ECEN 5823
Low Energy ADC Assignment
Fall 2017

Objective: Enable the continual ADC sensing of an analog signal in a low energy state.

Note: This assignment will begin with the completed Managing Energy Mode assignment.

Instructions:

1. Make any changes required to the Managing Energy Mode assignment.

2. Connect the STK6101C extension board to the main development kit board.

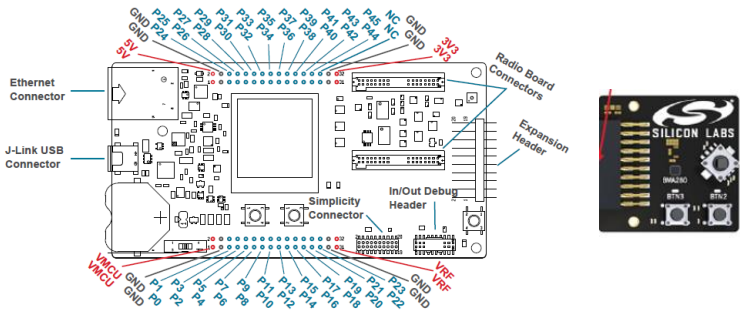

Figure 3.1. Mainboard Connector Layout

3. Program the ADC to sense / interrupt the Blue Gecko when an action occurs on the extension board's analog joystick.
    a. You must determine which pin the Joy Stick output is routed to the BGM121. One method is to trace the output of the Joy Stick to the extension board connector through the extension board of the main development kit board to the Radio Board connectors and finally to the BGM121 to determine which pin to use as the analog input.
    b. Program the designated analog input as an analog input pin

4. The ADC interrupt handler should be able to make the following distinctions when an event occurs:
    a. If Joy Stick is pressed away (north), turn LED1 on
    b. If Joy Stick is pressed toward you (south), turn LED1 off
    c. If Joy Stick is pressed to the right (east), increment on time of LED0 by 500mS
    d. If Joy Stick is pressed to the left (west), decrement on time of LED0 by 500mS
    e. If Joy Stick button is depressed, reset to on-time to reset condition
    f. Note:

        i. Circuit should be software de-bounced so that only one increment or decrement of the on-time occurs per press / pulse of the Joy Stick.
    g. Note:
        i. LETIMER counters should only change in its interrupt handler
    h. Note:
        i. On-time cannot go below 0 time. The least amount of time should be the default / reset on-time.
        ii. On-time cannot go above 100% of period

5. ADC's main parameters to enable grading are:
    a. 12-bit resolution
    b. No oversampling
    c. Continually sample the Joy Stick input 200 samples per second (200 Hz)
    d. 32 clocks for acquisition time

6. LETIMER0 should be set to the following conditions at startup / reset.
    a. Period = 3.0 seconds
    b. On-Time = 200mS (time that LED0 is on)
        i. LED0 should always be pulsing based on LETIMER0
        ii. The time that LED0 is on changes based on the joy stick being pressed to the east and west

7. The Blue Gecko should be running at the lowest possible energy state while the system is waiting for an input from the Joy Stick.

Questions:

In a separate document to be placed in the drop box with the program code, please answer the following questions:

NOTE: All average currents should be taken at a time scale of 200mS/div.

1. What is the lowest energy mode that the Blue Gecko will operate in while sampling the Joy Stick input?
    a. What is the average current when the LED0 is off and the Blue Gecko is sampling the Joy Stick input?
    b. What is the average current for one complete LETIMER0 period?
    c. After resetting the Energy Profiler measurement values, what is the Energy Score after 60 seconds?

2. After pressing the Joy Stick away (north), what is the average current when LED0 is off and the Blue Gecko is sampling the Joy Stick input?
    a. After resetting the Energy Profiler measurement values, what is the Energy Score score?

3. Press the Joy Stick towards you (south), and then press it once to the right (east).
    a. What is the average current when the LED0 is off and the Blue Gecko is sampling the Joy Stick input?
    b. What is the average current for one complete LETIMER0 period?
    c. After resetting the Energy Profiler measurement values, what is the Energy Score after 60 seconds?
    d. What is the on-time of LED0 in mS?

4. Now press the Joy Stick to the left (west) once.
    a. What is the average current when the LED0 is off and the Blue Gecko is sampling the Joy Stick input?
    b. What is the average current for one complete LETIMER0 period?
    c. After resetting the Energy Profiler measurement values, what is the Energy Score after 60 seconds?
    d. What is the on-time of LED0 in mS?

Deliverables:

1. One document that provides the answers to Energy Mode Assignment.

2. The completed program project or required files to enable the code to be ran on the instructing team's computer for grading.