EE 474
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Lab 5 Report

Procedure:

After reading the spec, I decided to implement the PWM that is able to dim the LED in Lab3 Task 1a. First, I looked through the datasheet section 23 about PWM, especially the initialization and configuration. To define the macros to access the PWM0, I followed the example in the initialization and configuration section (23.4). RCGC's address can be easily found by checking the attached pages for the offset. Then by checking 23.2, I learned that for PWM0 we need to use GPIO port F, which can be found by skimming through the GPIO register map. Last, for the rest of the pins needed for PWM0, we can find the base address in 23.5 and the offset from the attached pages in table 23-2, section 23.5.

The second step is to add an initialization function. I first added the function declaration to the task1a_inits.h file, and then completed this step basically following the guide in section 23.4 to create a 25kHz with 100% default duty cycle and a system clock of 60MHz in the task1a_inits.c file. Since the system clock is changed, the settings for clock divider, PWM0LOAD, PWM0CMPB are recalculated. Since the system clock is 60MHz, and I decide to use a clock divider of 4, there will be 600 ticks per period, PWM0LOAD should be changed to 599, and PWM0CMPB would be 0x0 to achieve the default duty cycle of 100%. Also, since I used PWM0, I'll need PF1 to connect to the circuit, which is initialized in the initialization function as well. I implemented the rest following the instructions.

The last step is to change the main function. I added the initialization function to the main function with the other initialization functions, and then in the while loop, I used the range of resistance as a condition for a different formula of the PWM0CMPB output. Specifically, PWM0CMPB will increase linearly when resistance is less than 7.5, but stay at 0x256 after resistance reaches 7.5.

Result:

From the code, I expect that with the increasing resistance connected in the circuit, the brightness of the yellow LED will increase as well and vice versa. However, when the resistance is higher than a certain amount (greater than 7.5 kOhm), the LED should be turned off. Specific details can be seen in the demo. The circuit is shown below in Fig. 1.

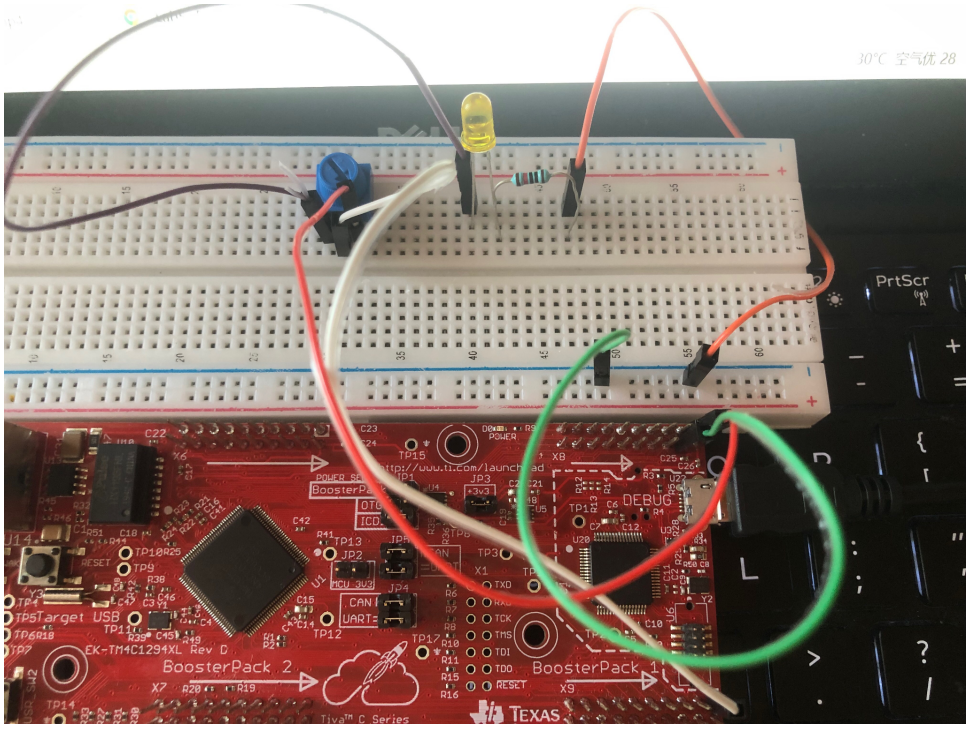

Fig. 1. Circuit connection of LED dimmer

Conclusion:

I think completely learning a module simply from a datasheet is kind of hard, though it is a good experience to practice reading the datasheet and learn how to use a module by oneself. PWM itself is very useful in power control, measurement and communication, etc. I've simply learned its initialization and configuration while there are more things it can do. I would explore it further with more time.