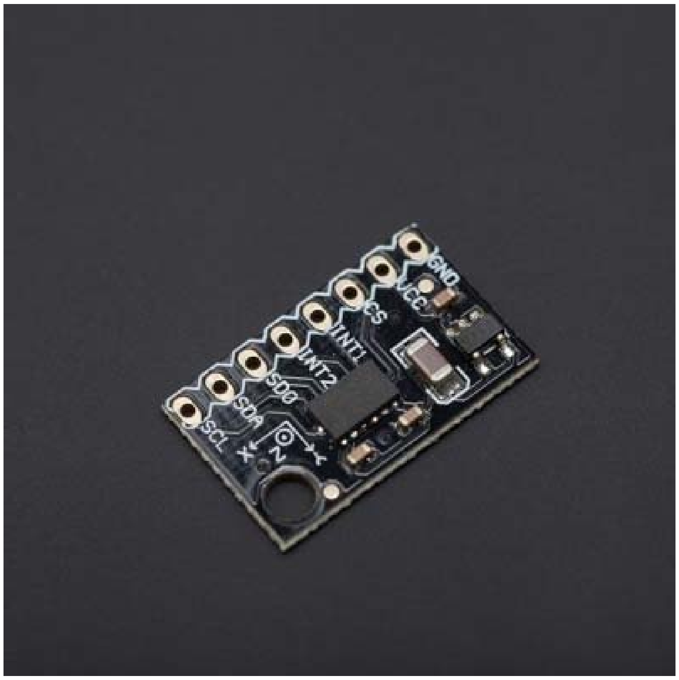
Triple Axis Accelerometer Breakout - ADXL345 (SKU:SEN0032)



Contents

Introduction

Breakout board for the Analog Device ADXL345. 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 twos complement and is accessible through either a SPI (3- or 4-wire) or I2C digital interface. The ADXL345 is well suited to measures 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 measurement of inclination changes less than 1.0°.

Several special sensing functions are provided. Activity and inactivity sensing detect the presence or lack of motion and if the acceleration on any axis exceeds a user-set level. Tap sensing detects single and double taps. Free-fall sensing detects if the device is falling. These functions can be mapped to one of two interrupt output pins. An integrated, patent pending 32-level first in, first out (FIFO) buffer can be used to store data to minimize host processor intervention. Low power modes enable intelligent motion-based power management with threshold sensing and active acceleration measurement at extremely low power dissipation.

Specification

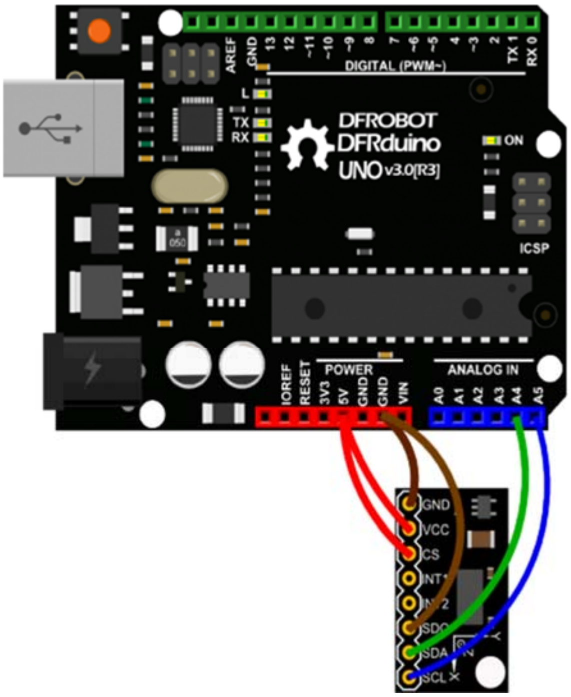
- Working voltage: 3.3~6V
- Current consumption @2.5v: 40uA / working mode, 0.1uA / standby mode
- Communication interface: I2C / SPI (3 or4 lines)
- Size: 20x15mm

Application

- Tap/Double Tap Detection
- Free-Fall Detection
- Selecting Portrait and Landscape Modes
- Tilt sensing

Connection Diagram

This diagram is an IIC connection method suitable with Arduino UNO. It would be differen if you use other Arduino Controllers which the SCL & SDA pin might be different. And if you want to use SPI interface, please refer to ADXL345 datasheet for more info.



Connection Diagram

Sample Code

Upload the sample sketch bellow to UNO or your board to check the 3-axis acceleration data and the module's tilt information.

```
#include <Wire.h>

#define DEVICE (0x53)      //ADXL345 device address
#define TO_READ (6)        //num of bytes we are going to read each time (two bytes for each axis)

byte buff[TO_READ] ;        //6 bytes buffer for saving data read from the device
char str[512];              //string buffer to transform data before sending it to the serial port
int regAddress = 0x32;      //first axis-acceleration-data register on the ADXL345
int x, y, z;                                    //three axis acceleration data
double roll = 0.00, pitch = 0.00;               //Roll & Pitch are the angles which rotate by the axis X and
y
//in the sequence of R(x-y-z),more info visit
// https://www.dfrobot.com/wiki/index.php?title=How_to_Use_a_Three-Axis_Accelerometer_for_Tilt_Sensing#Introd
uction

void setup() {
  Wire.begin();         // join i2c bus (address optional for master)
  Serial.begin(9600);  // start serial for output

  //Turning on the ADXL345
  writeTo(DEVICE, 0x2D, 0);
  writeTo(DEVICE, 0x2D, 16);
  writeTo(DEVICE, 0x2D, 8);
}

void loop() {

  readFrom(DEVICE, regAddress, TO_READ, buff); //read the acceleration data from the ADXL345
                                              //each axis reading comes in 10 bit resolution, ie 2 bytes.  Le
ast Significat Byte first!!
                                              //thus we are converting both bytes in to one int
  x = (((int)buff[1]) << 8) | buff[0];
  y = (((int)buff[3])<< 8) | buff[2];
  z = (((int)buff[5]) << 8) | buff[4];

  //we send the x y z values as a string to the serial port
  Serial.print("The acceleration info of x, y, z are:");
  sprintf(str, "%d %d %d", x, y, z);
  Serial.print(str);
  Serial.write(10);
  //Roll & Pitch calculate
  RP_calculate();
  Serial.print("Roll:"); Serial.println( roll );
  Serial.print("Pitch:"); Serial.println( pitch );
  Serial.println("");
  //It appears that delay is needed in order not to clog the port
  delay(50);
}

//---------------- Functions
//Writes val to address register on device
void writeTo(int device, byte address, byte val) {
  Wire.beginTransmission(device); //start transmission to device
  Wire.write(address);        // send register address
  Wire.write(val);        // send value to write
  Wire.endTransmission(); //end transmission
}

//reads num bytes starting from address register on device in to buff array
void readFrom(int device, byte address, int num, byte buff[]) {
  Wire.beginTransmission(device); //start transmission to device
  Wire.write(address);        //sends address to read from
  Wire.endTransmission(); //end transmission

    Wire.beginTransmission(device); //start transmission to device
  Wire.requestFrom(device, num);    // request 6 bytes from device

  int i = 0;
  while(Wire.available())    //device may send less than requested (abnormal)
  {
    buff[i] = Wire.read(); // receive a byte
    i++;
  }
  Wire.endTransmission(); //end transmission
}

//calculate the Roll&Pitch
void RP_calculate(){
  double x_Buff = float(x);
  double y_Buff = float(y);
  double z_Buff = float(z);
  roll = atan2(y_Buff , z_Buff) * 57.3;
  pitch = atan2((- x_Buff) , sqrt(y_Buff * y_Buff + z_Buff * z_Buff)) * 57.3;
}
```

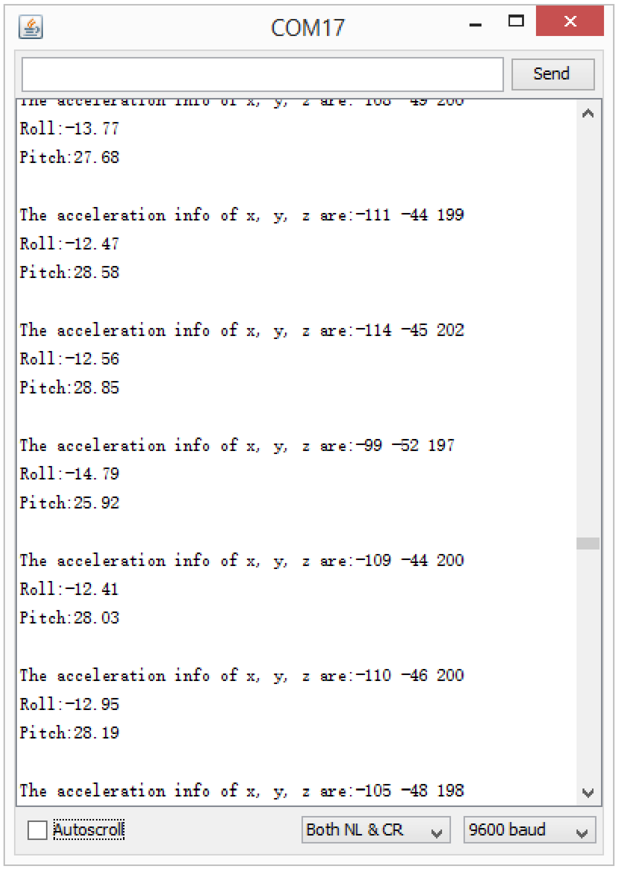
By the way, we have collected some useful 3-axis data processing methods: How to Use a Three-Axis Accelerometer for Tilt Sensing.

https://www.dfrobot.com/wiki/index.php/How_to_Use_a_Three-Axis_Accelerometer_for_Tilt_Sensing

Result

Open the Serial monitor to see the 3-axis acceleration data and Roll-Pitch angle. See changs as you sway the Accelerometer.

https://www.dfrobot.com/wiki/index.php/How_to_Use_a_ThreeAxis_Accelerometer_for_Tilt_Sensing



```
The acceleration info of x, y, z are:-108 -49 200
Roll:-13.77
Pitch:27.68

The acceleration info of x, y, z are:-111 -44 199
Roll:-12.47
Pitch:28.58

The acceleration info of x, y, z are:-114 -45 202
Roll:-12.56
Pitch:28.85

The acceleration info of x, y, z are:-99 -52 197
Roll:-14.79
Pitch:25.92

The acceleration info of x, y, z are:-109 -44 200
Roll:-12.41
Pitch:28.03

The acceleration info of x, y, z are:-110 -46 200
Roll:-12.95
Pitch:28.19

The acceleration info of x, y, z are:-105 -48 198
```

□ Autoscroll

Both NL & CR

9600 baud

Result in Arduino IDE serial monitor