Lab07 Interrupt & Timer

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PIC18F4520 Datasheet

MicroChip - PIC18F4520 Datasheet
(https://ww1.microchip.com/downloads/en/DeviceDoc/39631E.pdf)

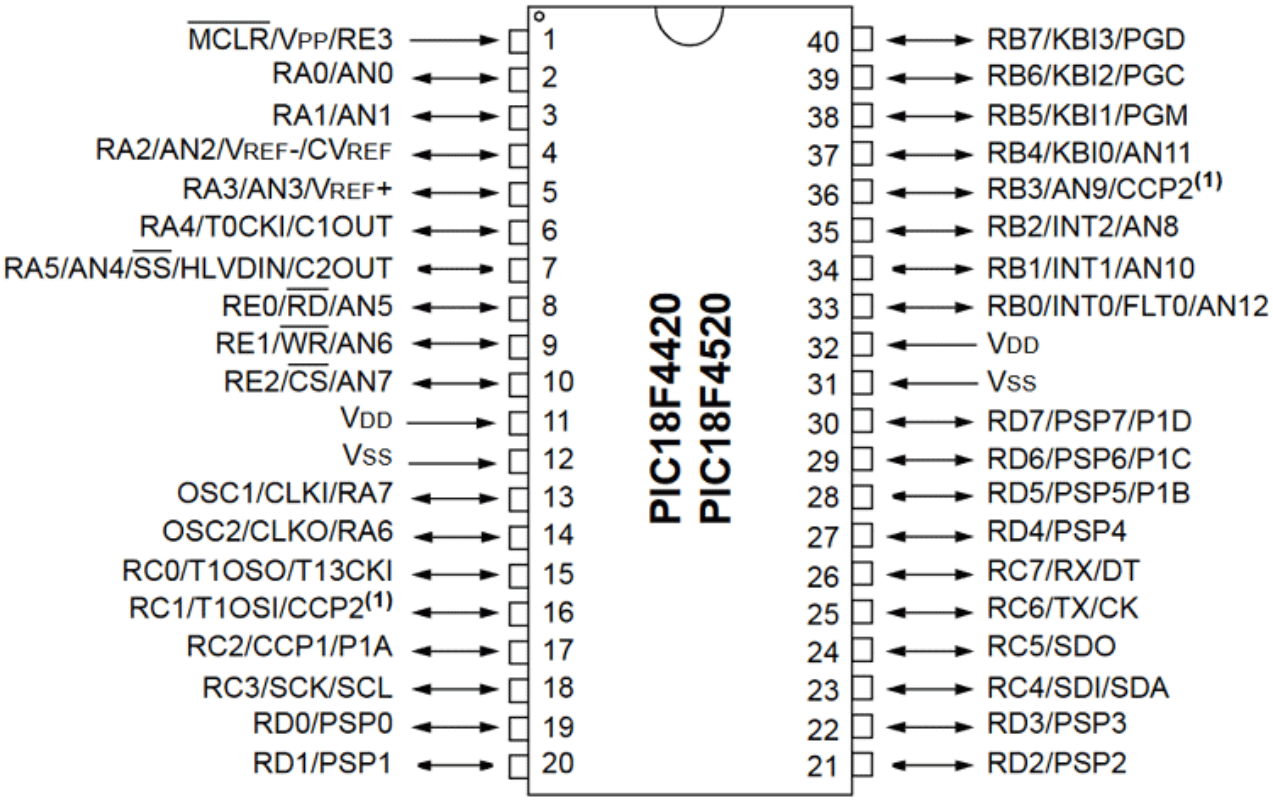
Interrupt用

Register名稱	在第幾頁	用途
RCON	第44頁	IPEN: 設定Interrupt優先度
INTCON	第95頁	GIE、INT0的[Flag bit, Enable Bit]
ADCON1	第226頁	設定數位類比

Timer用

Register名稱	在第幾頁	用途
OSCCON	第32頁	調整時脈 (可以玩看看)
T2CON	第135頁	設定Timer2的啟動、預除器後除器
PIR1	第98頁	TMR2IF、TMR1IF等
PIE1	第100頁	TMR2IE、TMR1IE等
IPR1	第102頁	TMR2IP、TMR1IP等

PIC18F4520 架構圖



Interrupt 範例程式碼

```
#include "p18f4520.inc"

; CONFIG1H
  CONFIG  OSC = INTIO67         ; Oscillator Selection bits (Internal osc
  CONFIG  FCMEN = OFF           ; Fail-Safe Clock Monitor Enable bit (Fai
  CONFIG  IESO = OFF            ; Internal/External Oscillator Switchover

; CONFIG2L
  CONFIG  PWRT = OFF            ; Power-up Timer Enable bit (PWRT disable
  CONFIG  BOREN = SBORDIS       ; Brown-out Reset Enable bits (Brown-out
  CONFIG  BORV = 3              ; Brown Out Reset Voltage bits (Minimum s

; CONFIG2H
  CONFIG  WDT = OFF             ; Watchdog Timer Enable bit (WDT disablec
  CONFIG  WDTPS = 32768         ; Watchdog Timer Postscale Select bits (1

; CONFIG3H
  CONFIG  CCP2MX = PORTC        ; CCP2 MUX bit (CCP2 input/output is mult
  CONFIG  PBADEN = ON           ; PORTB A/D Enable bit (PORTB<4:0> pins a
  CONFIG  LPT1OSC = OFF         ; Low-Power Timer1 Oscillator Enable bit
  CONFIG  MCLRE = ON            ; MCLR Pin Enable bit (MCLR pin enabled;

; CONFIG4L
  CONFIG  STVREN = ON           ; Stack Full/Underflow Reset Enable bit (
  CONFIG  LVP = OFF             ; Single-Supply ICSP Enable bit (Single-S
  CONFIG  XINST = OFF           ; Extended Instruction Set Enable bit (Ir

; CONFIG5L
  CONFIG  CP0 = OFF             ; Code Protection bit (Block 0 (000800-00
  CONFIG  CP1 = OFF             ; Code Protection bit (Block 1 (002000-00
  CONFIG  CP2 = OFF             ; Code Protection bit (Block 2 (004000-00
  CONFIG  CP3 = OFF             ; Code Protection bit (Block 3 (006000-00

; CONFIG5H
  CONFIG  CPB = OFF             ; Boot Block Code Protection bit (Boot bl
  CONFIG  CPD = OFF             ; Data EEPROM Code Protection bit (Data E

; CONFIG6L
  CONFIG  WRT0 = OFF            ; Write Protection bit (Block 0 (000800-0
  CONFIG  WRT1 = OFF            ; Write Protection bit (Block 1 (002000-0
  CONFIG  WRT2 = OFF            ; Write Protection bit (Block 2 (004000-0
  CONFIG  WRT3 = OFF            ; Write Protection bit (Block 3 (006000-0

; CONFIG6H
  CONFIG  WRTC = OFF            ; Configuration Register Write Protectior
  CONFIG  WRTB = OFF            ; Boot Block Write Protection bit (Boot b
  CONFIG  WRTD = OFF            ; Data EEPROM Write Protection bit (Data

; CONFIG7L
  CONFIG  EBTR0 = OFF           ; Table Read Protection bit (Block 0 (000
  CONFIG  EBTR1 = OFF           ; Table Read Protection bit (Block 1 (002
  CONFIG  EBTR2 = OFF           ; Table Read Protection bit (Block 2 (004
  CONFIG  EBTR3 = OFF           ; Table Read Protection bit (Block 3 (006
```

```
54
55  ; CONFIG7H
56    CONFIG  EBTRB = OFF           ; Boot Block Table Read Protection bit (E
57
58      L1 EQU 0x14
59      L2 EQU 0x15
60      org 0x00
61
62  DELAY macro num1, num2
63      local LOOP1
64      local LOOP2
65      MOVLW num2
66      MOVWF L2
67      LOOP2:
68          MOVLW num1
69          MOVWF L1
70      LOOP1:
71          NOP
72          NOP
73          NOP
74          NOP
75          NOP
76          NOP
77          DECFSZ L1, 1
78          BRA LOOP1
79          DECFSZ L2, 1
80          BRA LOOP2
81  endm
82
83  ; 程式邏輯：會一直卡在main裡面做無限迴圈，按下RB0的按鈕後會觸發interrupt，跳到I
84  ; ISR裡的內容會亮起所有在RA上的燈泡，Delay約0.5秒後熄滅。
85
86  goto Initial                    ; 避免程式一開始就會執行到ISR這一段，要跳過。
87  ISR:                            ; Interrupt發生時，會跳到這裡執行。
88      org 0x08
89      SETF LATA
90      DELAY  d'350' , d'180'      ; 約500_000cycles數， 在1MHz的情況下大約會De
91      CLRF LATA
92      BCF INTCON, INT0IF
93      RETFIE                     ; 離開ISR，回到原本程式執行的位址，同時會將GIE
94
95
96  Initial:                              ; 初始化的相關設定
97      MOVLW 0x0F
98      MOVWF ADCON1                ; 設定成要用數位的方式，Digitial I/O
99
100     CLRF TRISA
101     CLRF LATA
102     BSF TRISB,  0
103     BCF RCON, IPEN
104     BCF INTCON, INT0IF          ; 先將Interrupt flag bit清空
105     BSF INTCON, GIE             ; 將Global interrupt enable bit打開
106     BSF INTCON, INT0IE          ; 將interrupt0 enable bit 打開 (INT0與RB0 p
```

```
107
108 main:
109     bra main
110 end
```

Timer2 範例程式碼

```
#include "p18f4520.inc"

; CONFIG1H
  CONFIG  OSC = INTIO67         ; Oscillator Selection bits (Internal osc
  CONFIG  FCMEN = OFF           ; Fail-Safe Clock Monitor Enable bit (Fai
  CONFIG  IESO = OFF            ; Internal/External Oscillator Switchover

; CONFIG2L
  CONFIG  PWRT = OFF            ; Power-up Timer Enable bit (PWRT disable
  CONFIG  BOREN = SBORDIS       ; Brown-out Reset Enable bits (Brown-out
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  CONFIG  CP2 = OFF             ; Code Protection bit (Block 2 (004000-00
  CONFIG  CP3 = OFF             ; Code Protection bit (Block 3 (006000-00

; CONFIG5H
  CONFIG  CPB = OFF             ; Boot Block Code Protection bit (Boot bl
  CONFIG  CPD = OFF             ; Data EEPROM Code Protection bit (Data E

; CONFIG6L
  CONFIG  WRT0 = OFF            ; Write Protection bit (Block 0 (000800-0
  CONFIG  WRT1 = OFF            ; Write Protection bit (Block 1 (002000-0
  CONFIG  WRT2 = OFF            ; Write Protection bit (Block 2 (004000-0
  CONFIG  WRT3 = OFF            ; Write Protection bit (Block 3 (006000-0

; CONFIG6H
  CONFIG  WRTC = OFF            ; Configuration Register Write Protection
  CONFIG  WRTB = OFF            ; Boot Block Write Protection bit (Boot b
  CONFIG  WRTD = OFF            ; Data EEPROM Write Protection bit (Data

; CONFIG7L
  CONFIG  EBTR0 = OFF           ; Table Read Protection bit (Block 0 (000
  CONFIG  EBTR1 = OFF           ; Table Read Protection bit (Block 1 (002
  CONFIG  EBTR2 = OFF           ; Table Read Protection bit (Block 2 (004
  CONFIG  EBTR3 = OFF           ; Table Read Protection bit (Block 3 (006
```

```
54
55  ; CONFIG7H
56    CONFIG  EBTRB = OFF           ; Boot Block Table Read Protection bit (B
57
58      org 0x00
59
60  goto Initial
61  ISR:
62      org 0x08                ; 大致效果: 每0.5秒會進入一次interrupt
63      COMF LATA               ; interrupt會開關LATA一次
64      BCF PIR1, TMR2IF        ; 離開前記得把TMR2IF清空 (清空flag bit)
65      RETFIE
66
67  Initial:
68      MOVLW 0x0F
69      MOVWF ADCON1
70      CLRF TRISA
71      CLRF LATA
72      BSF RCON, IPEN
73      BSF INTCON, GIE
74      BCF PIR1, TMR2IF          ; 為了使用TIMER2，所以要設定好相關的TMR2IF、TM
75      BSF IPR1, TMR2IP
76      BSF PIE1 , TMR2IE
77      MOVLW b'11111111'         ; 將Prescale與Postscale都設為1:16，意思是之後
78      MOVWF T2CON               ; 而由於TIMER本身會是以系統時脈/4所得到的時脈為
79      MOVLW D'122'              ; 因此每256 * 4 = 1024個cycles才會將TIMER2 +
80      MOVWF PR2                 ; 若目前時脈為250khz，想要Delay 0.5秒的話，代表
81                                ; 因此PR2應設為 125000 / 1024 = 122.0703125
82      MOVLW D'00100000'
83      MOVWF OSCCON              ; 記得將系統時脈調整成250kHz
84
85  main:
86      bra main
87
88
89  end
90
```