

[https://www.dfrobot.com/product-](https://www.dfrobot.com/product-1716.html)

[1716.html](https://www.dfrobot.com/product-1716.html)).

Introduction

The BMI160 6-axis inertial motion sensor is a new product from DFRobot. It is based on Bosch BMI160 6-axis MEMS sensor which integrates 16-bit 3-axis accelerometer with ultra-low-power 3-axis gyroscope. Bosch BMI160 is designed for smartphones, tablets, wearable devices. It has built-in intelligent step-counting algorithms that can be read directly through registers. Built-in 3-axis acceleration and 3-axis gyroscope can detect running, fitness and other motion. Built-in LDO power management chip, supports 3.2~6V wide voltage power supply, and also has I2C level conversion circuit, compatible with Arduino 3.3V and 5V micro controller.

Application Scenarios

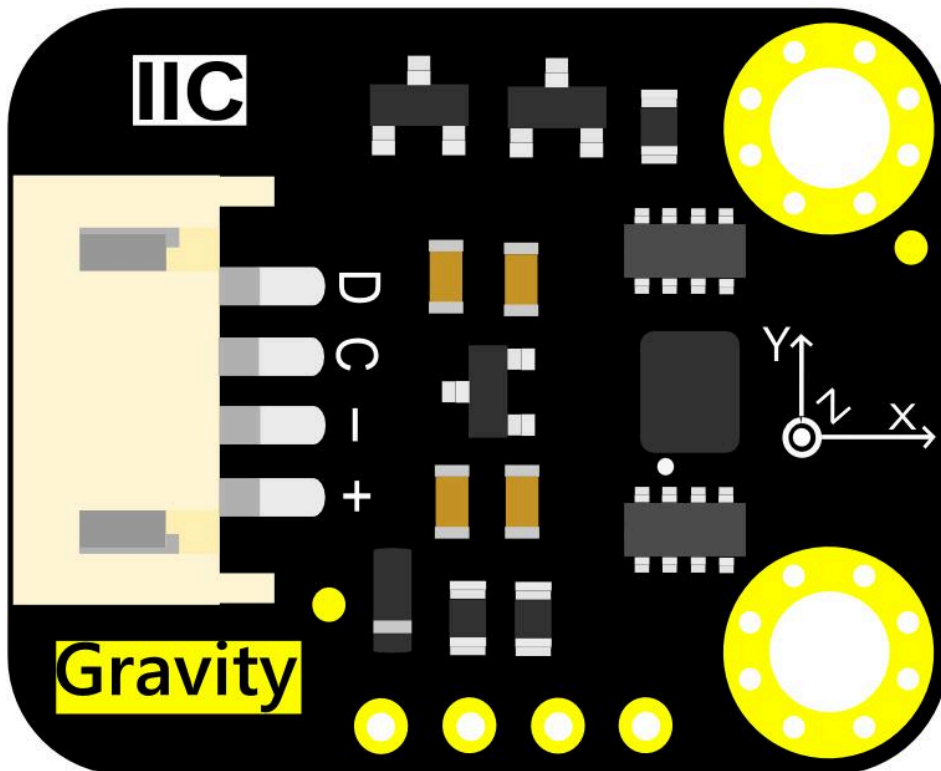
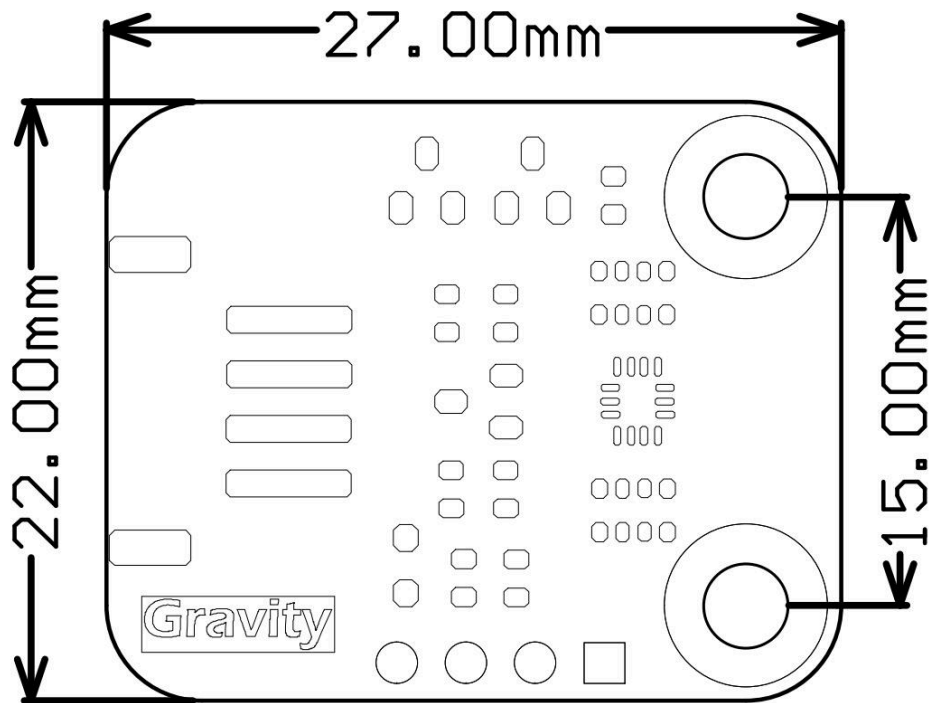
- Step Count
- Acceleration Detection

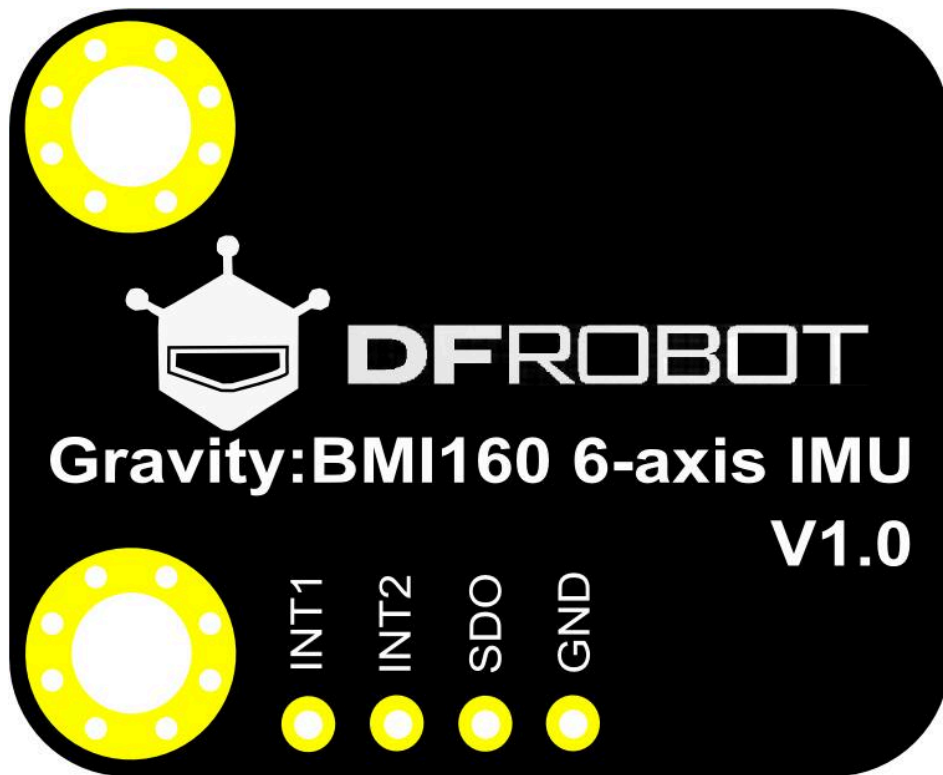
- Inclination Measurement
- Display Toggle Horizontal / Vertical Mode

Specifications

- Operating Voltage: 3.2V~6V
- Current Consumption: <1mA
- Interface: Gravity-IIC
- Acceleration Range: $\pm 2g/\pm 4g/\pm 8g/\pm 16g$
- Gyroscopes Range: $\pm 125^\circ/s, \pm 250^\circ/s, \pm 500^\circ/s, \pm 1000^\circ/s, \pm 2000^\circ/s$
- Acceleration Zero-g Offset: $\pm 40mg$
- Gyroscopes Zero-g Offset: $\pm 10^\circ/s$
- Programmable Frequency: 25/32Hz~1600Hz
- 6D Detection and Location
- 16-bit Data Output
- Shock Resistance: 1000gx 200us
- 2 Independent Programmable Interrupt Generators
- In-built 1024 Byte FIFO
- Working Temperature: $-40^\circ C \sim 85^\circ C$
- Dimension: 22X27mm/0.87x1.06 in

Appearance and Size Chart





Label	Name	Function
+	VCC	3.2~6V
-	GND	GND
C	SCL	I2C-SCL
D	SDA	I2C-SDA
INT1	INT1	Configurable interrupt output 1
INT2	INT2	Configurable interrupt output 2
SDO	SDO	Choose the address of I2C [GND: 0x68 VCC: 0x69 (Default)]

BMI160 6-Axis IMU Sensor Pin Description

Hardware

Hardware Preparation

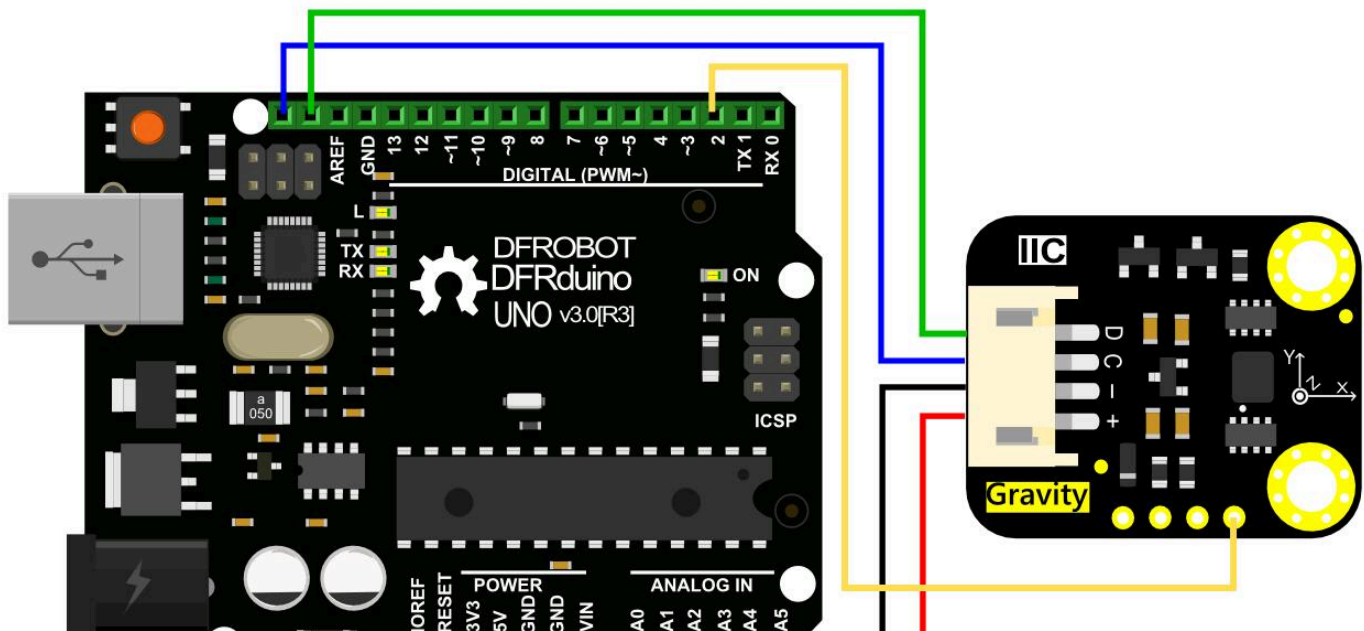
- 1 x BMI160 6-axis IMU
- 1 x Arduino Uno

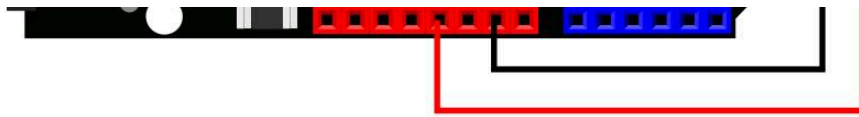
Hardware Connection

- Connect the BMI160 6-axis IMU to Arduino board by I2C (" "can connect "3V3" or "5V")
- Connect the INT1 or INT2 to the corresponding pins on the Arduino board, as shown in the following table

Arduino board	Corresponding Pins
Arduino UNO	D2
FireBeetle-ESP32	D13
FireBeetle-ESP8266	D13
FireBeetle-Board328P	D2
Leonardo	D3

Connection Diagram



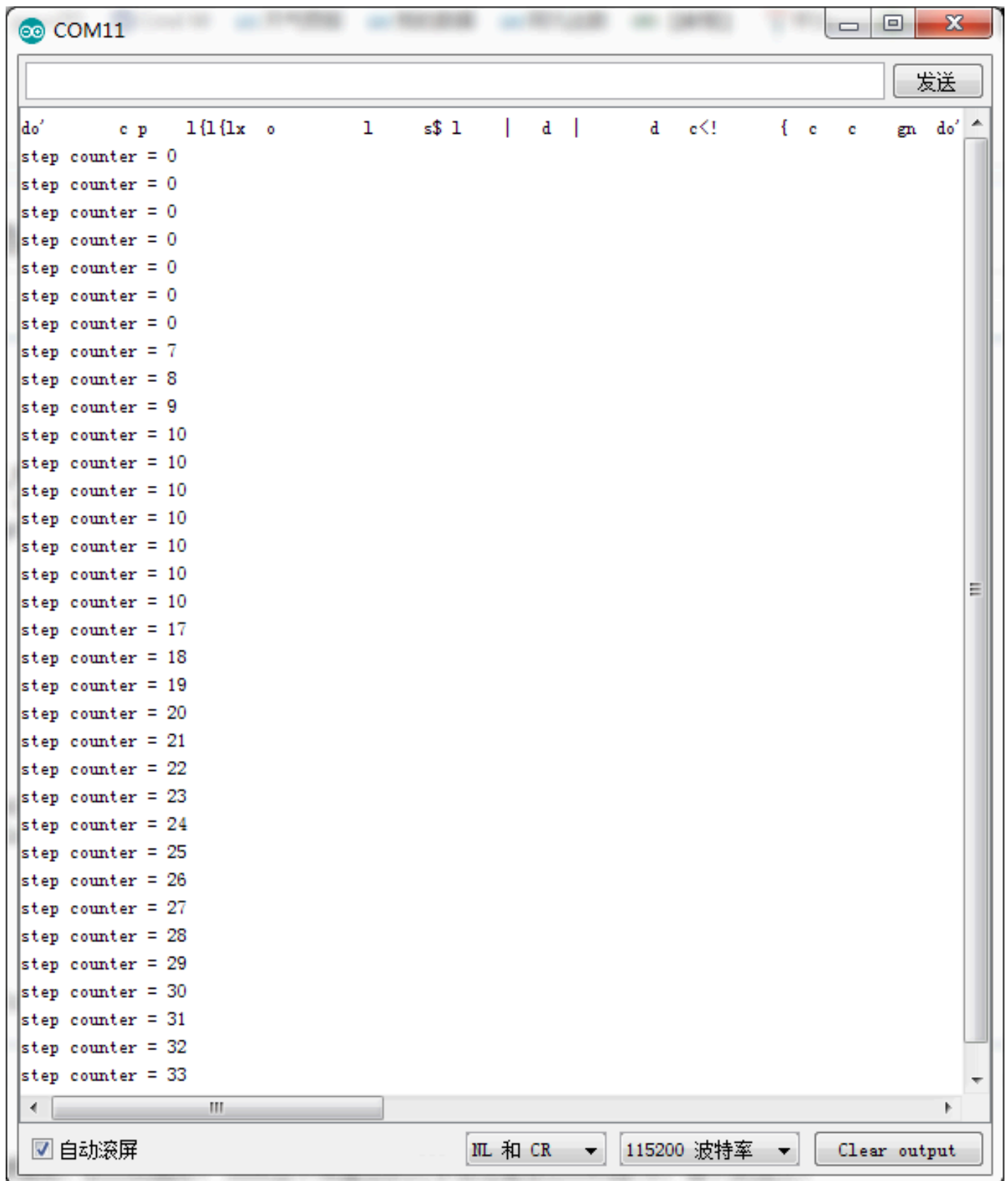


Examples

- Click to download **Arduino IDE** (<https://www.arduino.cc/en/software>)
- **DFRobot_BMI160 library (GitHub)**
(https://github.com/DFRobot/DFRobot_BMI160)

Step Count

Note: I2C has two addresses: 0x69 (Default, Vacant); 0x68 (Connect SDO to GND).



```
do'      c p  l{l{l x o      l      s$ l      | d |      d c<!      { c c      gn do' ^
step counter = 0
step counter = 0
step counter = 0
step counter = 0
step counter = 0
step counter = 0
step counter = 0
step counter = 0
step counter = 7
step counter = 8
step counter = 9
step counter = 10
step counter = 10
step counter = 10
step counter = 10
step counter = 10
step counter = 10
step counter = 10
step counter = 10
step counter = 10
step counter = 17
step counter = 18
step counter = 19
step counter = 20
step counter = 21
step counter = 22
step counter = 23
step counter = 24
step counter = 25
step counter = 26
step counter = 27
step counter = 28
step counter = 29
step counter = 30
step counter = 31
step counter = 32
step counter = 33
```

自动滚屏 ML 和 CR 115200 波特率 Clear output

- Tip: The pedometer algorithm does not recognize steps until after seven

consecutive steps, and then if you stop walking at a certain time for too long, the counter will reset, it also applies to INT1, INT2.

- o Note: At some point there is a discrepancy between the number of steps and the actual number of steps, due to the problem of the BMI chip itself."

```
#include <DFRobot_BMI160.h>

DFRobot_BMI160 bmi160;
const int8_t i2c_addr = 0x69;
bool readStep = false;

#if defined ARDUINO_AVR_UNO || defined ARDUINO_AVR_MEGA2560 || defined ARDUINO_AVR_LEONARDO
  //interrupt number of uno and mega2560 is 0
  int pbIn = 2;
#elif ARDUINO_AVR_LEONARDO
  //interrupt number of uno and leonardo is 0
  int pbIn = 3;
#else
  int pbIn = 13;
#endif
/*the bmi160 have two interrput interfaces*/
int int1 = 1;
int int2 = 2;

void stepChange()
{
  //once the step conter is changed, the value can be read
  readStep = true;
}

void setup(){
  Serial.begin(115200);
  delay(100);

  //set and init the bmi160 i2c address
  while (bmi160.I2cInit(i2c_addr) != BMI160_OK){
    Serial.println("i2c init fail");
    delay(1000);
  }

  //set interrput number to int1 or int2
```



```
if (bmi160.setInt(int1) != BMI160_OK){
  Serial.println("set interrupt fail");
  while(1);
}

//set the bmi160 mode to step counter
if (bmi160.setStepCounter() != BMI160_OK){
  Serial.println("set step fail");
  while(1);
}
#if defined ARDUINO_AVR_UNO || defined ARDUINO_AVR_MEGA2560 || defined ARDUINO_MEGA2560
//set the pin in the board to connect to int1 or int2 of bmi160
attachInterrupt(digitalPinToInterrupt(pbIn), stepChange, FALLING);
#else
  attachInterrupt(pbIn, stepChange, FALLING);
#endif
}

void loop(){
  if (readStep){
    uint16_t stepCounter = 0;
    //read step counter from hardware bmi160
    if (bmi160.readStepCounter(&stepCounter)==BMI160_OK){
      Serial.print("step counter = ");Serial.println(stepCounter);
    }
    readStep = false;
  }
}
```

Acceleration Gyroscope

COM11

发送

-80.66	36.09	7.41	-0.53	-0.80	-0.77
-77.14	21.70	12.02	-0.54	-0.56	-0.43
-103.78	23.18	6.19	-0.53	-0.35	-0.53
-73.13	18.12	2.42	-0.59	-0.47	-0.50
-50.17	16.69	10.34	-0.53	-0.47	-0.61
-29.74	16.45	4.94	-0.47	-0.23	-0.78
-17.64	11.93	5.76	-0.54	-0.35	-0.81
-5.15	3.47	15.47	-0.56	-0.45	-0.86
14.67	2.90	14.55	-0.50	-0.35	-0.71
38.76	-1.90	13.61	-0.56	-0.42	-0.74
67.30	-2.20	12.25	-0.58	-0.44	-0.69
81.33	-1.87	10.50	-0.55	-0.56	-0.85
103.06	-9.52	13.17	-0.49	-0.49	-0.76
148.91	-26.25	17.71	-0.54	-0.62	-0.88
311.87	-35.67	32.66	-0.66	-0.88	-0.25
375.21	-25.15	46.93	-0.58	-0.70	0.13
538.00	-54.64	73.13	-0.32	-0.65	-0.50
571.60	-5.15	236.56	-0.57	2.00	0.63
35.05	97.74	-28.14	-0.39	-0.64	0.87
52.16	4.03	13.62	-0.47	0.30	0.09
36.30	27.61	-6.23	-0.60	0.71	0.33
35.38	3.44	2.42	-0.61	0.47	0.19
9.66	14.08	18.32	-0.62	0.30	0.28
-15.51	18.46	32.83	-0.49	0.64	0.09
-25.05	9.61	51.83	-0.39	0.86	0.00
-31.89	9.23	47.01	-0.38	1.19	0.31
-45.02	4.40	47.78	-0.24	0.58	0.04
-56.05	10.73	65.21	-0.27	1.17	0.91
-66.41	22.83	47.12	-0.10	0.86	-0.05
-71.63	24.63	45.91	-0.18	1.03	0.83
-60.34	-12.86	55.93	-0.04	0.77	0.15
-78.22	46.47	34.98	0.00	0.90	0.89

自动滚屏

NL 和 CR

115200 波特率

Clear output

- Fig2: Gravity: BMI160 6-axis IMU Acceleration Gyroscope
- Tip: The first three columns are the data of the gyroscope in the direction of the X, Y, and Z axis, and the last three are the data of the acceleration in the direction of the X, Y, and Z axis.

```
#include "DFRobot_BMI160.h"

DFRobot_BMI160 bmi160;
const int8_t i2c_addr = 0x69;
void setup(){
  Serial.begin(115200);
  delay(100);

  //init the hardware bmin160
  if (bmi160.softReset() != BMI160_OK){
    Serial.println("reset false");
    while(1);
  }

  //set and init the bmi160 i2c address
  if (bmi160.I2cInit(i2c_addr) != BMI160_OK){
    Serial.println("init false");
    while(1);
  }
}

void loop(){
  int i = 0;
  int rslt;
  int16_t accelGyro[6]={0};

  //get both accel and gyro data from bmi160
  //parameter accelGyro is the pointer to store the data
  rslt = bmi160.getAccelGyroData(accelGyro);
  if(rslt == 0){
    for(i=0;i<6;i ){
      if (i<3){
        //the first three are gyro datas
        Serial.print(accelGyro[i]*3.14/180.0);Serial.print("\t");
      }else{
        //the following three data are accel datas
```

```
Serial.print(accelGyro[i]/16384.0);Serial.print("\t");
    }
}
Serial.println();
}else{
    Serial.println("err");
}
}
```

FAQ

For any questions, advice or cool ideas to share, please visit the **DFRobot Forum** (<https://www.dfrobot.com/forum/>).

More Documents

- Schematic & Layout
(https://github.com/ArduinoLibrary/DFRobot_Gravity_BMI160_6_Axis_Inertial_Motion_Sensor/raw/master/Gravity%20BMI160%206-axis%20IMU%20Schematic.pdf)
- Datasheet
(https://github.com/ArduinoLibrary/DFRobot_Gravity_BMI160_6_Axis_Inertial_Motion_Sensor/raw/master/BMI160-DataSheet.pdf)

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