Precision in Motion
Kionix®

Introduction

The Kionix Development Board provides developers and engineers with easy access to the full capabilities of Kionix tri-axis accelerometers. The development board can create a solid foundation for understanding motion, and enable quick and easy proof of concept. Also, with an onboard Kionix accelerometer, battery, MCU, memory, crystal oscillator and plenty of breadboard space, it has the ability to operate as a stand-alone development platform.

Features:

- Kionix KXM52 Tri-Axis Accelerometer
- Texas Instruments MSP430F149 MCU
- 32.768 kHz Clock for real-time applications
- 4Mhz Crystal Oscillator for a steady clock
- 2 Status LEDs (Green, Red)
- Accelerometer Enable LED (Yellow)
- RS232/Battery (2xCr2032)/external Power Sources
- RS232 Transceiver for serial communications
- 4Mbit Memory for data storage (~500kBytes)
- Software usable push button
- JTAG for reprogramming MCU and simulating
- Large development area for application prototyping
- 3 Analog outputs from the KXM52

Kionix KXM52 Tri-Axis Accelerometer

The KXM52 is a high-performance, silicon micro-machined linear tri-axis accelerometer that consists of a sensor element and an ASIC packaged in a 5x5x1.8mm Dual Flat No-lead (DFN). The sensor functions on the principle of differential capacitance. Acceleration causes displacement on a silicon structure resulting in a change in capacitance. The ASIC detects and transforms changes in capacitance into an analog output voltage, which is proportional to acceleration. Please refer to the Kionix KXM52 product sheet at http://www.kionix.com/Product Sheets/KXM52 Series.pdf for more information.

Texas Instruments MSP430F149 MCU

The Texas Instruments MSP430F149 is a 16Bit RISC MCU with 2 Kbytes of RAM and 60Kbytes of Flash Memory for program storage. It has an integrated 12-Bit SAR Analog to Digital Converter with 8 channels, 3 of which are being used by the on-board KXM52

leaving 5 channels available for further development. It also has 2 Hardware USARTS for communications, and is low power at 1.8-3.6V and 250uA per MIPS. For more information, refer to MSP430x14x Datasheet (SLAS272D) and MSP430x1xx User Guide (SLAU049C).

32.768 kHz Clock

The 32.768 kHz clock is used with the Watchdog timer to provide an interrupt every second. The clock can also be the source of the other timers on the MCU. Please refer to the MSP430 User guide for more information on this topic.

4MHz Crystal Oscillator

The 4MHz crystal oscillator can be used for a variety of applications. This, like the 32.768kHz crystal, can be the source of other times on the MCU. It may be possible that the 4MHz crystal does not fit your application, therefore it can be traded for a crystal from 500kHz – 8MHz.

Status LED's

The status LED's are software drivable, and can be used differently with the firmware. They are connected to Port1.0 (Red) and Port1.1 (Green)

Accelerometer Enable LED

The Accelerometer Enable LED is a status light for the accelerometer that shows the accelerometer is powered on and enabled.

Power Sources

The development board is designed to deal with many different DC power sources. There are jumpers on the board to toggle between different power modes. The Battery/RS232 jumper selects drawing power from a battery or the RS232 line. The Int/Ext jumper controls internal Power/External power. The external power is not buffered through the regulator so do not exceed 3.6v on the external power. You can get regulated external power by removing the battery holder and using the vias for your power hookup. For batteries, use 2x CR2032. If you plan on using a large array of different power sources, you should be careful to not have more than one power supply connected at the same time. Generally, this is only an issue when programming or simulating. A rule of thumb if you are using the JTAG connector to do anything; completely remove the jumper from the RS232/Battery jumper and set the Int/Ext power jumper to internal (Int).

RS232 Transceiver

The Development board has an RS232 Transceiver for serial communication with a host or other RS232 Device. Optionally, you can draw power from the RS232 line if supported. Using the MCU's UART, you can select many different communication speeds.

4Mbit Memory (~500kBytes)

The development board has 4 Mbits of Flash memory for data storage. This is a serial data flash memory from Atmel, Part: AT45DB041B. It is a SPI protocol and is hooked to the MCU's USART2. Being hooked to the second USART allows you to send and receive bytes without having to emulate the SPI protocol with IO pins.

Software Push Button

The Software usable push button is a simple push button attached to Port2.7. You can use the PORT2 interrupts to fire an interrupt when the switch is pressed.

JTAG port for Programming and Simulations

The JTAG port is for programming the MCU and running in circuit simulations. This makes the development and testing of the device much easier since you can reprogram the firmware if you need to.

Development Area

The development area is for rapid prototyping and proof of concept. It allows you to plug or wire in new or different modules for extending the development board or adding additional sensors. The development area supplies 16 IO pins for your application. The first 5 IO pins labeled P6.* are software selectable 12 Bit Analog to Digital Converter lines. They can also be used as digital IO pins, depending on the way they are set in the firmware.

Accelerometer Outputs

It should be noted that above the development area there are 3 vias labeled X OUT, Y OUT, Z OUT that are the analog output lines from the Kionix KXM52 accelerometer. These lines can be tied to a different A/D or other analog input device.

Hardware Profile

Circuit Description

Figure 1 links to the schematic (Adobe pdf) of the Kionix Development Board.

Figure 1

Figure 2 shows the board layout of the Kionix Development Board.