EE 444/645

Assigned 3/2/2023

Lab #4: MSP430–UART communication and interrupt mechanism

Report due: 3/09/2023 by 2:00 pm

Introduction

The goal of this laboratory is to configure the USCI module for the UART mode, and use it to communicate with a PC through its serial port. This lab assignment should also strengthen your understanding of the interrupt mechanism.

Equipment:

CrossStudio for MSP430
TI MSP-EXP430F5438 Experimenter Board
Oscilloscope, Frequency counter (optional for EE444 students, mandatory for EE645)

Task:

Write a program that receives characters from a terminal program (for example, TeraTerm) and echoes them back to the terminal, but it capitalizes all lower-case letters.

NOTE: *For a full credit your program should:*

- Use the SMCLK of **17** MHz to source the USCI
- Communicate with the PC at a baud rate of 38400 bps
- Use oversampling method to set up the baud rate
- Use the 7-bit data, even-parity, one-stop-bit protocol
- *Receive and send characters only in the interrupt service routine(s)*
- Exit from all interrupt service routines as soon as possible
- Spend the remaining time in the lowest possible low power mode.

Lab Assignments:

- Capture the signal generated by the microcontroller when it is sending a character through its serial port. Measure precisely the bit length and determine the exact baud rate.
- Capture the similar signal generated by the PC, as it is being sent to the microcontroller by TI TUSB transceiver. What is the exact baud rate now?
- Annotate your printouts to show start/stop bits, parity (if used), and the least significant and most significant bits of the character.
- Give the ASCII code of a character being sent and show that the signal you captured corresponds to this character.

optional for EE444 students, mandatory for EE645 students:

- Use the frequency counter to measure precisely the frequency of the clock used for BRCLK.
- Based on your measurements of actual baud rates and the frequency of your clock, make changes in your program to set the baud rate as close to the one used by the PC. You can also slightly change the frequency of the clock if you need to.

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 (including oscilloscope captures).
3. The report should include the detailed description of the program and the procedures used in completing this task.
4. The code should be included in your reports and reasonably commented.

Be extra careful when handling the board and connecting the oscilloscope.