To our customers,

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On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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GRADE A

MAEC TECHNICAL NEWS No.M16C-79-0110

M16C/20 Series

How To Use Pulse Width Modulation (PWM) Mode of Timer A and Timer X

Classification

Corrections and supplementary explanation of document

✔Notes

Knowhow

Others

Products Effected

M30201 Group

M302N1 Group

M302N2 Group

1. How to use pulse width modulation mode

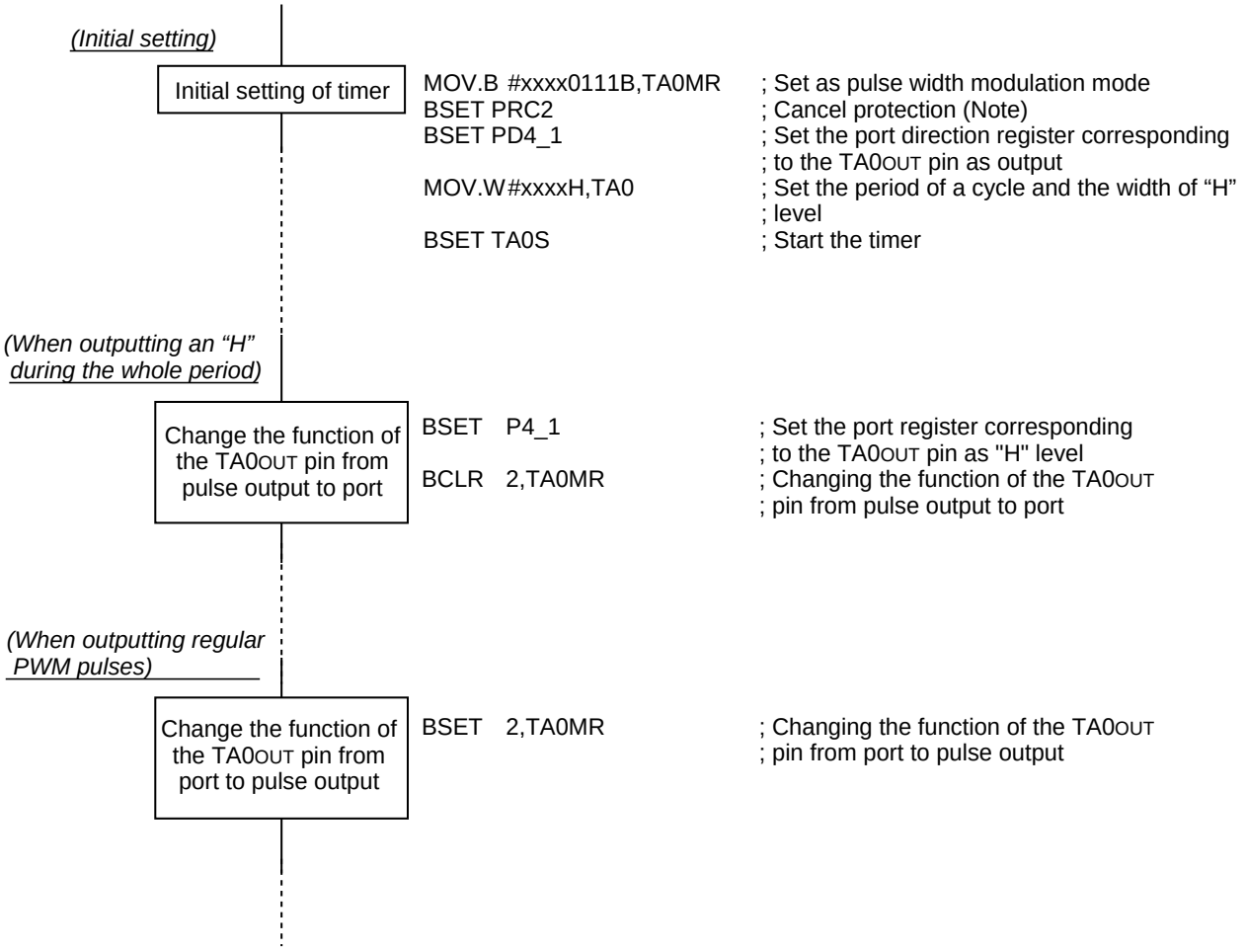
In the Timer A or Timer X pulse width modulation mode of the above-mentioned products, if an “H” level is going to be output during the whole period the recommended usage is described as below.

If bit 2 of Timer A0 mode register (TA0MR) is set as “0” in the pulse width modulation mode, the $TA0_{OUT}$ pin will function as port $P4_1$. Similarly, if bit 2 of Timer Xi mode register (TXiMR) is set as “0”, the TXi_{INOUT} pin will function as port $P4_3$ to $P4_5$. However, please note that for M302N1 group and M302N2 group, the TXi_{INOUT} pin becomes the port chosen by the Timer input/output pin selection register.

When an “H” level is going to be output during the whole period, set each port as to output an “H” level first. And then change the function of the corresponding pin from pulse output of the timer to port with bit 2 of the timer mode register.

A setting example of PWM output using Timer A is shown in the following pages.

Example: Setting of PWM output using Timer A



Note: The following two instructions must be executed in succession: (1) canceling of protection with PRC2 and (2) changing of the port P4 direction register.
If an interrupt is accepted between these instructions and the value is written to other addresses, the port P4 direction register is not changed.

2. Usage note

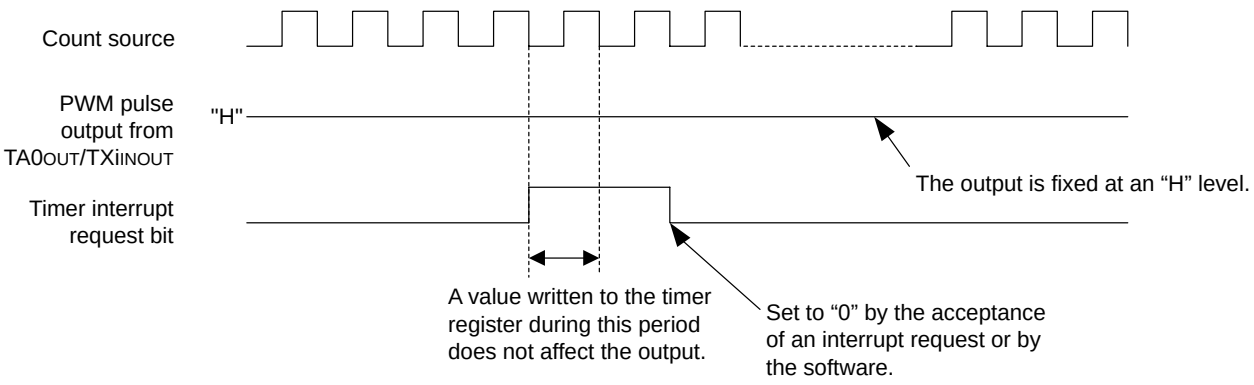
In the Timer A or Timer X pulse width modulation mode of the aforementioned products, if "FFFF16" is set to the timer register in 16-bit PWM mode or "FF16" to the higher address of the timer register in 8-bit PWM mode, the following operation is performed depending on the timing which a value is set to the timer register.

♦ 16-bit PWM mode

When the setting value of timer register is "FFFF16:

When outputting an "H" level during the whole period, assume a value is set to the timer register within the first one count of the count source from the occurrence of timer interrupt request. This setting value will not affect the pulse output. Furthermore, an interrupt request will not be generated.

(When 16-bit PWM mode)



♦ 8-bit PWM mode

When the setting value of the upper address of timer register is "FF16":

When outputting an "H" level during the whole period, assume a value is set to the timer register within the first one count of the 8-bit prescaler from the occurrence of timer interrupt request. This setting value will not affect the pulse output. Furthermore, an interrupt request will not be generated.

(When 8-bit PWM mode)