Experiment 2
FPGA Programming
ECE 482

The objectives of this experiment are:

- To become familiar with microcontroller programming and the MSP430 to be used latter in this course
- To understand and implement the gate driver signals of the Boost converter to be constructed

In this lab, you will use Texas Instruments' Code Composer Studio to program your central controller in order to implement a pair of PWM signals using the MSP430 Launchpad development board. The MSP430 family User's Guide, Datasheet, and example code files are available from the experiment webpage.

This experiment does not require a lab report.

I.   Voltage-Controlled PWM

In order to drive the MOSFETs in a synchronous boost converter, two complementary, constant-frequency PWM signals are needed, as shown in Fig. 1
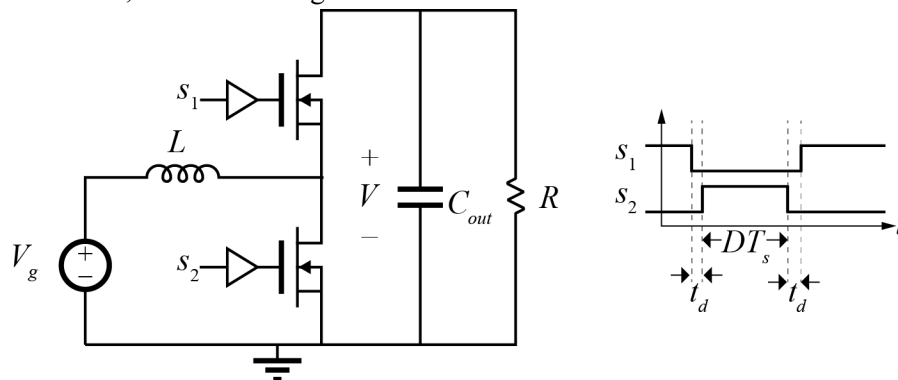

Figure 1: Boost converter gate drive signals s_1 and s_2, with deadtime t_d shown.

Using the example codes from Texas Instruments, or starting from scratch, write code to generate two complementary 20kHz PWM signals. Set the two deadtimes t_d to 500 ns. The duty cycle of the signal should be determined dynamically and set proportional to an analog input voltage. Limit the duty cycle so that at zero input voltage, the duty cycle is 1% and at 3.3V input, the duty cycle is 99%. You are free to have some error on all values mentioned here, as long as the basic functionality is achieved.
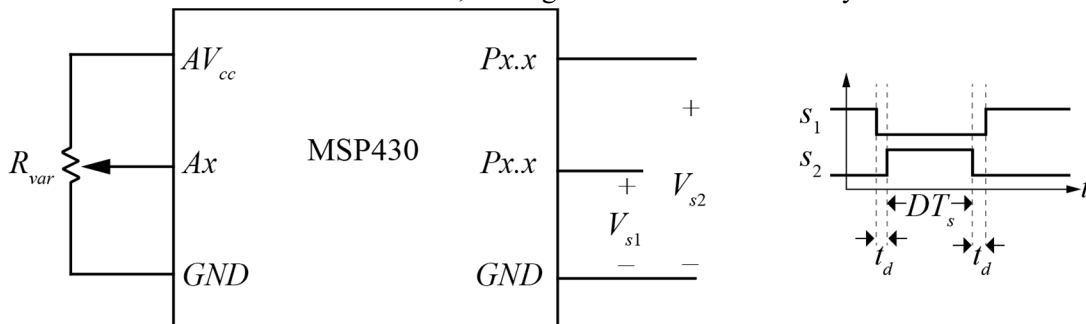

Figure 2: Connections to MSP430 board

Connect a variable resistor R_{var} as shown in Fig. 2 to one of the analog inputs of the MSP430. In your code, output the PWM signals to available GPIOs *Px.x* of your choice so that you can view them on the oscilloscope.

By taking experimental datapoints, complete the table below, including points spanning the full range.

Analog Voltage										
Duty Cycle										

Plot the resulting data in MATLAB. Once your plot is complete, demonstrate your working circuit, and show the resulting plot to your TA or Instructor. When both are sufficient, obtain a signature below to complete the experiment.

Successful completion of experiment on   _____ _____

                                             Date   Signature

Comments: