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April 1st, 2010
Renesas Electronics Corporation

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M16C/80 Group

Buzzer Output

1.0 Abstract

The timer mode is used to make the buzzer ring.
Use the following peripheral function:
• The pulse-outputting function in timer mode of timer A.

2.0 Introduction

Specifications

(1) Sound at 2-kHz buzz beep by use of timer A1.

(2) When the buzzer is off, set the port high-impedance.

(3) Connect a 20-MHz oscillator to X_{IN}.

Operation

(1) The microcomputer begins performing a count on timer A1. Timer A1 has disabled interrupts.

(2) The microcomputer begins pulse output by setting the port $P7_2$'s corresponding function select register A and B to $TA1_{OUT}$ output. $P7_2$ changes into $TA1_{OUT}$ pin and outputs 2-kHz pulses.

(3) The microcomputer stops outputting pulses by setting the port $P7_2$'s corresponding function select register to I/O port. $P7_2$ goes to an input pin, and the output from the pin becomes high-impedance.

Note • When setting the function select registers A, B, and C, sets the function select registers B and/or C first, and then sets the function select register A.

Figure 1 shows the operation timing.

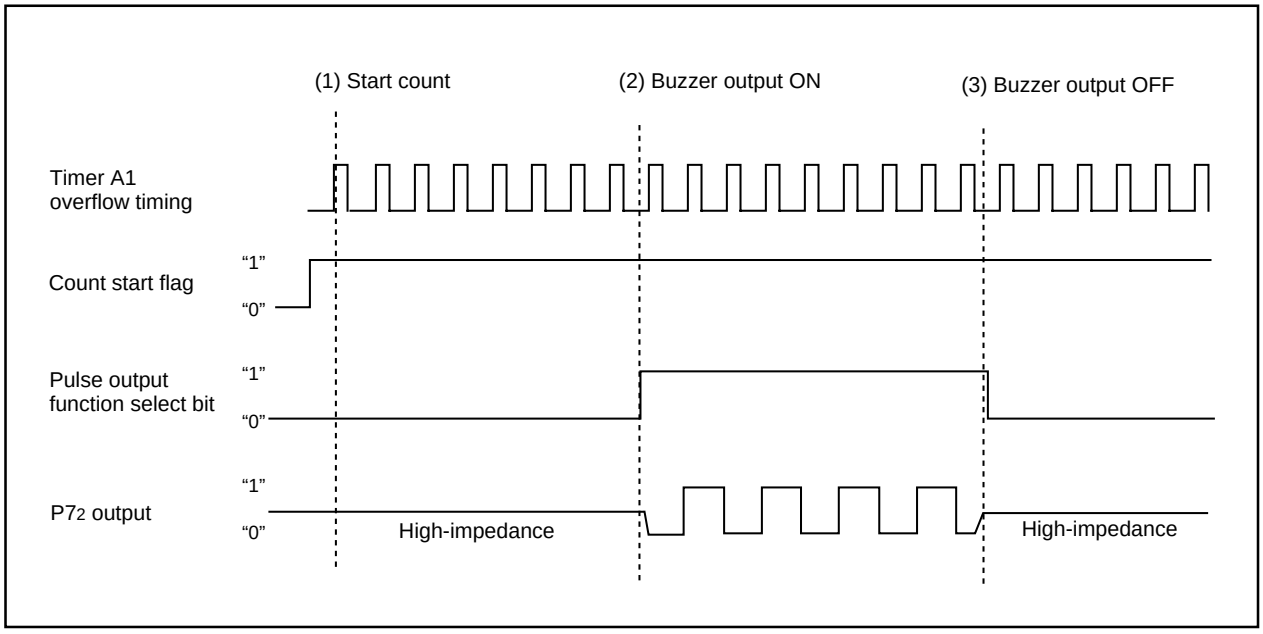
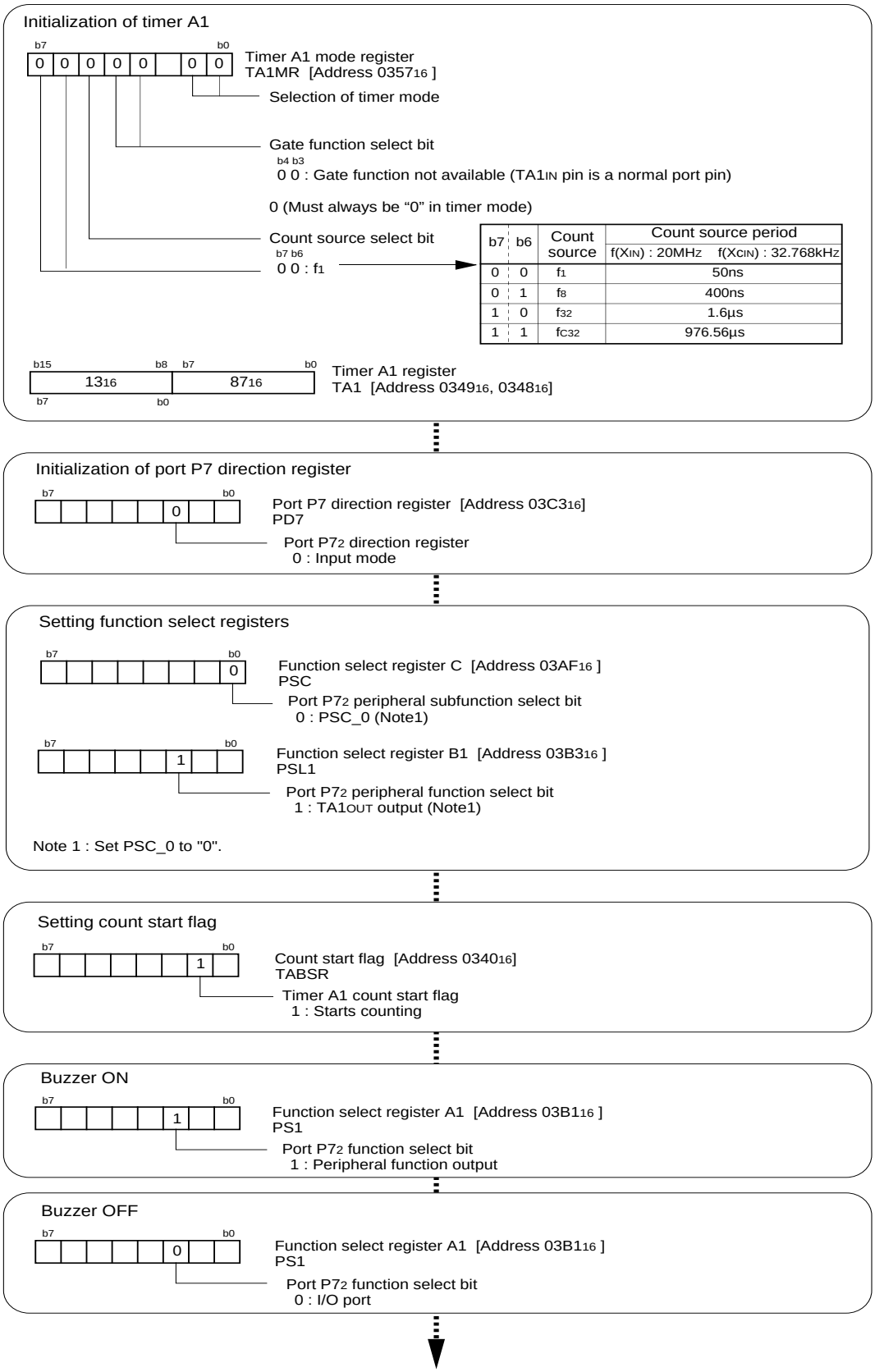


Figure 1. Operation timing of buzzer output

3.0 Set-up procedure



4.0 Programming Code

```
;***********************************************************************************
;
;   M16C/80 Program Collection
;
;   FILE NAME : rjj05b0508_src.a30
;   CPU       : M16C/80 Group
;   FUNCTION  : Timer A Applications
;               (Buzzer Output)
;   HISTORY   : 2004.03.15  Ver 1.00
;
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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
;***********************************************************************************
RAM_TOP          .EQU    000400H    ;Start address of RAM
RAM_END          .EQU    002BFFH    ;End address of RAM
ROM_TOP          .EQU    0FFC000H   ;Start address of ROM
FIXED_VECT_TOP   .EQU    0FFFFDCH   ;Start address of fixed vector
;***********************************************************************************
;       Allocation of work RAM area
;***********************************************************************************
        .SECTION    WORKRAM, DATA
        .ORG        RAM_TOP
WORKRAM_TOP:
WORKRAM_END:
;***********************************************************************************
;       Program area
;***********************************************************************************
;=================================================================================
;       Start up
;=================================================================================
        .SECTION    PROGRAM, CODE  ;Declares section name and section type
        .ORG        ROM_TOP        ;Declares start address
RESET:
        LDC      #RAM_END+1, ISP   ;Sets initial value in stack pointer
        ; 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
;
```

```
;===============================================================================
;       TimerA (buzzer output)
;===============================================================================
;-------------------------------------------------------------------------------
;       Initialization of Timer A1
;-------------------------------------------------------------------------------
        ; Selecting timer mode and functions
        MOV.B    #00000000B, 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 (00:f1)
        ; Clearing interrupt request bit and interrupt disabled
        MOV.B    #00000000B, ta1ic
        ; Setting divide ratio
        MOV.W    #01387H, ta1      ;(2kHz @20MHz, f1)
        ; Initialization of port P7 direction register
        BCLR     pd7_2             ;Port P72 direction register (0:Input mode)
        ; Setting function select registers
        BCLR     psc_0             ;Port P72 peripheral subfunction select bit
                                   ;(Set this bit to "0" when PSL1_2 = "1")
        BSET     psl1_2            ;Port P72 peripheral function select bit
                                   ;(1:TA1out output)
        ; Setting count start flag
        MOV.B    #00000010B, tabsr
;                       +----------;Timer A1 count start flag (1:Starts counting)
        JSR      BUZZER_ON
;
MAIN:
        JMP      MAIN
;
;-------------------------------------------------------------------------------
;       BUZZER ON
;-------------------------------------------------------------------------------
BUZZER_ON:
        BSET     ps1_2             ;Function select register A1
                                   ;(1:Peripheral function output, P72 is TA1out pin)
        RTS
;
;-------------------------------------------------------------------------------
;       BUZZER OFF
;-------------------------------------------------------------------------------
BUZZER_OFF:
        BCLR     ps1_2             ;Function select register A1
                                   ;(0:I/O port, P72 is I/O port)
        RTS
;
```

```
;=======================================================================
;       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

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E-mail: support_apl@renesas.com

Data Sheet

M16C/80 group Rev. E3

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