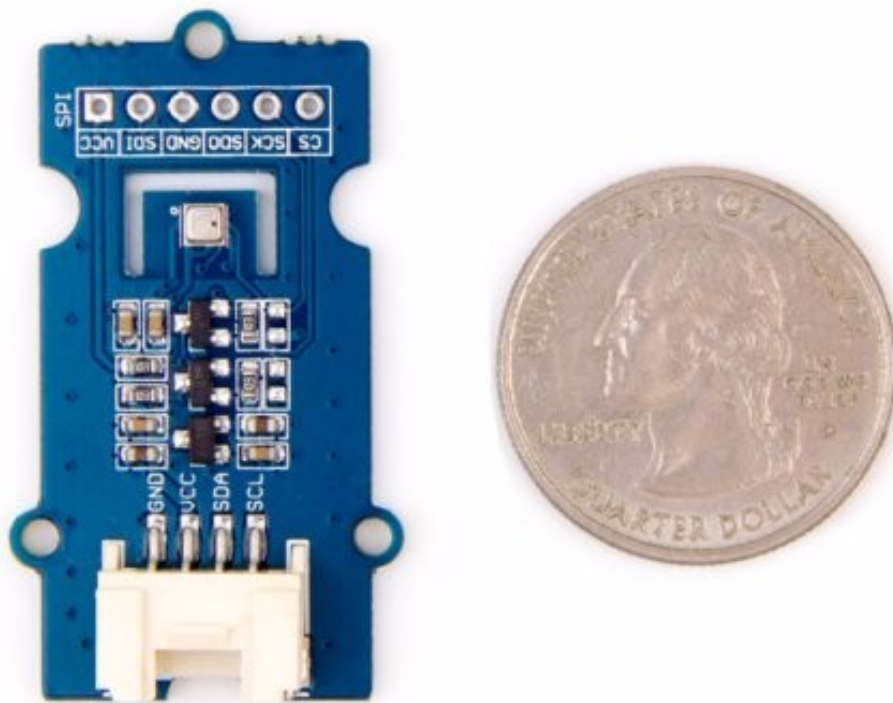# Grove - Barometer Sensor(BME280)

Grove - Temp&Humi&Barometer Sensor (BME280) is a breakout board for Bosch BMP280 high-precision, low-power combined humidity, pressure, and temperature sensor. This module can be used to measure temperature, atmospheric pressure and humidity accurately and fast. As the atmospheric pressure changes with altitude, it can also measure approximate **altitude** of a place. It can

be connected to a microcontroller with I^{2}C (integrated with Grove socket) or through SPI bus. We have also provided highly abstracted library to make this more product easier to use.

The BME280 is an upgraded version of BMP180, and BME280 gets dramatic improvements from BMP180. BME280 comes with a smaller footprint, lower power consumption, lower noise measurements, higher resolutions for pressure and temperature, lower RMS noise, newly added SPI bus, more measuring modes, higher measuring rate, and newly added filter against environmental interference. Since the atmosphere pressure reading is affected by altitude and temperature, we have added compensation features. Hence, Grove - Temp&Humi&Barometer Sensor (BME280) will be more reliable in providing precise temperature, atmospheric pressure values, humidity and approximate altitude data.

Using the sensor is easy. For Seeeduino [https://www.seeedstudio.com/depot/Seeeduino-V42-p-2517.html?cPath=6_7] (compliant with Arduino), just connect this breakout board using Grove cable [https://www.seeedstudio.com/depot/Grove-Universal-4-Pin-Buckled-5cm-Cable-5-PCs-Pack-p-925.html?cPath=98_106_57] to I2C Grove connector. Then, use the provided library and example code from GitHub. If you are using an Arduino either use Base Shield v2.0 or simply connect the VCC pin to the 5V voltage pin, GND to ground, SCL to I2C Clock (Analog 5) and SDA to I2C Data (Analog 4).

Typical applications: Enhancement of GPS navigation, outdoor/indoor navigation, weather forecast, or any other project that requires accurate atmospheric pressure reading.

Seeed IoTea Lora Solution

[https://www.seeedstudio.com/Grove-BME280-Environmental-Sensor-Temperature-Humidity-Barometer.html]

Features

- Get more precise temperature, atmospheric pressure values, humidity and approximate altitude data fast.

- Grove compatible and easy to use

- Highly abstracted library for building projects quicker

> 🔥 **Tip**
> More details about Grove modules please refer to Grove System
> [https://wiki.seeedstudio.com/Grove_System/]

Specifications

Parameter	Value
Input voltage	3.3V or 5V
I/O voltage	3.3V or 5V
Operating current	0.4mA
Operating temperature	-40 - 85 ℃
Atmospheric pressure sensor measurement range	300 - 1100 hPa (1 hPa= one hundred Pa) with ±1.0 hPa accuracy
Temperature sensor measurement range	-40 - 85 ℃, with ±1.0°C accuracy
Humidity sensor measurements range	0% - 100% relative humidity , with ±3% accuracy
Measurement modes	Piezo & Temperature, forced or periodic
Parameter	Value

Chip	BME280(datasheet [https://files.seeedstudio.com/wiki/Grove-Barometer_Sensor-BME280/res/Grove-Barometer_Sensor-BME280-.pdf])
Interface Bus	SPI, I^{2}C (use either one of them)
Weight	3.2 g (for breakout board), 9.3 g for whole package each piece
Dimensions	40 (length) × 20 (width) mm
I2C	0x76(default) or 0x77

> **Note**
>
> 1. We will show/describe how to select interface bus soon.
>
> 2. The altitude is calculated by a combination of temperature and atmospheric pressure. No specialized components for altitude.

Platforms Supported

Arduino	Raspberry Pi		

⚠ **Caution**

The platforms mentioned above as supported is/are an indication of the module's software or theoritical compatibility. We only provide software library or code examples for Arduino platform in most cases. It is not possible to provide software library / demo code for all possible MCU platforms. Hence, users have to write their own software library.

Hardware Overview
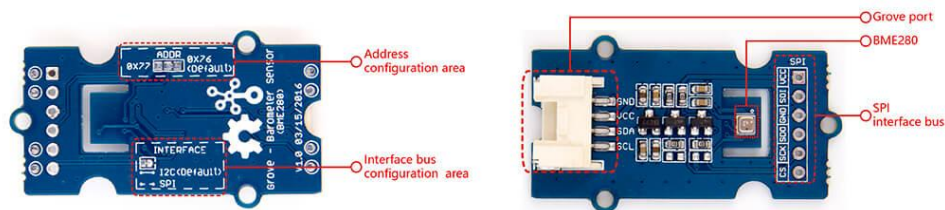
- **SPI soldering pads**, a voltage monitoring circuit.

- **Interface bus selection pads** , to select I^{2}C bus, connect the two pads by soldering (it is connected by default); to select SPI bus, cut the two pads with a sharp knife or a soldering iron.

- **Slave board address selection pads**, to select slave board address to avoid address collision.

  - If you have selected I2C bus, the default address for slave board is **0x76** (right-two pads are connected). If you want to use the address **0x77**, connect only the left two (disconnect right two) by soldering.

> **Tip**
> You can disconnect pads with just a sharp knife.

```
   - If you have selected SPI bus, the default address for
```

> ✏ **Note**
> Do not touch or shake or let this product in vibration when it works. This will cause interference and will affect the accuracy of data collected.

Package includes (main parts)

Parts name	Quantity
Grove - Temp&Humi&Barometer Sensor (BME280)	1 piece
Grove cable [https://www.seeedstudio.com/depot/Grove-Universal-4-Pin-Buckled-5cm-Cable-5-PCs-Pack-p-925.html?cPath=98_106_57]	1 piece

Getting Started

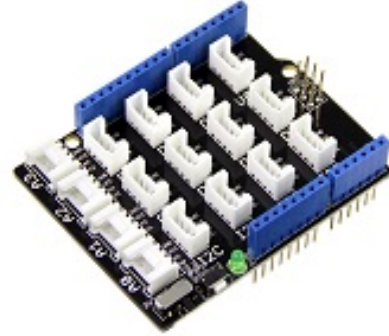Now let us run some basic examples with this module.

Play with Arduino

Hardware

- **Step 1.** Prepare the below stuffs:

Seeeduino V4.2	Base Shield

Get One Now
[https://www.seeedstudio.com/Seeeduino-V4.2-p-2517.html]

Get One Now
[https://www.seeedstudio.com/Base Shield-V2-p-1378.html]
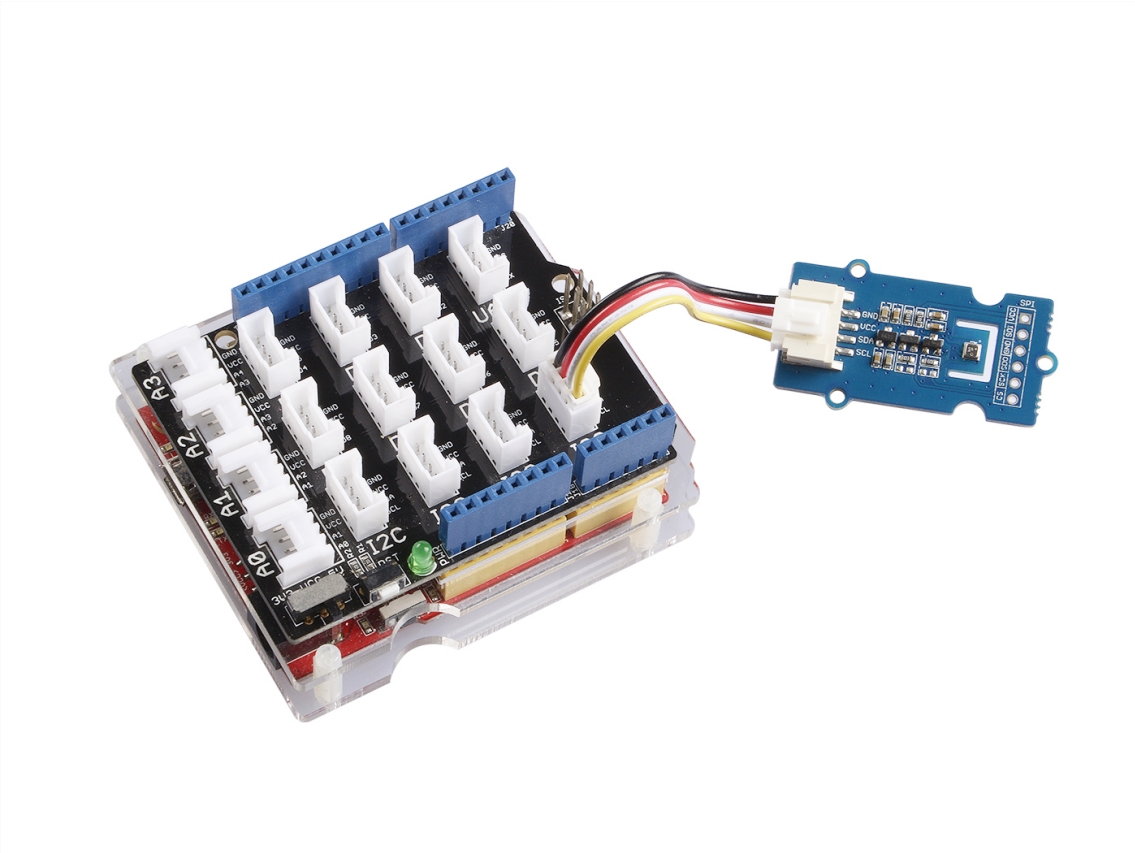
- **Step 2.** Connect Grove-Barometer_Sensor-BME280 to port **I2C** of Grove-Base Shield.

- **Step 3.** Plug Grove - Base Shield into Seeeduino.

- **Step 4.** Connect Seeeduino to PC via a USB cable.

> ✏️ **Note**
>
> If we don't have Grove Base Shield, We also can directly connect this module to Seeeduino as below.

seeeduino_v4	Grove-Barometer_Sensor-BME280
5V	VCC
GND	GND
SDA	SDA
SCL	SCL

Software

Step 1. Download the Library and example code

[https://github.com/Seeed-Studio/Grove_BME280] from Github.

Step 2. Refer How to install library

[https://wiki.seeedstudio.com/How_to_install_Arduino_Library] to

install library for Arduino.

Step 3. Create a new Arduino sketch and paste the codes below to

it or open the code directly by the path:File -> Example -

>Barometer_Sensor->Barometer_Sensor.

Here is the code

```
1   /*
2    * bme280_example.ino
3    * Example sketch for bme280
4    *
5    * Copyright (c) 2016 seeed technology inc.
6    * Website     : www.seeedstudio.com
7    * Author      : Lambor
8    * Create Time:
9    * Change Log :
10   *
11   * The MIT License (MIT)
12   *
13   * Permission is hereby granted, free of charge, to any
14   * of this software and associated documentation files (
15   * in the Software without restriction, including withou
16   * to use, copy, modify, merge, publish, distribute, sub
17   * copies of the Software, and to permit persons to whom
18   * furnished to do so, subject to the following conditio
19   *
20   * The above copyright notice and this permission notice
21   * all copies or substantial portions of the Software.
22   *
23   * THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF
24   * IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES
25   * FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.
```

```
26    * AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM,
27    * LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR
28    * OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE
29    * THE SOFTWARE.
30    */
31   #include "Seeed_BME280.h"
32   #include <Wire.h>
33
34   BME280 bme280;
35
36   void setup()
37   {
38     Serial.begin(9600);
39     if(!bme280.init()){
40       Serial.println("Device error!");
41     }
42   }
43
44   void loop()
45   {
46     float pressure;
47
48     //get and print temperatures
49     Serial.print("Temp: ");
50     Serial.print(bme280.getTemperature());
51     Serial.println("C");//The unit for  Celsius because or
52
53     //get and print atmospheric pressure data
54     Serial.print("Pressure: ");
55     Serial.print(pressure = bme280.getPressure());
56     Serial.println("Pa");
57
58     //get and print altitude data
59     Serial.print("Altitude: ");
60     Serial.print(bme280.calcAltitude(pressure));
61     Serial.println("m");
62
63     //get and print humidity data
64     Serial.print("Humidity: ");
65     Serial.print(bme280.getHumidity());
66     Serial.println("%");
```

```
67
68    delay(1000);
69  }
```

Step 4. Upload the code. If you do not know how to upload the code, please check how to upload code [https://wiki.seeedstudio.com/Upload_Code/].

Step 5. Open the serial monitor to receive the sensor's data including temperature, barometric pressure value, altitude and humidity.

Play With Wio Terminal (ArduPy)

Hardware

- **Step 1.** Prepare the below stuffs:

Wio Terminal	Grove-Barometer Sensor-BME280
Get One Now [https://www.seeedstudio.com/Wio-Terminal-p-4509.html]	Get One Now [https://www.seeedstudio.com/Grove-BME280-Environmental-Sensor-Temperature-Humidity-Barometer.html]

- **Step 2.** Connect Grove-Barometer Sensor-BME280 to the **I2C** Grove port of Wio Terminal.

- **Step 3.** Connect the Wio Terminal to PC through USB Type-C cable.
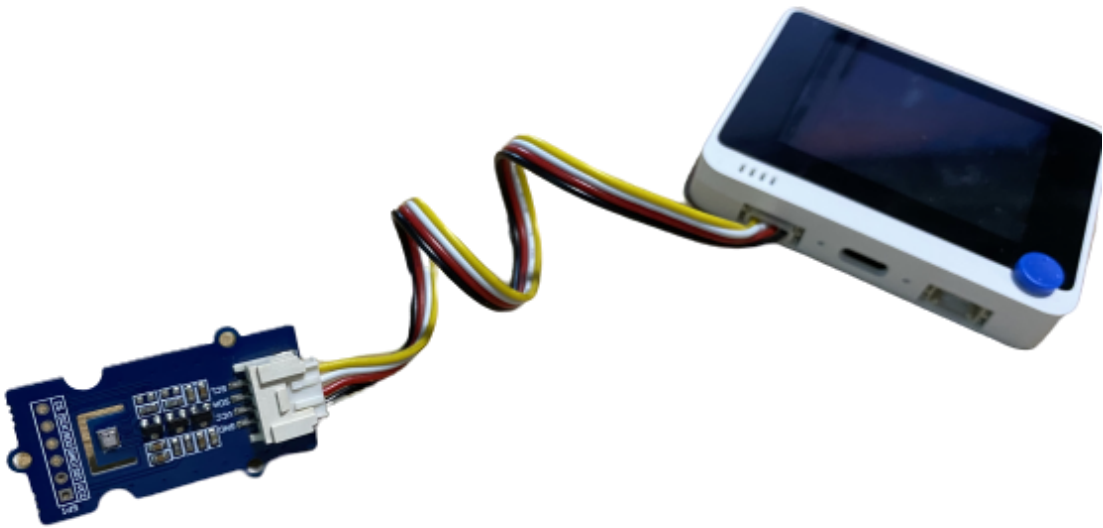
Software

- **Step 1.** Follow **ArduPy Getting Started**
  [https://wiki.seeedstudio.com/ArduPy/] to configure the ArduPy
  development environment on Wio Terminal.

- **Step 2.** Make sure that the ArduPy firmware is flashed into Wio
  Terminal. For more information, please follow **here**
  [https://wiki.seeedstudio.com/ArduPy/#ardupy-aip-cli-getting-
  started].

```
1   aip install Seeed-Studio/seeed-ardupy-bme280
2   aip build
3   aip flash
```

- **Step 3.** Copy the following code and save it as `ArduPy-`
  `bme280.py` :

```
1   from arduino import grove_bme280
2   from machine import LCD
3   from machine import Sprite
```

```
 4   import time
 5
 6   bme280 = grove_bme280()
 7   lcd = LCD()
 8   spr = Sprite(lcd) # Create a buff
 9
10   def main():
11       spr.createSprite(320, 240)
12       while True:
13         spr.setTextSize(2)
14         spr.fillSprite(spr.color.BLACK)
15         spr.setTextColor(lcd.color.ORANGE)
16         spr.drawString("BME280 Reading", 90, 10)
17         spr.drawFastHLine(40, 35, 240, lcd.color.DARKGREY)
18         spr.setTextColor(lcd.color.WHITE)
19         spr.drawString("- Temperature: ", 20, 50)
20         spr.drawString("- Humidity: ", 20, 80)
21         spr.drawString("- Pressure: ", 20, 110)
22
23         spr.drawFloat(bme280.temperature, 2, 220,50)
24         spr.drawNumber(bme280.humidity, 220,80)
25         spr.drawNumber(bme280.pressure, 220,110)
26         spr.pushSprite(0,0)
27         time.sleep_ms(500)
28
29         print ("\nTemperature: ", bme280.temperature, "C")
30         print ("Humidity: ", bme280.humidity, "%")
31         print ("Pressure: ", bme280.pressure, "Pa")
32
33   if __name__ == "__main__":
34       main()
```

- **Step 4.** Save the `ArduPy-bme280.py` in a location that you know. Run the following command and **replace** `<YourPythonFilePath>` with your `ArduPy-bme280.py` location.

```
1   aip shell -n -c "runfile <YourPythonFilePath>"
2   # Example:
3   # aip shell -n -c "runfile /Users/ansonhe/Desktop/ArduPy-
```

- **Step 5.** We will see the values display on terminal as below, and displaying on the Wio Terminal LCD screen.

```
1   ansonhe@Ansons-Macbook-Pro ~:aip shell -n -c "runfile /u
2   Positional argument (/dev/cu.usbmodem1414301) takes prec
3   Connected to ardupy
4
5   Temperature:  29.88 C
6   Humidity:  55 %
7   Pressure:  100332 Pa
8
9   Temperature:  29.91 C
10  Humidity:  55 %
11  Pressure:  100332 Pa
12
13  Temperature:  29.88 C
14  Humidity:  54 %
15  Pressure:  100331 Pa
```

Schematic Online Viewer

Resources

- **[Eagle]** Grove-Barometer_Sensor-BME280-v1.0_Schematics [https://files.seeedstudio.com/wiki/Grove-Barometer_Sensor-BME280/res/Grove-Barometer_Sensor-BME280-v1.0_Schematics.zip]

- **[Datasheet]** BME280 Datasheet
  [https://files.seeedstudio.com/wiki/Grove-Barometer_Sensor-
  BME280/res/Grove-Barometer_Sensor-BME280-.pdf]

- **[Library]** Grove_BME280 Library [https://github.com/Seeed-
  Studio/Grove_BME280] on GitHub

- **[Reference]** I^{2}C how-to for Arduino
  [https://www.arduino.cc/en/Reference/Wire]

Projects

Seeed LoRa IoTea Solution: An automatic information collection
system applied to tea plantation. It is part of intelligent agricultural
information collection.

(https://www.hackster.io/SeeedStudio/se
lora-iotea-solution-b5ee95)

**Seeed LoRa IoTea Solution
(https://www.hackster.io/SeeedStudio/seeed**

Tech Support

Please submit any technical issue into our forum
[https://forum.seeedstudio.com/].

[https://www.seeedstudio.com/act-4.html?
utm_source=wiki&utm_medium=wikibanner&utm_campaign=newpr
oducts]