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April 1st, 2010
Renesas Electronics Corporation

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M16C/80 Group

Operation of Timer B (event counter mode)

1.0 Abstract

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

Table 1. Chosed functions

Item	Set-up
Count source	0 Input signal to the TBIiN pin (counting falling edges)
	Input signal to the TBIiN pin (counting rising edges)
	Input signal to the TBIiN pin (counting rising edges and falling edges)
	Timer overflow (TBj overflow)

Note: $j = i - 1$, but $j = 2$ when $i = 0$, $j = 5$ when $i = 3$

2.0 Introduction

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, and the count continues. At this time, the timer Bi 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 • Set TBIiN pin's function select register A to I/O port and port direction register to "0".

Figure 1 shows the operation timing

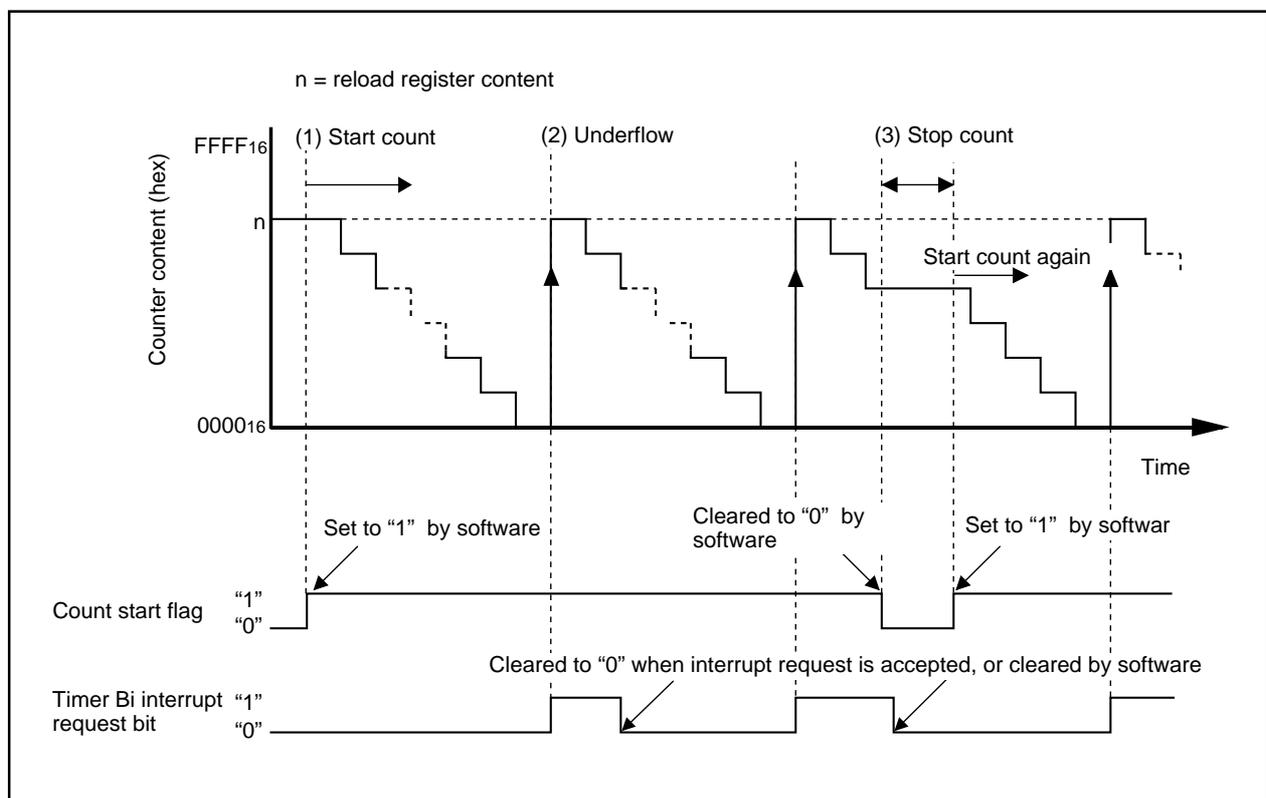


Figure 1. Operation timing of event counter mode

3.0 Set-up procedure

Selecting event counter mode and functions

Timer Bi mode register (i=0 to 5) [Address 035B₁₆ to 035D₁₆, 031B₁₆ to 031D₁₆] TBiMR (i=0 to 5)

Selection of event counter mode

Count polarity select bit
b3 b2
0 0 : Counts external signal falling edges

Fixed to "0" in event counter mode (i = 0, 3)
In an attempt to write to this bit, write "0" (i = 1, 2, 4, 5)

Invalid in event counter mode
In an attempt to write to this bit, write "0"

Invalid in event counter mode

Event clock select
0 : Input from TBIin pin (Note)

Note: Set the corresponding function select register A to I/O port, and port direction register to "0".

Setting divide ratio

Timer B0 register [Address 0351₁₆, 0350₁₆] TB0
 Timer B1 register [Address 0353₁₆, 0352₁₆] TB1
 Timer B2 register [Address 0355₁₆, 0354₁₆] TB2
 Timer B3 register [Address 0311₁₆, 0310₁₆] TB3
 Timer B4 register [Address 0313₁₆, 0312₁₆] TB4
 Timer B5 register [Address 0315₁₆, 0314₁₆] TB5

Can be set to 0000₁₆ to FFFF₁₆ (n)

Setting count start flag

Count start flag [Address 0340₁₆] TABSR

Timer B0 count start flag
 Timer B1 count start flag
 Timer B2 count start flag

Timer B3,4,5 count start flag [Address 0300₁₆] TBSR

Timer B3 count start flag
 Timer B4 count start flag
 Timer B5 count start flag

⋮
Start count

4.0 Programming Code

```

;*****
;
; M16C/80 Program Collection
;
; FILE NAME : rjj05b0135_src.a30
; CPU      : M16C/80 Group
; FUNCTION  : Operation of Timer B
;            (event counter 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
C_CNT_TB_EV  .EQU    (08000H-1H);Counter value on event counter mode
;
;*****
;      Program area
;*****
;=====
;      Start up
;=====
      .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
;

```

```

;=====
;   TimerB (event counter mode)
;=====
;   ; Selecting event counter mode and functions
MOV.B   #00000001B, tb0mr
;       ||| ||| ++-----; Selection of event counter mode
;       ||| ||| ++-----; Count polarity select bit
;       ||| |||           (00:Counts external signal falling edges)
;       ||| ++-----; Fixed to "0" in event counter mode
;       ||| ++-----; Invalid in event counter mode
;       ||| ++-----; Event clock select (0:Input from TB0IN pin) (Note)
;   ; (Note) Set the corresponding function select register A to I/O port
;   ; and port direction register to "0"
MOV.B   #00000100B, prcr ;Clearing the protect (set to write-enabled state)
;       +-----; Enables writing to port P9 direction register
BCLR   pd9_0           ;Port P90 direction register
MOV.B   #00000100B, prcr ;Clearing the protect (set to write-enabled state)
;       +-----; Enables writing to function select register A3
BCLR   ps3_0           ;Port P90 is I/O port
;   ; Setting divide ratio
MOV.W   #C_CNT_TB_EV, tb0
;   ; Setting count start flag
MOV.B   #00100000B, tabsr
;       +-----; Timer B0 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
;
.END

```

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
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User's Manual

M16C/80 group Rev. B
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