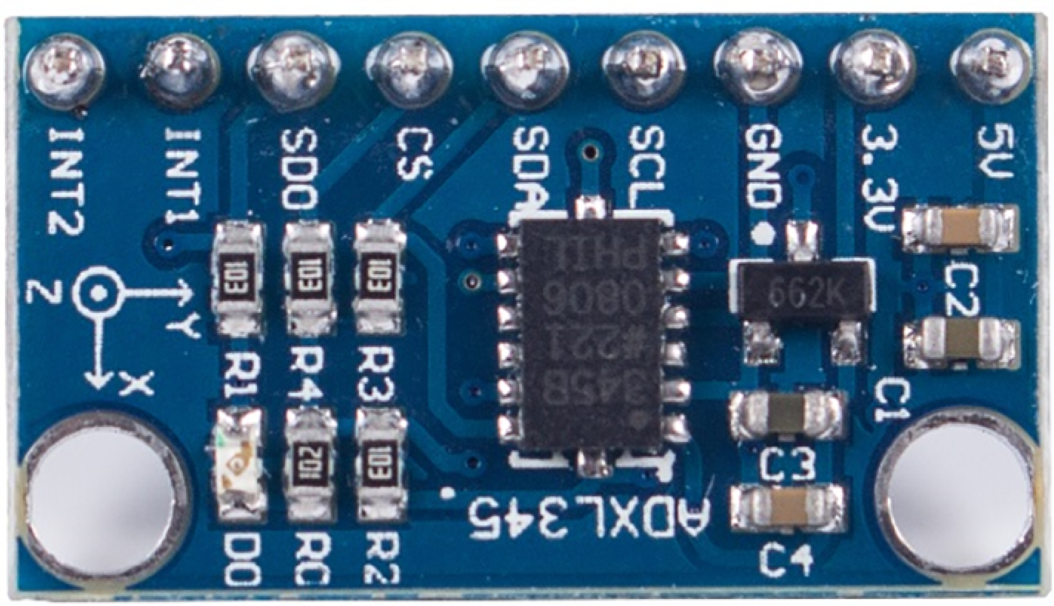
Digital Accelerometer ADXL345 Module

From Wiki

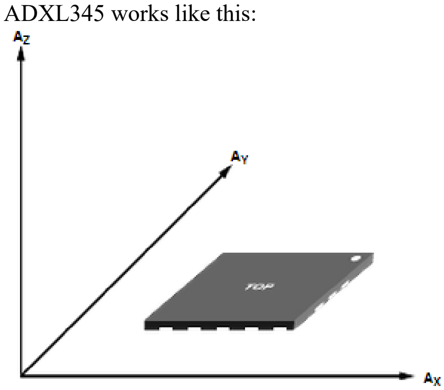
Contents

- 1 **Introduction**
- 2 **Features**
- 3 **Schematic**
- 4 **Test**
  - 4.1 **To use the ADXL345 with Arduino, you can take the following steps.**
- 5 **Resource**

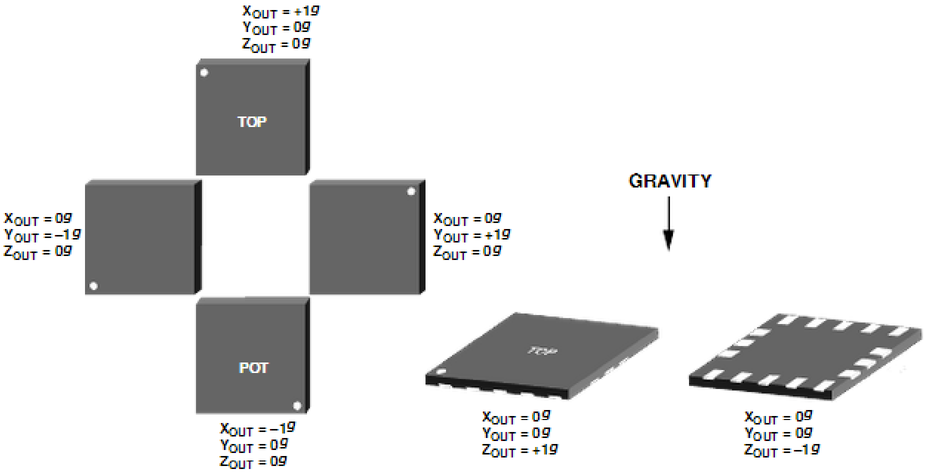
Introduction



The ADXL345 is a small, thin, low power, 3-axis accelerometer with high resolution (13-bit) measurement at up to ±16 g. Digital output data is formatted as 16-bit two's complement and is accessible through either an SPI (3- or 4-wire) or I2C digital interface.
The ADXL345 is well suited to measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock. Its high resolution (4 mg/LSB) enables the inclination change measurement by less than 1.0°. And the excellent sensitivity (3.9mg/LSB @2g) provides a high-precision output of up to ±16g.
In this experiment, I2C digital interface is used.
See the following figure for the schematic diagram. There is a 3.3v voltage regulator chip in the circuit, so you can power the module with 5V or 3.3V.
ADXL345 works like this:



When you place the module face up, Z_OUT is at the maximum which is +1g; face down, Z_OUT is at the minimum. No matter of face, as long as it's placed on a level surface, X_OUT increases along the Ax axis direction, so does Y_OUT along the Ay axis. See the picture below. Thus, when you rotate the module, you can see the changes of X_OUT, Y_OUT, and Z_OUT.



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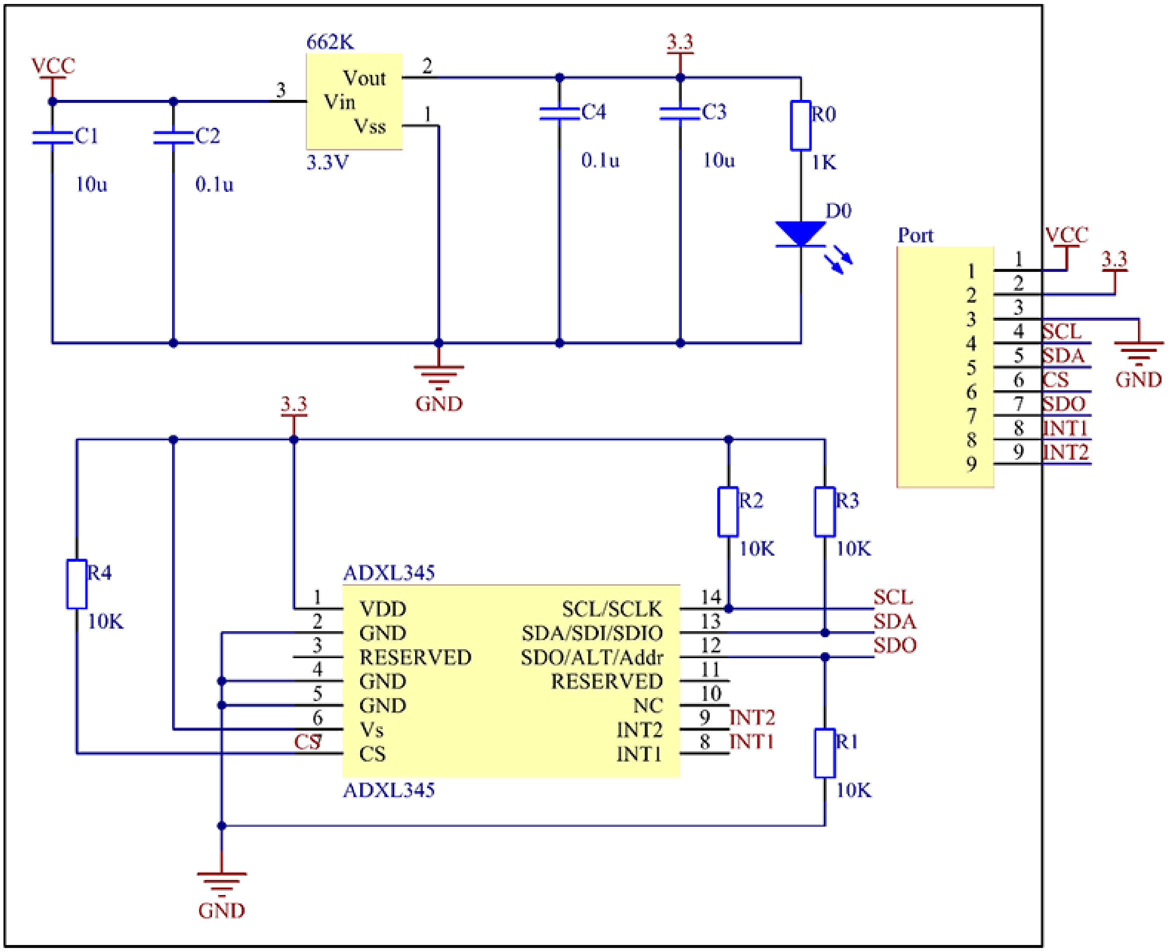
Features

Ultra low power: 25 to 130 µA at VS = 2.5 V (typ)
Power consumption scales automatically with bandwidth
User selectable fixed 10-bit resolution or 4mg/LSB scale
factor in all g-ranges, up to 13-bit resolution at ±16 g
32 level output data FIFO minimizes host processor load
Built in motion detection functions
• Tap/Double Tap detection
• Activity/Inactivity monitoring
• Free-Fall detection
Supply and I/O voltage range: 1.8 V to 3.6 V
SPI (3 and 4 wire) and I2C digital interfaces
Flexible interrupt modes – Any interrupt mappable to either
interrupt pin
Measurement ranges selectable via serial command
Bandwidth selectable via serial command
Wide temperature range (-40 to +85°C)
10,000 g shock survival
Pb free/RoHS compliant
Small and thin: 3 × 5 × 1 mm LGA package</p>

Schematic



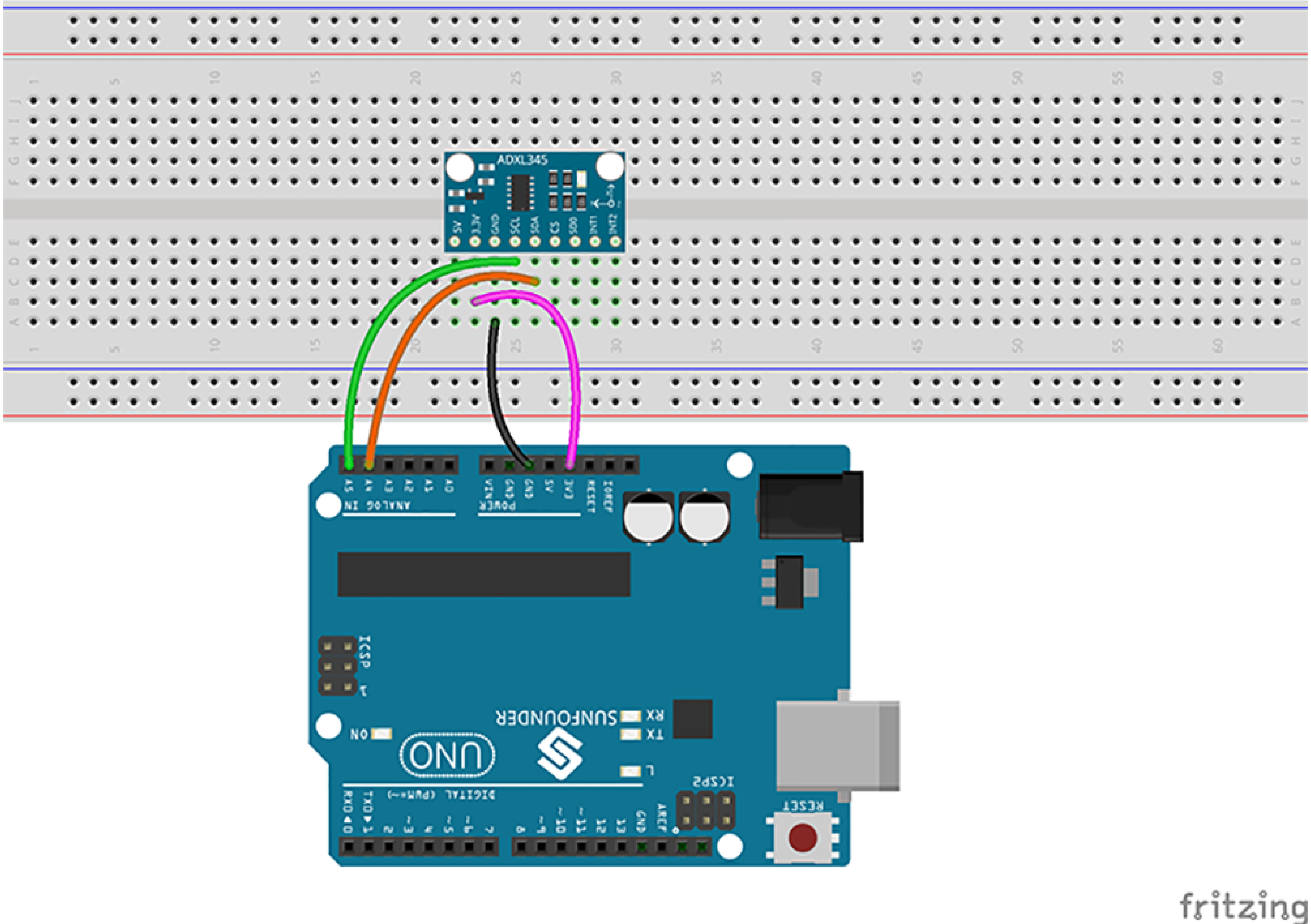
Test

To use the ADXL345 with Arduino, you can take the following steps.

Step1: Connecting circuit It can share the I2C bus with other I2C devices as long as each device has a unique address. Only 4 connections are required for I2C communication.

ADXL345 ------- Arduino Uno/Mega2560

GND --------- GND
3.3V ------- 3.3V
SCL ------- A5 Uno/pin21 Mega2560
SDA ------- A4 Uno/pin20 Mega2560



Step2: Upload the code

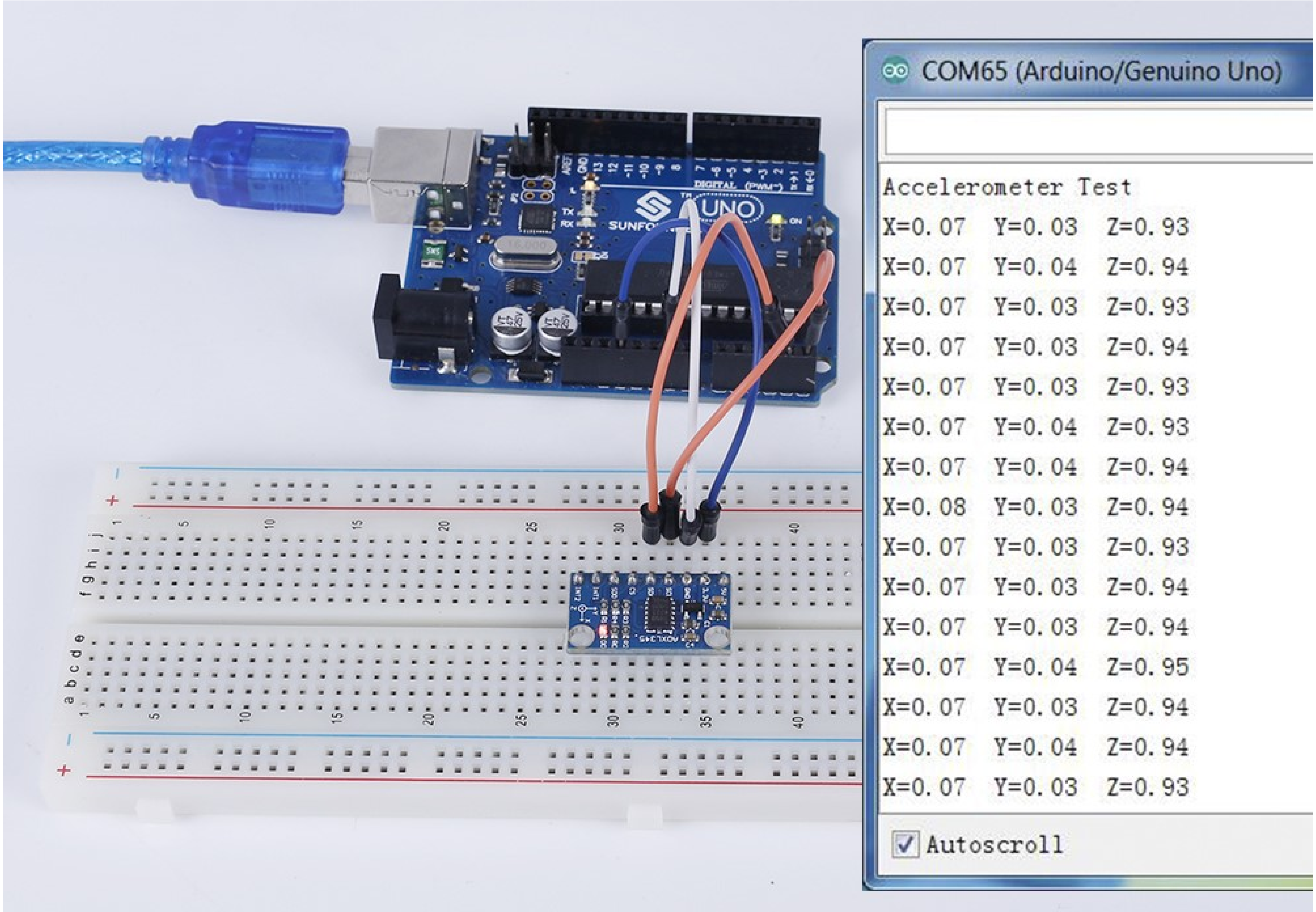
```
#include <Wire.h>
#define Register_ID 0
#define Register_2D 0x2D
#define Register_X0 0x32
#define Register_X1 0x33
#define Register_Y0 0x34
#define Register_Y1 0x35
#define Register_Z0 0x36
#define Register_Z1 0x37
int ADXAddress = 0x53;  //I2C address
int reading = 0;
int val = 0;
int X0,X1,X_out;
int Y0,Y1,Y_out;
int Z1,Z0,Z_out;
double Xg,Yg,Zg;

void setup()
{
  Serial.begin(9600);
  delay(100);
  Wire.begin();
  delay(100);
  Wire.beginTransmission(ADXAddress);
  Wire.write(Register_2D);
  Wire.write(8);
  Wire.endTransmission();
  Serial.println("Accelerometer Test ");
}
void loop()
{
  Wire.beginTransmission(ADXAddress);
  Wire.write(Register_X0);
  Wire.write(Register_X1);
  Wire.endTransmission();
  Wire.requestFrom(ADXAddress,2);
  if(Wire.available()<=2);
  {
    X0 = Wire.read();
    X1 = Wire.read();
    X1 = X1<<8;
    X_out = X0+X1;
  }
```

```
  Wire.beginTransmission(ADXAddress);
  Wire.write(Register_Y0);
  Wire.write(Register_Y1);
  Wire.endTransmission();
  Wire.requestFrom(ADXAddress,2);
  if(Wire.available()<=2);
  {
    Y0 = Wire.read();
    Y1 = Wire.read();
    Y1 = Y1<<8;
    Y_out = Y0+Y1;
  }
  Wire.beginTransmission(ADXAddress);
  Wire.write(Register_Z0);
  Wire.write(Register_Z1);
  Wire.endTransmission();
  Wire.requestFrom(ADXAddress,2);
  if(Wire.available()<=2);
  {
    Z0 = Wire.read();
    Z1 = Wire.read();
    Z1 = Z1<<8;
    Z_out = Z0+Z1;
  }
  Xg = X_out/256.00;
  Yg = Y_out/256.00;
  Zg = Z_out/256.00;
  Serial.print("X=");
  Serial.print(Xg);
  Serial.print("\tY=");
  Serial.print(Yg);
  Serial.print("\tZ=");
  Serial.println(Zg);
  delay(300);
}
```

Step3: Select correct Board and Port

Step4: Upload the sketch to the SunFounder Uno board

```
  After uploading, open Serial Monitor, where you can see the data detected. When the acceleration of the module changes, the figure will change accordingly on the windo
```



Resource

ADXL345datasheet (http://wiki.sunfounder.cc/images/4/45/ADXL345datasheet.pdf)

Test Experiment for Raspberry Pi (https://www.sunfounder.com/learn/Super_Kit_V3_0_for_Raspberry_Pi/lesson-17-adxl345-super-kit-v3-0-for-raspberry-pi.html)