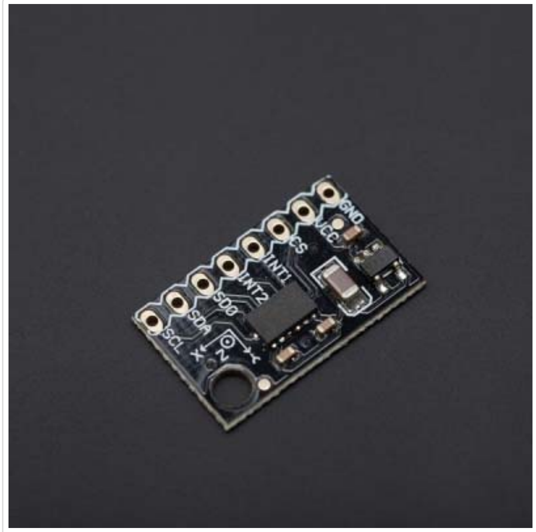
Triple Axis Accelerometer Breakout - ADXL345 (SKU:SEN0032)

Contents



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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

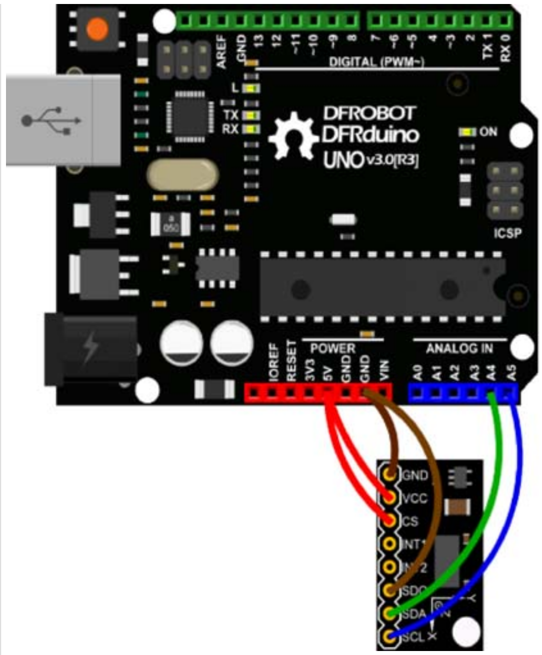
- Working voltage: 3.3~6V
- Current consumption @2.5v: 40uA / working mode, 0.1uA / standby mode
- Communication interface: I2C / SPI (3 or4 lines)
- Size: 20x15mm

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 (http://www.dfrobot.com/image/data/SEN0032/ADXL345_SEN0032_datasheet_EN.pdf) for more info.



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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.

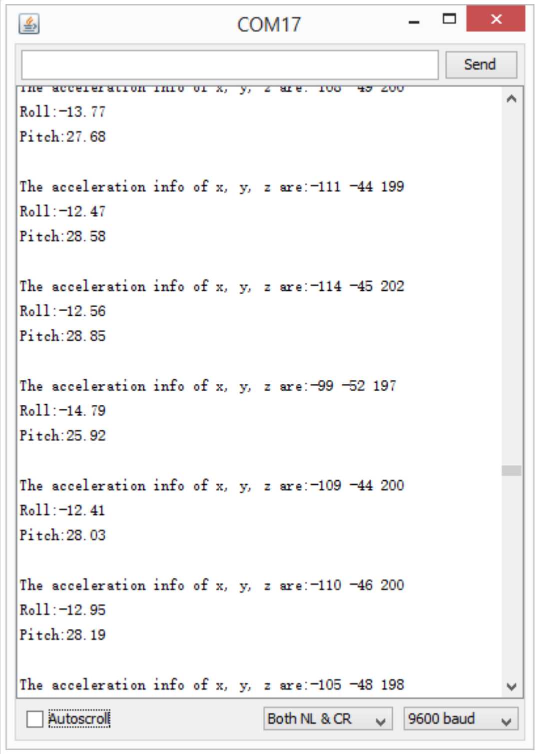
```
#include <Wire.h>

#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#Introduction

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.  Least 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. (http://www.dfrobot.com/wiki/index.php?title=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 (https://www.dfrobot.com/wiki/index.php?title=How_to_Use_a_Three-Axis_Accelerometer_for_Tilt_Sensing#Yaw-Pitch-Roll) angle. See changs as you sway the Accelerometer.



(/wiki/index.php/File:SEN0032_adxl345Res.png)

Result in Arduino IDE serial monitor

Documents

- Schematic (http://www.sparkfun.com/datasheets/Sensors/Accelerometer/ADXL345-BreakoutBoard-v10.pdf)
- Datasheet (http://www.sparkfun.com/datasheets/Sensors/Accelerometer/ADXL345.pdf)

→ (/wiki/index.php/File:Nextredirectltr.png)Go Shopping Triple Axis Accelerometer Breakout - ADXL345 (SKU:SEN0032) (http://www.dfrobot.com/index.php?route=product/product&filter_name=SEN0032&product_id=383)

Categories (/wiki/index.php/Special:Categories): Product Manual (/wiki/index.php/Category:Product_Manual) | SEN Series (/wiki/index.php/Category:SEN_Series) | Sensors (/wiki/index.php/Category:Sensors)