
7544 Group

Timer X Operation (Pulse Width Measurement Mode)

1. Abstract

The following article introduces and shows an application example of pulse width measurement mode of timer X.

2. Introduction

The explanation of this issue is applied to the following condition:

Applicable MCU: 7544 Group

3. Contents

Outline: "H" level width of pulse input to P14/CNTR₀ pin is counted.

Specifications: The "H" level width of a FG pulse input to the P14/CNTR₀ pin is counted. An underflow is detected by the timer X interrupt. The completion of "H" level of input pulse is detected by the CNTR₀ interrupt.

Operation clock: $f(X_{IN}) = 4.19 \text{ MHz}$, high-speed mode

Example: When $f(X_{IN}) = 4.19 \text{ MHz}$, the count source becomes $3.8 \mu\text{s}$ divided by 16. Measurement can be made up to 250 ms in the range of "FFFF₁₆" to "0000₁₆".

3.1 Connection of Timer and Setting of Division Ratio

Figure 1 shows the connection of timer and setting of division ratio.

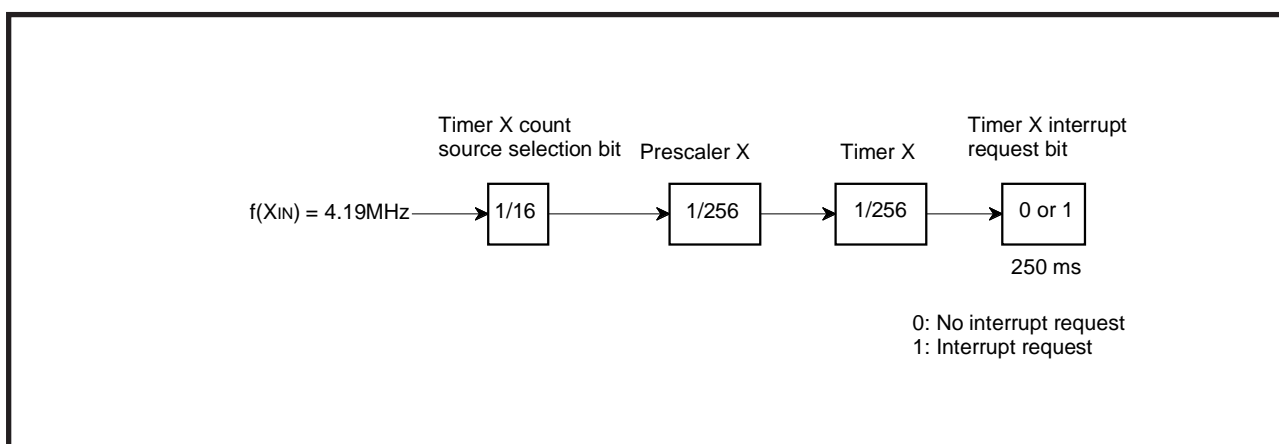


Figure 1 Connection of timer and setting of division ratio

3.2 Example of Control Procedure

Figure 2 shows an example of control procedure.

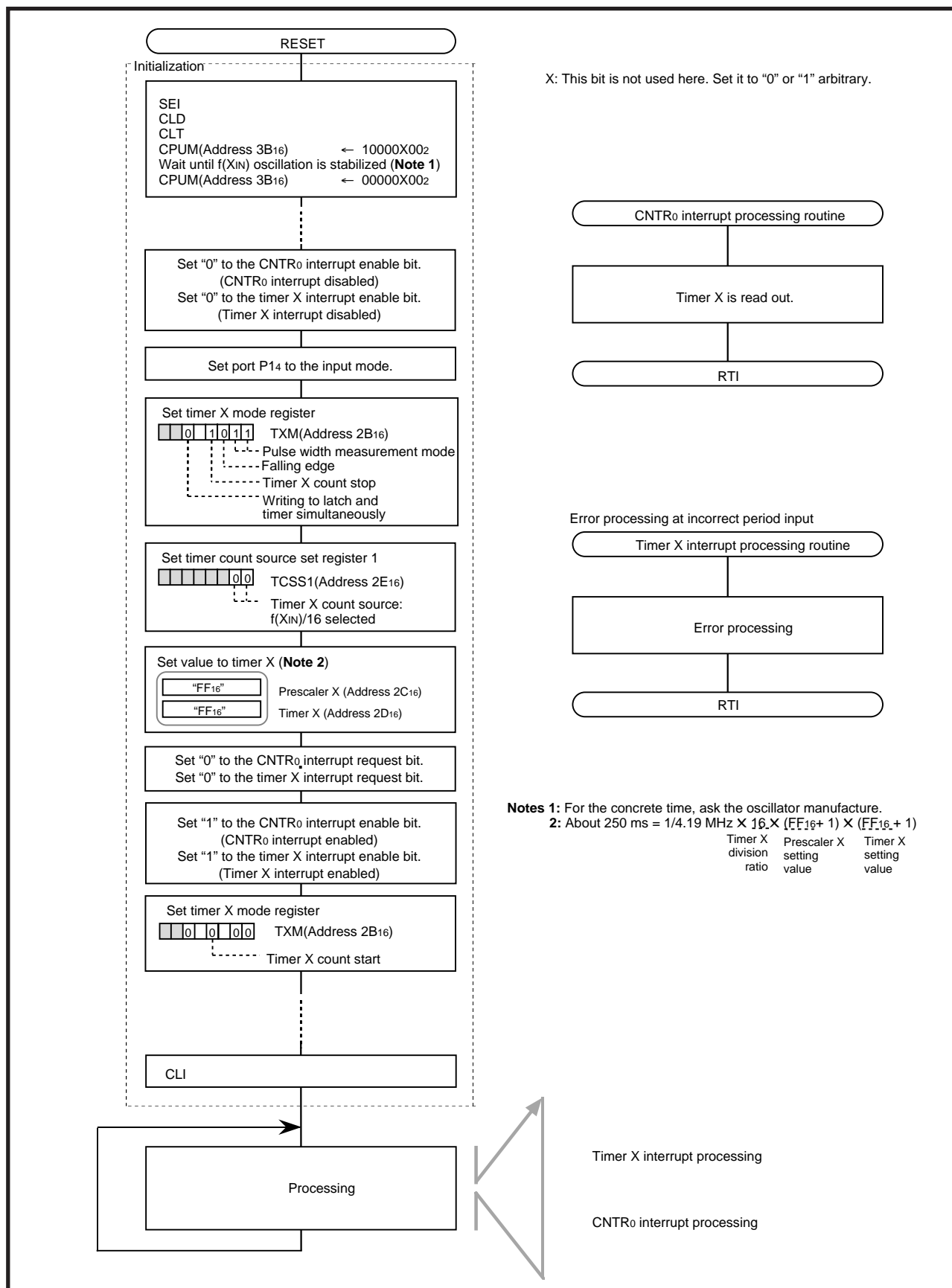


Figure 2 Example of control procedure

4. Sample Programming Code

[Reset Start •• Main Routine Process]

```

RESET:
    SEI                      ; Interrupt disable
    CLD
    CLT
;
    LDX #$FF                ; Set stack bottom
    TXS
;
    LDM #%10000000,CPUM     ; Set CPU mode register
;
; Wait f(XIN) oscillation stabilizing time
;
    LDM #%00000000,CPUM     ; Set CPU mode register
;
    LDA #0
    LDX #>RAM_top
RAM_clear:
    STA $00,X
    INX
    BNE RAM_clear
;
    CLB 5,ICON1             ; CNTR0 interrupt disable
    CLB 7,ICON1             ; TimerX interrupt disable
;
    LDM #%00000000,P1D     ; set P1_4 pin input mode
;
    LDM #%00001011,TXM     ; pulse width measurement mode
                          ; CNTR0 interrupt priority : falling edge
                          ; stop timer X count
;
    LDM #%00000000,TCSS1   ; select timer X count source : f(XIN)/16
;
    LDM #$FF,PREX          ; Set Prescaler X
    LDM #$FF,TX            ; Set Timer X
                          ; maximum measurement value 250ms
;
    CLB 5,IREQ1            ; clear CNTR0 interrupt request
    CLB 7,IREQ1            ; clear timer X interrupt request
    SEB 5,ICON1            ; enable CNTR0 interrupt
    SEB 7,ICON1            ; enable TimerX interrupt
;
    CLB 3,TXM              ; start timer X count
;
    CLI
;
__MAIN:
    ;
    ;   process
    ;
    BRA __MAIN
;

```

Figure 3 Sample Programming Code (1)

[CNTR0 Interrupt Process]

```

__INT_cntr0:
    CLD
    CLT
    PHA

;
    SEB 3,TXM                ; stop timer X count
;
    LDA PREX
    STA RESULT+0
    LDA TX
    STA RESULT+1
;
    LDM #$FF,PREX            ; set prescaler X
    LDM #$FF,TX              ; Set TimerX initial data
;
    CLB 3,TXM                ; start timer X count
;
    PLA
    RTI
;

```

[Timer X Interrupt Process]

```

__INT_timerX:
    CLD
    CLT
    PHA

;
; error process
;

    PLA
    RTI
;

```

Figure 4 Sample Programming Code (2)

5. Reference

Data Sheet
7544 Group Data sheet
7544 Group Data sheet (QzROM Version)

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REVISION HISTORY	7544 Group Timer X Operation (Pulse Width Measurement Mode)
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		Page	Summary
1.00	Apr 01, 2003	-	First Edition issued
2.00	Nov 12, 2004	4-5	Sample Programming Code added.

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