

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# M16C/Tiny Series

## Buzzer Output

### 1. 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. Introduction

The explanation of this issue is applied to the following condition:

Applicable MCU: M16C/26, M16C/26A, M16C/28, M16C/29 Group

This program can also be used when operating other microcomputers within the M16C family, provided they have the same SFR (Special Function Registers) as the M16C/26, M16C/26A, M16C/28, M16C/29 microcomputers. However, some functions may have been modified.

Refer to the User's Manual for details. Use functions covered in this Application Note only after careful evaluation.

### 3. Contents

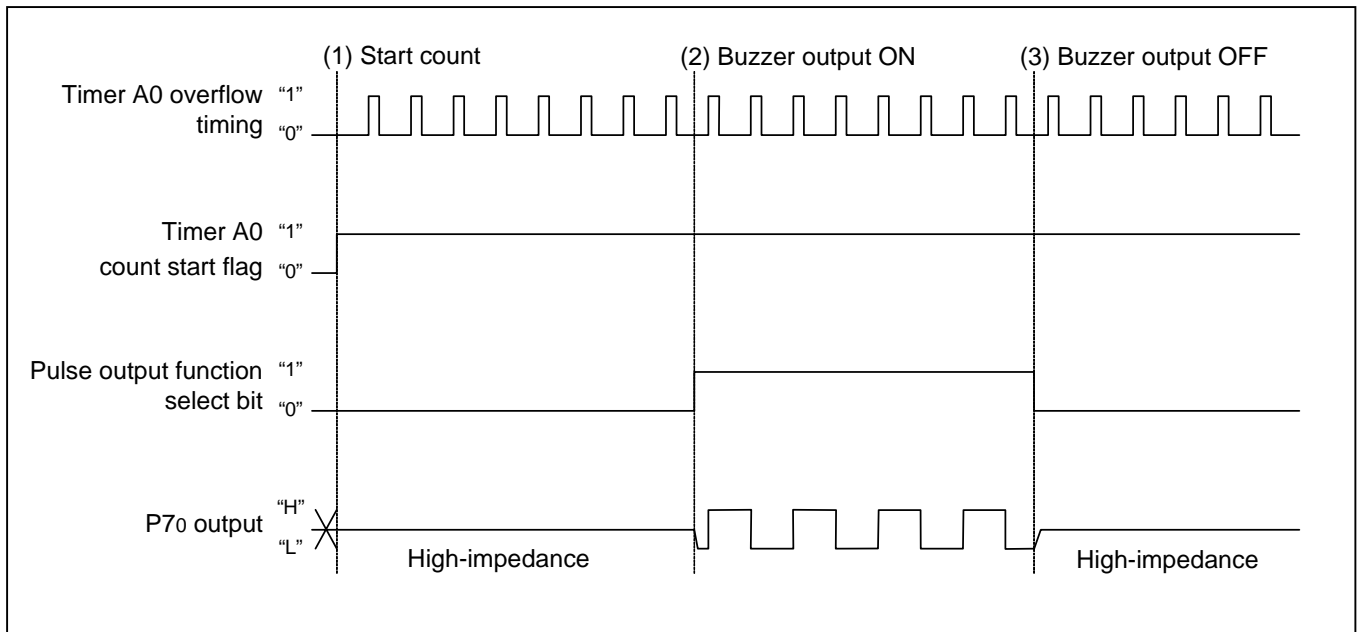
#### 3.1 Specification

- (1) Sound a 2kHz 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 20MHz oscillator to XIN.

#### 3.2 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<sub>0</sub> changes into TA0<sub>OUT</sub> pin and outputs 2kHz pulses.
- (3) The microcomputer stops outputting pulses by setting the pulse output function select bit to "Pulse output not effected". P7<sub>0</sub> goes to an input pin, and the output from the pin becomes high-impedance.

Figure 1 shows the operation timing of buzzer output.

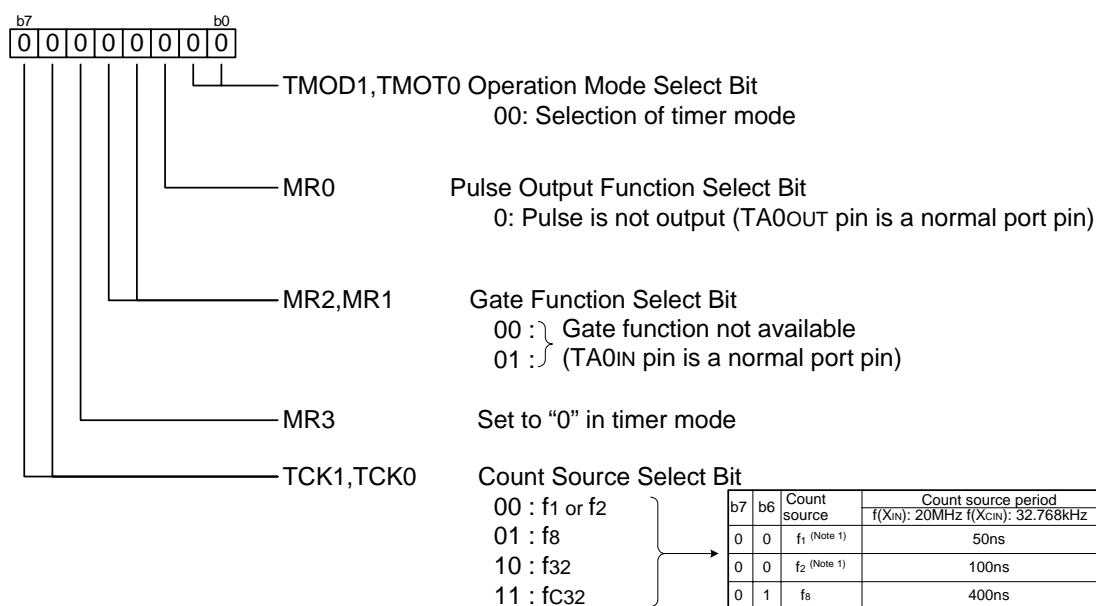


**Figure 1. Operation Timing of Buzzer Output**

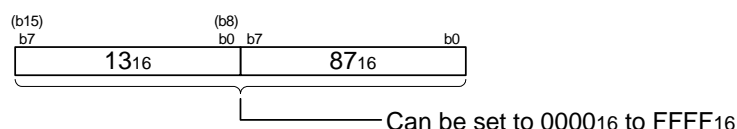
### 3.3 Register Setting

To enable the operation defined in “Section 3. Operation of timer A”, the following register settings must be taken place step by step. For detail configuration of each register, please refer to M16C/26 Group hardware manual, M16C/26A Group hardware manual, M16C/28 Group hardware manual, M16C/29 Group hardware manual.

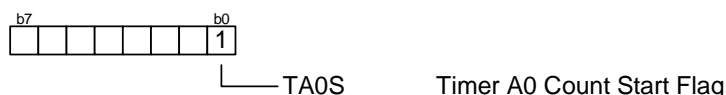
## (1) Setting timer A0 mode register



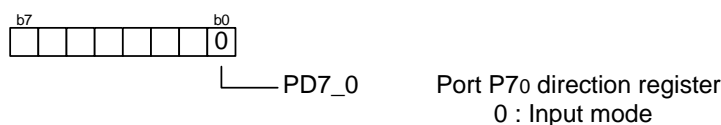
## (2) Setting timer A0 register



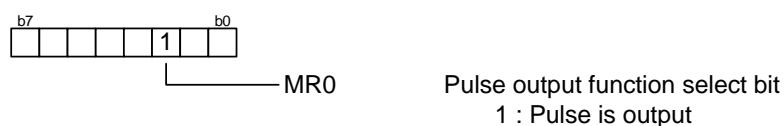
## (3) Setting count start flag



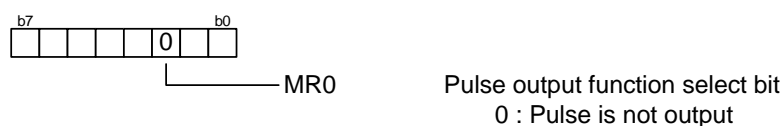
## (4) Setting port P7 direction register



## (5) Buzzer ON (timer A0 mode register)



## (6) Buzzer OFF (timer A0 mode register)



## 4. Sample Program

```

/*****
 *
 *   FILE NAME :
 *   CPU       : M16C/Tiny series
 *   Function  : Operation of Timer A
 *               (Buzzer Output)
 *
 *   Version   : 1.00
 *
 *   Copyright (C)2004, Renesas Technology Corp.
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 *
 *****/
/*****
 *   include file
 *****/
#include "sfr28.h"

/*****
 *   main
 *****/
void main(void) {

    ta0mr = 0x00; /* Selection of timer mode
                  Pulse output function select bit (0:Pulse is not output)
                  Gate function select bit (00:Gate fuction not available)
                  Count source (01:f1 or f2)
                  */

    ta0 = 5000-1; /* Setting counter value (1ms @20MHz, f1) */

    tabsr = 0x01; /* Setting Cout start flag
                  Timer A0 start
                  */

    pd7_0 = 0; /* Port P7_0 is set to in-put mode */

/* Buzzer ON */

    mr0_ta0mr = 1; /* Pulse is output */
    while (1) {

/* Buzzer OFF */

    mr0_ta0mr = 0; /* Pulse is not output */
    while (1) {

    }
}

```

## 5. Reference

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Hardware Manual

M16C/26, M16C/26A, M16C/28, M16C/29 Group Hardware Manual

(Use the latest version on the home page: <http://www.renesas.com>)

TECHNICAL UPDATE/TECHNICAL NEWS

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## REVISION HISTORY

Rev.	Date	Description	
		Page	Summary
1.00	2005.05.30	-	First edition issued



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