

Lab #2: MSP430 Timer A output modes

Report due: 2/23/2023 by 2:00 pm

INTRODUCTION

The goal of this laboratory is to use **Timer A** output capabilities to produce a given PWM (Pulse-Width Modulated) signal shape.

EQUIPMENT:

CrossStudio for MSP430

TI MSP-EXP430F5438 Experimenter Board

Oscilloscope

TASK:

Use Timer A to generate two PWM modulated signals on two of the available pins on the experimenter board (*check the experimenter board user's guide for available pins and the microcontroller datasheet for the pins associated with Timer A module*). Both signals should have a period of 10 μ s. One of them should have a duty cycle of 25% and the other one should have a duty cycle of 75%

Set the MCLK to be as close to 25 MHz as possible (M as in million, not 2^{20}). To achieve the highest precision, set the SMCLK to 25 MHz as well, and use it as the source for the timer.

Disable the clock request logic for SMCLK (*Read Section 5.2.11 in the User's Guide*).

1. Use the oscilloscope to confirm and measure the frequency of your SMCLK clock. Capture the signal.
2. Use the oscilloscope to confirm the timing of your signals. Are the values measured those you expected? Identify possible sources of errors. Capture the signal using the oscilloscope.
3. Try these three scenarios:
 - a. Your main program ends with an endless loop.
 - b. Your main program ends with a command LPM0 (Low Power Mode 0).
 - c. Your main program ends with a command LPM3 (Low Power Mode 3).

Measure the frequency of MCLK and SMCLK in each of these three cases. Explain the results.

REQUIREMENTS:

Use the lab report template provided on Blackboard and submit your reports through Blackboard. The report should also include:

1. All the programming files you wrote, reasonably commented;
2. All the measurements performed and answers to questions;
3. A detailed description of the program and the procedures used in completing this task;
4. Upload the programs you wrote as separate files, AND include them in your report.

NOTE: *Please be extra careful when handling the board and setting the I/O options for ports and TimerA. You can easily destroy the board. Avoid handling pins while the board is connected to power (JTAG interface connected). Use static mats.*