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April 1st, 2010
Renesas Electronics Corporation

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R32C/100 Series

Timer B Operation in Pulse-width Measurement Mode

1. Abstract

The functions listed in **Table 3.1** can be selected in pulse-period measurement mode or pulse-width measurement mode. The operation with the functions denoted with an “O” in **Table 3.1** is described in this document. The operation timing is shown in **Figure 4.1**, and the setting procedure for this operation is described in chapter 5. “**Setting**”. The reference program is based on the settings found in chapter 5. “**Setting**”. The example assumes a timer B0 interrupt is used.

2. Introduction

The application described in this document applies to the following MCU:

- MCU: R32C/118 Group

This program can be used with other R32C/100 Series MCUs which have the same special function registers (SFRs) as the R32C/118 Group. Check the manual for any additions or modifications to functions. Careful evaluation is recommended before using this application note.

3. Functions

Table 3.1 Functions Described in This Document

Function	Description	
Count source	O	Internal count source: f1, f8, f2n, or fC32
Measurement mode		Pulse-period measurement when pulse is between falling edges.
		Pulse-period measurement when pulse is between rising edges.
	O	Pulse-width measurement when pulse is either between a falling edge and a rising edge, or between a rising edge and a falling edge.

4. Operation

- (1) After setting the count start flag to 1, the counter starts counting the count source.
- (2) When the pulse to be measured changes from high to low, the counter value becomes 0000h, and measurement starts. At this point, the reload register transfers an undefined value. A timer Bi interrupt request (i =0 to 5) is not generated.
- (3) When the measured pulse again changes from high to low, the counter value is transferred to the reload register, and the timer Bi interrupt request flag becomes 1. Then, the counter value becomes 0000h and measurement starts again.

Supplemental Information

- The timer Bi interrupt request flag becomes 1 when the active edge of the measured pulse is input, or when timer Bi overflows. The interrupt request source can be determined with the timer Bi overflow flag in the interrupt routine.
- The counter value is undefined when the count starts. Therefore, after the count starts, the timer Bi overflow flag may become 1 before the active edge is input, and a timer Bi interrupt request may be generated.
- After reset, the timer Bi overflow flag is undefined. The timer Bi overflow flag becomes 0 when writing to the timer Bi mode register while the count start flag is 0. The timer Bi overflow flag cannot be set to 1 by the user.
- Set the TBiIN pin associated with the function select register to 00h (I/O port), and set the direction register to 0 (input port).

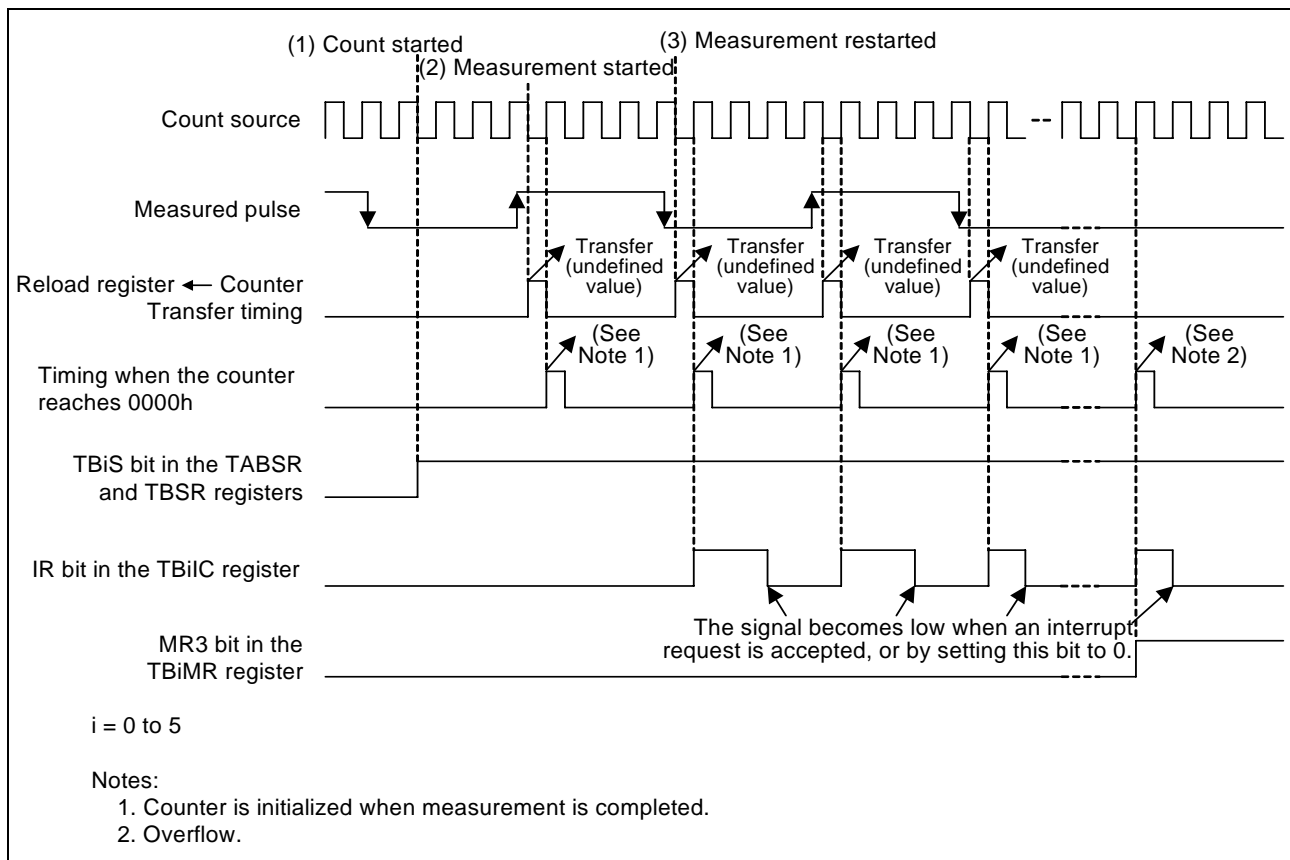
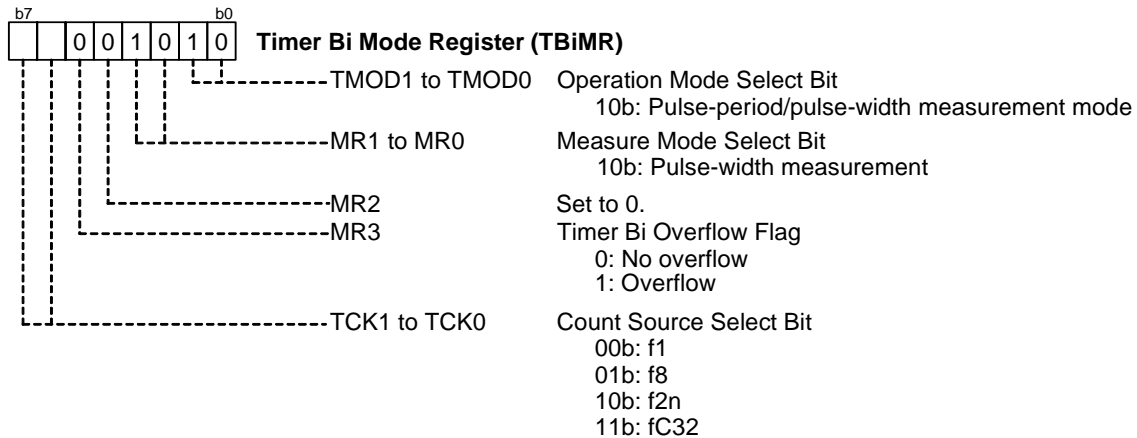


Figure 4.1 Operation Timing Diagram in Pulse-width Measurement Mode

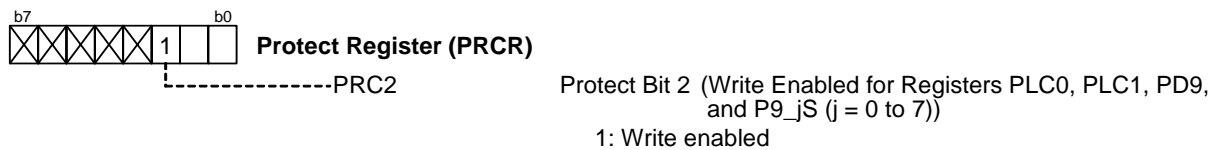
5. Setting

(1) Set the timer Bi register (i = 0 to 5).

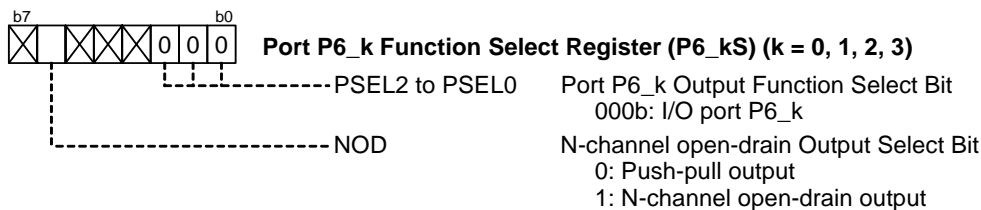
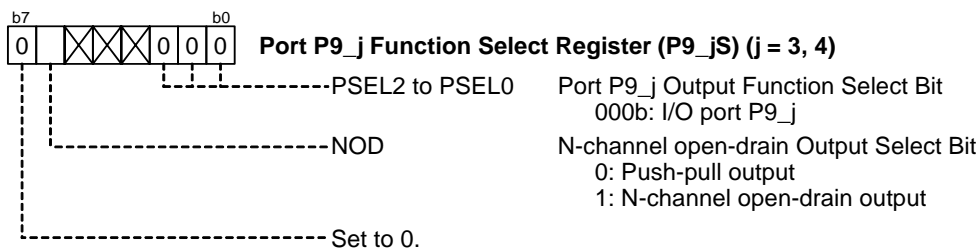


(2) Set the function select register. The TBiIN pin is assigned to P6_0 (TB0IN), P6_1 (TB1IN), P6_2 (TB2IN), P9_3 (TB3IN), P9_4 (TB4IN), and P6_3 (TB5IN). Set the output function select bit in the function select register to 000b (I/O port).

When Using P9_3 (TB3IN) and P9_4 (TB4IN)



Set the PRC2 bit to 1 (write enabled). With the next instruction, rewrite the P9_jS register. Do not generate an interrupt or perform DMA transfer between setting the PRC2 bit to 1 and rewriting the P9_jS register.

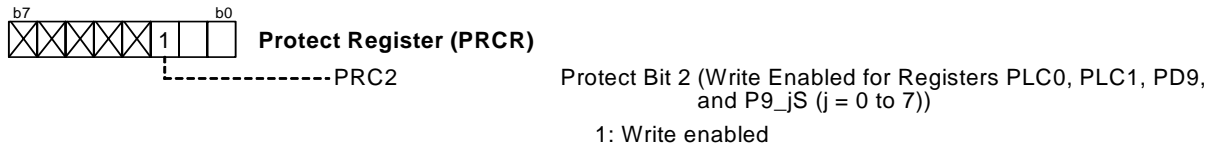


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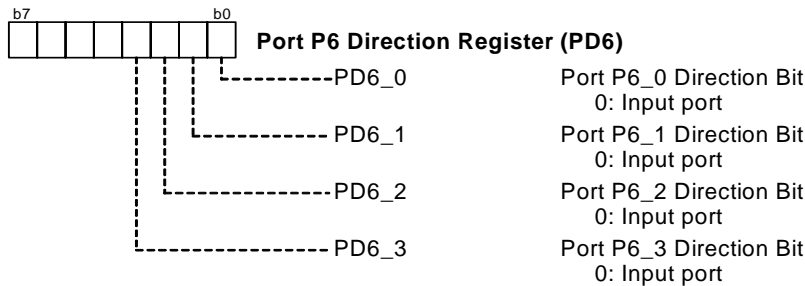
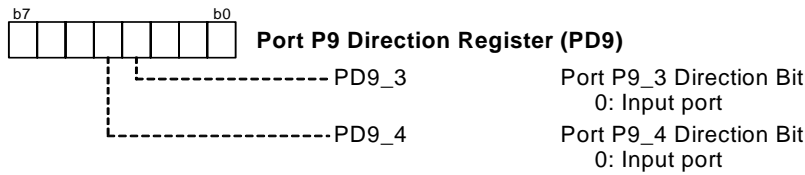
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(4) Set port P6 and P9 direction registers. Set the pin to be used as the TBiIN pin (i = 0 to 5) as an input port.

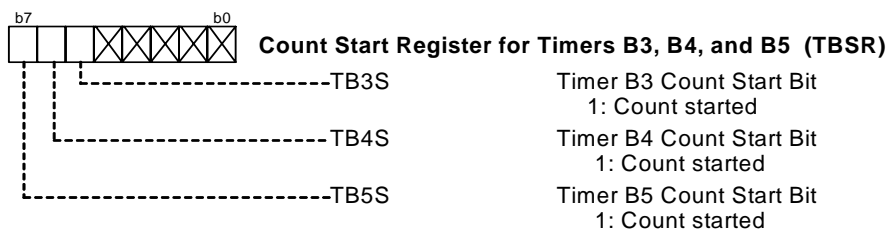
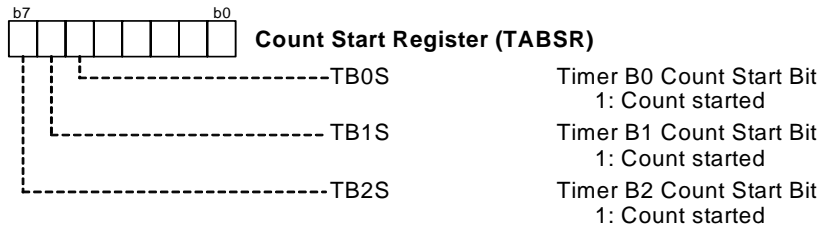
When Using P9_3 (TB3IN) and P9_4 (TB4IN)



Set the PRC2 bit to 1 (write enabled). With the next instruction, rewrite the P9_jS register. Do not generate an interrupt or perform DMA transfer between setting the PRC2 bit to 1 and rewriting the P9_jS register.



(5) Set the count start register.



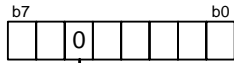
Start counter

Continued on next page

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(6) Enable interrupt. Set the I flag to 1 to enable an interrupt.

(7) Clear the overflow flag.



Timer Bi Mode Register (TBiMR) (i = 0 to 5)

Timer Bi Overflow Flag
 0: No overflow

6. Sample Program

A sample program can be downloaded from the Renesas Technology website.

7. Reference Documents

Hardware Manual

R32C/118 Group Hardware Manual Rev.1.00

The latest version can be downloaded from the Renesas Technology website.

Technical Update/Technical News

The latest information can be downloaded from the Renesas Technology website.

C Compiler Manual

R32C/100 Series C Compiler Package Ver. 1.02 Compiler User's Manual Rev. 1.00

The latest version can be downloaded from the Renesas Technology website.

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REVISION HISTORY	Timer B Operation in Pulse-width Measurement Mode
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Rev.	Date	Description	
		Page	Summary
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