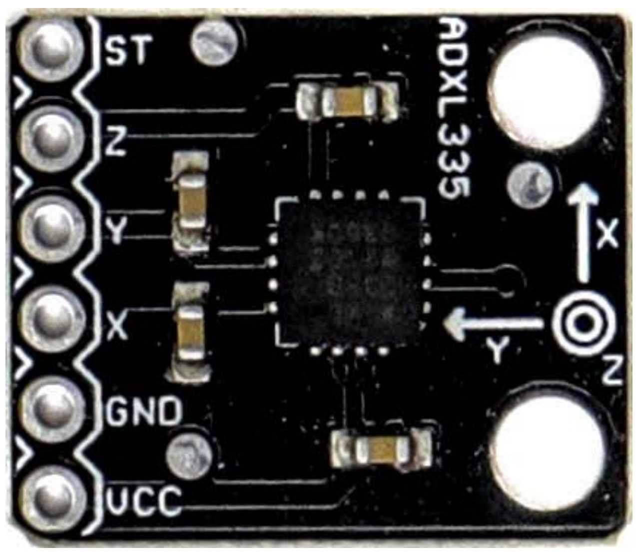
SmartElexTriple Axis Accelerometer Breakout - ADXL335



The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The bandwidth of the accelerometer is 50 Hz.

THEORY OF OPERATION

The ADXL335 is a complete 3-axis acceleration measurement system. The ADXL335 has a measurement range of ±3 g minimum. It contains a polysilicon surface-micromachined sensor and signal conditioning circuitry to implement an open-loop acceleration measurement architecture. The output signals are analog voltages that are proportional to acceleration. The accelerometer can measure the static acceleration of gravity in tilt-sensing applications as well as dynamic acceleration resulting from motion, shock, or vibration. The sensor is a polysilicon surface-micromachined structure built on top of a silicon wafer. Polysilicon springs suspend the structure over the surface of the wafer and provide a resistance against acceleration forces. Deflection of the structure is measured using a differential capacitor that consists of independent fixed plates and plates attached to the moving mass. The fixed plates are driven by 180° out-of-phase square waves. Acceleration deflects the moving mass and unbalances the differential capacitor resulting in a sensor output whose amplitude is proportional to acceleration. Phase-sensitive demodulation techniques are then used to determine the magnitude and direction of the acceleration. The demodulator output is amplified and brought off-chip through a 32 kΩ resistor. The user then sets the signal bandwidth of the device by adding a capacitor. This filtering improves measurement resolution and helps prevent aliasing.

SELF-TEST

The ST pin controls the self-test feature. When this pin is set to VS, an electrostatic force is exerted on the accelerometer beam. The resulting movement of the beam allows the user to test if the accelerometer is functional. The typical change in output is −1.08 g (corresponding to −325 mV) in the X-axis, +1.08 g (or +325 mV) on the Y-axis, and +1.83 g (or +550 mV) on the Z-axis. This ST pin can be left open-circuit or connected to common (COM) in normal use.

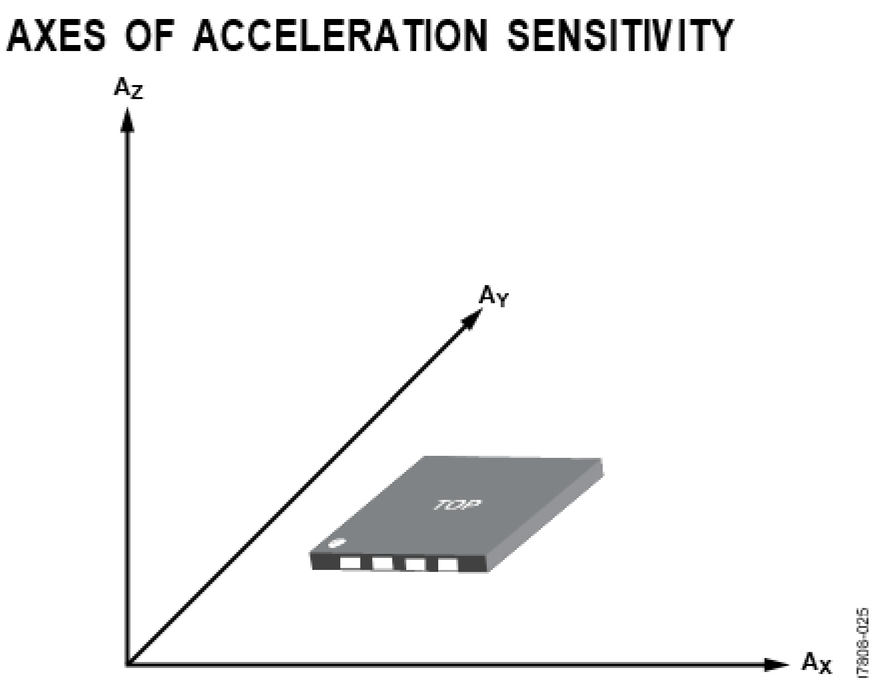


Figure 23. Axes of Acceleration Sensitivity; Corresponding Output Voltage Increases When Accelerated Along the Sensitive Axis.

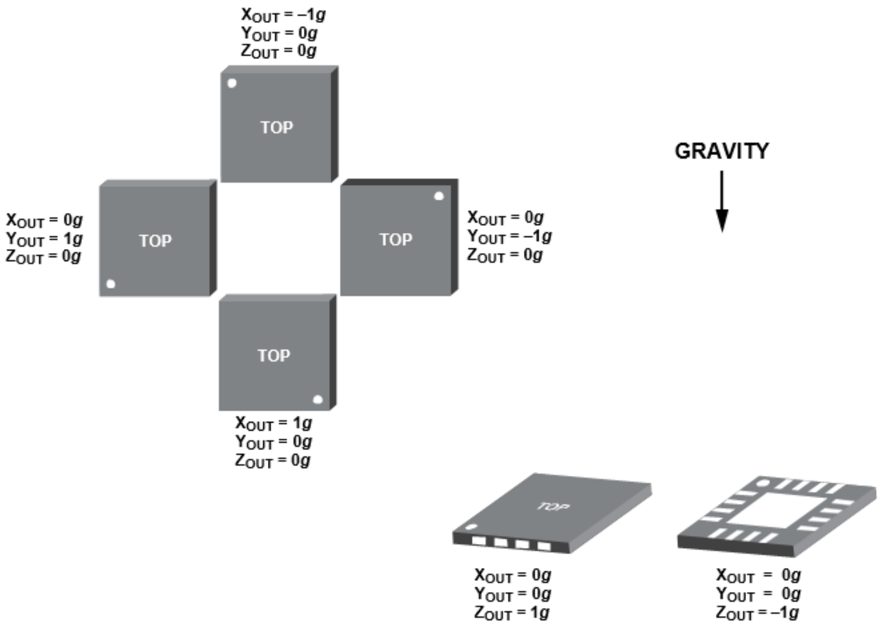


Figure 24. Output Response vs. Orientation to Gravity

USE WITH OPERATING VOLTAGES OTHER THAN 3 V

The ADXL335 output is ratiometric, therefore, the output sensitivity (or scale factor) varies proportionally to the supply voltage. At VS = 3.6 V, the output sensitivity is typically 360 mV/g. At VS = 2 V, the output sensitivity is typically 195 mV/g.

The zero g bias output is also ratiometric, thus the zero g output is nominally equal to VS/2 at all supply voltages.

The output noise is not ratiometric but is absolute in volts; therefore, the noise density decreases as the supply voltage increases. This is because the scale factor (mV/g) increases while the noise voltage remains constant. At VS = 3.6 V, the X-axis and Y-axis noise density is typically 120 µg/√Hz, whereas at VS = 2 V, the X-axis and Y-axis noise density is typically 270 µg/√Hz.

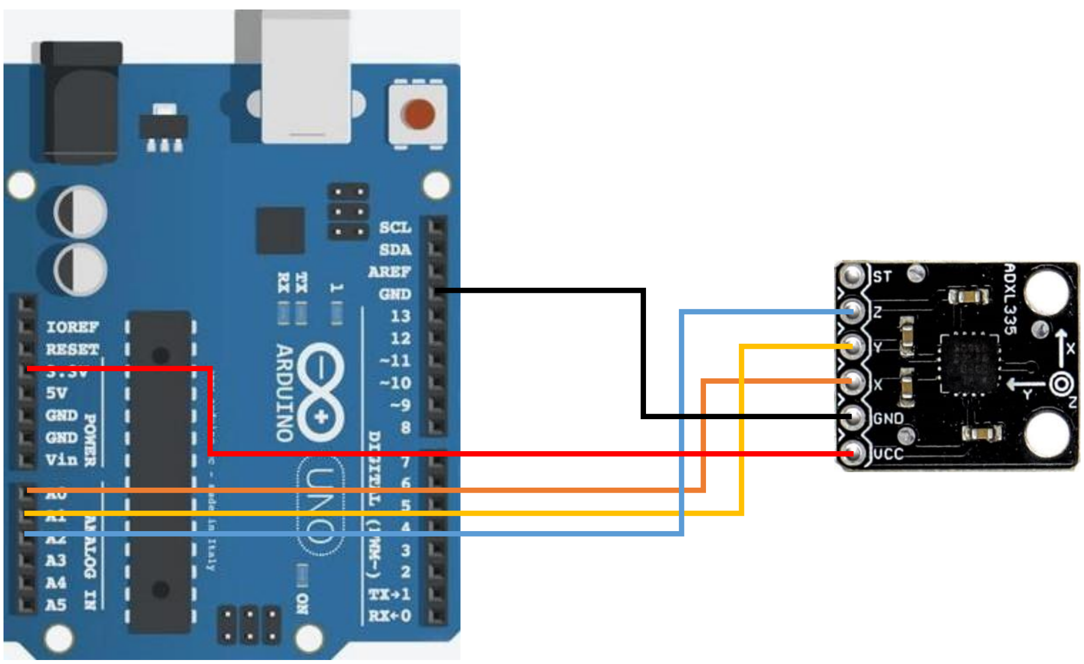
Self-test response in g is roughly proportional to the square of the supply voltage. However, when ratiometricity of sensitivity is factored in with supply voltage, the self-test response in volts is roughly proportional to the cube of the supply voltage. For example, at VS = 3.6 V, the self-test response for the ADXL335 is approximately −560 mV for the X-axis, +560 mV for the Y-axis, and +950 mV for the Z-axis.

The ADXL335 is tested and specified at VS = 3 V; however, it can be powered with VS as low as 1.8 V or as high as 3.6 V. Note that some performance parameters change as the supply voltage is varied.

At VS = 2 V, the self-test response is approximately −96 mV for the X-axis, +96 mV for the Y-axis, and −163 mV for the Z-axis.

The supply current decreases as the supply voltage decreases. Typical current consumption at VS = 3.6 V is 375 µA, and typical current consumption at VS = 2 V is 200 µA.

Wiring



Arduino	ADXL335
A0	X
A1	Y

A2	Z
3.3V	VCC
GND	GND

Example Code:

```
int x, y, z;

void setup()
{
  Serial.begin(9600);      // sets the serial port to 9600
}

void loop()
{
  x = analogRead(0);       // read analog input pin 0
  y = analogRead(1);       // read analog input pin 1
  z = analogRead(2);       // read analog input pin 1
  Serial.print("accelerations are x, y, z: ");
  Serial.print(x, DEC);    // print the acceleration in the X axis
  Serial.print(" ");       // prints a space between the numbers
  Serial.print(y, DEC);    // print the acceleration in the Y axis
  Serial.print(" ");       // prints a space between the numbers
  Serial.println(z, DEC);  // print the acceleration in the Z axis
  delay(100);              // wait 100ms for next reading
}
/////////////////////////////////////////END/////////////////////////////////////////
```