

To our customers,

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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## M32C/84, 85, 86, 87, 88 Group

### Timer A Operation in Timer Mode (Gate Function)

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#### 1. Abstract

When the gate function in timer mode is enabled, the timer counts the count value during the level specified by the input level on the TAIIN pin. When the count value underflows, an interrupt request is generated.

#### 2. Introduction

The application example described in this document is applied to the following MCUs and parameter(s):

MCUs: M32C/84 Group  
M32C/85 Group  
M32C/86 Group  
M32C/87 Group  
M32C/88 Group

This program can be used with other M16C Family MCUs which have the same special function registers (SFRs) as the above MCUs. Check the manual for any additions and modifications to functions. Careful evaluation is recommended before using this application note.

### 3. Application Example

This section describes how to count using the timer while the input level on the TAI<sub>i</sub>N pin is held at “H”.

#### 3.1 Example Description

- (1) When the TAI<sub>S</sub> bit in the TABSR register is set to 1 (count started) and the input signal to the TAI<sub>i</sub>N pin is held at “H”, the counter decrements the count source.
- (2) When the input signal to the TAI<sub>i</sub>N pin is held at “L”, the counter holds its count value and stops.
- (3) If the counter underflows, the counter reloads the content of the reload register and continues counting. At the same time, the IR bit in the TAI<sub>i</sub>C register is set to 1 (interrupt requested).
- (4) Setting the TAI<sub>S</sub> bit to 0 (count stopped) causes the counter to hold its count value and to stop.

NOTE: The pulse width of pulses input to the TAI pin should be two or more cycles of the count source.

Figure 1 shows the Timer Mode Operation When Gate Function Selected.

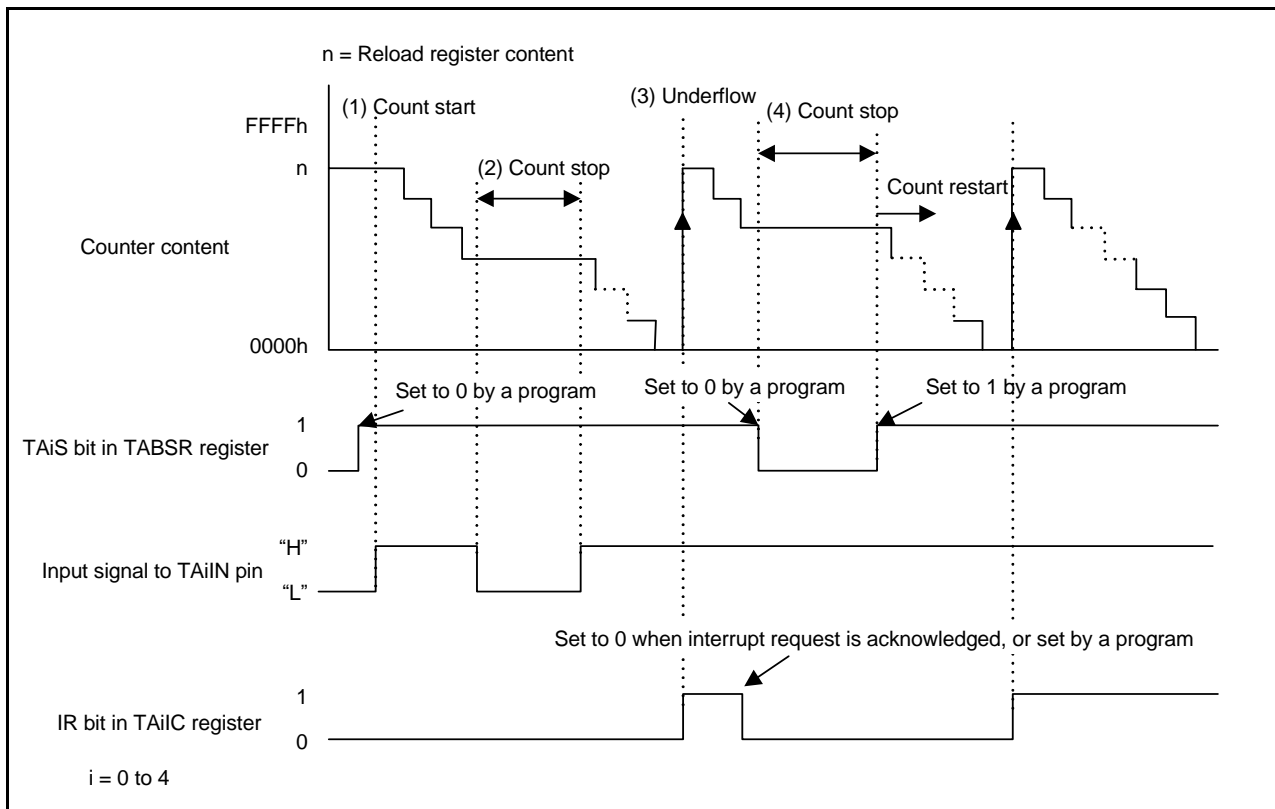


Figure 1 Timer Mode Operation When Gate Function Selected

### 3.2 Setup

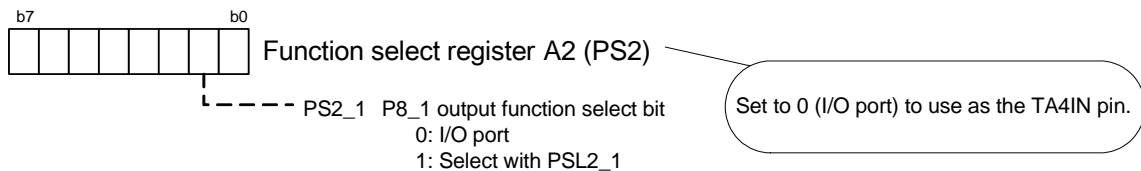
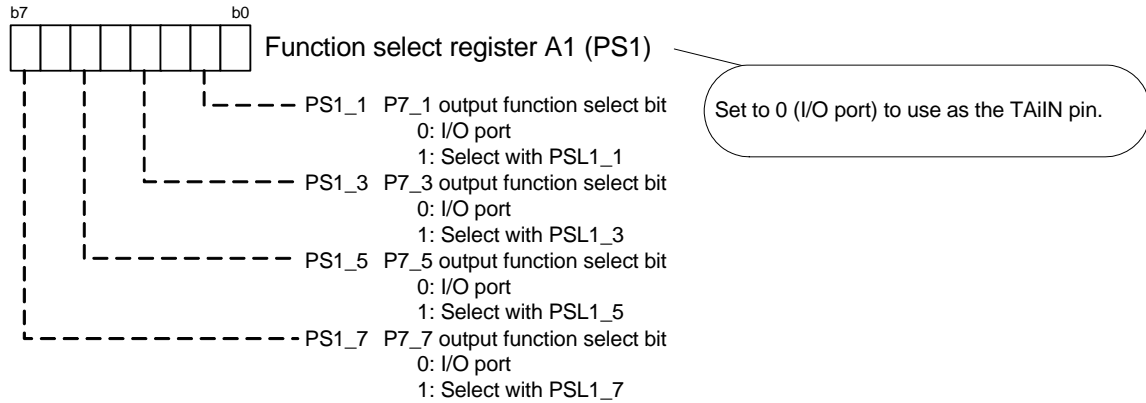
This section shows the setting steps and values to perform the application example described in

#### 3.1 Example Description.

Refer to the each MCUs Hardware Manuals for details of individual registers.

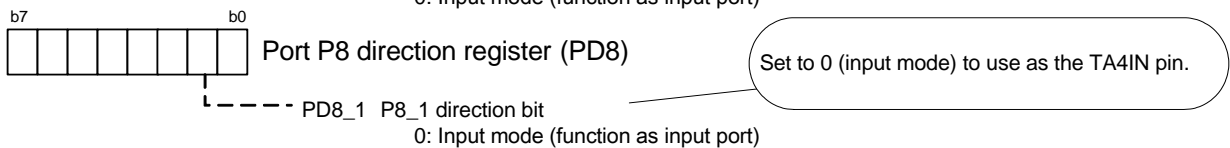
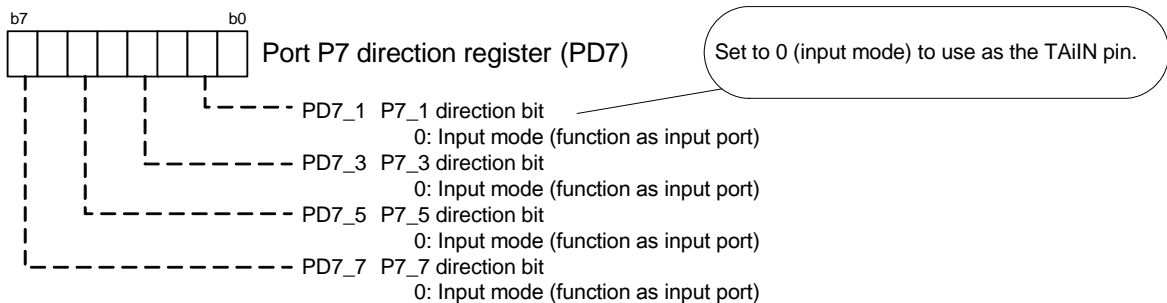
#### (1) Set the function select registers

The TAIIN pins are assigned to P7\_1 (TA0IN), P7\_3 (TA1IN), P7\_5 (TA2IN), P7\_7 (TA3IN), and P8\_1 (TA4IN).  
Select I/O ports using the function select registers.



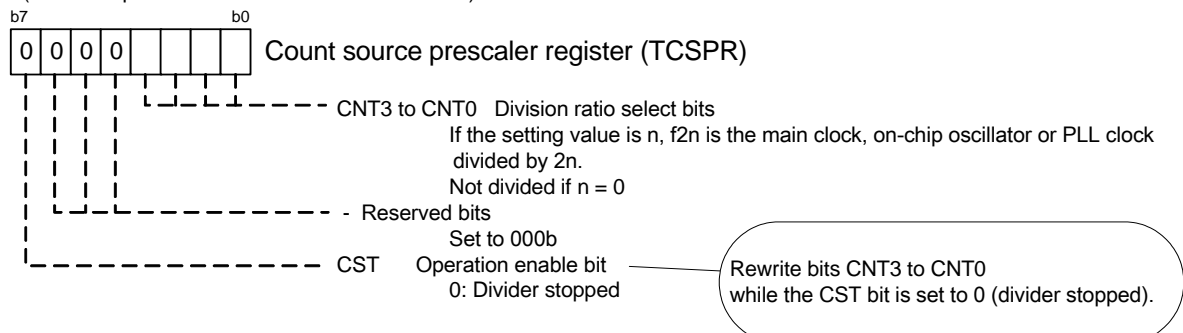
#### (2) Set the port P7 register and the port P8 direction register

Set the pin to use as the TAIIN pin to an input port.

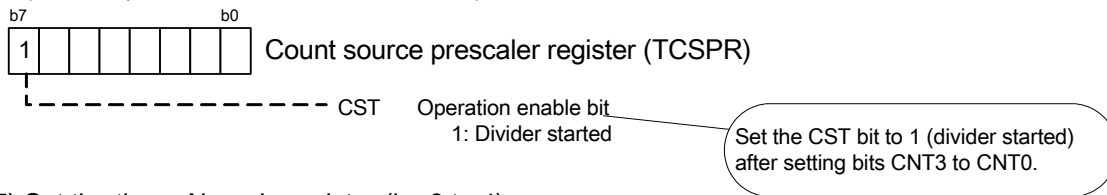


#### (3) Set the count source prescaler register

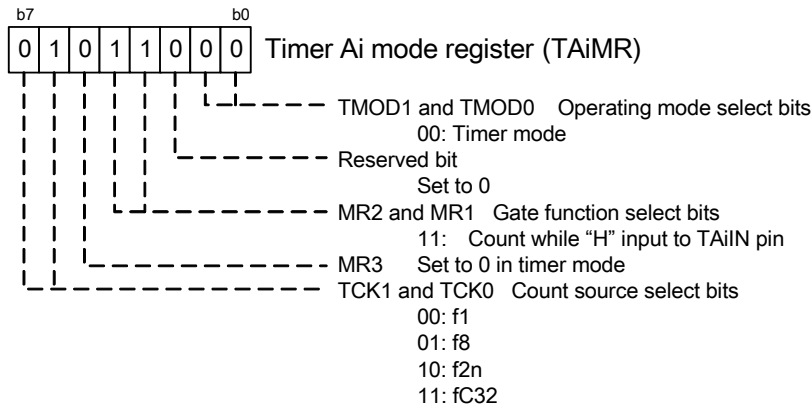
(This is required to use f2n as the count source.)



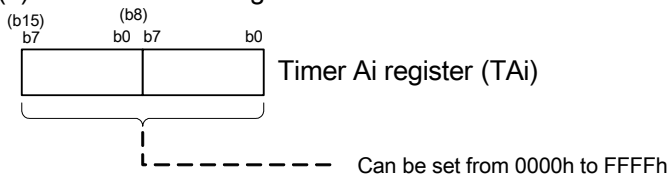
- (4) Set the count source prescaler register (divider operation)  
(This is required to use f2n as the count source.)



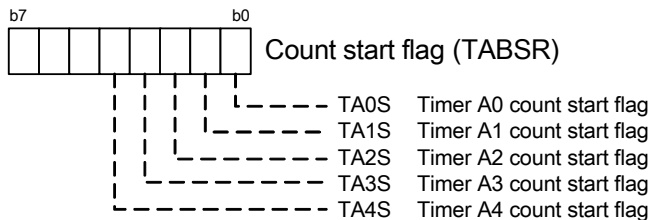
- (5) Set the timer Ai mode register (i = 0 to 4)



- (6) Set the timer Ai register



- (7) Set the count start flag



#### 4. Sample Programming Code

A sample program can be downloaded from the Renesas Technology website.  
For download, click “Application Notes” in the left-hand side menu of the M16C Family page.

#### 5. Reference Documents

Hardware Manuals

M32C/84 Group Hardware Manual

M32C/85 Group Hardware Manual

M32C/86 Group Hardware Manual

M32C/87 Group Hardware Manual

M32C/88 Group Hardware Manual

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REVISION HISTORY	M32C/84, 85, 86, 87, 88 Group Timer A Operation in Timer Mode (Gate Function)
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Rev.	Date	Description	
		Page	Summary
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