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Renesas Electronics Corporation

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M16C/64 Group

Delayed one-shot output

1. Abstract

The following are steps of outputting a pulse only once after a specified elapse since an external trigger is input.

Use the following peripheral function:

- One-shot timer mode of timer A

2. Introduction

This application note is applied to the M16C/64 group microcomputers.

This program can be operated under the condition of M16C family products with the same SFR (Special Function Register) as M16C/64 Group products. Because some functions may be modified of the M16C family products, see the user's manual. When using the functions shown in this application note, evaluate them carefully for an operation.

3. Specification

- (1) Set timer A0 in one-shot timer mode, and set timer A1 in one-shot timer mode with pulse output function.
- (2) Set 1 ms, an interval before a pulse is output, in timer A0; and set 50 μ s, a pulse width, in timer A1. Both timer A0 and timer A1 use fTIMAB for the count source.
- (3) Connect a 16-MHz oscillator to XIN.
- (4) Using POFS1 bit in TAPOFS register, select the output polarity of the TA1OUT pin.

4. Operation

- (1) Setting the trigger select bit to “1” and setting the count start flag to “1” enables the counter of timer A0 to count.
- (2) If an effective edge, selected by use of the external trigger select bit, is input to the TA0IN pin, the counter begins a down count. The counter of timer A0 performs a down count on count source fTIMAB.
- (3) As soon as the counter of timer A0 becomes “0000h”, the counter reloads the content of the reload register and stops counting. At this time, the timer A0 interrupt request bit goes to “1”.
- (4) An underflow in timer A0 triggers the counter of timer A1 and causes it to begin counting. When timer A1 begins counting, the output level of the TA1OUT pin goes to “H”.
- (5) As soon as the counter of timer A1 becomes “0000h”, the output level of the TA1OUT pin goes to “L”, the counter reloads the content of the reload register, and stops counting. At this time, timer A1 interrupt request bit goes to “1”.

Figure 1 shows the operation timing.

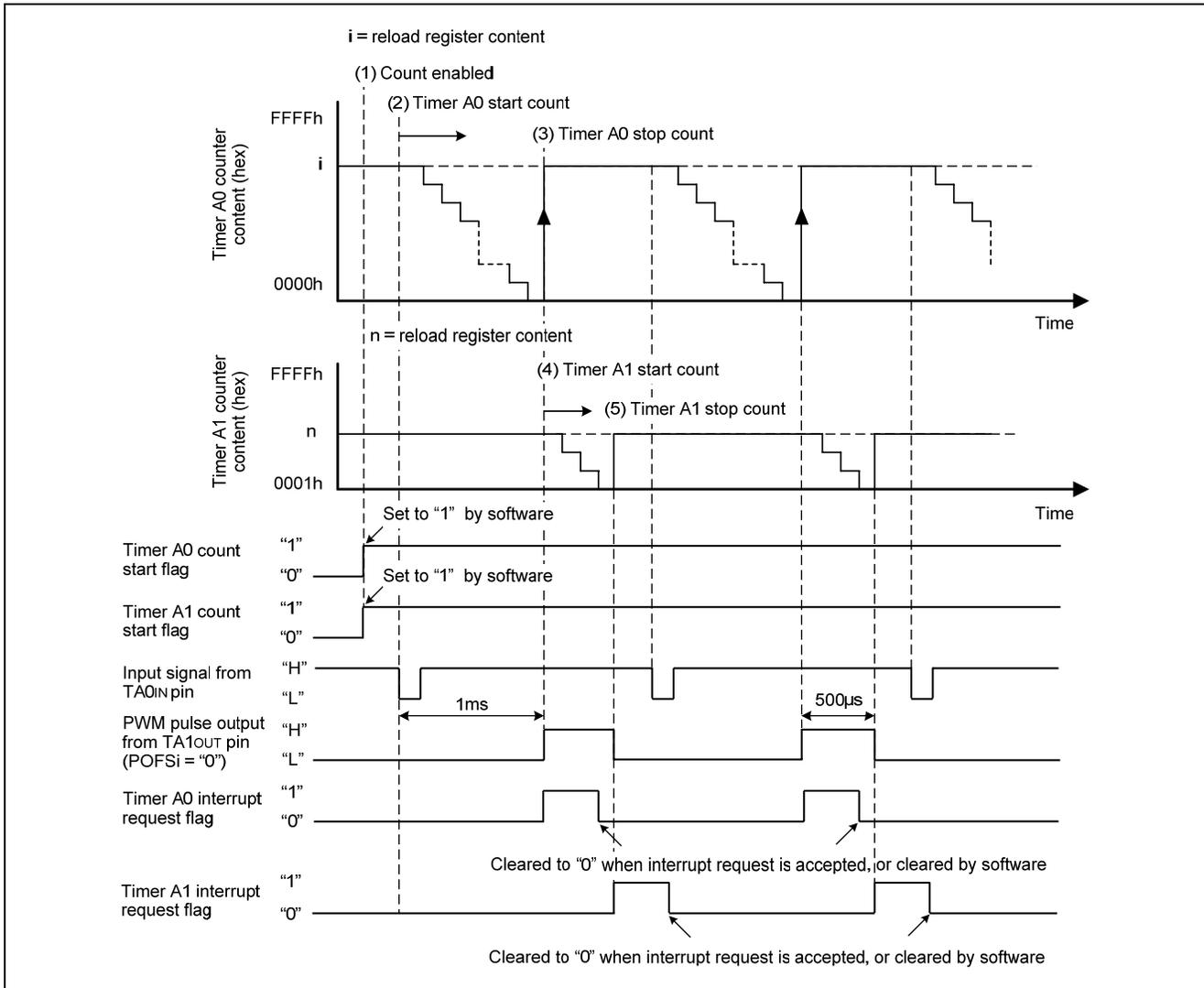


Figure 1. Operation timing of delayed one-shot output

Figure 2 shows the connection diagram.

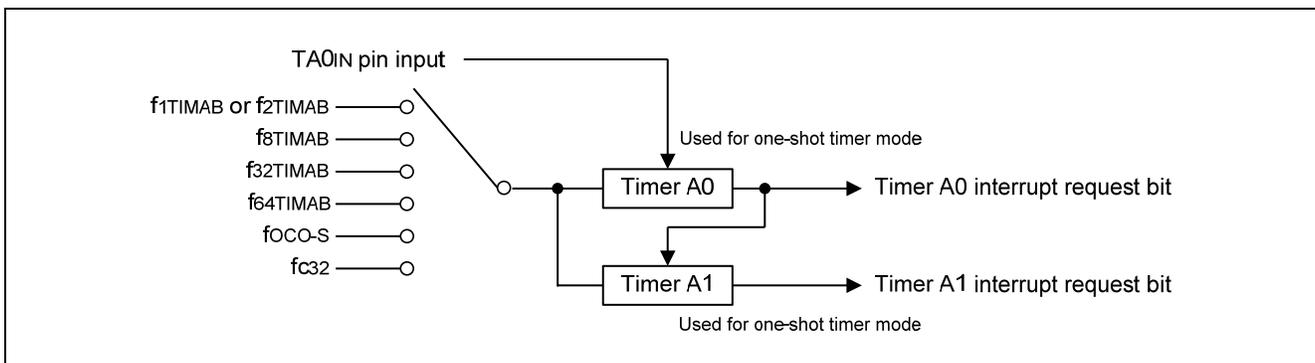


Figure 2. Connection diagram of delayed one-shot output

5. Set-up procedure

Table 1 shows Timer A count source, Figure 3 shows block diagram of Timer A count source in timer mode.

Table 1. Count Source Selection of Timer A

TACSj register (Note 1)				TAiMR register		Count source	Count source period
TCS3/ TCS7	TCS2/ TCS6	TCS1/ TCS5	TCS0/ TCS4	TCK1	TCK0		f(PLL):24MHz f(XcIN):32.768kHz
0	-	-	-	0	0	f1TIMAB/f2TIMAB (Note 2)	41.7ns or 83.3ns
0	-	-	-	0	1	f8TIMAB	333.3ns
0	-	-	-	1	0	f32TIMAB	1333.3ns
0	-	-	-	1	1	fc32	976.56μs
1	0	0	0	-	-	f1TIMAB/f2TIMAB (Note 2)	41.7ns or 83.3ns
1	0	0	1	-	-	f8TIMAB	333.3ns
1	0	1	0	-	-	f32TIMAB	1333.3ns
1	0	1	1	-	-	f64TIMAB	2666.7ns
1	1	0	1	-	-	foco-s	About 8μs
1	1	1	0	-	-	fc32	976.56μs

Note 1: TCS3~TCS0 bits of TACS0 register correspond to Timer A0 count source selection, TCS7~TCS4 bits of TACS0 register correspond to Timer A1 count source selection, TCS3~TCS0 bits of TACS1 register correspond to Timer A2 count source selection, TCS7~TCS4 bits of TACS1 register correspond to Timer A3 count source selection, and TCS3~TCS0 bits of TACS2 register correspond to Timer A4 count source selection.
 Note 2: When the PCLK0 bit in the PCLKR register is "1", the selected clock source is f1TIMAB. When the PCLK0 bit is "0", the selected clock source is f2TIMAB.

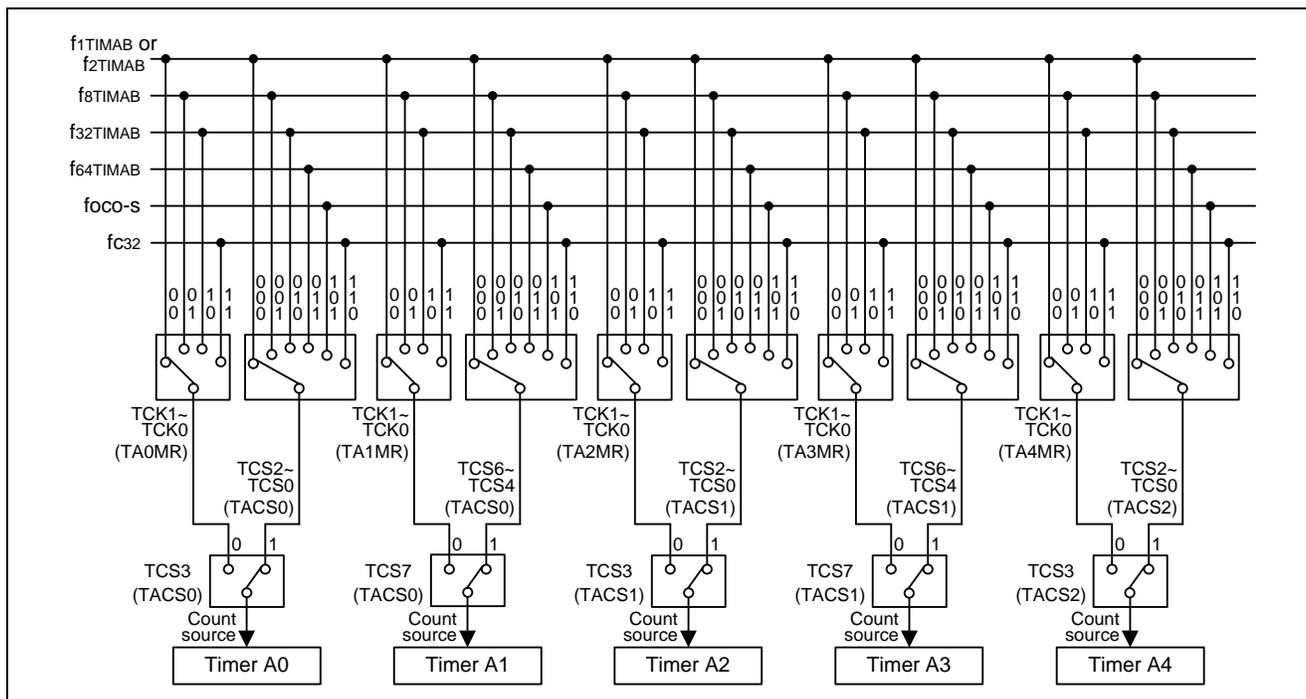
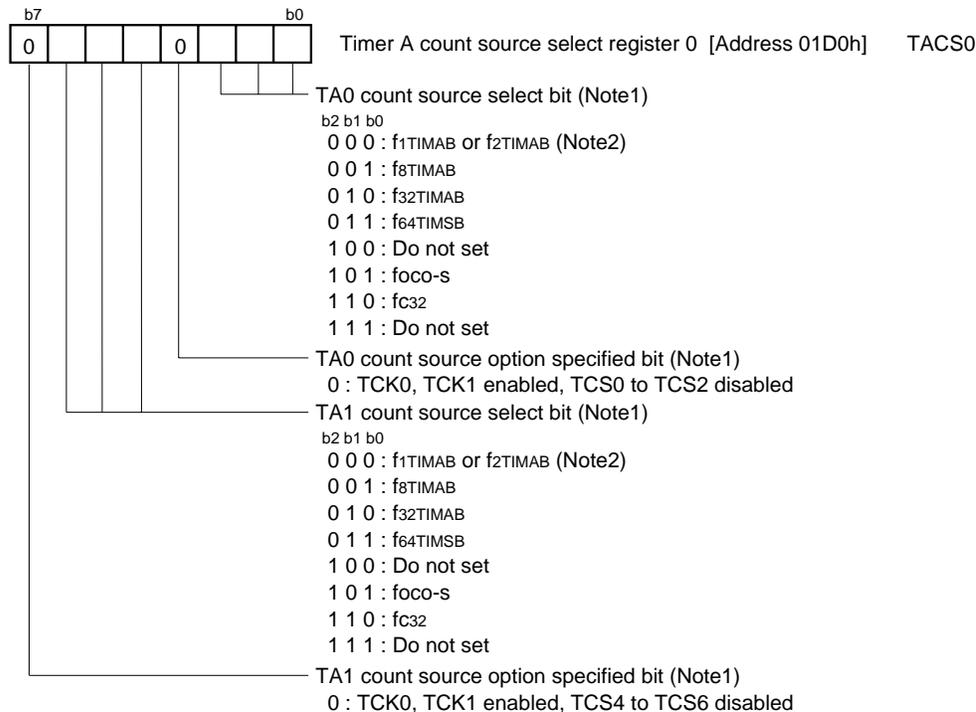


Figure 3. Count source of Timer A

Selecting timer count source

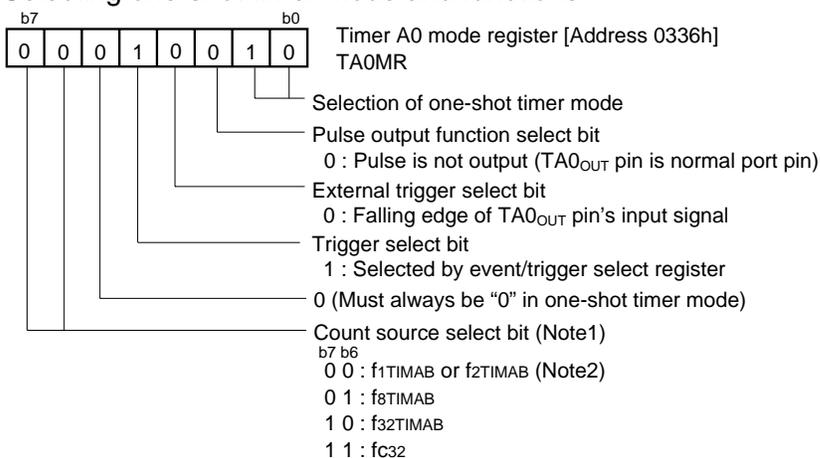


Note 1: About the count source period, please refer to Table 2.

Note 2: When the PCLK0 bit in the PCLKR register is "1", the selected clock source is f1TIMAB. When the PCLK0 bit is "0", the selected clock source is f2TIMAB.

Setting timer A0

Selecting one-shot timer mode and functions

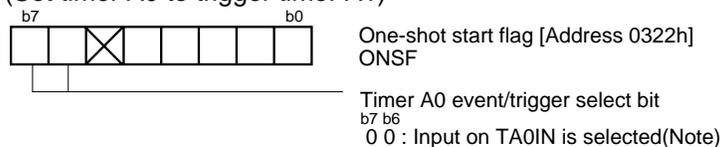


Note 1: Valid when the TCS3 bit or TCS7 bit in registers TACS0 to TACS2 is set to 0 (TCK0, TCK1 enabled). About the count source period, please refer to Table 2.

Note 2: When the PCLK0 bit in the PCLKR register is "1", the selected clock source is f1TIMAB. When the PCLK0 bit is "0", the selected clock source is f2TIMAB.

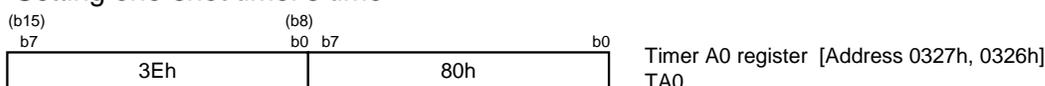
Setting one-shot start flag

(Set timer A0 to trigger timer A1)



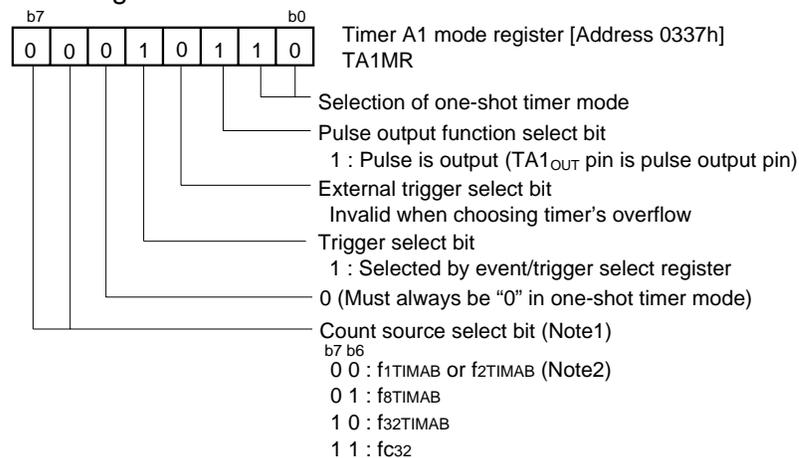
Note: Set the corresponding port direction register to "0"

Setting one-shot timer's time



Setting timer A1

Selecting one-shot timer mode and functions

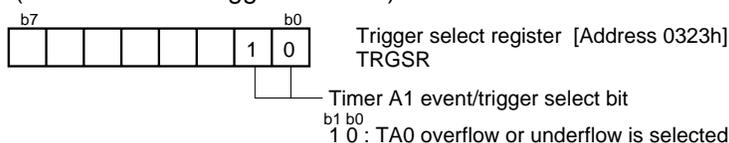


Note 1: Valid when the TCS3 bit or TCS7 bit in registers TACS0 to TACS2 is set to 0 (TCK0, TCK1 enabled). About the count source period, please refer to Table 2.

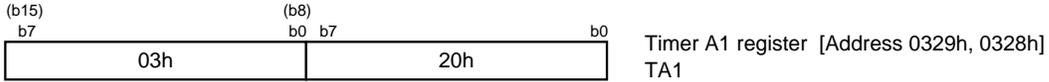
Note 2: When the PCLK0 bit in the PCLKR register is "1", the selected clock source is f_{1TIMAB}. When the PCLK0 bit is "0", the selected clock source is f_{2TIMAB}.

Setting event/trigger select bit

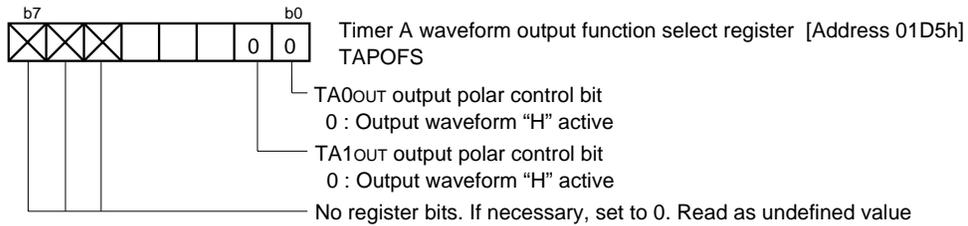
(Set timer A0 to trigger timer A1)



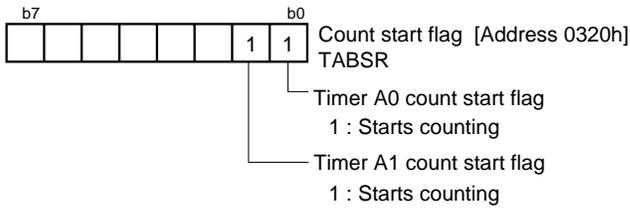
Setting one-shot timer's time



Selecting waveform output function



Setting count start flag



Start counting

6. Reference

Hardware manual

M16C/64 Group Hardware Manual

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Revision

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