

Lab07 Interrupt &...



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Lab07 Interrupt & Timer

PIC18F4520 Datasheet

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

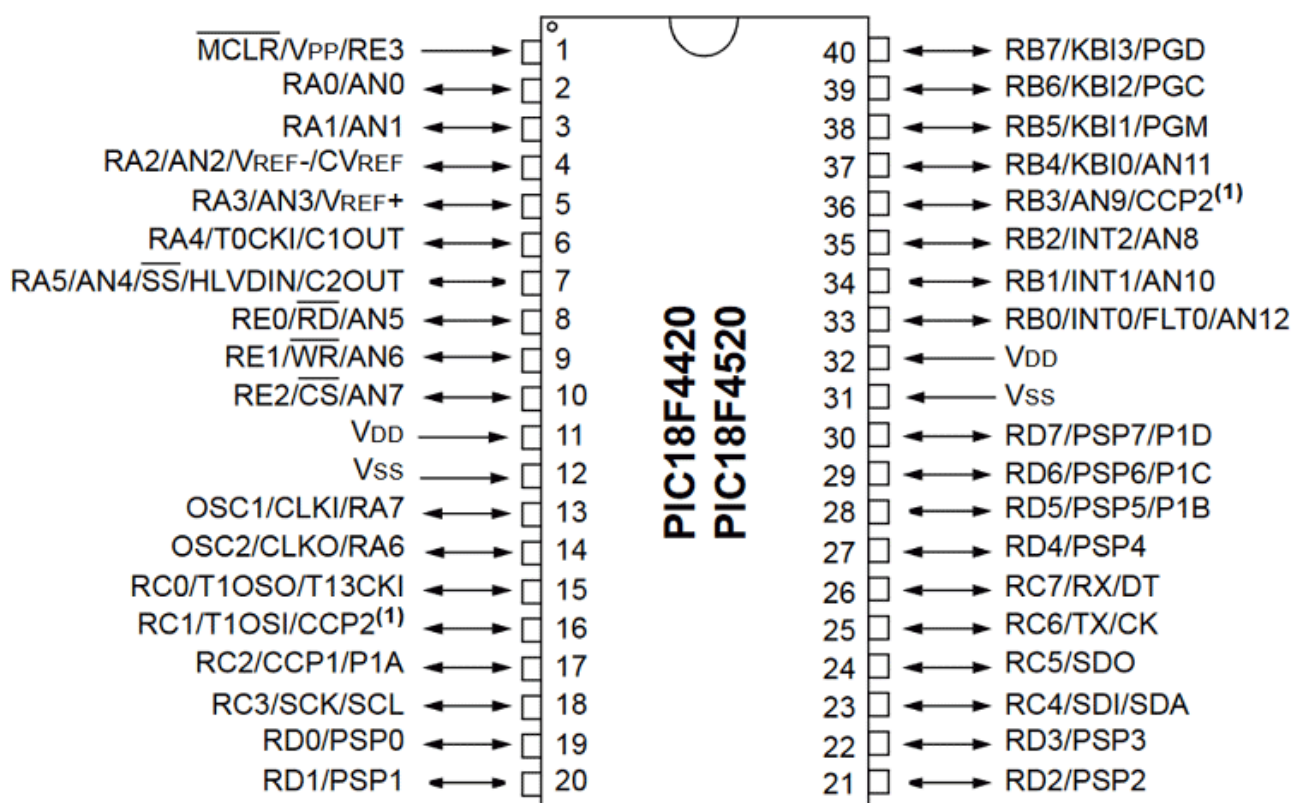
Interrupt用

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 oscillator
CONFIG FCEN = OFF         ; Fail-Safe Clock Monitor Enable bit (Fail-Safe
CONFIG IESO = OFF         ; Internal/External Oscillator Switchover bit (0

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

; CONFIG2H
CONFIG WDT = OFF          ; Watchdog Timer Enable bit (WDT disabled (contr
CONFIG WDTPS = 32768     ; Watchdog Timer Postscale Select bits (1:32768)

; CONFIG3H
CONFIG CCP2MX = PORTC     ; CCP2 MUX bit (CCP2 input/output is multiplexed
CONFIG PBADEN = ON        ; PORTB A/D Enable bit (PORTB<4:0> pins are conf
CONFIG LPT1OSC = OFF      ; Low-Power Timer1 Oscillator Enable bit (Timer1
CONFIG MCLRE = ON         ; MCLR Pin Enable bit (MCLR pin enabled; RE3 inp

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

; CONFIG5L
CONFIG CP0 = OFF          ; Code Protection bit (Block 0 (000800-001FFFh)
CONFIG CP1 = OFF          ; Code Protection bit (Block 1 (002000-003FFFh)
CONFIG CP2 = OFF          ; Code Protection bit (Block 2 (004000-005FFFh)
CONFIG CP3 = OFF          ; Code Protection bit (Block 3 (006000-007FFFh)

; CONFIG5H
CONFIG CPB = OFF          ; Boot Block Code Protection bit (Boot block (00
CONFIG CPD = OFF          ; Data EEPROM Code Protection bit (Data EEPROM n

; CONFIG6L
CONFIG WRT0 = OFF         ; Write Protection bit (Block 0 (000800-001FFFh)
CONFIG WRT1 = OFF         ; Write Protection bit (Block 1 (002000-003FFFh)
CONFIG WRT2 = OFF         ; Write Protection bit (Block 2 (004000-005FFFh)
CONFIG WRT3 = OFF         ; Write Protection bit (Block 3 (006000-007FFFh)

; CONFIG6H
CONFIG WRTC = OFF         ; Configuration Register Write Protection bit (C
CONFIG WRTB = OFF         ; Boot Block Write Protection bit (Boot block (0
CONFIG WRTD = OFF         ; Data EEPROM Write Protection bit (Data EEPROM

; CONFIG7L
CONFIG EBTR0 = OFF        ; Table Read Protection bit (Block 0 (000800-001
CONFIG EBTR1 = OFF        ; Table Read Protection bit (Block 1 (002000-003
CONFIG EBTR2 = OFF        ; Table Read Protection bit (Block 2 (004000-005
CONFIG EBTR3 = OFF        ; Table Read Protection bit (Block 3 (006000-007
```

```

; CONFIG7H
CONFIG EBTRB = OFF ; Boot Block Table Read Protection bit (Boot blo

L1 EQU 0x14
L2 EQU 0x15
org 0x00

DELAY macro num1, num2
    local LOOP1
    local LOOP2
    MOVLW num2
    MOVWF L2
    LOOP2:
        MOVLW num1
        MOVWF L1
    LOOP1:
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        DECFSZ L1, 1
        BRA LOOP1
        DECFSZ L2, 1
        BRA LOOP2
endm

; 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ISR執行
; ISR裡的內容會亮起所有在RA上的燈泡，Delay約0.5秒後熄滅。

goto Initial ; 避免程式一開始就會執行到ISR這一段，要跳過。
ISR: ; Interrupt發生時，會跳到這裡執行。
    org 0x08
    SETF LATA
    DELAY d'350' , d'180' ; 約500_000cycles數， 在1MHz的情況下大約會Delay0.5秒
    CLRF LATA
    BCF INTCON, INT0IF
    RETFIE ; 離開ISR，回到原本程式執行的位址，同時會將GIE設為1，允許之

Initial: ; 初始化的相關設定
    MOVLW 0x0F
    MOVWF ADCON1 ; 設定成要用數位的方式，Digital I/O

    CLRF TRISA
    CLRF LATA
    BSF TRISB, 0
    BCF RCON, IPEN
    BCF INTCON, INT0IF ; 先將Interrupt flag bit清空
    BSF INTCON, GIE ; 將Global interrupt enable bit打開
    BSF INTCON, INT0IE ; 將interrupt0 enable bit 打開 (INT0與RB0 pin腳位置相

main:
    bra main
end

```


Timer2 範例程式碼

```
#include "p18f4520.inc"

; CONFIG1H
CONFIG OSC = INTIO67      ; Oscillator Selection bits (Internal oscillator
CONFIG FCEN = OFF         ; Fail-Safe Clock Monitor Enable bit (Fail-Safe
CONFIG IESO = OFF         ; Internal/External Oscillator Switchover bit (0

; CONFIG2L
CONFIG PWRT = OFF         ; Power-up Timer Enable bit (PWRT disabled)
CONFIG BOREN = SBORDIS    ; Brown-out Reset Enable bits (Brown-out Reset e
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CONFIG CCP2MX = PORTC     ; CCP2 MUX bit (CCP2 input/output is multiplexed
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CONFIG CP0 = OFF          ; Code Protection bit (Block 0 (000800-001FFFh)
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CONFIG CP2 = OFF          ; Code Protection bit (Block 2 (004000-005FFFh)
CONFIG CP3 = OFF          ; Code Protection bit (Block 3 (006000-007FFFh)

; CONFIG5H
CONFIG CPB = OFF          ; Boot Block Code Protection bit (Boot block (00
CONFIG CPD = OFF          ; Data EEPROM Code Protection bit (Data EEPROM n

; CONFIG6L
CONFIG WRT0 = OFF         ; Write Protection bit (Block 0 (000800-001FFFh)
CONFIG WRT1 = OFF         ; Write Protection bit (Block 1 (002000-003FFFh)
CONFIG WRT2 = OFF         ; Write Protection bit (Block 2 (004000-005FFFh)
CONFIG WRT3 = OFF         ; Write Protection bit (Block 3 (006000-007FFFh)

; CONFIG6H
CONFIG WRTC = OFF         ; Configuration Register Write Protection bit (C
CONFIG WRTB = OFF         ; Boot Block Write Protection bit (Boot block (0
CONFIG WRTD = OFF         ; Data EEPROM Write Protection bit (Data EEPROM

; CONFIG7L
CONFIG EBTR0 = OFF        ; Table Read Protection bit (Block 0 (000800-001
CONFIG EBTR1 = OFF        ; Table Read Protection bit (Block 1 (002000-003
CONFIG EBTR2 = OFF        ; Table Read Protection bit (Block 2 (004000-005
CONFIG EBTR3 = OFF        ; Table Read Protection bit (Block 3 (006000-007
```



```

; CONFIG7H
CONFIG EBTRB = OFF ; Boot Block Table Read Protection bit (Boot blo

    org 0x00

goto Initial
ISR:
    org 0x08 ; 大致效果：每0.5秒會進入一次interrupt
    COMF LATA ; interrupt會開關LATA一次
    BCF PIR1, TMR2IF ; 離開前記得把TMR2IF清空（清空flag bit）
    RETFIE

Initial:
    MOVLW 0x0F
    MOVWF ADCON1
    CLRF TRISA
    CLRF LATA
    BSF RCON, IPEN
    BSF INTCON, GIE
    BCF PIR1, TMR2IF ; 為了使用TIMER2，所以要設定好相關的TMR2IF、TMR2IE、TMR
    BSF IPR1, TMR2IP
    BSF PIE1, TMR2IE
    MOVLW b'11111111' ; 將Prescale與Postscale都設為1:16，意思是之後每256個週
    MOVWF T2CON ; 而由於TIMER本身會是以系統時脈/4所得到的時脈為主
    MOVLW D'122' ; 因此每256 * 4 = 1024個cycles才會將TIMER2 + 1
    MOVWF PR2 ; 若目前時脈為250khz，想要Delay 0.5秒的話，代表每經過125
    ; 因此PR2應設為 125000 / 1024 = 122.0703125，約等於1

    MOVLW D'00100000'
    MOVWF OSCCON ; 記得將系統時脈調整成250kHz

main:
    bra main

end

```