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April 1st, 2010
Renesas Electronics Corporation

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M16C/Tiny Series

Operation of DMAC (One-Shot Transfer Mode)

1. Abstract

In one-shot transfer mode of DMAC, choose functions from those listed in Table 1. Operations of the checked items are described below.

Table 1. Choosed Functions

Item	Set-up	
Transfer space	Yes	From any address in the 1M bytes space to a fixed address
		From a fixed address to any address in the 1M bytes space
		From a fixed address to a fixed address
Unit of transfer	Yes	8 bits
		16 bits

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 be used for the other M16C Families which have the same SFR (Special Function Register) as the one in the M16C/26, M16C/26A, M16C/28, M16C/29 However, since some functions may be modified such as added functions, check it in a manual. Execute sufficient evaluation when using this application note.

3. Operation of DMAC

- (1) When software trigger is selected, setting software DMA request bit to “1” generates a DMA transfer request signal.
- (2) If DMAC is active, data transfer starts, and the contents of the address indicated by the DMAi forward-direction address pointer are transferred to the address indicated by the DMAi destination pointer. When data transfer starts directly after DMAC becomes active, the value of the DMAi transfer counter reload register is reloaded to the DMAi transfer counter, and the value of the DMAi source pointer is reloaded by the DMAi forward-direction address pointer. Each time a DMA transfer request signal is generated, 1 byte of data is transferred. The DMAi transfer counter is down counted, and the DMAi forward-direction address pointer is up counted.
- (3) If the DMAi transfer counter underflows, the DMAi enable bit changes to “0” and DMA transfer is completed. The DMAi interrupt request bit changes to “1” simultaneously.

Figure 1 shows the operation timing.

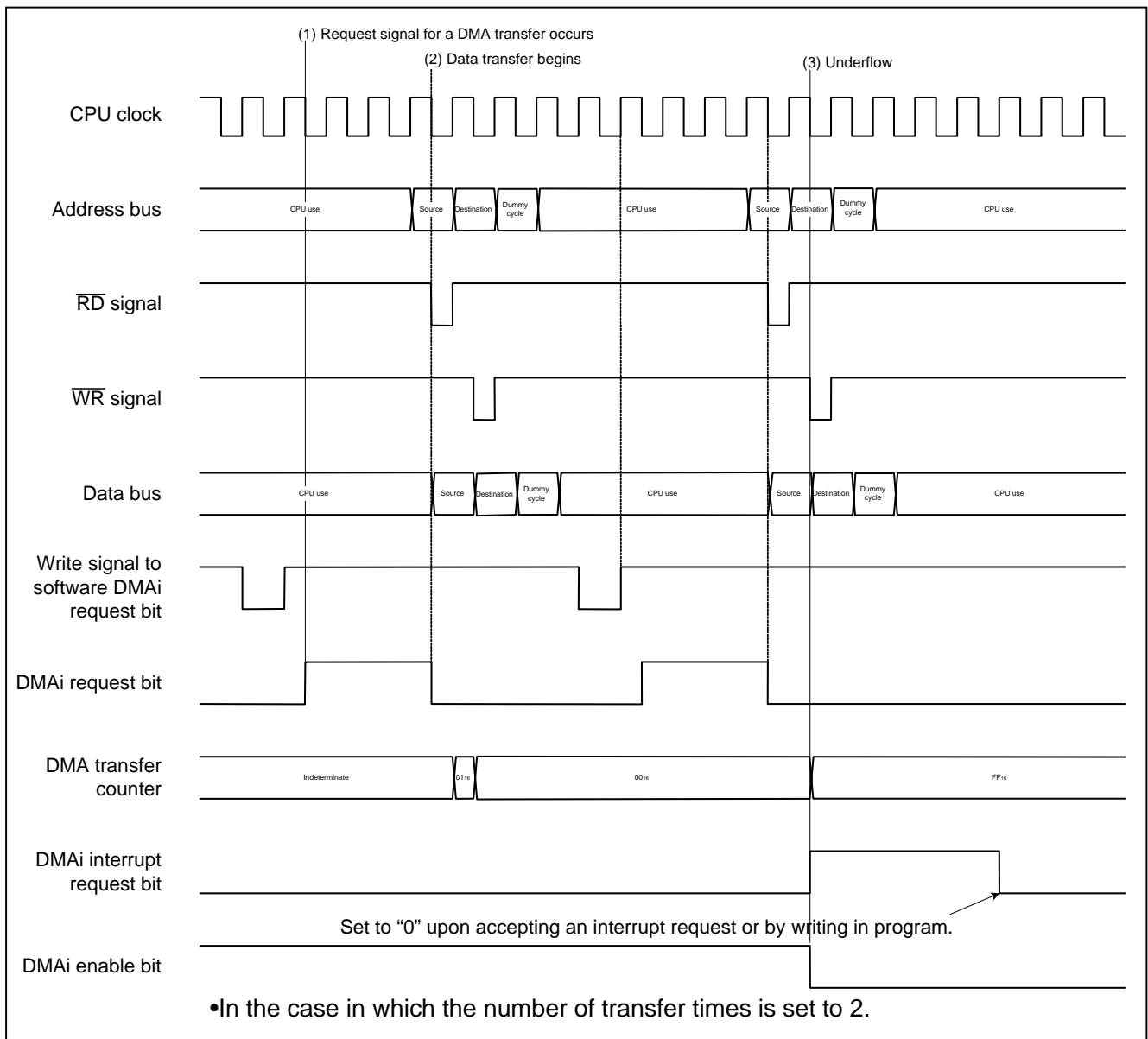
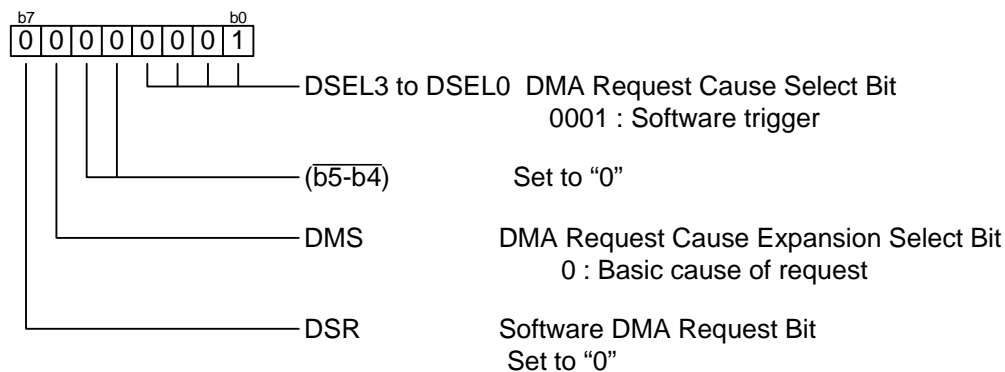


Figure 1. Operation Timing of One-Shot Transfer Mode

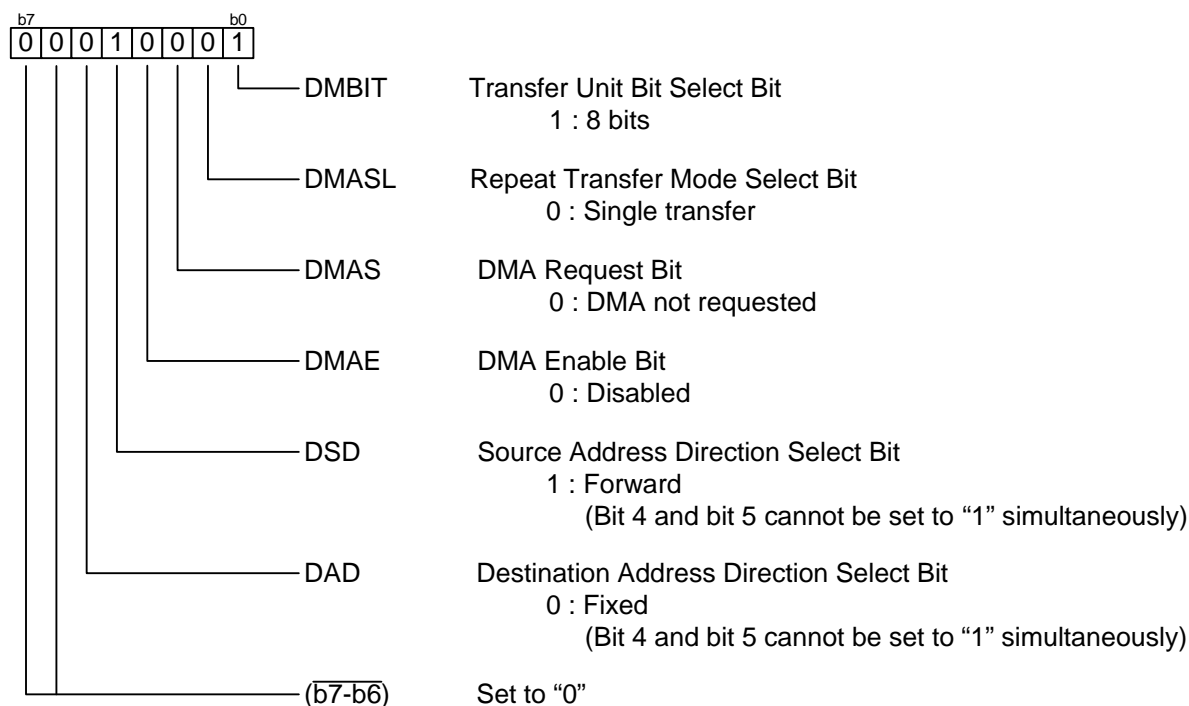
3.1 Register Setting

To enable the operation defined in “Section 3. Operation of A/D Converter”, 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

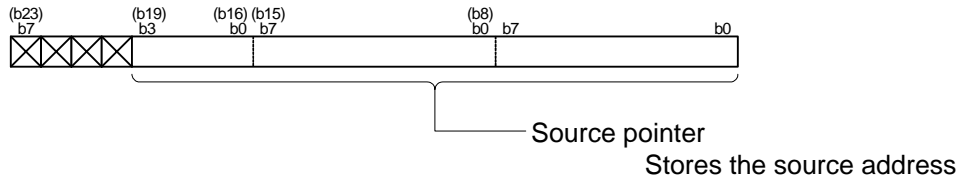
(1) Setting DMAi request cause select register



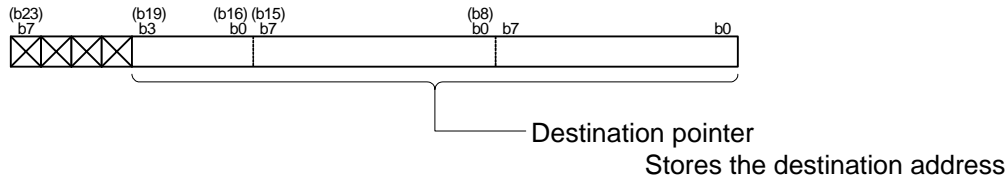
(2) Setting DMAi control register



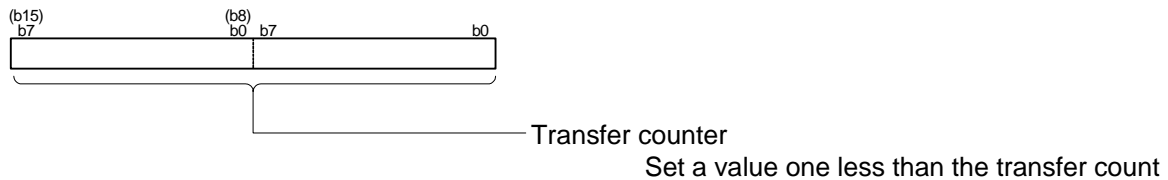
(3) Setting DMAi source pointer



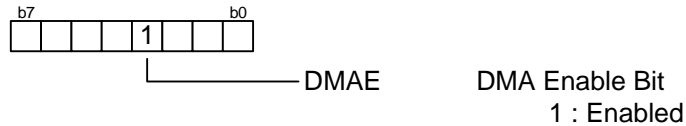
(4) Setting DMAi destination pointer



(5) Setting DMAi transfer counter



(6) DMA enable (Setting DMAi control register)



(7) When software DMA request bit = "1", start DMA transmission

4. Sample Program

```

/*****
 *
 * FILE NAME :
 * CPU : M16C/Tiny series
 * Function : Operation of DMAC
 * (one-shot transfer mode)
 * Version : 1.00
 *
 * Copyright (C)2004, Renesas Technology Corp.
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 *
 *****/
/*****
 * include file
 *****/
#include "sfr28.h"

/*****
 * Function Definition
 *****/
voidport_init(void);

/*****
 * Global variable declaration
 *****/
const static char data0[] = {0x1,0x3,0x7,0xf,0x1f,0x3f,0x7f,0xff};

/*****
 * main
 *****/

void main(void) {

    port_init();
    dm0ic = 0;
    dm0sl = 0x01; /* Setting DMA0 request cause select register
                  * DMA request cause select bit is selected to software trigger
                  */

    dm0con = 0x11; /* Setting DMA0 control register
                  * Transfer unit bit select bit is selected to 8 bit
                  * Repeat transfer mode select bit is selected to single transfer
                  * DMA request bit is set to DMA not request
                  * DMA enable bit is set to disable
                  * Source address direction select bit is set to forward
                  * Destination address direction select bit is set to fixed
                  */

    sar0_addr.byte.low = (char>(&data0); /* Setting DMA0 source pointer */
    sar0_addr.byte.mid = (char)((unsigned long>(&data0) >> 8 );
    sar0_addr.byte.high = (char)((unsigned long>(&data0) >> 16 );
    dar0_addr.byte.low = (char>(&p0); /* Setting DMA0 destination pointer */
    dar0_addr.byte.mid = (char)((unsigned long>(&p0) >> 8 );
    dar0_addr.byte.high = (char)((unsigned long>(&p0) >> 16 );
    tcr0 = 7; /* Setting DMA0 transfer counter */

    dmae_dm0con = 1; /* DMA enabled */

    while ( !ir_dm0ic )
    {
        dsr_dm0sl = 1;
    }

    while (1) {
    }
}

void port_init() {
    p0 = 0;

    pd0 = 0xff;
}

```

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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