![seeed studio logo]

Grove - 6-Axis Accelerometer&Gyroscope(BMI088)

The Grove - 6-Axis Accelerometer&Gyroscope(BMI088) is a 6 DoF(degrees of freedom) High-performance Inertial Measurement Unit(IMU) .This sensor is based on BOSCH BMI088, which is a high-performance IMU with high vibration suppression. The 6-axis sensor combines a 16 bit triaxial gyroscope and a 16 bit triaxial accelerometer. Specialy, you can use this sensor on the drone and robotics application in demanding environments.

Features

- The BM1088 is designed for drones, robotics and industry applications with challenging performance requirements.
- Wide acceleration measurment range(up to 24g)
- The accelerometer features a low TCO of 0.2 mg/K and low spectral noise of only 230 pg/sqrt(Hz) in the widest measurement range of ± 24 g

Specification

Item	Value
Operating Voltage	3.3V / 5V
Measurement range and sensitivity	**Accelerometer** ±3g @10920 LSB/g ±6g @5460 LSB/g ±12g @2730 LSB/g ±24g @1365 LSB/g **Gyroscope** ±125°/s @262.1 LSB/°/s ±250°/s @131.1 LSB/°/s ±500°/s @65.5 LSB/°/s ±1000°/s @32.8 LSB/°/s ±2000°/s @16.4 LSB/°/s
Operating Temperature Range	-40℃ ~ +85℃
Zero Offset	**Accelerometer** ±30 mg **Gyroscope** ±1°/s
TCO	**Accelerometer** ±0.2 mg/K **Gyroscope** ±0.015°/s/K
External interface	I²C
I²C Address	**Accelerometer** 0x19(default) \ 0x18(optional) **Gyroscope** ±1°/s0x69(default) \ 0x68(optional)

Typical Applications

- Drones and flying toys
- Industrial robots, hover boards
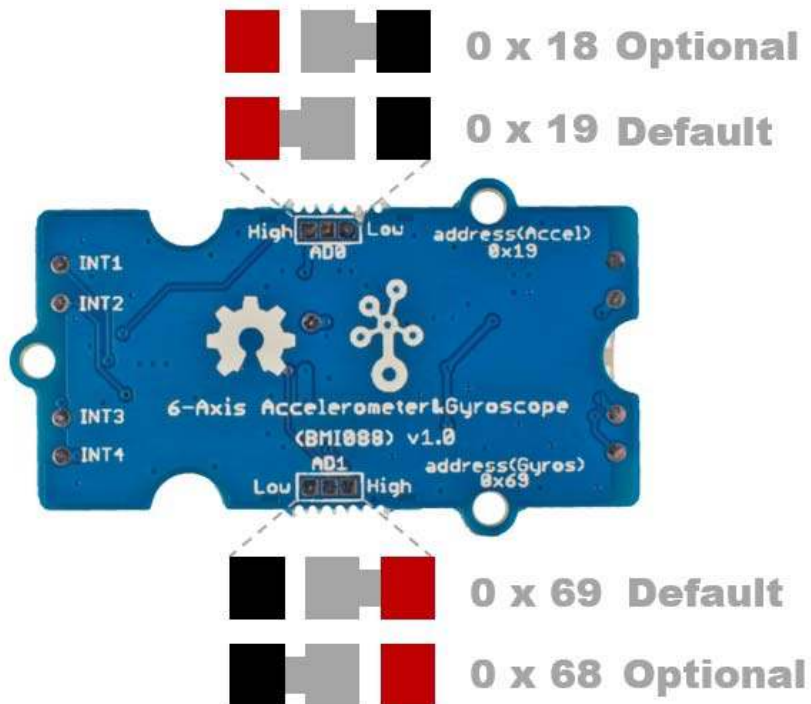- Domestic applications(e.g. vacuum cleaner, social robots,etc.)
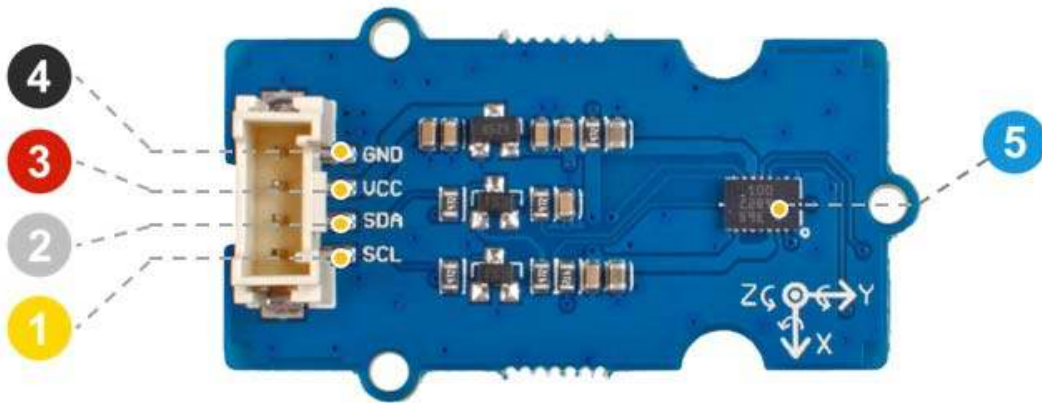
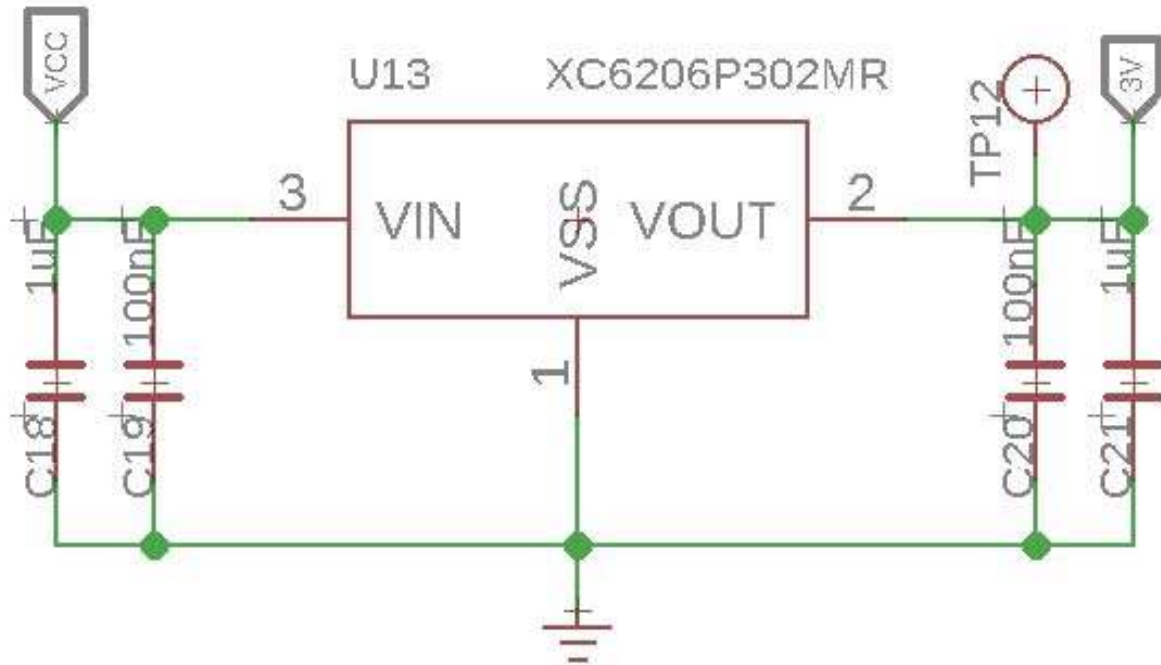④ GND: connect this module to the system GND   ⑤ the BMI088 module

③ VCC: you can use 5V or 3.3V for this module

② SDA: I²C serial data

① SCL: I²C serial clock

0 x 18 Optional

0 x 19 Default

0 x 69 Default

0 x 68 Optional

Schemaitc

Power

The operating voltage range of BMI088 is 2.4-3.6V, so we use the XC6206P30 chip to provide a stable 3.0V. The input of XC6206P30 ranges from 1.8V to 6.0V, so you can use this module with your Arduino both in 3.3V and 5V.

Bi-directional level shifter circuit
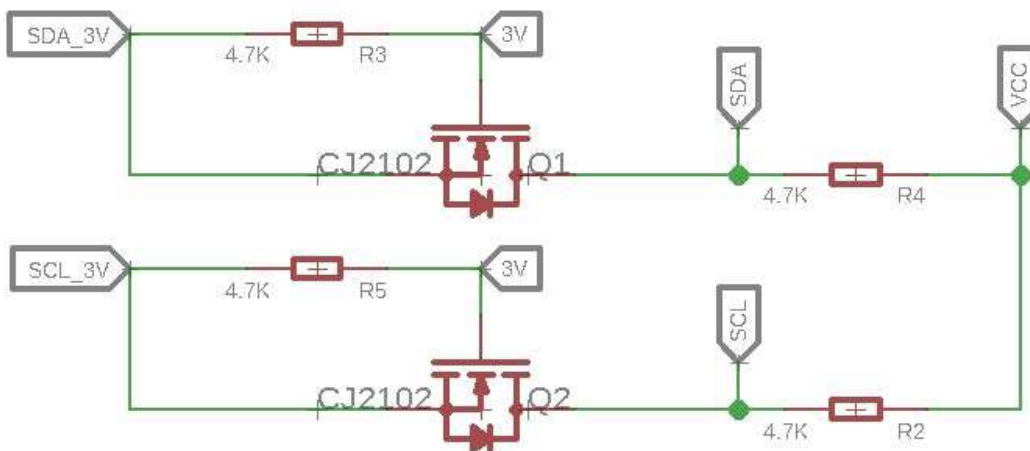
This is a typical Bi-directional level shifter circuit to connect two different voltage section of an I²C bus. The I²C bus of this sensor use 3.3V, if the I²C bus of the Arduino use 5V, this circuit will be needed. In the schematic above, **Q1** and **Q2** are N-Channel MOSFET CJ2102, which act as a bidirectional switch. In order to better understand this part, you can refer to the AN10441

Platforms Supported

Arduino	Raspberry Pi	BeagleBone	Wio	LinkIt ONE

Caution

The platforms mentioned above as supported is/are an indication of the module's hardware 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.

Getting Started

Play With Arduino

Hardware

Materials required

Seeeduino V4.2	Base Shield	Grove (BMI088)

Note
1 Please plug the USB cable gently, otherwise you may damage the port. Please use the USB cable with 4 wires inside, the 2 wires cable can't transfer data. If you are not sure about the wire you have, you can click here to buy

2 Each Grove module comes with a Grove cable when you buy. In case you lose the Grove cable, you can click here to buy.

- **Step 1.** Connect the Grove - 6-Axis Accelerometer&Gyroscope(BMI088) to port **I²C** of Grove-Base Shield.

- **Step 2.** Plug Grove - Base Shield into Seeeduino.

- **Step 3.** Connect Seeeduino to PC via a USB cable.
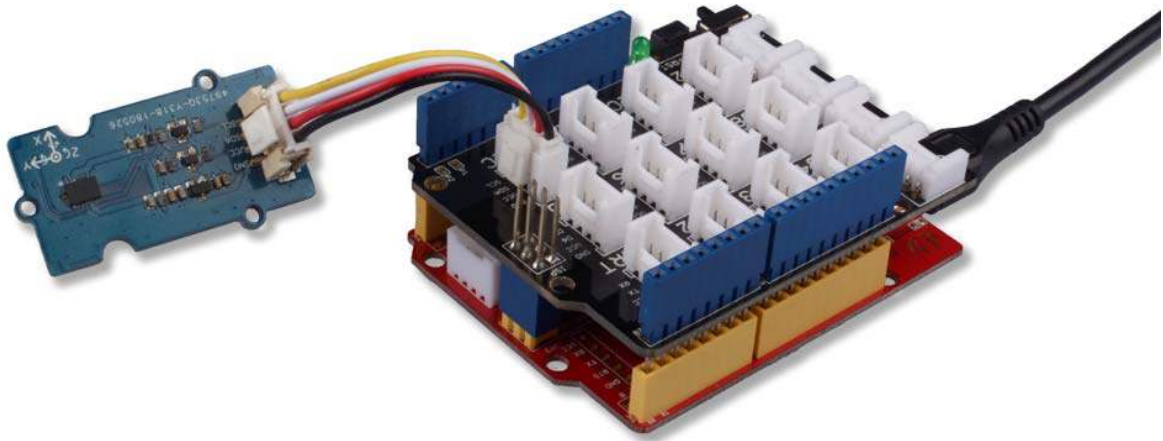
Note
If we don't have Grove Base Shield, We also can directly connect this module to Seeeduino as below.

| Seeeduino	Grove Cable	Grove (BMI088)
GND	Black	GND
5V or 3.3V	Red	VCC
SDA	White	SDA
SCL	Yellow	SCL

Software

Attention
If this is the first time you work with Arduino, we strongly recommend you to see Getting Started with Arduinobefore the start.

- **Step 1.** Download the Seeed_BMI088 Library from Github.

- **Step 2.** Refer to How to install library to install library for Arduino.

- **Step 3.** Restart the Arduino IDE. Open the example, you can open it in the following three ways :

  a. Open it directly in the Arduino IDE via the path: **File → Examples → Grove 6-Axis Accelerometer&Gyroscope → BM1088_Example**.
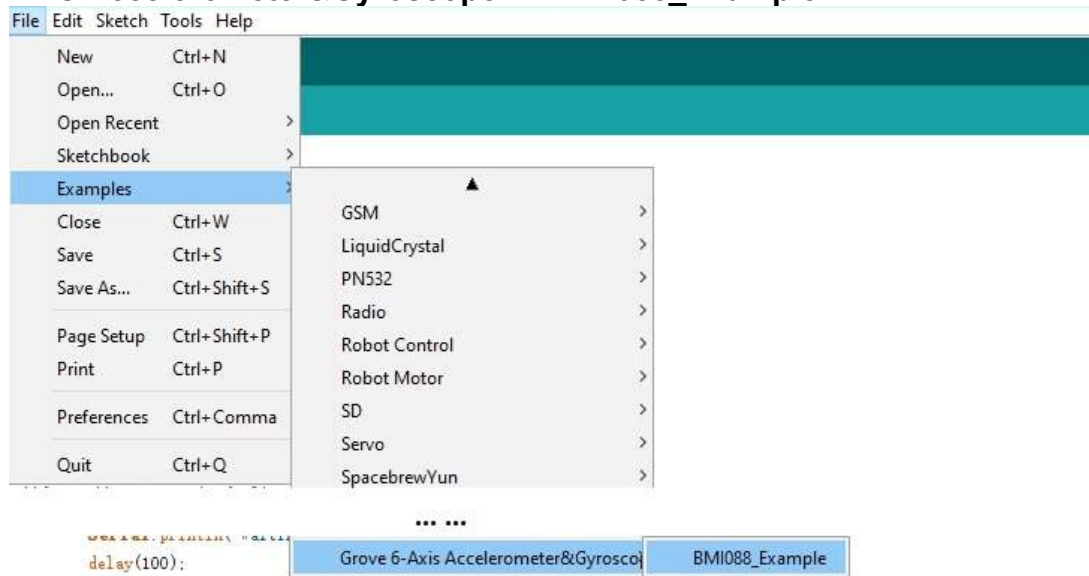
  b. Open it in your computer by click the **BM1088_Example.ino** which you can find in the folder **XXXX\Arduino\libraries\Grove_6Axis_Accelerometer_And_Gyroscope_BMI088-master\examples\BMI088_Example**, **XXXX** is the location you installed the Arduino IDE.
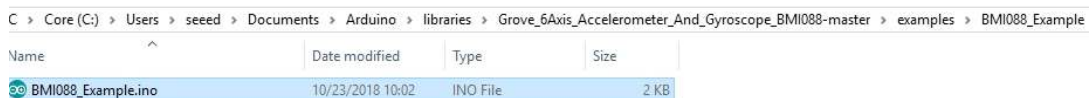
  c. Or, you can just click the icon in upper right corner of the code block to copy the following code into a new sketch in the Arduino IDE.

```
1  #include "BMI088.h"
2
3  float ax = 0, ay = 0, az = 0;
4  float gx = 0, gy = 0, gz = 0;
5  int16_t temp = 0;
6
7  void setup(void)
8  {
9    Wire.begin();
10   Serial.begin(115200);
```

```
11
12    while(!Serial);
13    Serial.println("BMI088 Raw Data");
14
15    while(1)
16    {
17        if(bmi088.isConnection())
18        {
19            bmi088.initialize();
20            Serial.println("BMI088 is connected");
21            break;
22        }
23        else Serial.println("BMI088 is not connected");
24
25        delay(2000);
26    }
27}
28
29void loop(void)
30{
31    bmi088.getAcceleration(&ax, &ay, &az);
32    bmi088.getGyroscope(&gx, &gy, &gz);
33    temp = bmi088.getTemperature();
34
35    Serial.print(ax);
36    Serial.print(",");
37    Serial.print(ay);
38    Serial.print(",");
39    Serial.print(az);
40    Serial.print(",");
41
42    Serial.print(gx);
43    Serial.print(",");
44    Serial.print(gy);
45    Serial.print(",");
46    Serial.print(gz);
47    Serial.print(",");
48
49    Serial.print(temp);
50
51    Serial.println();
52
53    delay(50);
54}
```

Attention
The library file may be updated. This code may not be applicable to the updated library file, so we recommend that you use the first two methods.

- **Step 4.** Upload the demo. If you do not know how to upload the code, please check How to upload code.

- **Step 5.** Open the **Serial Monitor** of Arduino IDE by click **Tool-> Serial Monitor**. Or tap the `Ctrl` + `Shift` + `M` key at the same time. Set the baud rate to **115200**.

Success
If every thing goes well, when you open the Serial Monitor, it may show as below:

```
1 BMI088 Raw Data
2 BMI088 is connected
3 394.41,-383.06,818.66,1.71,-4.88,-2.93,27
4 390.20,-385.25,830.38,5.49,0.24,1.83,27
5 388.37,-380.31,826.54,0.73,2.93,7.57,27
6 395.51,-384.16,823.79,-0.85,-5.74,5.98,27
7 385.80,-386.72,824.52,3.78,-5.00,1.59,27
8 395.51,-384.52,824.71,1.46,3.17,10.86,27
```

Tech Support

Please do not hesitate to submit the issue into our forum