CPE403 – Advanced Embedded Systems

# Design Assignment 4

DO NOT REMOVE THIS PAGE DURING SUBMISSION:

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Github Repository link (root): <https://github.com/PeppersJ/v4e0nk_i3>

Youtube Playlist link (root): <https://drive.google.com/drive/u/2/folders/1fJ029-AAWjTnN-QrRqNLd0iLwKGm6A08>

**Follow the submission guideline to be awarded points for this Assignment.**

Submit the following for all Assignments:

1. In the document, for each task submit the modified or included code (from the base code) with highlights and justifications of the modifications. Also include the comments. If no base code is provided, submit the base code for the first task only.
2. Create a private Github repository with a random name (no CPE/403, Lastname, Firstname). Place all labs under the root folder TIVAC, sub-folder named Assignment1, with one document and one video link file for each lab, place modified c files named as asng\_taskxx.c.
3. If multiple c files or other libraries are used, create a folder asng1\_t01 and place these files inside the folder.
4. The folder should have a) Word document (see template), b) source code file(s) with startup\_ccs.c and other include files, c) text file with youtube video links (see template).
5. Submit the doc file in canvas before the due date. The root folder of the github assignment directory should have the documentation and the text file with youtube video links.
6. Organize your youtube videos as playlist under the name “cpe403”. The playlist should have the video sequence arranged as submission or due dates.
7. Only submit pdf documents. Do not forget to upload this document in the github repository and in the canvas submission portal.
8. Code for Tasks. for each task submit the modified or included code (from the base code) with highlights and justifications of the modifications. Also include the comments. If no base code is provided, submit the base code for the first task only. Use separate page for each task.

/\* Modified By: Rishawn Peppers Johnson

\* Date Created: 13 November 2020

\* Device: CC1352R1 & MKII

\* CpE 403 Assignment 04

\*

\* Purpose: Interface the TivaC123GH6PM with the Educational BoosterPack MKII to

\* read the MKII's vertical joystick value using TivaC's ADC, display the ADC

\* value to terminal through UART, constatly update the PWM duty cycle routed

\* to an LED.

\*

\* Inputs: MKII horizontal joystick

\* Outputs: UART to terminal ADC value

\* PWM value to LED

\* \*/

/\*

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\*/

/\*

\* ======== hello.c ========

\*/

**#include** <stdio.h> // Common C functions

/\* XDC Module Headers \*/

**#include** <xdc/std.h>

**#include** <xdc/cfg/global.h>

**#include** <xdc/runtime/System.h>

/\* BIOS Module Headers \*/

**#include** <ti/sysbios/BIOS.h>

**#include** <ti/sysbios/knl/Task.h>

**#include** <ti/sysbios/knl/Semaphore.h>

**#include** <ti/sysbios/knl/Clock.h>

/\* Driver Header files \*/

**#include** <ti/drivers/ADC.h>

**#include** <ti/drivers/UART.h>

**#include** <ti/drivers/GPIO.h>

**#include** <ti/drivers/PWM.h>

/\* Board Header file \*/

**#include** <ti/drivers/Board.h>

/\* Driver configuration \*/

**#include** "ti\_drivers\_config.h"

// Variables

uint16\_t adcValue;

uint16\_t count = 0; // 1ms timer interrupt count

// Prototypes

**void** **timer0Fxn**();

**void** **idleFxn**();

**void** **readADCFxn**();

**void** **displayUARTFxn**();

**void** **ledPWMFxn**();

**void** **hearbeatFxn**();

/\*

\* ======== main ========

\*/

**int** **main**() {

/\* Call driver init functions \*/

Board\_init();

**GPIO\_init**();

**UART\_init**();

**PWM\_init**();

**ADC\_init**();

/\* Configure the LED pin \*/

**GPIO\_setConfig**(CONFIG\_GPIO\_LED\_0, GPIO\_CFG\_OUT\_STD | GPIO\_CFG\_OUT\_LOW);

/\* Turn on user LED \*/

**GPIO\_write**(CONFIG\_GPIO\_LED\_0, CONFIG\_GPIO\_LED\_ON);

System\_printf("Assignment 4\nUse the MKII's horizontal joy stick to adjust green LEDs PWM value");

// Kernal Start

BIOS\_start();

**return**(0);

}

**void** **timer0Fxn**() {

// Triggered every 1ms

count++;

**if** (count == 5) // Run ADC

Semaphore\_post(adc\_sem);

**else** **if** (count == 10) // Display ADC value on UART

Semaphore\_post(uart\_sem);

**else** **if** (count == 15) { // Update PWM value

Semaphore\_post(pwm\_sem);

count = 0;

}

}

**void** **workLoopFxn**() {

// Main loop

Timer\_start(timer0); // Start counting Timer

**while** (1) {}

}

**void** **readADCFxn**() {

// Read in AD0's (horizontal joy stick) value

// Create and initialize joy stick peripheral

ADC\_Handle adc;

ADC\_Params params;

**ADC\_Params\_init**(&params);

adc = **ADC\_open**(CONFIG\_ADC\_0, &params);

**while**(1) { // Dosen't check if conversion was successful

**ADC\_convert**(adc, &adcValue);

Semaphore\_pend(adc\_sem, BIOS\_WAIT\_FOREVER);

}

}

**void** **displayUARTFxn**() {

// Displays ADC value to terminal

**const** **char** prompt[] = "Console Entry:\r\n";

UART\_Handle uart;

UART\_Params uartParams;

/\* Create a UART with data processing off. \*/

**UART\_Params\_init**(&uartParams);

uartParams.writeDataMode = *UART\_DATA\_BINARY*;

uartParams.readDataMode = *UART\_DATA\_BINARY*;

uartParams.readReturnMode = *UART\_RETURN\_FULL*;

uartParams.baudRate = 115200;

uart = **UART\_open**(CONFIG\_UART\_0, &uartParams);

**if** (uart == NULL) {

/\* UART\_open() failed \*/

**while** (1);

}

**UART\_write**(uart, prompt, **sizeof**(prompt));

**char** adcValueStr[6]; // ADC value as C string

uint32\_t clearCount = 0; // Count till clearing console

**while** (1) { // Infinitely display ADC value

**sprintf**(adcValueStr, "%d\r", adcValue); // Convert int to string

**UART\_write**(uart, adcValueStr, **sizeof**(adcValueStr));

**if**(clearCount == 60) {

**UART\_write**(uart, " \r", **sizeof**(adcValueStr)); // Clear old value

clearCount = 0;

}

clearCount++;

Semaphore\_pend(uart\_sem, BIOS\_WAIT\_FOREVER);

}

}

**void** **ledPWMFxn**() {

// Check if switch is pressed and update PWM duty cycle to LED

PWM\_Handle pwm;

PWM\_Params params;

uint16\_t pwmPeriod = 3100; // Period and duty in microseconds

uint16\_t duty = 0;

// Create and initialize PWM

**PWM\_Params\_init**(&params);

params.periodUnits = *PWM\_PERIOD\_US*;

params.periodValue = pwmPeriod;

params.dutyUnits = *PWM\_DUTY\_US*;

pwm = **PWM\_open**(CONFIG\_PWM\_0, &params);

**PWM\_start**(pwm);

**while** (1) {

duty = adcValue; // 32bit to 16bit

**PWM\_setDuty**(pwm, duty);

Semaphore\_pend(pwm\_sem, BIOS\_WAIT\_FOREVER);

}

}

**void** **hearbeatFxn**() {

// Toggle Red LED every 1s

uint32\_t time = 1000000/Clock\_tickPeriod; // 1 second

**while** (1) {

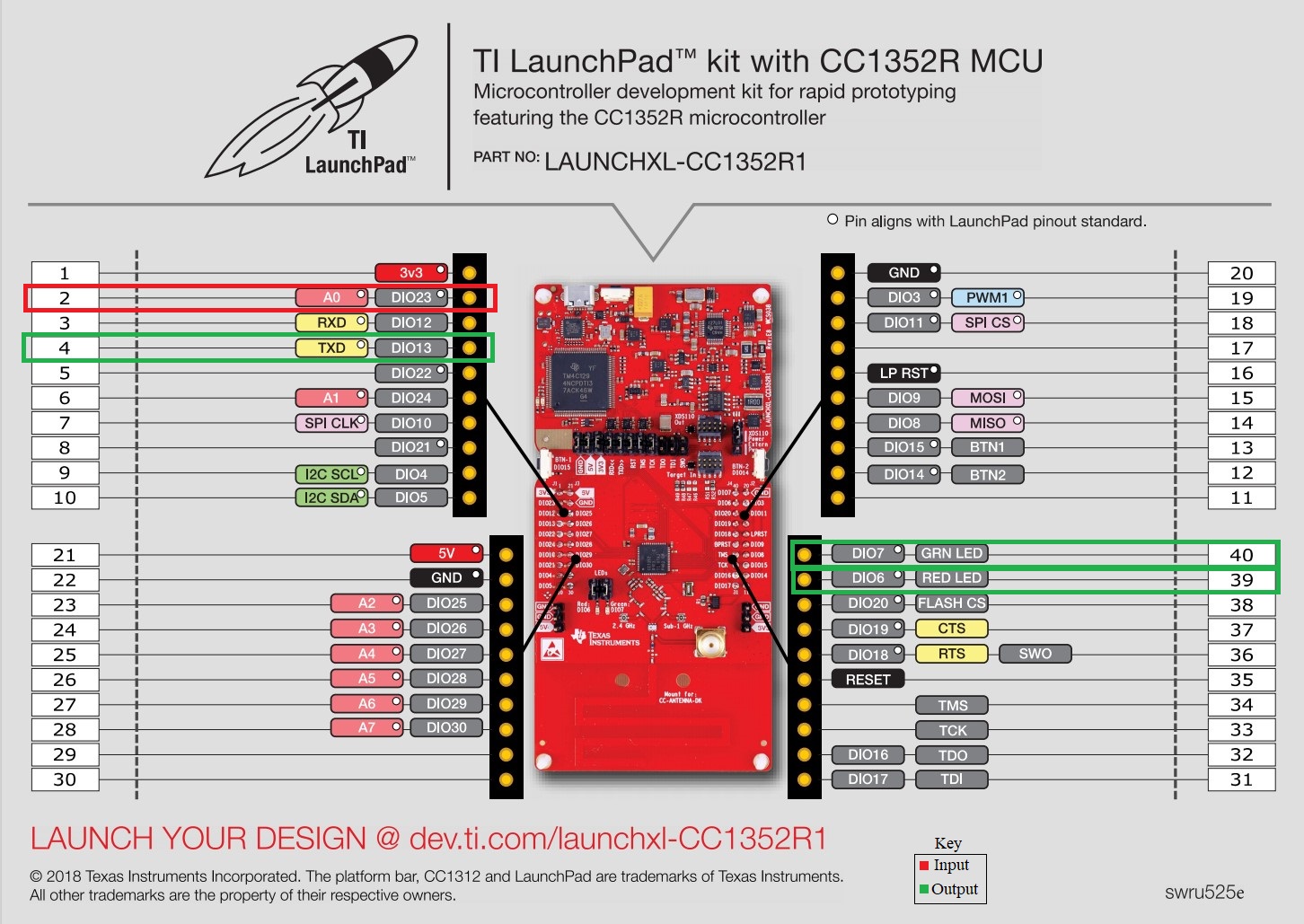
Task\_sleep(time);

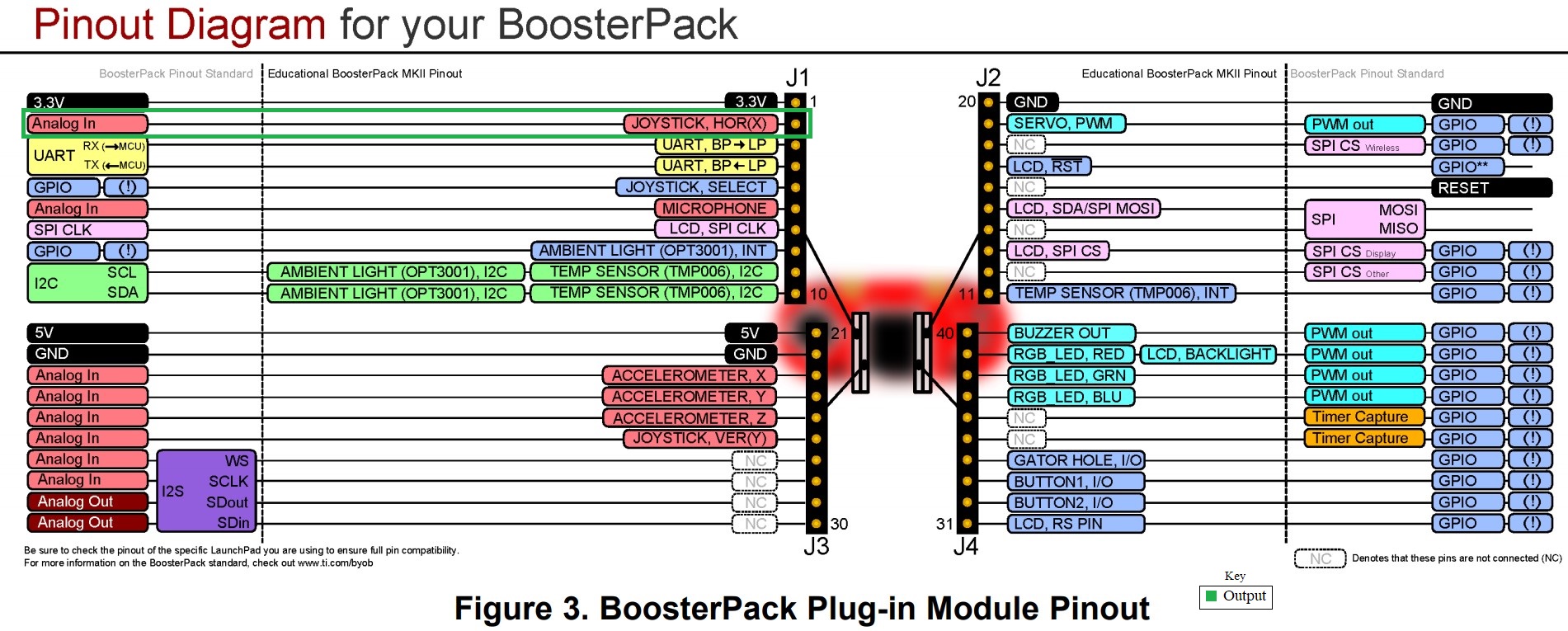
**GPIO\_toggle**(CONFIG\_GPIO\_LED\_0);

}

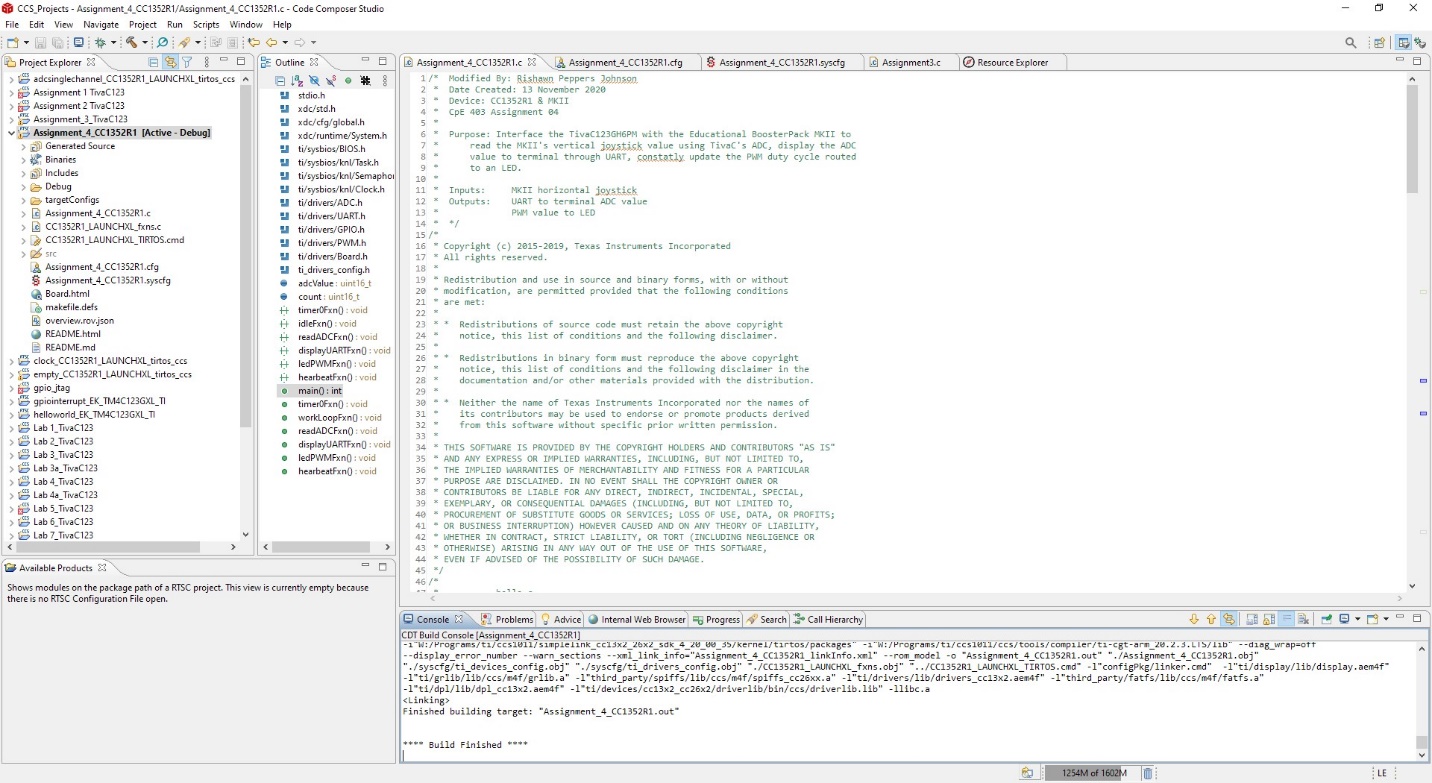
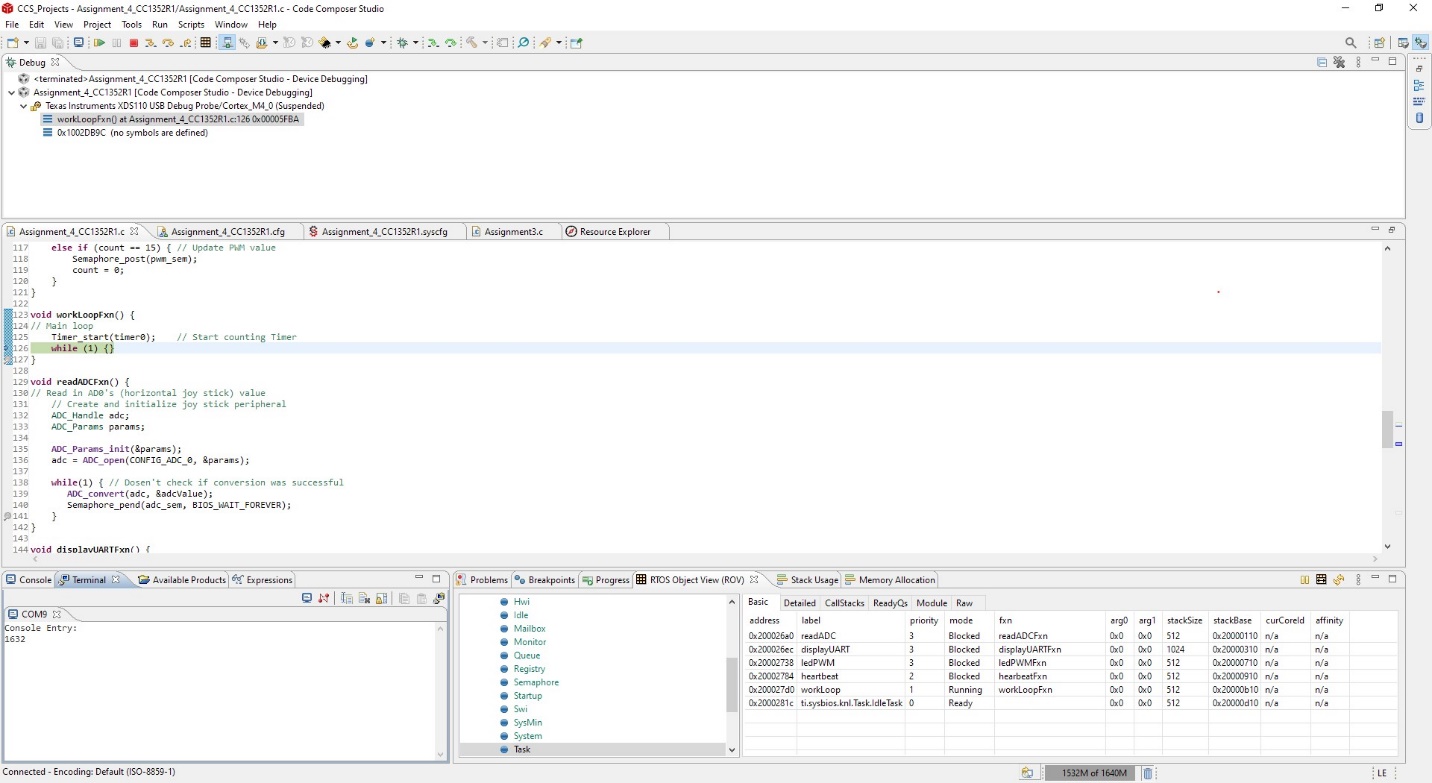
}

1. Block diagram and/or Schematics showing the components, pins used, and interface.





1. Screenshots of the IDE, physical setup, debugging process - Provide screenshot of successful compilation, screenshots of registers, variables, graphs, etc.





1. Declaration

I understand the Student Academic Misconduct Policy - http://studentconduct.unlv.edu/misconduct/policy.html

“This assignment submission is my own, original work”.

Rishawn Peppers Johnson