

# Arduino基礎教學

控制LED、使用開關

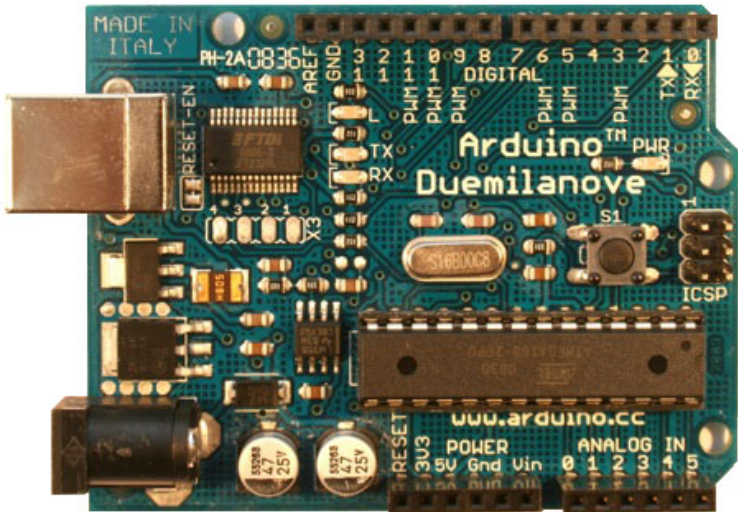
# **Lesson 0**

Arduino

# Lesson 0 - Arduino

- 什麼是Arduino?
- Arduino的種類
- 如何取得Arduino?

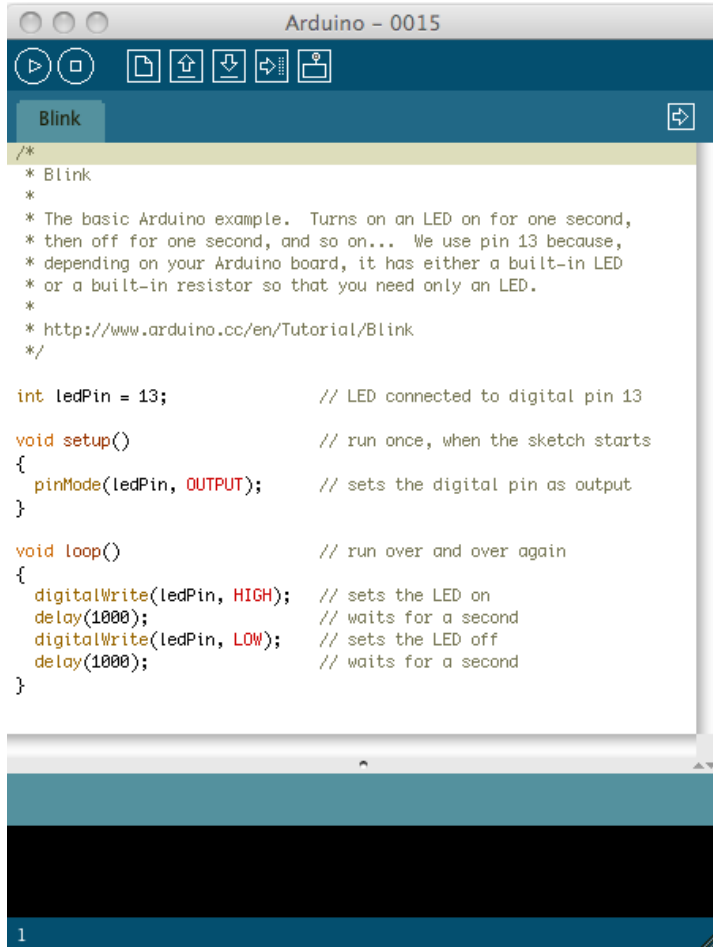
# 什麼是Arduino?



Arduino Duemilanove

- open source
  - 硬體(Arduino I/O board)
  - 軟體(Arduino IDE)
- 能快速製作電子電路原型 (electronics prototyping)
- 有彈性、易使用
- 目標對象：  
藝術家、設計師、任何對互動有興趣的人

# 什麼是Arduino?

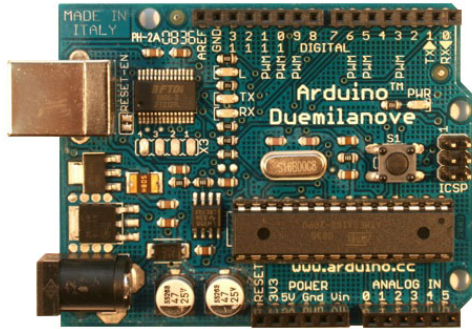


```
/*  
 * Blink  
 *  
 * The basic Arduino example. Turns on an LED on for one second,  
 * then off for one second, and so on... We use pin 13 because,  
 * depending on your Arduino board, it has either a built-in LED  
 * or a built-in resistor so that you need only an LED.  
 *  
 * http://www.arduino.cc/en/Tutorial/Blink  
 */  
  
int ledPin = 13;           // LED connected to digital pin 13  
  
void setup()               // run once, when the sketch starts  
{  
  pinMode(ledPin, OUTPUT); // sets the digital pin as output  
}  
  
void loop()                // run over and over again  
{  
  digitalWrite(ledPin, HIGH); // sets the LED on  
  delay(1000);                // waits for a second  
  digitalWrite(ledPin, LOW);  // sets the LED off  
  delay(1000);                // waits for a second  
}
```

Arduino IDE

- 藉由感應器(sensor)能感知周遭環境變化(如:紅外線感應器)
- 能控制周遭裝置(如:燈)
- Arduino電路可獨自運作
- Arduino電路也可以搭配電腦運作, 跟電腦溝通

# 什麼是Arduino?

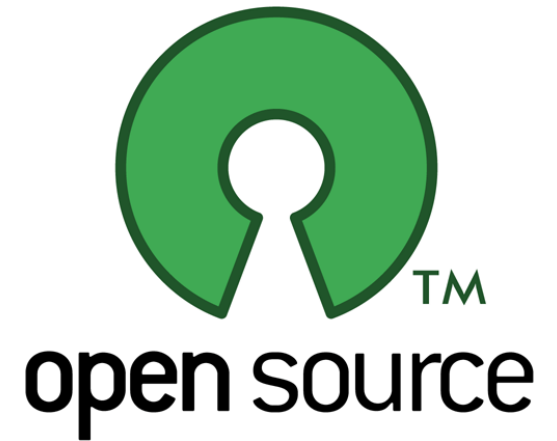


+

A screenshot of the Arduino IDE window titled "Arduino - 0015". The window shows the "Blink" sketch, which is a basic example for turning an LED on and off. The code is as follows:

```
/*  
 * Blink  
 *  
 * The basic Arduino example. Turns on an LED on for one second,  
 * then off for one second, and so on... We use pin 13 because,  
 * depending on your Arduino board, it has either a built-in LED  
 * or a built-in resistor so that you need only an LED.  
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 * http://www.arduino.cc/en/Tutorial/Blink  
 */  
  
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void setup()              // run once, when the sketch starts  
{  
  pinMode(ledPin, OUTPUT); // sets the digital pin as output  
}  
  
void loop()               // run over and over again  
{  
  digitalWrite(ledPin, HIGH); // sets the LED on  
  delay(1000);                // waits for a second  
  digitalWrite(ledPin, LOW);  // sets the LED off  
  delay(1000);                // waits for a second  
}
```

+

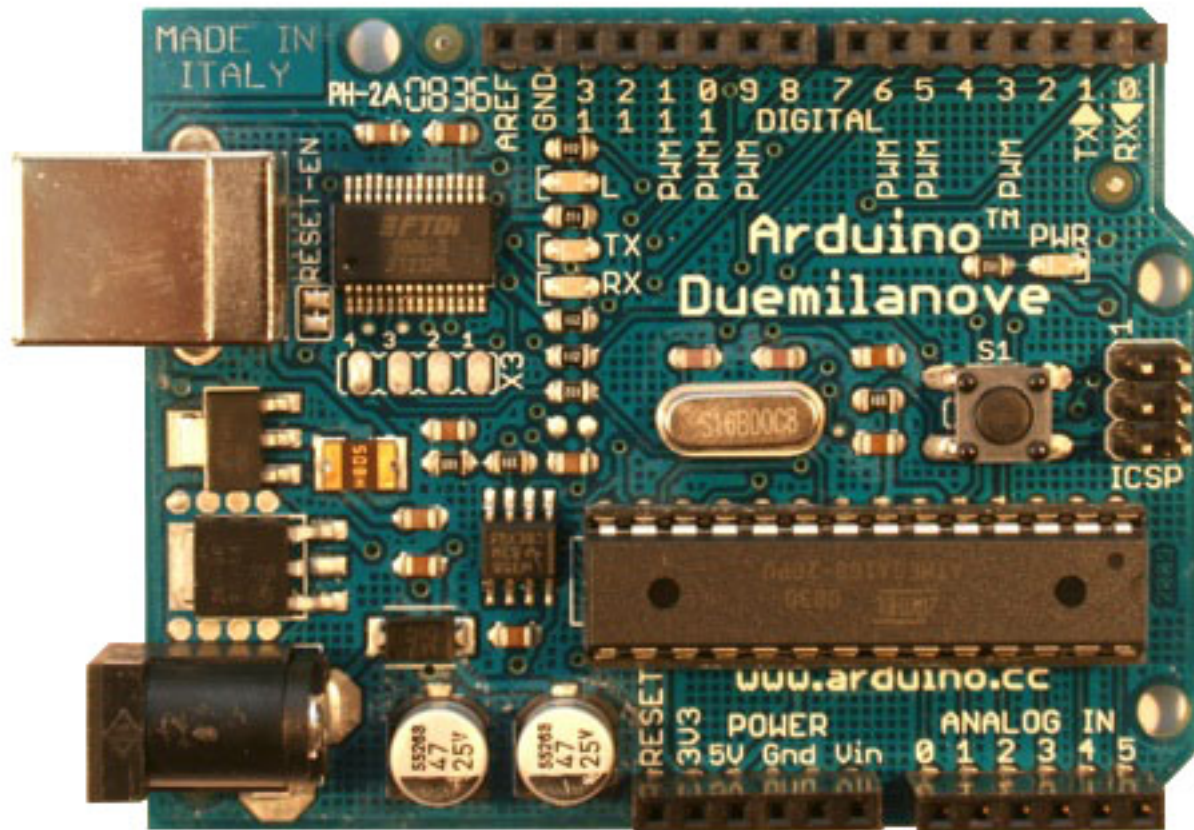


# Arduino的種類

- Arduino Duemilanove (這次工作坊用的)
- Arduino Diecimila
- Arduino Nano
- Arduino Mega
- Arduino Bluetooth
- Arduino LilyPad
- Arduino Mini
- Arduino Mini USB Adapter
- Arduino Pro
- Arduino Pro Mini
- Arduino Serial
- Arduino Serial Single Sided

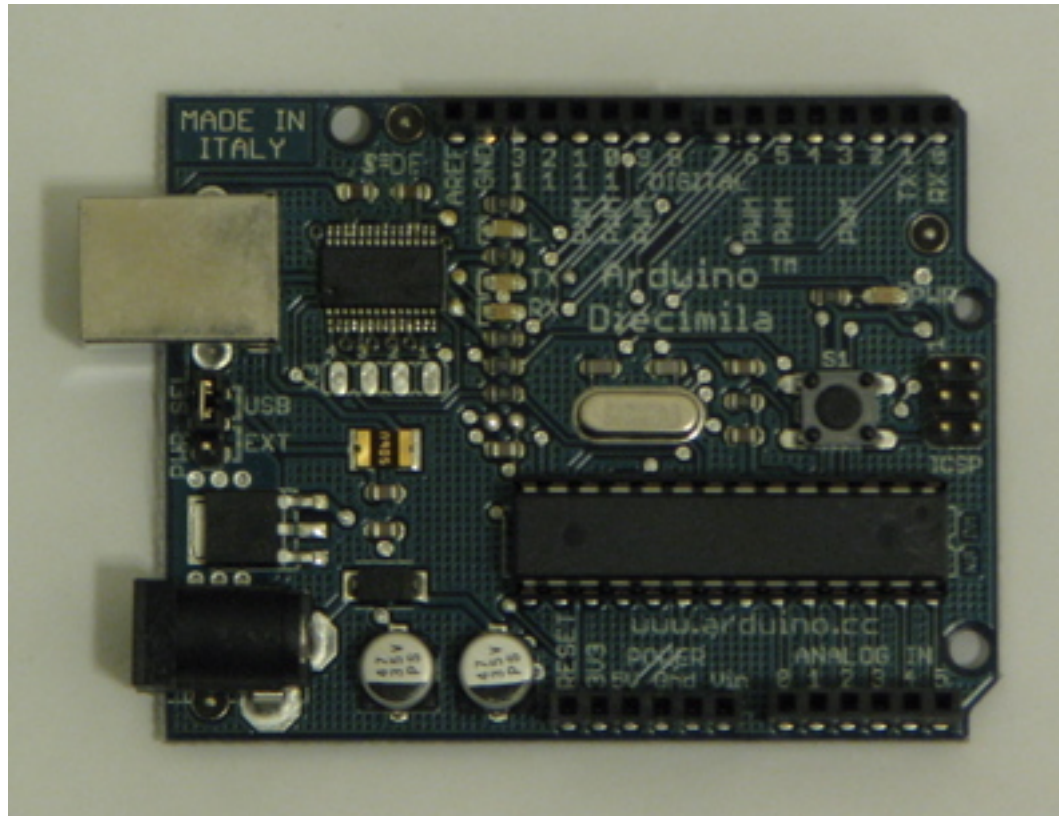
來源網站：<http://arduino.cc/en/Main/Hardware>

# Arduino Duemilanove (這次工作坊用的)

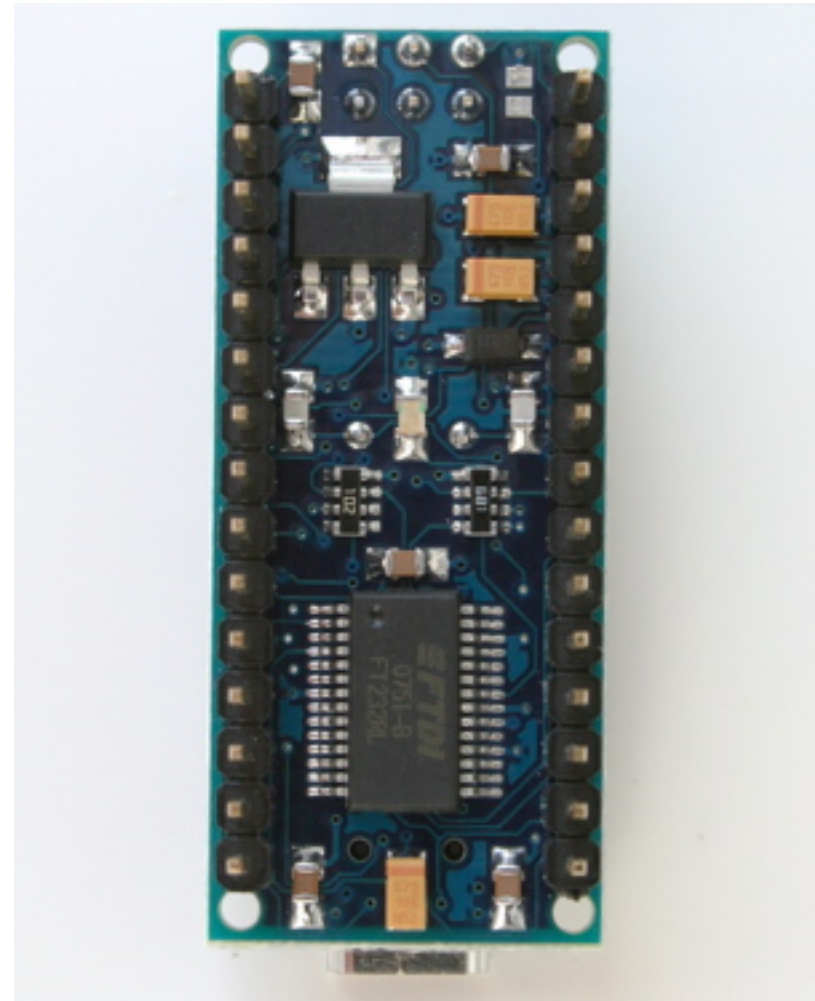




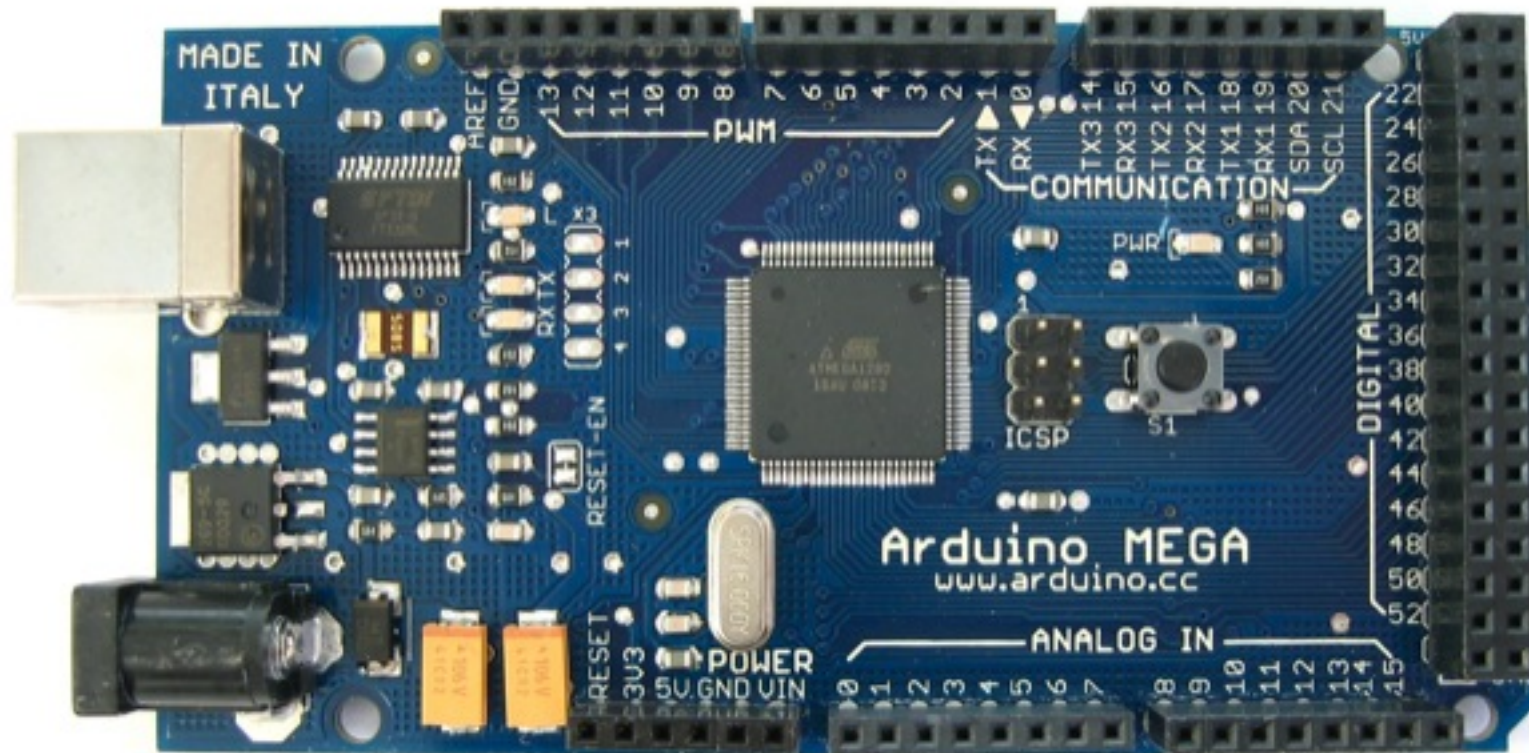
# Arduino Diecimila



# Arduino Nano

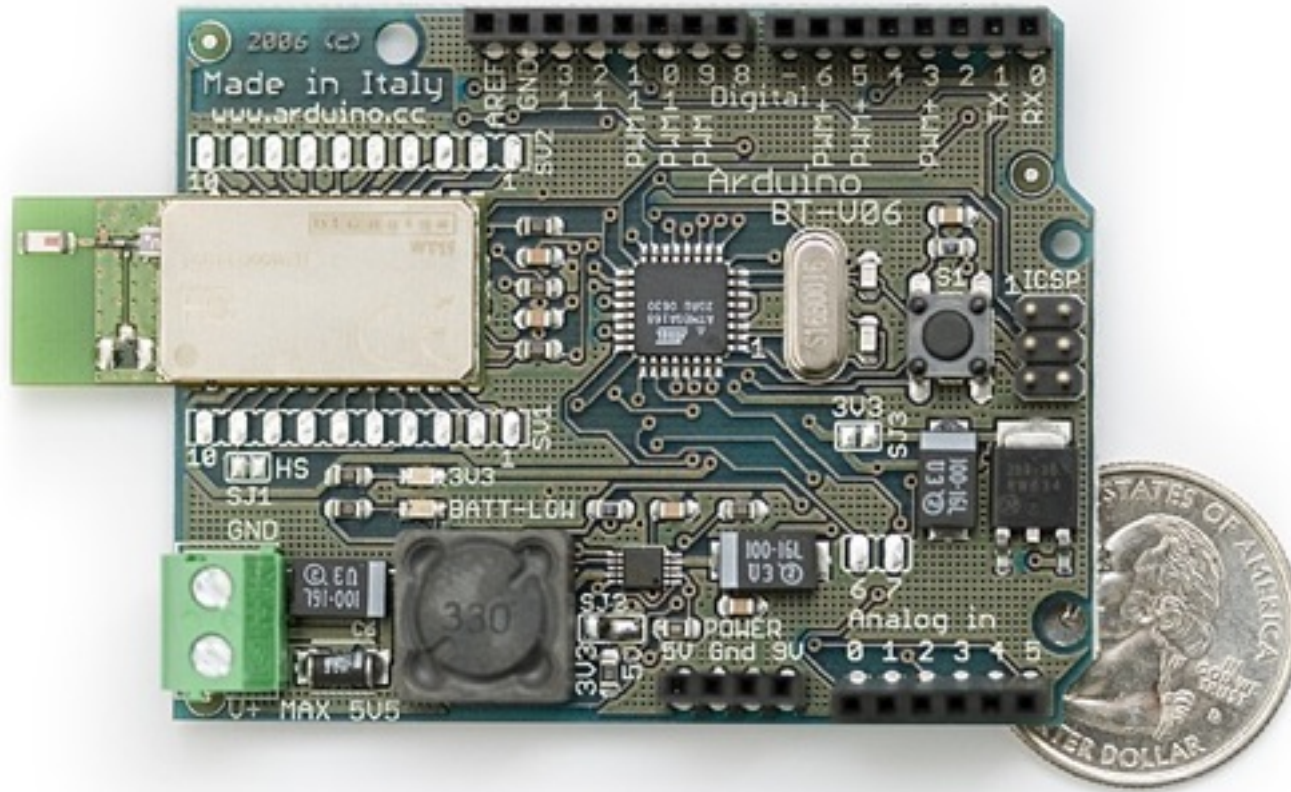


# Arduino Mega

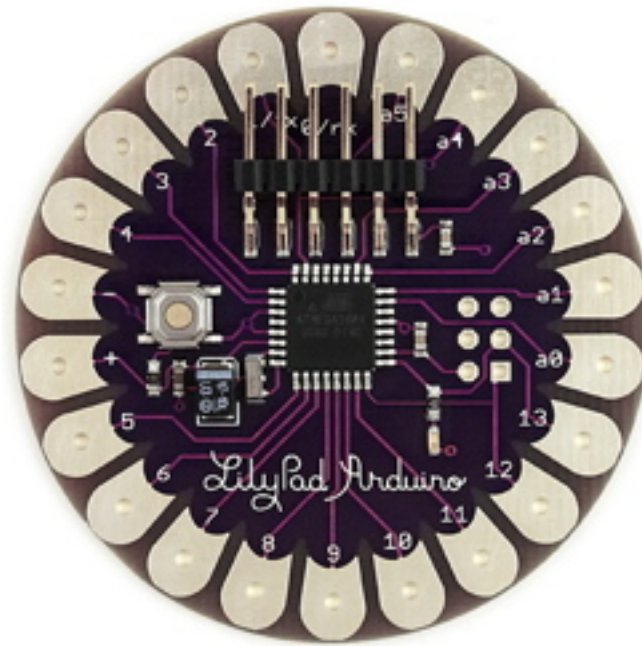




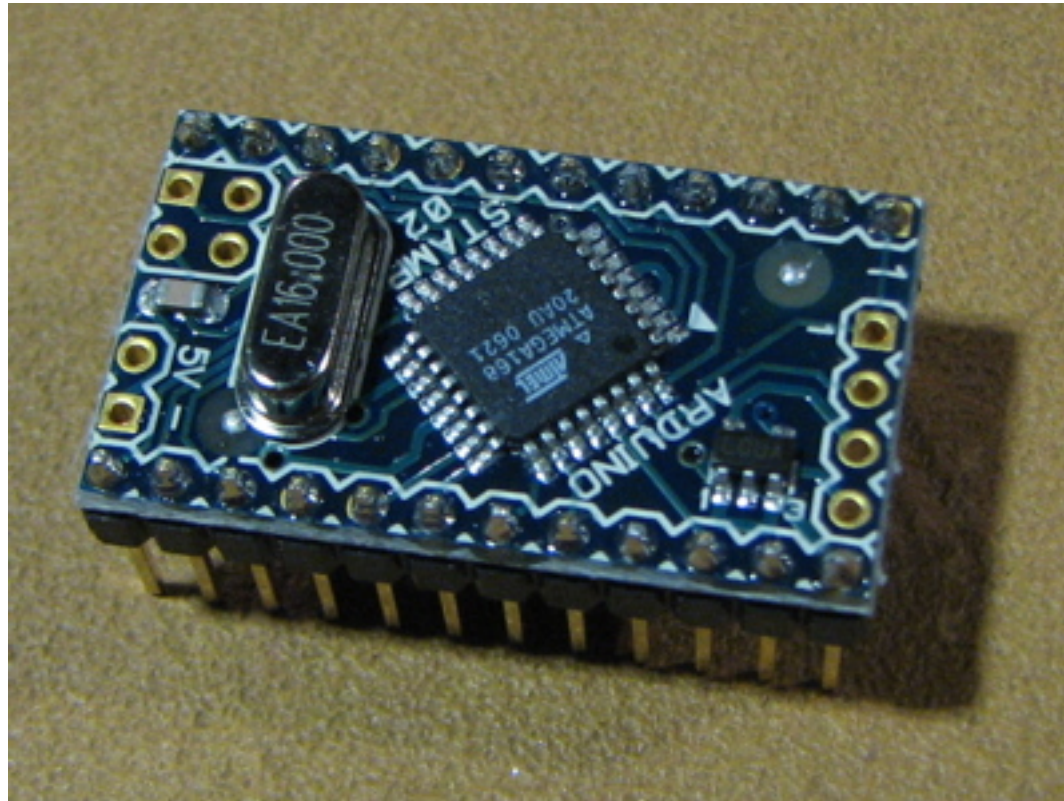
# Arduino Bluetooth



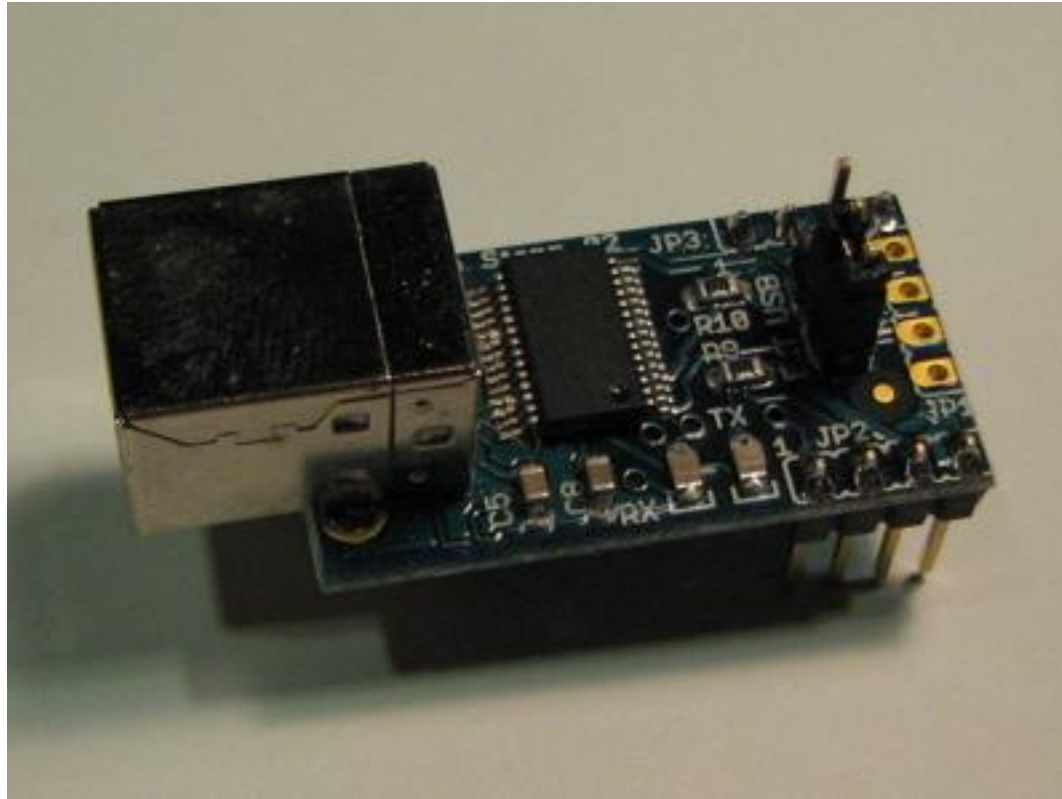
# Arduino LilyPad



# Arduino Mini

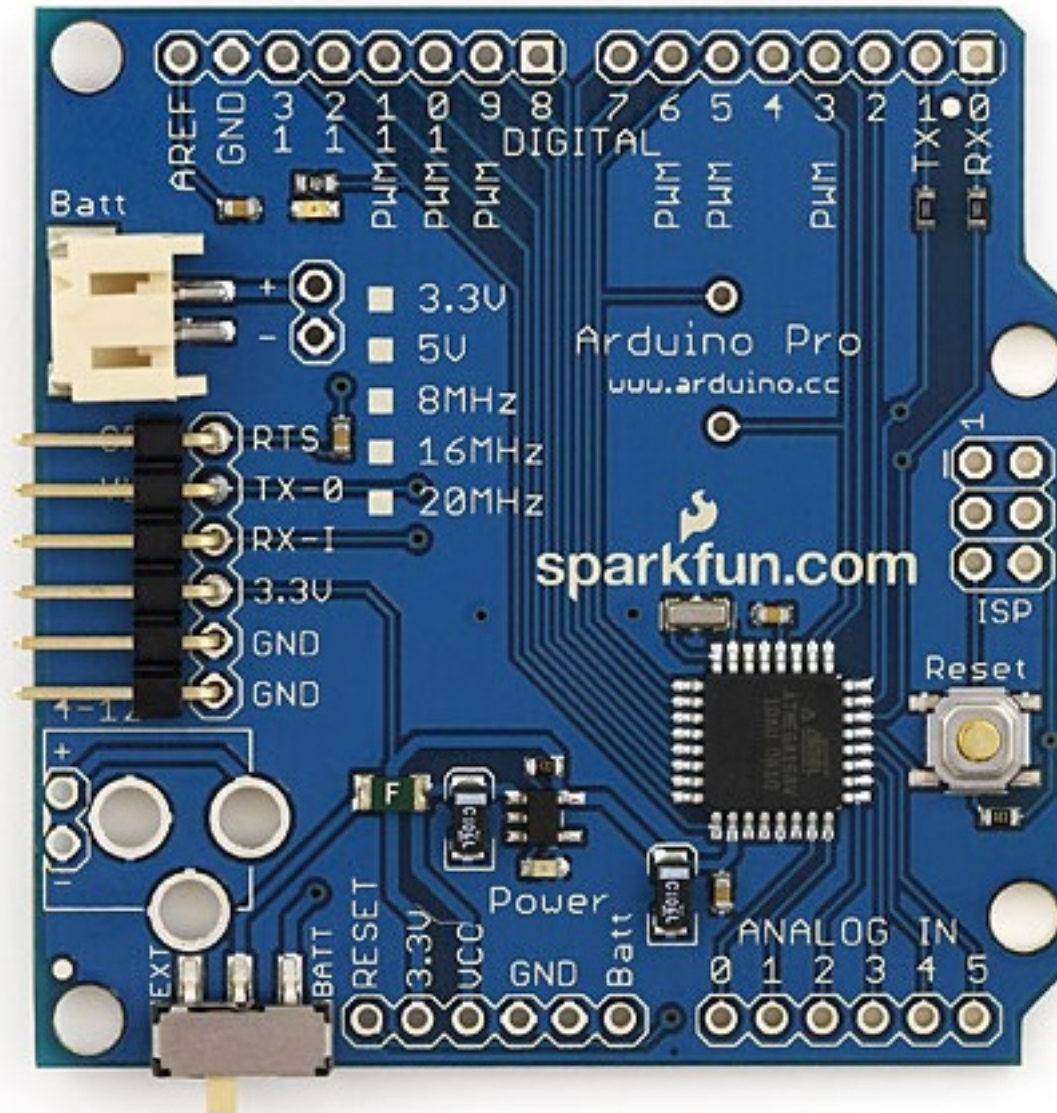


# Arduino Mini USB Adapter



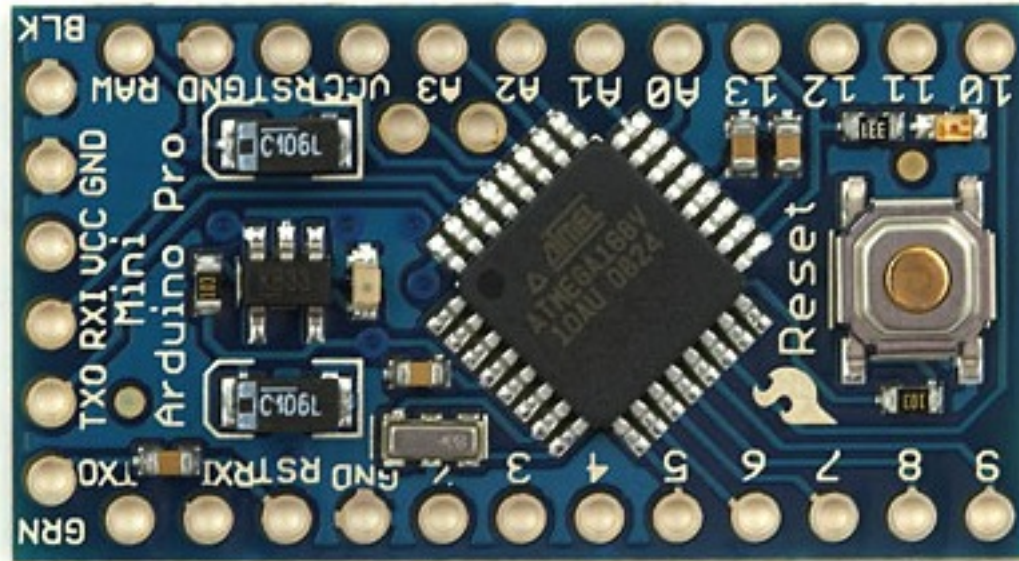


# Arduino Pro

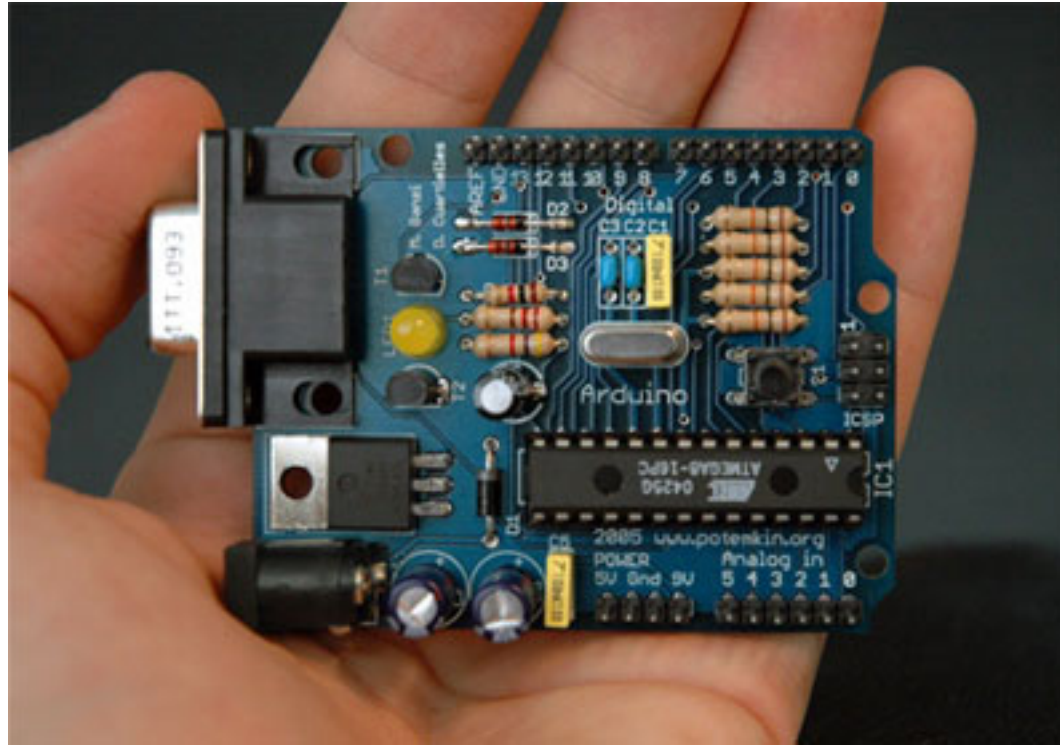




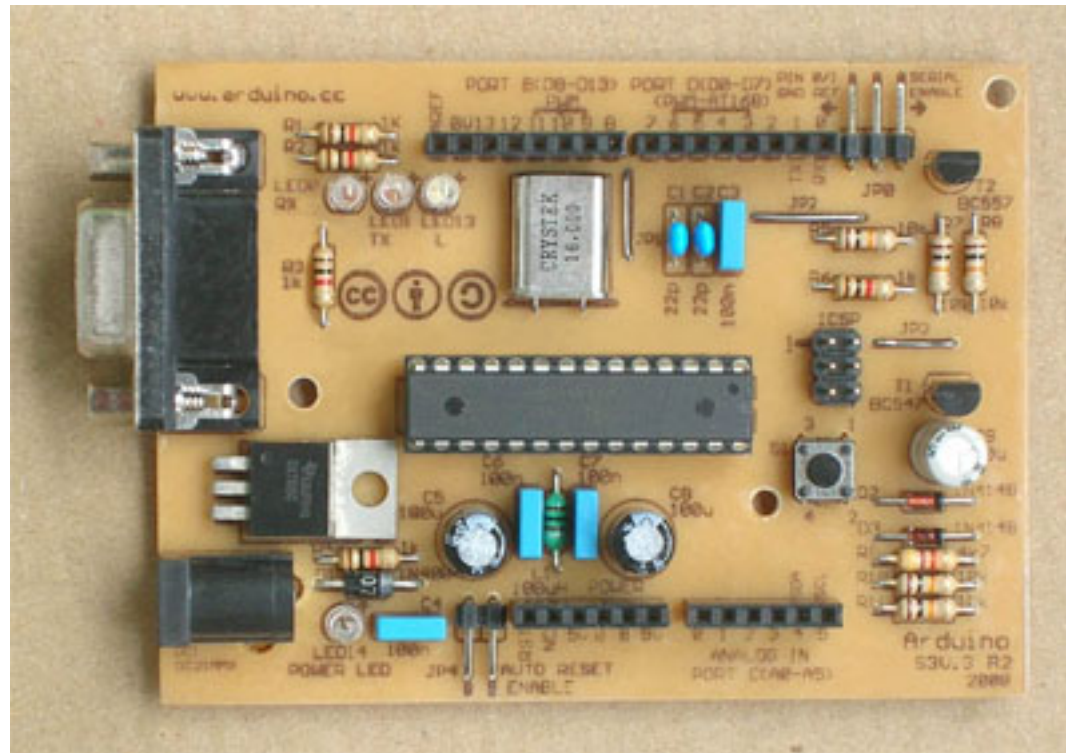
# Arduino Pro Mini



# Arduino Serial



# Arduino Serial Single Sided



# 類Arduino或Arduino相容的I/O board

- Seeeduino
- Sanguino
- Pinguino
- funnel IO
- ...族繁不及備載, 請上網尋找! (這就是open source的樂趣啊!)



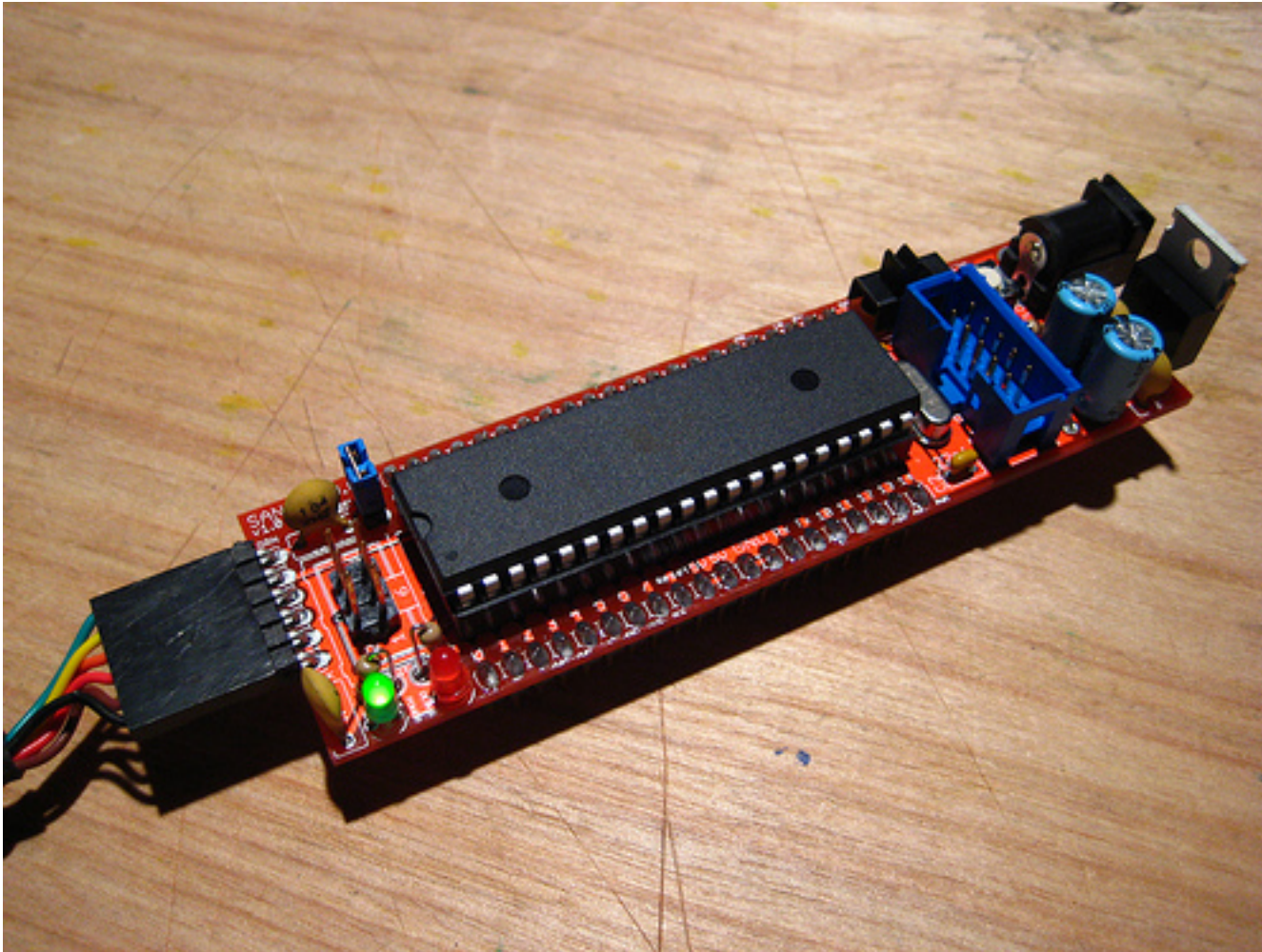
# Seeeduino

[http://www.seeedstudio.com/blog/?page\\_id=110](http://www.seeedstudio.com/blog/?page_id=110)



# Sanguino

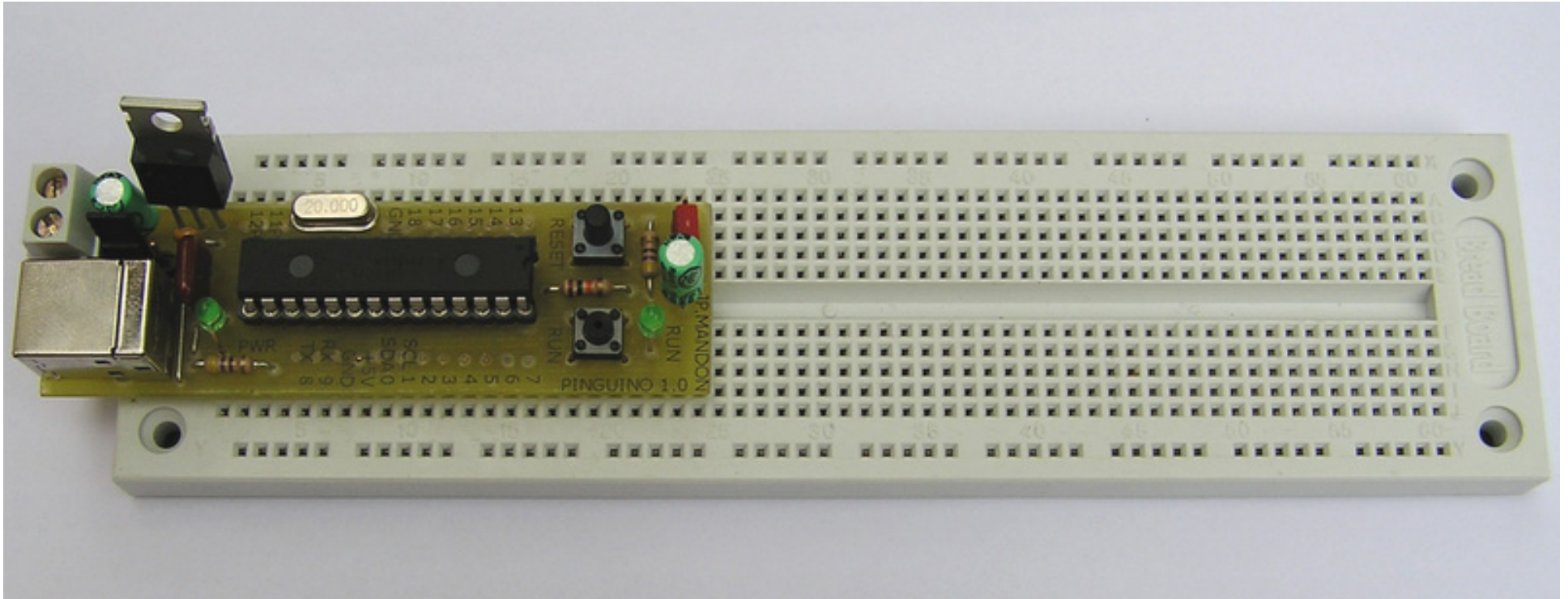
<http://sanguino.cc/>





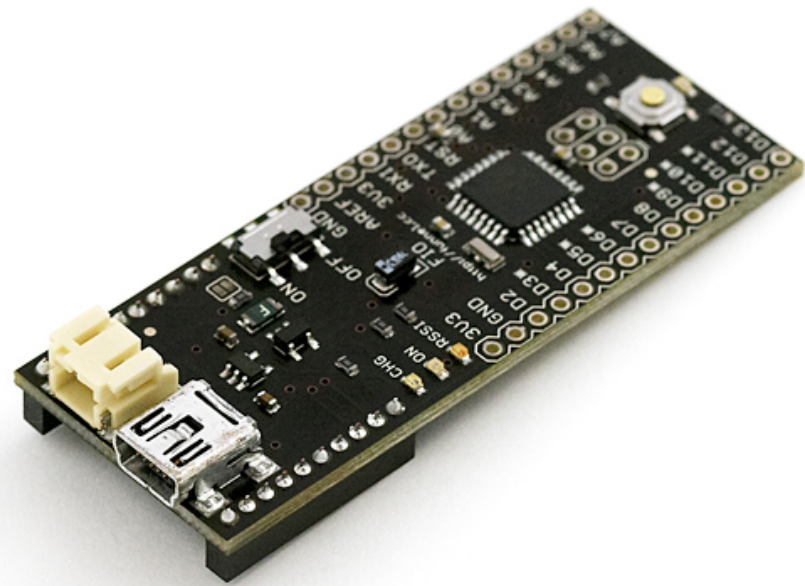
# Pinguino

<http://www.hackinglab.org/pinguino/index.html>



# funnel IO

<http://funnel.cc/Main/HomePage>





# 如何取得Arduino?

台灣代理商:



[http://www.playrobot.com/home\\_index.htm](http://www.playrobot.com/home_index.htm)



<http://www.aroboto.com/>

國外代理商:



<http://www.sparkfun.com/commerce/categories.php>

其他:

Arduino官網上列出全世界許多代理商

<http://arduino.cc/en/Main/Buy>

# **Lesson 1**

Let's get start!

# Lesson 1 - Let's get start!

- 事前準備
- 利用USB線將Arduino連接上電腦
- 了解Arduino I/O board
- 了解Arduino IDE
- 了解麵包板
- 最簡單的電路
- 範例一 Hello Arduino: blink LED!
- 範例二 LED loop
- 第二簡單的電路
- 範例三 Button

# 事前準備

1. 取得Arduino I/O board
2. 下載安裝Arduino IDE

<http://arduino.cc/en/Main/Software>

3. 安裝USB驅動程式(USB driver)

## [Windows 使用者]

下載Arduino IDE後，利用USB將Arduino和PC相連接後，螢幕上會出現安裝驅動程式畫面。指定驅動程式安裝路徑(在arduino資料夾裡 -> [drivers] -> [FTDI USB Drivers])，連續安裝兩次即可。

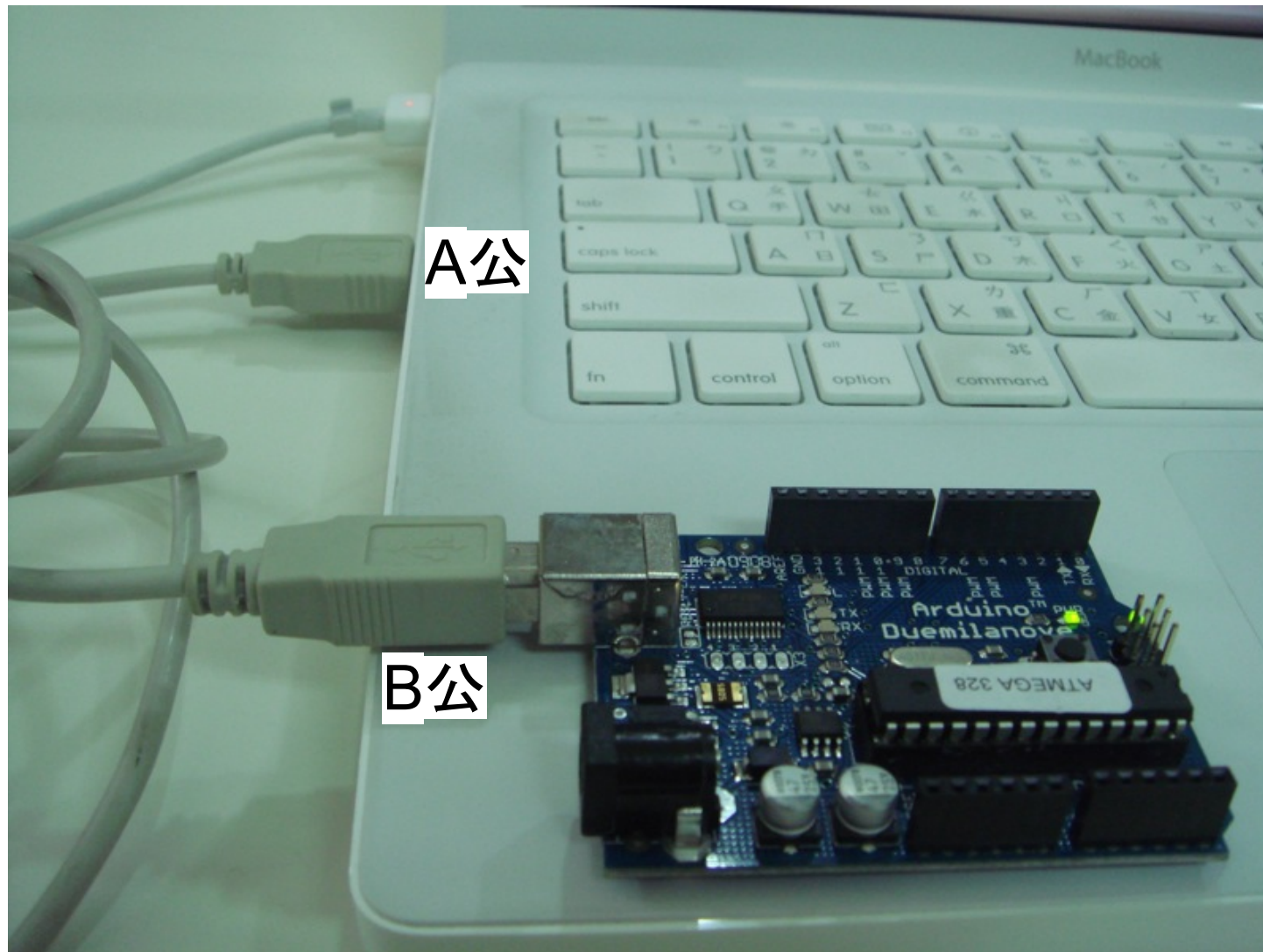
## [PowerPC Mac 使用者 (Powerbook, iBook, G4 or G5)]

下載Arduino IDE後，在arduino資料夾裡 -> [drivers] -> 執行FTDIUSBSerialDriver\_v2\_1\_9.dmg安裝

## [Intel Mac 使用者 (MacBook, MacBook Pro, or Mac Pro)]

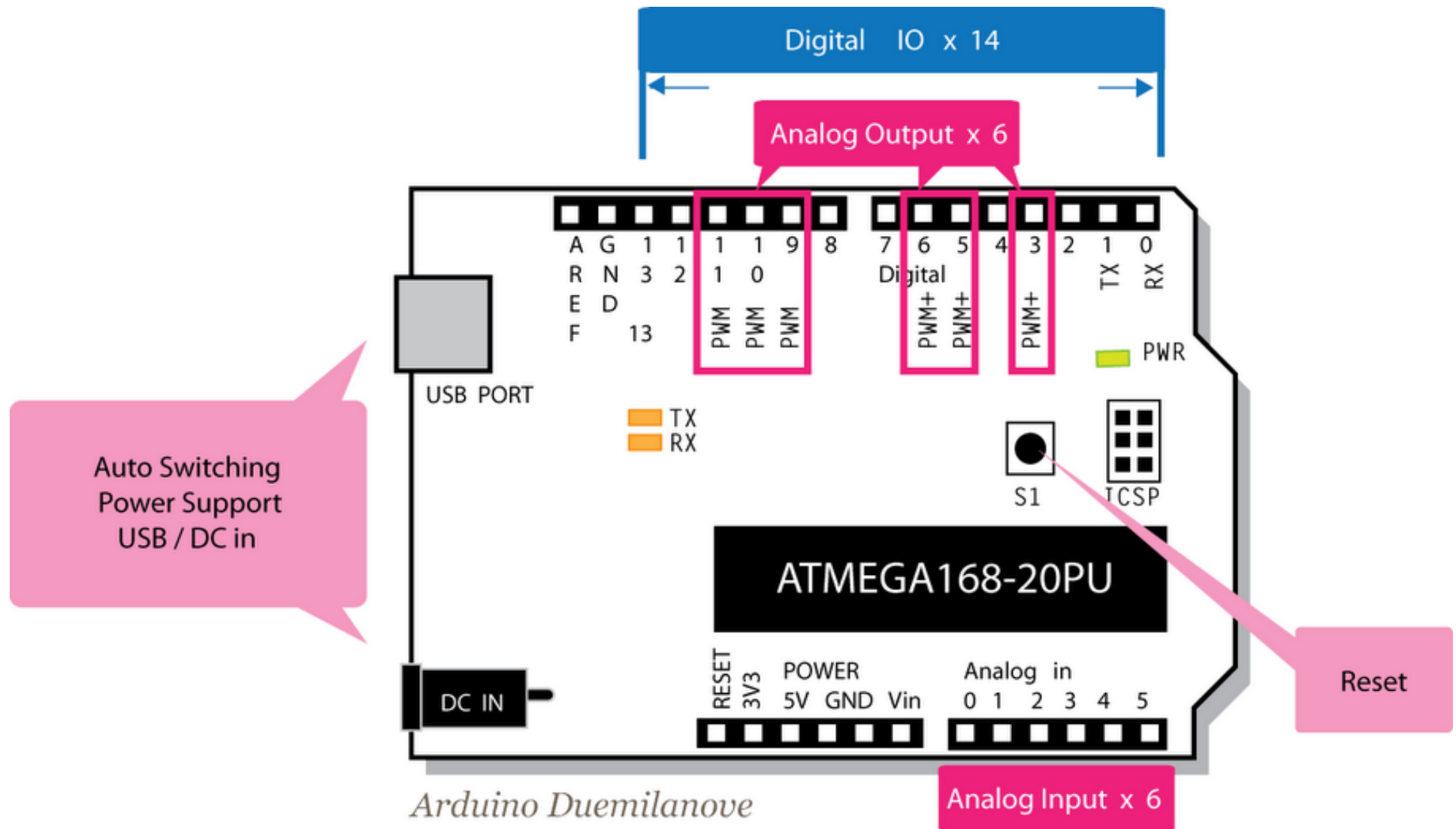
下載Arduino IDE後，在arduino資料夾裡 -> [drivers] -> 執行FTDIUSBSerialDriver\_v2\_1\_9.dmg安裝

# 利用USB線(A公-B公)將Arduino連接上電腦



PS. Windows使用者此時若出現“發現新硬體”的視窗，一直點選下一步安裝USB驅動程式即可（請參考 Arduino官網 <http://arduino.cc/en/Guide/Windows>）

# 了解Arduino I/O board



# 了解Arduino I/O board

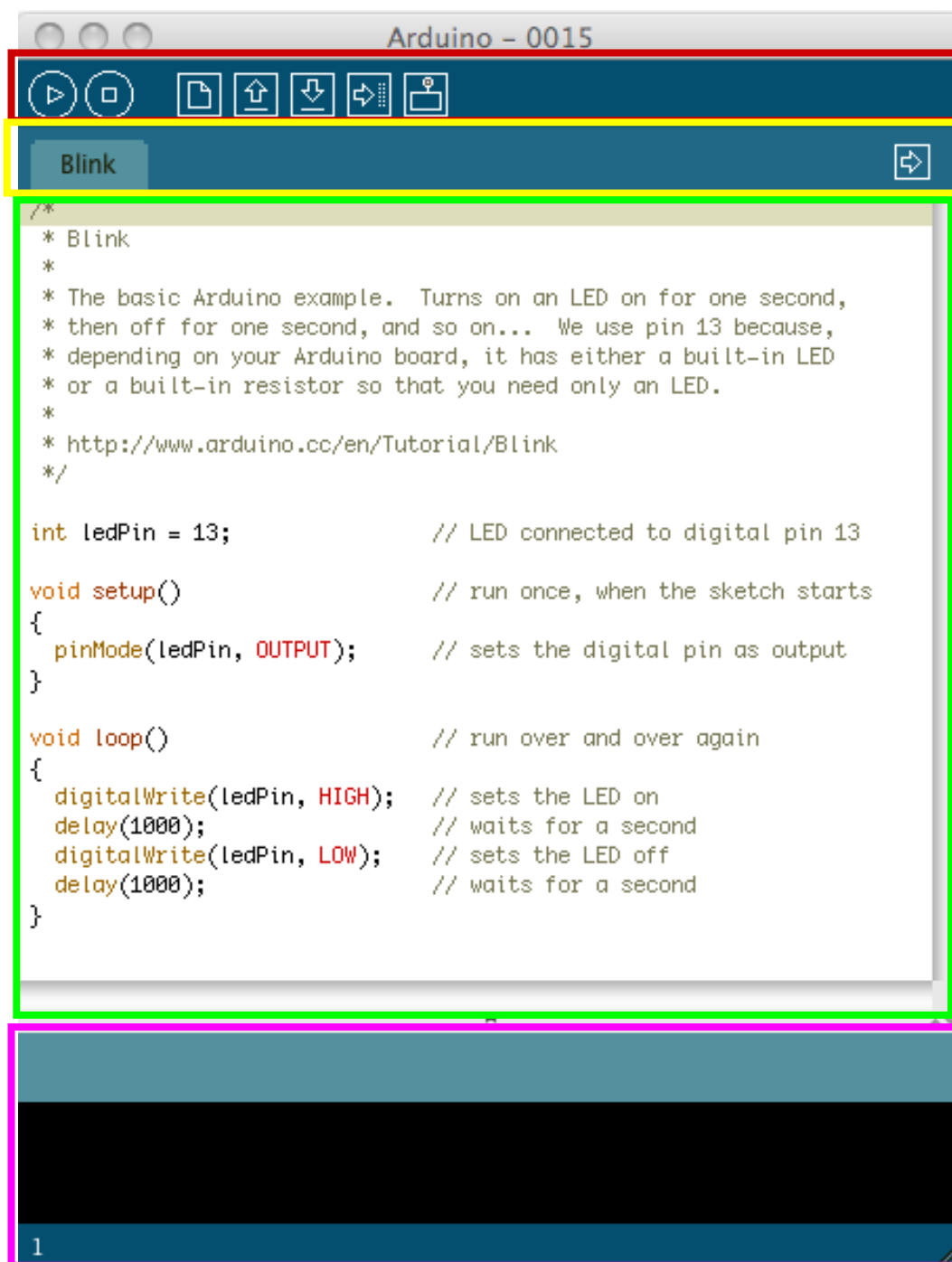
Digital I/O	共13，數位輸出/輸入端(pin 13作為LED指示用)
Analog Out	共6，在Digital I/O中的pin 3,5,6,9,10,11 可做類比輸出使用
Analog In	共6，類比輸入端pin 0~5
Tx/Rx	支援Tx/Rx訊號輸入輸出（若使用時，Digital I/O pin 0,1不可作為數位輸出入/使用）
USB傳輸與供電	支援USB直接供電，以及USB接頭資料傳輸
輸入電壓	可選擇USB直接供電或外部供電(建議7V~12V)，用JUMP切換 (Duemilanove版本改用自動切換)
輸出電壓	有5V、3.3V與Vin三種電壓輸出
支援線上燒錄功能	免去燒入經片需要重複拔插晶片的痛苦
LED 13	pin 13內建一個LED

p.s.

- (1) 當Digital I/O不敷使用時，可用Analog In pin另外代用，宣告為pin 14~19
- (2) 一般不建議使用Digital I/O pin 0,1，因為常作為Serial port傳輸用

資料來源：<http://interactive2go.blogspot.com/2009/04/get-to-start.html>

# 了解Arduino IDE



工具列

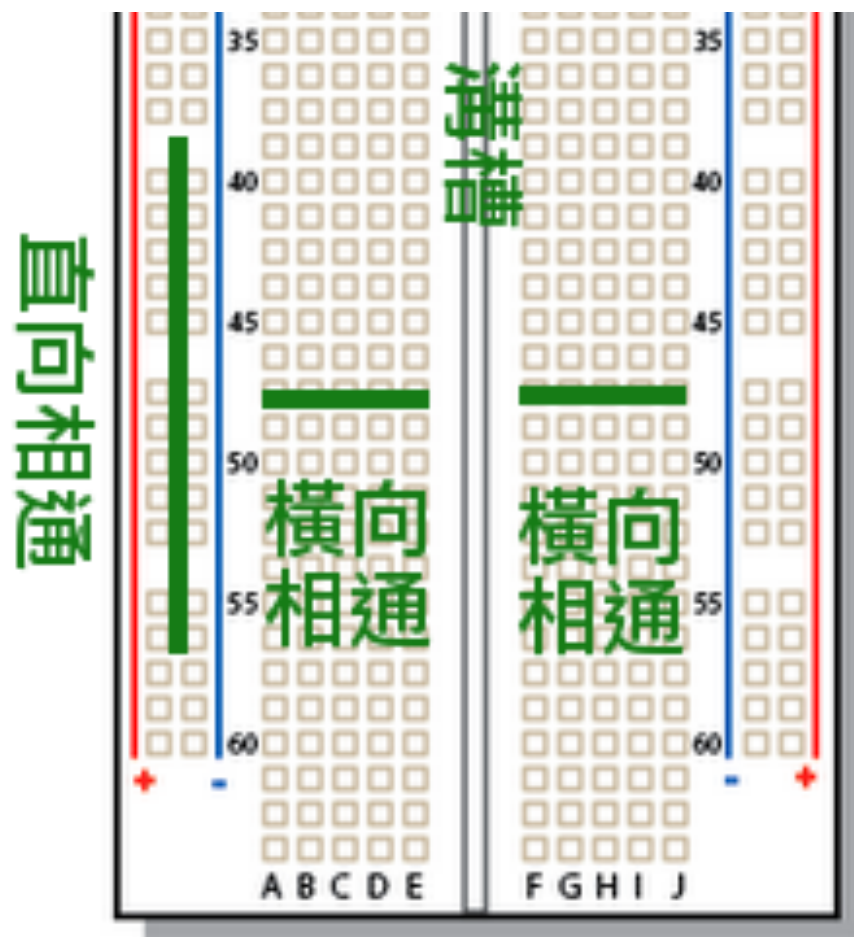
程式碼分頁

程式內容

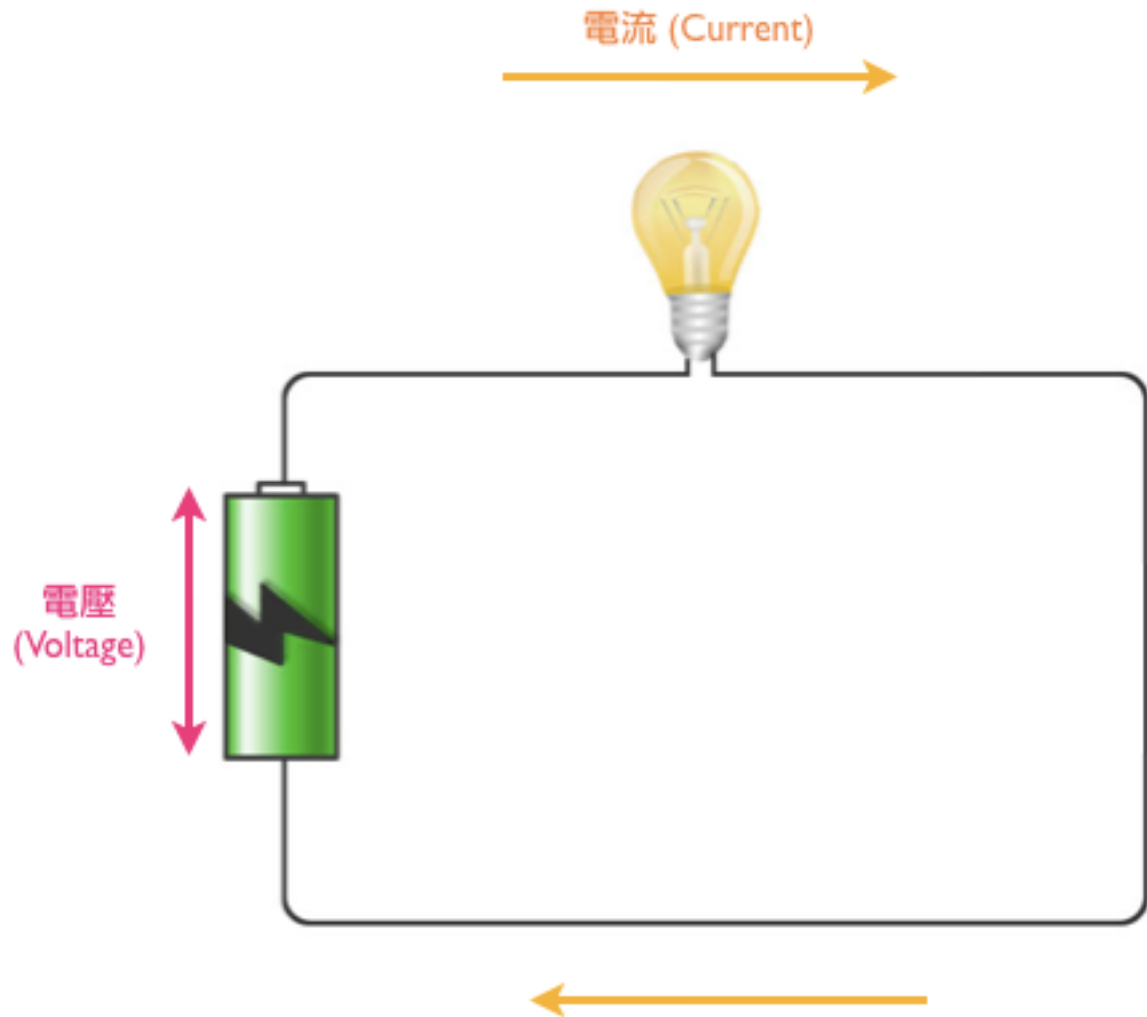
訊息顯示區



# 了解麵包板

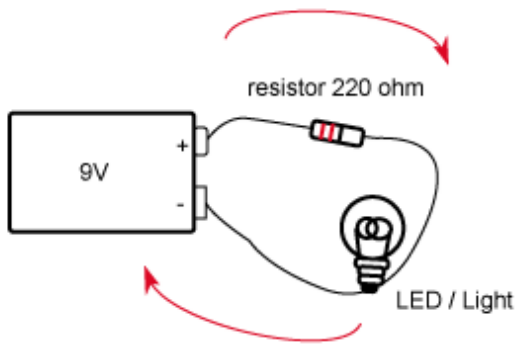


# 最簡單的電路

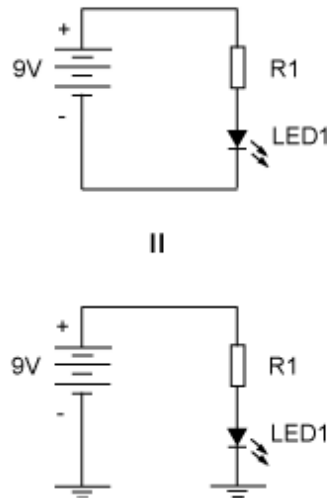


圖片來源：<http://interactive2go.blogspot.com/2009/04/digital-out.html>

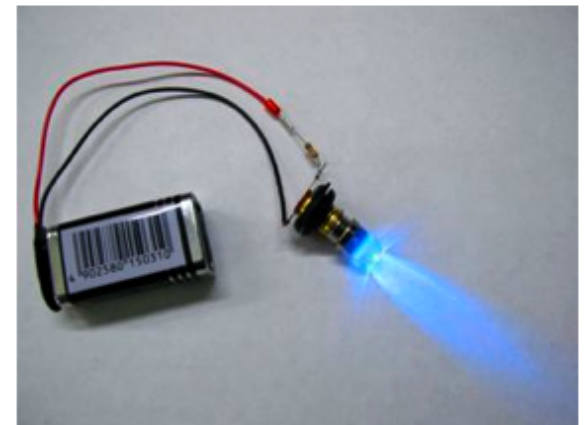
# 最簡單的電路 (加上電阻)



線路示意圖

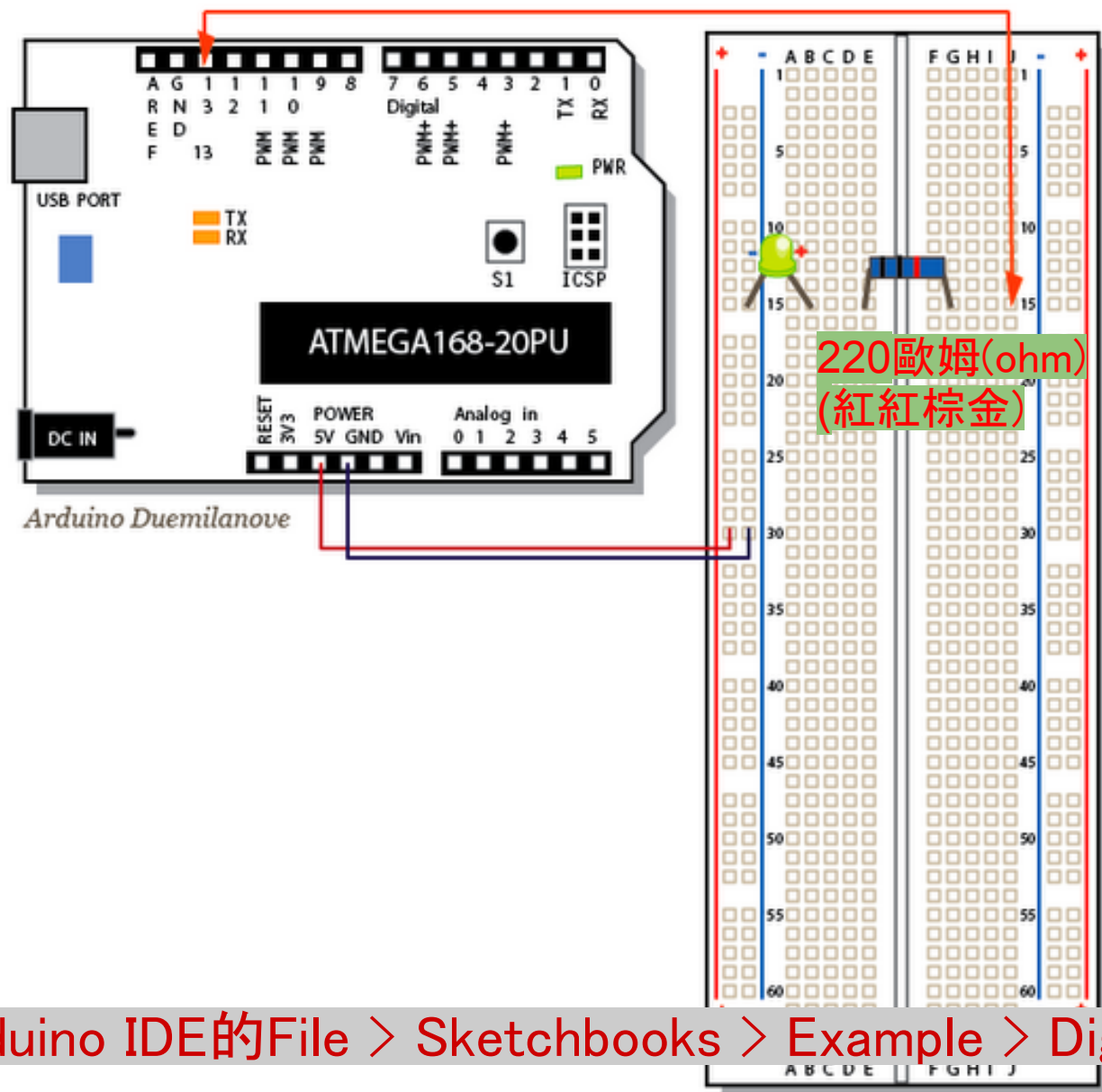


電路圖



實作此電路

# 範例一 Hello Arduino: blink LED!



程式檔: Arduino IDE的File > Sketchbooks > Example > Digital > Blink

圖片來源: <http://interactive2go.blogspot.com/2009/04/digital-out.html>

# 上傳程式至Arduino板子

1. 撰寫Arduino程式

2. 檢查程式是否有誤



3. 設定Arduino板子型號:

Tools > Board > Arduino Duemilanove w/ ATmega328

4. 設定USB serial port:

Tools > Serial Port > (windows跟mac不同)

Windows用戶請參考: <http://arduino.cc/en/Guide/Windows>

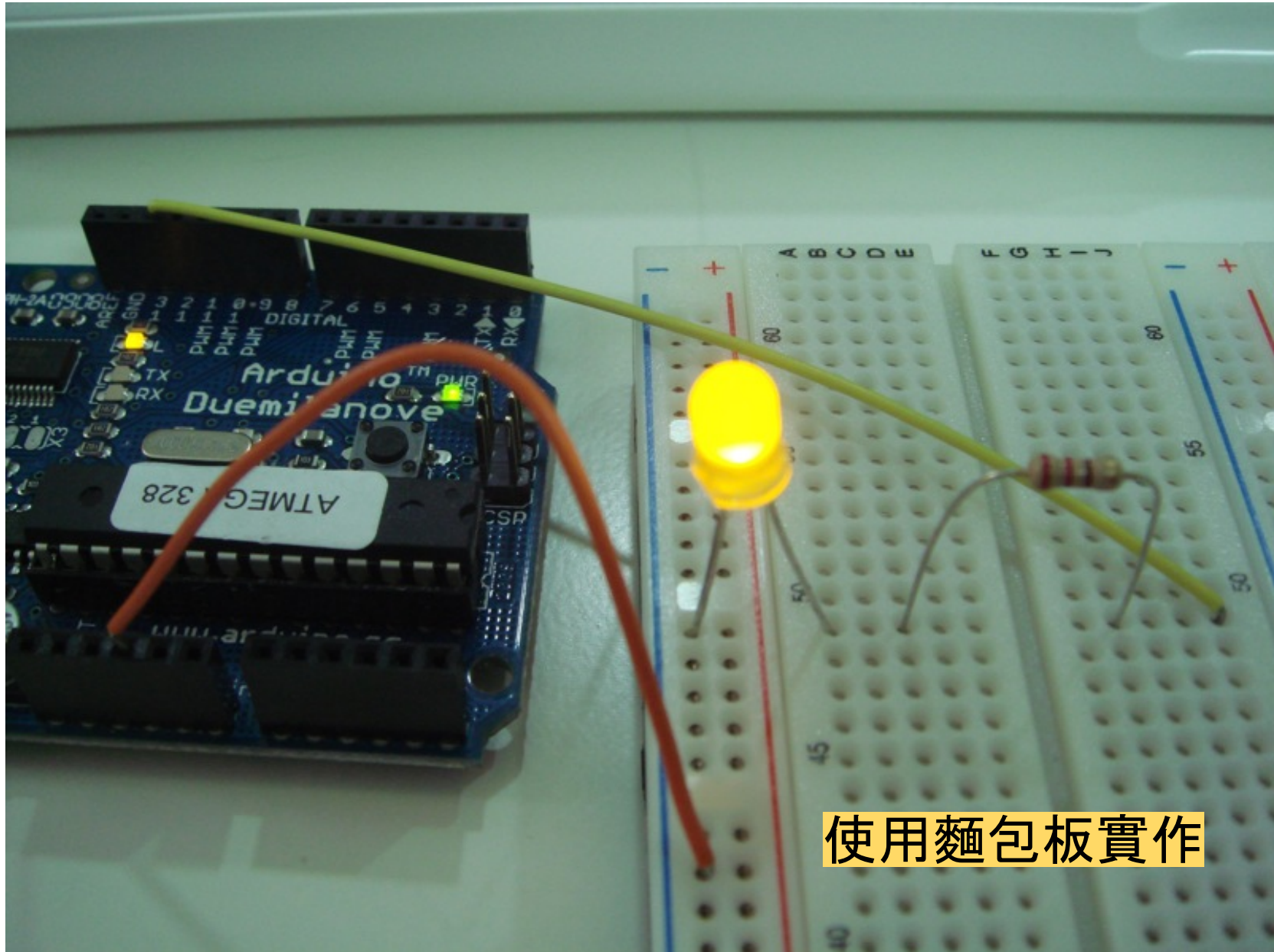
Mac用戶請參考: <http://arduino.cc/en/Guide/MacOSX>

5. 上傳程式至Arduino板子





# 範例一 Hello Arduino: blink LED!



# 範例一 Hello Arduino: blink LED!

使用Arduino板子上的pin 13跟GND實作  
(Arduino板子已內建電阻)





# 範例一 Hello Arduino: blink LED!

Duemilanove、Diecimila and LilyPad  
已內建接在pin 13的LED燈



# Blink程式碼解說

```
void setup()           //初始設定區塊（只執行一次）  
{  
  
}
```

```
void loop()            //重複執行區塊（不斷地重複執行）  
{  
  
  
}
```

# Blink程式碼解說

```
int ledPin = 13;
```

```
//設定第13pin為接LED燈的pin腳
```

```
void setup()
```

{

}

```
void loop()
```

{

}



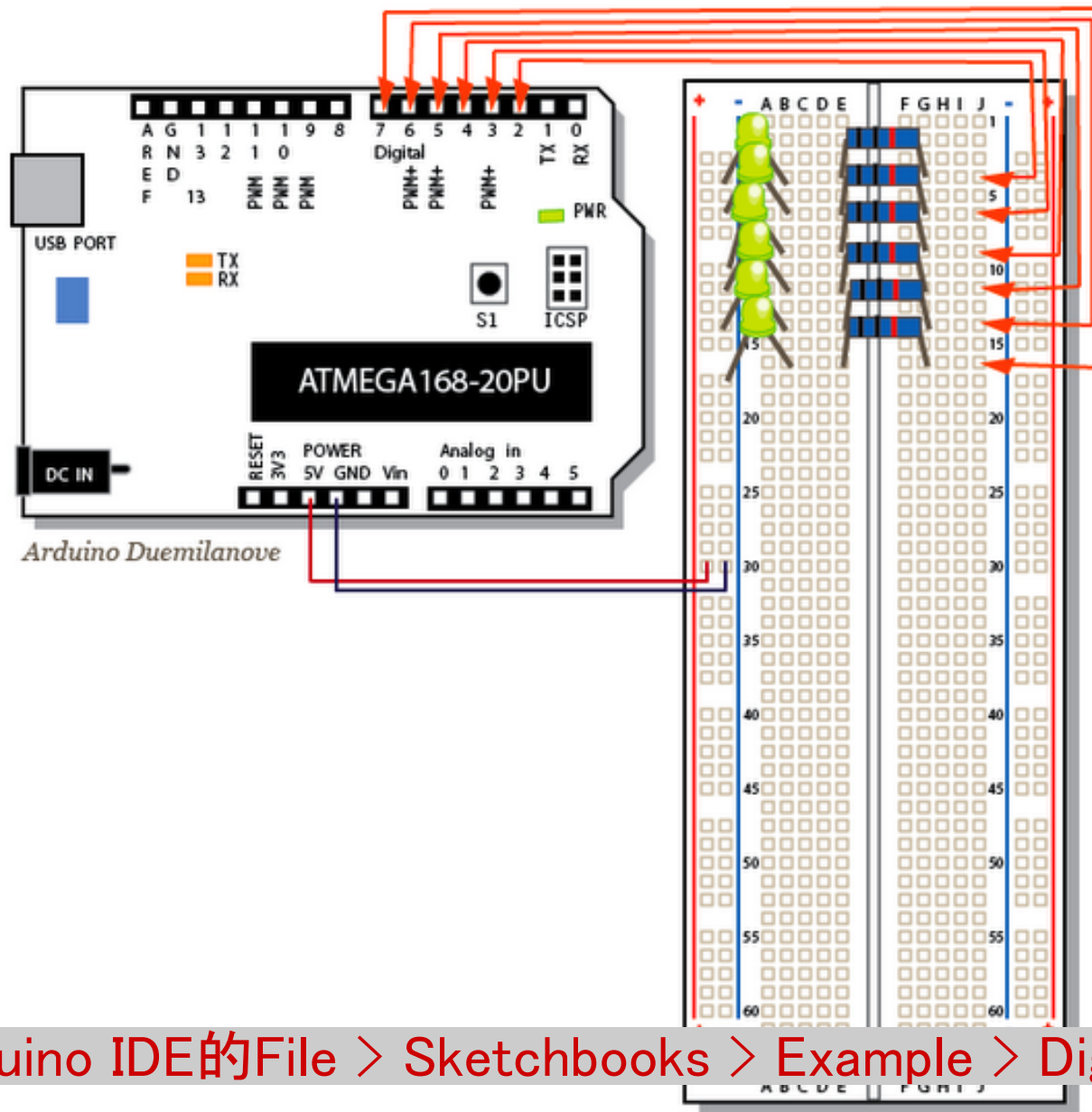
# Blink程式碼解說

```
int ledPin = 13;                                //設定第13pin為接LED燈的pin腳

void setup()
{
  pinMode(ledPin, OUTPUT);  //設定pin腳模式為輸出
}

void loop()
{
  digitalWrite(ledPin, HIGH); //給pin腳高電壓 (LED通電就亮)
  delay(1000);                //延遲1秒鐘(1000毫秒)
  digitalWrite(ledPin, LOW);  //給pin腳低電壓 (LED不通電就暗)
  delay(1000);                //延遲1秒鐘(1000毫秒)
}
```

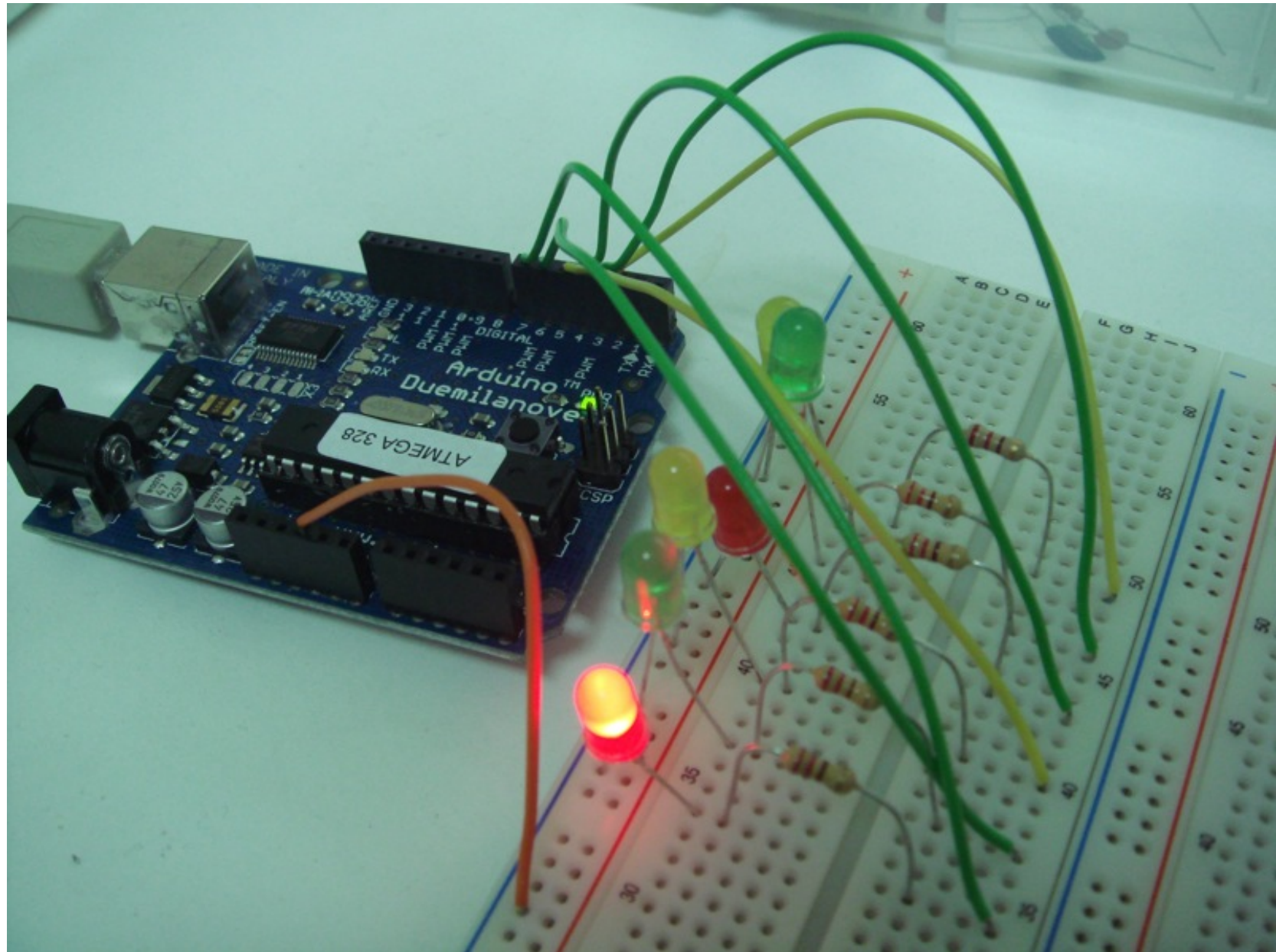
# 範例二 LED loop



程式檔: Arduino IDE的File > Sketchbooks > Example > Digital > Loop

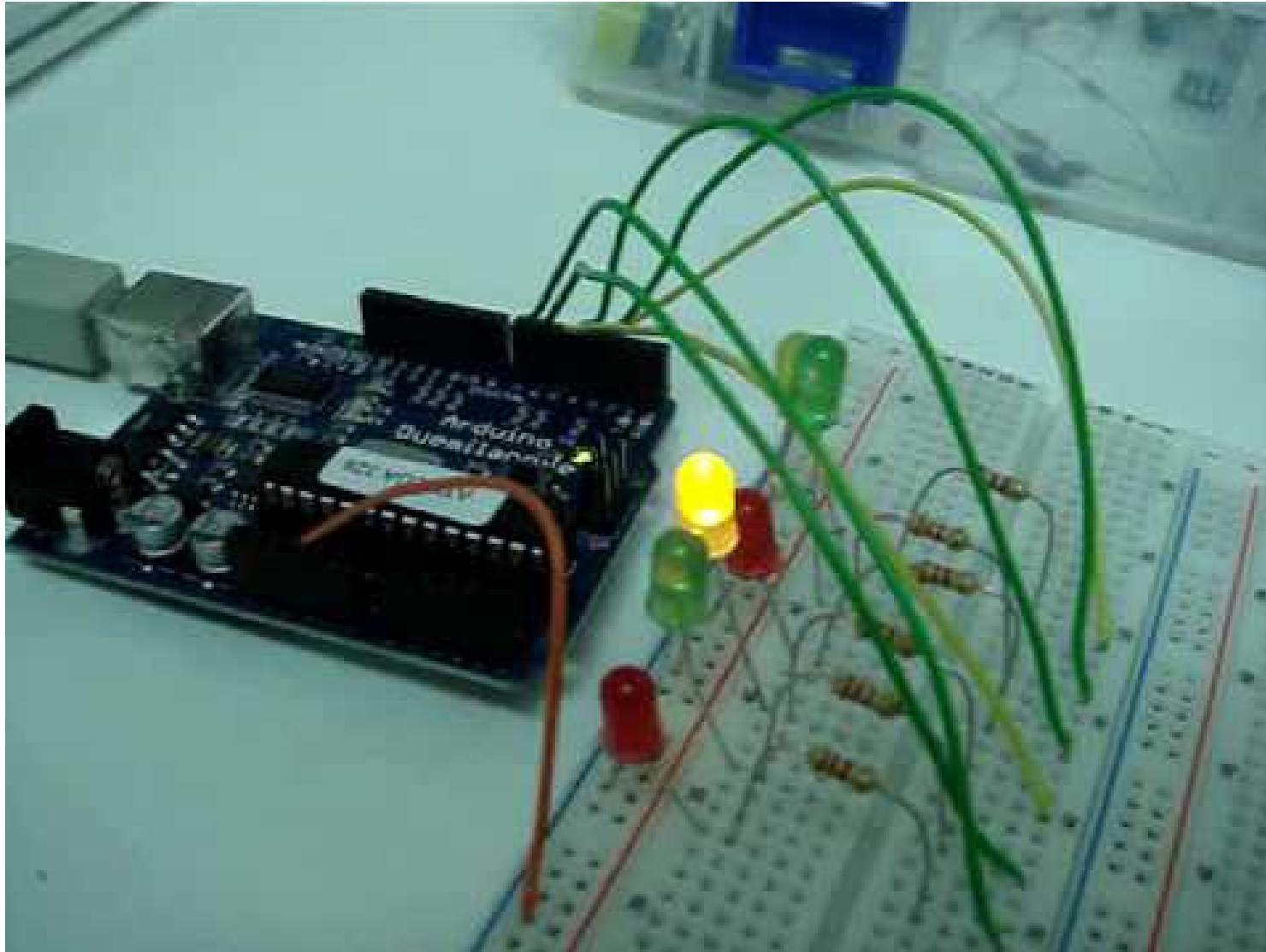
圖片來源: <http://interactive2go.blogspot.com/2009/04/digital-out.html>

## 範例二 LED loop

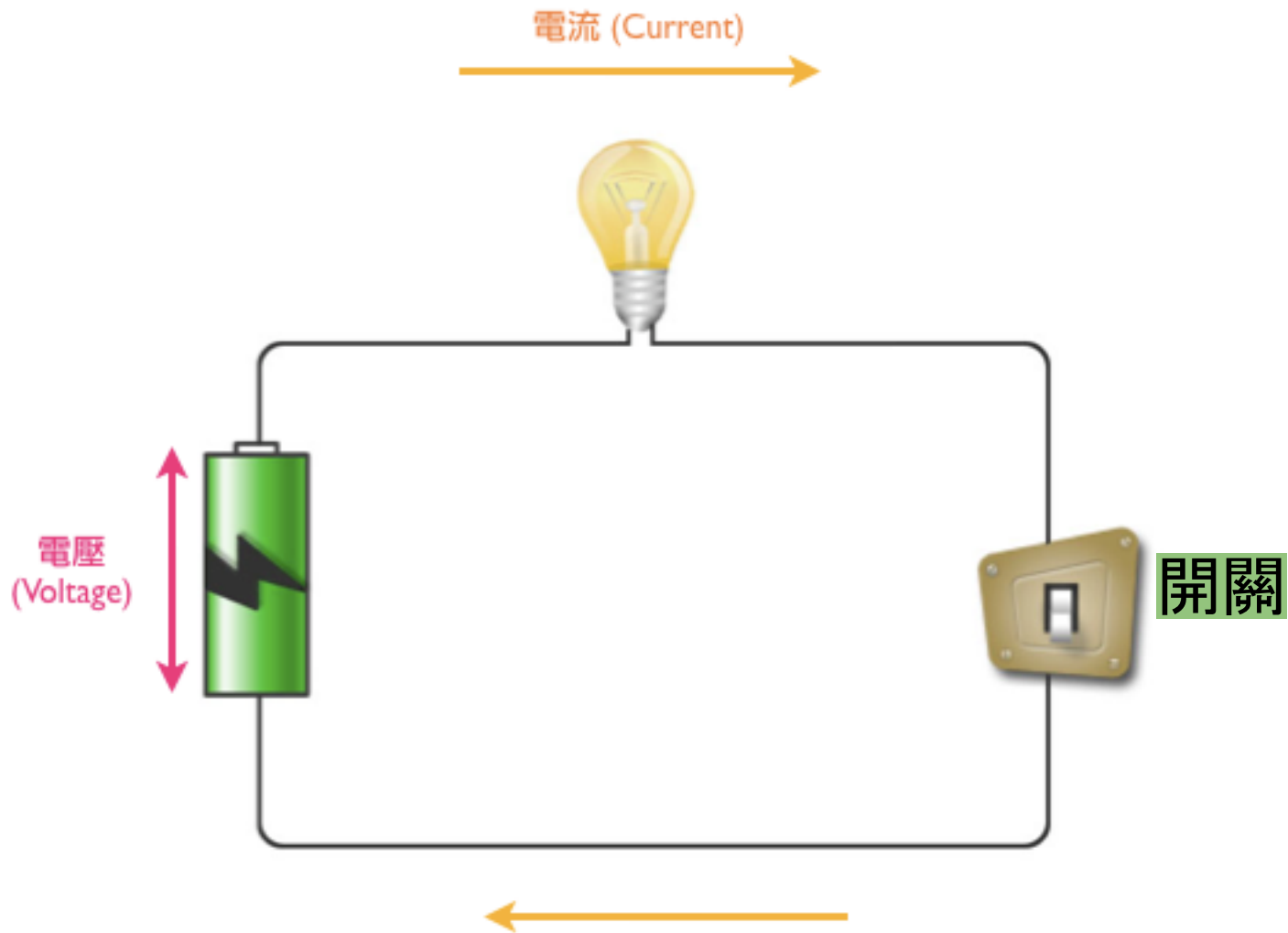


# 範例二 LED loop

影片來源: <http://www.youtube.com/watch?v=2q2jiePq6Ww>



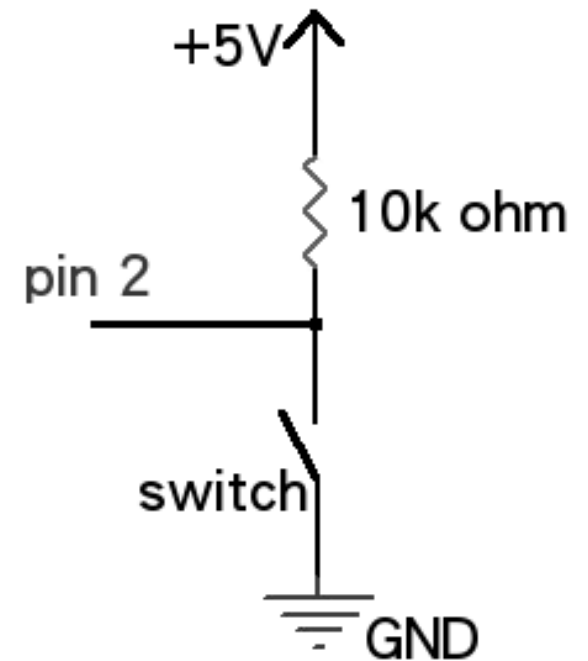
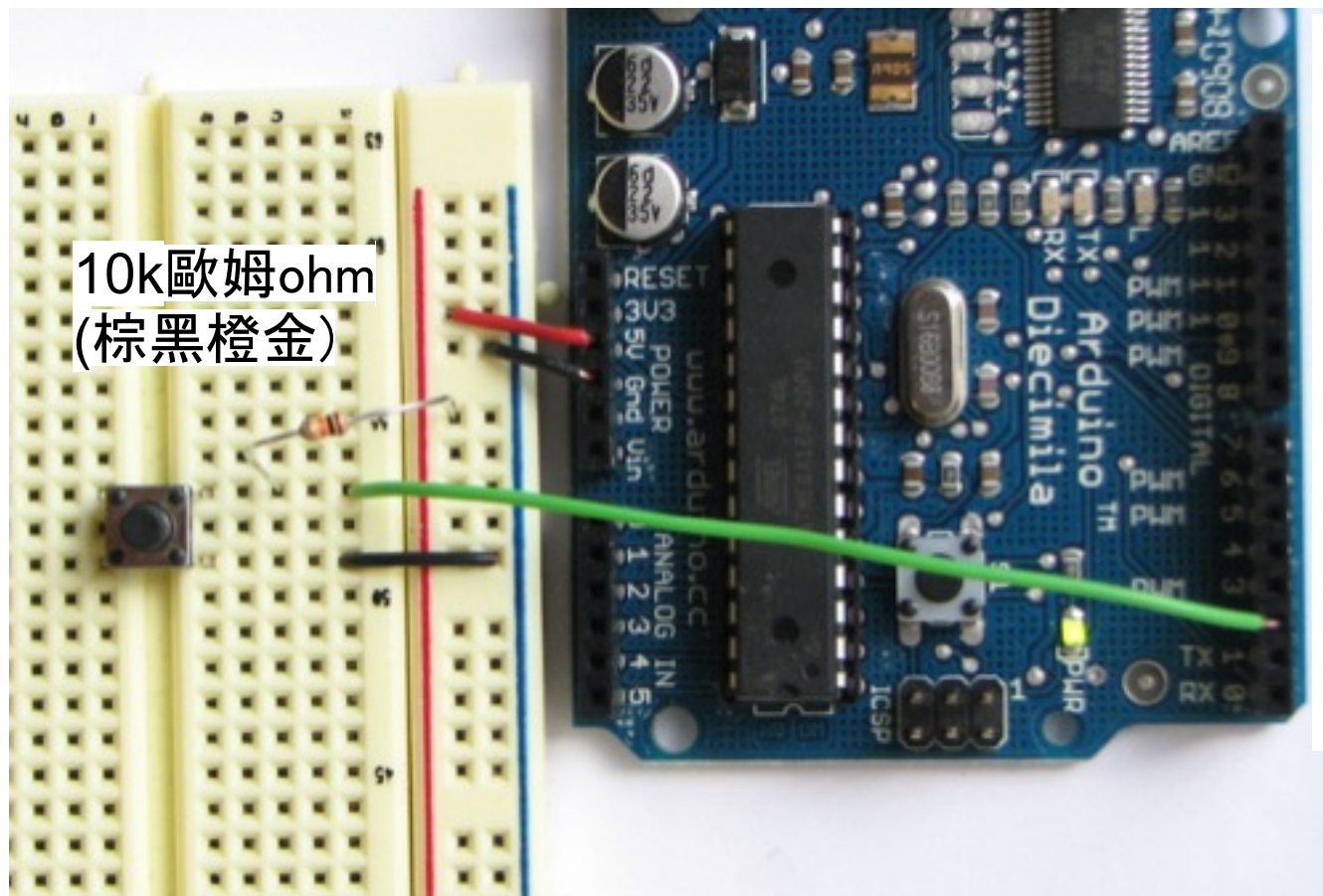
## 第二簡單的電路（加上開關）



圖片來源：<http://interactive2go.blogspot.com/2009/04/digital-out.html>



# 範例三 Button (接法一)



程式檔: Arduino IDE的File > Sketchbooks > Example > Digital > Button

圖片來源: <http://arduino.cc/en/Tutorial/Button>

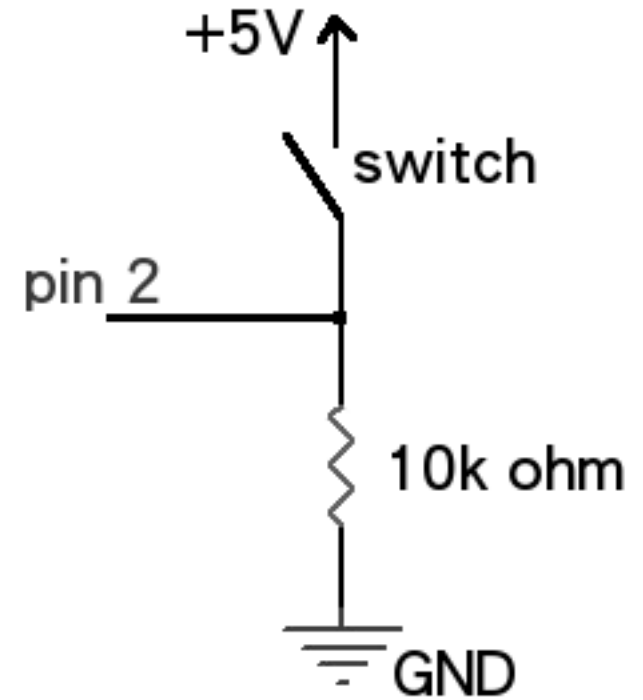
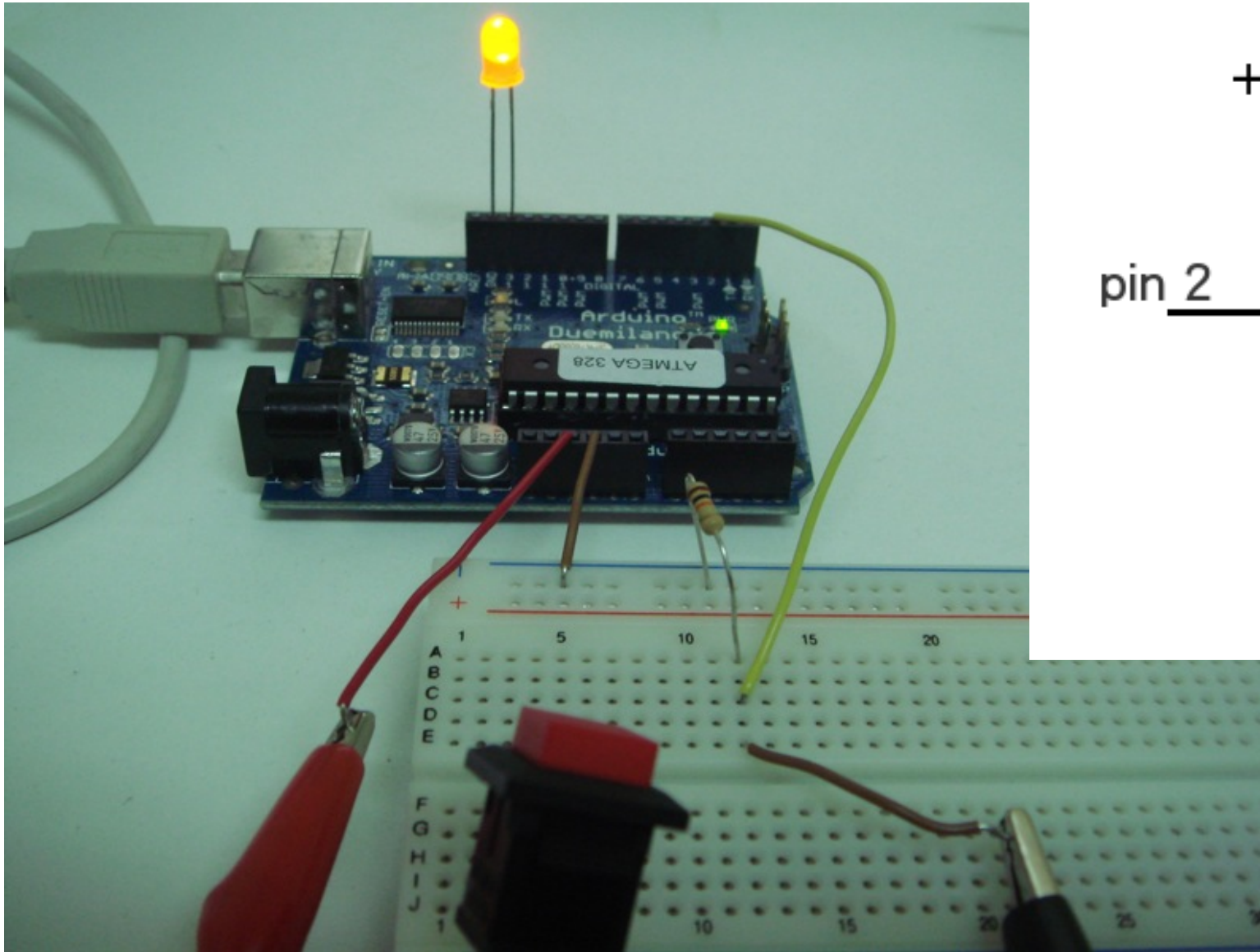
# Button (接法一) 程式碼解說

```
int ledPin = 13;    //設定第13 pin給LED燈
int inPin = 2;      //設定第2 pin為輸入pin (為了讀取按鈕狀態)
int val = 0;        //讀取按鈕狀態

void setup() {
  pinMode(ledPin, OUTPUT); //設定LED pin腳狀態為輸出
  pinMode(inPin, INPUT);   //設定第2 pin狀態為輸入
}

void loop(){
  val = digitalRead(inPin); //讀取輸入pin腳的值
  if (val == HIGH) {        //確認是否輸入為高電壓 (按鈕壓下)
    digitalWrite(ledPin, LOW); //給pin腳低電壓 (關掉LED燈)
  } else {
    digitalWrite(ledPin, HIGH); //給pin腳高電壓 (開啟LED燈)
  }
}
```

# 範例三 Button (接法二)



# 參考資料

- Arduino官網 <http://arduino.cc>
- Arduino樂園 <http://arduino.tw/>
- 小毛的Interactive2Go <http://interactive2go.blogspot.com>
- ladyada的Arduino Tutorail <http://www.ladyada.net/learn/arduino/index.html>
- 基本電學常識 <http://tw.group.knowledge.yahoo.com/primary-school/listitem/view?iid=190>
- 電阻色碼計算 [http://samengstrom.com/nxl/3660/4\\_band\\_resistor\\_color\\_code\\_page.en.html](http://samengstrom.com/nxl/3660/4_band_resistor_color_code_page.en.html)
- 線上相關電學計算網站 <http://bbs.audiohall.net/viewtopic.php?t=1337&sid=999ddd2b9f932f45c95e192388a5dfa3>
- 電阻概論 <http://sun.cis.scu.edu.tw/~lab/knowledge/r.htm>
- 歐姆定律 [http://en.wikipedia.org/wiki/Ohm%27s\\_law](http://en.wikipedia.org/wiki/Ohm%27s_law)