

# Grove - Alcohol Sensor

## Introduction

**Grove - Alcohol Sensor** a complete alcohol sensor module for **Arduino** or **Seeeduino**. It is built with [MQ303A](#) semiconductor alcohol sensor. It has *good sensitivity* and *fast response* to alcohol. It is suitable for making **Breathalyzer**. This Grove implements all the necessary circuitry for [MQ303A](#) like power conditioning and heater power supply. This sensor outputs a voltage inversely proportional to the alcohol concentration in air.

Model: [SEN21723P](#)



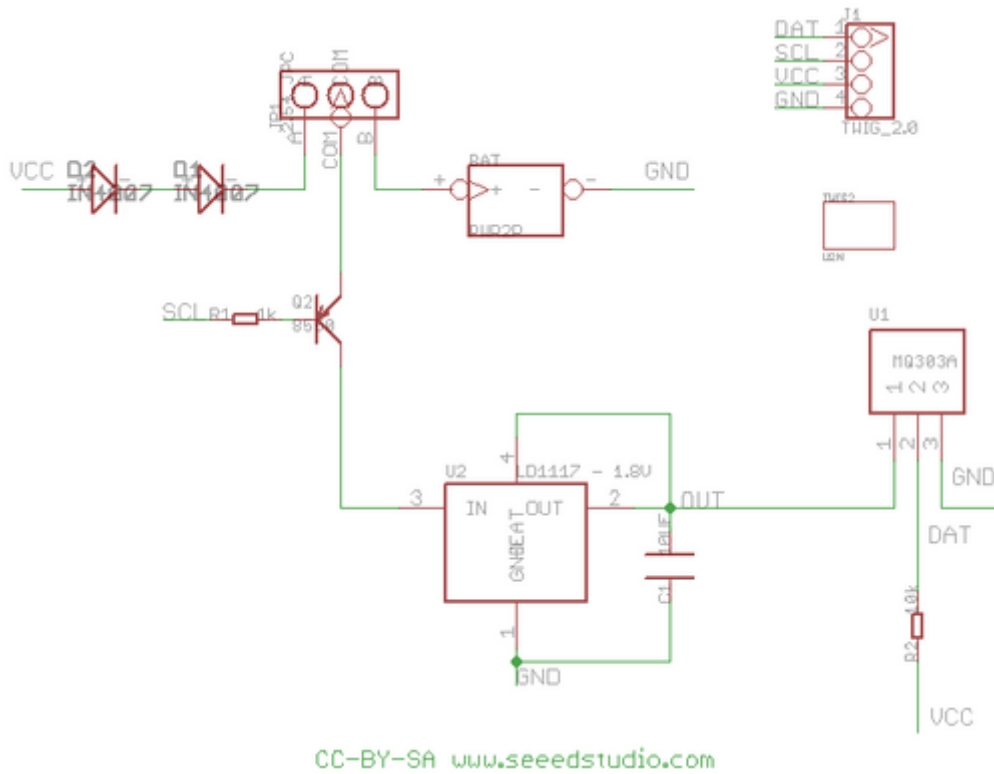
## Features

- 4 Pin Grove connector for using with [Grove - Base Shield](#).
- 2 pin connector for connecting battery to sensor heating element.
- Highly sensitive to alcohol.
- Fast response and resumes quickly after alcohol exposure.
- Long life.
- Compact form factor.

## Cautions

- **Alcohol sensor is very sensitive semiconductor device. Handle with care.**
- **Do not expose to organic silicon steam, alkali or corrosive gases.**
- **Do not use freeze or spill water.**
- **Maintain proper working voltage.**

## Schematic



CC-BY-SA [www.seeedstudio.com](http://www.seeedstudio.com)

## Specification

- Detection Gas: Alcohol
- Power requirements: 5 VDC @ ~120 mA (for heater on)
- Concentration: 20-1000ppm Alcohol
- Interface: a TTL compatible input (SEL) for enabling heater, a 5V compatible ADC output (DAT)
- Dimension: 40mmX20mmX12mm
- Heater Voltage: 0.9V ± 0.1V AC or DC
- Heater Current: 120±20mA

## Application Ideas

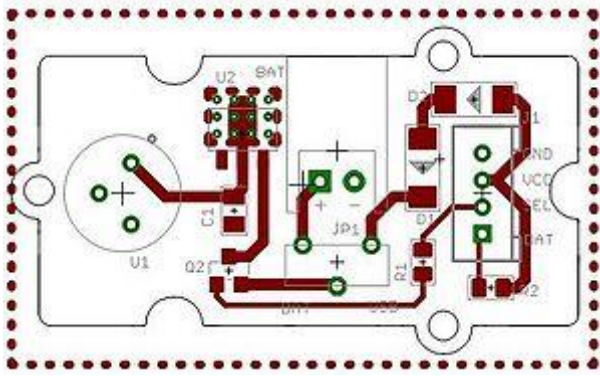
- **Breathalyzer** - Alcohol over-limit detection
- Environmental monitoring equipments

## Pin definition and Rating

Pin	Name	Function and note	Rating
P1	+ (positive)	3~5 VDC power	3~5V
P2	- (negative)	Ground, connects to common ground	0V
P3	GND	Ground, connects to common ground	0V
P4	VCC	+5 VDC power	5V
P5	SEL	Heat switch input from microcontroller, active low	0V/5V
P6	DAT	Analog Data output to host MCU. Value inversely proportional to alcohol level	Floating

## Mechanic Dimensions

Grove - Alcohol Sensor is of 2.6cm x 4.3cm dimension.



## Usage

### Hardware Installation

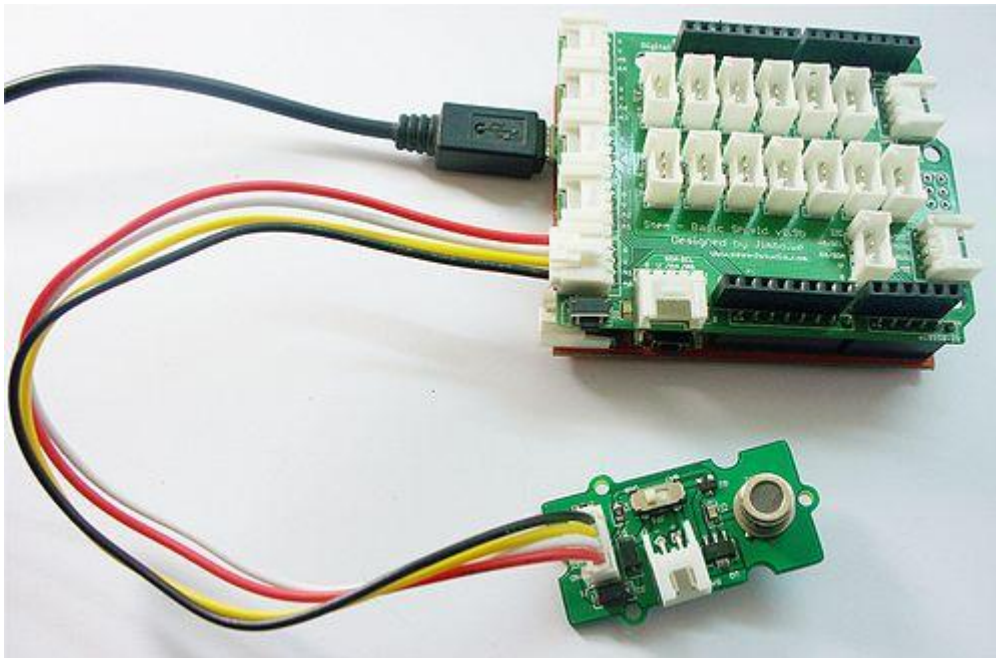
The MQ303Q heater requires adequate current(150mA). Based on the position of J1 toggle switch, heater power source can be set to VCC(USB) or to BAT(External Battery).

#### *Mode1: Toggle Switch set to VCC*

In this mode the alcohol sensor will be heated by VCC power. A word of caution, heater will drop about 150mA current from VCC. Make sure your system can accept this voltage change.

#### *Mode2: Toggle Switch set to BAT*

In this mode, you need to provide an extra power to heat the alcohol sensor. And the heating will not influence the VCC power.



Hardware Arrangement for Programming

## Programming

- The following example is to test alcohol sensor with Seeeduino.
- Set the switch to VCC(i.e USB).
- Upload the following sketch.
- You will get analog values from 0 to 1023.

//MQ303A Testing - A simple sketch to understand the working of Alcohol sensor. Can be used to study how to calibrate threshold values.

```
//Alcohol Sensor DAT Pin is connected to Analog Input Pin 0 (A0)
#define analogInDatPin 0

//Alcohol Sensor SEL Pin is connected to Analog Input Pin 1 (A1). In this case it is used as
digital ouput.
//15 is mapped to A1
#define heaterSelPin 15

int sensorValue = 0;

void setup() {
  pinMode(heaterSelPin,OUTPUT); // set the heaterSelPin as digital output.
  digitalWrite(heaterSelPin,HIGH); //when heaterSelPin is set, heater is switched off.
  Serial.begin(9600); // open the serial port at 9600 bps
}

void loop() {
  digitalWrite(heaterSelPin,LOW); //switch on the heater of Alcohol sensor
  sensorValue = analogRead(analogInDatPin); //read the analog value

  //Disply the results in serial monitor.
  Serial.print("sensor test value = ");
  //sensorValue goes down when alcohol is detected. Hence subtracting from 1023.
  Serial.println(1023-sensorValue);
  delay(100);
}
```

## Output

- Sensor value after heating sensor for 5~10 mins and before exposure to alcohol:



The screenshot shows a serial monitor window titled "/dev/ttyUSB0" with a "Send" button. The output text is as follows:

```
sensor test value = 144
sensor test value = 144
sensor test value = 145
sensor test value = 145
sensor test value = 144
sensor test value = 144
sensor test value = 144
sensor test value = 144
sensor test value = 144
sensor test value = 143
sensor test value = 143
sensor test value = 143
sensor test value = 143
sensor test value = 143
sensor test value = 143
sen
```

The baud rate is set to 9600 baud.

- Sensor value after exposure to alcohol:

```
/dev/ttyUSB0
Send
sensor test value = 634
sensor test value = 638
sensor test value = 639
sensor test value = 640
sensor test value = 641
sensor test value = 641
sensor test value = 640
sensor test value = 638
sensor test value = 637
sensor test value = 636
sensor test value = 633
sensor test value = 632
sensor test value = 630
sensor test value = 628
sensor test value = 627
9600 baud
```

```
/dev/ttyUSB0
Send
sensor test value = 898
sensor test value = 898
sensor test value = 898
sensor test value = 899
sensor test value = 899
sensor test value = 900
sensor test value = 900
sensor test value = 901
sensor test value = 901
sensor test value = 901
sensor test value = 901
sensor test value = 901
sensor test value = 901
sensor test value = 901
9600 baud
```

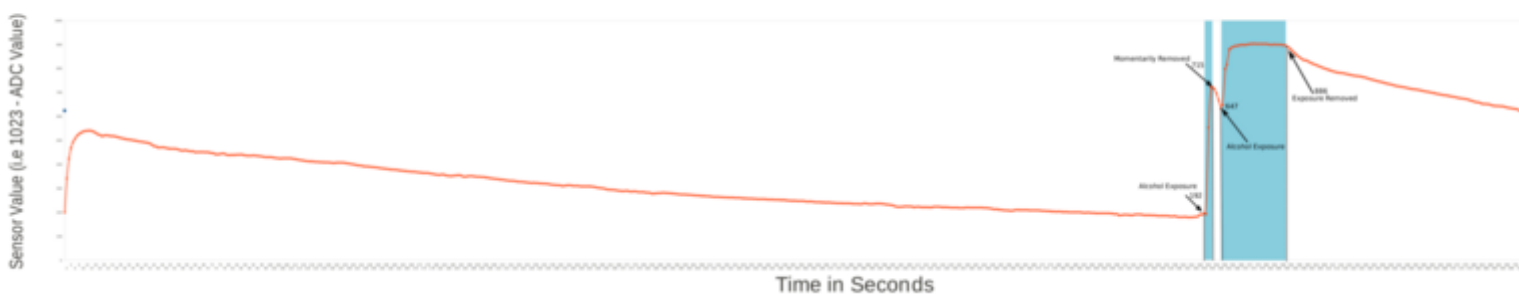
- The value varies between 500 - 905. Hence any value above 650 indicates alcohol vapor in the vicinity.
- Once exposed to alcohol vapor, it takes some time for the sensor value to decrease completely.
- Yet, any new exposure will show instant increase in sensor value.

### MQ303A Sensor - Response to Alcohol

- To give a better idea of MQ303A working, the following characteristics graph is provided.
  - The moment sensor is heated, sensor value starts to decrease slowly.
  - When sensor is exposed to Alcohol ([Tested with Listerine Mouth Wash - which has 26% Ethanol](#)), the sensor reading shows a sharp increase.
  - When Alcohol is removed, the sensor value decreases slowly.

**MQ303A Alcohol Sensor Response Characteristics**

H/W Arrangement : Twig - Alcohol Sensor Connected to Sseeduino. Toggle switch set to USB (Internal Power for Hearer)

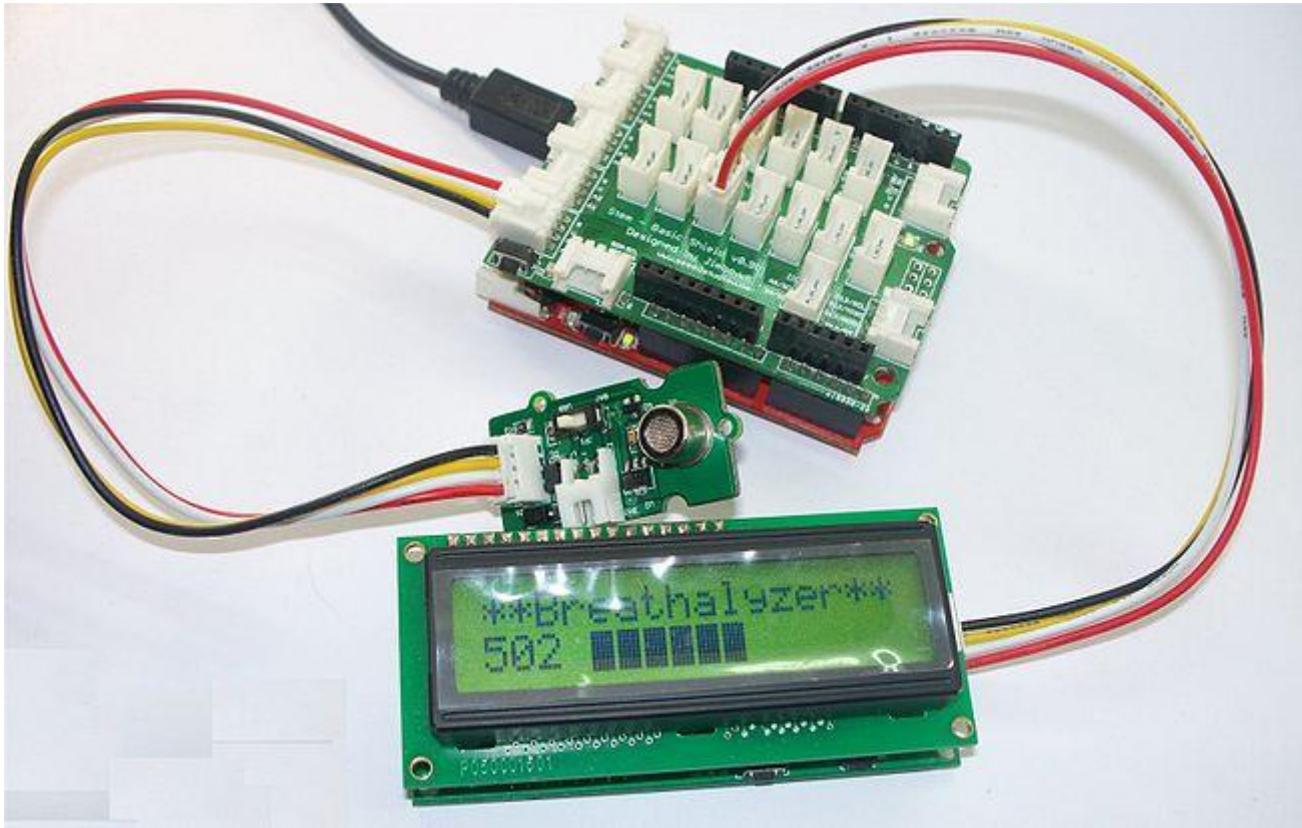


MQ303A Response Characteristics

[Download MQ303A Alcohol Sensor - Response Characteristics : A HighRes PDF](#)

## Breathalyzer

A simple breathalyser design is presented below.



 Seed Breathalyzer - Using MQ303A Alcohol Sensor

- Connect **Alcohol sensor** Grove to A0-A1 connector of [Base Shield](#).
- Connect [Serial LCD](#) Grove to D11-D12 connector of [Base Shield](#).
- Upload the following sketch.
- Press reset button of Serial LCD.
- Bring some alcohol([use Listerine mouthwash](#) ) near sensor.

```
#include <SerialLCD.h>
#include <NewSoftSerial.h>

// initialize the slcd library
SerialLCD slcd(11,12); //this is a must, assign soft serial pins

//Alcohol Sensor DAT Pin is connected to Analog Input Pin 0 (A0)
#define analogInDatPin 0

//Alcohol Sensor SEL Pin is connected to Analog Input Pin 1 (A1). In this case it is used as
digital ouput.
//15 is mapped to A1
#define heaterSelPin 15

int sensorValue = 0;

void setup() {
    pinMode(heaterSelPin,OUTPUT); //set the heaterSelPin as digital output.
```



```

digitalWrite(heaterSelPin,HIGH); //when heaterSelPin is set, heater is switched off.
slcd.begin();
//Disply the results in Sseed Serial LCD.
slcd.setCursor(0,0);
slcd.print("**Breathalyzer**");

// Serial.begin(9600); //debug port: Uncomment if required
}

void loop() {
digitalWrite(heaterSelPin,LOW); //switch on the heater of Alcohol sensor
sensorValue = analogRead(analogInDatPin); // read the analog in value

//Disply the results in Sseed Serial LCD.
slcd.setCursor(0,1);
slcd.print(1023 - sensorValue,DEC);
slcd.print(" ");

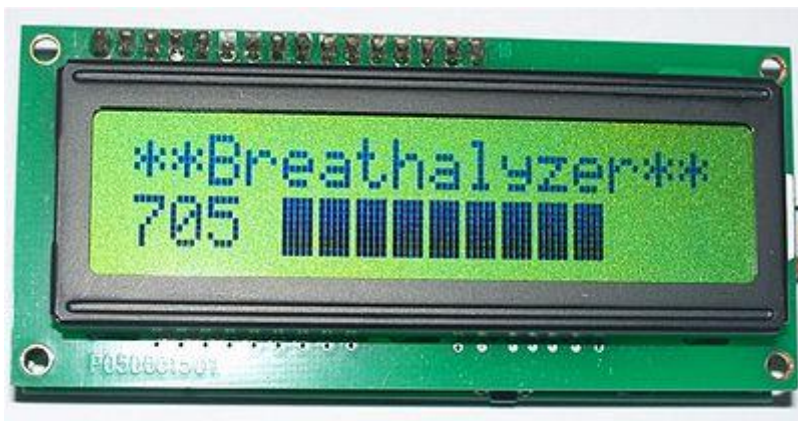
char scale=((1023 - sensorValue)/77); // (999 / 13). As the display can show upto 13
levels after display levels in decimals.
for(char level=0;level<scale;level++)
{
slcd.print(0xFF); //All black character
}

for(char level=0;level<(13-scale);level++)
{
slcd.print(" "); //Clear remaining characters
}

// Serial.println(1023 - sensorValue,DEC); //debug port: Uncomment if required
delay(500);
}

```

## Outputs



Breathalyzer - High Concentration of Alcohol detected



## Bill of Materials (BOM) /parts list

Grove - Alcohol Sensor v0.9b			
Part	Quantity	Value	Package
BAT	1	PWR2P	PWR_JST
C1	1	10UF	0805
D1,D2	2	IN4007	D2010
J1	1	GROVE_2.0	2.0_1X4
JP1	1	2.54_JPC	2.54_JP_C
Q2	1	8550	SOT23
R1	1	1k	0805
R2	1	10k	0805
GROVE2	1	U2N	U2N
U\$1	1		GROVELOGO_BOTTOM
U1	1	MQ303A	MQ303A
U2	1	LD1117 - 1.8V	SOT89

## FAQ

Please list your question here (if any).

## Support

If you have questions or other better design ideas, you can go to our [forum](#) or [wish](#) to discuss.

## Version Tracker

Revision	Descriptions	Release date
Grove - Alcohol Sensor v1.0	Initial public release	Dec 24, 2010

## Bug Tracker

Bug Tracker is the place where you can list any bugs (that you think have) found during use. This will help us improve our products.

## Additional Idea

The Additional Idea is the place to write your project ideas about this product, or other usages you've found.

## Resources

- [Schematics and Board files in Eagle Format](#)
- [Schematics in PDF Format](#)
- [MQ303A Alcohol Sensor - Response Characteristics High Res PDF](#)



- [SerialLCD-Library](#)
- [NewSoftLibrary used by Serial LCD](#)

## How to buy

Click here to buy Grove - Alcohol Sensor v0.9b: [http://www.seeedstudio.com/depot/twig-alcohol-sensor-p-764.html?cPath=144\\_151](http://www.seeedstudio.com/depot/twig-alcohol-sensor-p-764.html?cPath=144_151).

## See Also

- [GROVE - Starter Bundle](#)
- [Grove - Base Shield](#)
- [Grove - Serial LCD](#)
- [2-axis compass Module](#)
- [Grove - I2C 3-axis Accelerometer](#)
- [Grove - 3-axis Compass](#)
- [Grove - Water Sensor](#)
- [Grove - Light Sensor](#)
- [Grove - Touch Sensor](#)
- [Grove - Temp&Humi Sensor](#)
- [Grove - Magnetic Switch](#)
- [Grove - 3-axis Gyro](#)
- [Grove - RTC](#)
- [Grove - Electricity Sensor](#)
- [Grove - Sound Sensor](#)

## Licensing

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## External Links

- [Wikipedia - Listerine Mouth Wash](#)
- [Wikipedia - Alcohol By volume](#)
- [Wikipedia - Breathalyzer](#)