Gravity: BMI160 6-Axis Inertial Motion Sensor SKU: SEN0250

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.

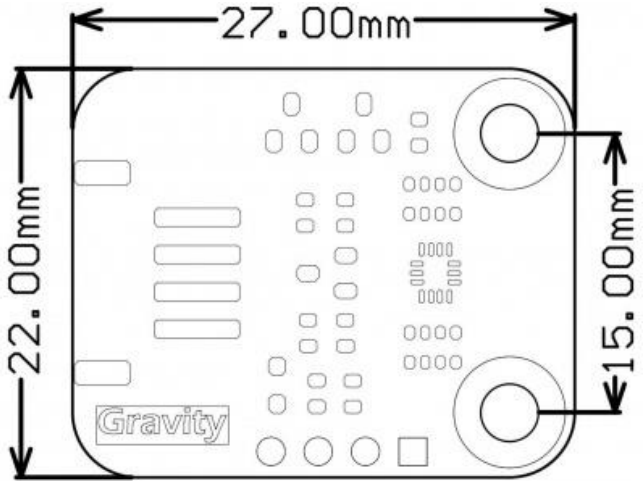
Application Scenarios

- Step Count
- Acceleration Detection
- Inclination Measurement
- Display Toggle Horizontal / Vertical Mode

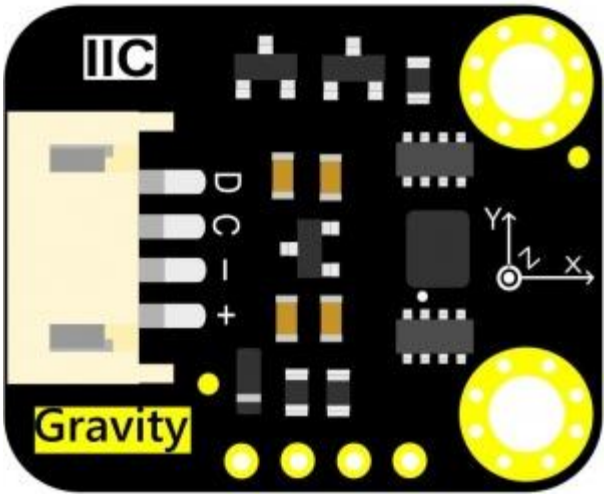
Specifications

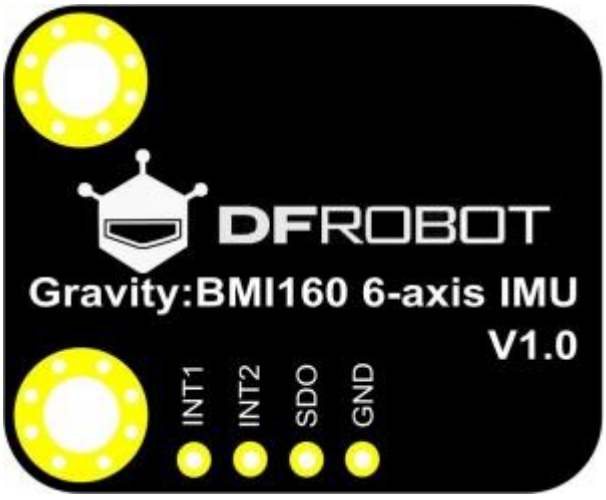
- Operating Voltage: 3.2V~6V
- Current Consumption: <1mA
- Interface: Gravity-IIC
- Acceleration Range: ±2g/±4g/±8g/±16g
- Gyroscopes Range: ±125°/s,±250°/s,±500°/s,±1000°/s,±2000°/s
- Acceleration Zero-g Offset: ±40mg
- Gyroscopes Zero-g Offset: ±10°/s
- Programmable Frequency: 25/32Hz~1600Hz
- 6D Detection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

Appearance and Size Chart



BMI160 6-axis IMU Size Chart





BMI160 6-Axis IMU Sensor Pin Description

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)]

Hardware

Hardware Preparation

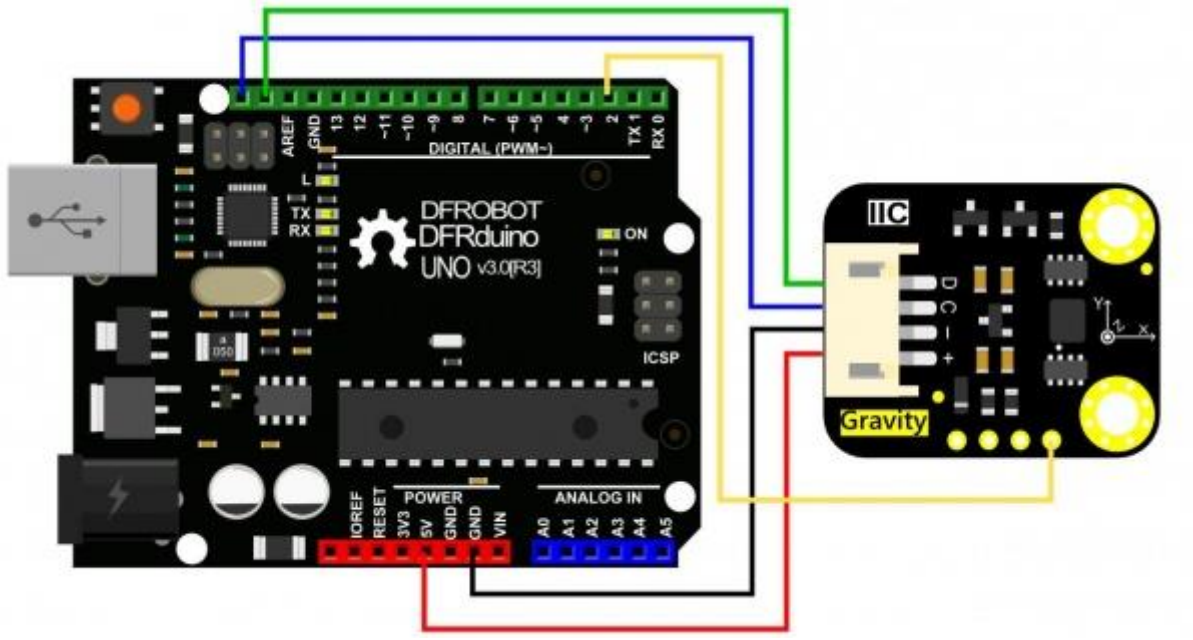
- 1 x BMI160 6-axis IMU
- 1 x Arduino Uno

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



Arduino UNO-BMI160 6-Axis IMU Sensor

Examples

- Click to download Arduino IDE
- DFRobot_BMI160 library (GitHub)

Step Count

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

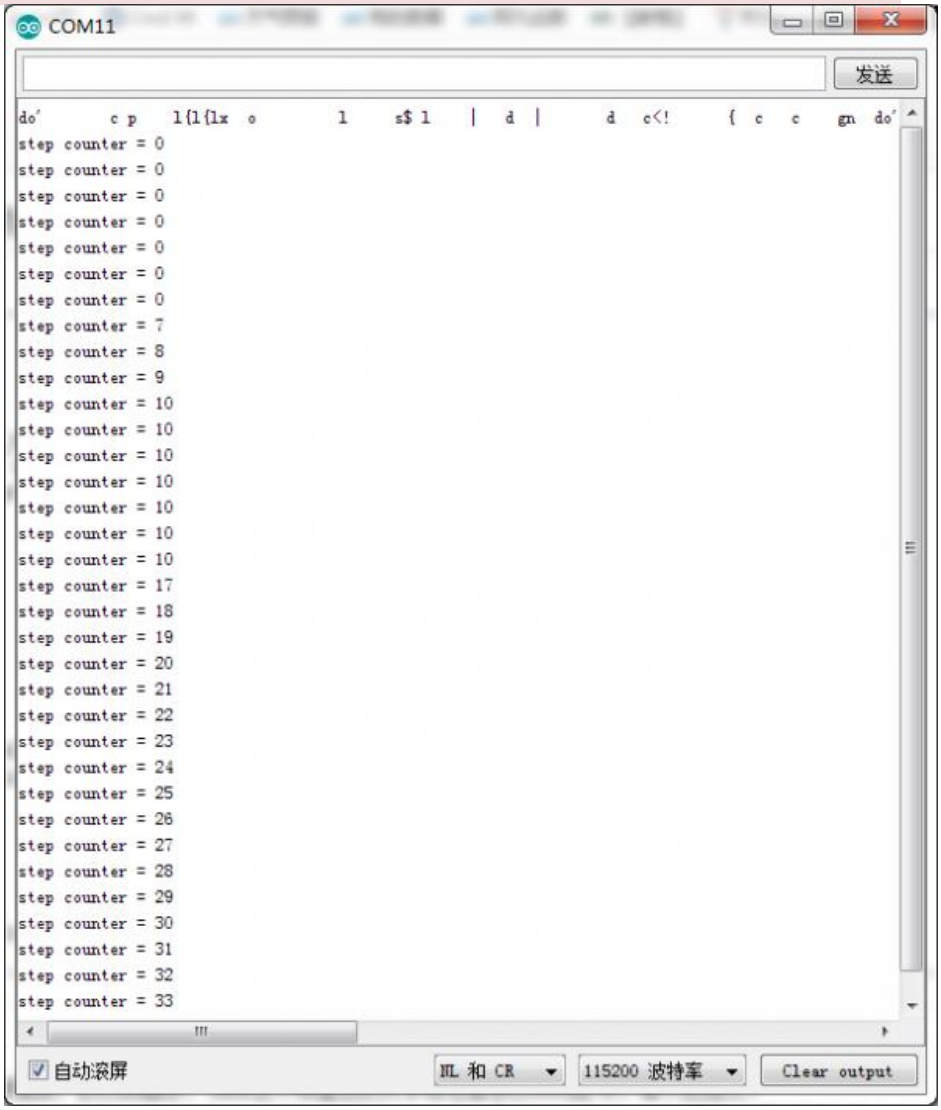


Fig1:Gravity:BMI160 6-axis IMU pedometer

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 is also applies to INT1, INT2.

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 ARDUIN
O_AVR_PRO
  //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 interrput 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 ARDUIN
O_AVR_LEONARDO || defined ARDUINO_AVR_PRO
  //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

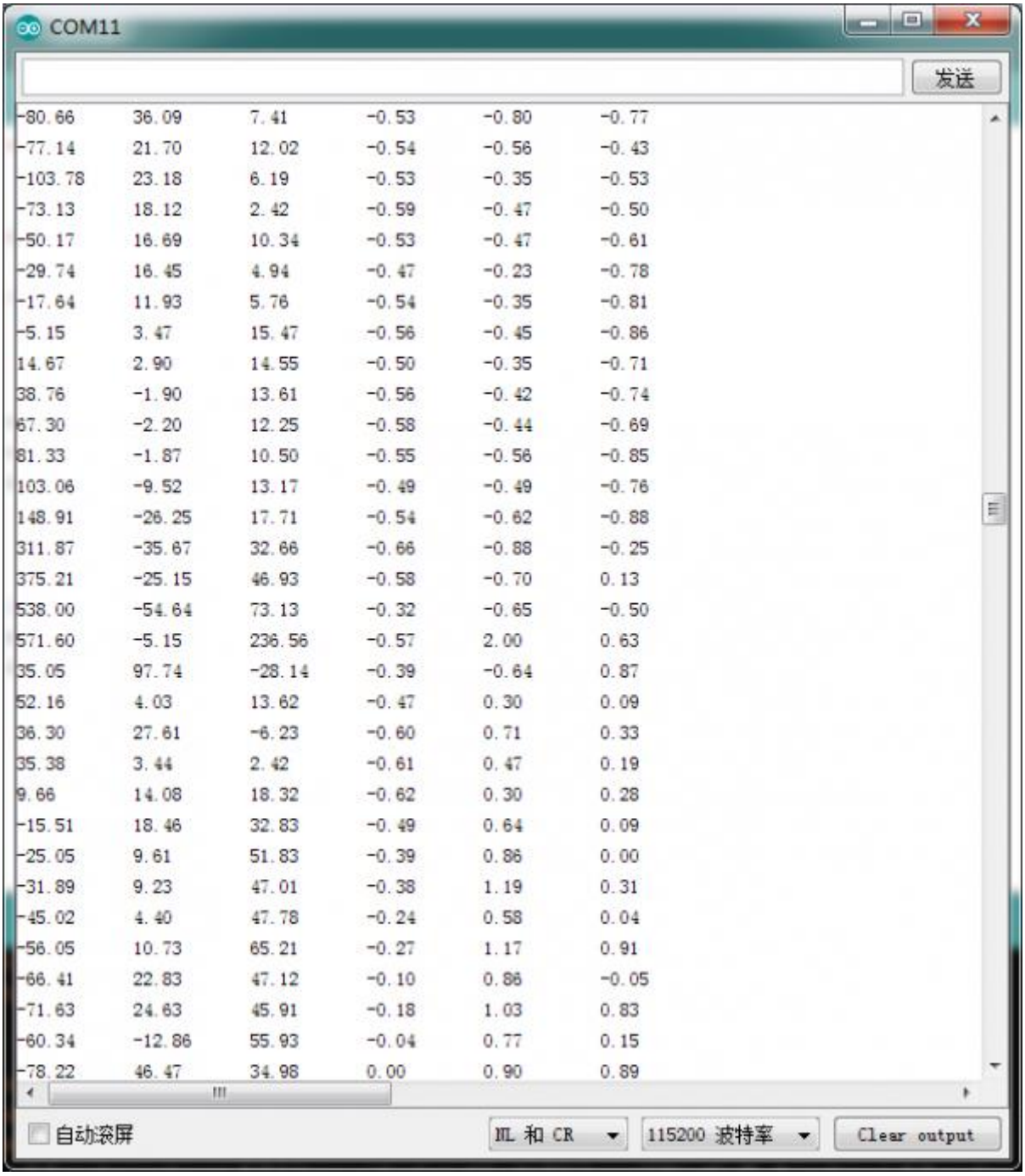


Fig2:Gravity:BMI160 6-axis IMU Acceleration Gyroscope

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");
  }
}
```

More Documents

- Schematic & Layout
- Datasheet