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April 1st, 2010
Renesas Electronics Corporation

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M16C/Tiny Series

Operation of Timer A (Timer Mode)

1. Abstract

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

Table 1. Chosed Functions

Item	Set-up	
Count source		f1 or f2
	Yes	f8
		f32
		fC32
Pulse output function	Yes	No pulses output
		Pulses output
Gate function	Yes	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. Introduction

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

Applicable MCU: M16C/26, M16C/26A, M16C/28, M16C/29 Group

This program can also be used when operating other microcomputers within the M16C family, provided they have the same SFR (Special Function Registers) as the M16C/26, M16C/26A, M16C/28, M16C/29 microcomputers. However, some functions may have been modified.

Refer to the User's Manual for details. Use functions covered in this Application Note only after careful evaluation.

3. Operation of Timer A

- (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".
- (3) Setting the count start flag to "0" causes the counter to hold its value and to stop.

Figure 1 shows the operation timing of timer mode.

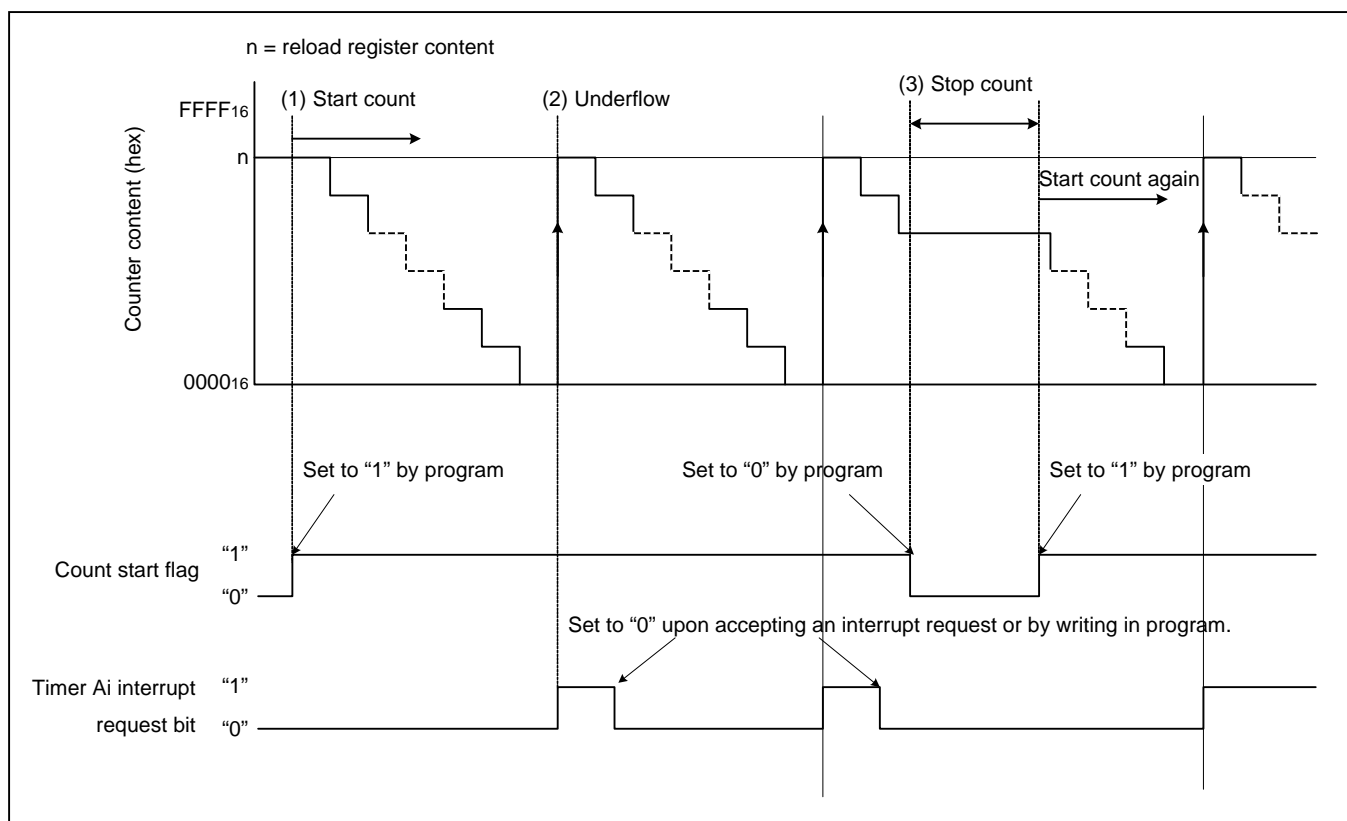
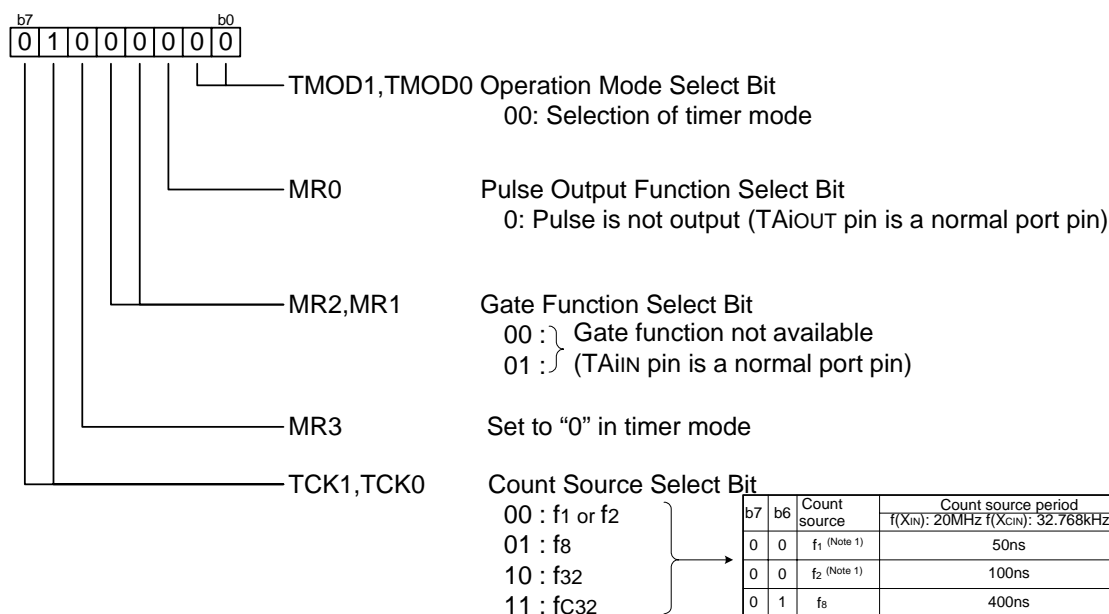


Figure 1. Operation Timing of Timer Mode

3.1 Register Setting

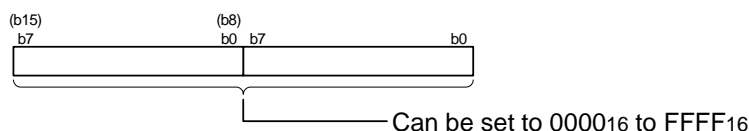
To enable the operation defined in “Section 3. Operation of timer A”, the following register settings must be taken place step by step. For detail configuration of each register, please refer to M16C/26 Group hardware manual, M16C/26A Group hardware manual, M16C/28 Group hardware manual, M16C/29 Group hardware manual.

(1) Setting timer Ai mode register (i=0 to 4)



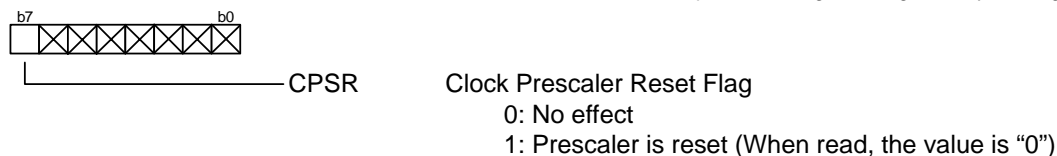
Note 1: Count source is f2 if PCLK0 bit in the PCLKR register is “0”, f1 if PCLK0 bit in the PCLKR register is “1”.

(2) Setting timer Ai register (i=0 to 4)

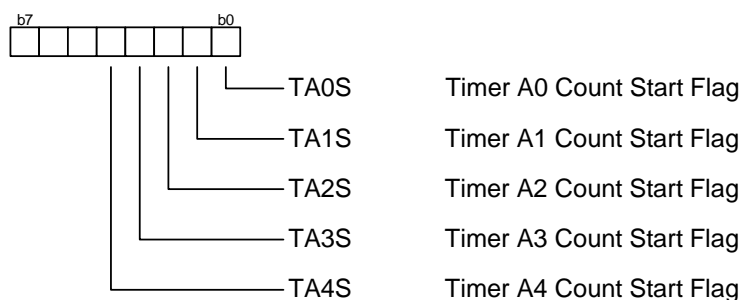


(3) Setting clock prescaler reset flag

(This function is effective when fc32 is selected as the count source. Reset the prescaler for generating fc32 by dividing the XCIN by 32.)



(4) Setting count start flag



4. Sample Program

```

/*****
 *
 *   FILE NAME :
 *   CPU       : M16C/Tiny series
 *   Function  : Operation of Timer A (Timer Mode)
 *   Version   : 1.00
 *
 *   Copyright (C)2004, Renesas Technology Corp.
 *   Copyright (C)2004, Renesas Solutions Corp.
 *
 *****/
/*****
 *   include file
 *****/
#include "sfr28.h"

/*****
 *   main
 *****/
void main(void) {

    talmr = 0x40; /* Selection of timer mode
                  Pulse output function select bit (0:Pulse is not output)
                  Gate function select bit (00:Gate fuction not available)
                  Count source (01:f8) */

    tal = 2500-1; /* Setting counter value (1msec @20MHz, f8) */

    cpsrf = 0; /* Setting clock prescaler reset flag (0:No effect) */

    tals = 1; /* TimerA1 count start */

    while (1) {
    }
}

```

5. Reference

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Hardware Manual

M16C/26, M16C/26A, M16C/28, M16C/29 Group Hardware Manual

(Use the latest version on the home page: <http://www.renesas.com>)

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