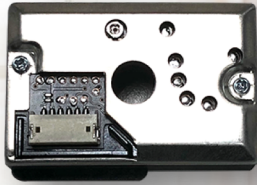


Dust sensor GP2Y1027AU0F Application Notes



Dust Sensor
GP2Y1027AU0F

This is Application Note of dust sensor module (GP2Y1027AU0F) is a document consists from explanation how to use, cautions when using it, characteristics data for the customer's reference when applying this device. When designing the device, please refer to this document and also evaluate it under actual usage conditions.

Dust Sensor Applications

- Air purifier / cleaner
- Air conditioner
- Air quality monitor
- HVAC, environmental monitoring
- Portable consumer products
- Wearable products and smartphone integration
- Customers range from home appliance makers to startup companies



1. 概述 Overview

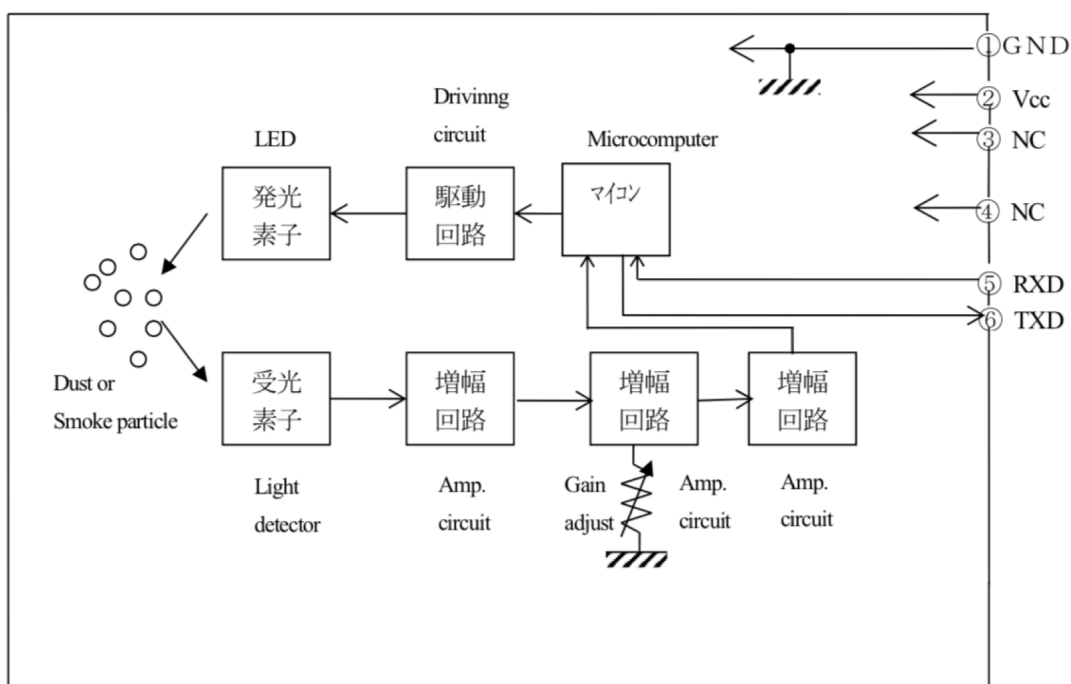
這是灰塵傳感器模塊的應用說明 (GP2Y1027AU0F) 是一個文件，包括說明如何使用，使用時的注意事項，特徵數據，供客戶在使用本設備時參考。

在設計設備時，請參閱此文檔，並在實際使用條件下進行評估。

This is Application Note of dust sensor module (GP2Y1026AU0F) is a document consists from explanation how to use, cautions when using it, characteristics data for the customer's reference when applying this device.

When designing the device, please refer to this document and also evaluate it under actual usage conditions.

1.1 Internal block diagram

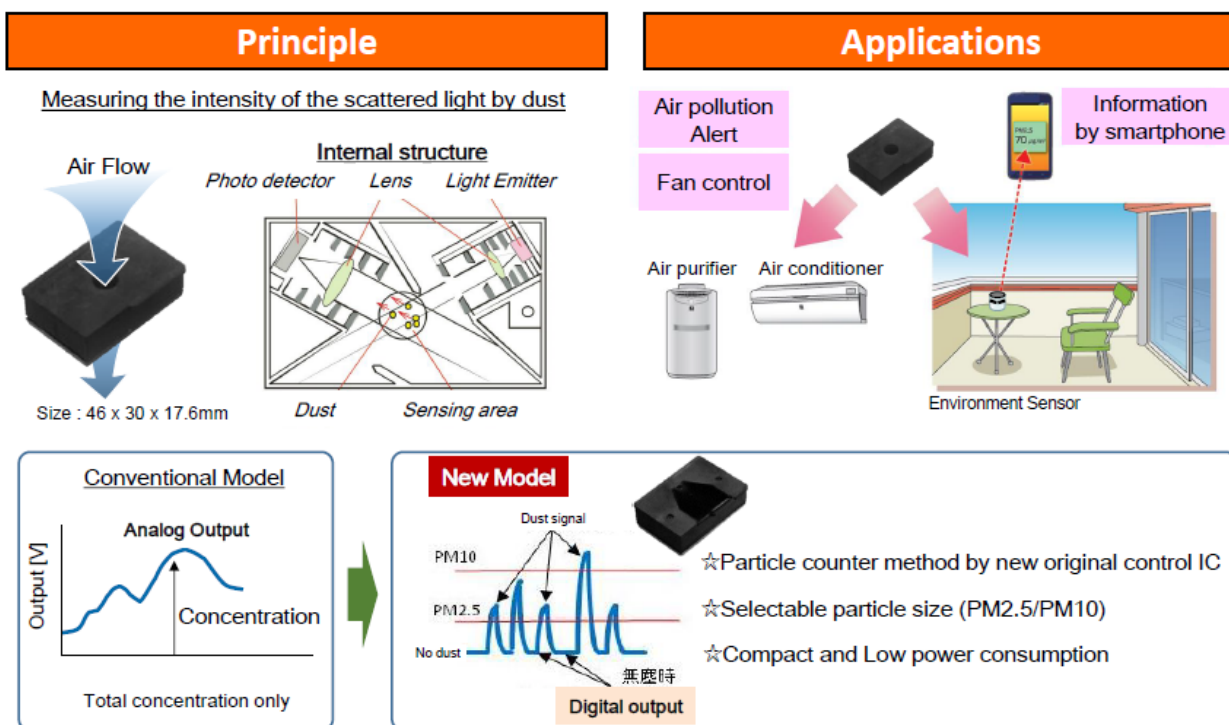


1.2 特點 Features

- 1.高精度：±10%
- 2.內置LED脈衝驅動電路
- 3.內置微處理器
 - @Dust濃度轉換為UART信號輸出。
 - @不需要偏移校正，也不需要再在集合中求平均值。
- 4.內置溫度校正。

- 1.High accuracy : ±10%
- 2.Built-in LED Pulse Drive Circuit
- 3.Built-in Microprocessor
 - @Dust concentration is converted to UART signal output.
 - @No need for offset correction nor averaging in set.
- 4.Built-in Temperature Correction.

1.3 原理 Principle



1.4 注意事项 Note in the use

- ★為了降低積灰的影響，傳感器需要垂直放置。

Please mount the devices so that printed model name on the devices to be in upper side to minimize the affect of dust sticking.

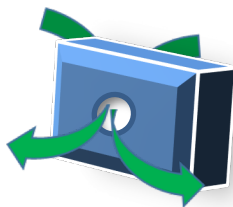


- ★為了避免太陽光等外部光源的影響，印字的一面需要超內側放置。

Please mount the device so that a plane with the print to face inside of the system to minimize the affect of disturbance light

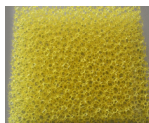
- ★為了測定房間內的空氣質量，需要有能夠讓空氣進去傳感器感應孔的簡單氣流。

A simple airflow that takes air in the sensor hole is necessary to measure the atmosphere of the room.

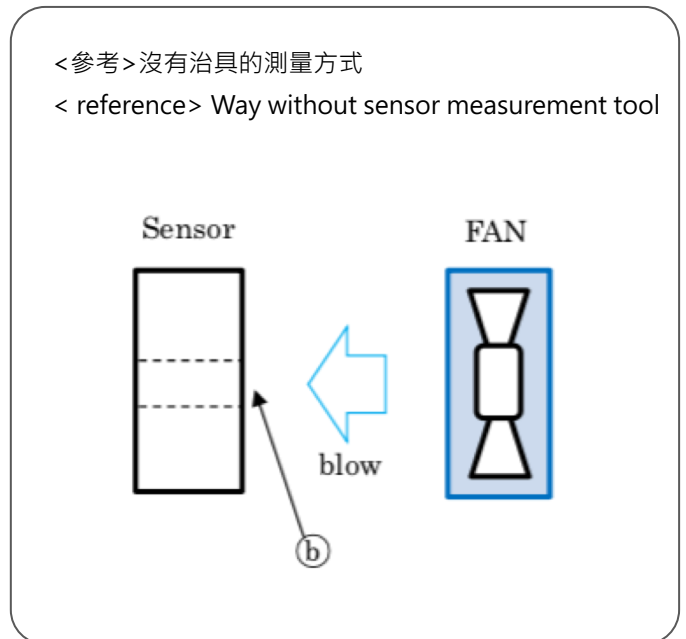
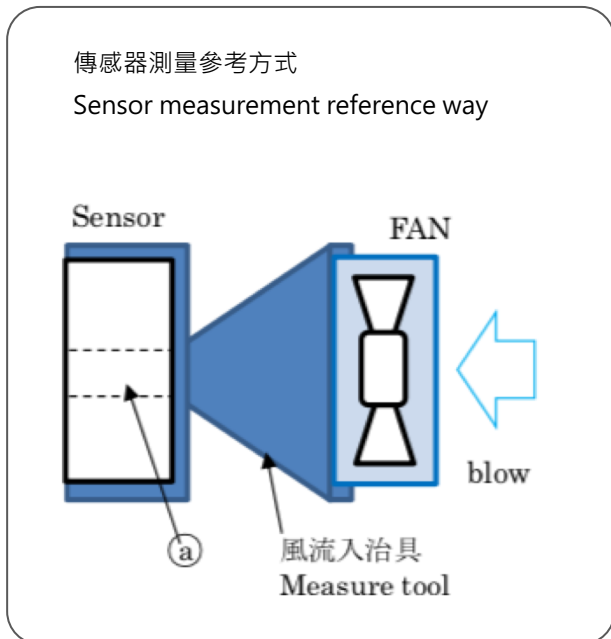


- ★為了防止絲狀灰塵或大顆粒灰塵進入傳感器內部積存，推薦在灰塵的通過孔（感應孔）的前面設置小孔徑過濾泡棉。

Please consider the structure and the mechanism of the equipment so that big dust (string dust, etc.) should not enter the inside of the sensor. The installation of a coarse molttfilter in front of dust through hole is effective for the capture of big dust .



1.5 治具 Measure tool



1.6 建議風速 Recommended wind speed

- 0.1 - 4.0 m/s

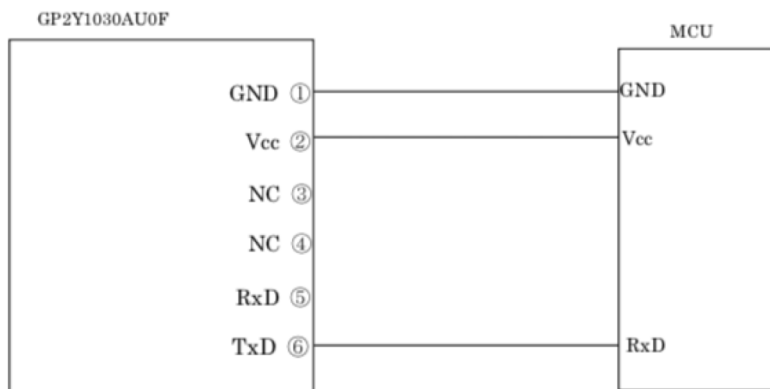
2. 引腳排列 Pin arrangement

端子 No. Pin no.	端子名 Name	I/O	端子說明 Description
1	GND	P	GND
2	Vcc	P	GND5V 電源 Power supply of 5V
3	NC	P	Non connector
4	NC	P	Non connector
5	RxD	I	UART RxD 端子 UART RxD terminal
6	TxD	O	UART TxD 端子 UART TxD terminal

2.1 連接器規格 Specifications of output connector

The module connector [11501W90-6P-S-HF](#)
Shenglan Technology.co.,LTD.(JCTC)

2.2 用法說明 Description of usage



傳感器輸出為TxD端串行數據傳輸。

微處理器放大後由A / D轉換的數據進行計算。

Sensor output is transferred as the serial data on TxD terminal.

The calculation is conducted by microcomputer using the data converted by A/D after amplified.

2.3 傳感器TxD的細節 The detail of Sensor output TxD

傳感器使用UART輸出TxD的串行數據。

Sensor output TxD is a serial data output used UART.

2.4 串行輸出 Serial output

- 1) Transmission rate : 2400 bit/s
- 2) 1 byte transmits every 10ms(The 7 bytes output in total)
(Checksum=Vout(H)+ Vout(L)+Vref(H)+Vref(L))
- 3) Data transmission format:

Start	Vout (H)	Vout (L)	Vref (H)	Vref (L)	Checksum	End
0xaa	Ex: 0x01	Ex: 0x3a	Ex: 0x00	Ex: 0x7a	Ex: 0xb5	0xff

4)Data handling:

Calculating formula of output voltage Vout : $Vout = (Vout(H) * 256 + Vout(L)) / 1024 * 5$

Ex: Vout(H)=0x01 · Decimal number 1;

Vout(L)=0x3a, Decimal number 58;

$Vout = (1 * 256 + 58) / 1024 * 5 = 1.533V$; (Vout is data update every approximately one second)

4.其他 Other

4.1設置方法 The installation method

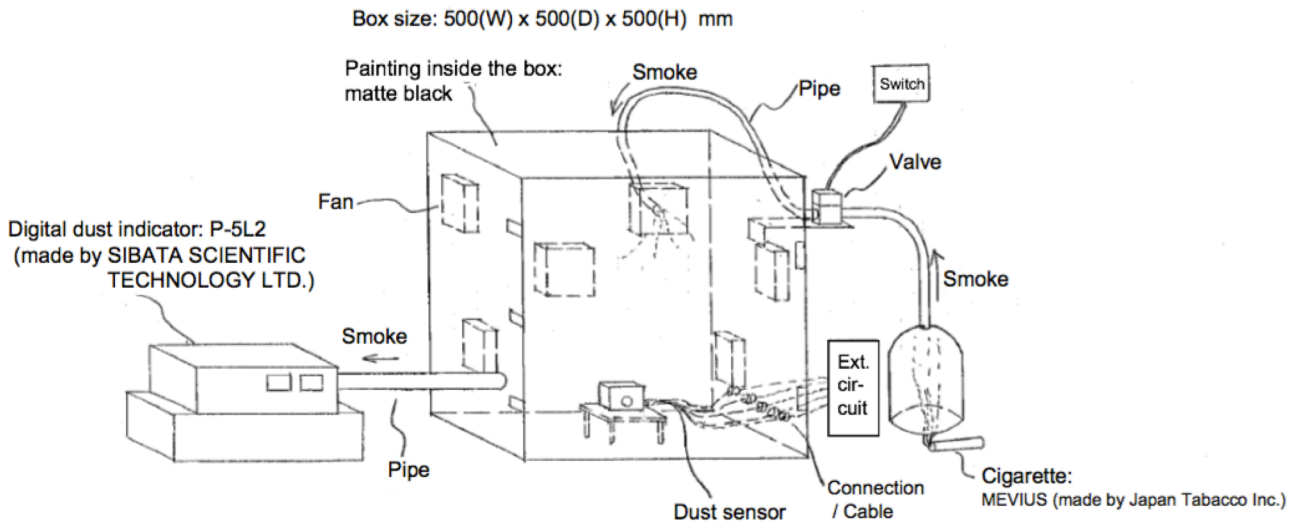
- 當光線通過打印面上的灰塵通孔時，傳感器輸出可能會受到影響。
- 為了減少外部光線的影響，請將傳感器的打印面朝向設備內部。
- 如果可以確保進氣口有風，即使進氣口朝上下左右，也可以毫無問題地測量。
- 請考慮設備的結構，使大灰塵不容易進入傳感器內部。在灰塵傳感器通孔前安裝粗網過濾器可有效過濾大灰塵。
- There is a case that the sensor output may be affected when outer-light comes through dust through hole on the printed side.
- In order to make it less susceptible to external light, please place the sensor's print side facing the inside of the equipment you are using.
- The direction of the sensor itself can be measured without problems if the air intake can be secured even if the intake port faces up, down, left, or right.
- Please consider the structure and the mechanism of the equipment so that big dust should not enter the inside of the sensor. The installation of a coarse mesh filter in front of dust through hole is effective for the capture of big dust .

4.2拆解模組Disassemble of this module

請勿拆卸本產品。拆卸後，即使組裝，也可能無法滿足原本規格值

Don't disassemble the module. Sharp will not guarantee the specification even after re-assebling.

6.測量方法 Measurement Method



將灰塵傳感器設置在盒子中並接上線。檢查P-5L2顯示0mg / m³後，測量灰塵傳感器的輸出低電平脈衝寬度：Voc (μs)。

※請不要直接在盒子裡放香煙。

@測量靈敏度：K (μs / (100μg / m³))

打開/關閉閥門並在一定時間內點燃香煙並將香煙煙霧導入盒子中。離開1分鐘後，檢查P-5L2與灰塵傳感器輸出的值：Vo (μs)。

靈敏度K的計算方法 $K = (Vo - Voc) / P-5L2$ 監控值

(注意) 輸出電壓由示波器測量。測量結果是平均64次測量的數據。

·風扇一直在盒子裡運轉。

To set dust sensor in the box and to be wired. After checking P-5L2 shows 0mg/m³, to measure output Low level pulse width of dust sensor: Voc (μs).

※ Please don't put smoke of a cigarette in the box.

Measuring Sensitivity: K (μs / (100μg / m³))

To fire up a cigarette and to put smoke of a cigarette in the box within a certain time by opening/closing the valve. After leaving for 1 minute, to check P-5L2 monitor and to measure output Low level pulse width of dust sensor: Vo (μs).

Calculation method of Sensitivity $K = (Vo - Voc) / P-5L2$ monitor

(Noted) · Output voltage is measured by oscilloscope. A result of measurement is the data which averaged 64 times of measure.

· Fan is always revolving in the box.

7. 質量濃度換算方法 Conversion formula

灰塵傳感器輸出的數據不是質量濃度 ($\mu\text{g} / \text{m}^3$) 。
為了轉換為質量濃度，有必要從測量樣本取得相關數據並進行計算。
PM 2.5的濃度可以通過以下方法轉換成近似值。

The data output from the dust sensor is not the mass concentration ($\mu\text{g} / \text{m}^3$).
To convert to mass concentration, it is necessary to calculate from the correlation data with the reference unit using the measurement sample.
The concentration of PM 2.5 can be approximated by the following conversion method.

* 轉換方法範例 Conversion method example

客戶可使用灰塵分析儀來取得係數，係數通常約為500~700
根據客戶使用的不同灰塵分析儀和不同的裝配條件，係數會有所不同。

```
int a = 700; //自定義係數  
float dustDensity = vOut * a / 1000;
```

The user uses a dust meter to compare the coefficient, usually about 500 ~ 700 (1000 ~)
According to the different dust analyzers used by the customer and the different assembly conditions, the coefficients will be different.

```
int a = 700; //Custom coefficient  
float dustDensity = vOut * a / 1000;
```

8. Demo Kits介紹

8.1. Getting Started with Arduino

The Arduino Software (IDE) allows you to write programs and upload them to your board. Below we use Arduino 2560 as an example:

1. Install the Arduino Desktop IDE : <https://www.arduino.cc/en/Guide/HomePage>
To get step-by-step instructions select one of the following link accordingly to your operating system.

Windows(<https://www.arduino.cc/en/Guide/Windows>)

Mac OS X(<https://www.arduino.cc/en/Guide/MacOSX>)

Linux(<https://www.arduino.cc/en/Guide/Linux>)

Portable IDE (Windows and Linux) (<https://www.arduino.cc/en/Guide/PortableIDE>)

(Reference: <https://www.arduino.cc/en/Guide/HomePage>)

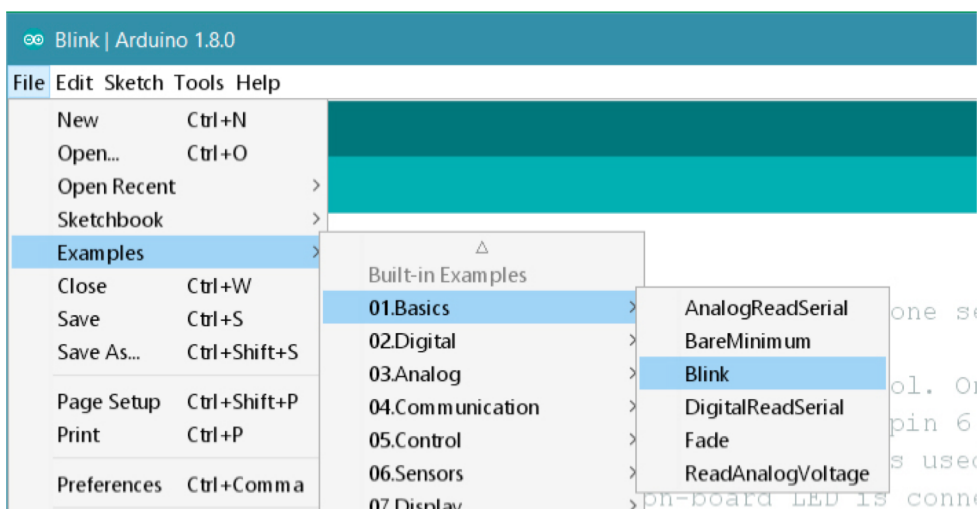
2. Use your Arduino Mega 2560 on the Arduino Desktop IDE
(<https://www.arduino.cc/en/Guide/ArduinoMega2560>)

2.1 Connect your board

The USB connection with the PC is necessary to program the board and not just to power it up. The Mega2560 automatically draw power from either the USB or an external power supply. Connect the board to your computer using the USB cable. The green power LED (labelled PWR) should go on.

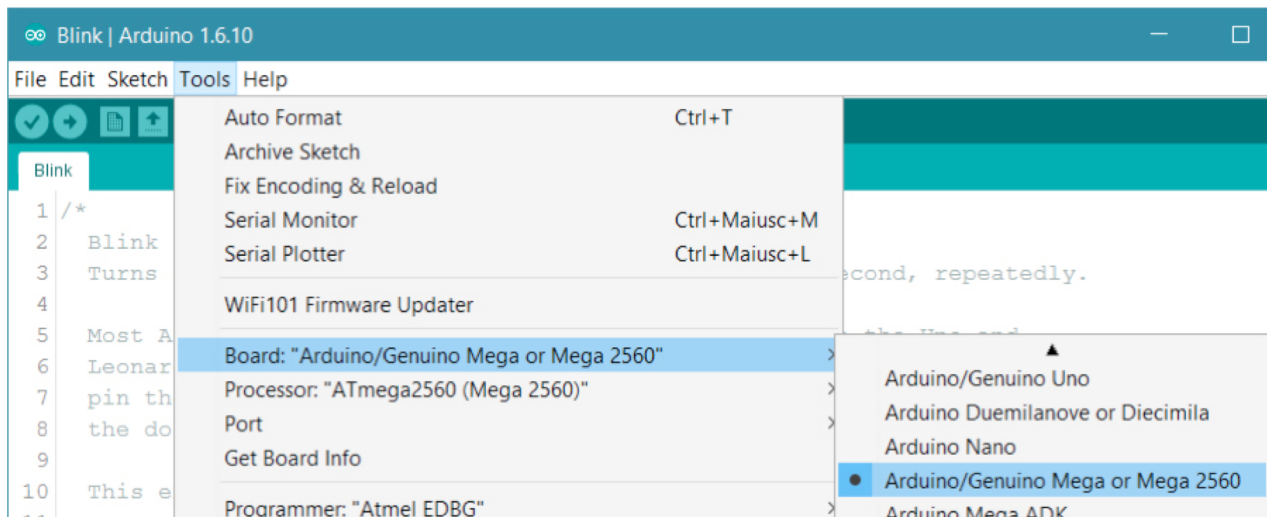
2.2 Open your first sketch and test

Open the LED blink example sketch: File > Examples > 01.Basics > Blink.

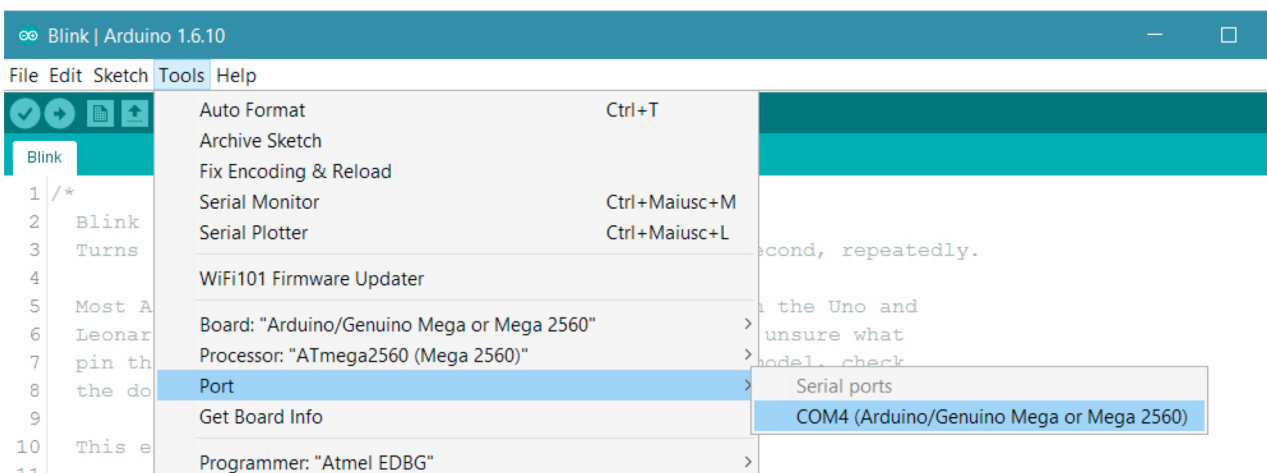


2.3 Select your board type and port

You'll need to select the entry in the Tools > Board menu that corresponds to your Arduino or Genuino board. You have a Mega2560, therefore it has an ATmega2560 microcontroller, selected by default as processor.

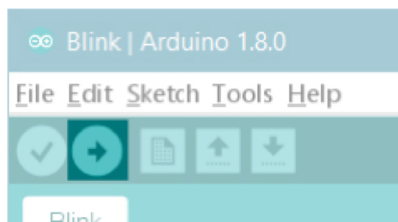


Select the serial device of the board from the Tools | Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your board and re-open the menu; the entry that disappears should be the Arduino or Genuino board. Reconnect the board and select that serial port.



2.4 Upload the program

Now, simply click the "Upload" button in the environment. Wait a few seconds - you should see the RX and TX leds on the board flashing. If the upload is successful, the message "Done uploading." will appear in the status bar.

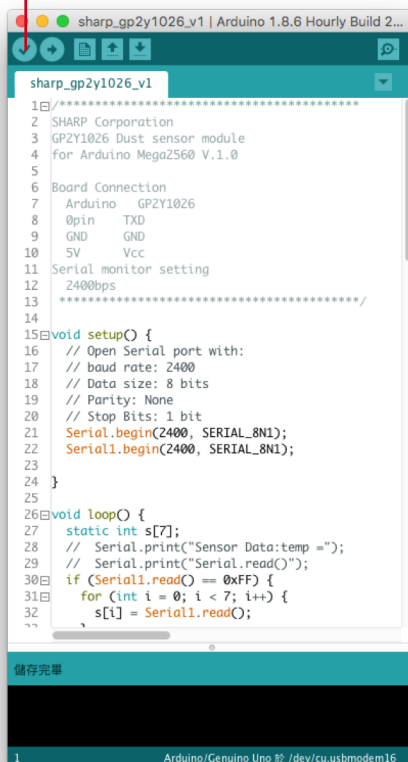


2.5 Run code

A few seconds after the upload finishes, you should see the pin 13 (L) LED on the board start to blink (in orange). If it does, congratulations! Your board is up-and-running.

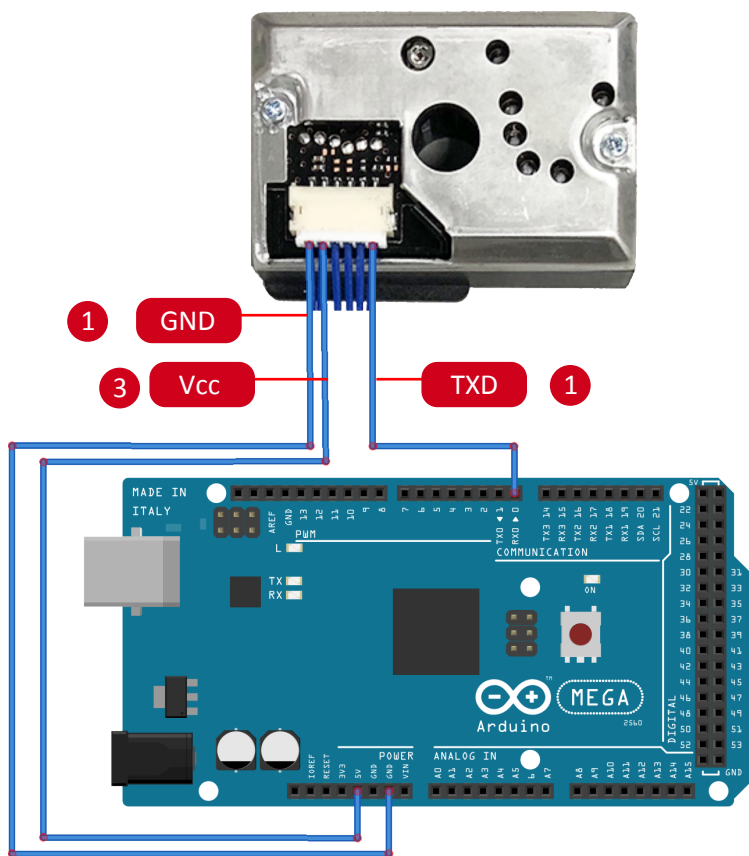
1. Open file:
2. Connect Arduino
3. Upload the code

Upload code



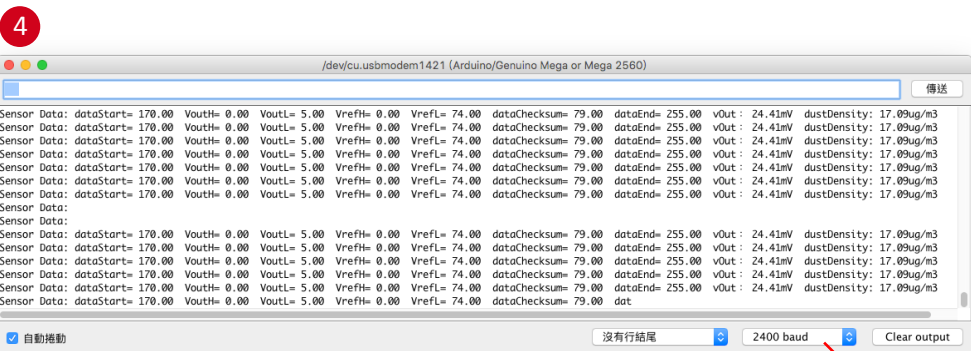
8.2. Connect sensor to Arduino

- 1 Connect Tx(Sensor) to Rx(Arduino), Gnd
- 2 Open serial window
- 3 Connect Vcc
- 4 Data show in serial window
- 5 Set Baud rate to 2400 and you can see the data



2 Open Serial

```
sharp_gp2y1026_v1
1|*****
2 SHARP Corporation
3 GP2Y1026 Dust sensor module
4 for Arduino Mega2560 V.1.0
5
6 Board Connection
7 Arduino GP2Y1026
8 0pin TXD
9 GND GND
10 5V Vcc
11 Serial monitor setting
12 2400bps
13 *****/
14
15 void setup() {
16   Serial.begin(2400);
17 }
18
19 void loop() {
20   static int s[7];
21   // Serial.print("Sensor Data:temp -");
22   // Serial.print("Serial.read()");
23   if (Serial.read() == 0xFF) {
24     for (int i = 0; i < 7; i++) {
```



9.Revision History 版本更新

Version	Modification	Date
V1.383	1st version release	2018/10/03



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