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April 1st, 2010
Renesas Electronics Corporation

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7544 Group

Timer X Operation (Pulse Output Mode)

1. Abstract

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

2. Introduction

The explanation of this issue is applied to the following condition:
Applicable MCU: 7544 Group

3. Contents

Outline: The pulse output mode of timer X is used for a piezoelectric buzzer output.

Specifications: The rectangular waveform which is clock f(X_{IN}) = 4 MHz divided up to 4 kHZ is output from the $P1_4$/$CNTR_0$ pin.
The level of the $P1_4$/$CNTR_0$ pin is fixed to “H” while a piezoelectric buzzer output is stopped.
Operation clock: f(X_{IN}) = 4 MHz, double-speed mode

3.1 Example of Peripheral Circuit

Figure 1 shows an example of a peripheral circuit.

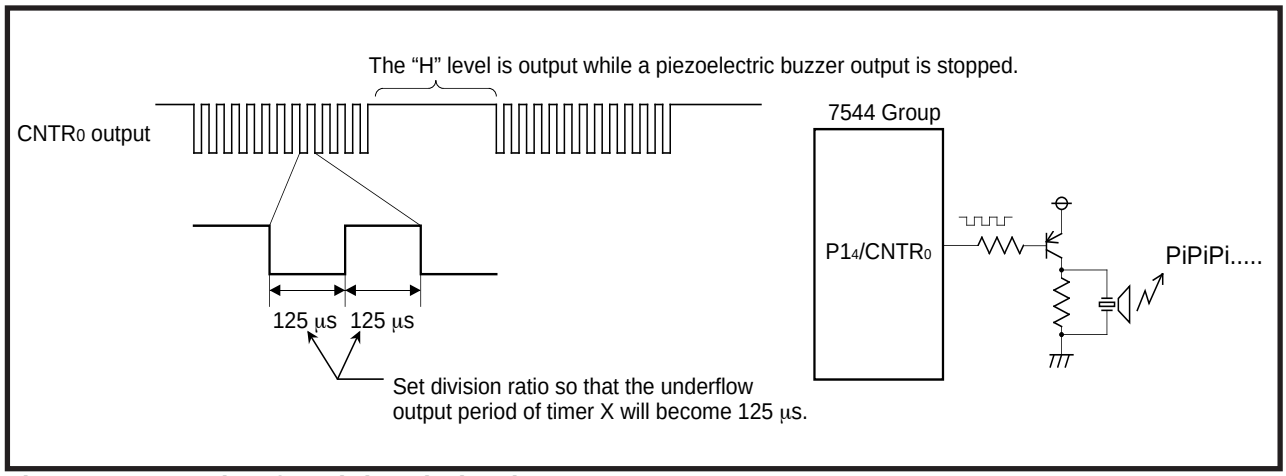


Figure 1 Example of peripheral circuit

3.2 Connection of Timer and Setting of Division Ratio

Figure 2 shows the connection of timer and setting of the division ratio.

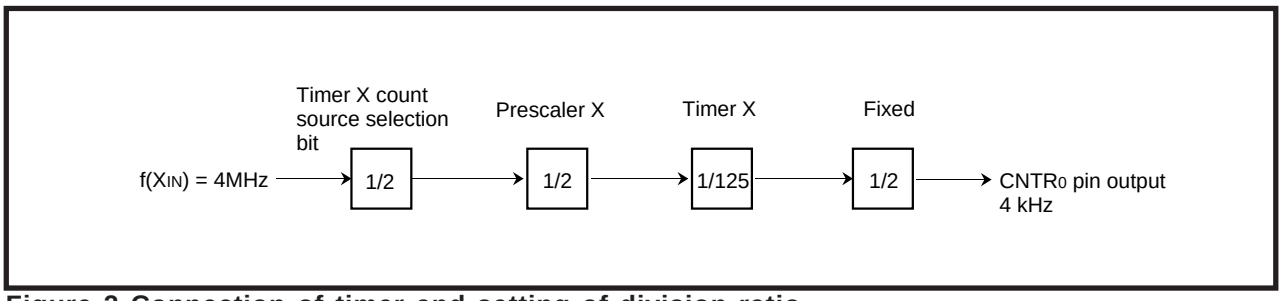
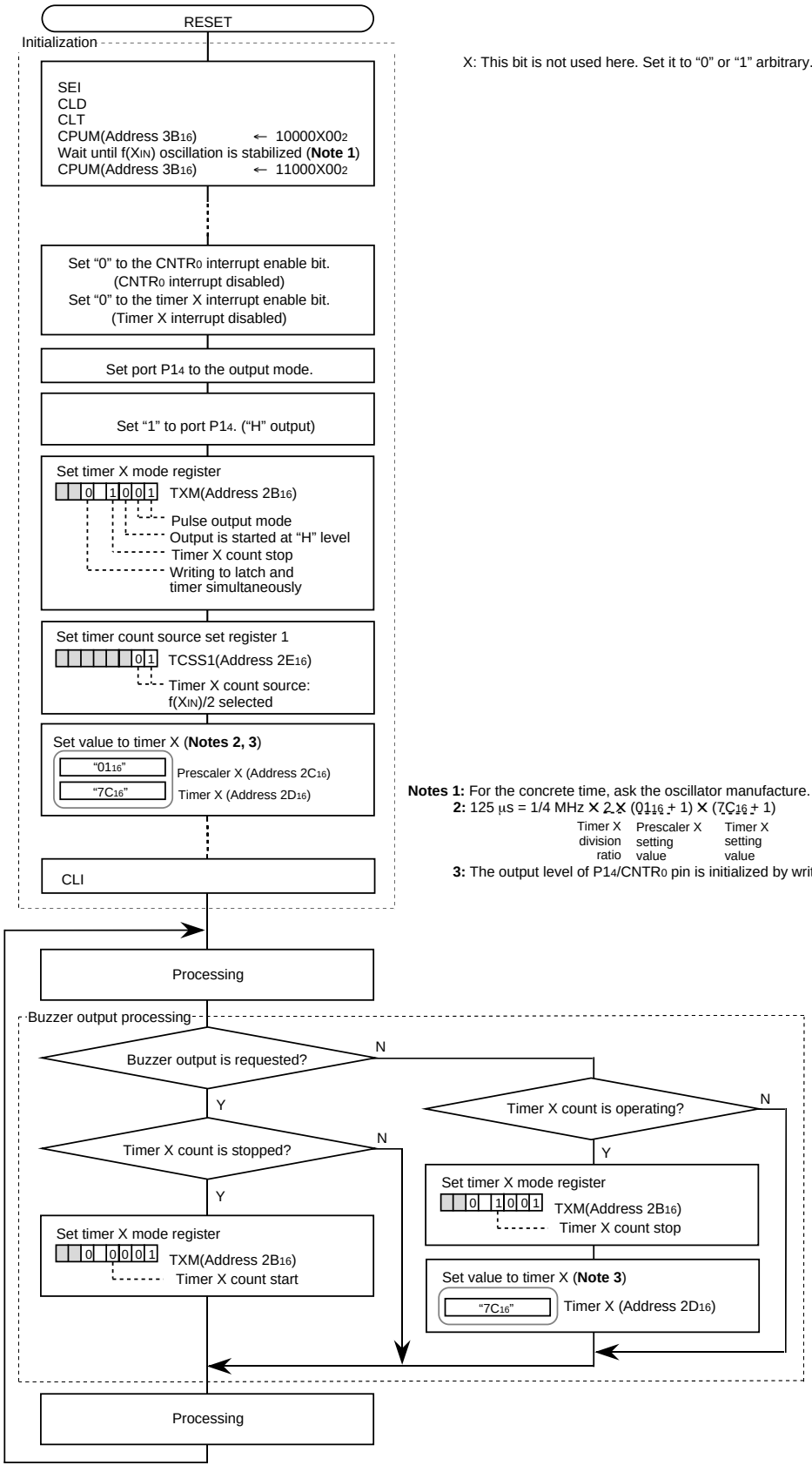


Figure 2 Connection of timer and setting of division ratio

3.3 Example of Control Procedure

Figure 3 shows an example of control procedure.



X: This bit is not used here. Set it to "0" or "1" arbitrary.

Notes 1: For the concrete time, ask the oscillator manufacture.

2: 125 μs = 1/4 MHz × 2 × (01_{16} + 1) × ($7C_{16}$ + 1)

Timer X division ratio | Prescaler X setting value | Timer X setting value

3: The output level of P14/CNTR0 pin is initialized by writing to timer X.

Figure 3 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  #%11000000,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  #%00010000,P1D
          SEB  P1_4
;
          LDM  #%00001001,TXM     ; Set Timer X mode register
;
          LDM  #%00000001,TCSS1   ; select timer X count source : f(Xin)/2
;
          LDM  #$01,PREX          ; Set Prescaler X
          LDM  #$7C,TX            ; Set Timer X
;

__MAIN:
          BBS  f_REQ_BUZZ,__MAIN_00
          BBS  3,TXM,__MAIN_10
          SEB  3,TXM              ; stop timer X count
          LDM  #$01,PREX          ; Set Prescaler X
          LDM  #$7C,TX            ; Set Timer X
          BRA  __MAIN_10
;
__MAIN_00:
          BBC  3,TXM,__MAIN_10
          CLB  3,TXM              ; start timer X count
;
__MAIN_10:
               ;
               ;   process
               ;
          BRA  __MAIN
;
```

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 Output Mode)

Rev.	Date	Description	
		Page	Summary
1.00	Apr 01, 2003	-	First Edition issued
2.00	Nov 12, 2004	4	Sample Programming Code added.

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