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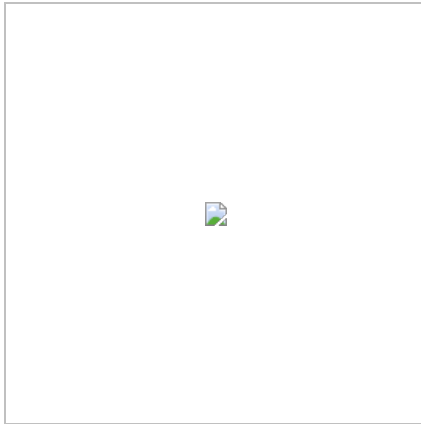
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Nov 13 Sharp Dust Sensor and Arduino

Paul **Arduino, Sensor** air quality, analog, Arduino, dust, pwm, sharp **29** Comments

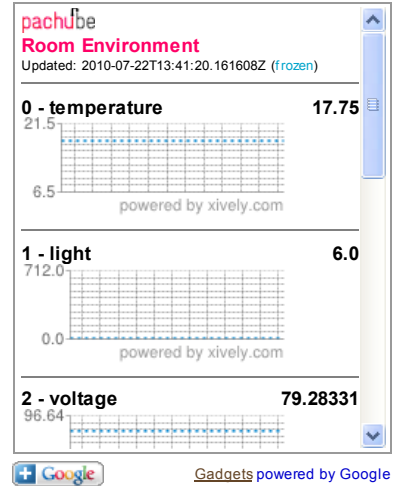
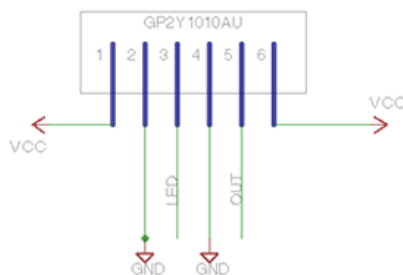
Sharp's GP2Y1010AU0F is an optical air quality sensor, designed to sense dust particles. An infrared emitting diode and a phototransistor are diagonally arranged into this device, to allow it to detect the reflected light of dust in air. It is especially effective in detecting very fine particles like cigarette smoke, and is commonly used in air purifier systems.



The sensor has a very low current consumption (20mA max, 11mA typical), and can be powered with up to 7VDC. The output of the sensor is an analog voltage proportional to the measured dust density, with a sensitivity of 0.5V/0.1mg/m3.

This is how the optical dust sensor works:

According to the [GP2Y1010AU0F data sheet](#), all 6 pins on sensor need to be connected to Arduino:



pdeng@sensorapp.net

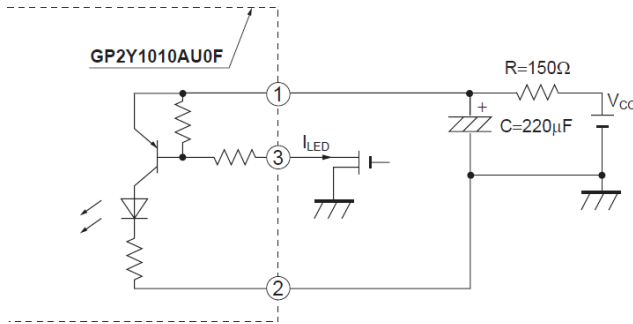
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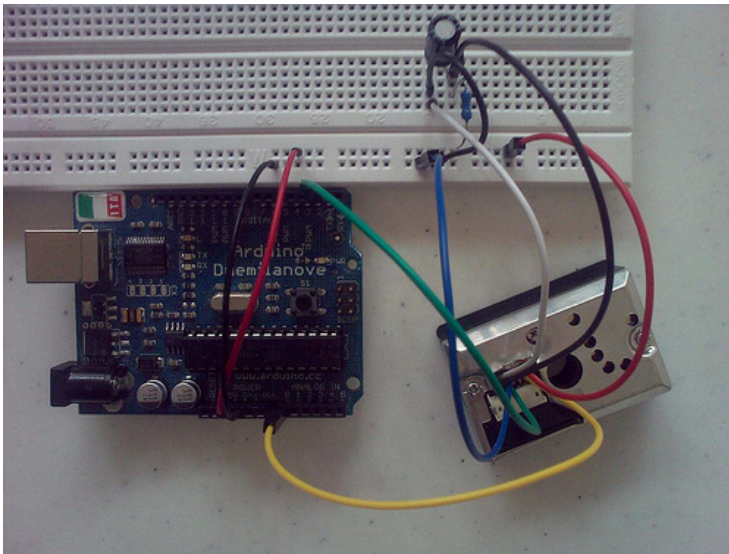
Do not miss the 150ohm resistor and a 220uF capacitor:



Sensor Pin	Arduino Pin
1 Vled	-> 5V (150ohm resistor)
2 LED-GND	-> GND
3 LED	-> Digital pin 2
4 S-GND	-> GND
5 Vo	-> Analog pin 0
6 Vcc	-> 5V

The LED pin has to be modulated with a cycle of 1ms as discussed in the datasheet. The LED seems to use a PNP transistor so to power on, the LED pin must actually receive a lower voltage.

Ok, you should now have every thing connected:



The Arduino source code:

```

01 int dustPin=0;
02 int dustVal=0;
03
04 int ledPower=2;
05 int delayTime=280;
06 int delayTime2=40;
07 float offTime=9680;
08 void setup(){
09   Serial.begin(9600);
10   pinMode(ledPower,OUTPUT);
11   pinMode(4, OUTPUT);
12 }
13
14 void loop(){
15   // ledPower is any digital pin on the arduino connected to Pin 3 on
16   digitalWrite(ledPower,LOW); // power on the LED
17   delayMicroseconds(delayTime);
18   dustVal=analogRead(dustPin); // read the dust value via pin 5 on th
19   delayMicroseconds(delayTime2);
20   digitalWrite(ledPower,HIGH); // turn the LED off
21   delayMicroseconds(offTime);
22
23   delay(3000);
    
```

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```

24 | Serial.println(dustVal);
25 | }

```

Reference:

- <http://www.staceyk.org/airSensors/sensorsetup.php>
- <http://itp.nyu.edu/physcomp/sensors/uploads/arduino.txt>
- <http://itp.nyu.edu/physcomp/sensors/Reports/GP2Y1010AU>

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29 Comments *(+add yours?)*



Jarrod

Nov 29, 2010 @ 13:38:55

Thanks, great no-nonsense tutorial



brian

Dec 03, 2010 @ 10:42:16

why can't they make one with the light receptor directly across the LED and just transduce the light intensity to voltage? That's simpler i guess, and you can measure things beyond dust.



Gene

Apr 12, 2012 @ 00:00:09

I just received one, wired it up as shown and ran the code also as shown. While sealed in an antistatic bag I'm showing random readings with about 10 zeros, then 29, then 5 more zeros, then a 45, a few more zeros, a 9 etc. Since there is only a short pulse these numbers don't sound right at all. It's not noise on my arduino as just looking at the sensor output it jumps around. Has anyone actually made this work?

I have done a lot of searching and this and one more examples are all I've found. I would like to hear from someone that experienced good results with this sensor. Gene



tbitson

Jun 24, 2012 @ 12:01:58

Any idea what the 150 ohm resistor does? Power supply filtering?



Matt

Aug 08, 2012 @ 18:02:56

Hey Gene,

I did some work with the sensors and it seems to me that your sensor may be broken. In my first experiments, I think I fried the LED of one of my sensors and afterwards it showed a similar response to what you described. Hope that helps...

Matt



Dusty

Sep 06, 2012 @ 03:49:01

Hey Gene,

I got the same results before I hooked up a 220uF capacitor between VLed and Gnd. However, after I plugged in the capacitor between pin 1(VLed) and ground, the sensor seemed to work just fine.



Vincenzo Cocca

Sep 24, 2012 @ 19:34:25

Good morning. Could You help me to calibrate this sensor? Thank you very much.

Vincenzo



Paul

Nov 01, 2012 @ 08:59:25

Hi Vincenzo,

It is not a very accurate sensor. I do not think calibrate it will somehow make it work better.

Cheers,
Paul



Vincenzo Cocca



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Nov 05, 2012 @ 21:39:07

Thank you Paul. Does it required periodic recalibration of this sensor? Or no?

Thank you
Vincenzo



kyle

Nov 06, 2012 @ 16:04:02

what's the voltage on the 220uF Capacitor?



Evgeny

Nov 07, 2012 @ 15:19:15

For this example, any more than 5 volts (example 220uF 25v)



A different kyle

Dec 05, 2012 @ 11:04:18

I'm a bit confused regarding the role of the capacitor.

When i assemble the circuit without it, i get analog results ranging from 0 – 765 using the sample Arduino sketch provided.

When i add the capacitor to the circuit, the base value moves to ~200. And the sample range is (~200 – 765).

In the latter case, i am no longer able to achieve "near-zero" values. Which i assume is wrong.

I have spent considerable time checking the wire-up of the circuit, so im pretty sure that's not the issue.

Any suggestions would be appreciated!



Nicholas

Jan 19, 2013 @ 03:21:03

Hey guys,

Just a thought that you're probably going to want to calibrate the sensor for temperature and humidity if you want it to work correctly.



Shashi Maurya

Jan 23, 2013 @ 01:29:01

Hello everyone!

I have no background in electronics. I'd like to know after logging the voltage output from the sensor, what is the unit for the dust density?

Thanks.



Vincenzo Cocca

Jan 25, 2013 @ 00:51:21

Hi Shashi,
dust density is in mg/m3.



Vincenzo Cocca

Jan 25, 2013 @ 01:43:57

Good afternoon to everyone.

I have a problem with this sensor. I read an erratic value of dust density. I think the dust is adhered to the inside of sensor. On datasheet it is written that I must consider the maintenance such as vacuuming. Could you say me more information about it?



hozone

Jan 31, 2013 @ 20:35:46

hello,

i'm experimenting too with GP2Y1010AU0F, but i've found a strange behaviour.

my sensor is conncted like datasheet explain, pin 3 direct to atmega (i've also try using a mosfet but it do not change)

if i run GP2Y1010AU0F with 5.330 voltage i read an output voltage between 0.800 and 0.850

if i run GP2Y1010AU0F with 5.080 voltage i read an output voltage between 0.770 and 0.830

if i run GP2Y1010AU0F with 4.670 voltage i read an output voltage between 0.700 to 0.770 so there's a small drift when supply voltage change.

i suppose the fig 3 of datasheet, from which we can extract slope and offset to find dust sensity, it's 5.0v supply voltage, so reading an "incorrect" voltage would bring to incorrect mg/m³ conversion.

have you also find this behavior?

have you find a way to balance the supply voltage drift?

thanks all



Vincenzo Cocca

Feb 01, 2013 @ 19:41:40

Hi hozone. I don't find this behavior because I use this sensor by Libelium system (www.libelium.com) and I don't know exact value of supply voltage. Sorry.

hello



HooverTeam

Feb 22, 2013 @ 21:46:19

Hello everybody,

We are a group of students that will try to make this sensor work on a vacuum cleaner. Can someone tell us if this is going to work or is it too sensitive to be able to send valid data from such a strong airflow as the one resulting from a hoover's activity?

Thank you all in advance.



kim

Feb 26, 2013 @ 15:09:29

Hi all,

Does anyone know whether this sensor can detect PM 2.5 particles. I have read the datasheet and it only mentioned about the density sensitivity, so what about the size sensitivity?

Thanks all



Vincenzo Cocca

Mar 01, 2013 @ 00:09:13

Hi Kim. This sensor detects PM2.5 particles.



xocapick

Mar 04, 2013 @ 22:39:42

Hi all..

I have a question...

What exactly range voltage between having no dust, and lot off dust.. Because in the datasheet they say that Output voltage range is 3,4 min, and do not say anything about the max.. and the graphic isn't clear ...

Best regrats



kim

Mar 07, 2013 @ 14:05:59

Thank you for your reply Vincenzo,

If i just want to detect particles that are smaller than PM2.5 do you think it will work if i place a PM2.5 filter paper at the air intake. What would you recommend.

Thanks.



kim

Mar 09, 2013 @ 20:40:57

Hi all,

I'm confused as to how this sensor's sensitivity is measured. From what i understand, it uses the particle scattering method to detect dust. However how is the sensitivity units in density and not pieces or particles per liter (psc/L). How can you detect the weight of dust through this optical method.

Can someone please shed some light.

Thanks.



Vincenzo Cocca

Mar 20, 2013 @ 23:31:22

Hi kim.

I know that there aren't PM2.5 filter. Only cyclone or impactor.

Then, this sensor doesn't count number of particles but only their mass. There is a relation between ppm and mg/m3. Let you see on web.

Bye



Alex

Mar 29, 2013 @ 08:44:37

Hello

Can anybody say what is the role of the capacitor of 220uF?

I tested the sensor i I obtained a strange behavior without the capacitor (i don't have it in this moment). The values obtained are: 10 10 10 120 10 10 10 10. The maximum value is

1000. Are the values correct ? for example 10 means no dust?
Can the sensor be used as a fog detector? In my tests i observed that when the humidity is high (as in the case of fog) the detected values are higher.
thanks.



Ken

Mar 31, 2013 @ 06:35:36

I am trying to set this up for the first time. How is everyone doing the wire connection to the sensor? Did you get a connector for the 6-pin connector or did you somehow just wire it in? I am not familiar with such fine wiring as the connector is quite small. Thanks.



Paul

Apr 02, 2013 @ 09:46:00

Hi Ken,

Connector is tiny, it is even harder than soldering wires direct on to the pins.

Connector can be found here <https://www.sparkfun.com/products/9690>

Cheers,
Paul



Chris

Jun 07, 2013 @ 10:26:10

This may be of help. If you multiply the sensor output by .0049, you get the voltage reading from the analog pin. If you're a rookie to Arduino like I am, that could save you some time. Voltage = analog output * 0.0049.

I got that from this Arduino reference page:
<http://arduino.cc/en/Reference/AnalogRead>.

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