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April 1st, 2010
Renesas Electronics Corporation

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M16C/65 Group
Operation of Timer A (event counter mode, reload type)

1. Abstract

In event counter mode, choose functions from those listed in Table 1. Operations of the circled items are described below.

2. Introduction

This application note is applied to the M16C/65 group microcomputers.

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

Table 1. Chosen functions

<table>
<thead>
<tr>
<th>Item</th>
<th>Set-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count source</td>
<td>O Input signal to TAiIn (counting falling edges)</td>
</tr>
<tr>
<td></td>
<td>Input signal to TAiIn (counting rising edges)</td>
</tr>
<tr>
<td></td>
<td>Timer overflow (TB2/TAj overflow)</td>
</tr>
<tr>
<td>Pulse output function</td>
<td>O No pulses output</td>
</tr>
<tr>
<td></td>
<td>Pulses output</td>
</tr>
<tr>
<td>Count operation type</td>
<td>O Reload type</td>
</tr>
<tr>
<td></td>
<td>Free-run type</td>
</tr>
</tbody>
</table>

Note: j = i - 1, but j = 4 when i = 0.

4. Operation

(1) Setting the count start flag to “1” causes the counter to count the falling edges of the count source.

(2) If an underflow occurs, the content of the reload register is reloaded to the counter, and the count continues. At this time, the timer Ai interrupt request bit goes to “1”.

(3) If switching from an up count to a down count or vice versa while a count is in progress, the switch takes effect from the next effective edge of the count source.

(4) Setting the count start flag to “0” causes the counter to stop and to hold its value.

(5) If an overflow occurs, the content of the reload register is reloaded to the counter, and the count continues. At this time, the timer Ai interrupt request bit goes to “1”.

Figure 1 shows the operation timing.

![Figure 1. Operation timing of event counter mode, reload type selected](attachment:image.png)
5. Set-up procedure

Selecting event counter mode and functions

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>b7</td>
<td>Pulse output function select bit</td>
</tr>
<tr>
<td>b6</td>
<td>Counter polarity select bit</td>
</tr>
<tr>
<td>b5</td>
<td>Count operation type select bit</td>
</tr>
</tbody>
</table>

- Pulse output function select bit
  - 0: Pulse is not output (TA0OUT pin is a normal port pin)
  - 1: Counts external signal's falling edge
- Counter polarity select bit
  - 0: Counts external signal's falling edge
  - 0: (Must always be "0" in event counter mode)
- Count operation type select bit
  - 0: Reload type
  - 0: Invalid in event counter mode

Setting counter value

Can be set to 0000h to FFFFh

Setting up/down flag

Setting one-shot start flag and trigger select register

Setting count start flag

Notes:
- Set the corresponding port direction register to "0"
6. Reference

Hardware manual
M16C/65 Group Hardware Manual
(Use the most recent version of the document on the Renesas Technology Web site.)

Technical news/Technical update
(Use the most recent version of the document on the Renesas Technology Web site.)

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