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April 1st, 2010
Renesas Electronics Corporation

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M16C/62A Group

Operation of Timer A (timer mode, pulse output function)

1.0 Abstract

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

Table 1. Choosed functions

Item	Set-up	
Count source	O	Internal count source(f_1 / f_8 / f_{32} / fc_{32})
Pulse output function		No pulses output
	O	Pulses output
Gate function	O	No gate function
		Performs count only for the period in which the TAi_{IN} pin is at "L" level
		Performs count only for the period in which the TAi_{IN} pin is at "H" level

2.0 Introduction

Operation (1) Setting the count start flag to "1" causes the counter to perform a down count on the count source.

(2) If an underflow occurs, the content of the reload register is reloaded and the count continues. At this time, the timer Ai interrupt request bit goes to "1". Also, the output polarity of the TAi_{OUT} pin reverses.

(3) Setting the count start flag to "0" causes the counter to hold its value and to stop. Also, the TAi_{OUT} pin outputs an "L" level.

Figure 1 shows the operation timing

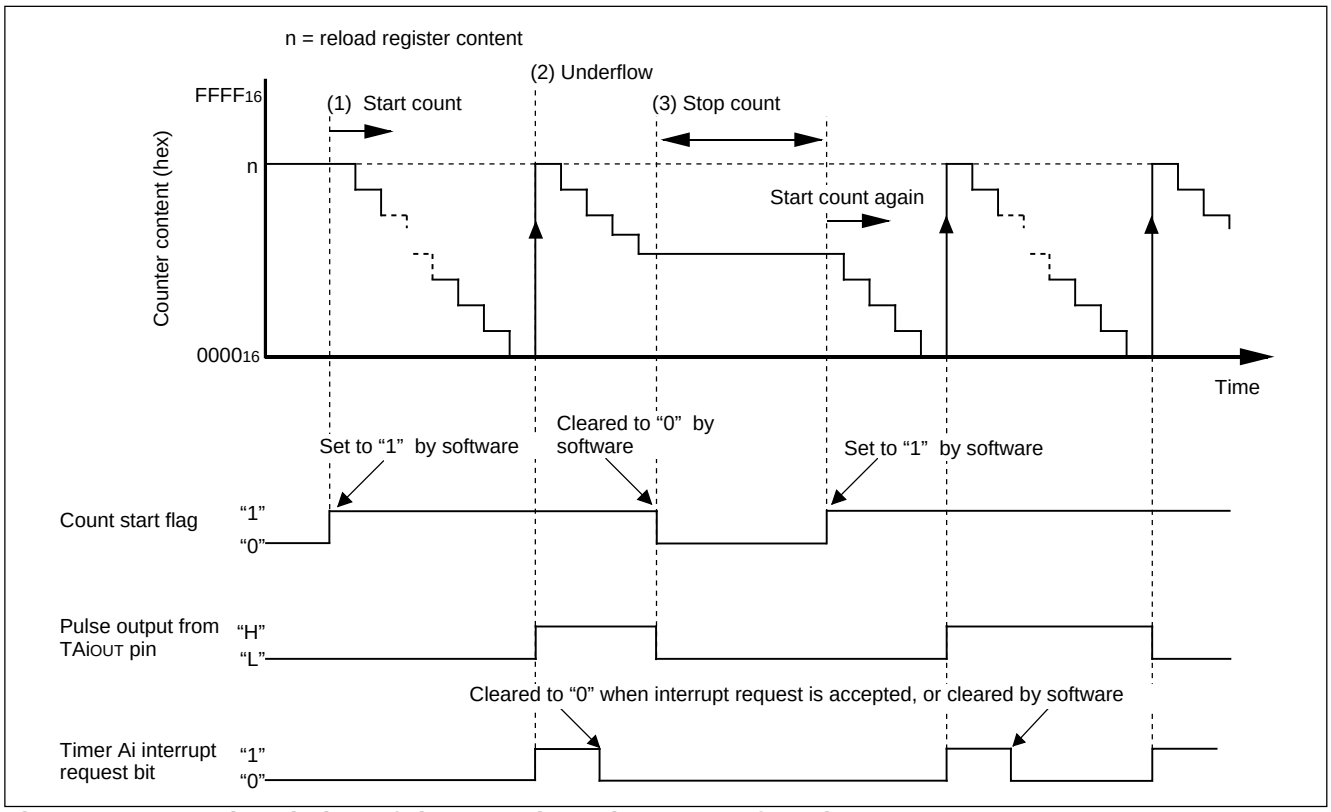
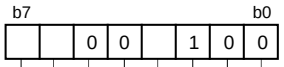


Figure 1. Operation timing of timer mode, pulse output function

3.0 Set-up procedure

Selecting timer mode and functions



Timer Ai mode register (i=0 to 4) [Address 0396_{16} to $039A_{16}$]
TAiMR (i=0 to 4)

Selection of timer mode

1 : Pulse is output (Note) (TAiOUT pin is a pulse output pin)

Gate function select bit

b4 b3
0 0 :
0 1 : } Gate function not available (TAiIN pin is a normal port pin)

0 (Must always be "0" in timer mode)

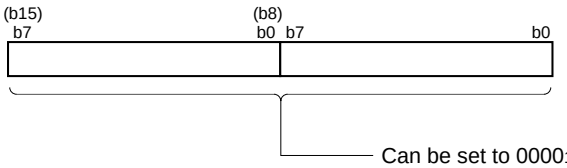
Count source select bit

b7 b6
0 0 : f_1
0 1 : f_8
1 0 : f_{32}
1 1 : fc_{32}

b7	b6	Count source	Count source period f(X_{IN}) : 16MHz f(X_{CIN}) : 32.768kHz
0	0	f_1	62.5ns
0	1	f_8	500ns
1	0	f_{32}	2µs
1	1	fc_{32}	976.56µs

Note: The settings of the corresponding port register and port direction register are invalid.

Setting counter value

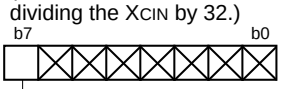


Timer A0 register [Address 0387_{16}, 0386_{16}] TA0
Timer A1 register [Address 0389_{16}, 0388_{16}] TA1
Timer A2 register [Address $038B_{16}$, $038A_{16}$] TA2
Timer A3 register [Address $038D_{16}$, $038C_{16}$] TA3
Timer A4 register [Address $038F_{16}$, $038E_{16}$] TA4

Can be set to 0000_{16} to $FFFF_{16}$

Setting clock prescaler reset flag

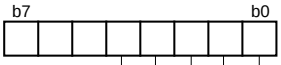
(This function is effective when fc_{32} is selected as the count source. Reset the prescaler for generating fc_{32} by dividing the X_{CIN} by 32.)



Clock prescaler reset flag [Address 0381_{16}]
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 0380_{16}]
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 : rjj05b0032_src.a30
;   CPU       : M16C/62A Group
;   FUNCTION  : Operation of Timer A
;               (timer mode, pulse output function)
;   HISTORY   : 2003.05.16  Ver 1.00
;
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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 (timer mode,pulse output function selected)
;=======================================================================
        MOV.B    #01000100B, ta1mr  ;Selecting timer mode and functions
;                 ||||||++---------;Selection of timer mode
;                 |||||+-----------;Pulse output function select bit (1:Pulse is output)
;                 |||++------------;Gate function select bit (00:Gate function not available)
;                 ||+--------------;Must always be "0" in timer mode
;                 ++---------------;Count source (01:f8)
        MOV.W    #2000-1, ta1       ;Setting counter value (1msec @16MHz, f8)
        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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