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April 1st, 2010
Renesas Electronics Corporation

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M16C/62A Group

Operation of Timer A (one-shot timer mode, external trigger)

1.0 Abstract

In one-shot timer mode, choose functions from those listed in Table 1. Operations of the circled items are described below.

Table 1. Chosen functions

Item	Set-up
Count source	○ Internal count source ($f_1 / f_8 / f_{32} / f_{c32}$)
Pulse output function	No pulses output
	○ Pulses output
Count start condition	External trigger input (falling edge of input signal to the TAI _{IN} pin)
	○ External trigger input (rising edge of input signal to the TAI _{IN} pin)
	Timer overflow (TB2/TA _j /TAK overflow)
	Writing "1" to the one-shot start flag

Note: $j = i - 1$, but $j = 4$ when $i = 0$; $k = i + 1$, but $k = 0$ when $i = 4$.

2.0 Introduction

Operation (1) If the TAI_{IN} pin input level changes from "L" to "H" with the count start flag set to "1", the counter performs a down count on the count source. At this time, the TAI_{OUT} pin output level goes to "H" level.

(2) If the value of the counter becomes "0000₁₆", the TAI_{OUT} pin outputs an "L" level, and the counter reloads the content of the reload register and stops counting. At this time, the timer Ai interrupt request bit goes to "1".

(3) If a trigger occurs while a count is in progress, the counter reloads the value of the reload register again and continues counting. The reload timing is in step with the next count source input after the trigger.

(4) Setting the count start flag to "0" causes the counter to stop and to reload the content of the reload register. Also, the TAI_{OUT} pin outputs an "L" level. At this time, the timer Ai interrupt request bit goes to "1".

Note • When the timer Ai register is set to "0000₁₆", the counter does not operate and the timer Ai interrupt request is not generated. When the pulse is set to output, the pulse does not output from the TAI_{OUT} pin.

Figure 1 shows the operation timing

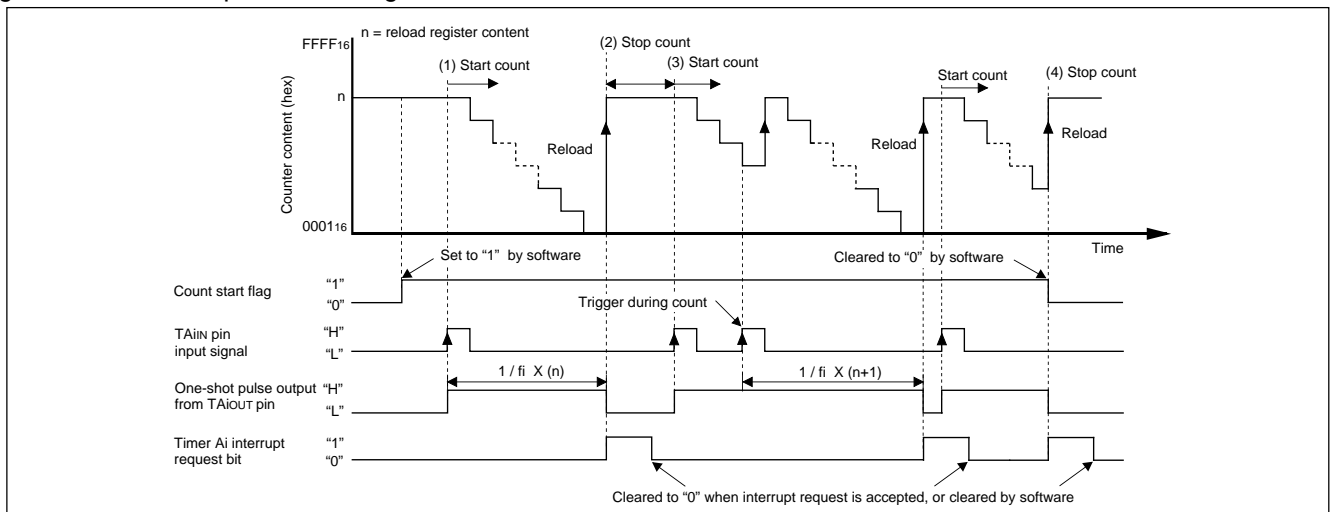


Figure 1. Operation timing of one-shot mode, external trigger

3.0 Set-up procedure

Selecting one-shot timer mode and functions

Timer Ai mode register (i=0 to 4) [Address 0396₁₆ to 039A₁₆]
TAiMR (i=0 to 4)

Selection of one-shot timer mode
Pulse output function select bit
1 : Pulse is output
External trigger select bit
1 : Rising edge of TAiIN pin's input signal
Trigger select bit
1 : Selected by event/trigger select register
0 (Must always be "0" in one-shot timer mode)
Count source select bit

b7	b6	Count source	Count source period	
b7	b6		f(XiN) : 16MHz	f(XcIN) : 32.768kHz
0	0	f1	62.5ns	
0	1	f8	500ns	
1	0	f32	2μs	
1	1	fc32	976.56μs	

Count source select bit
b7 b6
0 0 : f1
0 1 : f8
1 0 : f32
1 1 : fc32

Clearing timer Ai interrupt request bit Refer to 'Precaution for Timer A (one shot timer mode)'

Timer Ai interrupt control register [Address 0055₁₆ to 0059₁₆]
TAiIC (i=0 to 4)

Interrupt request bit

Setting event/trigger select bit

One-shot start flag [Address 0382₁₆]
ONSF

Timer A0 event/trigger select bit
b7 b6
0 0 : Input on TA0IN is selected (Note)

Trigger select register [Address 0383₁₆]
TRGSR

Timer A1 event/trigger select bit
b1 b0
0 0 : Input on TA1IN is selected (Note)

Timer A2 event/trigger select bit
b3 b2
0 0 : Input on TA2IN is selected (Note)

Timer A3 event/trigger select bit
b5 b4
0 0 : Input on TA3IN is selected (Note)

Timer A4 event/trigger select bit
b7 b6
0 0 : Input on TA4IN is selected (Note)

Note: Set the corresponding port direction register to "0".

Setting one-shot timer's time

Timer A0 register [Address 0387₁₆, 0386₁₆] TA0
Timer A1 register [Address 0389₁₆, 0388₁₆] TA1
Timer A2 register [Address 038B₁₆, 038A₁₆] TA2
Timer A3 register [Address 038D₁₆, 038C₁₆] TA3
Timer A4 register [Address 038F₁₆, 038E₁₆] TA4

Can be set to 0001₁₆ to FFFF₁₆

Setting clock prescaler reset flag
(This function is effective when fc32 is selected as the count source. Reset the prescaler for generating fc32 by dividing the XcIN by 32.)

Clock prescaler reset flag [Address 0381₁₆]
CPSRF

Clock prescaler reset flag
0 : No effect
1 : Prescaler is reset (When read, the value is "0")

Setting count start flag

Count start flag [Address 0380₁₆]
TABSR

Timer A0 count start flag
Timer A1 count start flag
Timer A2 count start flag
Timer A3 count start flag
Timer A4 count start flag

Start count

4.0 Programming Code

```

;*****
;
; M16C/62A Program Collection
;
; FILE NAME : rjj05b0038_src.a30
; CPU       : M16C/62A Group
; FUNCTION  : Operation of Timer A
;            (one-shot timer mode, external trigger)
;
; Copyright(C)2003, Renesas Technology Corp.
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;
;*****
;*****
; Include
;*****
; .LIST      OFF           ;Stops outputting lines to the assembler list file
; .INCLUDE   sfr62a.inc    ;Reads the file that defined SFR
; .LIST      ON            ;Starts outputting lines to the assembler list file
;
;*****
; Symbol definition
;*****
ROM_TOP      .EQU    0F8000H ;Start address of ROM
FIXED_VECT_TOP .EQU  0FFFDCH ;Start address of fixed vector
;
;*****
; Program area
;*****
;=====
; Start up
;=====
; .SECTION   PROGRAM, CODE ;Declares section name and section type
; .ORG      ROM_TOP        ;Declares start address
RESET:
MOV.B      #03H, prcr      ;Removes protect
; Set processor mode registers 0 and 1
MOV.B      #00000000B, pm0 ; Single-chip mode
MOV.B      #00000000B, pm1 ; No expansion, No wait
; Set system clock control registers 0 and 1
MOV.B      #00001000B, cm0 ; Xcin-Xcout High
MOV.B      #00100000B, cm1 ; Xin-Xout High, Main clock is No divison
MOV.B      #00H, prcr      ;Protects all registers
;

```

```

=====
;
;   TimerA (one-shot timer mode,external trigger selected)
;=====
MOV.B   #01011110B, talmr ;Selecting one-shot timer mode and functions
;
;       |||||++-----;Selection of one-shot timer mode
;       |||||+-----;Pulse output function select bit (1:Pulse is output)
;       ||||+-----;Rising edge of TA1IN pin's input signal
;       |||+-----;Trigger select bit
;       |||              (1:Selected by event/trigger select register
;       ||+-----;Must always be "0" in one-shot timer mode
;       ++-----;Count source (01:f8)
MOV.B   #00000000B, talic ;Clearing timerA1 interrupt request bit
;
;       +-----;Interrupt request bit
MOV.B   #00000000B, trgsr ;Setting event/trigger select bit
;
;       ++-----;(00:Input on TA1IN is selected) (Note)
BCLR   pd7_3              ;(Note) Set the corresponding port direction register to 0
MOV.W   #2000, tal        ;Setting one-shot timer's time
MOV.B   #00000000B, cpsrf ;Setting clock prescaler reset flag
;
;       +-----;Clock prescaler reset flag (0:No effect)
MOV.B   #00000010B, tabsr ;Setting count start flag
;
;       +-----;TimerA1 count start flag
;
MAIN:
    JMP   MAIN
;
=====
;
;   Dummy interrupt processing program
;=====
dummy:
    REIT
;
;*****
;
;   Setting of fixed vector
;*****
.SECTION   F_VECT, ROMDATA
.ORG      FIXED_VECT_TOP
;
.LWORD    dummy      ;Undefined instruction interrupt vector
.LWORD    dummy      ;Overflow (INT0 instruction) interrupt vector
.LWORD    dummy      ;BRK instruction interrupt vector
.LWORD    dummy      ;Address match interrupt vector
.LWORD    dummy      ;Single-step interrupt vector
.LWORD    dummy      ;Watchdog timer interrupt vector
.LWORD    dummy      ;DBC interrupt vector
.LWORD    dummy      ;NMI interrupt vector
.LWORD    RESET      ;Sets reset vector
;
.END

```

5.0 Reference

Renesas Technology Corporation Semiconductor Home page
<http://www.renesas.com/>

Technical Support

E-mail: support_apl@renesas.com

Data Sheet

M16C/62A group Rev. C.1
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User's Manual

M16C/62A group Rev. 1.0
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