

Lab #3: MSP430: ADC12_A

Report due: 3/2/2023 by 2:00 pm

Introduction

The goal of this laboratory is to learn how to use ADC12_A to sample an analog signal.

Equipment:

CrossStudio for MSP430.

TI MSP-EXP430F5438 Experimenter Board

Oscilloscope

Tasks:

1. Set the MCLK and SMCLK to 16 MHz.
2. Set up the ADC12, and send the ADC12 reference voltage out so you can check it using the oscilloscope.
3. Wait for the user to press the button switch S1 and then:
 - Start/clear the timer.
 - Take 8 consecutive samples from the internal temperature sensor (with as little delay as possible) using SMCLK as the ADC12 clock. Don't forget to use appropriate sampling time.
 - Once the sampling is done, in the ADC12 interrupt service routine, capture the current timer value (but don't stop the timer), calculate the average temperature expressed in degrees Celsius (using the data provided in the TLV structure so that you are taking calibration into account)
 - Calibrate the temperature sensor using the data provided in the TLV structure
 - Stop the timer/capture the current value.
 - Set the breakpoint so that you can check the calculated temperature value, the time it took to perform ADC, and the time it took to calculate calibrate.

So, the goal is to measure the time it takes to perform ADC and to measure the time it takes to perform calculations.

NOTES:

- Use interrupts rather than polling.
- Keep the microcontroller in the low(est) power mode, for as long as possible.
- To make the LCD work properly, you have to *initialize* it and *initialize the backlight*.
- Don't forget to set the appropriate core voltage so that you can run at 16 MHz.
- Compare your temperature with the temperature measured by others in the lab.
- Include the measured times and temperatures.

Report requirements:

Use the lab report template provided on Blackboard.

1. The report should include all the programming files you wrote.
2. The report should include all the measurements.
3. The report should include the detailed description of the program and the procedures used in completing this task.
4. The code should be reasonably commented.

NOTE: Please be extra careful when handling the board, especially now that we are using analog input channels.