To our customers,

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April 1\(^{st}\), 2010
Renesas Electronics Corporation

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Issued by: Renesas Electronics Corporation ([http://www.renesas.com](http://www.renesas.com))

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

Table 1. Chosse functions

<table>
<thead>
<tr>
<th>Item</th>
<th>Set-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count source</td>
<td>Internal count source (f1 / f3 / f32 / fcs2)</td>
</tr>
<tr>
<td>Pulse output function</td>
<td>No pulses output</td>
</tr>
<tr>
<td></td>
<td>Pulses output</td>
</tr>
<tr>
<td>Gate function</td>
<td>No gate function</td>
</tr>
<tr>
<td></td>
<td>Performs count only for the period in which the TAI&lt;sub&gt;n&lt;/sub&gt; pin is at “L” level</td>
</tr>
<tr>
<td></td>
<td>Performs count only for the period in which the TAI&lt;sub&gt;n&lt;/sub&gt; pin is at “H” level</td>
</tr>
</tbody>
</table>

2.0 Introduction

Operation

(1) Setting the count start flag to “1” causes the counter to perform a down count on the count source.
(2) If an underflow occurs, the content of the reload register is reloaded, and the count continues. At this time, the timer Ai interrupt request bit goes to “1”.
(3) Setting the count start flag to “0” causes the counter to hold its value and to stop.

Note
- When not using pulse output, do not select TAI<sub>OUT</sub> output function with the function select register A and B.

Figure 1 shows the operation timing

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Figure 1. Operation timing of timer mode
3.0 Set-up procedure

Selecting timer mode and functions

<table>
<thead>
<tr>
<th>b7 b0</th>
<th>Count source</th>
<th>Count source period</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0</td>
<td>f1</td>
<td>20MHz</td>
</tr>
<tr>
<td>0 1</td>
<td>f8</td>
<td>400ns</td>
</tr>
<tr>
<td>1 0</td>
<td>f32</td>
<td>1.6μs</td>
</tr>
<tr>
<td>1 1</td>
<td>fc32</td>
<td>976.56μs</td>
</tr>
</tbody>
</table>

Gate function select bit
- 0 0 : Gate function not available (TAIN pin is a normal port pin)
- 0 1 : Gate function enabled
- 0 (Must always be "0" in timer mode)

Count source select bit
- 0 0 : XIN
- 0 1 : XaIN
- 1 0 : XbIN
- 1 1 : XcIN

Setting divide ratio

Can be set to 0000 to FFFF

Setting clock prescaler reset flag
(This function is effective when fc32 is selected as the count source. Reset the prescaler for generating fc32 by dividing the XaIN by 32.)

Clock prescaler reset flag
- 0 : No effect
- 1 : Prescaler is reset (When read, the value is "0")

Setting count start flag

Start count
4.0 Programming Code

;************************************************************************************
;  M16C/80 Program Collection
;  FILE NAME : rjj05b0122_src.a30
;  CPU       : M16C/80 Group
;  FUNCTION  : Operation of Timer A
;               (timer mode)
;  HISTORY   : 2003.06.16  Ver 1.00
;  Copyright(C)2003, Renesas Technology Corp.
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;  All rights reserved.
;  **********************************************************************************
;  Include
;  **********************************************************************************
LIST       OFF            ;Stops outputting lines to the assembler list file
INCLUDE    sfr80100.inc   ;Reads the file that defined SFR
LIST       ON             ;Starts outputting lines to the assembler list file
;
;**********************************************************************************
; Symbol definition
;**********************************************************************************
ROM_TOP         .EQU    0FFC000H   ;Start address of ROM
FIXED_VECT_TOP  .EQU    0FFFFDCH   ;Start address of fixed vector
;
;**********************************************************************************
; Program area
;**********************************************************************************
.SECTION    PROGRAM, CODE  ;Declares section name and section type
.ORG        ROM_TOP        ;Declares start address
RESET:
    ; Sets Processor mode, System clock and Main clock division
    MOV.B    #03H, prcr        ;Removes protect
    MOV.B    #10000000B, pm0   ; Single-chip mode
    MOV.B    #11000000B, pm1   ; Flash memory version
    MOV.B    #00001000B, cm0   ; Xcin-Xcout High
    MOV.B    #00100000B, cm1   ; Xin-Xout High
    MOV.B    #00010010B, mcd   ; No division mode
    MOV.B    #00H, prcr        ;Protects all registers


; Operation of Timer A (timer mode)

; Selecting timer mode and functions
MOV.B #01000000B, ta1mr
;                          ||||||++---------; Selection of timer mode
;                          |||||+-----------; This bit is invalid in M16C/80 series
;                          |||++------------; Gate function select bit
;                          |||               (00 or 01: Gate function not available)
;                          ||+--------------; Must always be "0" in timer mode
;                          ++---------------; Count source select bit (01: f8)

; Setting divide ratio
MOV.W #2500-1, ta1      ; (1msec @20MHz, f8)

; Setting clock prescaler reset flag
; (This function is effective when fC32 is selected as the count source)
MOV.B #00000000B, cpsrf
;                          +----------------; Clock prescaler reset flag (0: No effect)

; Setting count start flag
MOV.B #00000010B, tabsr
;                          +----------; Timer A1 count start flag

MAIN:
JMP      MAIN

; Dummy interrupt processing program

dummy:
REIT

; Setting of fixed vector

.SECTION    F_VECT, ROMDATA
.ORG        FIXED_VECT_TOP

.LWORD    dummy    ; Undefined instruction
.LWORD    dummy    ; Overflow
.LWORD    dummy    ; BRK instruction execution
.LWORD    dummy    ; Address match
.LWORD    dummy    ;
.LWORD    dummy    ; Watchdog timer
.LWORD    dummy    ;
.LWORD    dummy    ; NMI
.LWORD    RESET    ; Reset
5.0 Reference
Renesas Technology Corporation Semiconductor Home page
http://www.renesas.com/

Technical Support
E-mail: support_apl@renesas.com

Data Sheet
M16C/80 group Rev. E3
(Use the latest version on the Home page: http://www.renesas.com/)

User's Manual
M16C/80 group Rev. B
(Use the latest version on the Home page: http://www.renesas.com/)
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