

ELEC 6760 Project, Spring 2013: ADXL278 - Dual-Axis, High-g, Accelerometers

Brian Arnberg

The ADXL278 is a dual-axis accelerometer capable of measuring high-g accelerations. It is a low power device built on a single monolithic IC. Additionally, the voltage outputs the device are signal conditioned. It can measure dynamic or static acceleration. Also, its effective acceleration magnitudes are 35, 50, and 70 -g in the x-axis and 35, 50, and 35 -g in the y-axis. The data sheet indicates that while the device is primarily concerned with airbag applications (front/side), it can be used in a wide variety of other applications. This is because the device is designed to work in an automotive vehicle. Because it is designed for such use, it is temperature stable and “accurate over the automotive temperature range” (pg 1). In addition to this built in stability, the ADXL278 boasts a self-test feature that tests all of the relevant elements (electrical and mechanical) by exercising them. The MEMS sensor is an 8-terminal package.

The data sheet lists specifications for three different models: AD22284, AD22285, and AD22286. For each model, the temperature range is from -40 C to +105 C. The non-linearity of each model is typically 0.2%. Each typically has a package alignment error of 1 Degree, with a sensor-to-sensor alignment error of 0.1 Degrees. The cross-axis sensitivity is -5% to +5%. The resonant frequency is 24kHz. For the first model, the ratiometric sensitivity is 55mV/g; for the second, 38mV/g, and for the third, 55mV/g. The Zero-g Output Voltage offset for the first two models ranges from -150mV to +150mV (in both axes), the ranges for the third model are -100mV to +100mV in the X-axis and -150mV to +150mV in the Y-axis. The clock noise for each model is 5mV p-p. The frequency response for -3dB Frequency is typically 400 Hz (for the 2-pole Bessel filter), while the frequency response for the -3dB Frequency Drift is 2Hz (for the same 2-pole Bessel filter). The self-test has a logic high of 3.5V and a logic low of 1V, with a typical input resistance of 50kOhms.

The data sheet lists some absolute maximum ratings for the ADXL278. The maximum allowable acceleration, in any axis, powered or un-powered, is 4,000g. The maximum V_s is -0.3V to +7.0V. For other pins, the maximum range is (COM-0.3V) to (V_s +0.3V). There is an indefinite output short-circuit duration maximum rating. The maximum temperature range, for both operation and storage, is -65 C to +150 C. Operating the device outside any of these ranges, or above any of the maximum settings, is liable to permanently degrade the device. Additionally, this device is sensitive to Electrostatic Discharge.

The chip has 8-terminals. Terminals 1, 7, and 8 are to be connected to VDD3, VDD, and VDD2, all of which can range from 3.5V to 6V. Pins 2 and 6 serve as output pins for Yout and Xout. Pin 3 is the common pin, and Pin 4 is used to activate the self-test. Pin 5 is not to be connected.