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M16C/29

Interface to Dual Accelerometer

Introduction

This application note illustrates how to interface an RSKM16C29 board with an accelerometer. The tilt angles of the accelerometer board (X and Y axis) can be recorded and displayed in real-time on the LCD screen. The recorded data can also be displayed on a PC screen through serial communication. Several features of M30290FC MCU such as timer, A/D conversion, and serial communication are employed in this application. The source code accompanied with this application note illustrates how to use the aforementioned MCU to read accelerometer data and display it to the user.

Target Device

Applicable MCU: M30290FC. The method discussed can be used on any number of devices.

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1. Requirement

This application note illustrates the use of RSKM16C29 board to interface with an accelerometer evaluation board, ADXL311EB, from Analog Device™. The application program is required to read analog data from the accelerometer, interpret the data for the tilt angles (X, Y axis) of the board, and display the data on the LCD screen. Acceleration data is also recorded in the internal RAM and can be displayed on a PC screen by a serial terminal program (e.g. HyperTerminal) running on Windows® through an RS-232 serial communication connection.

2. The ADXL311EB Accelerometer Evaluation Board

ADXL311EB is an evaluation board for examining the performance of the ADXL311 dual axis ±2 g accelerometer.

The ADXL311EB board provides a 5-pin, 0.1 inch spaced header for access to all power and signal lines so that this can be connected to the RSKM16C29 board, or any other prototyping board. ADXL311EB is 20 mm × 20 mm, with mounting holes set at the corners of the PCB. ADXL311 can measure both dynamic acceleration (e.g. vibration) and static acceleration (e.g. gravity). The outputs are analog voltages proportional to acceleration. The detailed specification of ADXL311EB can be found at www.analog.com.

The interface between the ADXL311EB and the RSKM16C29 board is illustrated in Figure 1. TheADXL311EB is powered by the RSKM16C29. The acceleration data signals for X and Y axis are fed to the A/D converter pins AD0 and AD1 on the RSKM16C29.

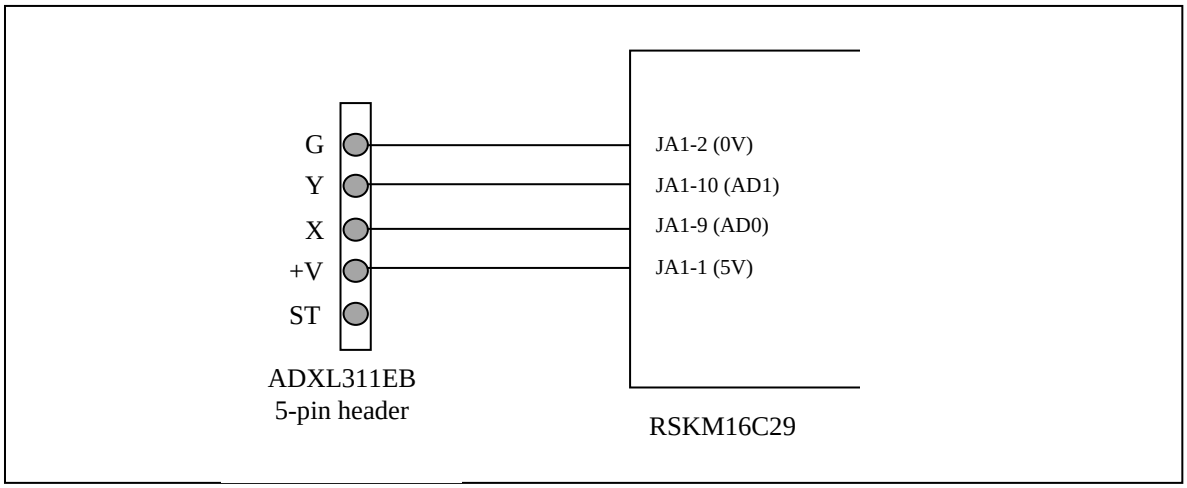

Figure 1 Interface between the ADXL311EB and the RSKM16C29 board.

3. Timer

To service the accelerometer interface we need one timer to interrupt at the time interval between each acceleration data sampling. To do this we set Timer A1 to operate in timer mode and to trigger every 0.1 sec. The interrupt service routine (ISR) will then sample each set of data.

If the user presses SW2, the data will be recorded. This can be done repetitively by the user again and again up to a predefined number of times. Later, the user can request to display the data on a PC using the serial communication interface between the PC and the RSKM16C29.

4. A/D converter

Since we need to maintain the data sampling at a predefined interval and as there are two analog signals to read, this application uses the A/D converter in Single Sweep mode. Single Sweep allows us to read two or more pins consecutively with only one A/D Start command. This is different from One Shot mode in which the selection of the A/D pin needs to be set every time we read a different pin. Also, in Repeat Sweep mode, the A/D conversion runs continuously, but the time interval between two reads at the same pin cannot be accurately controlled.

5. Serial I/O

In order for RSKM16C29 board to communicate with a PC through RS-232 serial port, we need to set up the serial I/O on our MCU to operate in clock asynchronous serial (UART) mode.

We need to select the baud rate along with the data format. In our setup, we will use

- 19200 baud
- 8-bit data
- No parity bit
- 1 stop bit
- No flow control

6. Result

The operation of data transmission and reception can be done by polling the MCU's UART flags related to completion of transmission and reception, or by using interrupts. For receive notification we use interrupts by setting the UART Receive Interrupt Control Level to a nonzero value, but we will *poll* the Transmit buffer empty flag, TI, before sending each character data. This can simplify the code a bit. The efficiency is less of a concern here.

In order to run the application program accompanied with this application note, we need a RS-232 cable to connect between RSK16C29 board and the PC's COM port. Then, we need to start the HyperTerminal program on the PC and set the COM port connection as above. Finally; build, download, and run the program to test the interface with the accelerometer.

As the application starts up, the LCD will show a splash screen for the accelerometer interface application. Press SW2 to start recording the tilt angles data from the accelerometer on the evaluation board. During data recording, notice that LED1 blinks. After LED1 stops blinking, the recorded data is ready to be displayed on PC. Press 'P' on the PC keyboard to request for the recorded tilt angles data to be sent over the serial port from the RSK to the PC. A resulting display example of angles is shown in Figure 2.

After the first data recording, the tilt angles of for the X and Y axis of the accelerometer are displayed in real-time on the LCD screen.

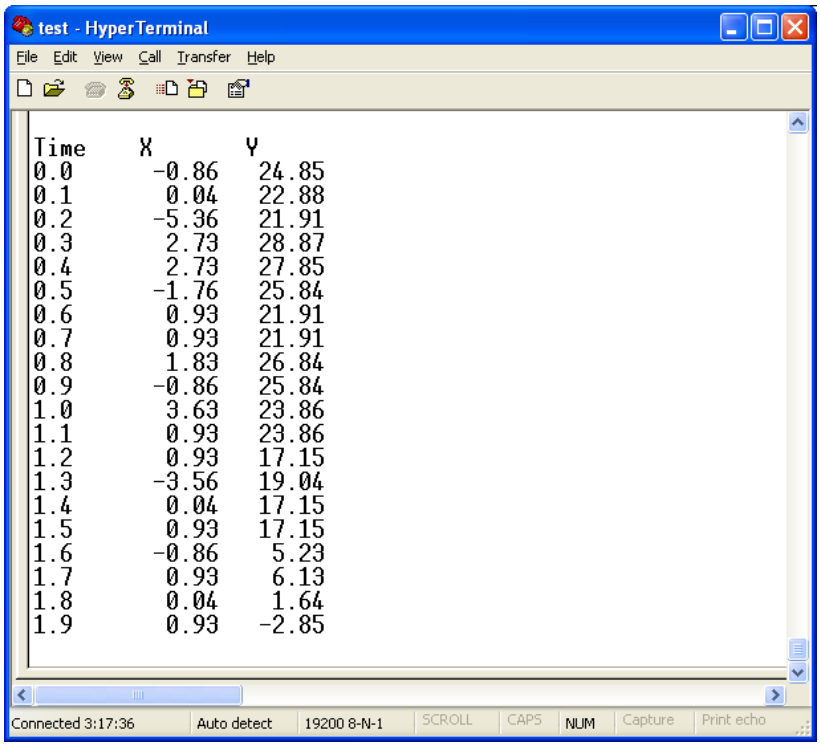

Figure 2 HyperTerminal program displaying recorded tilt angles

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Revision Record

		Description	
Rev.	**Date**	**Page**	**Summary**
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