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April 1st, 2010
Renesas Electronics Corporation

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M16C/62A 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 a 2-kHz buzz beep by use of timer A0.
(2) Effect pull-up in the relevant port by use of a pull-up resistor. When the buzzer is off, set the port high-impedance, and stabilize the potential resulting from pulling up.
(3) Connect a 16-MHz oscillator to X_{IN}.

Operation (1) The microcomputer begins performing a count on timer A0. Timer A0 has disabled interrupts.
(2) The microcomputer begins pulse output by setting the pulse output function select bit to "Pulse output effected". $P7_0$ changes into $TA0_{OUT}$ pin and outputs 2-kHz pulses.
(3) The microcomputer stops outputting pulses by setting the pulse output function select bit to "Pulse output not effected". $P7_0$ goes to an input pin, and the output from the pin becomes high-impedance.

Figure 1 shows the operation timing

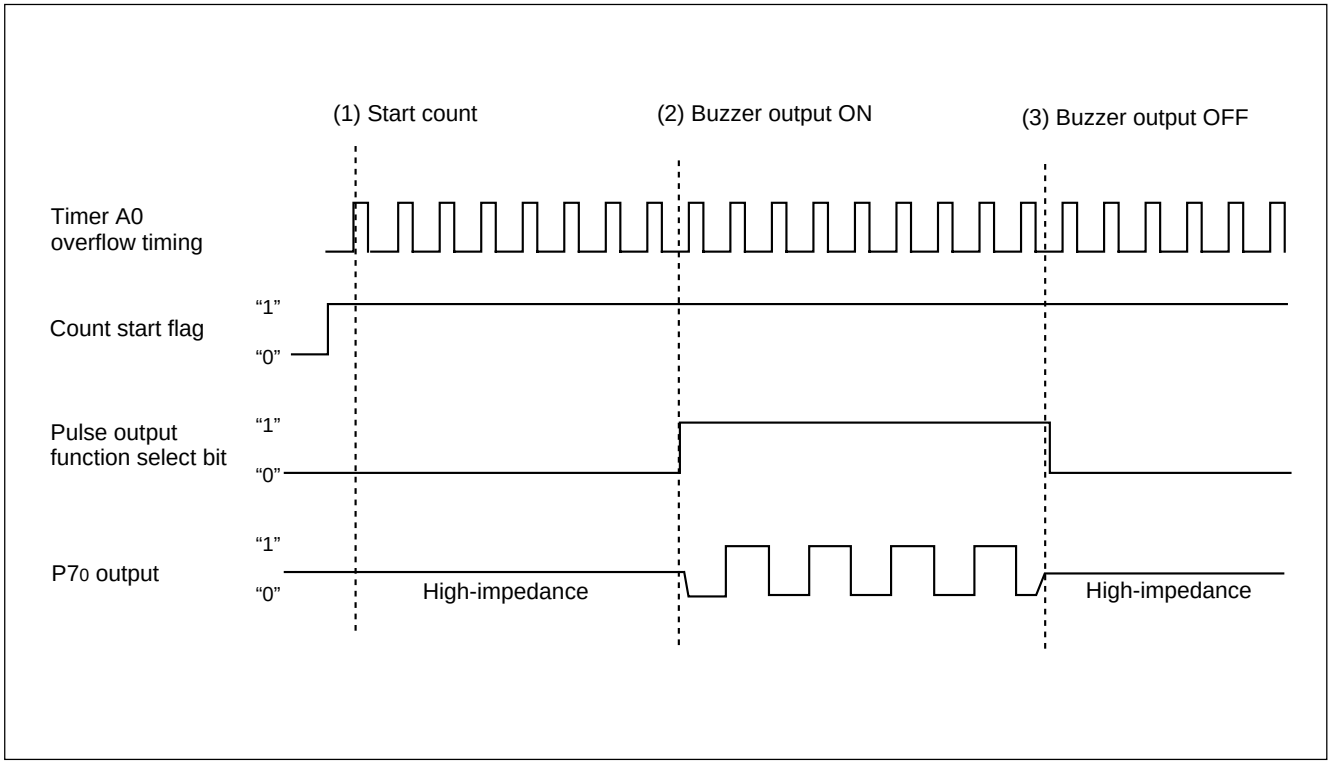
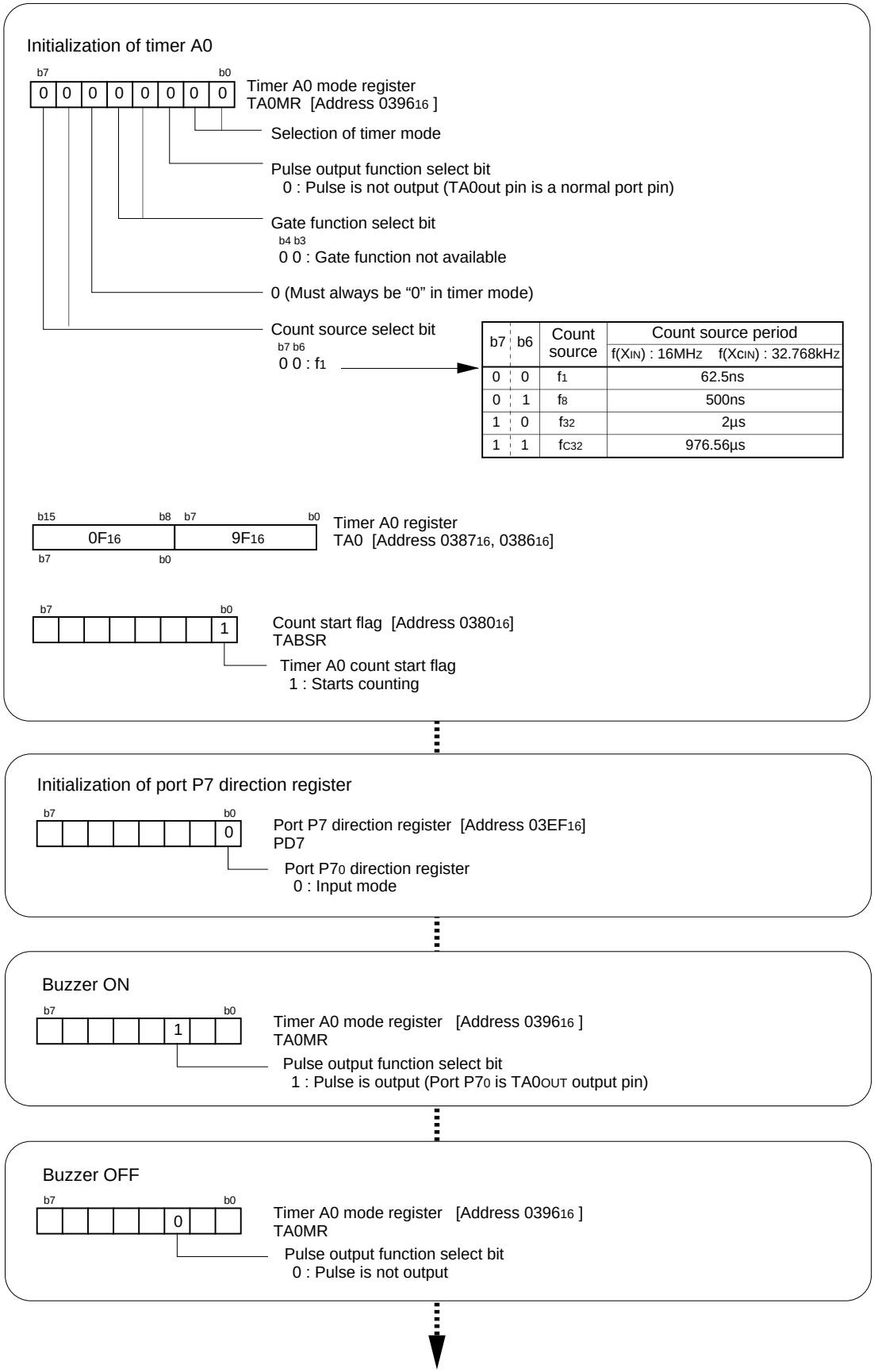


Figure 1. Operation timing of buzzer output

3.0 Set-up procedure



4.0 Programming Code

```
;*****************************************************************************
;
;   M16C/62A Program Collection
;
;   FILE NAME : rjj05b0072_src.a30
;   CPU       : M16C/62A Group
;   FUNCTION  : Timer A Applications
;               (Buzzer Output)
;   HISTORY   : 2003.05.16  Ver 1.00
;
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;   All rights reserved.
;
;*****************************************************************************
;*****************************************************************************
;       Include
;*****************************************************************************
        .LIST       OFF             ;Stops outputting lines to the assembler list file
        .INCLUDE    sfr62a.inc      ;Reads the file that defined SFR
        .LIST       ON              ;Starts outputting lines to the assembler list file
;
;*****************************************************************************
;       Symbol definition
;*****************************************************************************
ROM_TOP         .EQU    0F8000H     ;Start address of ROM
FIXED_VECT_TOP  .EQU    0FFFDCH     ;Start address of fixed vector
;
;*****************************************************************************
;       Program area
;*****************************************************************************
;=============================================================================
;       Start up
;=============================================================================
        .SECTION    PROGRAM, CODE   ;Declares section name and section type
        .ORG        ROM_TOP         ;Declares start address
RESET:
        MOV.B    #03H, prcr         ;Removes protect
                                    ;Set processor mode registers 0 and 1
        MOV.B    #00000000B, pm0    ; Single-chip mode
        MOV.B    #00000000B, pm1    ; No expansion, No wait
                                    ;Set system clock control registers 0 and 1
        MOV.B    #00001000B, cm0    ; Xcin-Xcout High
        MOV.B    #00100000B, cm1    ; Xin-Xout High, Main clock is No divison
        MOV.B    #00H, prcr         ;Protects all registers
;
;=============================================================================
;       TimerA (buzzer output)
;=============================================================================
        MOV.B    #00h, ta0ic        ;Timer A0 has disabled interrupts
;
        BCLR     pd7_0              ;Port P70 direction register (0:Input mode)
        MOV.B    #00000000B, ta0mr  ;TimerA0 mode register
;                 ||||||++---------;Selection of timer mode
;                 |||||+-----------;Pulse output function select bit
;                 |||||             (0:Pulse is not output (TA0OUT pin is a normal port pin))
;                 |||++------------;Gate function not available
;                 ||+--------------;Must always be "0" in timer mode
;                 ++---------------;Count source f1
        MOV.W    #0F9FH,ta0         ;TimerA0 register (250u @16MHz, f1 --> 2kHz)
        MOV.B    #00000001B, tabsr  ;Count start flag
;                       +---------;TimerA0 count start flag (1:Starts counting)
;
```

```
;-------------------------------------------------------------------------
;       BUZZER ON
;-------------------------------------------------------------------------
BUZZER_ON:
        BSET     mr0_ta0mr         ;Pulse output function select
                                   ;Pulse is output (Port P70 is TA0out output pin)
;
MAIN:
        JMP      MAIN
;
;-------------------------------------------------------------------------
;       BUZZER OFF
;-------------------------------------------------------------------------
BUZZER_OFF:
        BCLR     mr0_ta0mr         ;Pulse is not output
;
;=========================================================================
;       Dummy interrupt processing program
;=========================================================================
dummy:
        REIT
;
;************************************************************************************
;
;       Setting of fixed vector
;************************************************************************************
;
        .SECTION    F_VECT, ROMDATA
        .ORG        FIXED_VECT_TOP
;
        .LWORD    dummy    ;Undefined instruction interrupt vector
        .LWORD    dummy    ;Overflow (INT0 instruction) interrupt vector
        .LWORD    dummy    ;BRK instruction interrupt vector
        .LWORD    dummy    ;Address match interrupt vector
        .LWORD    dummy    ;Single-step interrupt vector
        .LWORD    dummy    ;Watchdog timer interrupt vector
        .LWORD    dummy    ;DBC interrupt vector
        .LWORD    dummy    ;NMI interrupt vector
        .LWORD    RESET    ;Sets reset vector
;
        .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/62A group Rev. C.1
(Use the latest version on the Home page: http://www.renesas.com/)

User's Manual

M16C/62A group Rev. 1.0
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