Exercise 3: ADC with Keyboard Interrupt

EG-252 Group Design Exercise – Microcontroller Laboratory

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September 2014

Exercise 2: ADC with Keyboard Interrupt

I. Overview

For this lab exercise you are provided a sample ADC assembly program given in the appendix. An electronic version of the program is available on the Blackboard site. The program uses interrupt generated by push buttons to trigger an ADC process on the MC9S08AW60 evaluation board. You are to carry out the following two tasks with this exercise:

- Use the sample program to practice on pushbutton with interrupt mechanism and ADC process with the evaluation board.
- Design an equivalent program in C language which can perform the same keyboard interrupt and ADC processing functions as provided by the example assembly program.

This exercise is worth 6 marks. For this exercise you need only demonstrate your program with the evaluation board to *Dr Chris Jobling by Monday, 8 December 2013*. No report is needed.

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Appendix

Sample Program in Assembly

```
1  ;*********************************************************************
2  ;*      kbi_adc.asm                                                 *
```

```
 3   ;*                                                                         *
 4   ;*          MC9S08AW60 Evaluation board keyboard interrupt example          *
 5   ;*          - Switch SW3 onboard connected to Port D pin 3, KBI pin6;        *
 6   ;*          - Switch SW4 onboard connected to Port D pin 2, KBI pin5         *
 7   ;*                                                                         *
 8   ;*          Function:                                                       *
 9   ;*          On reset all LEDs will light on. If SW3 or SW4 pressed,          *
10   ;*  an interrupt is generated, which set LEDs 0:3 to light on.              *
11   ;*          More interrupts are genereated if SW3 or SW4 are pressed.        *
12   ;*************************************************************************
13
14                   INCLUDE         'derivative.inc' ; Include derivative-specific definitions
15
16   FLASH           EQU                     $2000
17   RAM                     EQU                     $0070
18   WATCH           EQU                     $1802
19
20                   ORG                     RAM
21   LED_on          DS.B        1                       ; Define a variable VAR_D with a size of 1 byte
22
23   ;Start program after reset
24                   ORG                     FLASH
25   START_UP
26                   LDA                     #$00
27                   STA                     WATCH           ; Turn off the watchdog timer
28
29   ;Init_GPIO init code
30                   LDA         #$FF
31                   STA         PTFDD
32                   MOV         #$0F, LED_on        ; Initialize VAR_D, used to control the LEDs
33                   LDA         #$FF
34                   STA         PTDPE               ; Port D is enabled with pull-up
35                   RSP                                                 ; Reset stack pointer
36
37   ;Enable interrupt for Keyboard input
38                   LDA         #$60
39                   STA         KBI1PE              ; KBI1PE: enable KBI function for pins 5 and 6 only
40                   BSET        $02, KBI1SC         ; KBI1SC: KBACK=1, to clear KBI flag
41                   BSET        $01, KBI1SC         ; KBI1SC: KBIE=1, enable KBI
42
43                   CLI                             ; Enable interrupt
44
45   MAINLOOP
46                   LDA         LED_on              ; Simple loop
47                   BRA                     MAINLOOP
48
```

```
49  ;Interrupt service routine for a keyboard interrupt generated upon the press of a pushbutton
50  ;with a falling edge (transition from high logic level "1" to low logic level "0")
51  LED_SWITCH
52              BSET    $02, KBI1SC     ; Clear KBI flag
53              LDA     #8
54              STA     ADC1SC1         ; ADC conversion will start after a number is writte
55  ADCLOOP
56              TST     ADC1SC1         ; Check the COCO bit (conversion complete flag).
57              BPL     ADCLOOP         ; if not complete, wait in the ADC loop.
58              LDA     ADC1RL          ; if complete, read the ADC outcome (digital value)
59              STA     PTFD            ; display over LED bar
60              RTI
61
62  ;INT_VECTOR
63              ORG     $FFD2
64              DC.W    LED_SWITCH
65
66              ORG     $FFFE
67              DC.W    START_UP
```