

2 created · 0 backed

Has not connected Facebook

thingm.com

Share 10 | Tweet | Embed

구성

IFTTT

Application

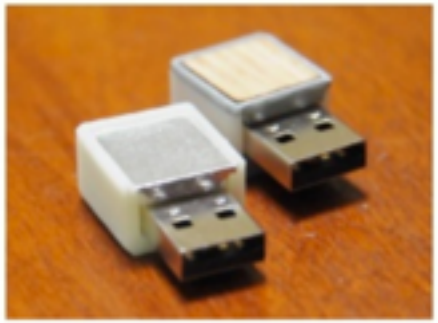
Blink (1)

http://thingm.com/products/blink-1/

개발 프로세스

idea → prototype → kickstarter → production

2 weeks

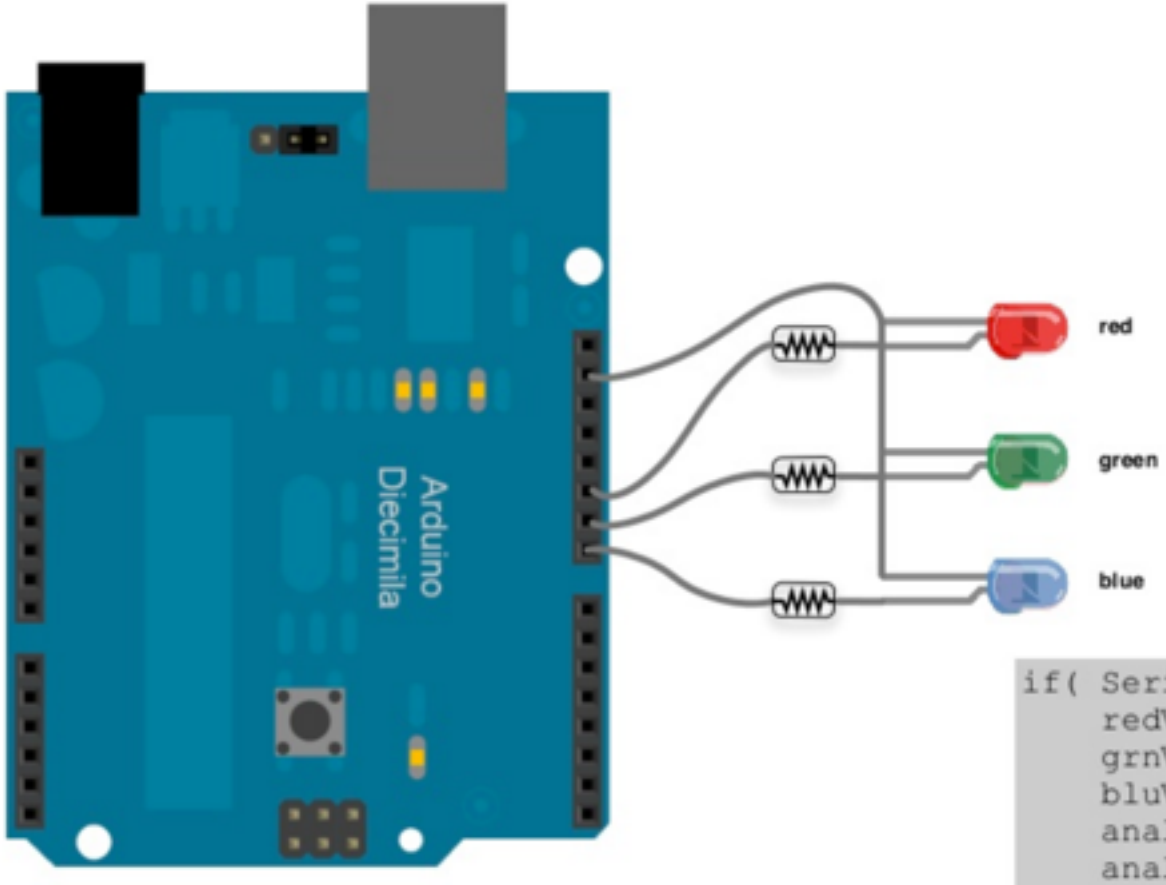


3 months

1 month

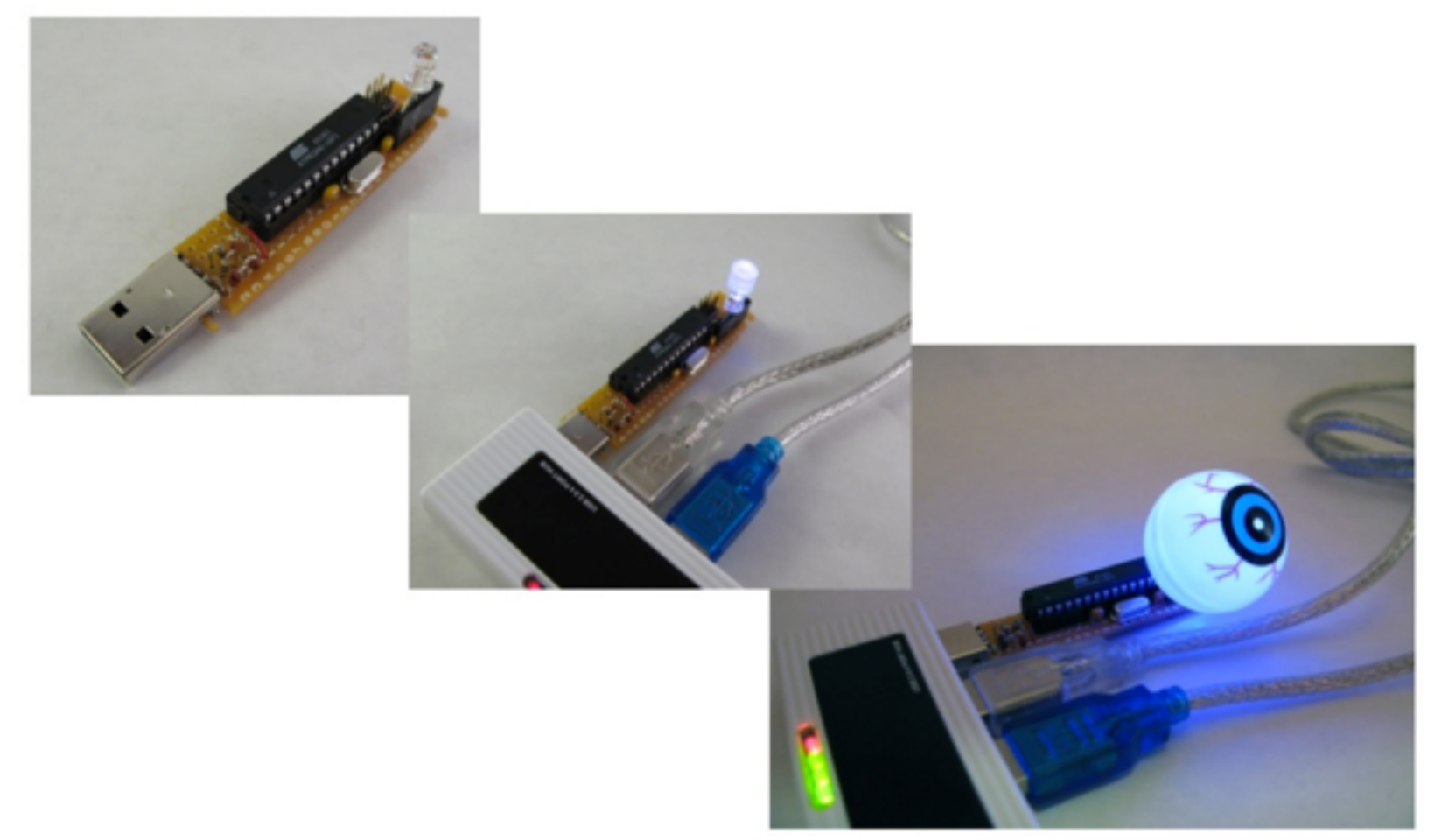
3 months

처음 시작은 이렇게

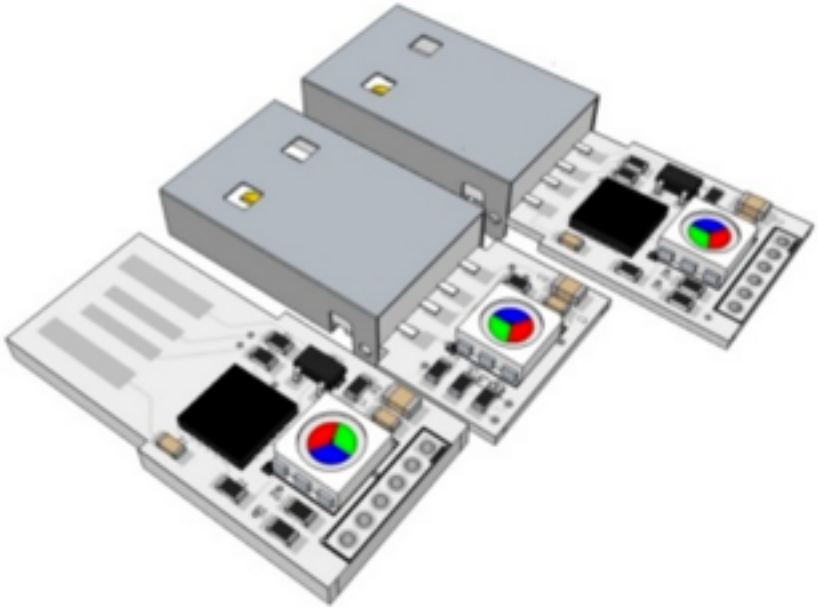



```
if( Serial.available() == 3 ) {
    redVal = Serial.read();
    grnVal = Serial.read();
    bluVal = Serial.read();
    analogWrite( redPin, redVal );
    analogWrite( grnPin, grnVal );
    analogWrite( bluPin, bluVal );
}
```

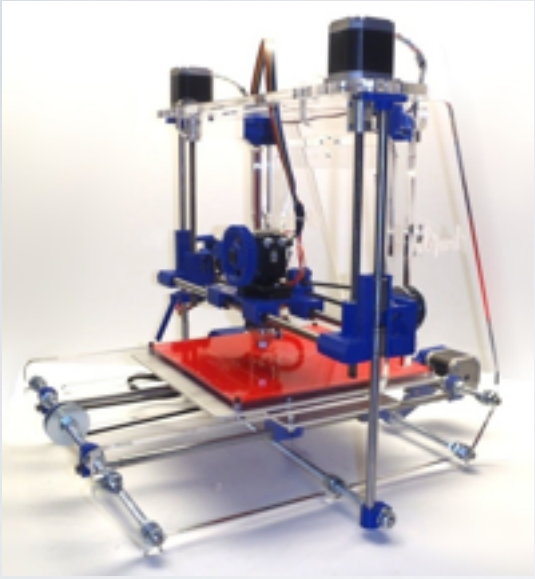
커스텀 보드를 만들어서

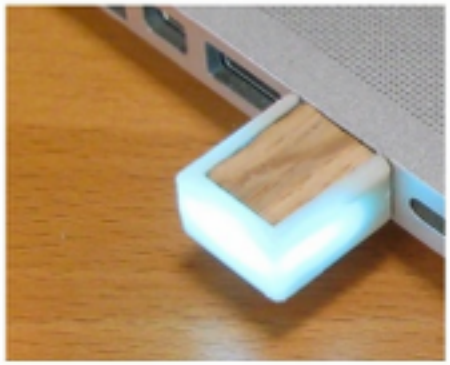


작게 만들고..

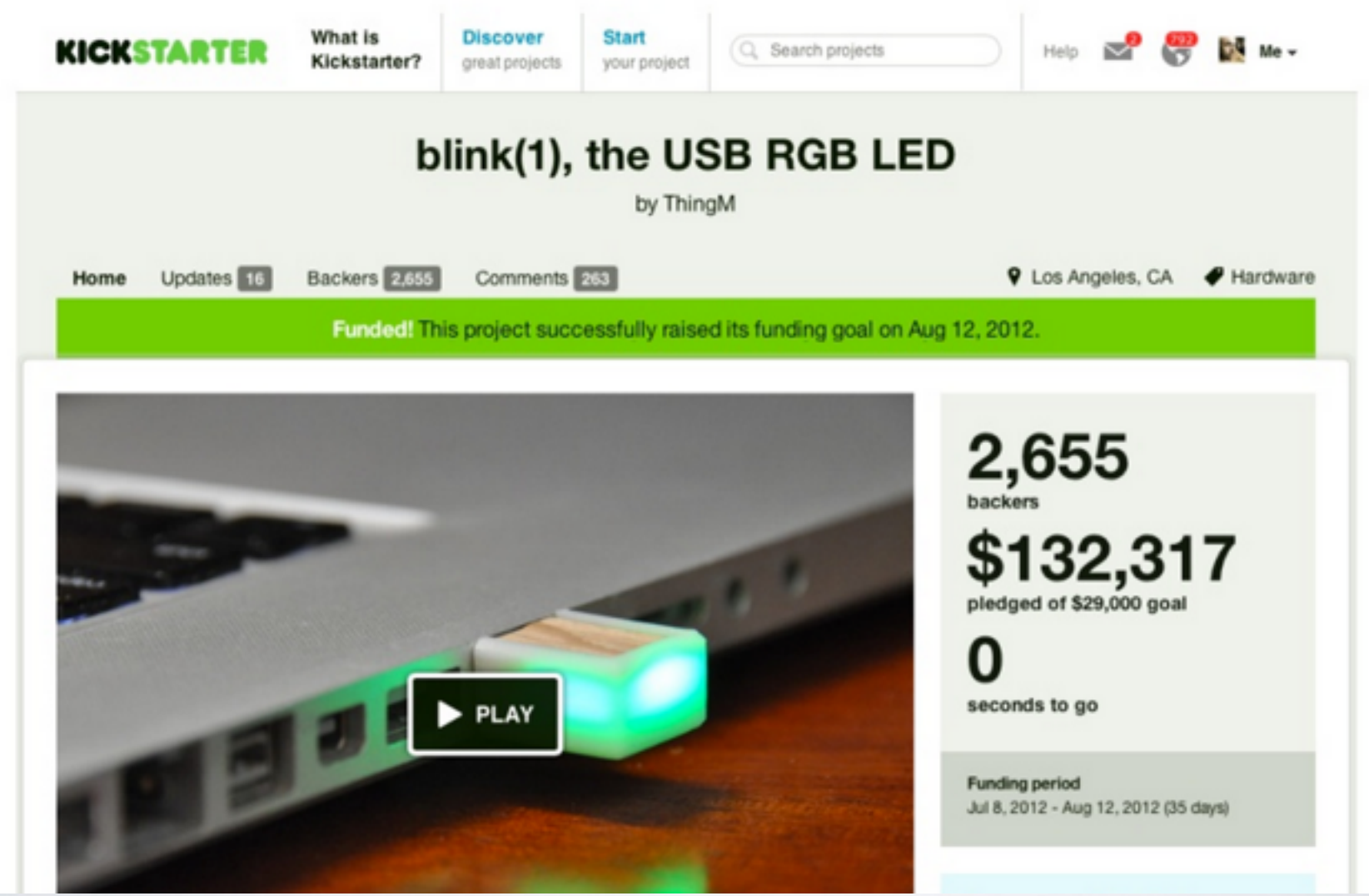


3D 프린터로 케이싱

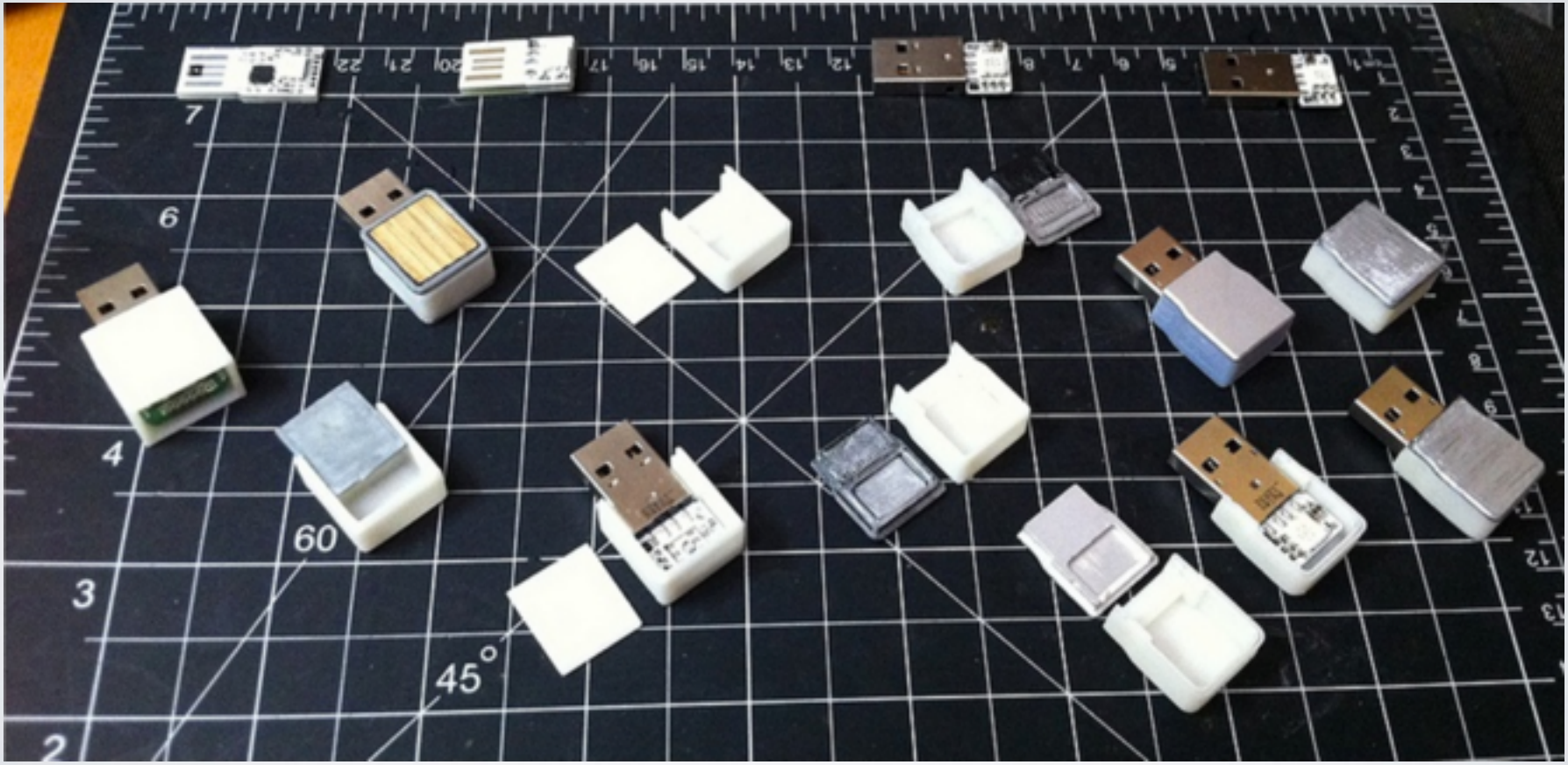




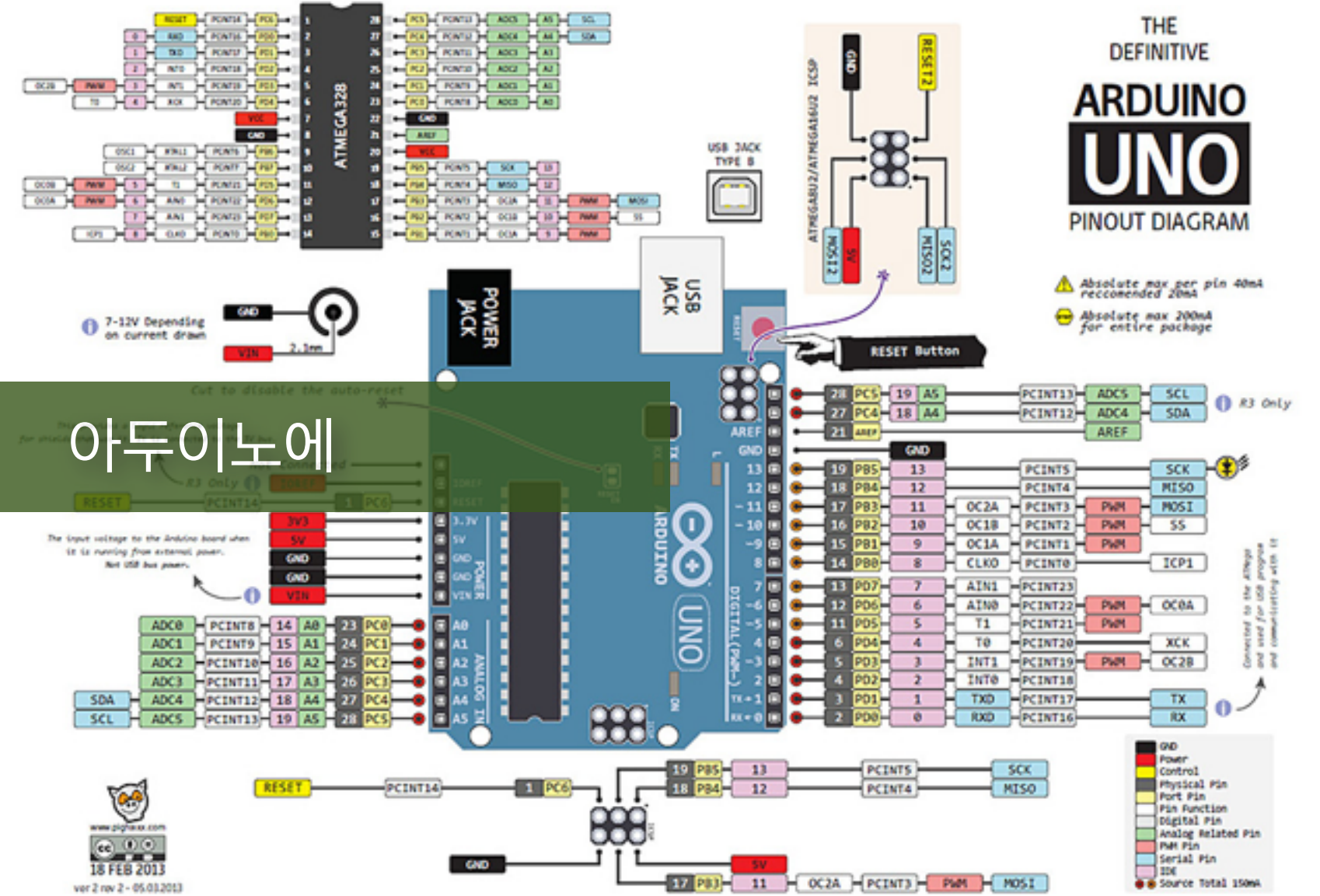
클라우드 펀딩으로 자금 확보



추가 개발



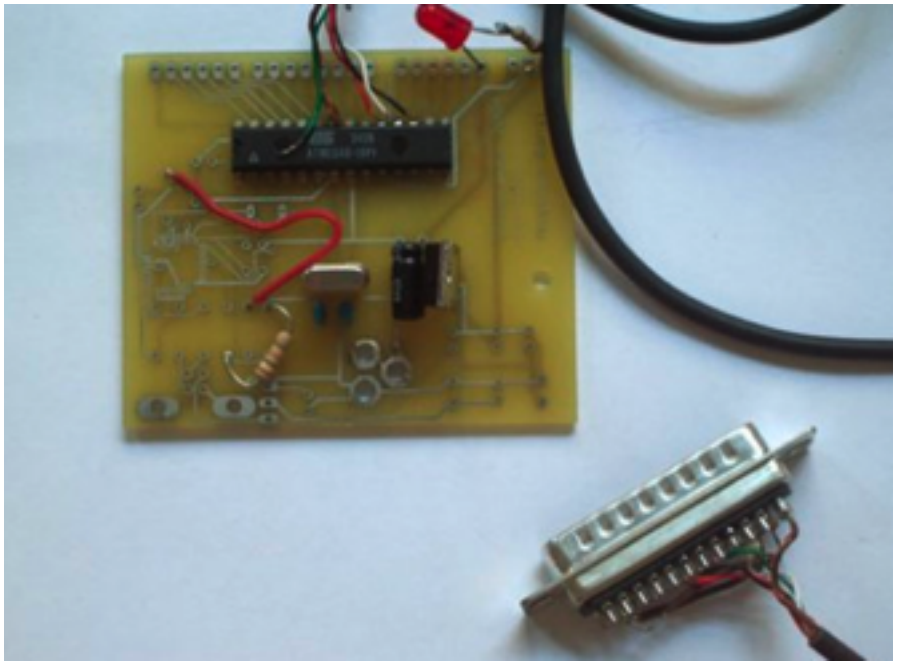
발송


THE DEFINITIVE
ARDUINO
UNO
PINOUT DIAGRAM
ATMEGA328
USB JACK TYPE B
ATMEGA8U2/ATMEGA16U2 ICSP
POWER JACK
USB JACK
RESET Button
7-12V Depending on current drawn
Absolute max per pin 40mA reccomended 20mA
Absolute max 200mA for entire package
R3 Only
18 FEB 2013
ver 2 rev 2 - 05.03.2013

아두이노에

아두이노

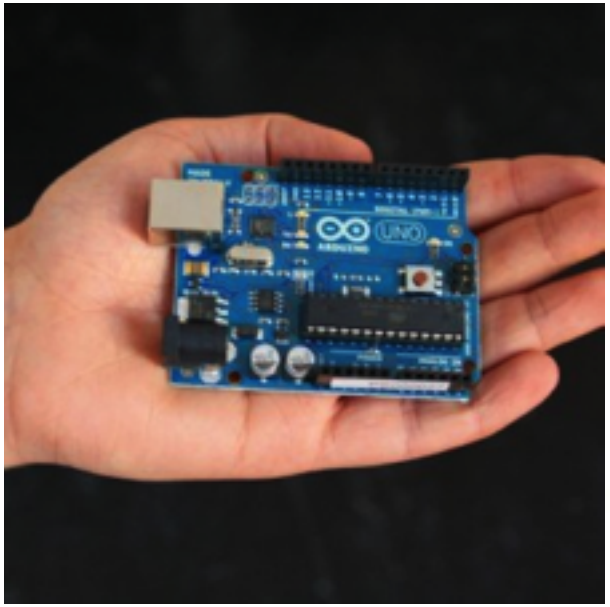
- 아두이노(Arduino) : 이탈리어어로 Strong Friend
- 2005년 이탈리어의 SADI IDII(Interaction Design Institute Ivera) 에서 탄생
- 인터렉션 디자이너 Massimo Banzi / Davide Cuatielles
- 저렴한 방법으로 인터랙티브 디자인 경험을 주기위해 개발
- 방학 기간동안 작은 기판 제작 ➔ 첫번째 아두이노



- 쉬운 접근성
- 저렴한 비용
- 무한 확장성

아두이노의 특성

- 멀티플랫폼 : 윈도우/Mac/리눅스
- 쉬운 프로그래밍 : 디자이너들이 사용하기 쉬운 프로세싱 프로그래밍
- 오픈소스 : 회로도 다운로드, 부품 구입, 나만의 아두이노
- 저렴한 가격
- 활발한 커뮤니티



아두이노 구성요소

open source

open source hardware

ARDUINO

아두이노의 관점

- 문제를 얼마나 빨리 & 효과적으로 & 싸게 해결하는가?
- no……
- 문제를 얼마나 빨리 해결하는가…

다양한 보드

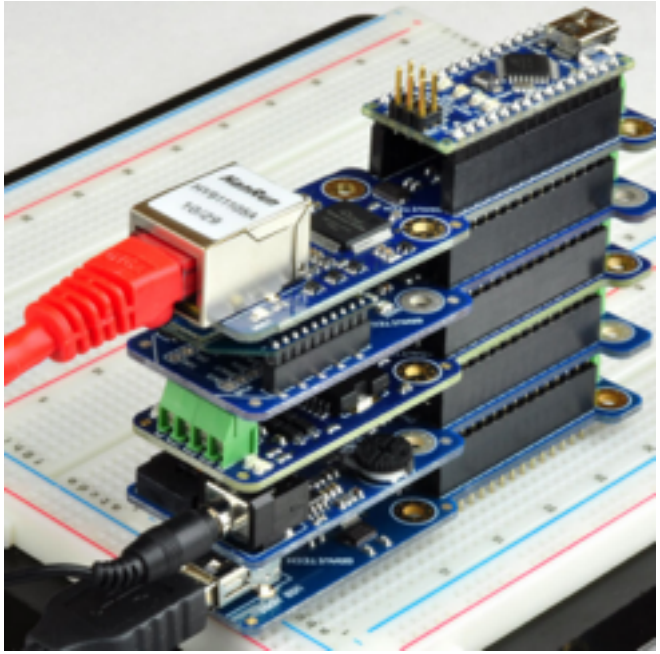


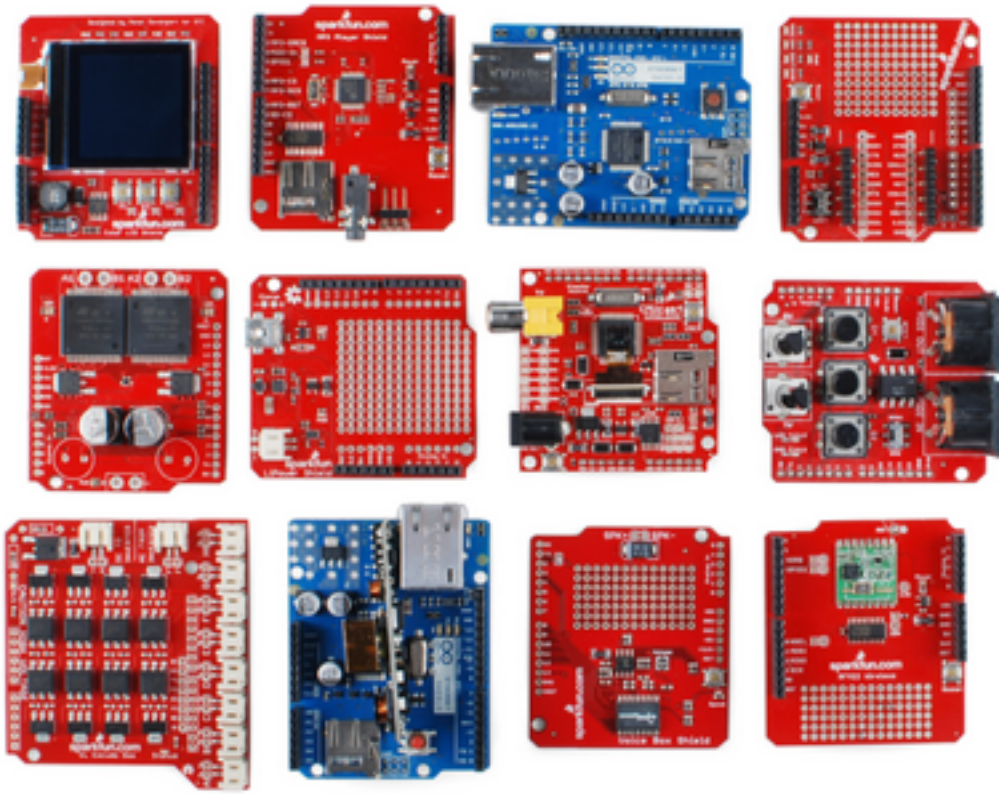






아두이노 확장성





아두이노 활용 예.

"Location-aware motion-detecting music player"

motion detector + Arduino + GPS shield + MP3 shield

아두이노 활용 예.

Working prototype in an afternoon

ARDUINO UNO - SPEC

Summary

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

Intel 286

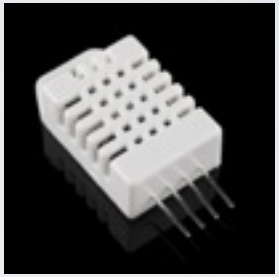
6 MHz – 8,12,16 MHz

인텔 286 정도의 성능

SENSOR & ACTUATOR

flex sensor

muscle sensor



Humidity
Temperature Sensor

Force Sensitive

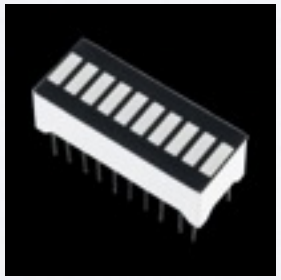
MIC

3-Axis
Magnetometer

IR Receiver Diode

Hydrogen Gas
Sensor

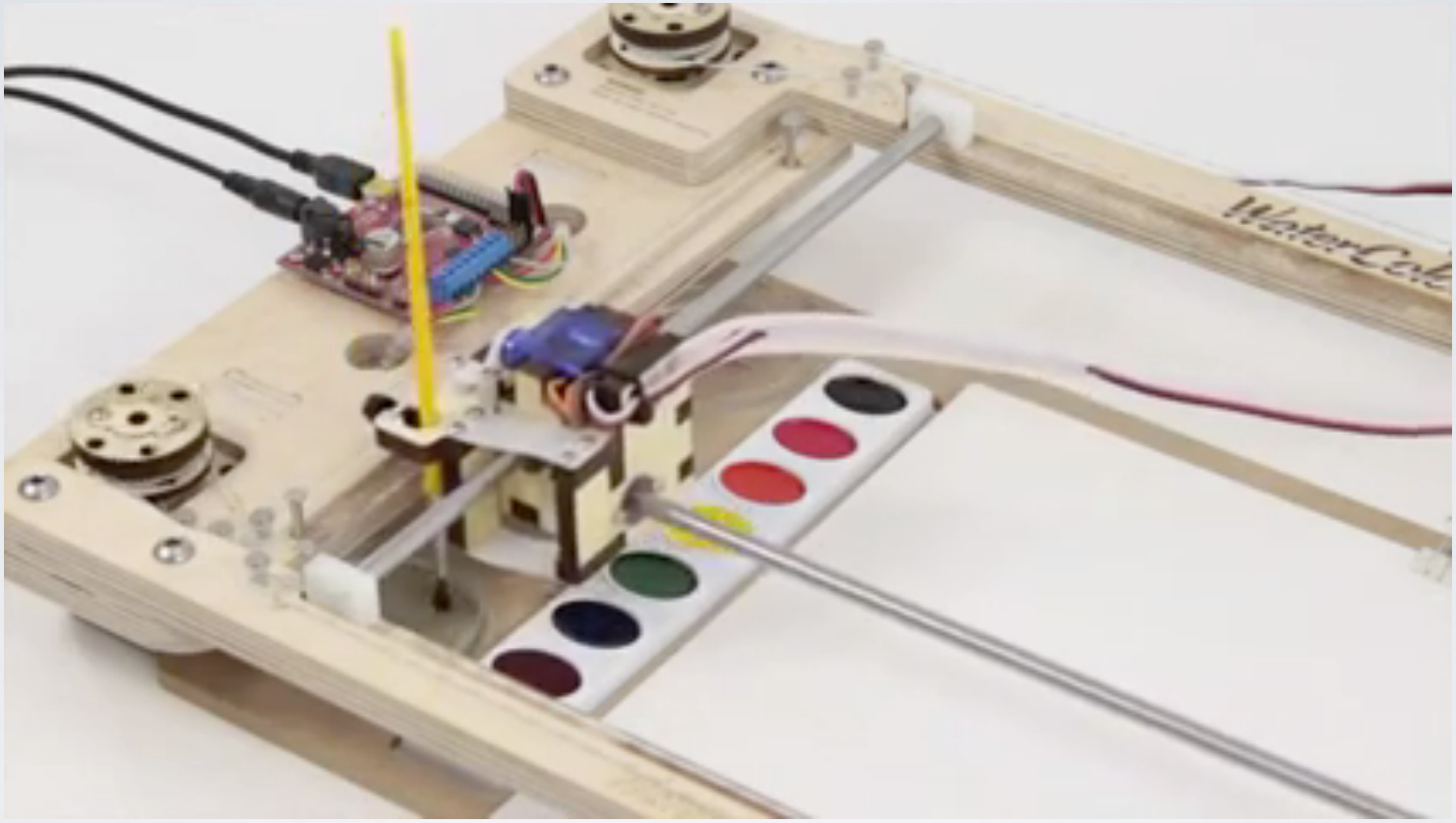
motor



LED Bar Graph

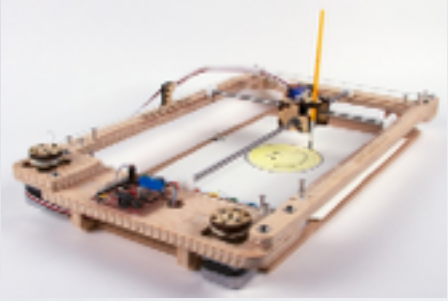
7-Segment

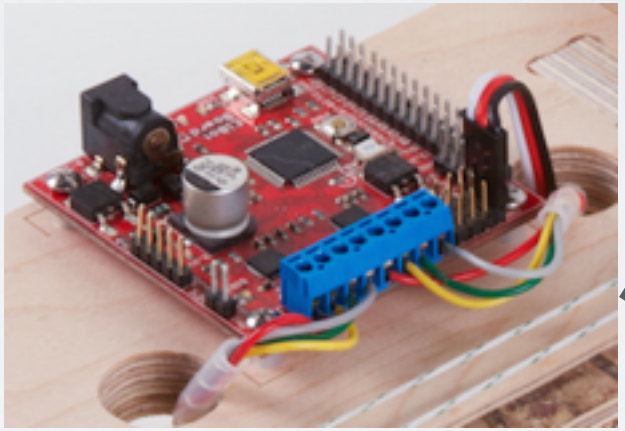
SENSOR & ACTUATOR



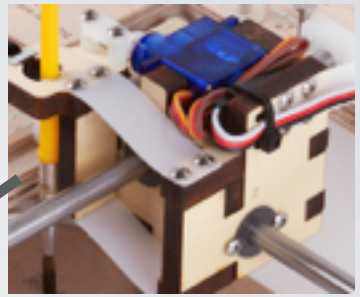
http://www.youtube.com/watch?v=VGGBjnfPs5Y

SENSOR & ACTUATOR





Control Board



Servo Motor

Step Motor * 2

아두이노 개발 환경

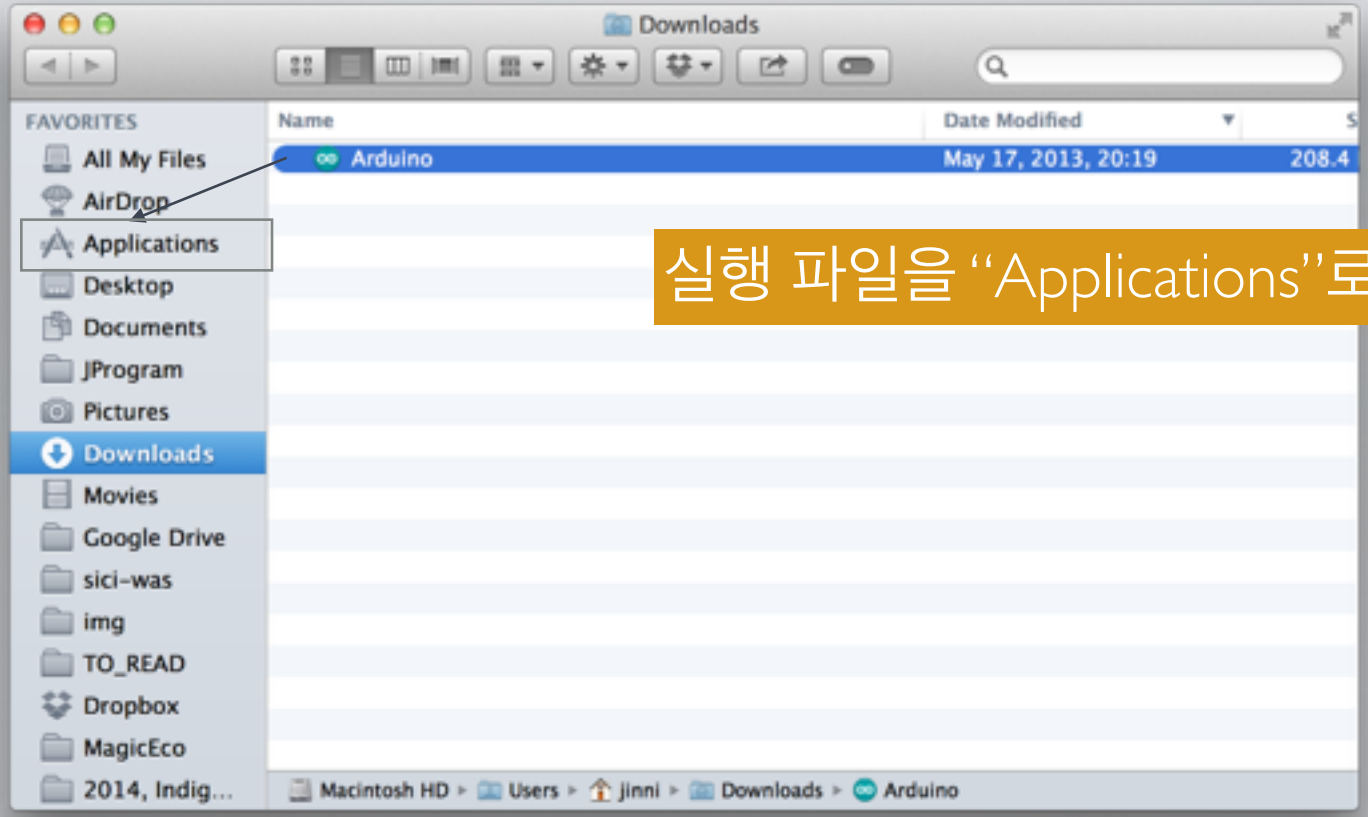
- IDE 설치
  - 드라이버 설치

IDE 다운 받기

DOWNLOAD 클릭

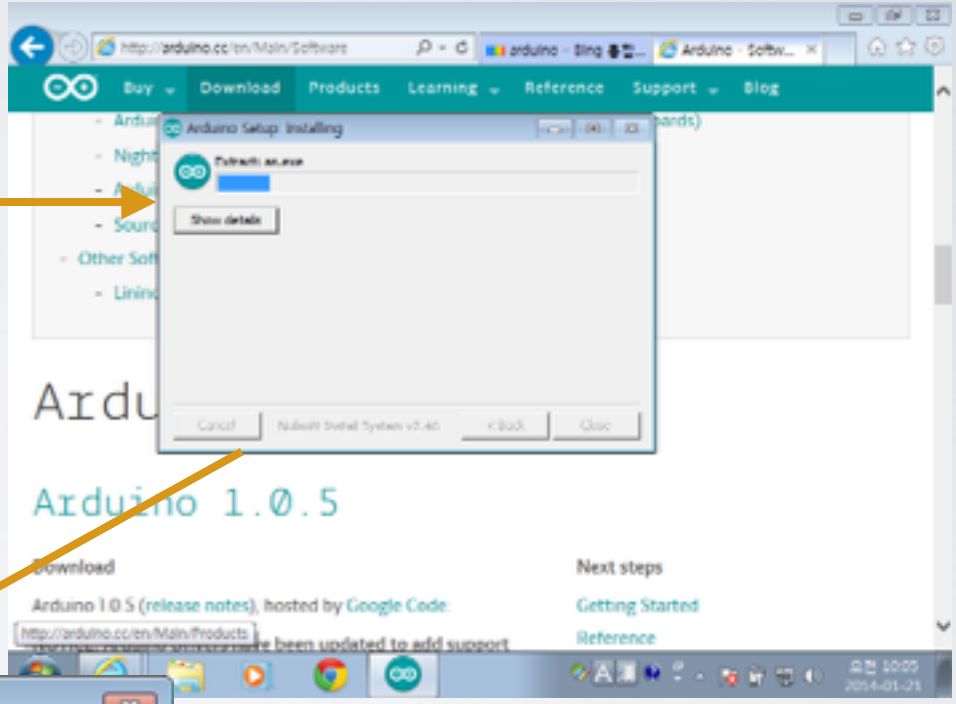
OS에 맞는 것으로 선택

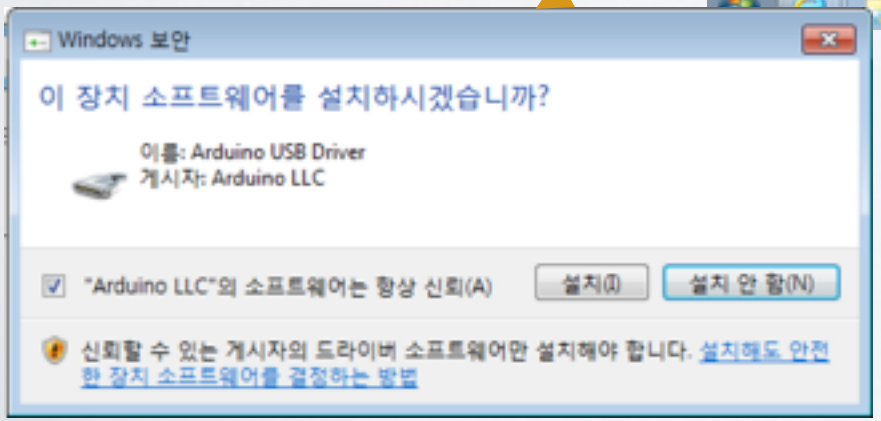
IDE 설치 - MAC



실행 파일을 "Applications"로 복사

IDE 설치 - WINDOW

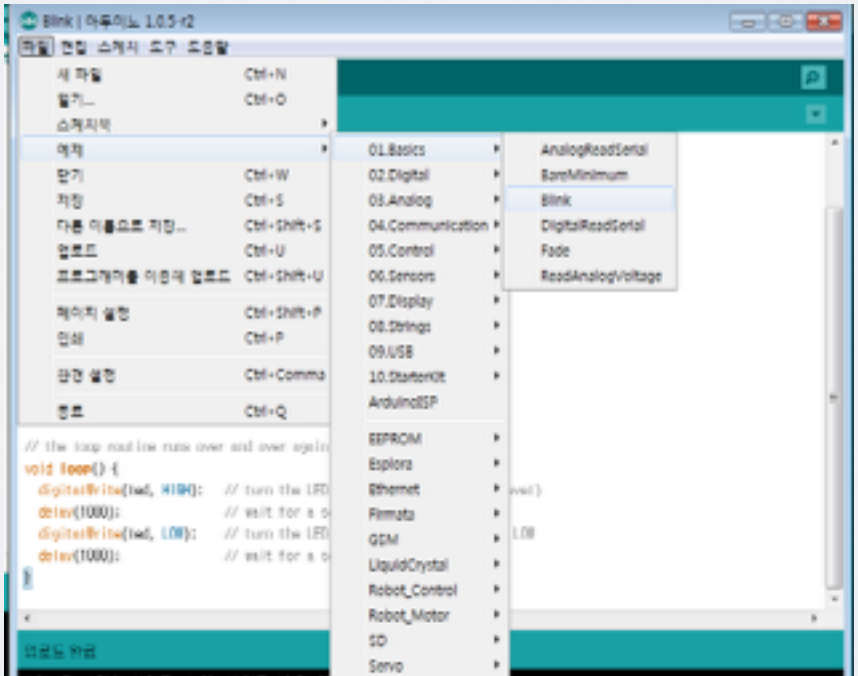




- USB Driver 설치
  - 아두이노와 연결을 위해

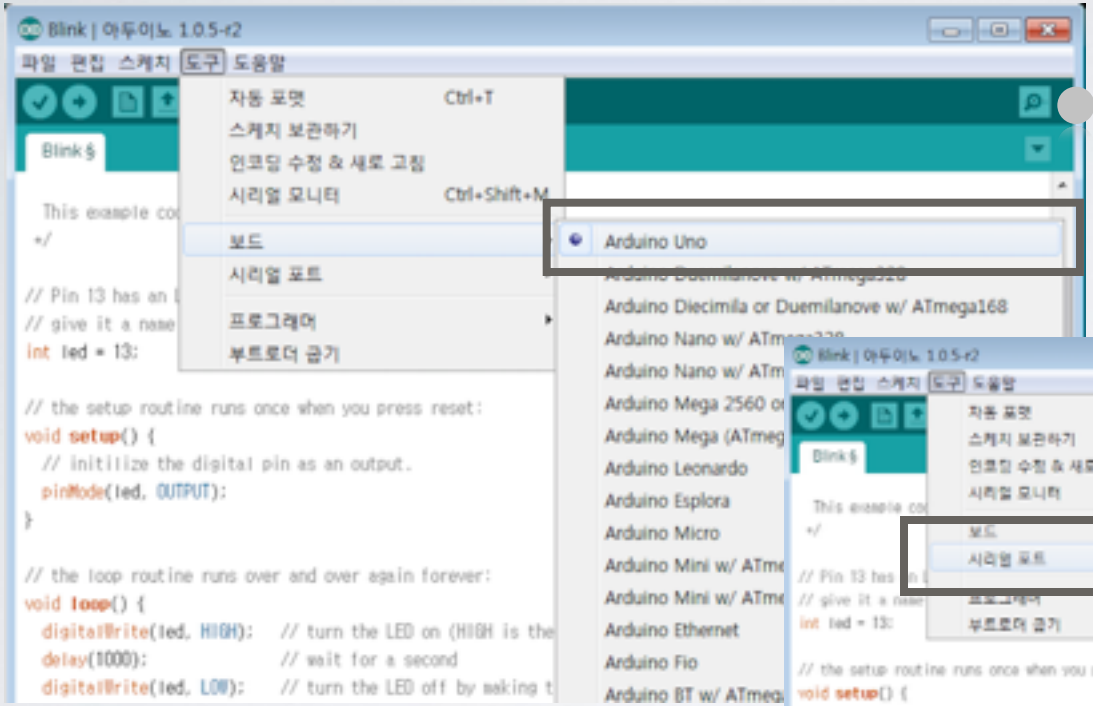
BOARD TEST

1. 보드를 **PC**에 연결

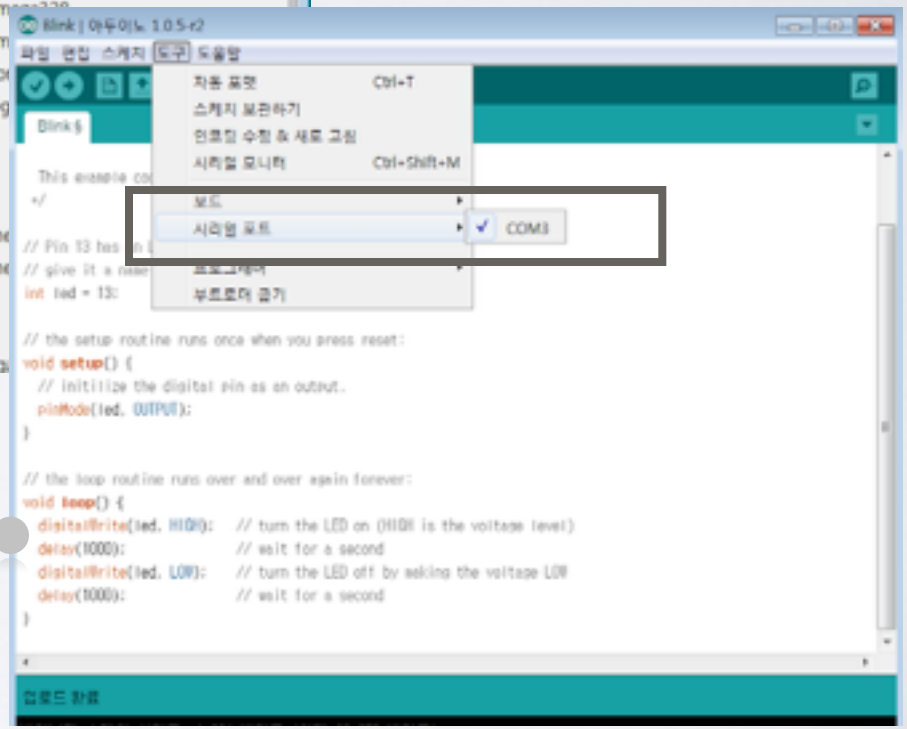


2. Blink 예제 로드

BOARD TEST



보드: **Arduino Uno**

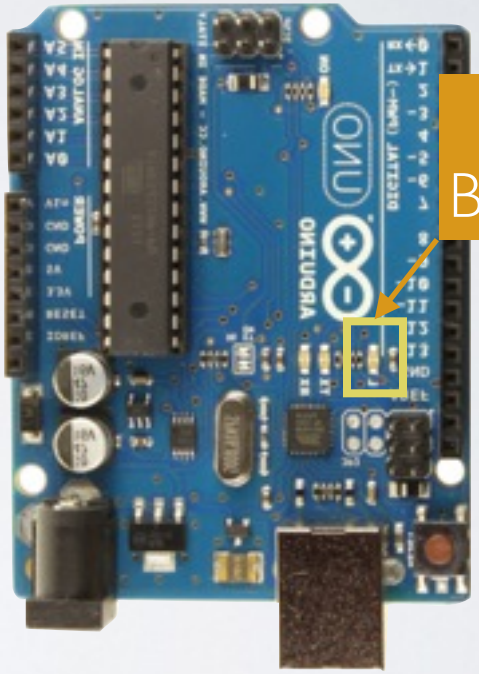


포트 : **COM3**

맥에서는
tty.usbmodem-xxxx 형태

보드 테스트

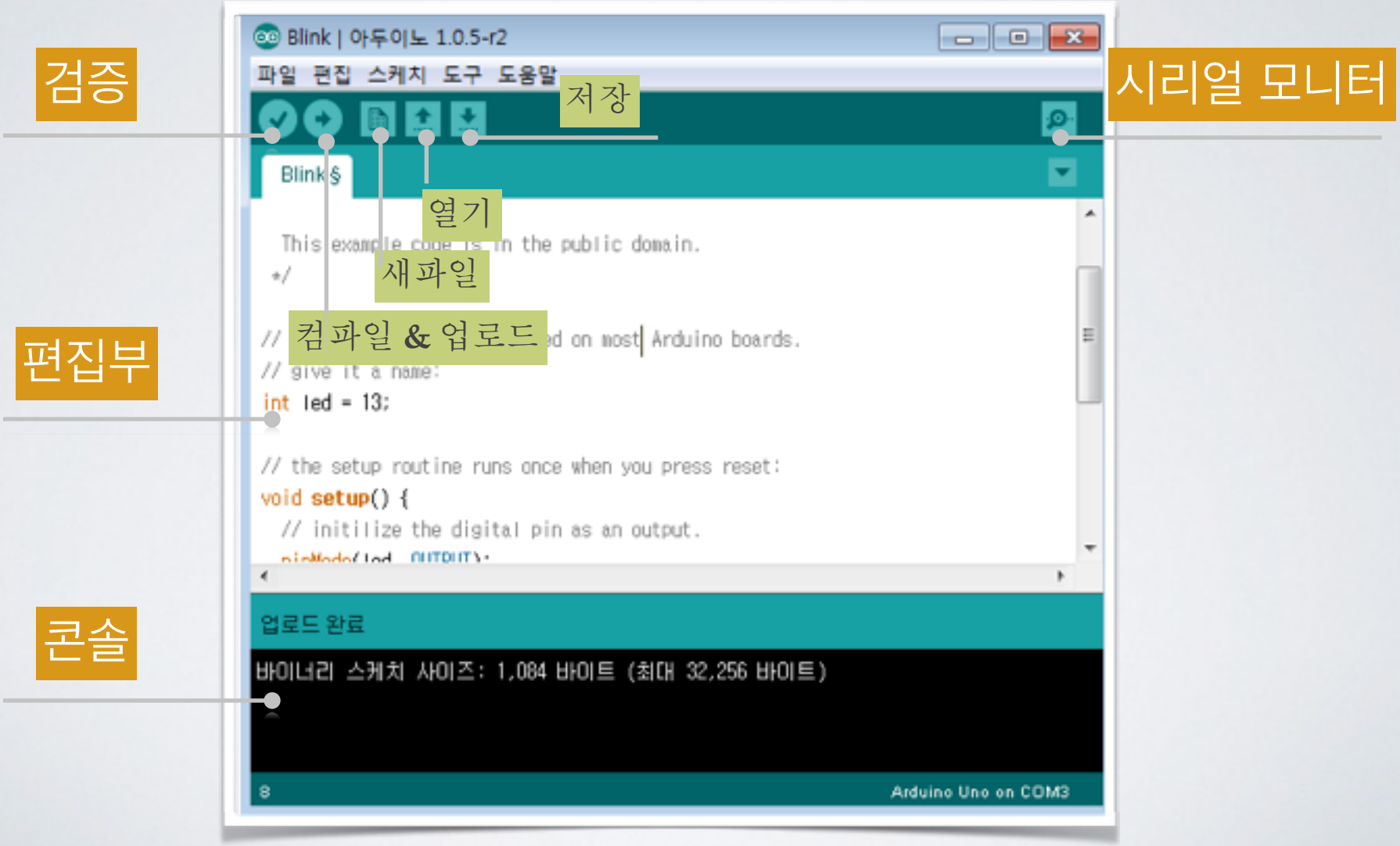

Compile & Upload
// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;
// the setup routine runs once when you press reset:
void setup() {
// initialize the digital pin as an output.
pinMode(led, OUTPUT);
}
// the loop routine runs over and over again forever:
void loop() {
digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage level)
delay(1000); // wait for a second
digitalWrite(led, LOW); // turn the LED off by making the voltage LOW
delay(1000); // wait for a second
}


LED
Blinking

IDE - SKETCH

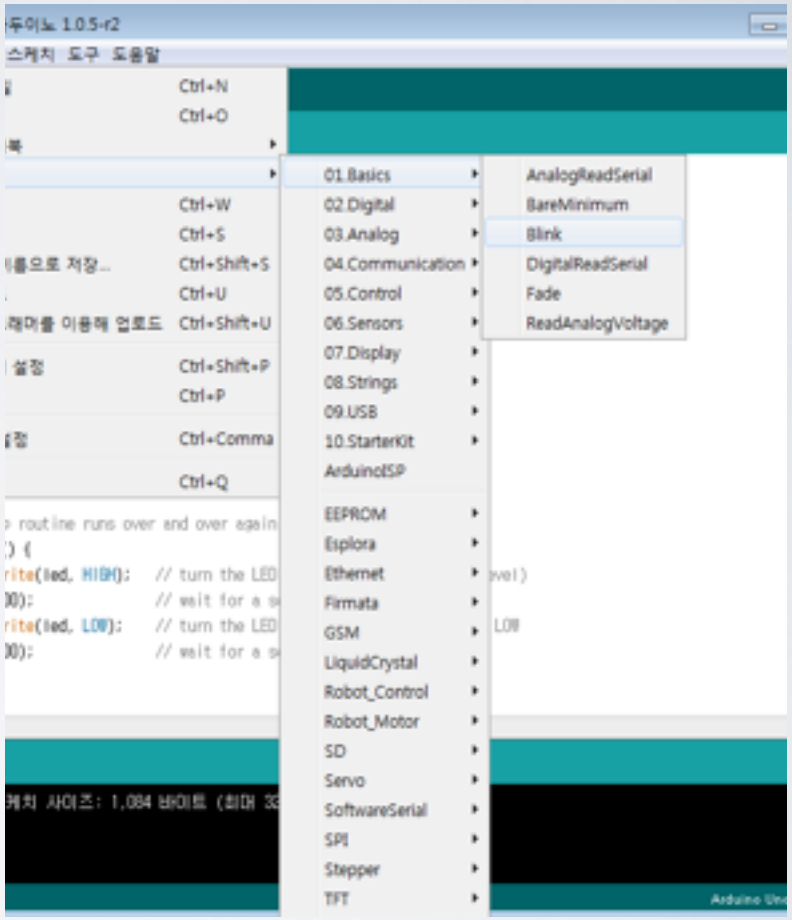

sketch_jul03a | Arduino 1.5.6-r2
sketch_jul03a
void setup() {
// put your setup code here, to run once:
}
void loop() {
// put your main code here, to run repeatedly:
}
1
Arduino Uno on /dev/cu.usbmodem1431

IDE 구성


검증
시리얼 모니터
저장
열기
새파일
컴파일 & 업로드
편집부
콘솔
Blink | 아두이노 1.0.5-r2
파일 편집 스케치 도구 도움말
Blink §
This example code is in the public domain.
*/
// give it a name:
int led = 13;
// the setup routine runs once when you press reset:
void setup() {
// initilize the digital pin as an output.
업로드 완료
바이너리 스케치 사이즈: 1,084 바이트 (최대 32,256 바이트)
8
Arduino Uno on COM3

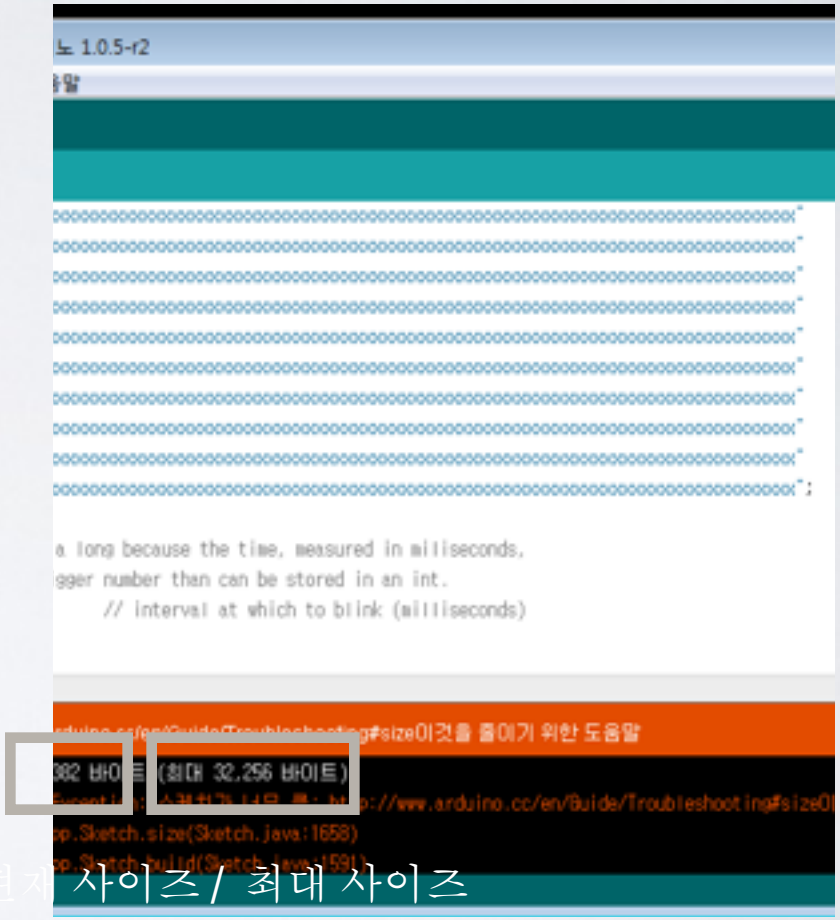
예제들

- 다양한 샘플들 지원
- 보드 동작 테스트를 위한 Blink
- Digtal / Analog 연결
- 각종 센서 소스들..



메시지는 콘솔에

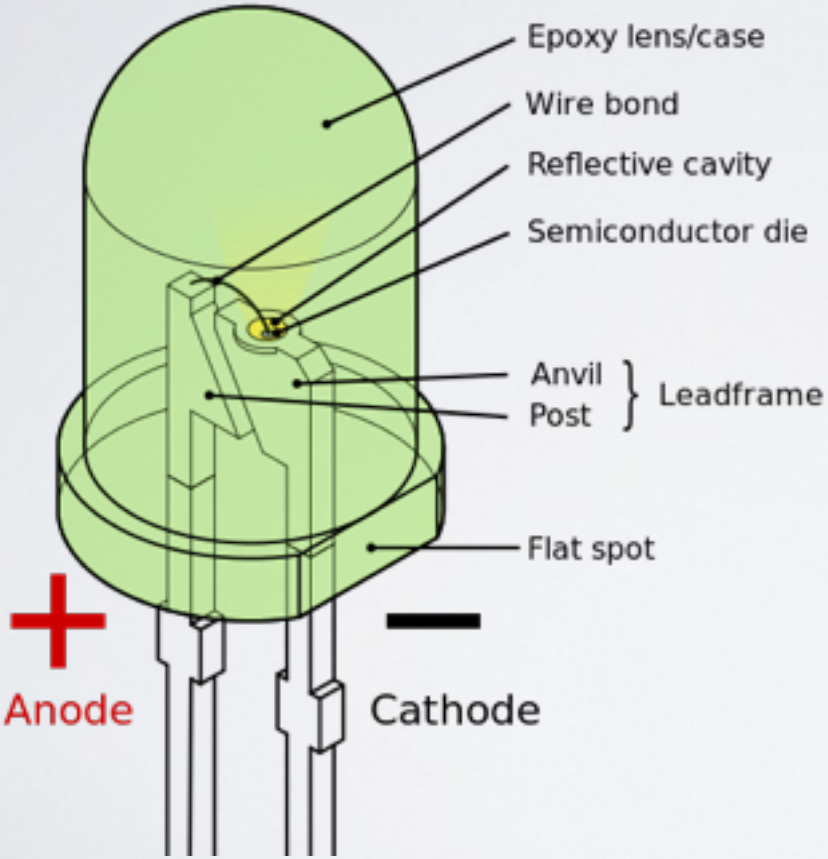
- 콘솔은 메시지가 출력됨
  - 현재 진행중인 동작
  - 에러
- 컴파일된 이미지 사이즈



현재 사이즈 / 최대 사이즈

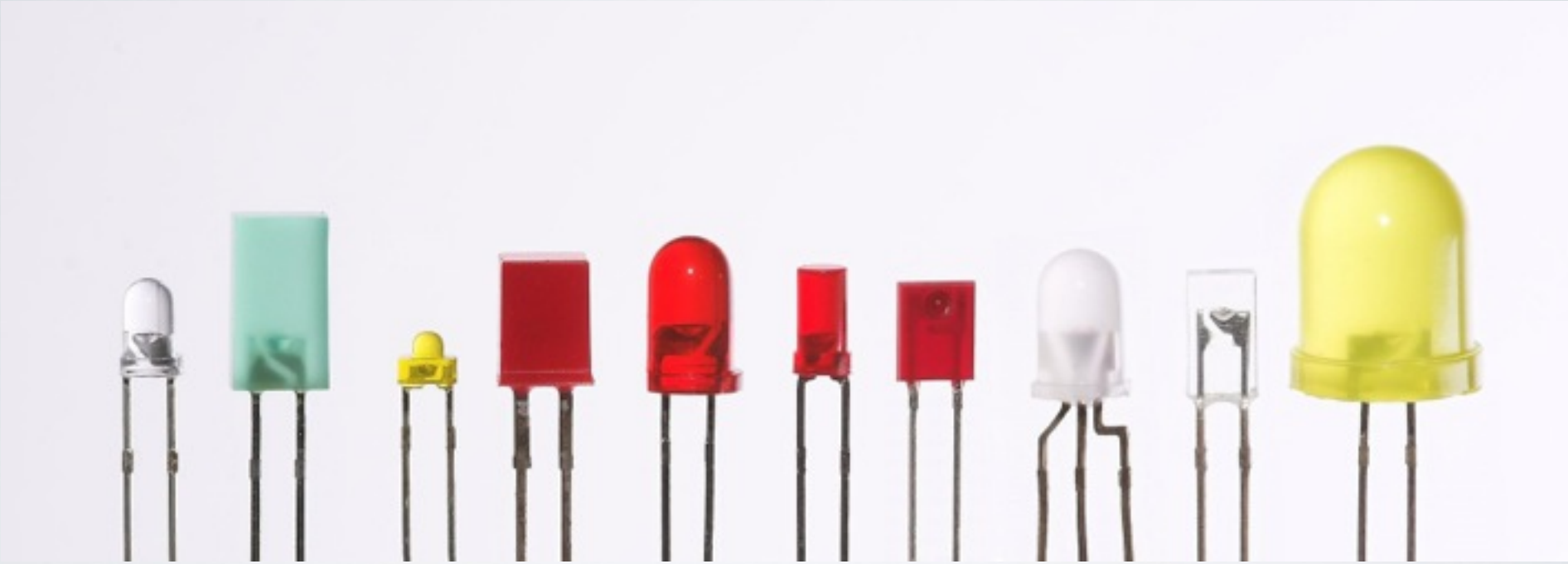
LED

WHAT IS "LED"



- 일리노이 대학의 닉 호로니악
- 1962년에 최초로 개발
- 전자가 직접 빛으로 변환
- 긴 수명
- 극성 존재

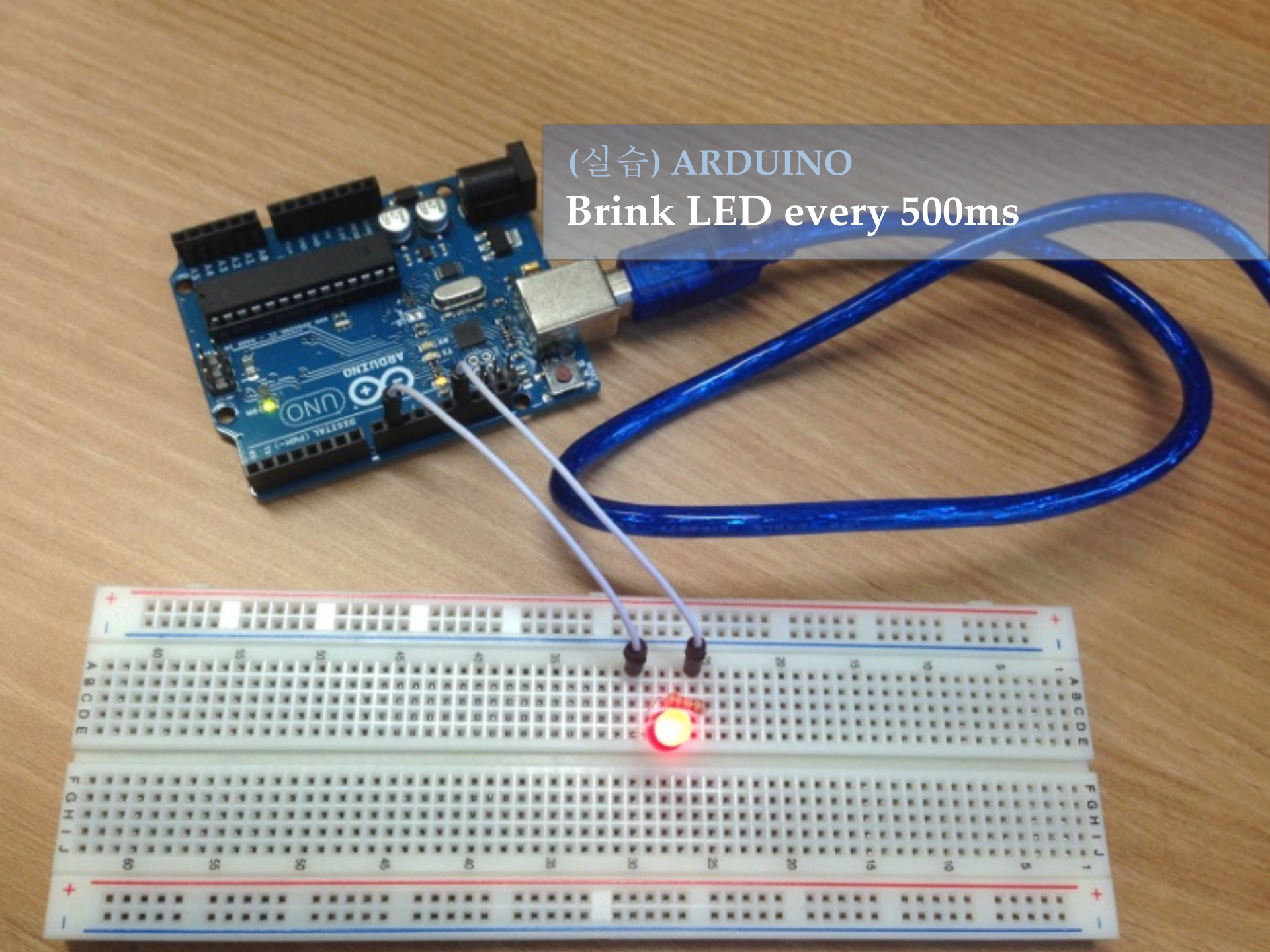
VARIOUS LED



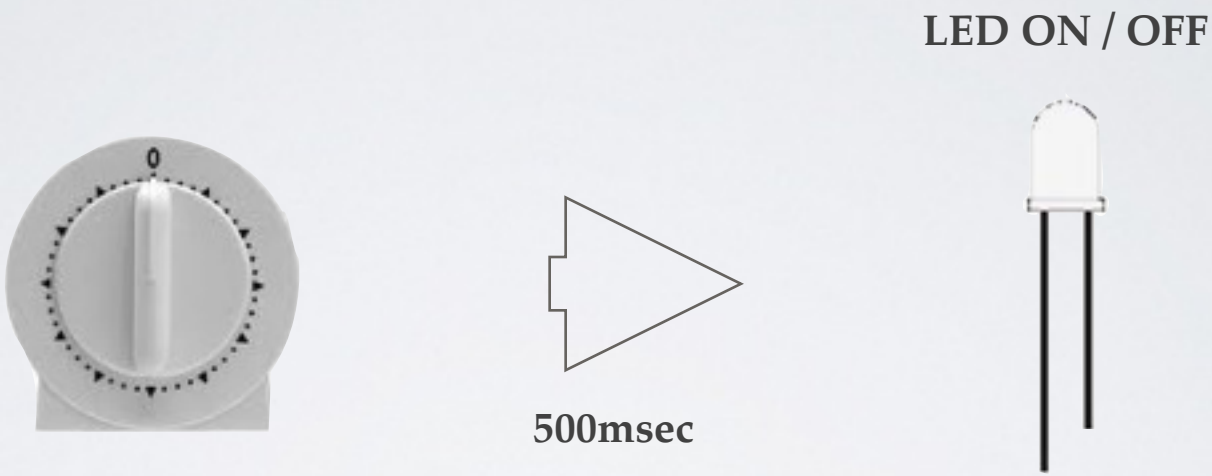
- 재료에 따라 다양한 색

(실습) ARDUINO

Brink LED every 500ms



FEATURE



- 500ms 마다 LED ON/OFF
- LED ON/OFF (디지털 핀 값 쓰기)

준비물

USB Cable

RED LED

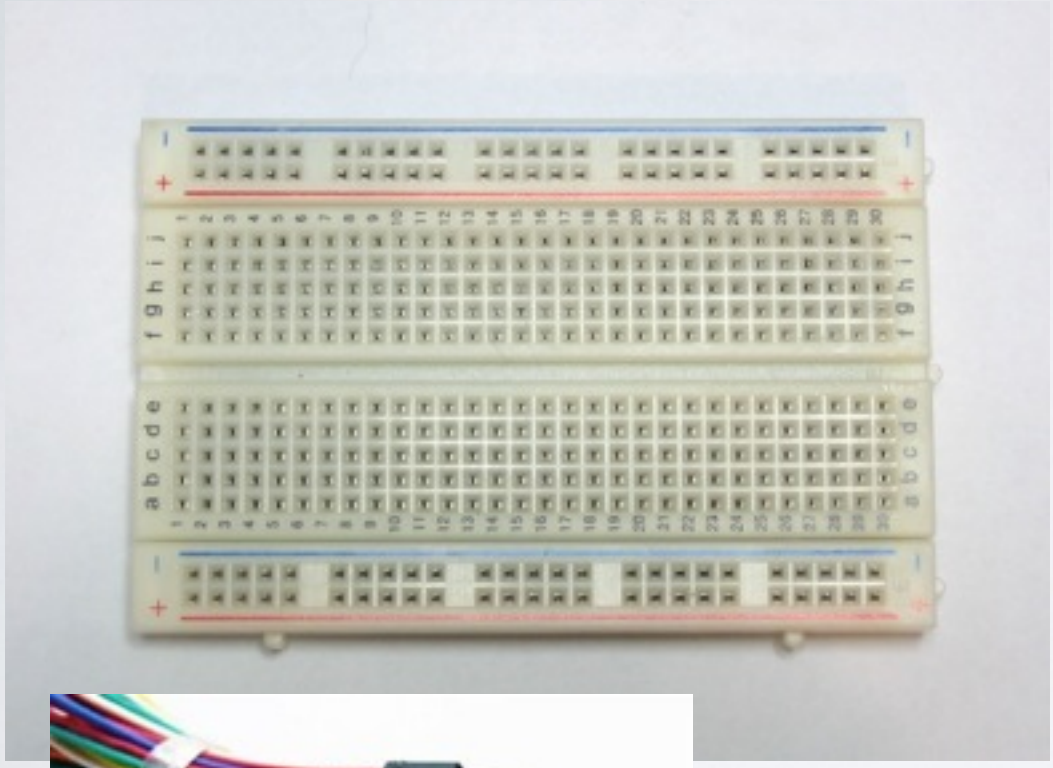
arduino

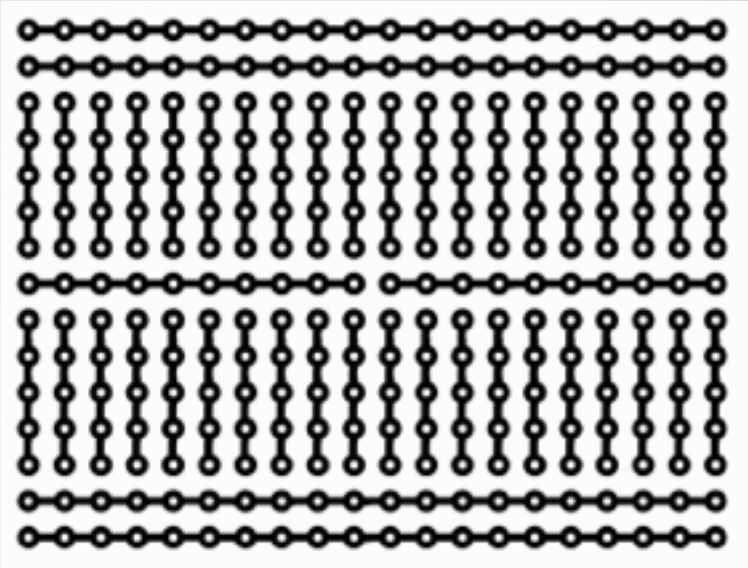
bread board

330 ohm register (주주갈)

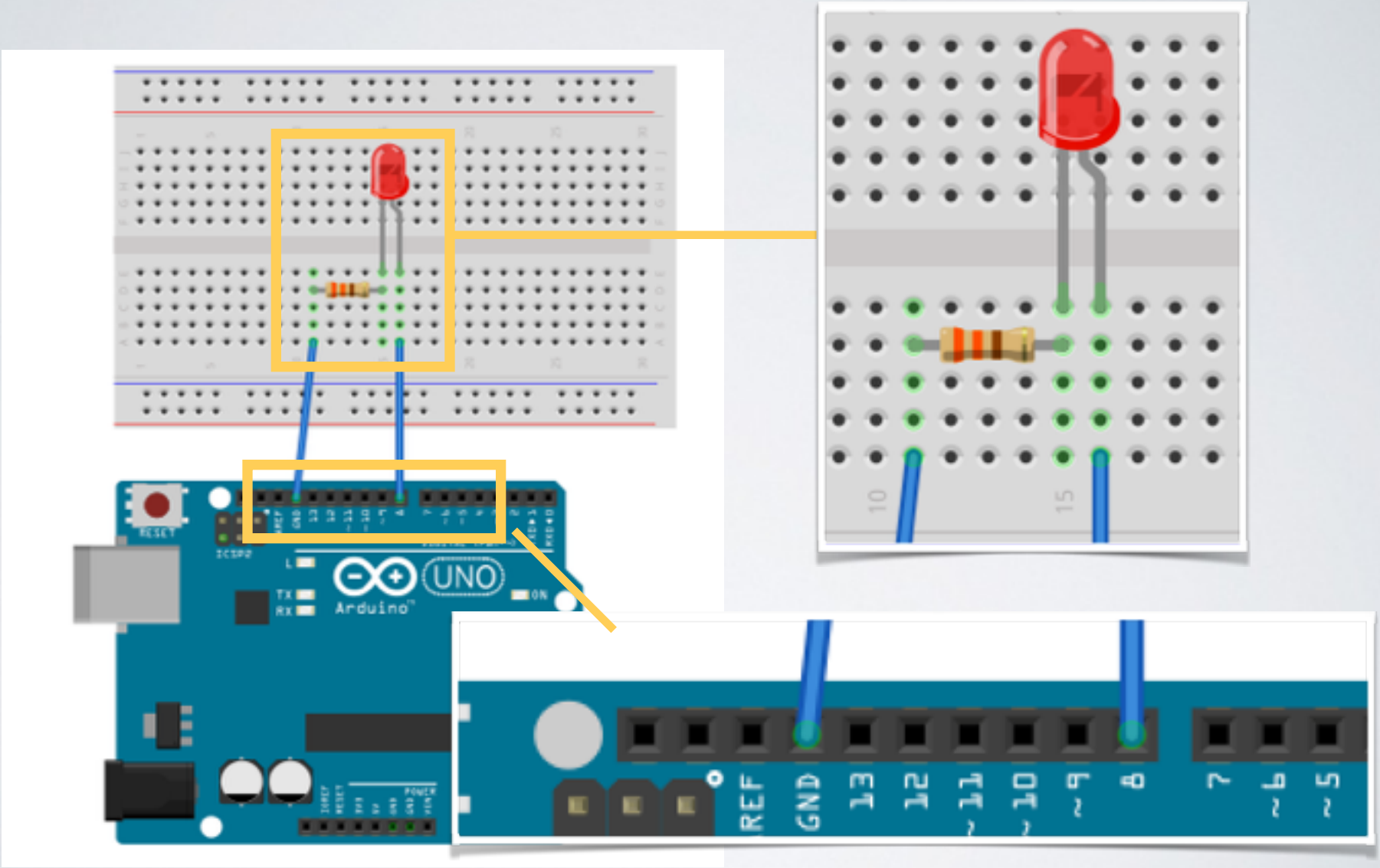
점퍼 케이블 * 2

BREAD BOARD & CABLE

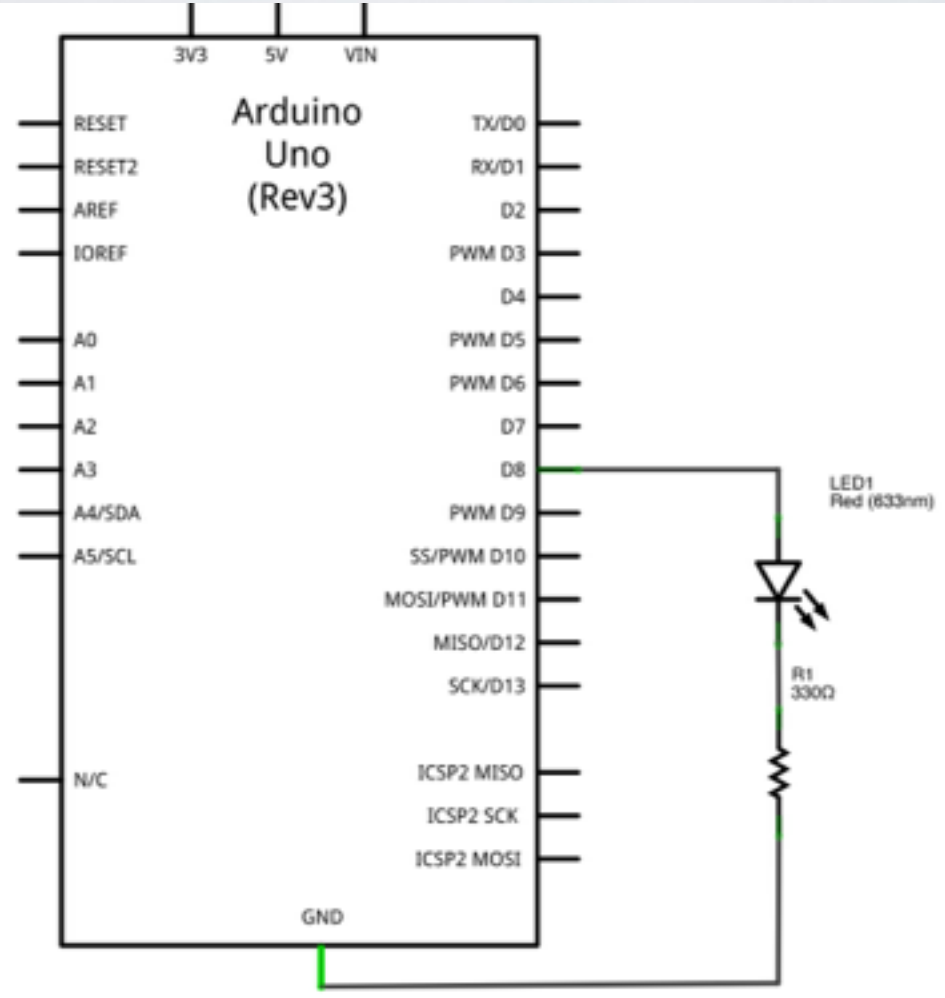




부품 연결



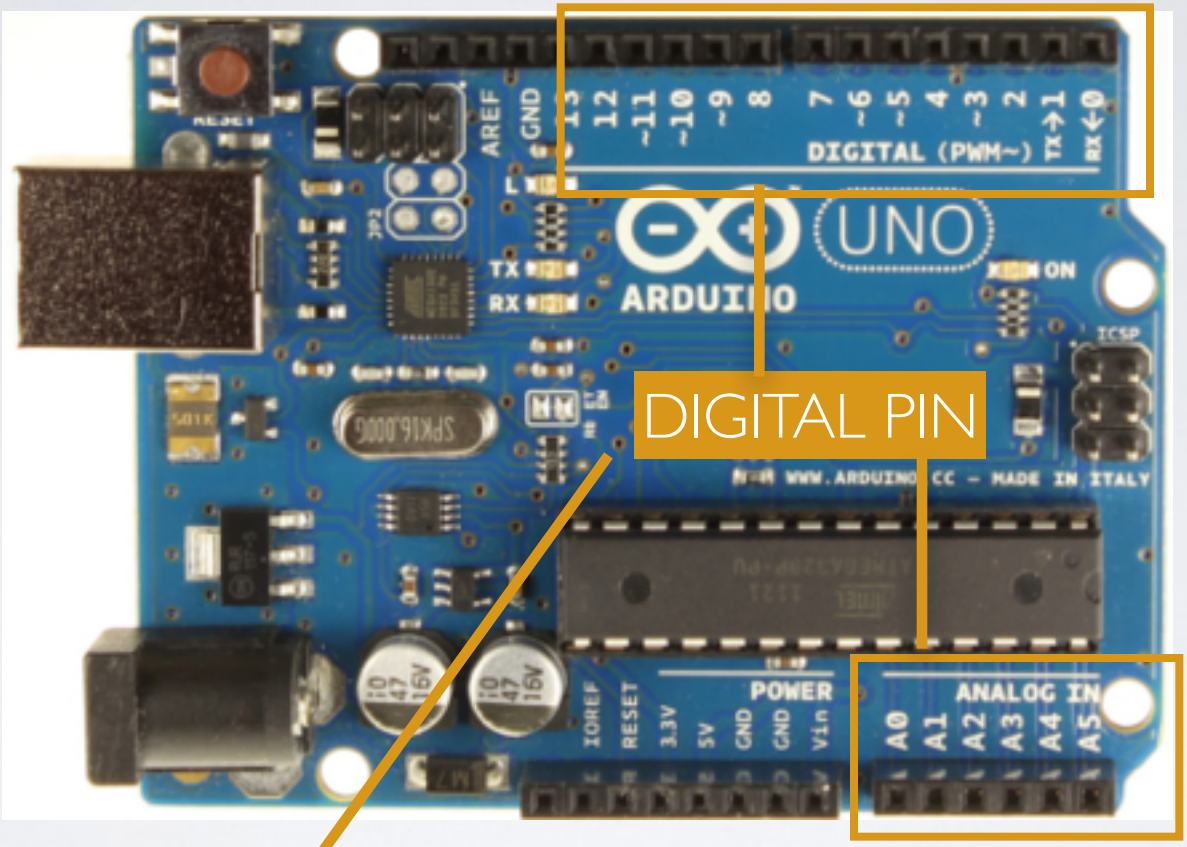
부품 회로도


3V3
5V
VIN
Arduino
Uno
(Rev3)
RESET
RESET2
AREF
IOREF
A0
A1
A2
A3
A4/SDA
A5/SCL
N/C
TX/D0
RX/D1
D2
PWM D3
D4
PWM D5
PWM D6
D7
D8
PWM D9
SS/PWM D10
MOSI/PWM D11
MISO/D12
SCK/D13
ICSP2 MISO
ICSP2 SCK
ICSP2 MOSI
GND
LED1
Red (633nm)
R1
330Ω

PROGRAM

- API
  - pinMode
  - digitalWrite
  - delay

API



pinMode(<pin id>, < INPUT or OUTPUT >)

API

digitalWrite(<pin id>, < HIGH or LOW >)

CAUTION

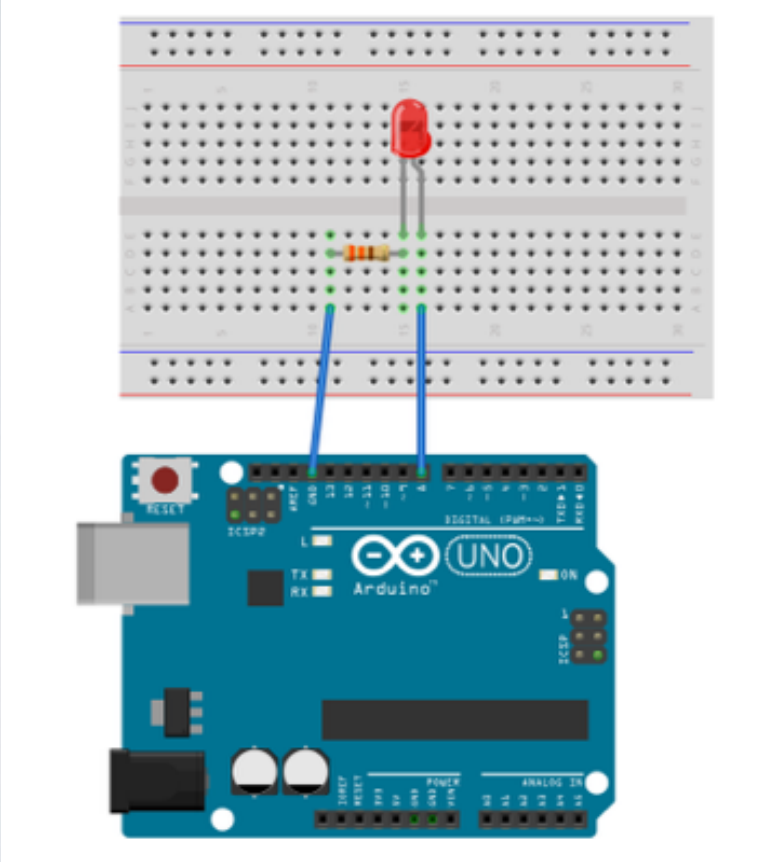
LED는 극성이 있어요.

- 긴쪽이 + 극, 짧은 쪽이 - 극

LED는 디지털 핀에 꽂으세요.

- LED를 제어하려면 디지털 핀에 연결
- 모드는 OUTPUT 모드로

FAQ



- 저항의 목적?
  - LED 보호
- 저항을 + 쪽으로 이동해도 되는가?
  - 저항은 어느쪽으로 와도 됨

저항값 읽기

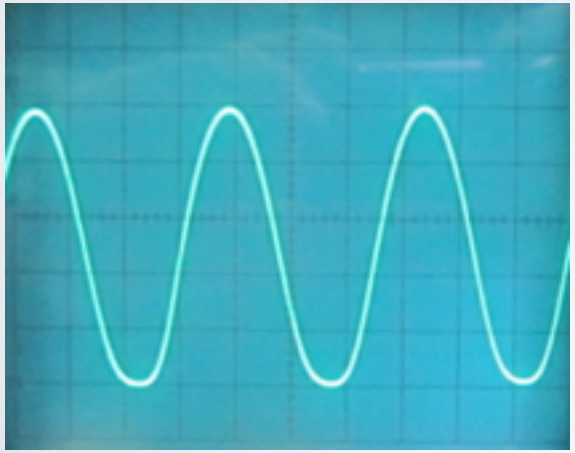
끝에서부터 color까지의폭이
좁은쪽 부터 읽어나갑니다.

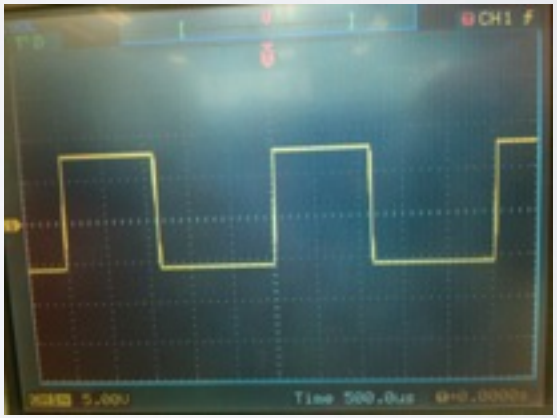
제4색띠 : 저항값의 오차표시
제3색띠 : 셋째 수
(곱하는수,0의 갯수)
제2색띠 : 둘째 수
제1색띠 : 첫째 수

	제1색띠	제2색띠	제3색띠	저항오차	
1)	주황	주황	적색	금색	
	3	3	100	±5% ->	3300Ω = 3,3kΩ,오차±5%
2)	갈색	흑색	금색	금색	
	1	0	0,1	±5% ->	1Ω,오차±5%
3)	노랑	보라	노랑	금색	
	4	7	10000	±5% ->	470000Ω = 470kΩ,오차±5%

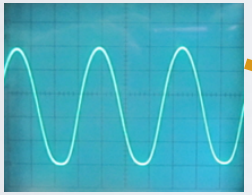
색 상 COLOR		저 항 환 산 표			
		첫째 수	둘째 수	셋째 수(곱하는 수)	오차표시
	검 정(흑색)	0	0	1	
	밤 색(갈색)	1	1	10	
	빨 강(적색)	2	2	100	
	주황색(등색)	3	3	1000	
	노 랑(황색)	4	4	10000	
	초록색(녹색)	5	5	100000	
	파랑색(청색)	6	6	1000000	
	보라색(자색)	7	7	10000000	
	회 색(회색)	8	8	100000000	
	흰 색(백색)	9	9	1000000000	
	금 색			0,1	± 5%
	은 색			0,01	± 10%
	무 색				± 20%

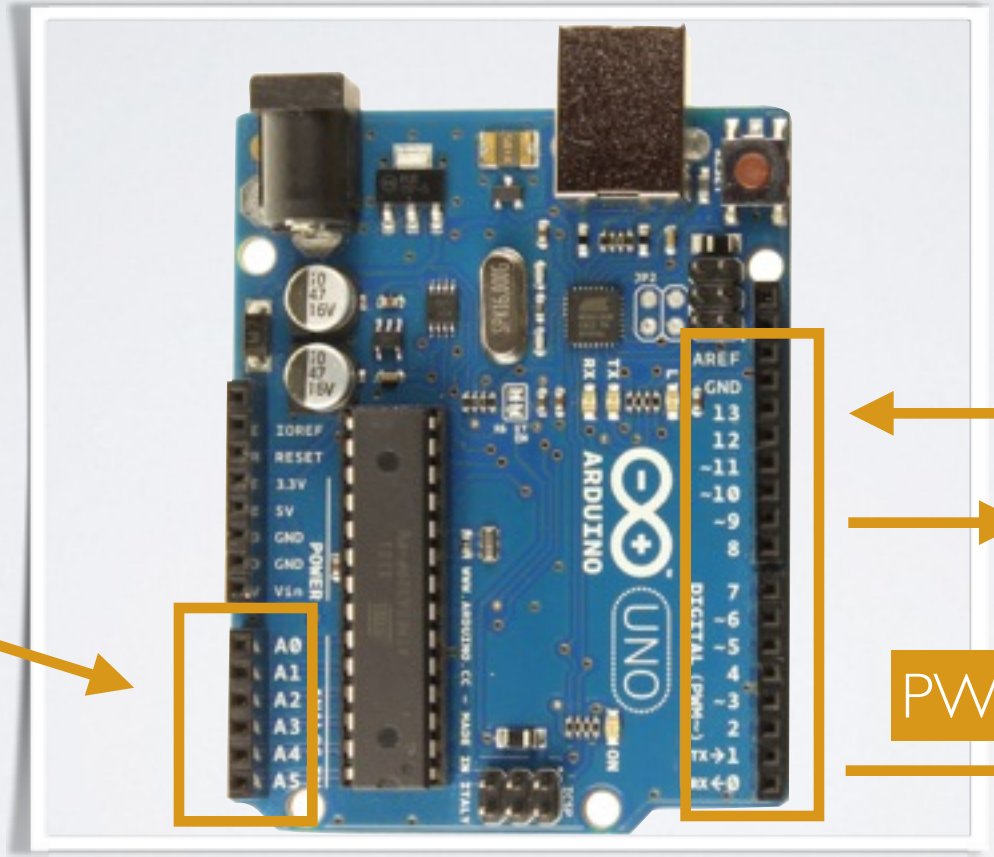
DIGITAL VS. ANALOG

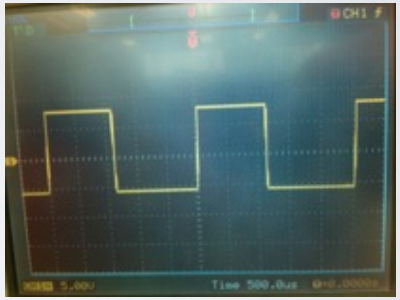




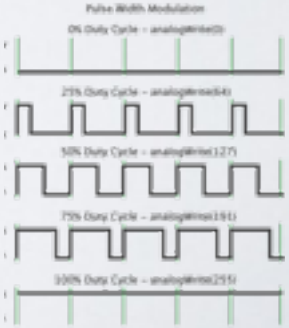
DIGITAL VS. ANALOG

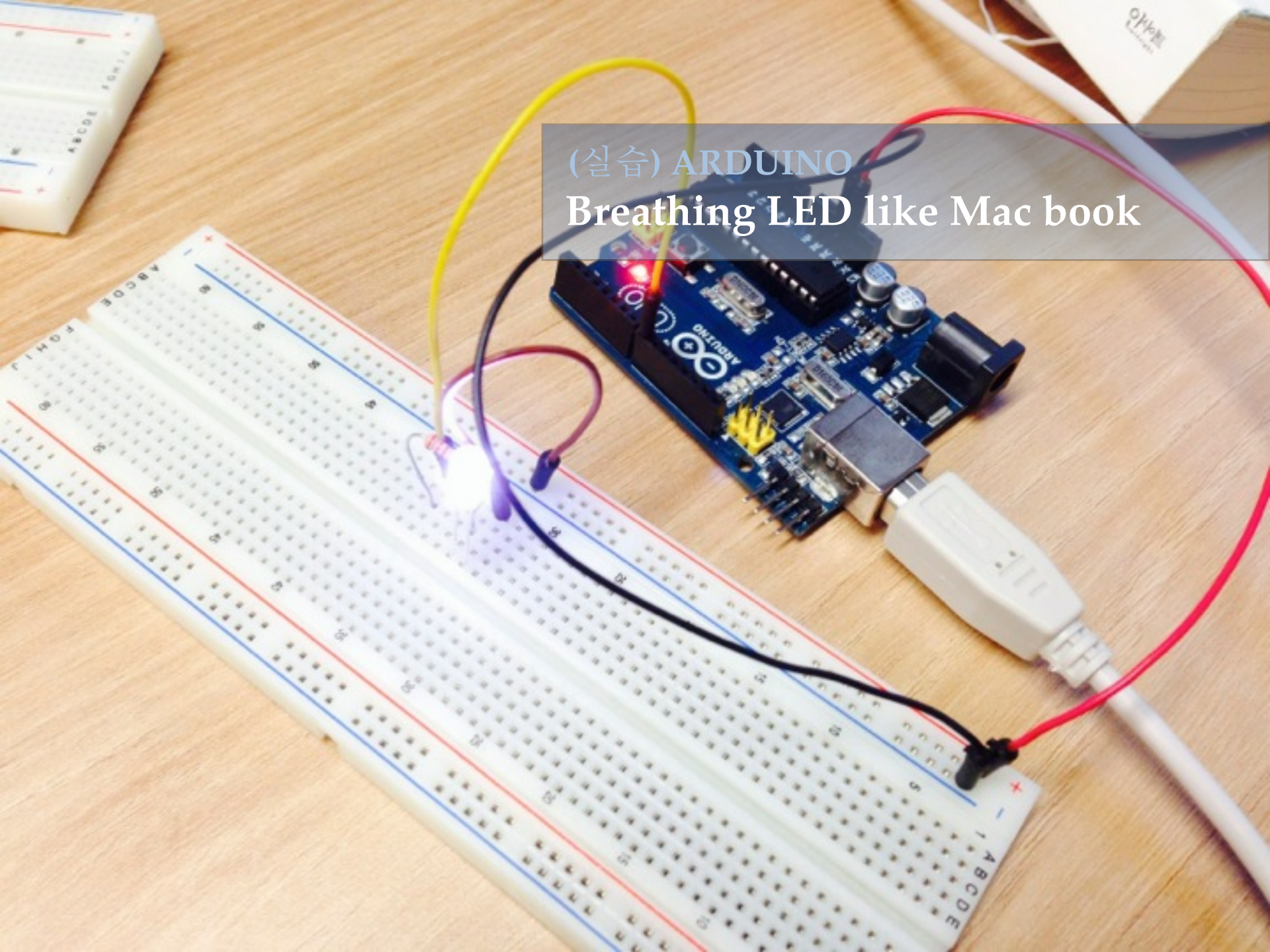






PWM





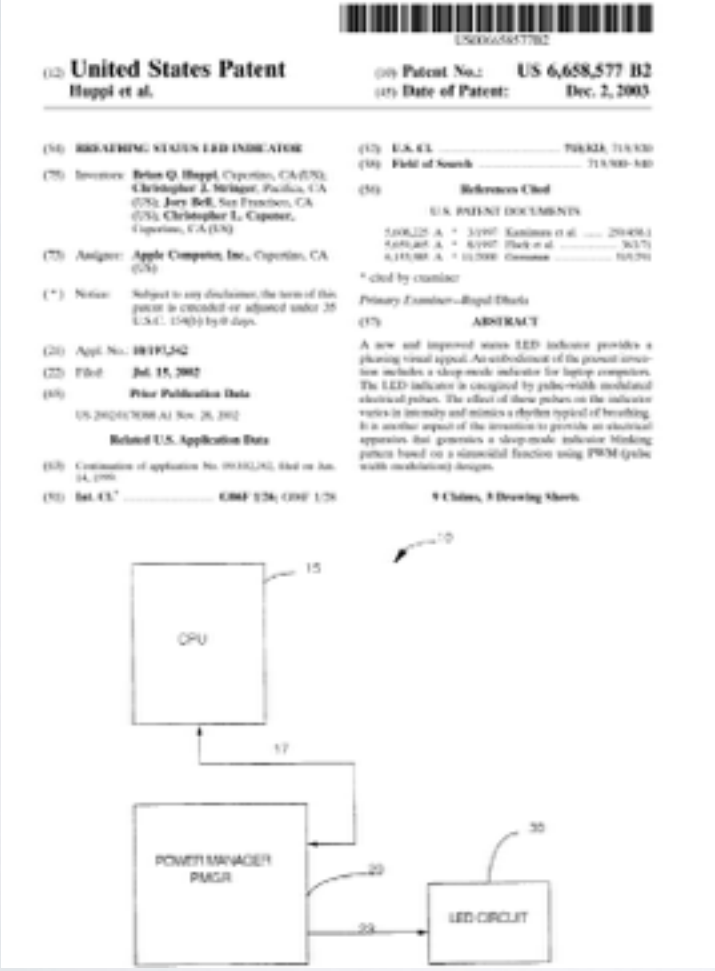
(실습) ARDUINO

Breathing LED like Mac book

감성적인 LED

youtube link

감성적인 LED



(12) **United States Patent**
Huppi et al.

(10) **Patent No.: US 6,658,577 B2**
(45) **Date of Patent: Dec. 2, 2003**

(54) **BREATHING STATUS LED INDICATOR**

(75) Inventors: **Brian Q. Huppi**, Cupertino, CA (US); **Christopher J. Stringer**, Pacifica, CA (US); **Joey Bell**, San Francisco, CA (US); **Christopher L. Cypster**, Cupertino, CA (US)

(73) Assignee: **Apple Computer, Inc.**, Cupertino, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/197,242**

(22) Filed: **Jul. 15, 2002**

(65) **Prior Publication Data**

US 2002/0170008 A1 Nov. 28, 2002

Related U.S. Application Data

(63) Continuation of application No. 09/102,242, filed on Jun. 24, 1998.

(51) **Int. Cl.**[7] **G06F 1/26**; G06F 1/28

(52) **U.S. Cl.** **713/323**; 713/330

(58) **Field of Search** 713/300–340

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,608,225 A * 3/1997 Kanninen et al. 250/458.1
5,656,805 A * 8/1997 Black et al. 361/75
6,145,085 A * 11/2000 Gossman 713/501

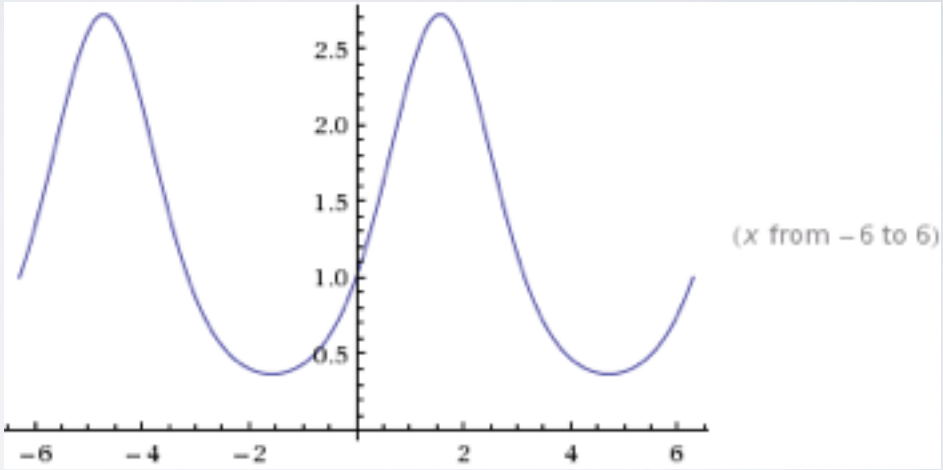
* cited by examiner

Primary Examiner—Rupal Dharia

(57) **ABSTRACT**

A new and improved status LED indicator provides a pleasing visual appeal. An embodiment of the present invention includes a sleep-mode indicator for laptop computers. The LED indicator is energized by pulse-width modulated electrical pulses. The effect of these pulses on the indicator varies in intensity and mimics a rhythm typical of breathing. It is another aspect of the invention to provide an electrical apparatus that generates a sleep-mode indicator blinking pattern based on a sinusoidal function using PWM (pulse width modulation) designs.

9 Claims, 3 Drawing Sheets

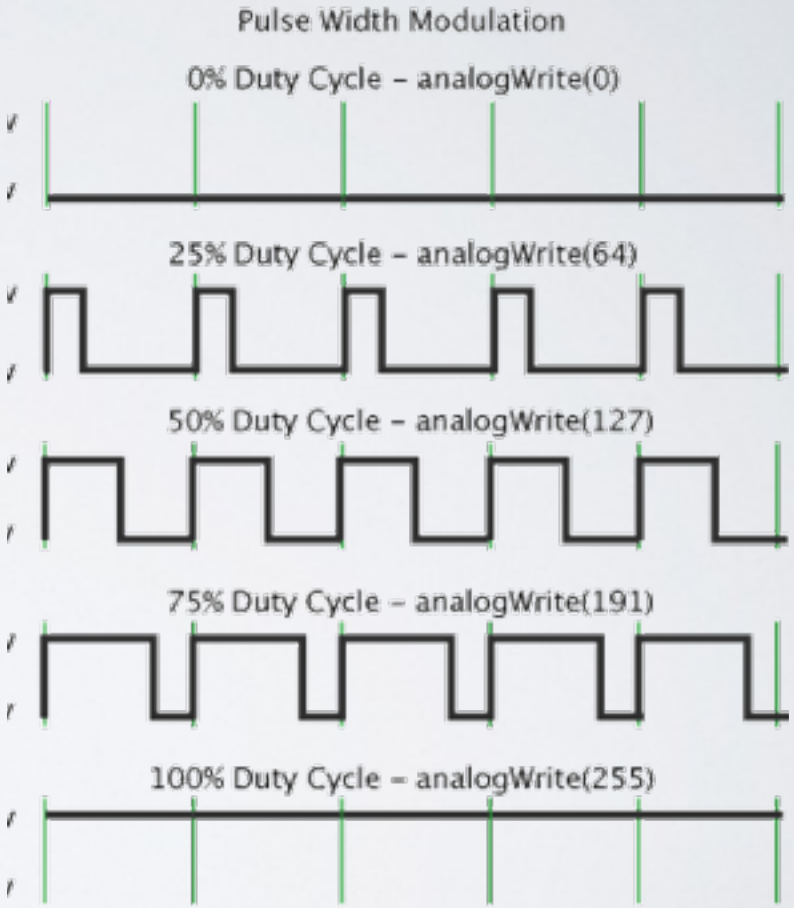


$$\left(\exp(\sin(x)) - \frac{1}{e}\right) \times \frac{255}{e - \frac{1}{e}}$$

PWM (펄스 폭 변조)

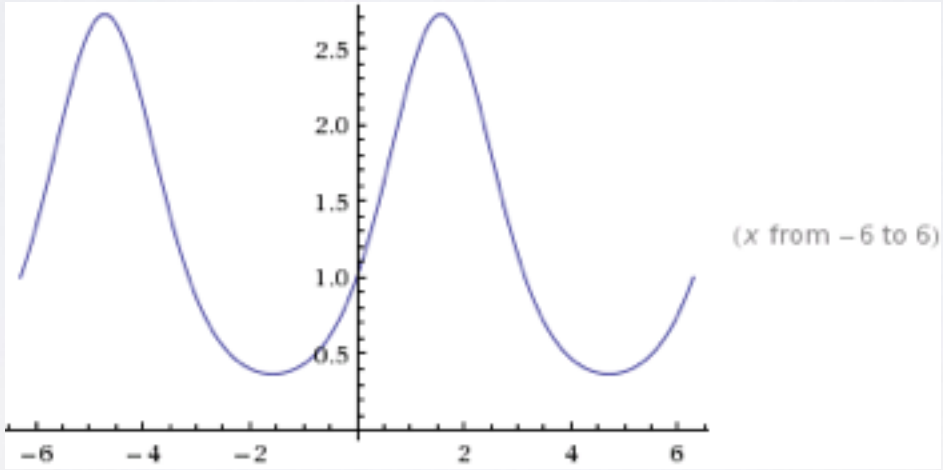
- 디지털 신호를 이용해서 아날로그 전압 출력
  ex) 0, 5V로 2.5V를 출력할 방법

- analogWrite API 사용
  0~255범위의 값



기능

- 맥북의 LED 처럼 깜빡이는 불빛을 낸다.



준비물

USB Cable

RED LED

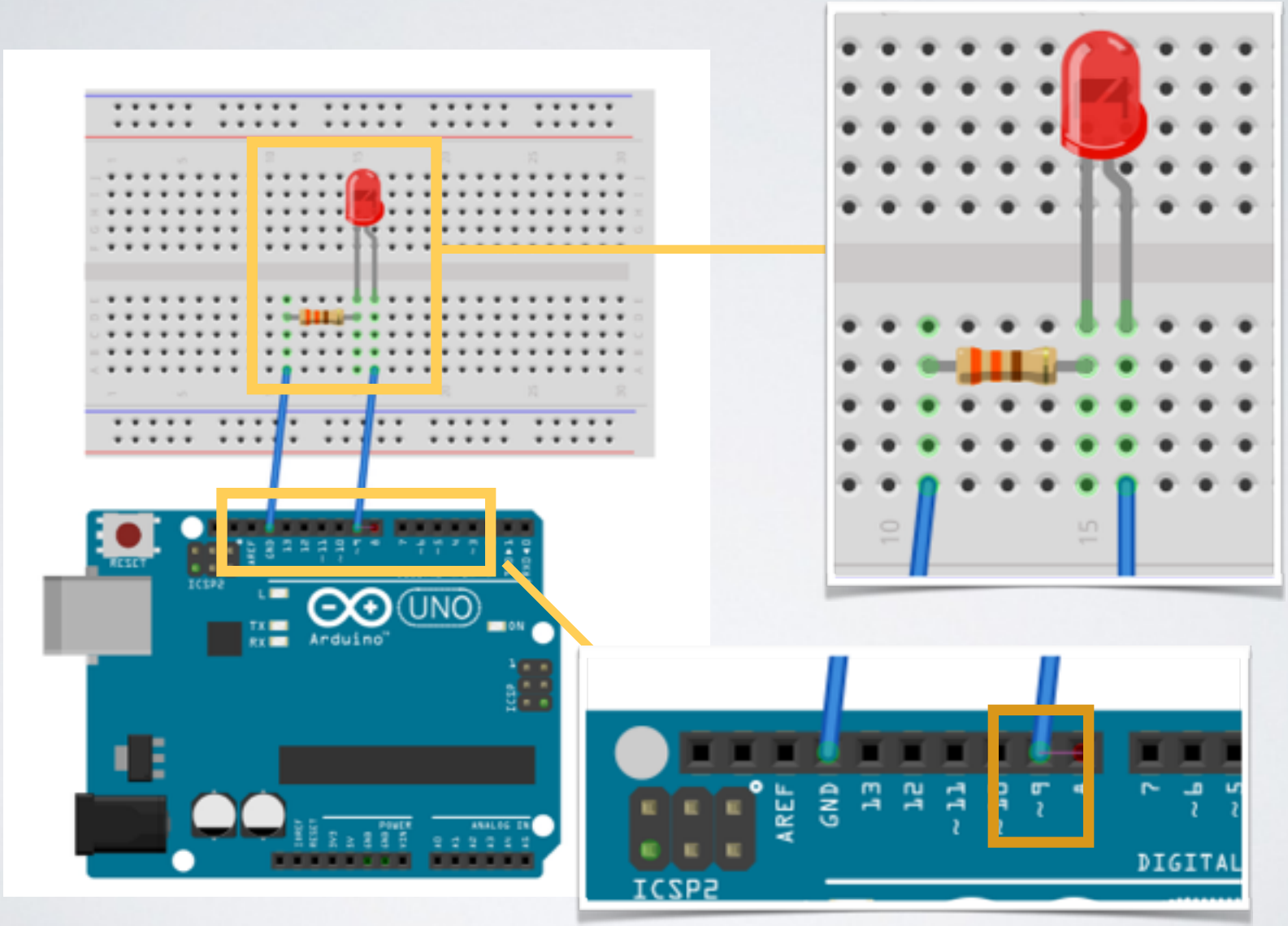
arduino

bread board

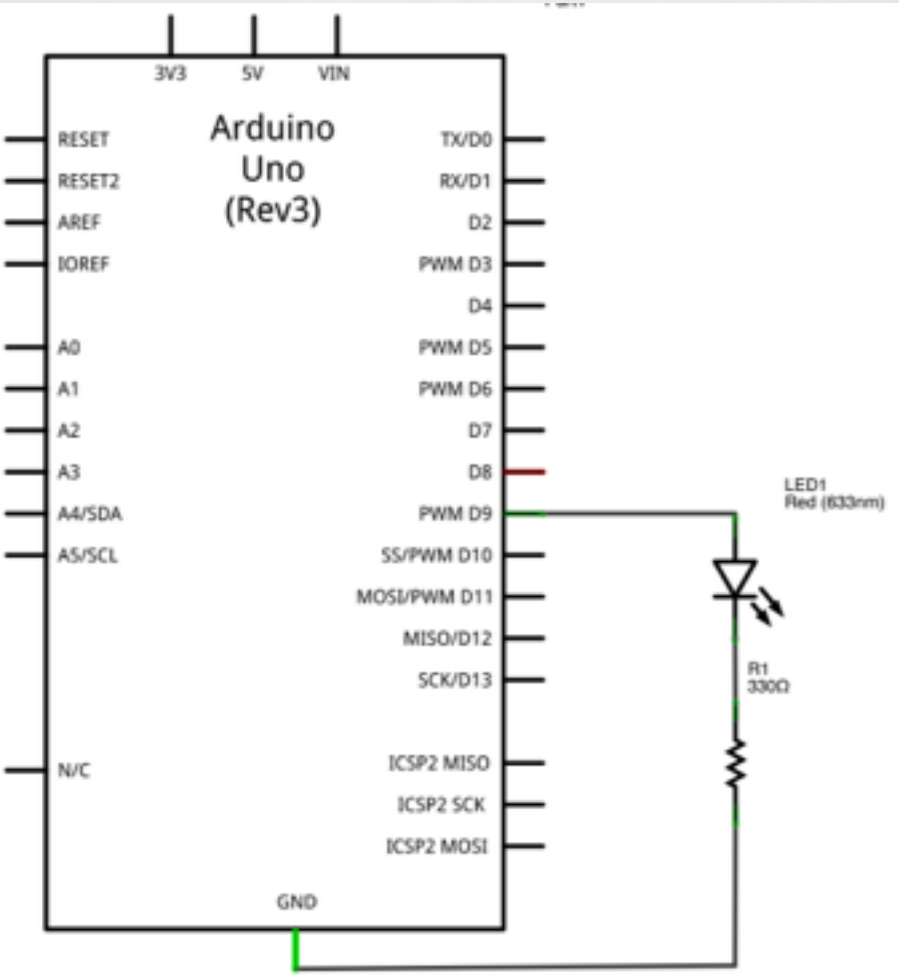
330 ohm register (주주갈)

wire * 2

부품 연결



부품 회로도


3V3
5V
VIN
Arduino
Uno
(Rev3)
RESET
RESET2
AREF
IOREF
A0
A1
A2
A3
A4/SDA
A5/SCL
N/C
TX/D0
RX/D1
D2
PWM D3
D4
PWM D5
PWM D6
D7
D8
PWM D9
SS/PWM D10
MOSI/PWM D11
MISO/D12
SCK/D13
ICSP2 MISO
ICSP2 SCK
ICSP2 MOSI
GND
LED1
Red (633nm)
R1
330Ω

PROGRAM

Breathing_LED

```
1  const int ledPin = 9;
2
3  void setup() {
4  }
5
6  void loop() {
7    float val = ( exp(sin(millis() / 2000.0 * PI)) - 0.36787944) * 108.0;
8    analogWrite( ledPin, val);
9  }
10
11
```

$$\left(\exp(\sin(x)) - \frac{1}{e}\right) \times \frac{255}{e - \frac{1}{e}}$$

1: 사용할 핀은 9번

7: 밝기를 조절

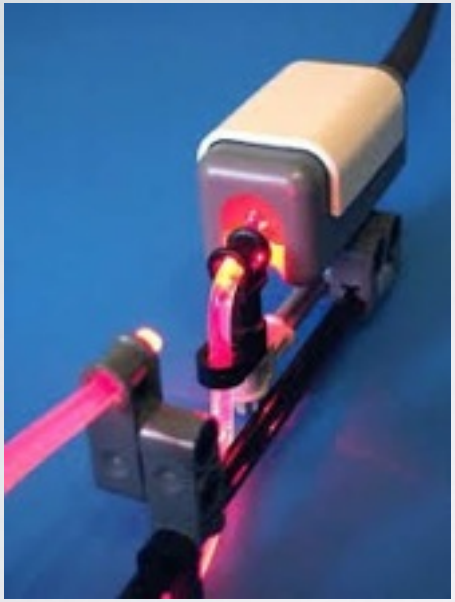
8: LED 켜기

API:

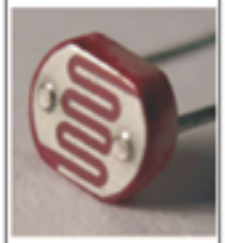
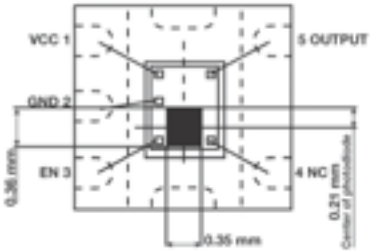
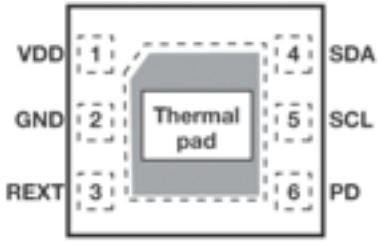
- millis()
- exp()
- sin()
- analogWrite()

LIGHT SENSOR

LIGHT SENSOR

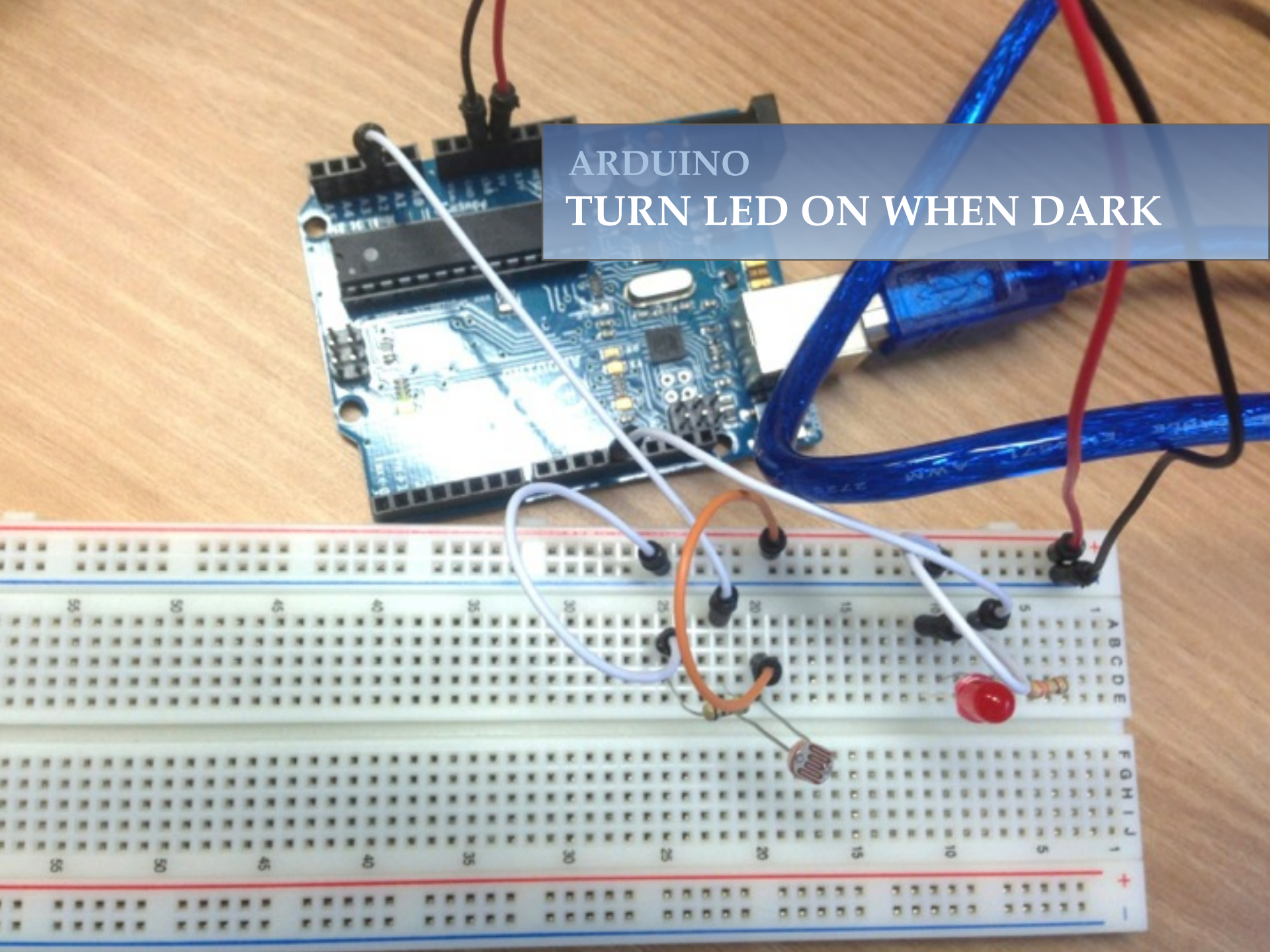


종류

Device	Photo resistor	Photo diode	Photo transistor	Photo diode and current amplifier	Photo diode, current amp, ADC and filter
Referenced part #	PDV-P500X	Everlight DTD-15	Everlight DPT-092	EL7900	ISL29001
					
Accuracy	Not guaranteed	Not guaranteed	± 75%	± 33%	15-bit resolution
Current (1000 lux)	Varies	3 μA	2.6 mA (70 klux)	0.9 mA	0.3 mA
Range	1 to 100 lux	7 to 50 klux	1 k to 100 klux	1 to 100 klux	0.3 to 10 klux
Response time	55 ms	6 ns	15 μs	0.5 ms	100 ms
Enable function	No	No	No	Yes	Yes

광도

0.27 lux	맑은 밤의 보름달[1][2]
1 lux	열대 위도를 덮은 보름달[3]
3.4 lux	맑은 하늘 아래의 어두운 황혼[4]
50 lux	거실[5]
80 lux	복도/화장실[6]
100 lux	매우 어두운 낮[1]
320 lux	권장 오피스 조명 (오스트레일리아)[7]
400 lux	맑은 날의 해돋이 또는 해넘이
1000 lux	인공 조명[1]; 일반적인 TV 스튜디오 조명
10,000–25,000 lux	낮 (직사광선이 없을 때)[1]
32,000–130,000 lux	직사광선



ARDUINO

TURN LED ON WHEN DARK

FEATURE

- 어두우면 LED를 켜고
- 밝으면 LED를 끈다.

준비물

USB Cable

LIGHT SENSOR

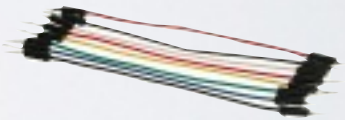
RED LED

arduino

bread board

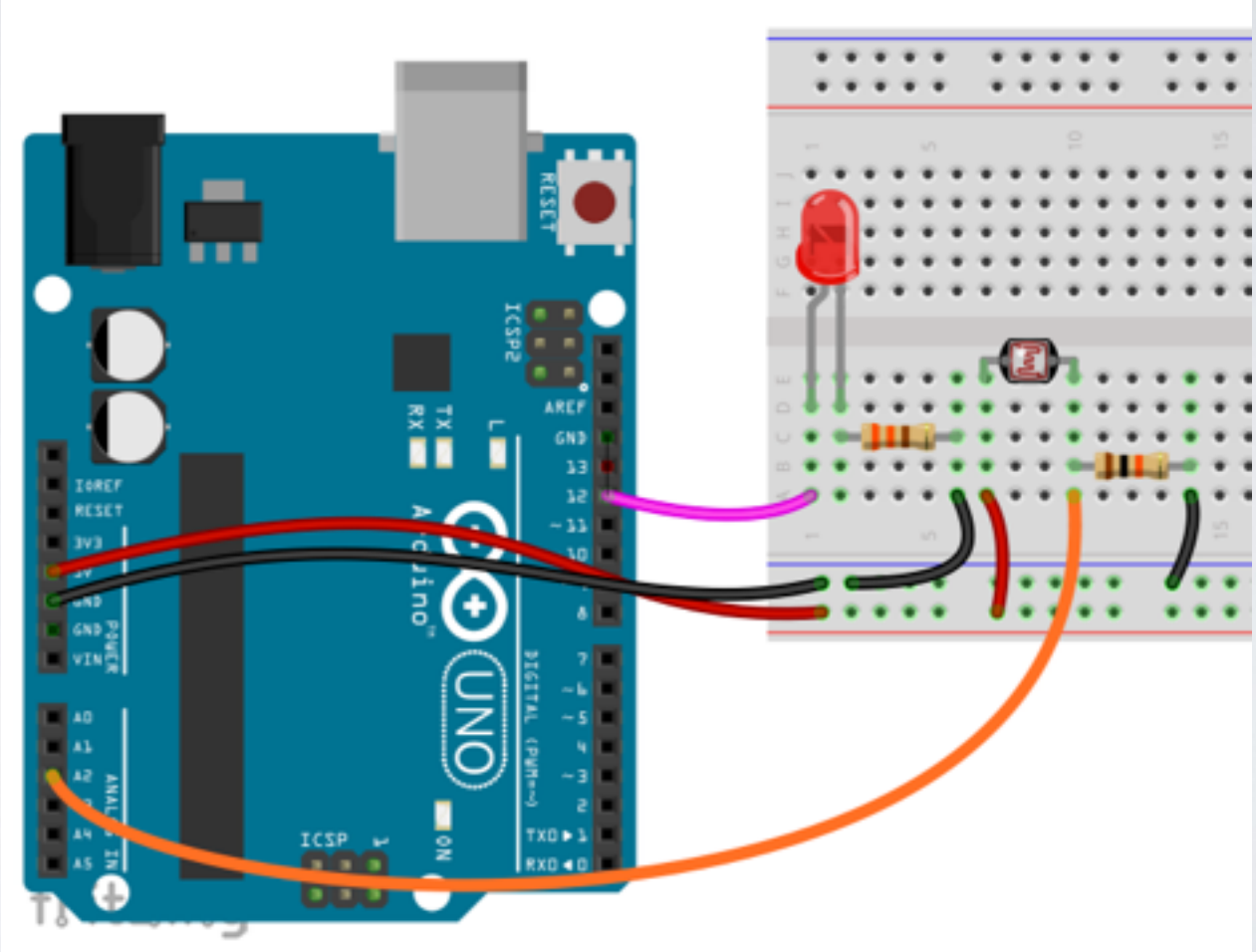
330 옴 저항 (주주갈)

10K 옴 저항 (갈흑주)

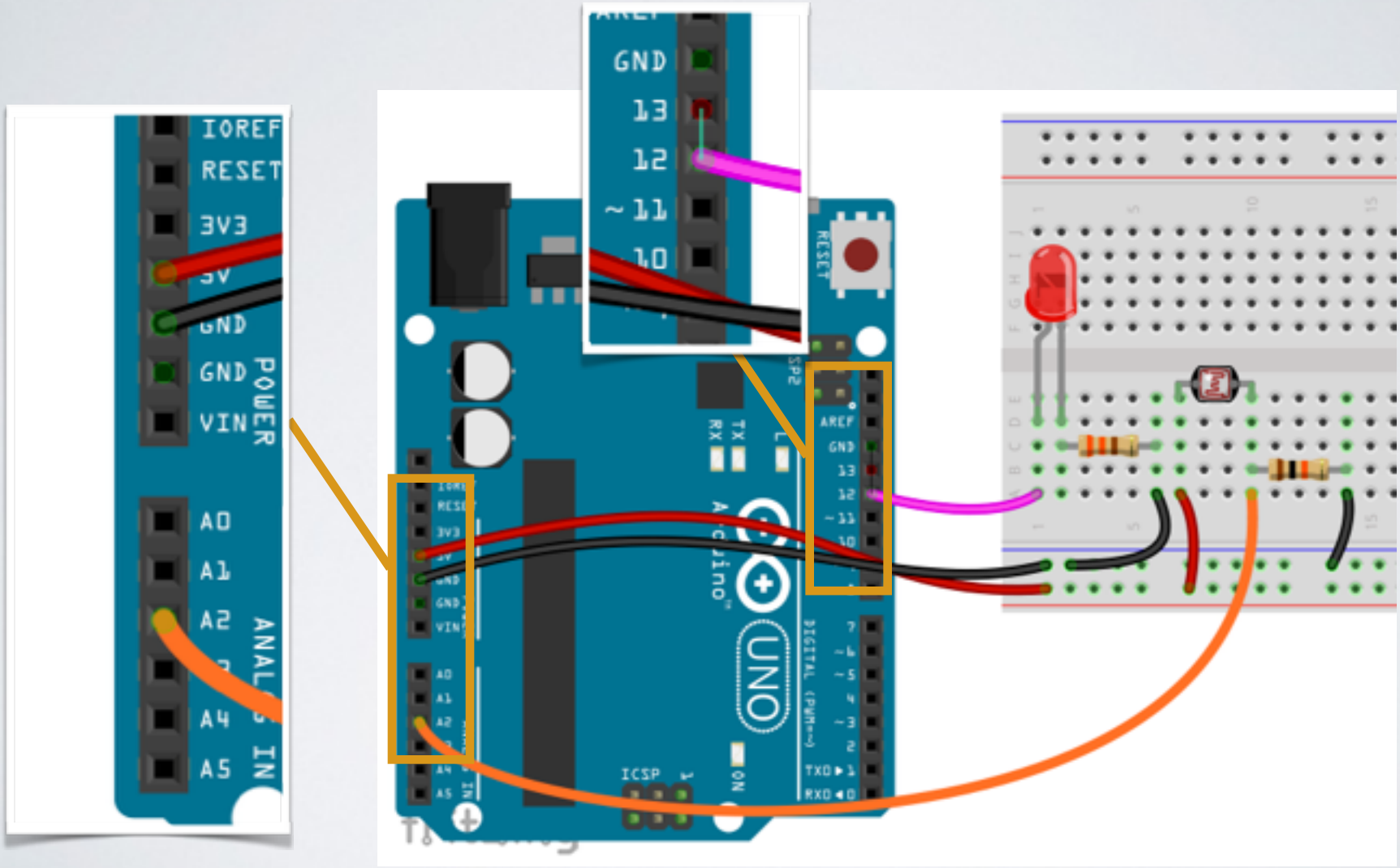


wire * 7

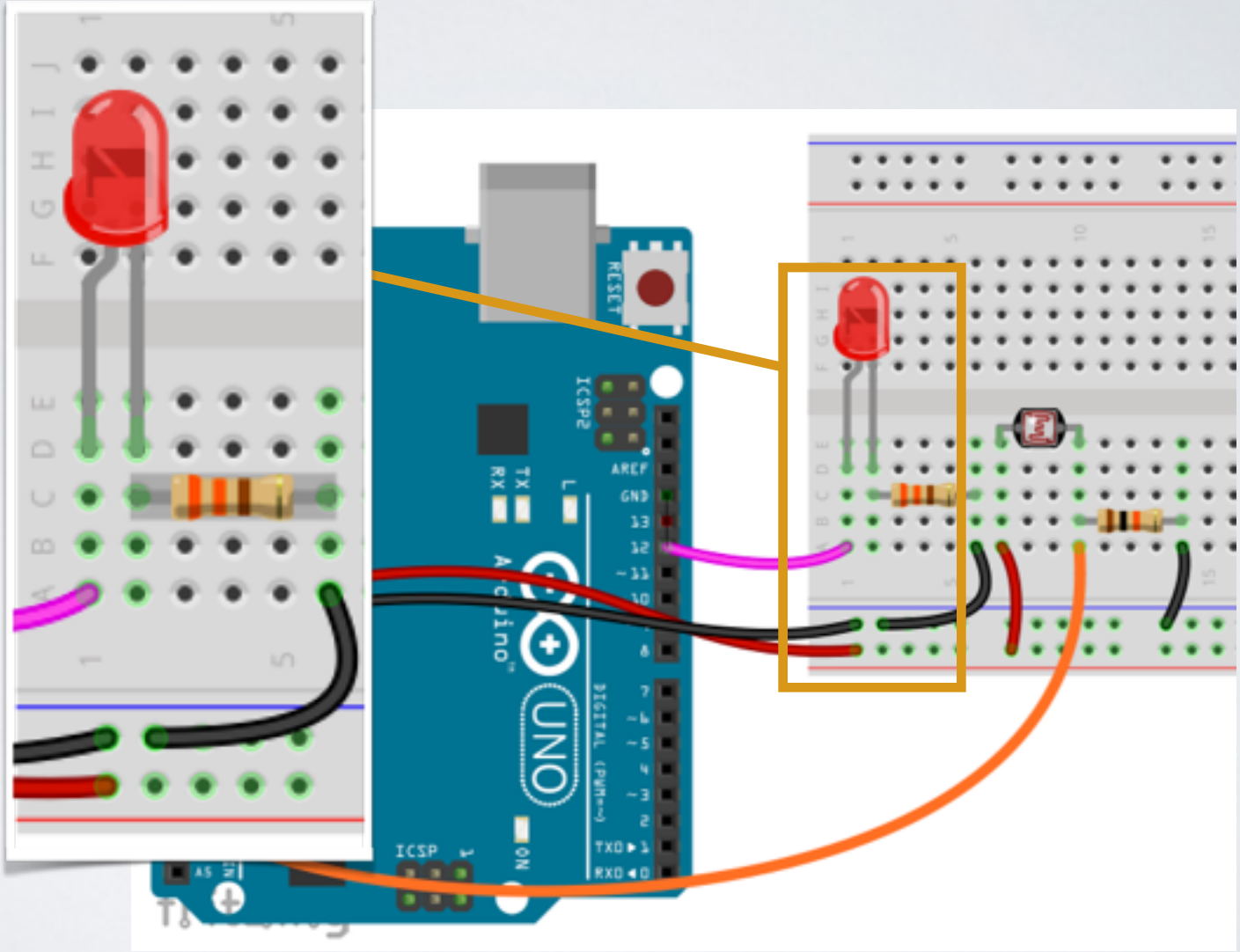
부품 연결..


RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TXO▶1
RXO◀0
DIGITAL (PWM~)
L
TX
RX
ON
ICSP
UNO
Arduino
IOREF
RESET
3V3
5V
GND
GND
VIN
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN

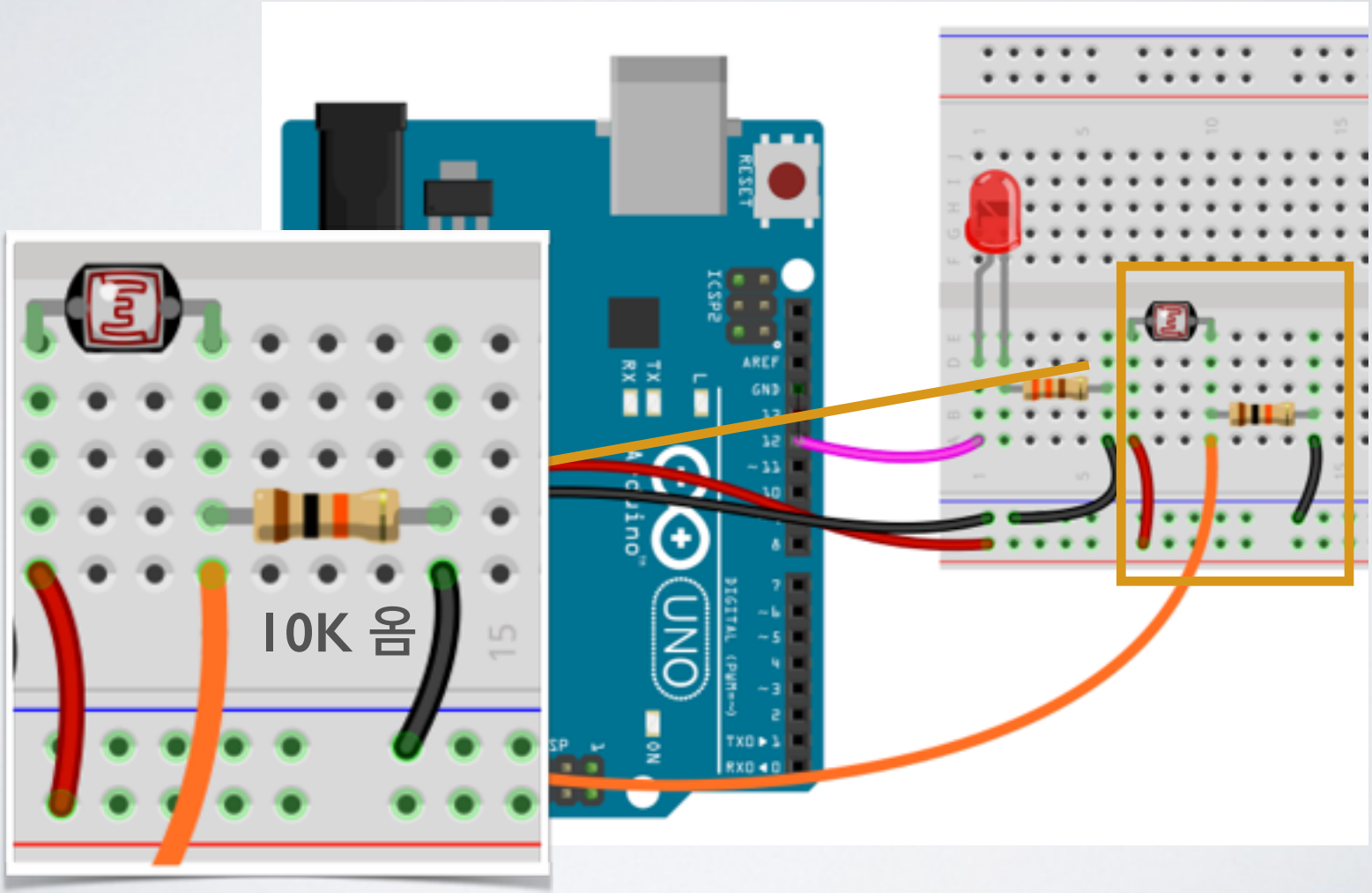
부품 연결..


IOREF
RESET
3V3
5V
GND
GND
VIN
POWER
A0
A1
A2
A4
A5
ANALOG IN
GND
13
12
~ 11
10
RESET
AREF
GND
13
12
~ 11
10
TX
RX
L
ICSP
ON
UNO
Arduino
DIGITAL (PWM~)
TXD
RXD

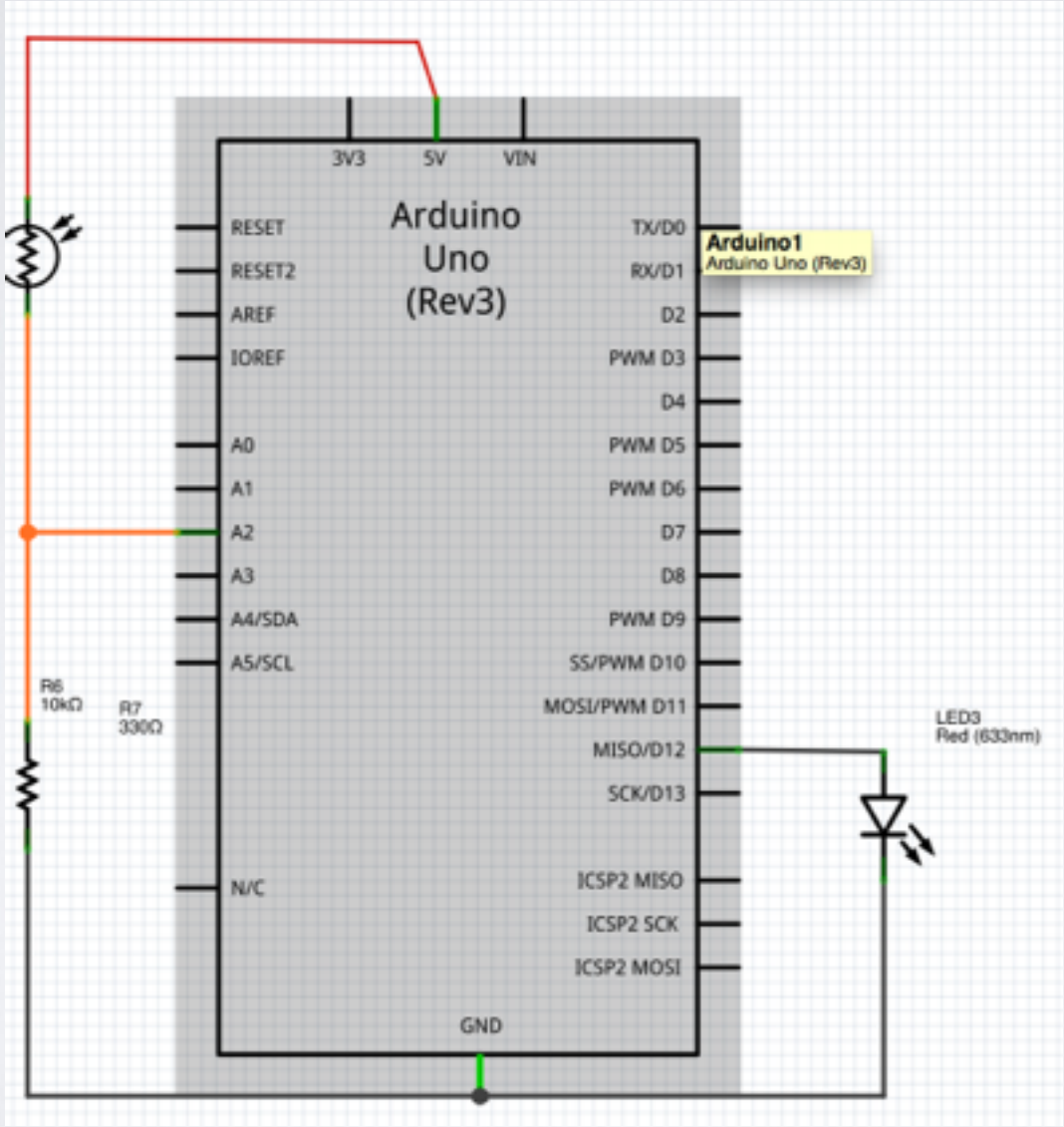
부품 연결..


RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM=~)
TX
RX
L
Arduino
UNO
ON
ICSP
ICSP
A5
IN

부품 연결..


10K 옴
RESET
ICSP2
AREF
GND
TX
RX
L
UNO
Arduino
DIGITAL (PWM~)
TXD
RXD
ON

회로도


3V3
5V
VIN
Arduino
Uno
(Rev3)
RESET
RESET2
AREF
IOREF
A0
A1
A2
A3
A4/SDA
A5/SCL
N/C
TX/D0
RX/D1
D2
PWM D3
D4
PWM D5
PWM D6
D7
D8
PWM D9
SS/PWM D10
MOSI/PWM D11
MISO/D12
SCK/D13
ICSP2 MISO
ICSP2 SCK
ICSP2 MOSI
GND
Arduino1
Arduino Uno (Rev3)
R6
10kΩ
R7
330Ω
LED3
Red (633nm)

PROGRAM

turn_on_when_dark

```
1  int sensorPin = A2;    // select the input pin for the potentio
2  int ledPin = 12;      // select the pin for the LED
3  int sensorValue = 0;  // variable to store the value coming fro
4
5  void setup() {
6    // declare the ledPin as an OUTPUT:
7    pinMode(ledPin, OUTPUT);
8    Serial.begin(9600);
9  }
10
11 void loop() {
12   // read the value from the sensor:
13   sensorValue = analogRead(sensorPin);
14   Serial.println(sensorValue);
15
16   if( sensorValue < 500 ) {
17     // turn the ledPin on
18     digitalWrite(ledPin, HIGH);
19     // stop the program for <sensorValue> milliseconds:
20     delay(sensorValue);
21   } else {
22     // turn the ledPin off:
23     digitalWrite(ledPin, LOW);
24     // stop the program for for <sensorValue> milliseconds:
25     delay(sensorValue);
26   }
27 }
```

7: 12번 핀을 OUTPUT으로

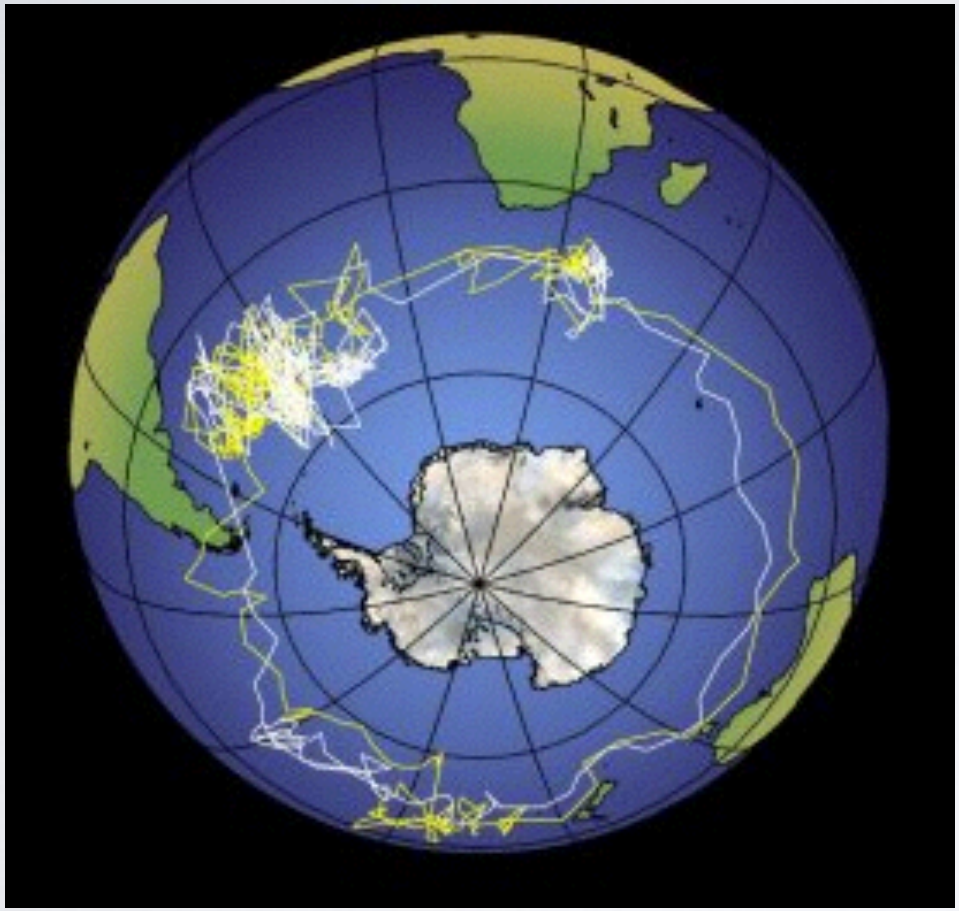
13: 밝기 읽기

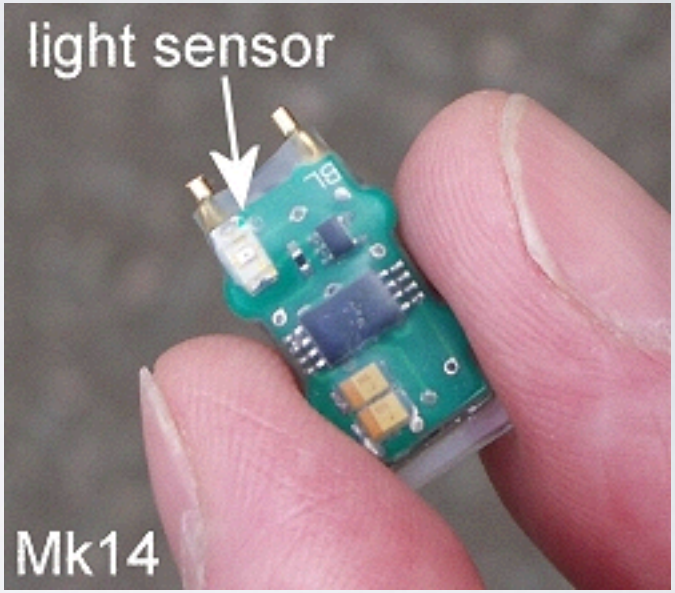
16~20: 어두우면 LED를 ON

21~ 26: 밝으면 LED OFF

* 어둠고 밝은 정도를 조정 하려면
* 16번째 줄 수정

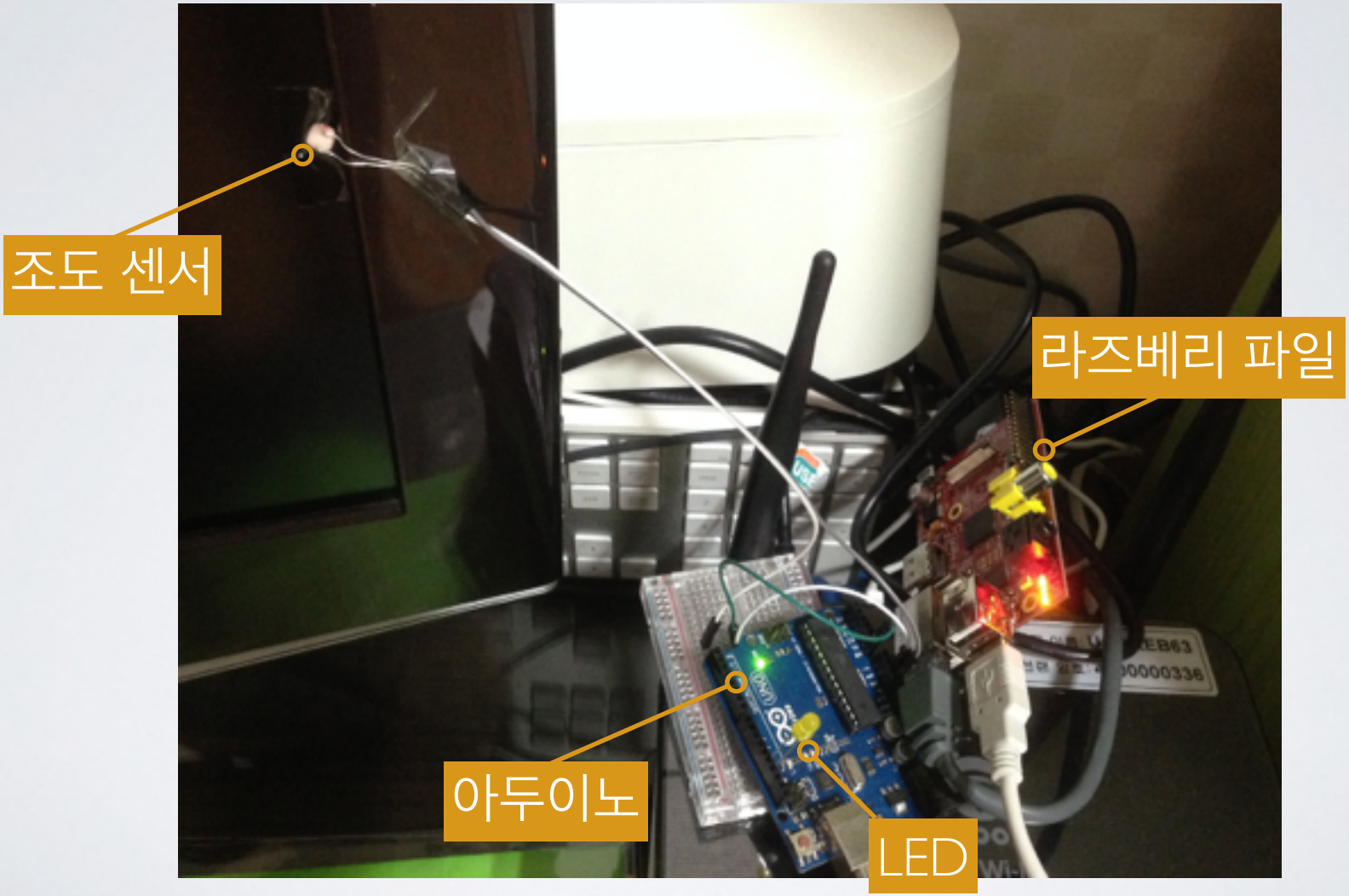
새들의 이동 경로 추적





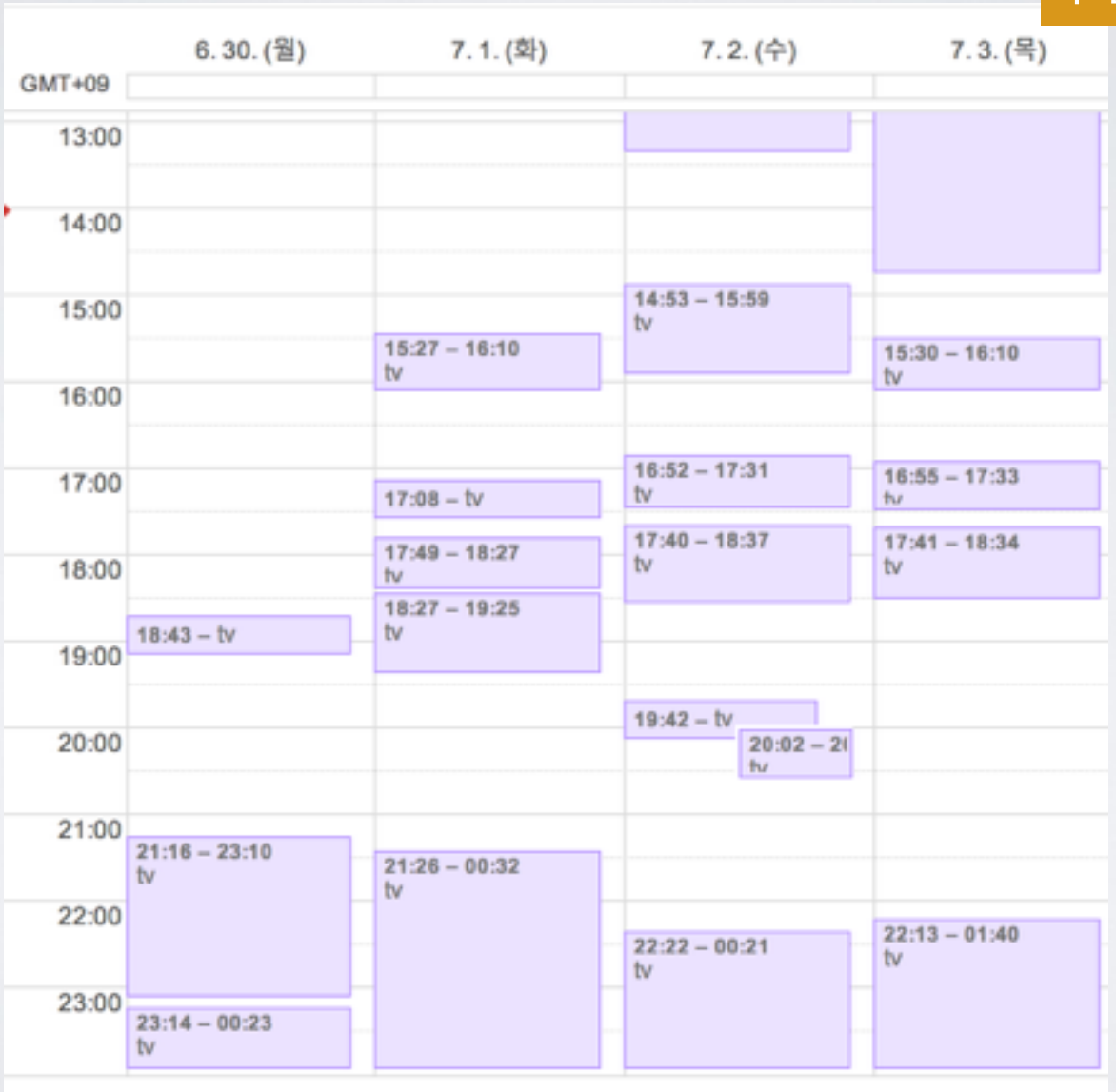
http://www.birdtracker.co.uk

TV 시청 시간 측정



TV 시청 시간 측정

구글 칼렌더



출처: 영화”만원동 인공위성”

국내 최초 인공 위성 발사

송호준

10:00 UTC on April 19, 2013　카자흐스탄

National Aeronautics and Space Administration

Wednesday, 27 August 2014

NSSDC Master Catalog Search

- Spacecraft
- Experiments
- Data Collections
- Personnel
- Publications
- Maps
- New/Updated Data
- Lunar/Planetary Events

OSSI-1

NSSDC/COSPAR ID: 2013-015B

Description

The 950 g satellite has a beacon in the 145 MHz band and a data communications transceiver in the 435 MHz band. This innovative satellite carries a 44 watt LED array to flash Morse Code messages to observers on Earth. Radio hams can reserve messages by sending signals to the satellite then observers can see the messages at the scheduled time in a flashing Morse Code LED pattern.

Alternate Names

- 39131

Facts in Brief

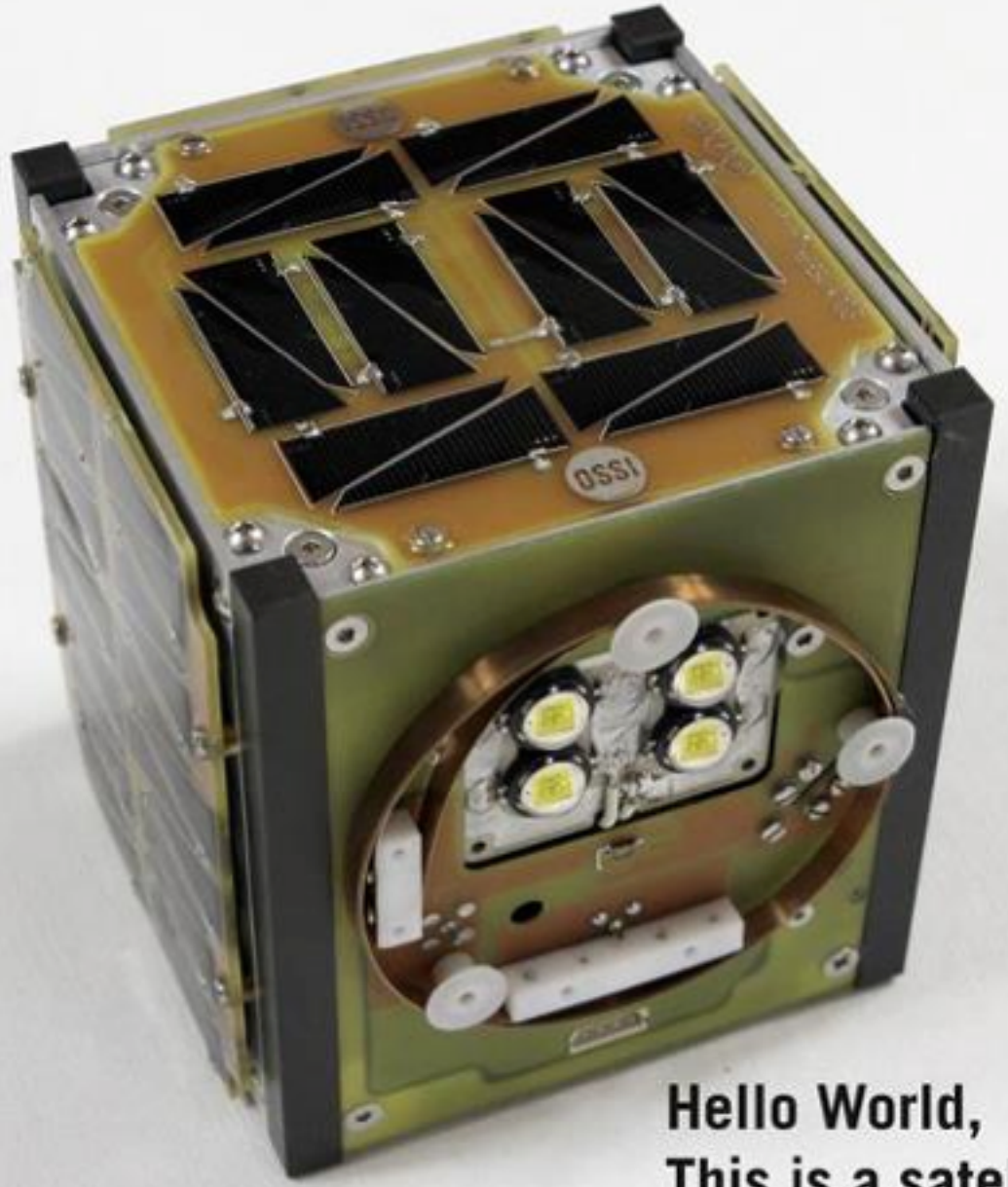
Launch Date: 2013-04-19
Launch Vehicle: Soyuz-2.1a
Launch Site: Tyuratam (Baikonur Cosmodrome), Kazakhstan

Funding Agency

- Unknown (South Korea)

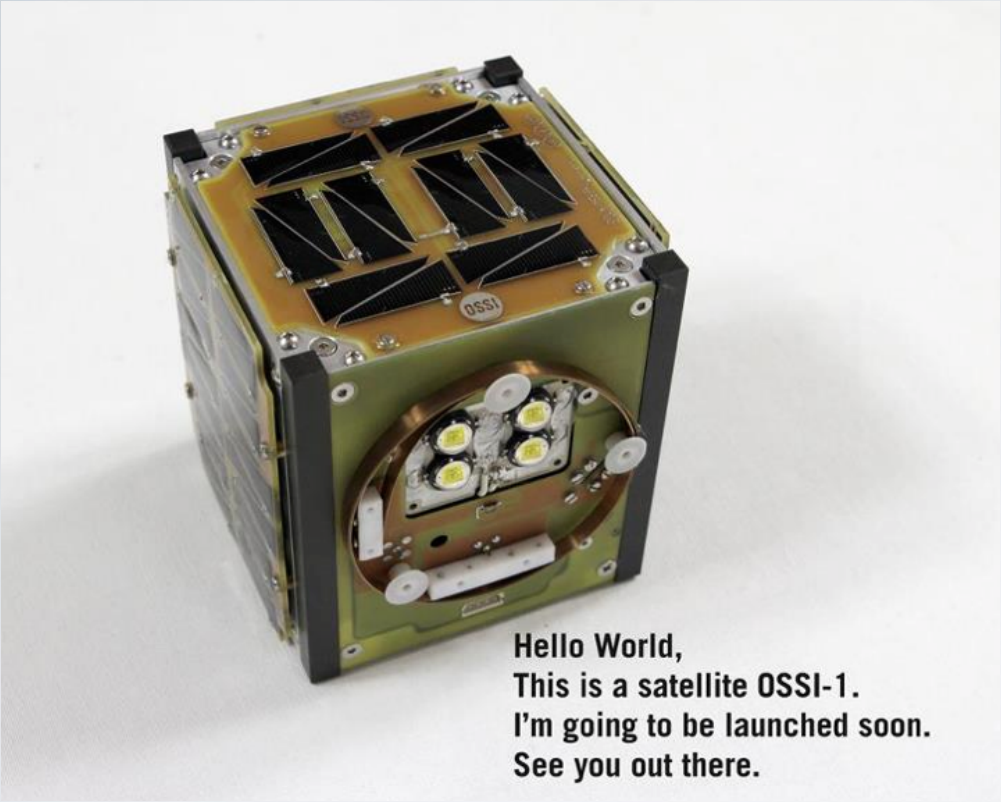
Discipline

http://nssdc.gsfc.nasa.gov/nmc/masterCatalog.do?sc=2013-015B

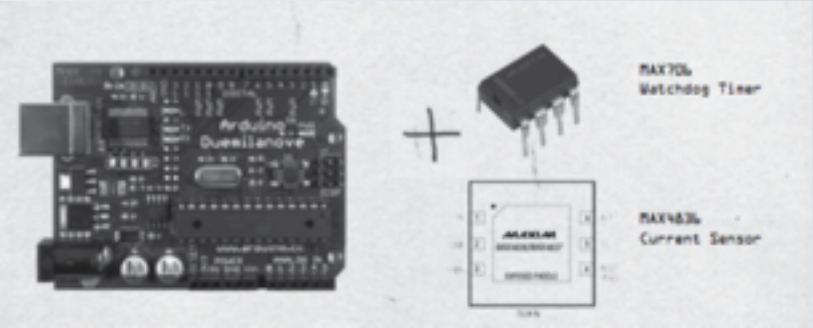


제작비:
40만원 정도

Hello World,
This is a satellite OSSI-1.
I'm going to be launched soon.
See you out there.

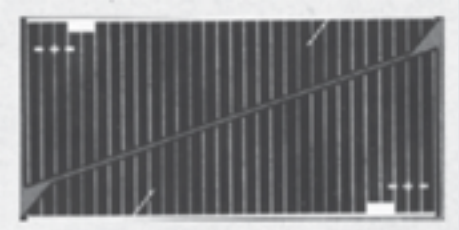


Controller:



Automotive 급으로 변경: -40°C to 150°C

Battery:

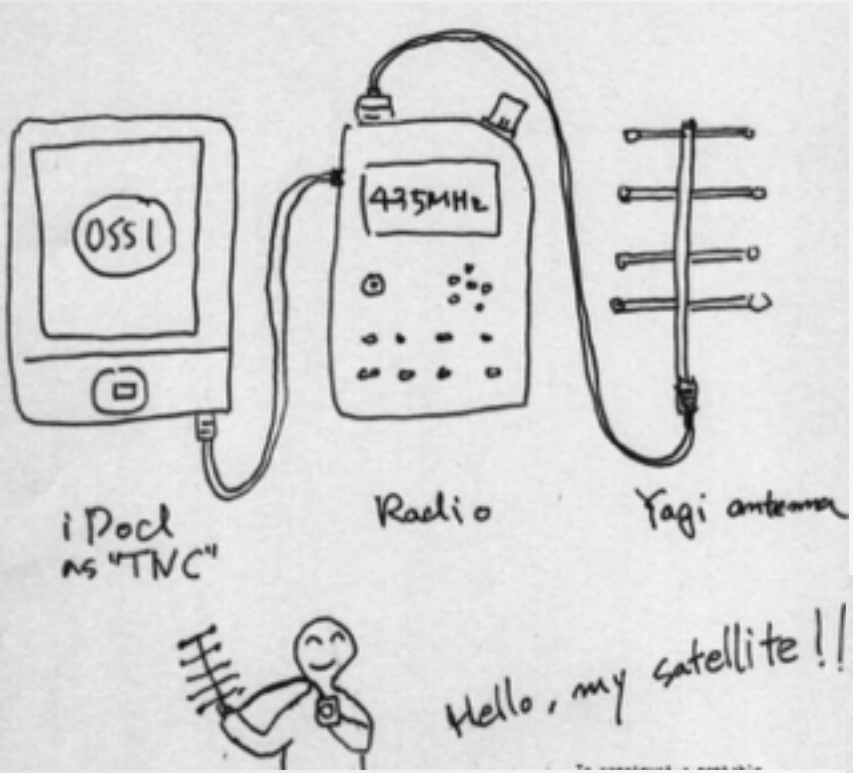


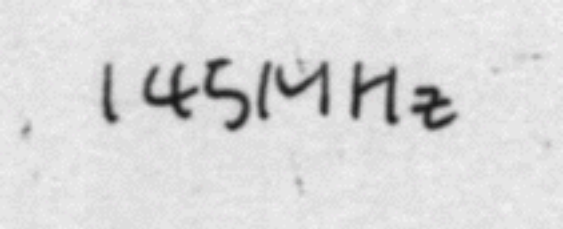
LED * 4

통신: RF 통신

통신은

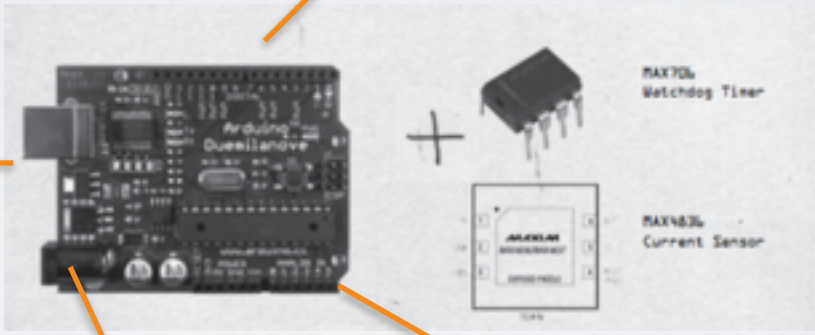
Moorse code:
OS0 DE OSSI1 ANYOUNG

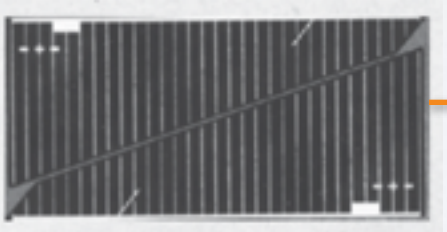




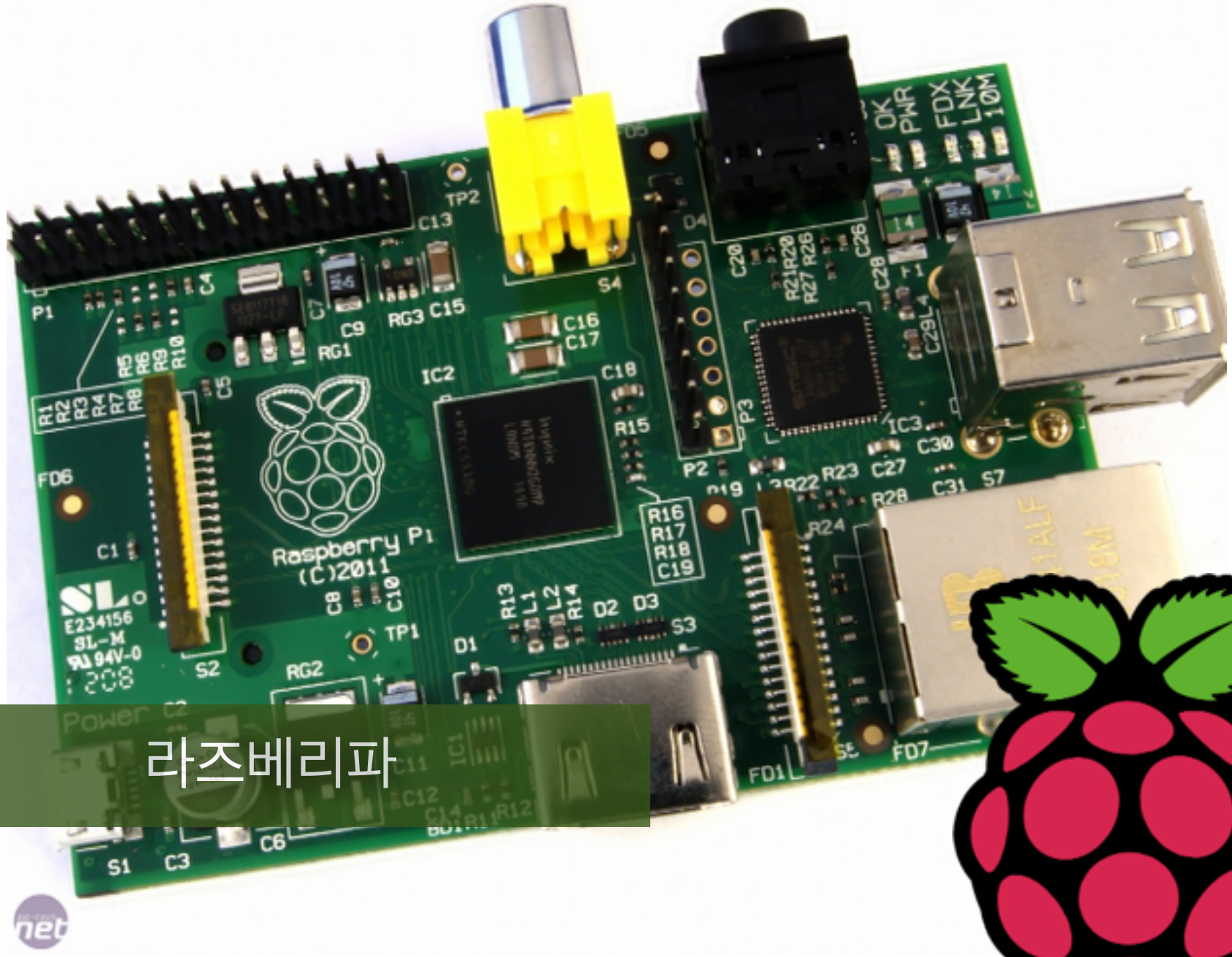
RF 제어 코드
Moorse 코드 변환기
LED 제어

USB





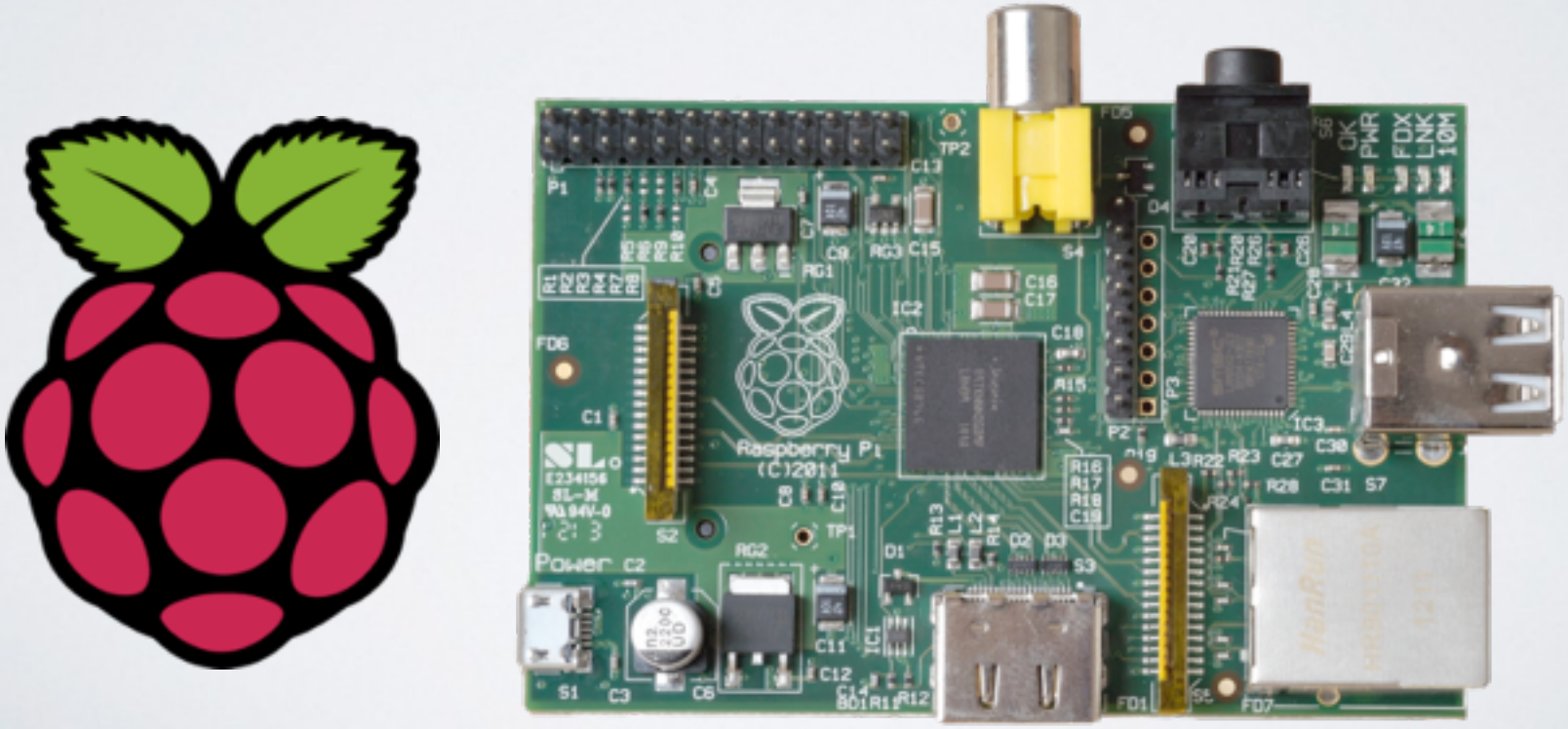
개발은



라즈베리파

RASPBERRY PI

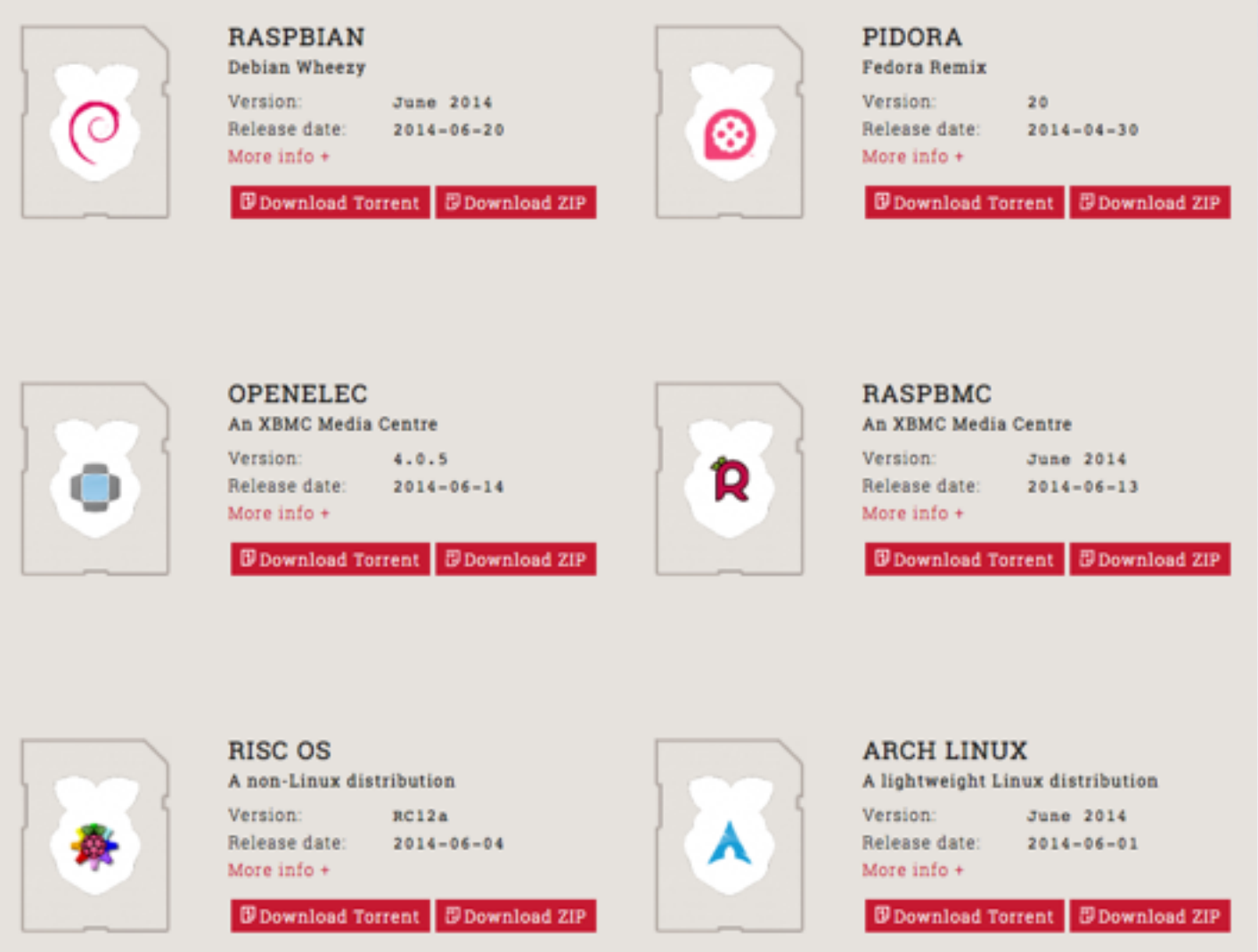
- 영국에서 개발되어 전 세계에 보급
- 저가용 교육용 컴퓨터 보급에 중점을 두고 개발된 제품
- 가격이 매우 저렴하며, 다양한 확장 도구를 갖추고 있음
- BCM2835 칩을 사용해 회로를 단순화함
- 신용카드 크기의 초소형 PC 플랫폼



RASPBERRY PI - SPEC

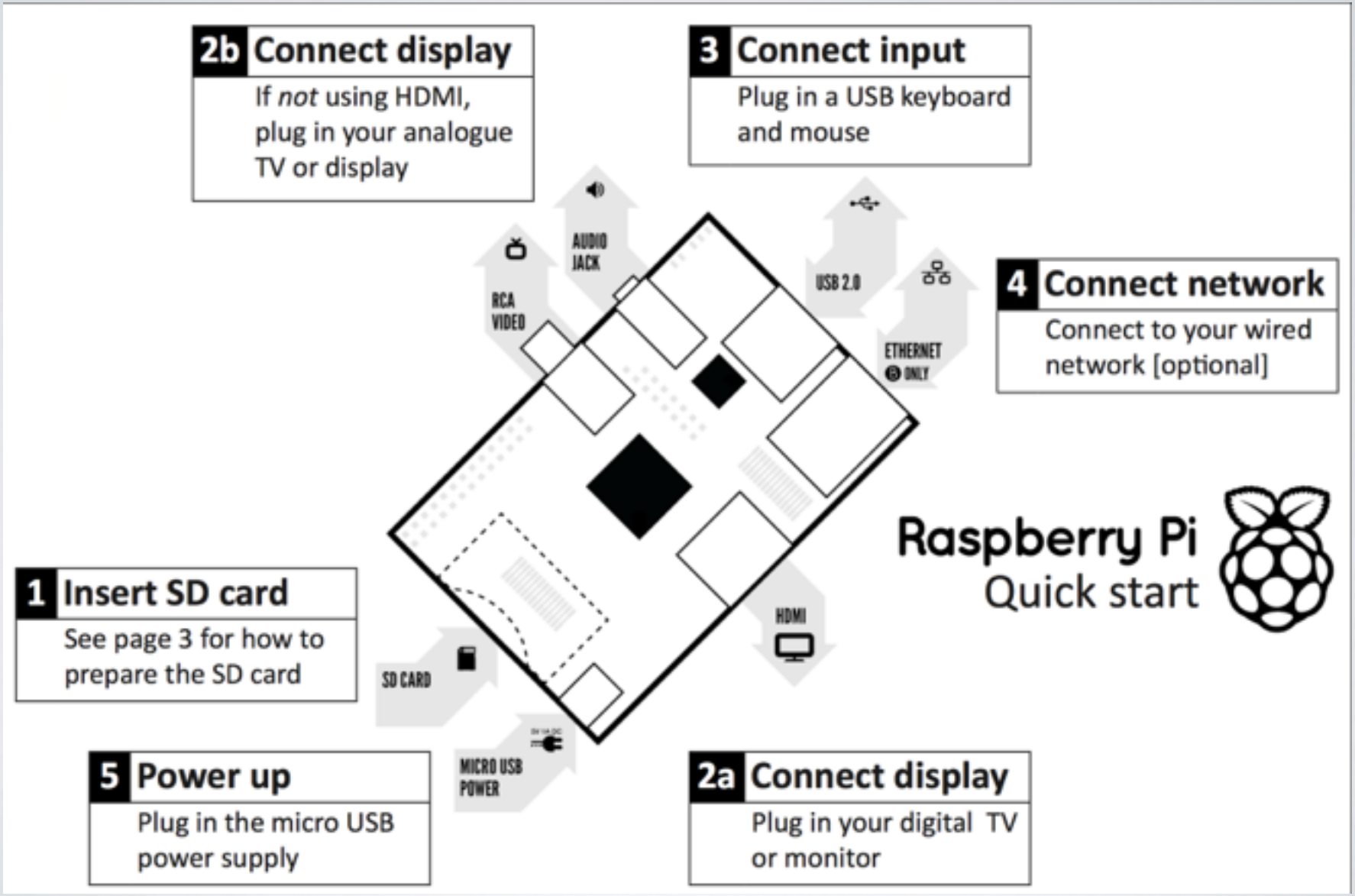
	모델 A	모델 B
목표 가격:[5]	US$ 25	US$ 35[57]
SoC:[5]	브로드컴 BCM2835 (CPU, GPU, DSP, 그리고 SDR SDRAM)[3]	
CPU:	700 MHz ARM1176JZF-S core (ARM11 계열)[3]	
GPU:	브로드컴 비디오코어 IV,[58] OpenGL ES 2.0, 1080p30 h.264/MPEG-4 AVC 높은 프로파일 디코더[3]	
메모리 (SDRAM):	256 MB (GPU와 같이 사용)	512 MB (GPU와 같이 사용) as of October 15, 2012
USB 2.0 ports:[10]	1	2 (내장 USB 허브 하나 제외)[53]
비디오 출력:[5]	컴포지트 RCA (PAL & NTSC), HDMI (rev 1.3 & 1.4),[59] 액정 디스플레이를 위한 디스플레이 시리얼 인터페이스[60][61] 640×350 부터 1920×1200 이상의 14개의 HDMI 해상도와 여러 PAL, NTSC 표준들[62]	
오디오 출력:[5]	3.5 mm 잭, HDMI	
내장 저장장치:[10]	SD / MMC / SDIO 카드 슬롯	
내장 네트워크:[5][10]	None	10/100 이더넷 (RJ45)[53]
로우레벨 주변장치:	8 × GPIO, UART, I²C 버스, 2개의 칩을 선택할수 있는 SPI, +3.3 V, +5 V, 접지[58][63]	
전력:	500 mA (2.5 W)[5]	700 mA (3.5 W)
전원:[5]	MicroUSB에서 받는 5 볼트 혹은 GPIO 헤더	
크기:	85.60×53.98mm[64]	
무게:	45g[65]	
계획중인 운영체제:	Debian GNU/Linux, Fedora, Arch Linux ARM,[2] RISC OS[25]	

RASPBERRY PI - OS

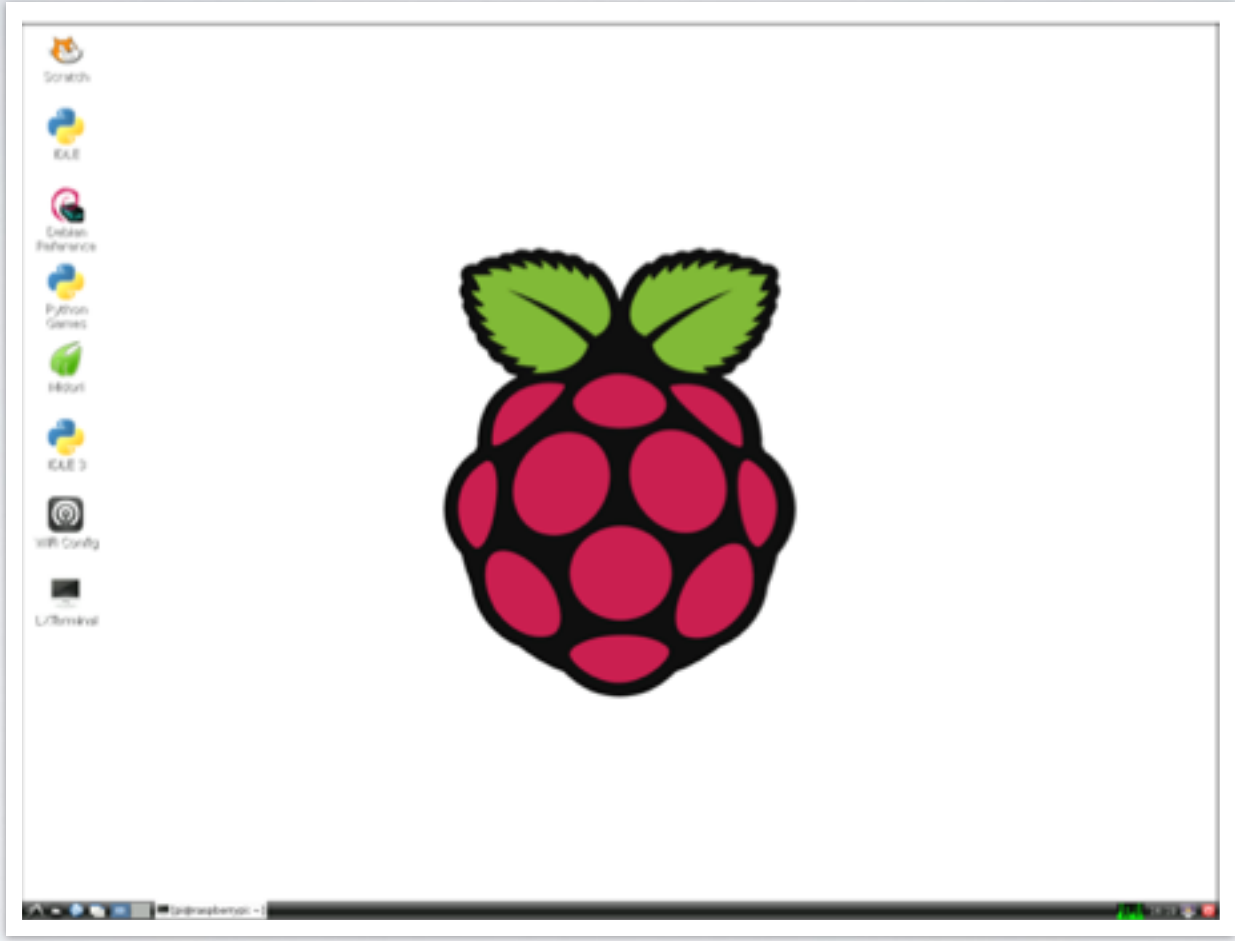


http://www.raspberrypi.org/downloads/

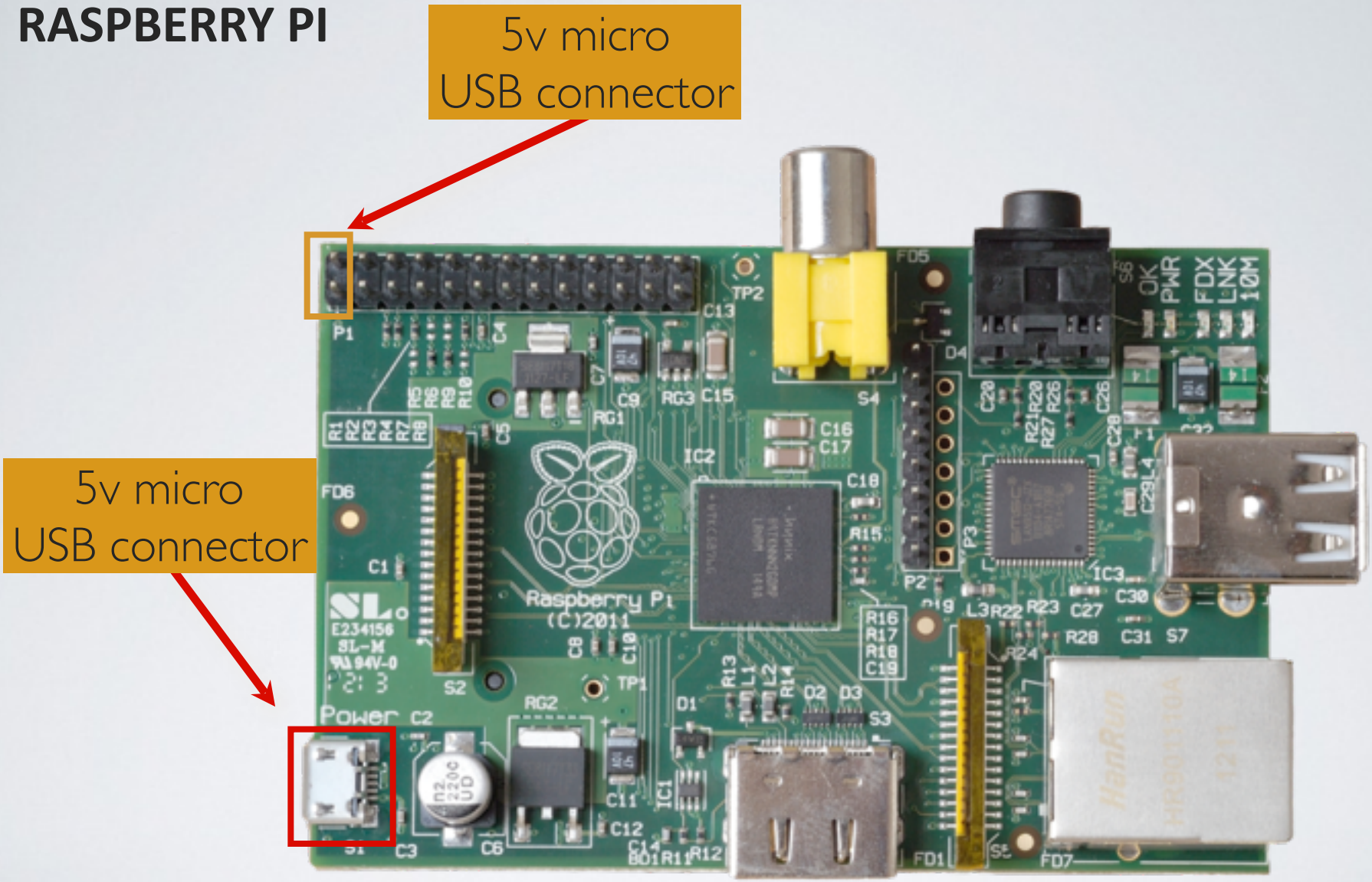
RASPBERRY PI - INTERFACE



RASPBERRY PI - WINDOW



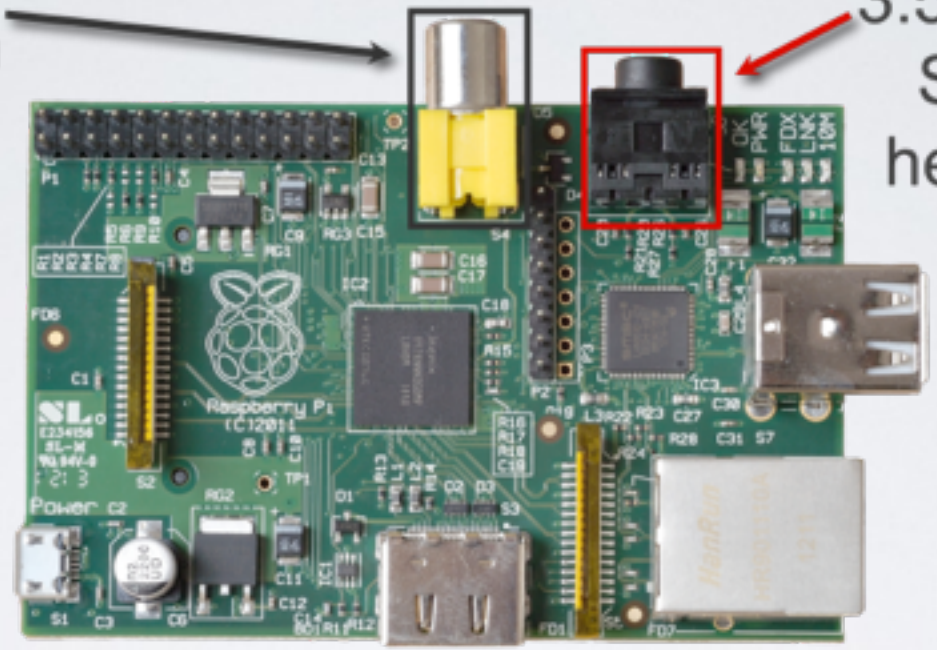
RASPBERRY PI



Raspberry Pi - A/V (Audio/Video)

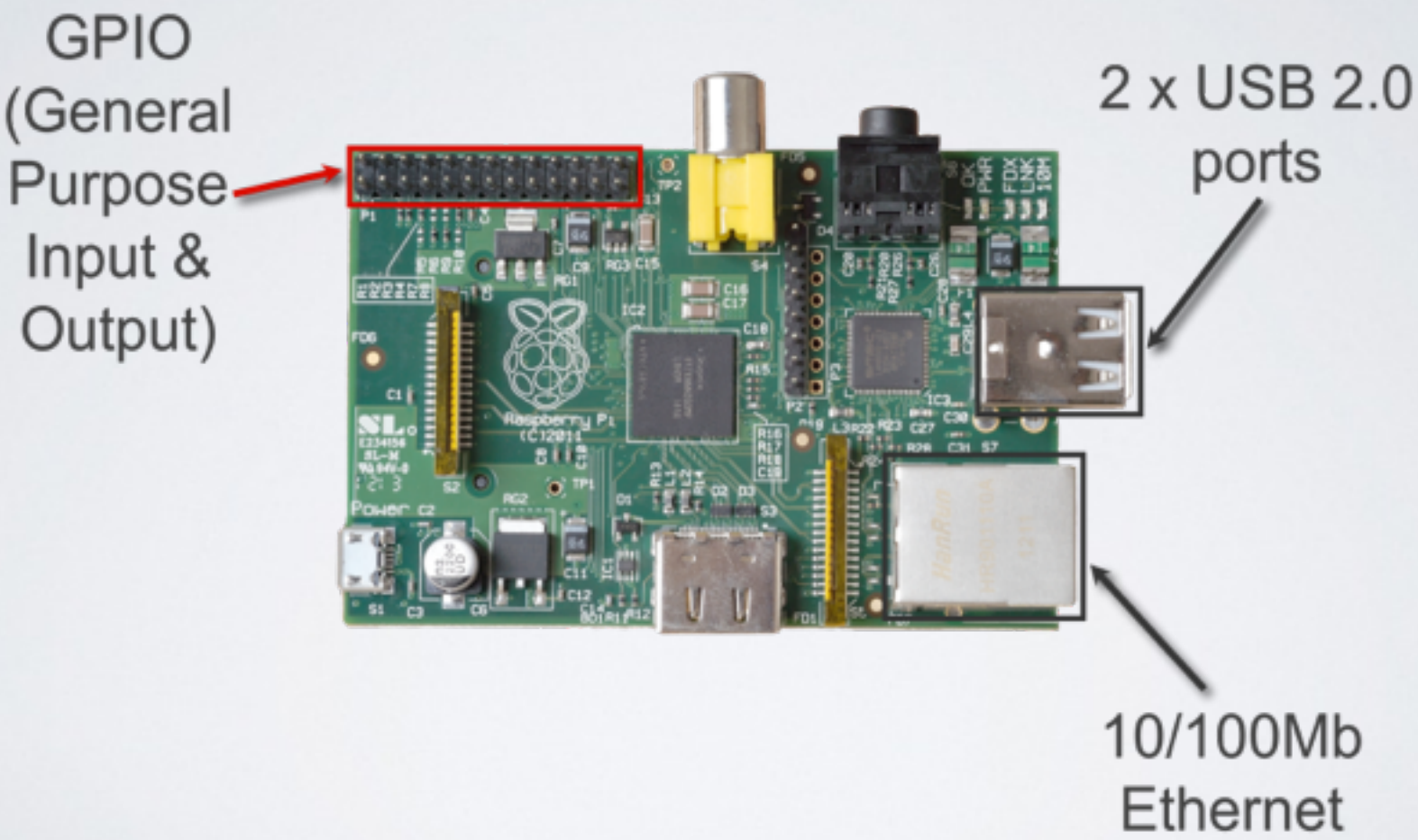
RCA Video (works with most older TVs)

3.5mm Audio Standard headphone socket

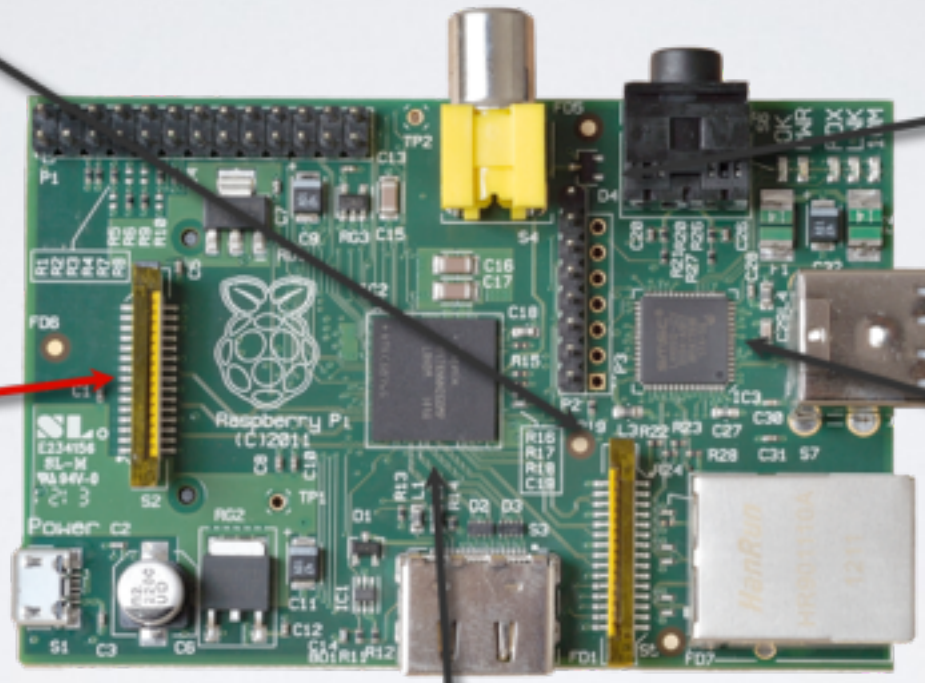


HDMI Audio & Video
(works with modern TVs and DVI monitors)

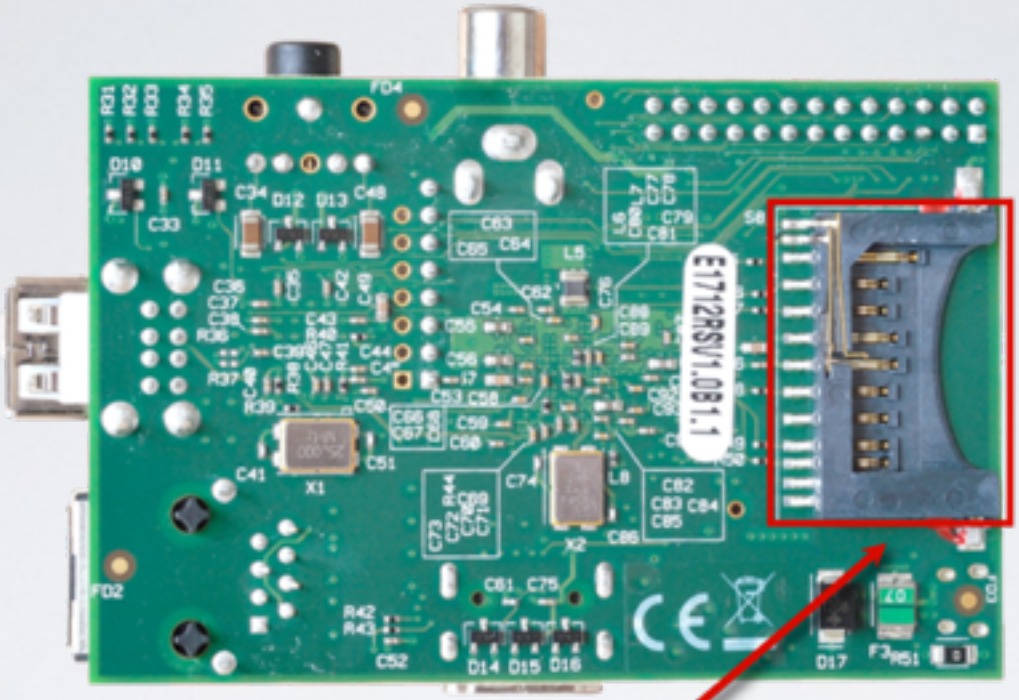
RASPBERRY PI - CONNECTIVITY



RASPBERRY PI - ETC



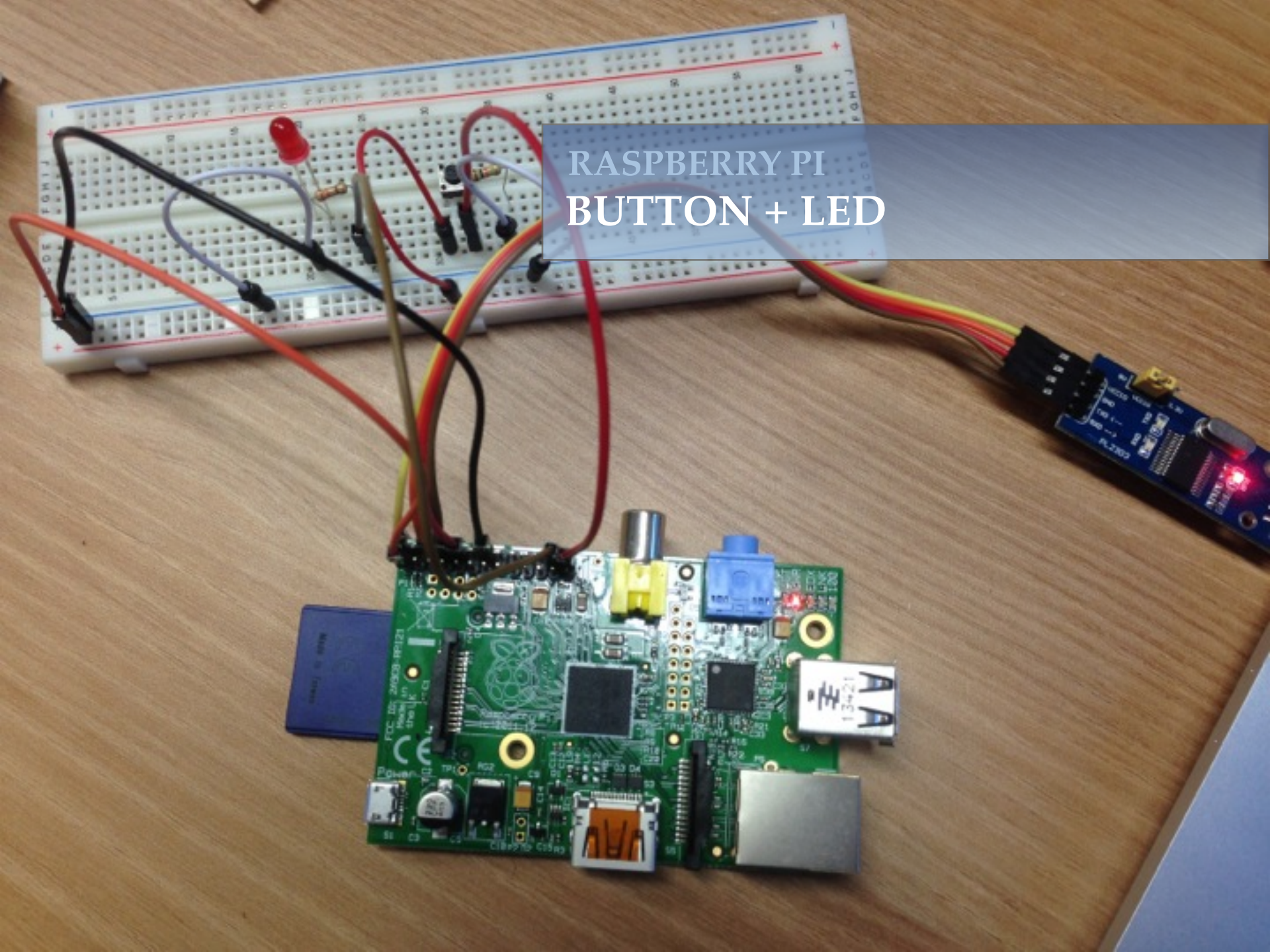
RASPBERRY PI - SD CARD



SD Card Slot
(supports SD cards up to 32GB)

GPIO 쉘로 LED 켜기

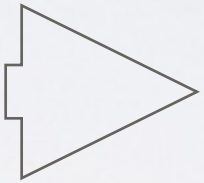

```
$> sudo bash
$> echo "8" > /sys/class/gpio/export
$> echo "7" > /sys/class/gpio/export
$> echo “out” > /sys/class/gpio/gpio8/direction
$> echo “out” > /sys/class/gpio/gpio7/direction
$> echo 1 > /sys/class/gpio/gpio7/value
$> echo 0 > /sys/class/gpio/gpio8/value
```



RASPBERRY PI

BUTTON + LED

FEATURE



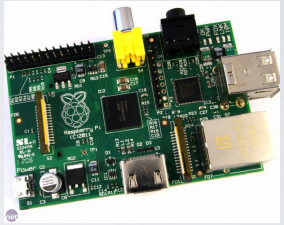
LED ON / OFF

- 버튼 누르는지 감지
- 버튼이 눌리면 LED ON

준비물

RED LED

Button



Raspberry Pi

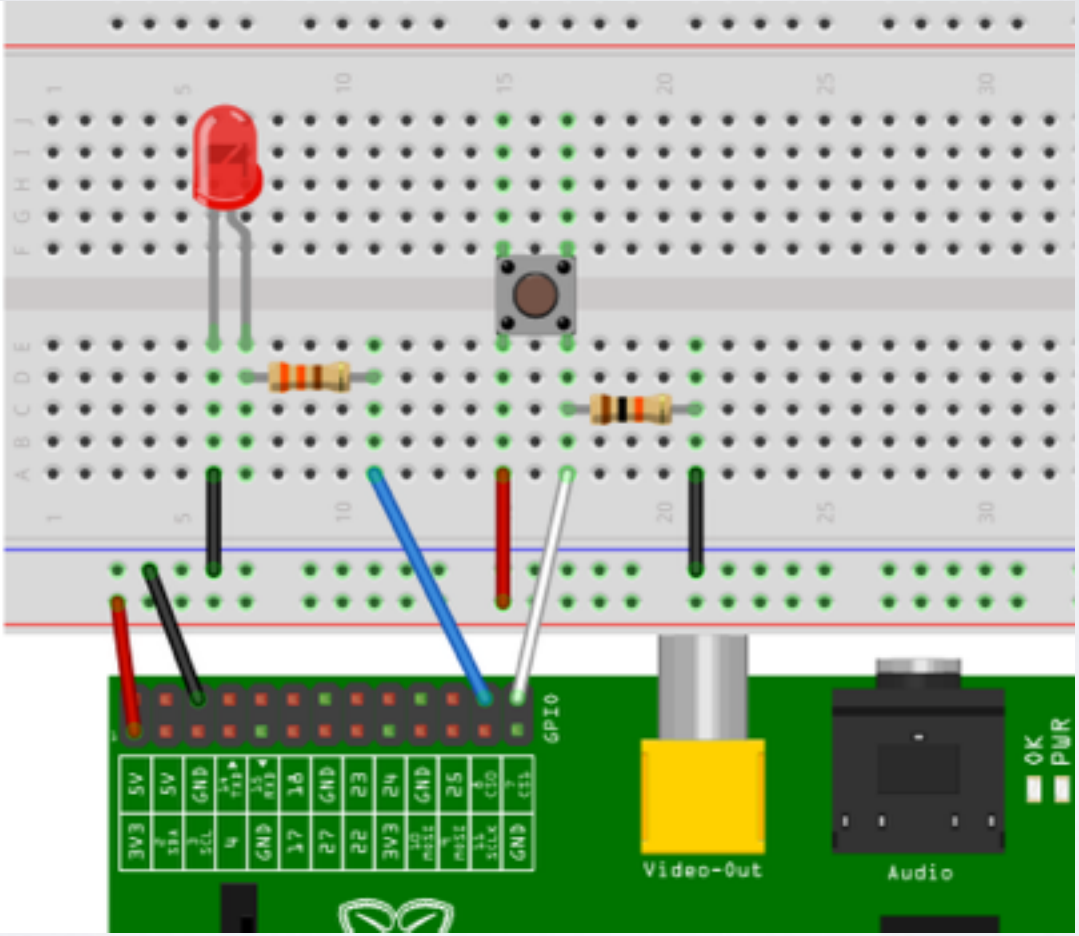
bread board

330 ohm register
(주주갈)

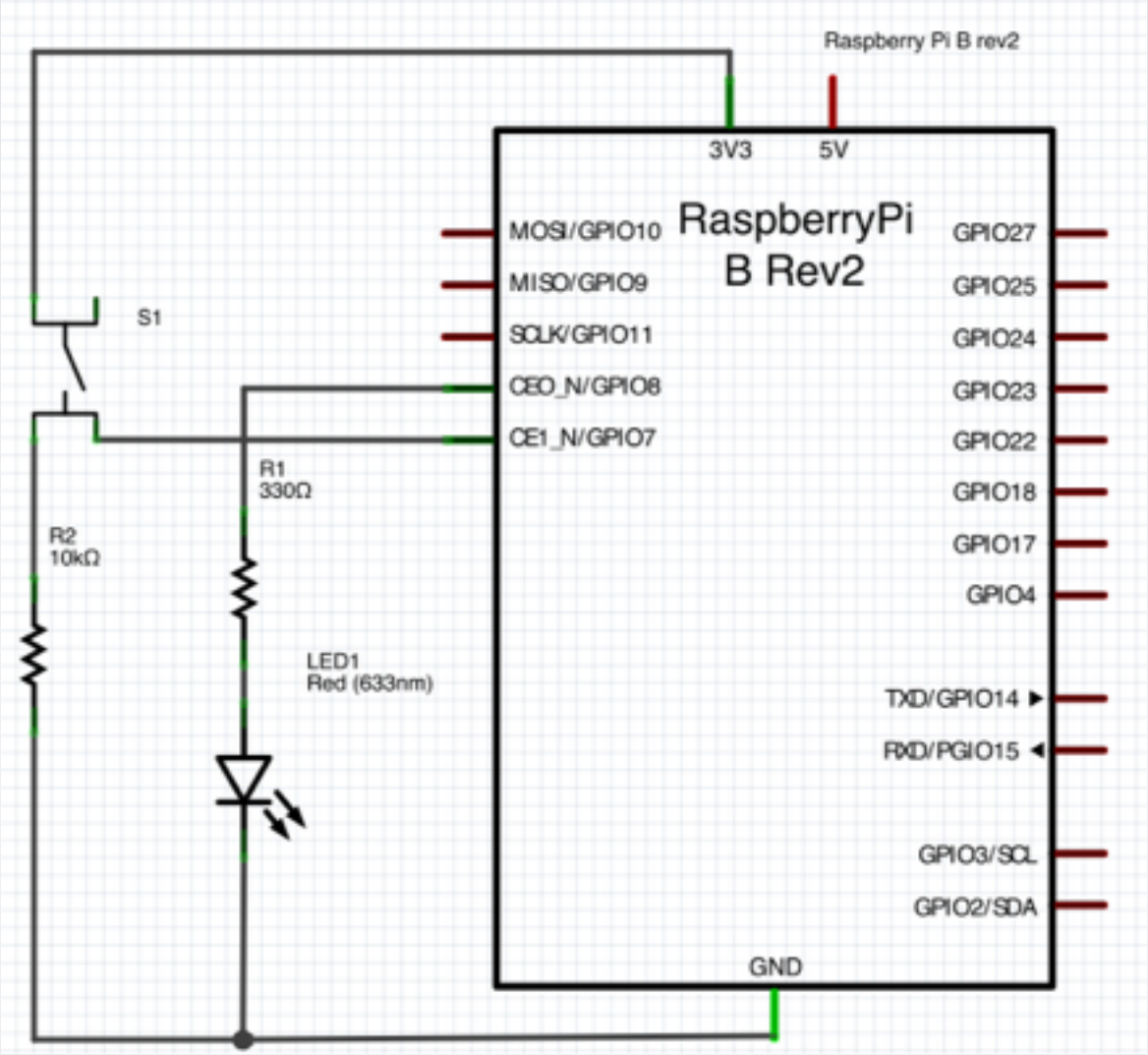
10K ohm register
(갈흑주)

암-수 점퍼 * 4
수-수 * 2

연결


GPIO
5V
5V
GND
14
15
18
GND
23
24
GND
25
8
7
3V3
2
3
4
GND
17
27
22
3V3
10
9
11
GND
Video-Out
Audio
OK
PWR

회로도


Raspberry Pi B rev2
3V3
5V
RaspberryPi
B Rev2
MOSI/GPIO10
MISO/GPIO9
SCLK/GPIO11
CE0_N/GPIO8
CE1_N/GPIO7
GPIO27
GPIO25
GPIO24
GPIO23
GPIO22
GPIO18
GPIO17
GPIO4
TXD/GPIO14
RXD/PGIO15
GPIO3/SCL
GPIO2/SDA
GND
S1
R1
330Ω
R2
10kΩ
LED1
Red (633nm)

PYTHON CODE

$> nano turn_on_off_using_button.py

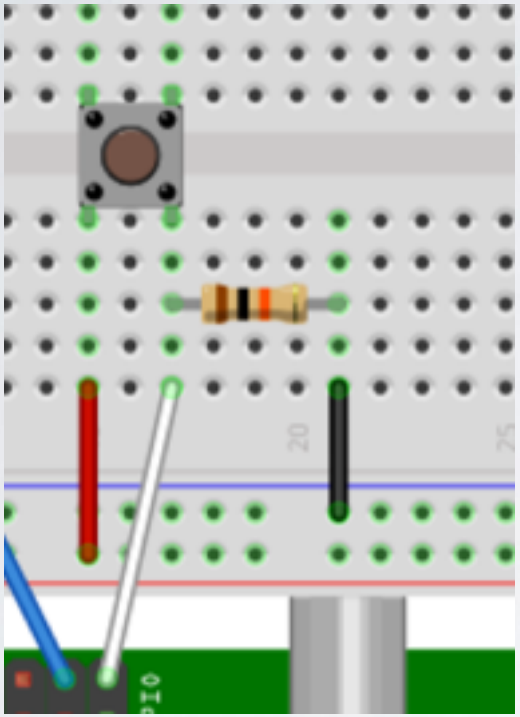
```
# load library
import time
import RPi.GPIO as GPIO
GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)

# setup pin
GPIO.setup(8, GPIO.OUT)
GPIO.setup(7, GPIO.IN)

# turn led on/off
while True:
    if( GPIO.input(7) == 1 ):
        GPIO.output(8, 1)
    else:
        GPIO.output(8, 0)

    time.sleep(0.1)

GPIO.cleanup()
```

$> sudo python turn_on_off_using_button.py

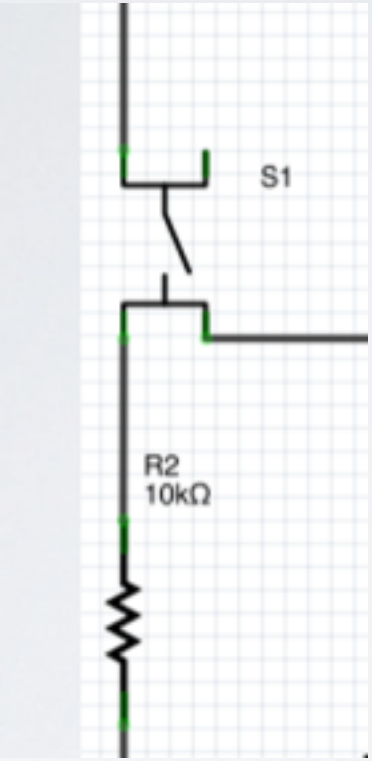
LED 제어 - CMD

```
$> sudo bash
$> echo "8" > /sys/class/gpio/export
$> echo “out” > /sys/class/gpio/gpio8/direction
$> echo 1 > /sys/class/gpio/gpio8/value
```

PULL-UP / PULL-DOWN



5V

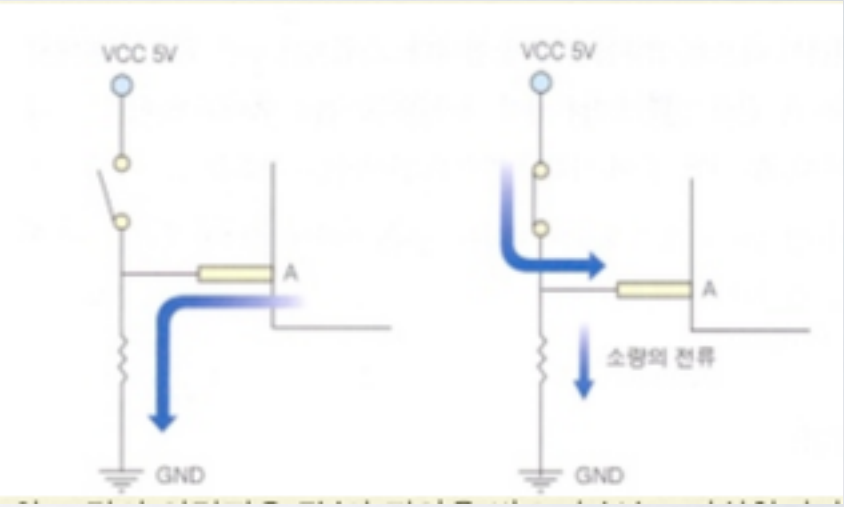


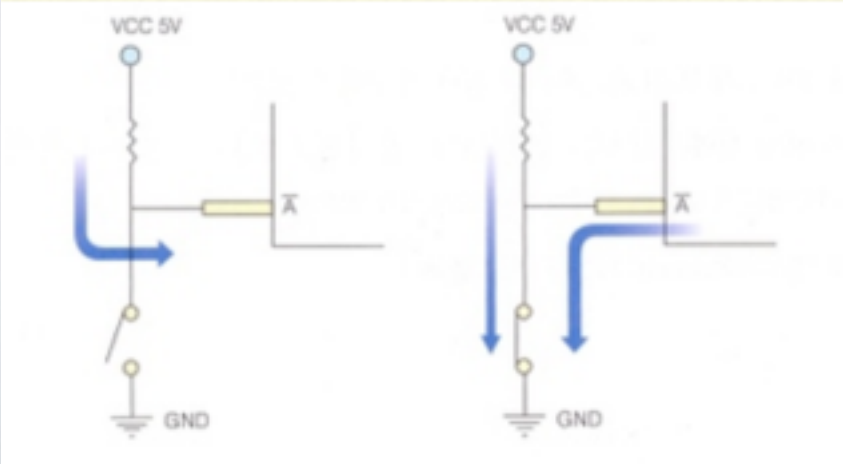
GPIO7

0V

PULL-UP / PULL-DOWN

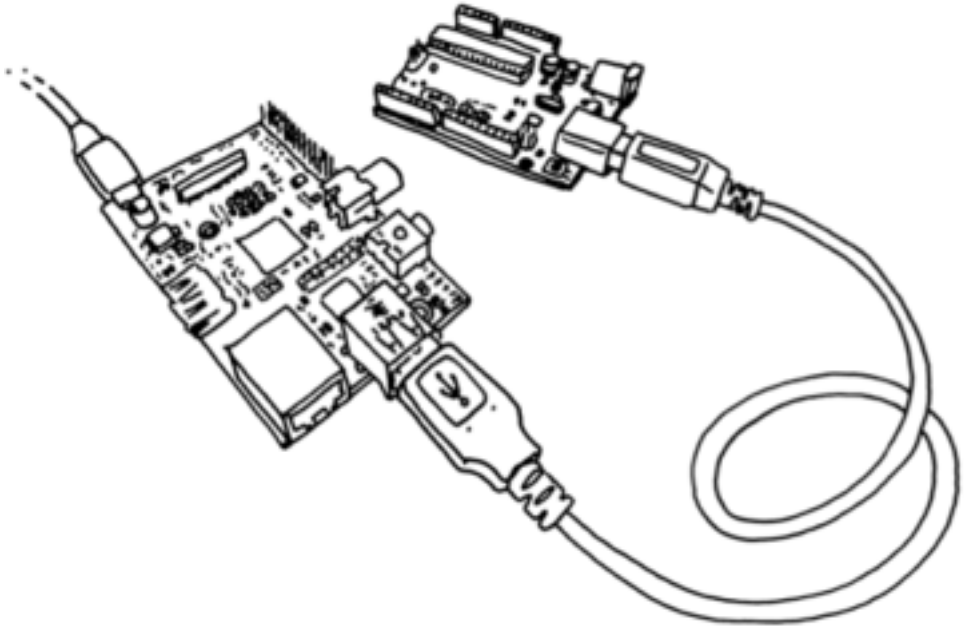
Floating





1 or 0 ???

Arduino and Raspberry Pi



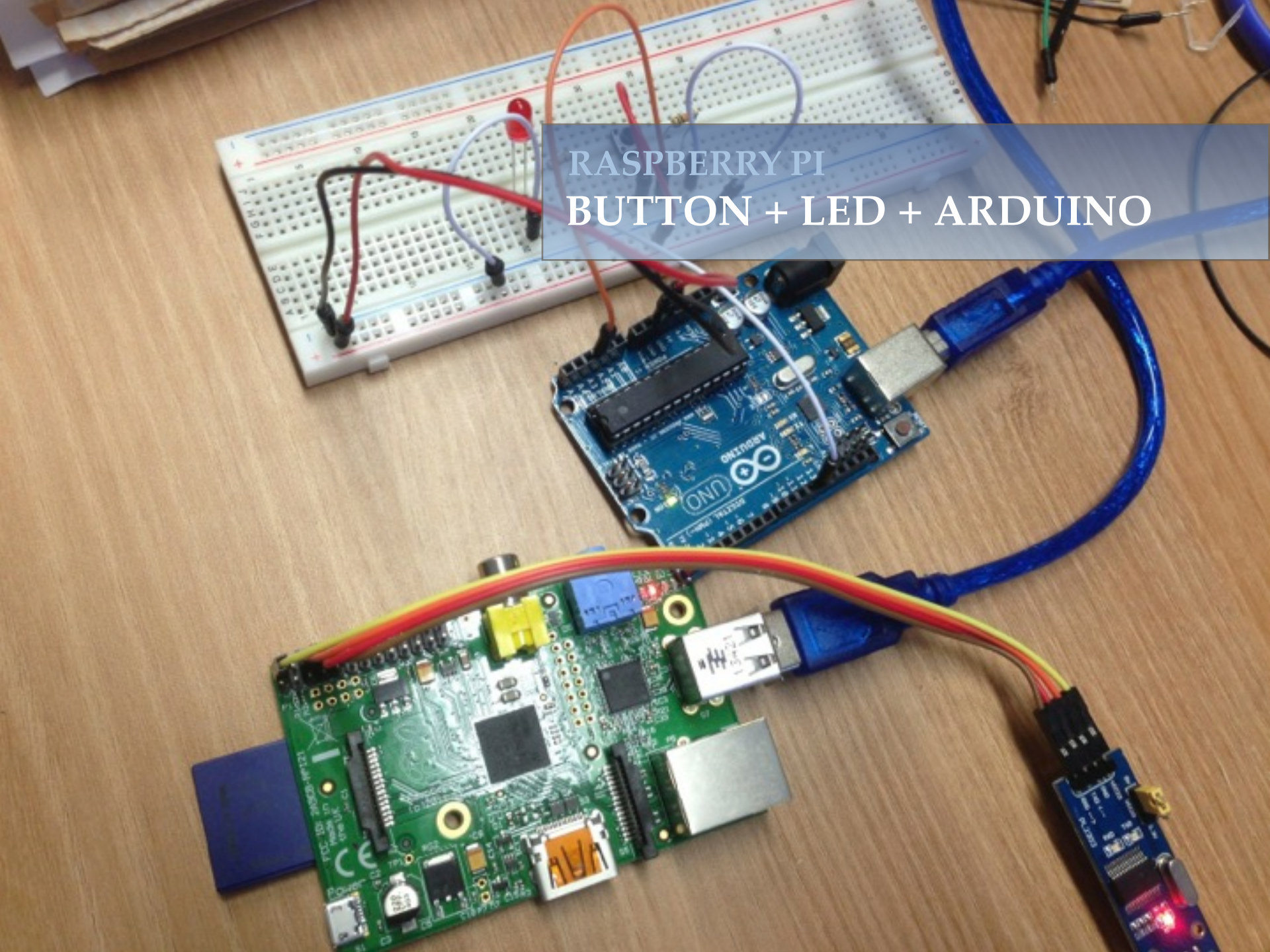
```
void setup() {
  Serial.begin(9600);
}

void loop() {
  for (byte n = 0; n < 255; n++) {
   Serial.write(n);
   delay(50);
  }
}
```

```
sudo apt-get update ❶
sudo apt-get install arduino ❷
```

```
sudo usermod❶ -a -G❷ tty pi
sudo usermod -a -G dialout pi
```

❶ usermod is a Linux program to manage users

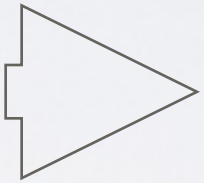
❷ -a -G puts the user (pi) in the specified group (tty, then dialout)



RASPBERRY PI

BUTTON + LED + ARDUINO

FEATURE



LED ON / OFF

- 버튼 누르는지 감지
- 버튼이 눌리면 LED ON

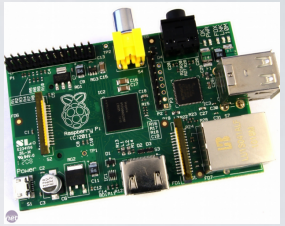
준비물

RED LED

USB Cable

Button

arduino

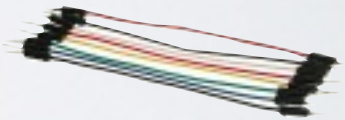


Raspberry Pi

bread board

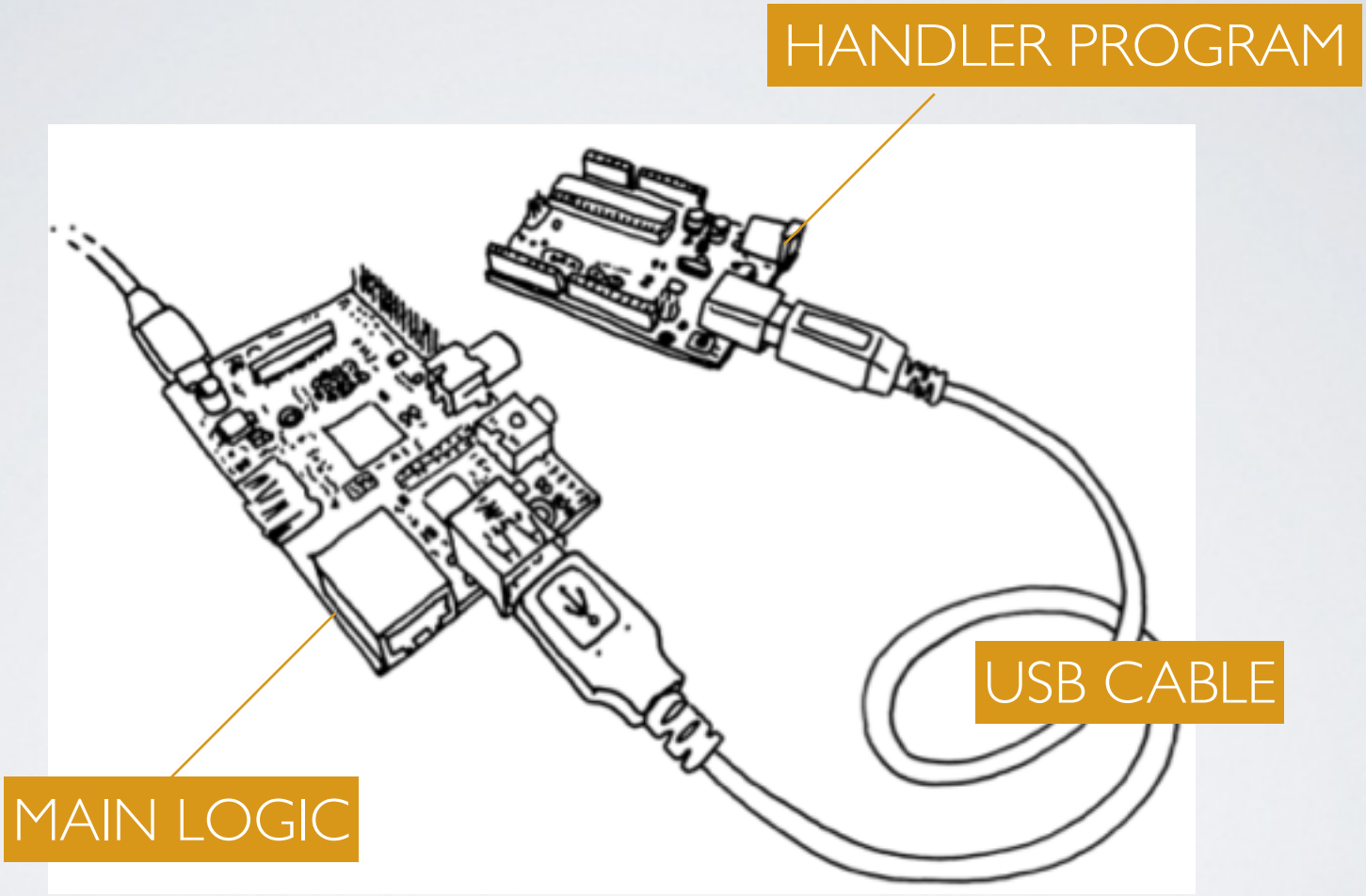
330 ohm register
(주주갈)

10K ohm register
(갈흑주)

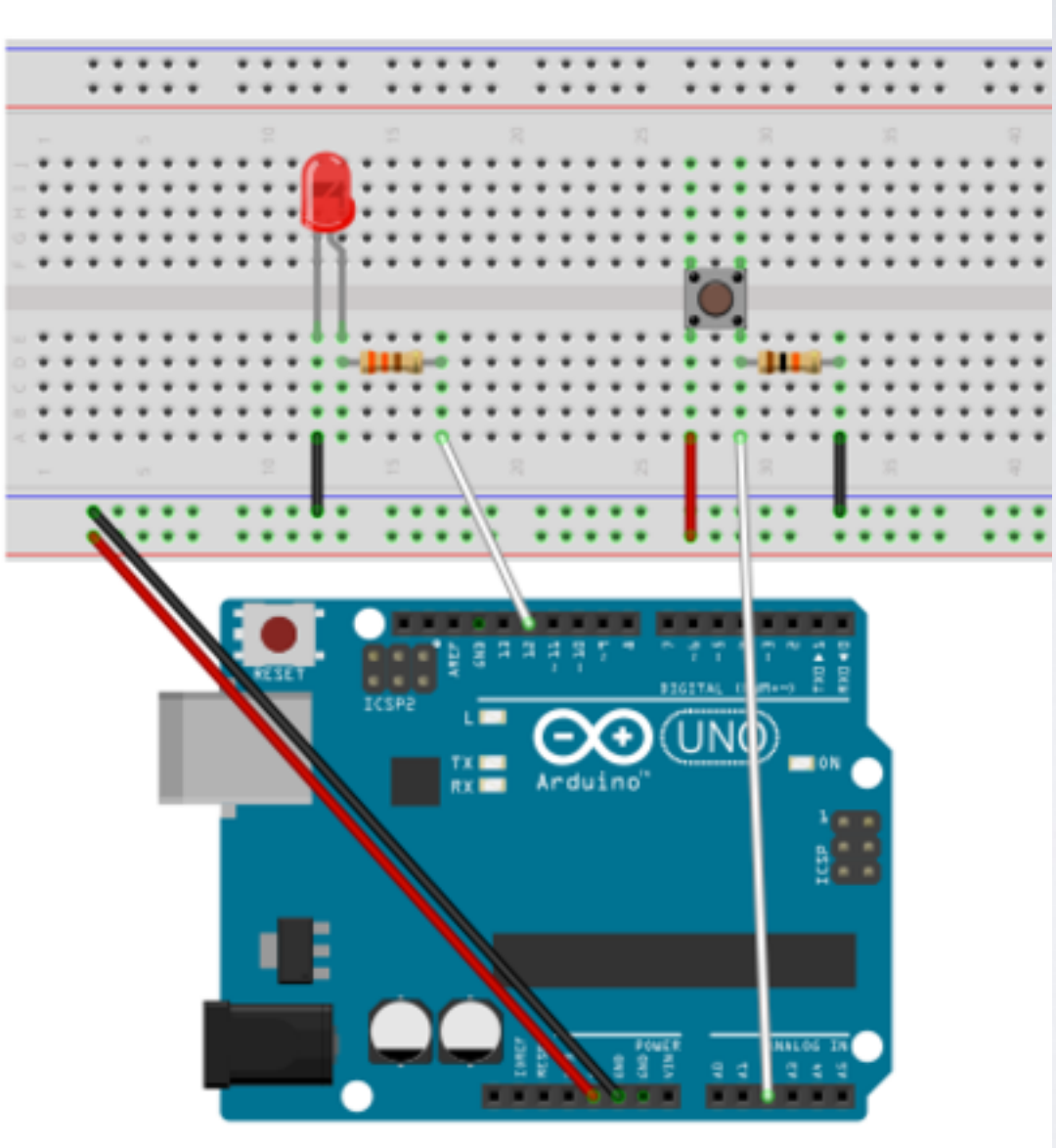


암-수 점퍼 * 4
수-수 * 2

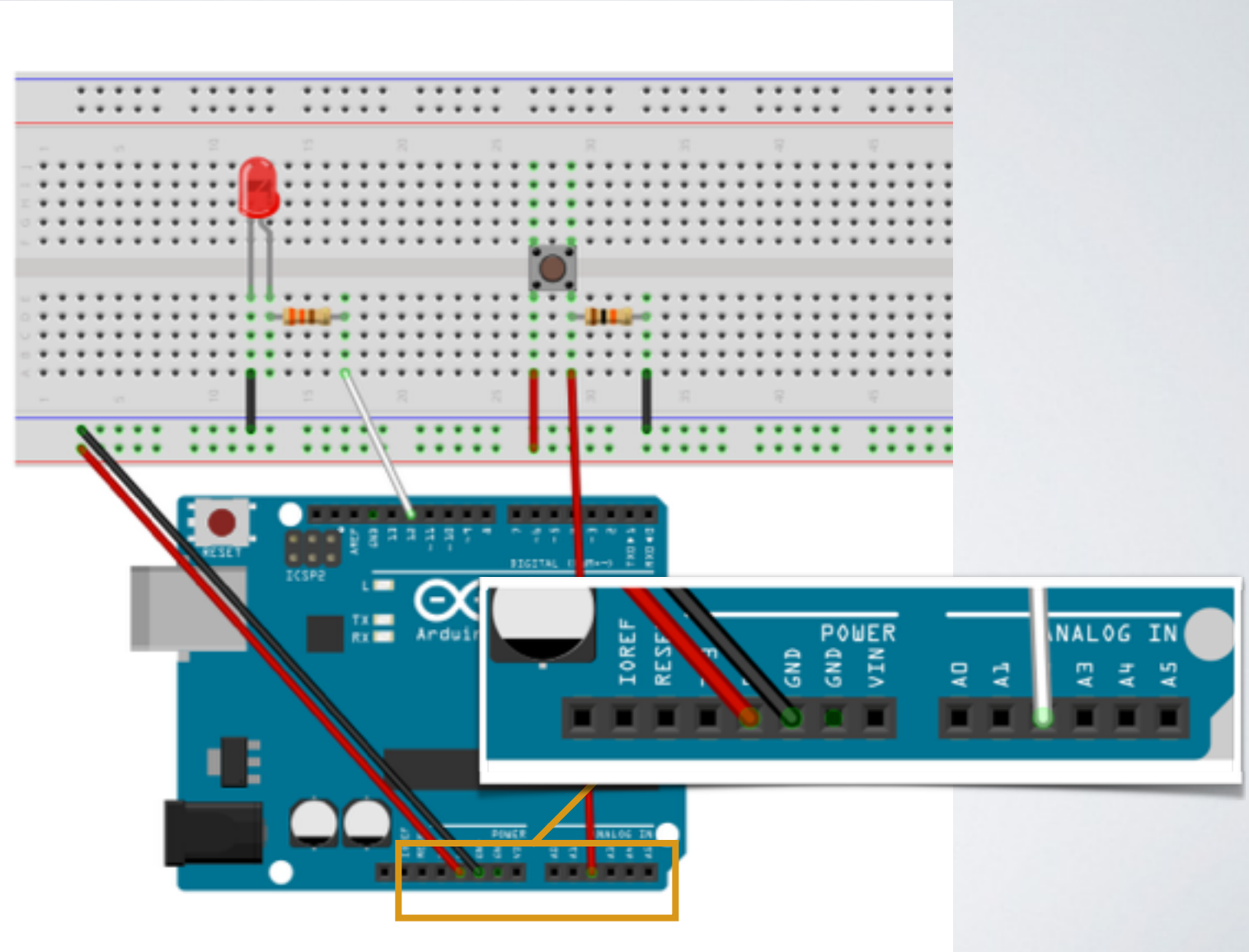
연결



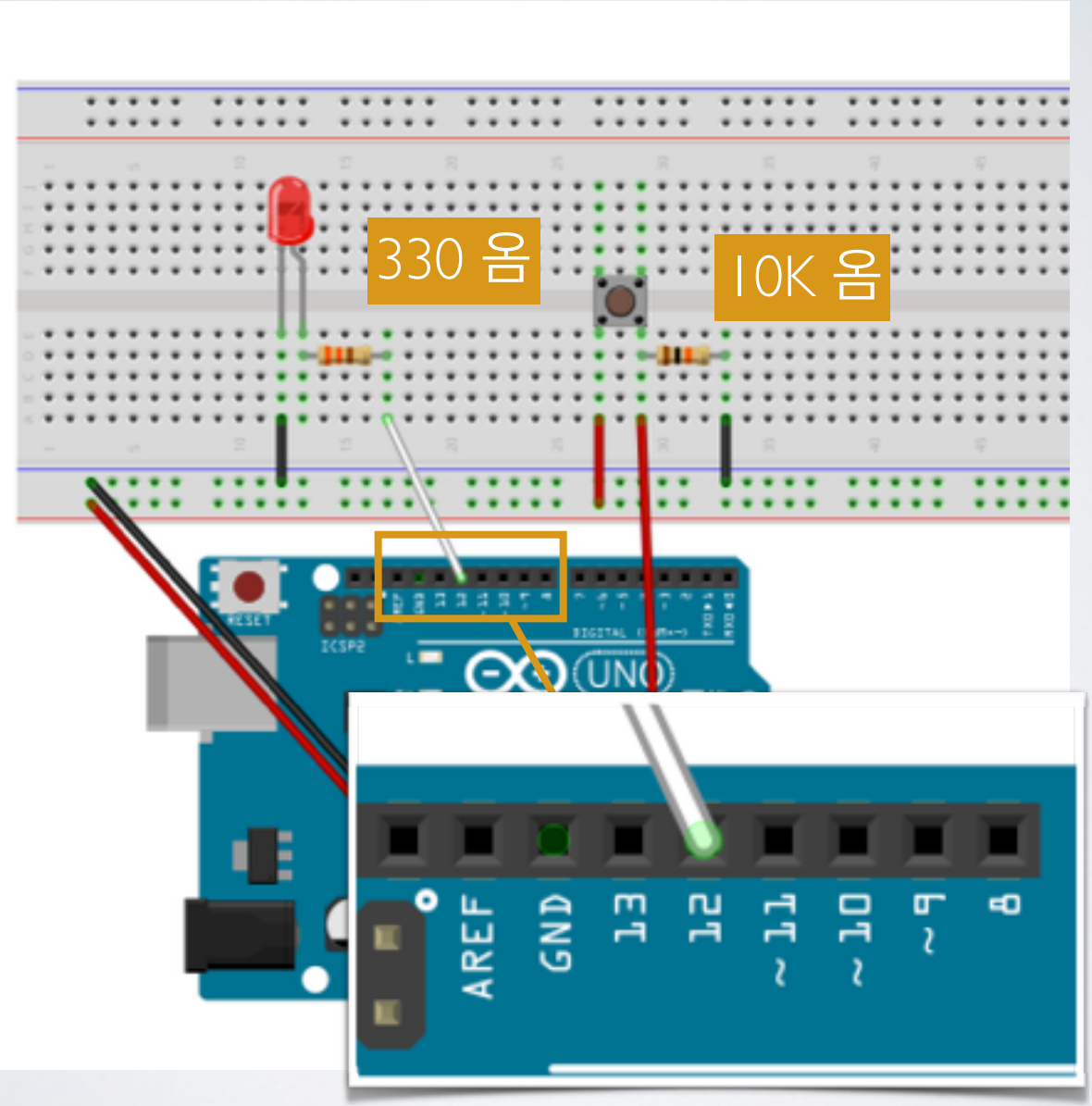
연결



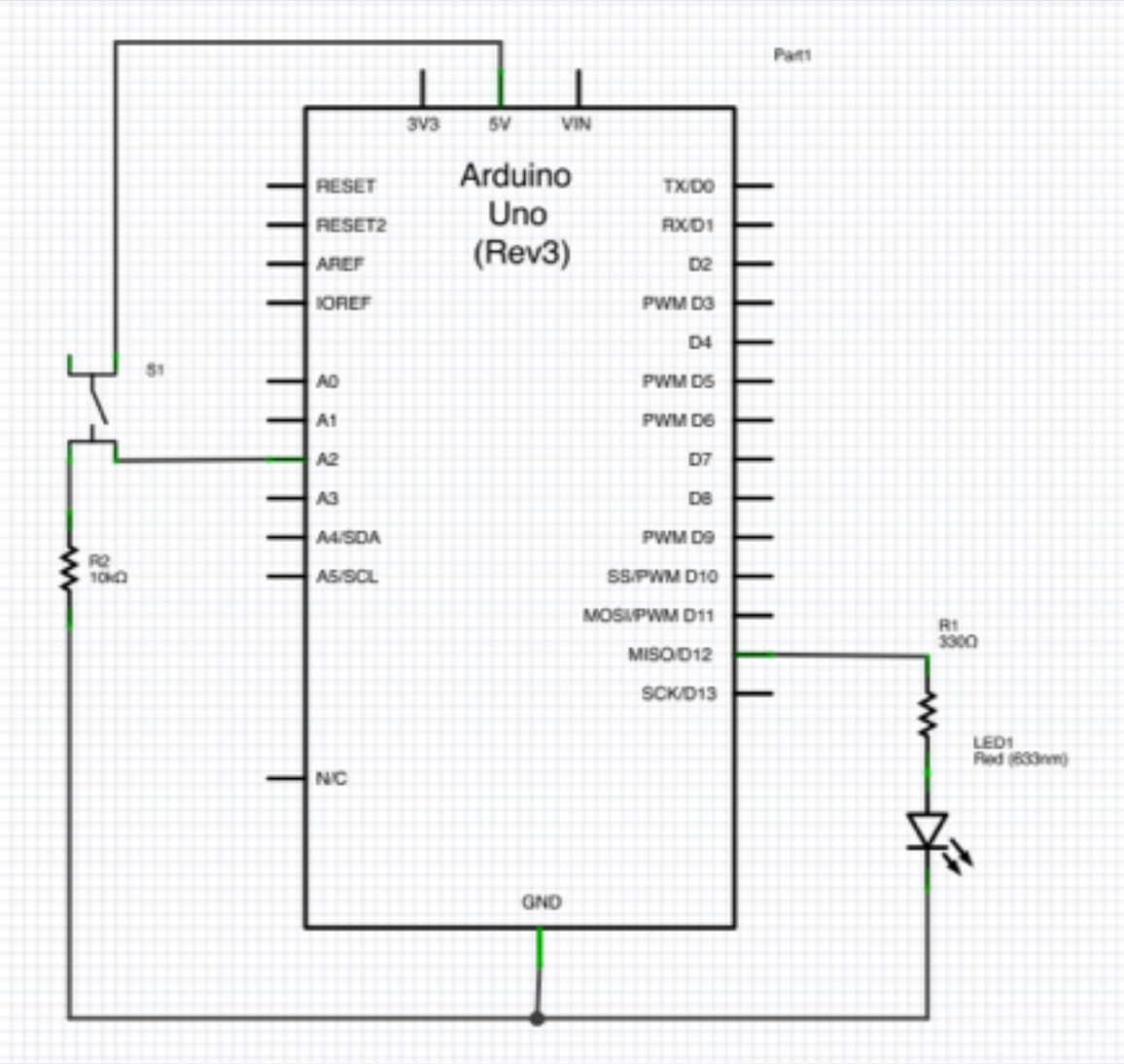
연결



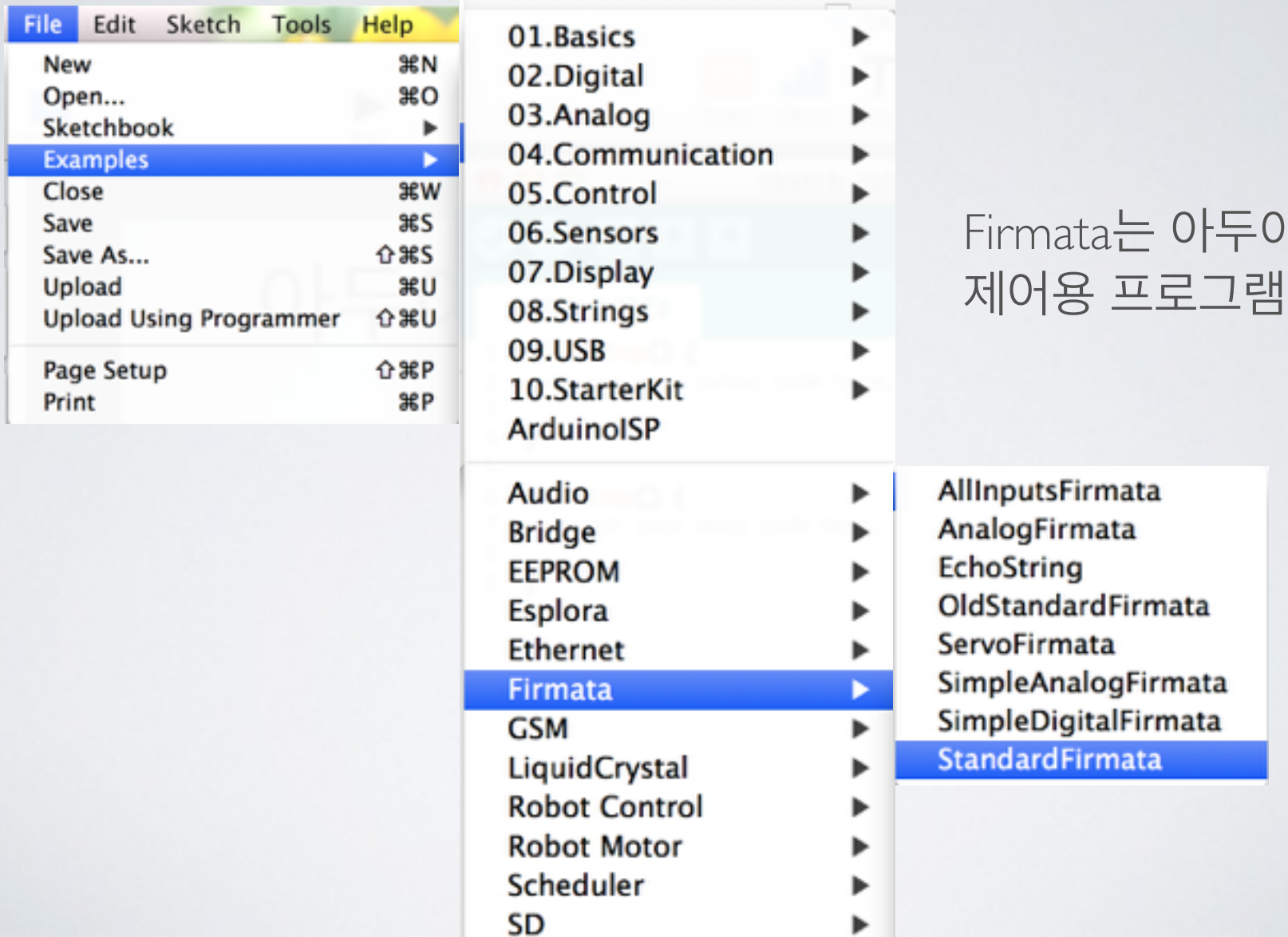
연결



회로도


Part1
3V3
5V
VIN
Arduino
Uno
(Rev3)
RESET
RESET2
AREF
IOREF
A0
A1
A2
A3
A4/SDA
A5/SCL
N/C
TX/D0
RX/D1
D2
PWM D3
D4
PWM D5
PWM D6
D7
D8
PWM D9
SS/PWM D10
MOSI/PWM D11
MISO/D12
SCK/D13
GND
S1
R2
10kΩ
R1
330Ω
LED1
Red (633nm)

아두이노에 FIRMATA 올리기



Firmata는 아두이노 제어용 프로그램

INSTALL MODULE

```
$> sudo apt-get install python-setuptools
$> sudo easy_install pyfirmata
```

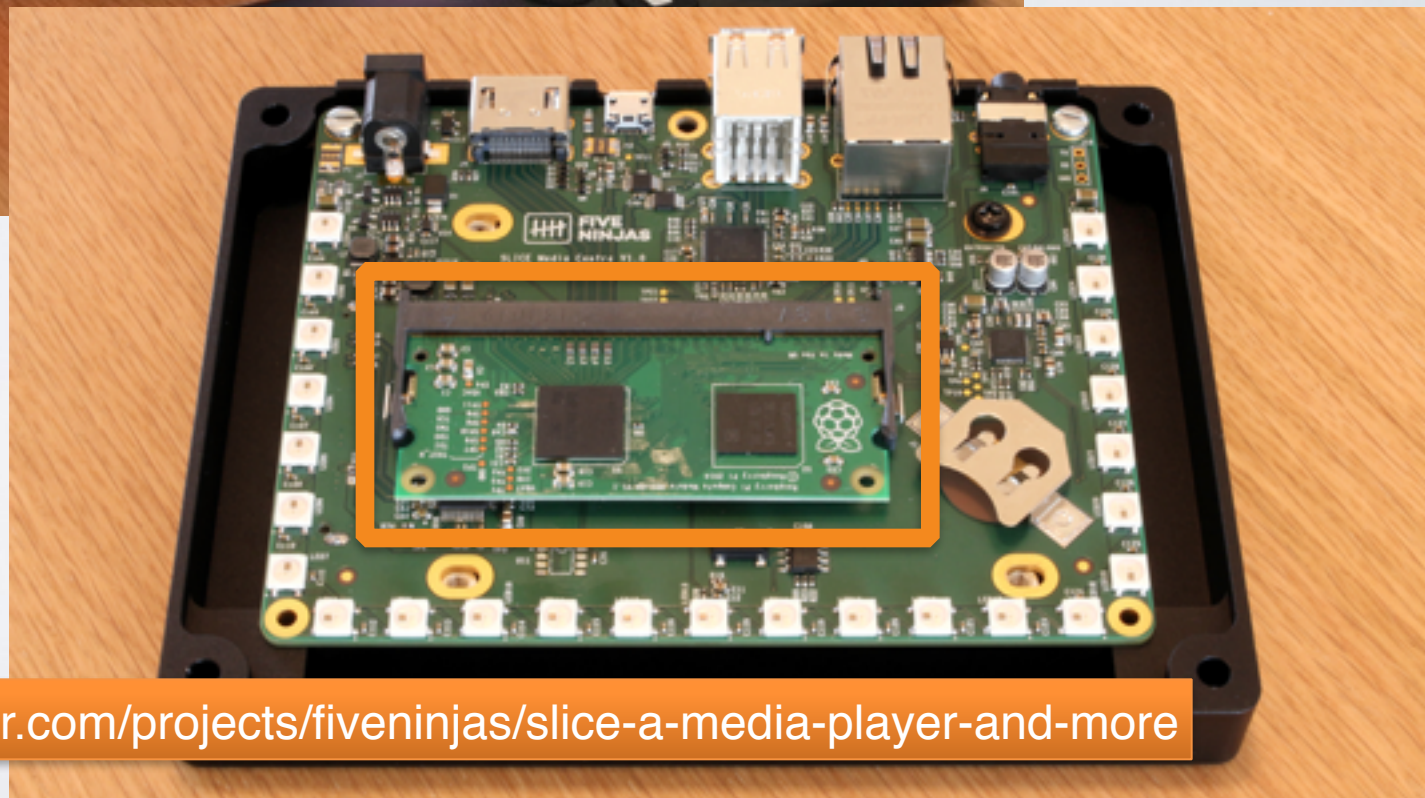
PYTHON CODE

$> nano firmata_turn_on_off_using_button.py

```
#load library
from pyfirmata import Arduino, util
import time

# create arduino object
board = Arduino('/dev/ttyACM0')

# read button event
it = util.Iterator(board)
it.start()
board.analog[2].enable_reporting()

print 'Start program'

while True:
        try:
                if( board.analog[2].read() == 1 ):
                        board.digital[12].write(1)
                else:
                        board.digital[12].write(0)
                time.sleep(0.1);
        except:
                board.analog[2].disable_reporting()
                board.exit()
                exit(0)
```

$> sudo python firmata_turn_on_off_using_button.py

Slice



https://www.kickstarter.com/projects/fiveninjas/slice-a-media-player-and-more

PiPhone

http://www.raspberrypi.org/piphone-home-made-raspberry-pi-smartphone/


감사합니다.