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Applications of "[Embedded - Microcontrollers](#)"

Details

| | |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Status | Active |
| Core Processor | PIC |
| Core Size | 8-Bit |
| Speed | 4MHz |
| Connectivity | I ² C, SPI, UART/USART |
| Peripherals | Brown-out Detect/Reset, POR, PWM, WDT |
| Number of I/O | 33 |
| Program Memory Size | 7KB (4K x 14) |
| Program Memory Type | OTP |
| EEPROM Size | - |
| RAM Size | 192 x 8 |
| Voltage - Supply (Vcc/Vdd) | 4V ~ 5.5V |
| Data Converters | A/D 8x8b |
| Oscillator Type | External |
| Operating Temperature | 0°C ~ 70°C (TA) |
| Mounting Type | Surface Mount |
| Package / Case | 44-QFP |
| Supplier Device Package | 44-MQFP (10x10) |
| Purchase URL | https://www.e-xfl.com/product-detail/microchip-technology/pic16c74b-04-pq |



TIMER1 MODULE

Timer1 Module Data Sheet Errata

Clarifications/Corrections to the Data Sheet:

In the Device data sheets listed below, the following clarifications and corrections should be noted. Any silicon issues related to the Timer1 Module will be reported in a separate silicon errata. Please check the Microchip web site for any existing issues.

| Device | Data Sheet | Device | Data Sheet | Device | Data Sheet | Device | Data Sheet |
|------------|------------|------------|------------|------------|------------|-------------|------------|
| PIC12F609 | DS41302 | PIC16F716 | DS41206 | PIC18F2321 | DS39689 | PIC18F6585 | DS30491 |
| PIC12HV609 | | PIC16F737 | DS30498 | PIC18F4321 | DS39616 | PIC18F6680 | |
| PIC12F615 | | PIC16F747 | | PIC18F2331 | | PIC18F8585 | |
| PIC12HV615 | | PIC16F767 | | PIC18F2431 | | PIC18F8680 | |
| PIC12F617 | | PIC16F777 | DS41249 | PIC18F4331 | | PIC18F24J10 | DS39682 |
| PIC12F629 | DS41190 | PIC16F785 | | PIC18F4431 | | PIC18F25J10 | |
| PIC12F675 | | PIC16HV785 | DS39598 | PIC18F2439 | DS30485 | PIC18F44J10 | |
| PIC12F635 | DS41232 | PIC16F818 | | PIC18F2539 | | PIC18F45J10 | |
| PIC16F636 | | PIC16F819 | | PIC18F4439 | | PIC18F63J11 | DS39774 |
| PIC16F639 | | PIC16F870 | DS30569 | PIC18F4539 | DS39632 | PIC18F64J11 | |
| PIC12F683 | DS41211 | PIC16F871 | | PIC18F2455 | | PIC18F65J11 | |
| PIC14000 | DS40122 | PIC16F872 | DS30221 | PIC18F2550 | | PIC18F83J11 | |
| PIC16C62A | DS30234 | PIC16F873 | DS30292 | PIC18F4455 | DS39637 | PIC18F84J11 | DS39770 |
| PIC16C63 | | PIC16F874 | | PIC18F4550 | | PIC18F85J11 | |
| PIC16C64A | | PIC16F876 | | PIC18F2480 | | PIC18F63J90 | |
| PIC16C65A | | PIC16F877 | | PIC18F4480 | | PIC18F64J90 | |
| PIC16C66 | | PIC16F873A | DS39582 | PIC18F4580 | DS39636 | PIC18F65J90 | |
| PIC16C67 | | PIC16F874A | | PIC18F2510 | | PIC18F83J90 | DS39663 |
| PIC16C62B | DS35008 | PIC16F876A | | PIC18F2610 | | PIC18F84J90 | |
| PIC16C72A | | PIC16F877A | | PIC18F4510 | | PIC18F85J90 | |
| PIC16C63A | DS30605 | PIC16F882 | DS41291 | PIC18F4610 | DS39631 | PIC18F65J10 | |
| PIC16C65B | | PIC16F883 | | PIC18F2520 | | PIC18F65J15 | DS39663 |
| PIC16C73B | | PIC16F884 | | PIC18F4520 | DS39625 | PIC18F66J10 | |
| PIC16C74B | | PIC16F886 | | PIC18F2585 | | PIC18F66J15 | |
| PIC16C72 | DS30390 | PIC16F887 | DS41250 | PIC18F2680 | | PIC18F67J10 | |
| PIC16C73A | | PIC16F913 | | PIC18F4585 | DS39626 | PIC18F85J10 | |
| PIC16C74A | | PIC16F914 | | PIC18F4680 | | PIC18F85J15 | |
| PIC16C76 | | PIC16F916 | | PIC18F2620 | | PIC18F86J10 | |
| PIC16C77 | | PIC16F917 | | PIC18F4620 | | PIC18F85J15 | |
| PIC16C745 | DS41124 | PIC16F946 | | | | PIC18F87J10 | |
| PIC16C765 | | | | | | | |

TIMER1 MODULE

| Device | Data Sheet | Device | Data Sheet | Device | Data Sheet | Device | Data Sheet | |
|------------|------------|------------|------------|-------------|-------------|-------------|-------------|---------|
| PIC16C773 | DS30275 | PIC17C42A | DS30412 | PIC18F4685 | DS39761 | PIC18F65J50 | DS39775 | |
| PIC16C774 | | PIC17C43 | | PIC18F6390 | DS39629 | PIC18F66J50 | | |
| PIC16C923 | DS30444 | PIC17C44 | PIC18F6490 | PIC18F66J55 | | | | |
| PIC16C924 | | PIC17C752 | PIC18F8390 | PIC18F67J50 | | | | |
| PIC16C925 | DS39544 | PIC17C756A | PIC18F8490 | PIC18F85J50 | | | | |
| PIC16C926 | | PIC17C762 | PIC18F6520 | DS39609 | PIC18F85J55 | | | |
| PIC16F72 | DS39597 | PIC17C766 | PIC18F6620 | | PIC18F87J50 | | | |
| PIC16F73 | DS30325 | PIC18C242 | PIC18F6720 | | PIC18F66J11 | DS39778 | | |
| PIC16F74 | | PIC18C252 | PIC18F8520 | PIC18F66J16 | | | | |
| PIC16F76 | | PIC18C442 | PIC18F8620 | PIC18F67J11 | | | | |
| PIC16F77 | | PIC18C452 | PIC18F8720 | PIC18F86J11 | | | | |
| PIC16F87 | DS30487 | PIC18C601 | DS39541 | PIC18F6525 | DS39612 | | PIC18F86J16 | DS39762 |
| PIC16F88 | | PIC18C801 | | PIC18F6621 | | PIC18F87J11 | | |
| PIC16F610 | DS41288 | PIC18C658 | DS30475 | PIC18F8525 | | PIC18F66J60 | | |
| PIC16HV610 | | PIC18C858 | | PIC18F8621 | PIC18F66J65 | | | |
| PIC16F616 | | PIC18F242 | PIC18F6527 | PIC18F67J60 | | | | |
| PIC16HV616 | DS40044 | PIC18F252 | DS39564 | PIC18F6622 | PIC18F86J60 | | | |
| PIC16F627A | | PIC18F442 | | PIC18F6627 | PIC18F86J65 | | | |
| PIC16F628A | | PIC18F452 | | PIC18F6722 | PIC18F87J60 | | | |
| PIC16F648A | PIC18F248 | PIC18F8527 | | DS39646 | PIC18F96J60 | | | |
| PIC16F630 | DS40039 | PIC18F258 | PIC18F8622 | | PIC18F96J65 | | | |
| PICF676 | | PIC18F458 | PIC18F8627 | | PIC18F97J60 | | | |
| PIC16F631 | DS41262 | PIC18F1220 | DS39605 | | PIC18F8722 | | | |
| PIC16F677 | | PIC18F1320 | | | | | | |
| PIC16F685 | | PIC18F1230 | DS39758 | | | | | |
| PIC16F687 | | PIC18F1330 | | | | | | |
| PIC16F689 | | PIC18F2220 | DS39599 | | | | | |
| PIC16F690 | | PIC18F2330 | | | | | | |
| PIC16F684 | DS41202 | PIC18F4220 | | | | | | |
| PIC16F688 | DS41203 | PIC18F4320 | | | | | | |

1. Asynchronous Counter

When Timer1 is started or updated, the timer needs to see a falling edge from the external clock source before a rising edge can increment the counter. If writes to TMR1H and TMR1L are not completed while the external clock pulse is still high, Timer1 will miss counting the first clock pulse after the update.

When using an external crystal, the pulse width from rising to falling edge is temperature dependent and may decrease with temperature. As a result, the timer may require an additional oscillation to overflow.

Code examples are given for the affected devices:

- PIC12/14/16/17 devices – Example 1 and Example 2
- PIC18 devices – Example 3

Both examples include code to wait for Timer1 to increment twice between the `RTCisr` and `Update` labels.

In PIC18 devices, it is not possible to reliably update Timer1 in a *low-priority* interrupt. A high-priority interrupt could occur at any time and unexpectedly delay the TMR1 update.

PIC18 devices also include Timer3 which is functionally identical to Timer1.

Work around

Switching Timer1 to the main system oscillator after reloading, the timer ensures the timer will see a falling edge before switching back to the external clock source.

Due to the time from Timer1 overflow to the reload being application specific, wait for the timer to increment before beginning the reload sequence. This ensures the timer does not miss a rising edge during reload. The timing of the clock source changing is critical and is detailed in Example 1 and Example 2.

EXAMPLE 1: PIC12/14/16/17 CODE EXAMPLE FOR 1 SECOND OVERFLOW PERIOD WITH 32.786 KHZ OSCILLATOR

```
BTFSC    TMR1L,0
GOTO     $-1
BTFSS    TMR1L,0
GOTO     $-1           ;Timer has just incremented, 31 μs before next rising edge to
                        ;complete reload

Update:

    BCF    T1CON,TMR1CS ;Select system clock for Timer1
    BSF    TMR1H,7      ;Timer1 high byte 0x80
    BCF    T1CON,TMR1ON ;Timer1 off
    BSF    T1CON,TMR1C   ;Select external crystal
    BSF    T1CON,TMR1ON ;Timer1 on
```

Critical Timing of code sequence for instructions following last write to TMR1L or TMR1H.

TIMER1 MODULE

EXAMPLE 2: PIC12/14/16/17 CODE EXAMPLE FOR OVERFLOW PERIODS OTHER THAN 1 SECOND OR USING AN OSCILLATOR OTHER THAN 32.768 KHZ

```
BTFSC    TMR1L, 0
GOTO     $-1
BTFSS    TMR1L, 0
GOTO     $-1                ;Timer has just incremented, 31µs before next rising
                             edge to complete reload.

BCF       T1CON, TMR1CS      ;Select system clock for Timer1.
MOVWF    TMR1, W             ;Sample low byte of Timer1 before increments.
ADDWF    TMR1_Reload_lo, F   ;Add reload value for low byte
BTFSC    STATUS, C           ;if this generates a carry then
INCF     TMR1_Reload_hi, F   ;modify the reload value for the high byte.

MOVWF    TMR1_Reload_hi, W   ;Reload Timer1 high byte.
MOVWF    TMR1H

MOVWF    TMR1_Reload_lo, W   ;Reload Timer1 low byte.
MOVW     TMR1L

BCF       T1CON, TMR1ON      ;Timer1 off.
BSF       T1CON, TMR1CS      ;Select external crystal.
BSF       T1CON, TMR1ON      ;Timer1 on.
```

Critical Timing of code sequence for instructions.

EXAMPLE 3: PIC18 HIGH-PRIORITY INTERRUPT SERVICE ROUTINE

```
HintVector code 0x0008      ; (3-4Tcy), fixed interrupt latency
goto      HighISR          ; (3Tcy) jump to high priority ISR code

code                ; unprotected code space

HighISR:
    btfss   PIR1,TMR1IF     ; (1Tcy) TMR1 overflow?
    goto    NextISR         ; (2Tcy) No, check another interrupt source

; Insert the next 4 lines of code when TMR1 can not
; be reliably updated before clock pulse goes low
RTCSir:
    btfsc   TMR1L,0         ; wait for TMR1L<0> to become clear
    bra     $-2             ; may already be clear (loops for 0 to 30.5us)
    btfss   TMR1L,0         ; wait for TMR1L<0> to become set
    bra     $-2             ; (loops for 30.5us)

; If TMR1 update can be completed before clock pulse
; goes low, start update here
Update:
    bsf     TMR1H,7         ; reload for next 1 second overflow
    bcf     PIR1,TMR1IF     ; clear flag
    incf    Seconds,F       ; record second
    retfie  FAST

NextISR:                ; Another interrupt source...
    ....                ; code for other interrupts, if needed

retfieFAST
```

REVISION HISTORY

Rev A Document (7/2007)

Initial release of this errata.

Rev B Document (03/2010)

Added PIC12F617 device to the Clarifications/
Corrections to the Data Sheet section.

TIMER1 MODULE

NOTES:

Note the following details of the code protection feature on Microchip devices:

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