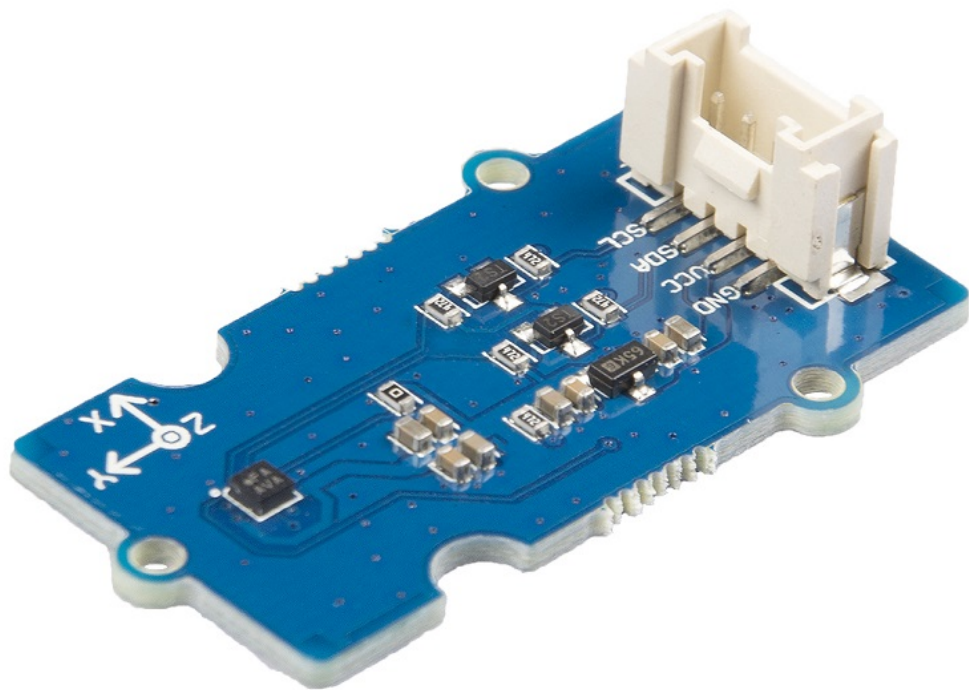# Grove - 3-Axis Digital Accelerometer ±16g Ultra-low Power (BMA400) SKU:101020582

The Grove - 3-Axis Digital Accelerometer ±16g Ultra-low Power (BMA400) sensor is a 12 bit, digital, triaxial acceleration sensor with smart on-chip motion and position-triggered interrupt features. It can detect your movement posture, such as Walking, Running, Standing still.

Version

Product Version	Changes	Released Date
Grove - 3-Axis Digital Accelerometer ±16g Ultra-low Power (BMA400)	Initial	Nov 2018

Features

- Ultra-low power
- Programmable functionality
- On-chip FIFO
- On-chip interrupt features

> Auto-low power/Auto wakeup
>
> Activity/In-activity
>
> Step counter
>
> Activity Recognition(Walking,Running,Standing still)
>
> Orientation detection
>
> Tap/Double tap

Specification

Item	Value
Operating Voltage	3.3V / 5V
Power consumption	18uA @5V 14uA @3.3V
Operating Temperature	-40℃ ~ +85℃
Acceleration Range	±2g, ±4g, ±8g, ±16g
Sensitivity	1024LSB/g @±2g 512LSB/g @±4g 256LSB/g @±8g 128LSB/g @±16g
Interface	I^2^C
I^2^C Address	0x15(default) / 0x14(optional)
Size	L: 40mm W: 20mm H: 10mm
Weight	3.2g
Package size	L: 140mm W: 90mm H: 10mm
Gross Weight	10g

Typical applications

- Step Counting with ultra-low current consumption for extensive battery lifetime
- Fitness applications / Activity Tracking
- Tap / double tap sensing
- Drop detection for warranty logging
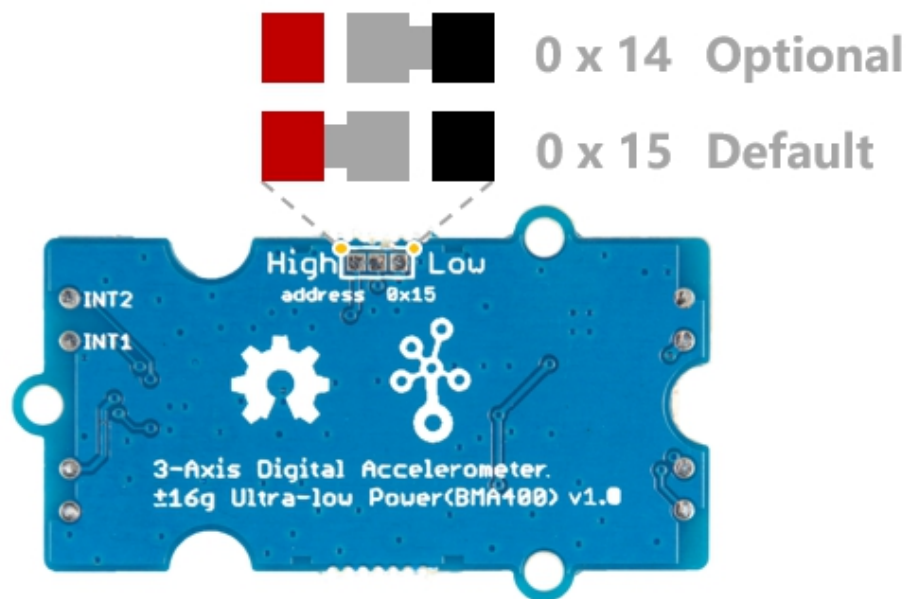- Window/door measurements for climate control and alarm systems
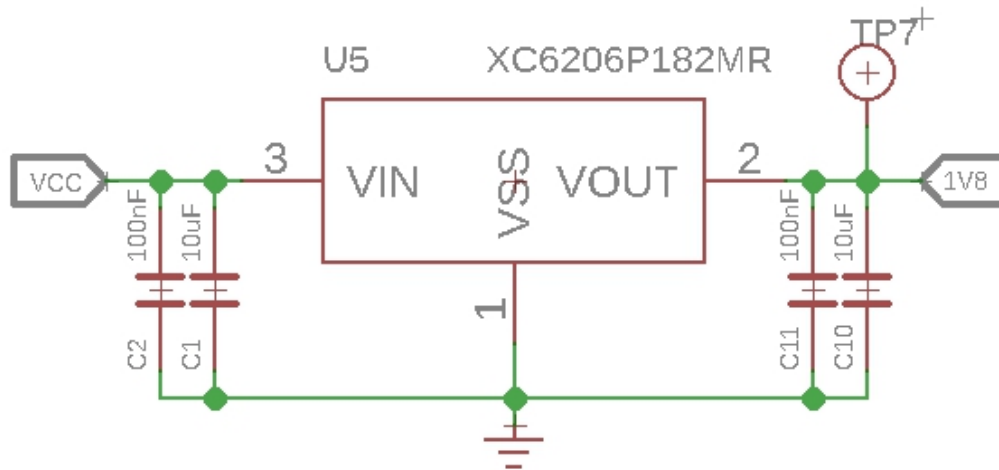
Hardware Overview

Pin Out
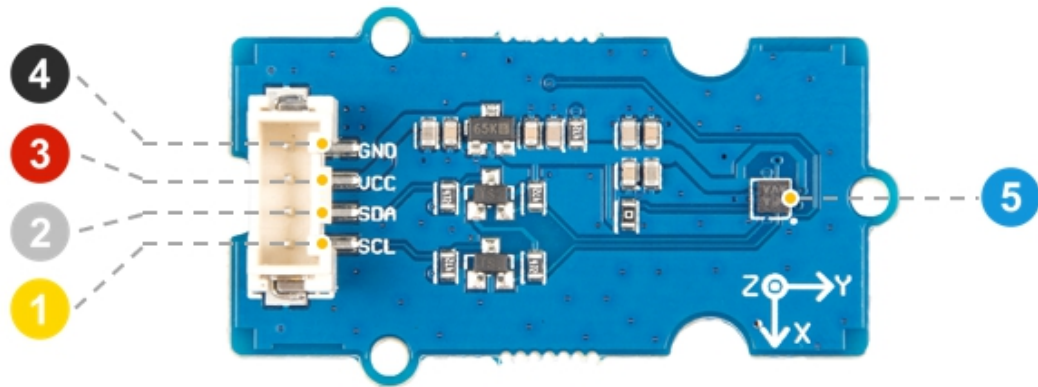
④ GND: connect this module to the system GND

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

② SDA: I²C serial data

① SCL: I²C serial clock

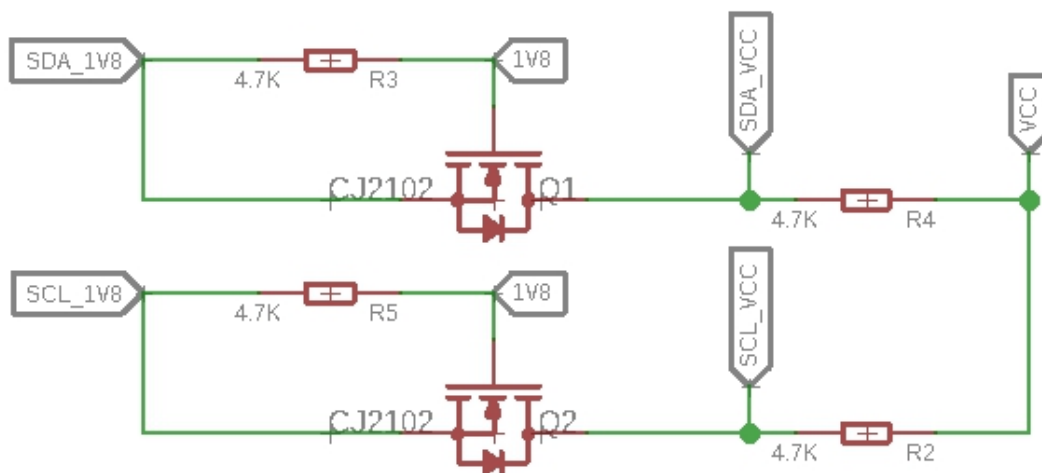⑤ The BMA400 module

0 x 14 Optional

0 x 15 Default

Schemaitc

Power

The typical voltage of BMA400 is 1.8V, so we use the XC6206P182MR chip to provide a stable 1.8V. The input of XC6206P33 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 I^2^C bus. The I^{2}C bus of this sensor use 1.8V, if the I^{2}C bus of the Arduino use 5V or 3.3v, 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

Arduino	Raspberry Pi	BeagleBone	Wio	LinkIt ONE

!!!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.

Getting Started

Play With Arduino

Hardware

Materials required

Seeeduino V4.2	Base Shield	Grove BMA400

!!!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 - 3-Axis Digital Accelerometer ±16g Ultra-low Power (BMA400) to port **I^2^C** of Grove-Base Shield.

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

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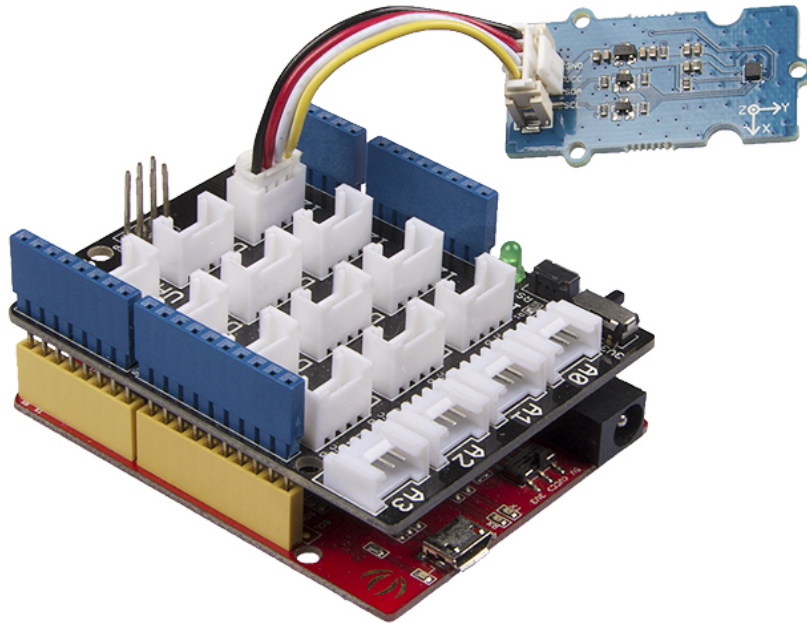
!!!Note If we don't have Grove Base Shield, We also can directly connect this module to Seeeduino as below.

Seeeduino	Grove Cable	Grove BMA400
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 Arduino before the start.

- **Step 1.** Download the Seeed_BMA400 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：

    1. Open it directly in the Arduino IDE via the path: **File --> Examples --> Grove 3-Axis Digital Accelerometer ±16g Ultra-low Power(BMA400) --> BMA400_Example**.
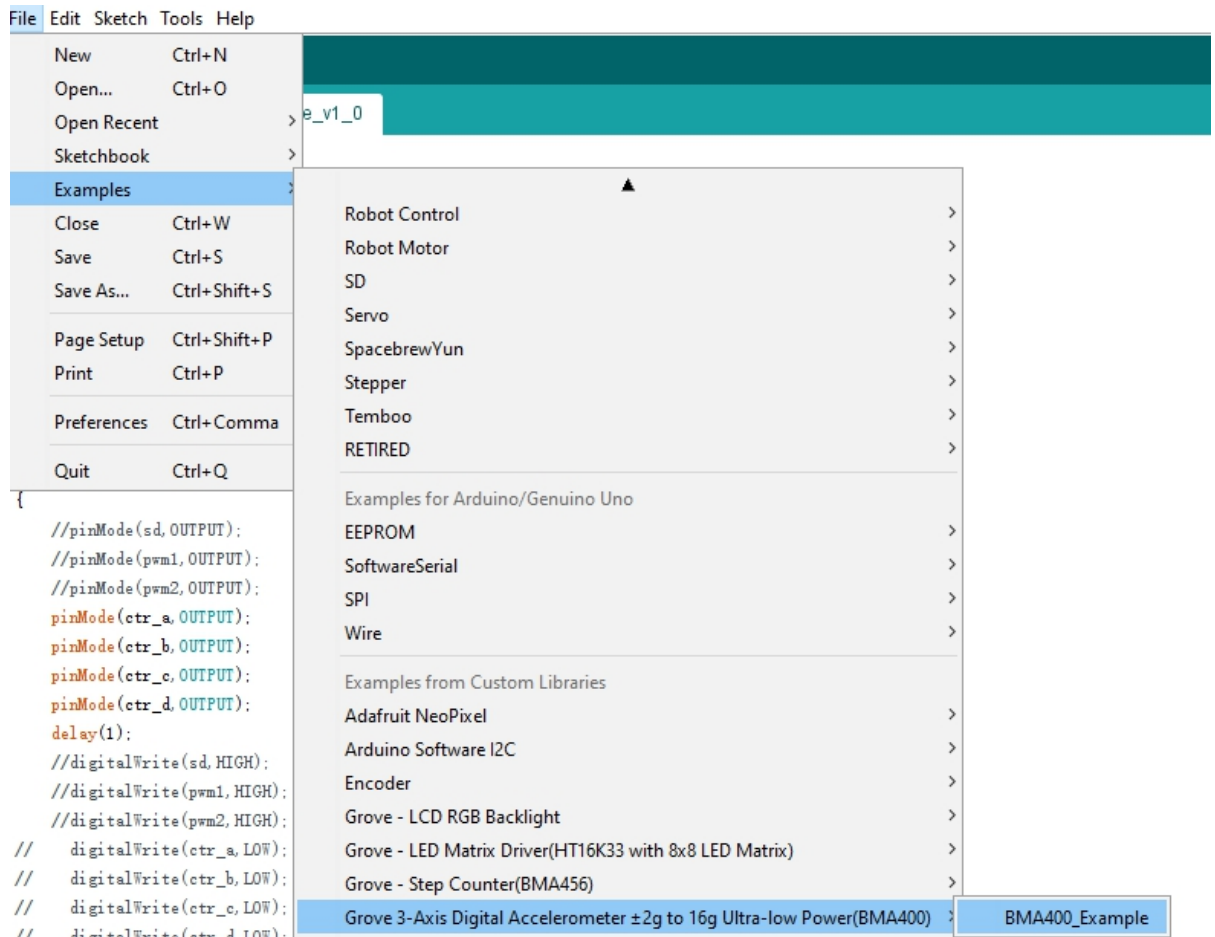
2. Open it in your computer by click the **BMA400_Example.ino** which you can find in the folder **XXXX\Arduino\libraries\Grove_3Axis_Digital_Accelerometer_BMA400-master\examples\BMA400_Example**, **XXXX** is the location you installed the Arduino IDE.
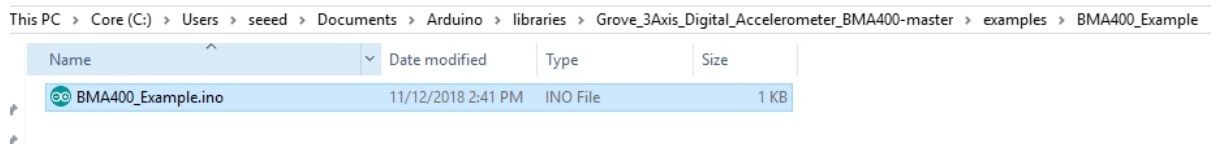
3. Or, you can just click the icon in upper right corner of the code block to copy the following code into a new sketch in the Arduino IDE.

```cpp
#include "BMA400.h"

float x = 0, y = 0, z = 0;
int16_t temp = 0;

void setup(void)
{
    Wire.begin();

    Serial.begin(115200);
    while(!Serial);
    Serial.println("BMA400 Raw Data");

    while(1)
```

```
        {
            if(bma400.isConnection())
            {
                bma400.initialize();
                Serial.println("BMA400 is connected");
                break;
            }
            else Serial.println("BMA400 is not connected");

            delay(2000);
        }
    }

    void loop(void)
    {
        bma400.getAcceleration(&x, &y, &z);
        temp = bma400.getTemperature();

        Serial.print(x);
        Serial.print(",");
        Serial.print(y);
        Serial.print(",");
        Serial.print(z);
        Serial.print(",");

        Serial.print(temp);

        Serial.println();

        delay(50);
    }
```

!!!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, it may show as below:

```
BMA400 Raw Data
BMA400 is connected
85.94,357.42,916.02,23
-148.44,222.66,464.84,23
-626.95,320.31,1109.38,23
-500.00,-111.33,144.53,23
-398.44,-232.42,433.59,23
```

```
-783.20,-255.86,638.67,23
-1453.13,-552.73,822.27,23
```

The raw data format:

X-axis/unit mg; Y-axis/unit mg; Z-axis/unit mg; temperature/unit ℃

Resources

- **[Zip]** Grove - 3-Axis Digital Accelerometer ±16g Ultra-low Power (BMA400) Eagle Files

- **[Zip]** Seeed BMA400 Library

- **[PDF]** Datasheet BMA400

- **[PDF]** XC6206 DATASHEET

Tech Support

Please do not hesitate to submit the issue into our forum