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## **M16C/62 Group**

### **DMA setup procedures using C language**

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#### **1.0 Abstract**

The following article introduces DMA setup procedures using C language and its application example.

#### **2.0 Introduction**

The explanation of this issue is applied of the following condition.

Applicable MCU: M16C/62 Group

This program can be also operated under the condition of M16C family products with the same SFR (Special Function Register) as M16C/62 Group products. Because some functions may be modified of the M16C family products, see the user's manual. When using the functions shown in this application note, evaluate them carefully for an operation.

### 3.0 Description of the application example

This chapter describes an example of DMA transfer using C compiler for M16C/60, M16C/20, M16C/10 series.

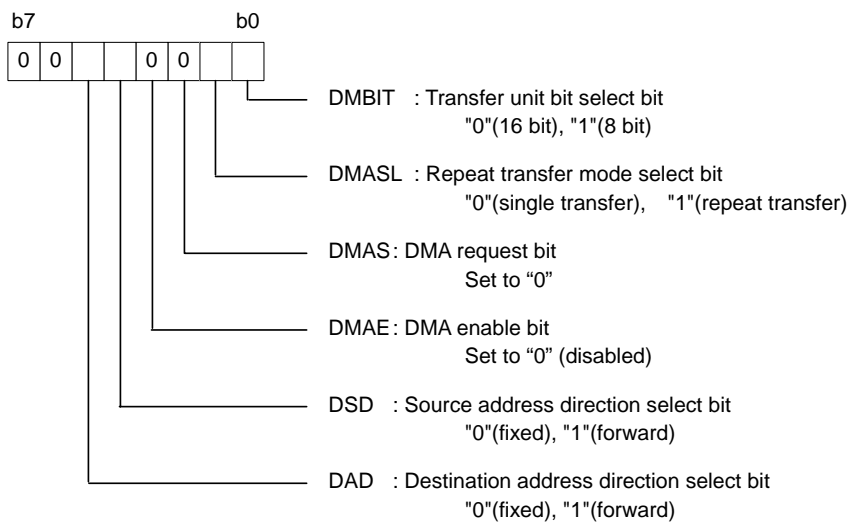
### 3.1 Setup procedures

The setup procedures and the setting value will be shown to use DMA0. Refer to M16C/62 Group datasheet for the details of each register.

#### (1) Set DMA0control register (DM0CON)

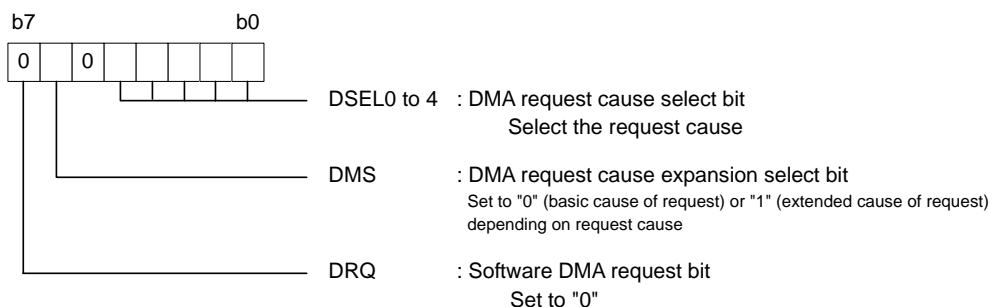
Set DMA enable bit to "0" (disabled)

Set transfer unit.

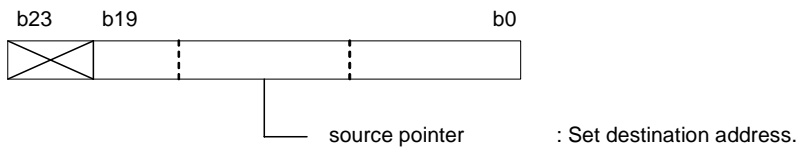


#### (2) Set DMA0 request cause select register (DM0SL)

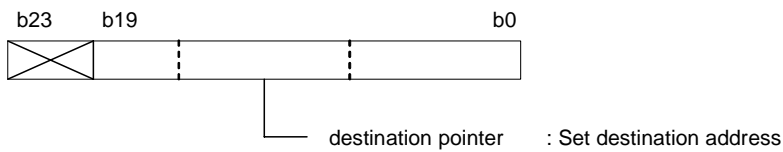
Set the request factors that trigger DMA transfer using DMA request cause select bit.



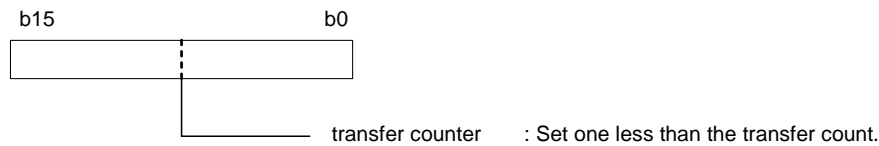
### (3) Set DMA0 source pointer (SAR0)



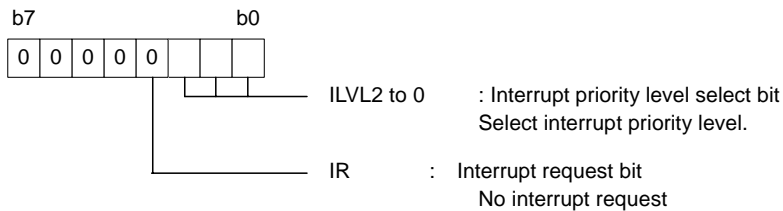
### (4) Set DMA0 destination pointer (DAR0)



### (5) Set DMA0 transfer counter (TCR0)

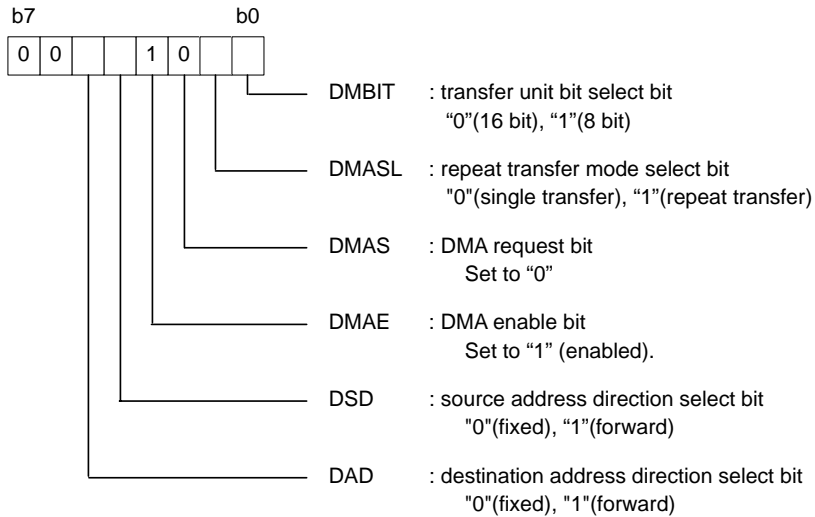


### (6) Set DMA0 interrupt control register (DM0IC)



(7) Reset DMA0 control register (DM0CON)

Set DMA enable bit to "1" (enabled).



(8) Set interrupt to be enabled. (I flag="1")

(9) Start up peripheral functions for DMA0 request cause.

## 4.0 Sample program

A sample program will be shown below when DMA request cause = "Timer A1", transfer memory space = from any address in the 1M bytes space to a fixed address, transfer unit = 8 bit, transfer address direction = repeat transfer.

```

/*****/
/*  FILE NAME : rjj05b0218_src.c                */
/*  Ver      : 1.10                            */
/*  CPU      : M16C/62                          */
/*  FUNCTION  : The DMA setting procedure in the C language. */
/*-----*/
/*  Copyright(C)2003, Renesas Technology Corp.    */
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/*  All rights reserved.                          */
/*                                                */
/*****/
/*****/
/*  include file                                */
/*****/
#include "sfr62a.h" // Special Function Register Header File

/*****/
/*  Function declaration                        */
/*****/
void ta1_init(void);
void dma0_int(void);

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

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

```

```

pd0  = 0xff;           // P0 is an output port.
pd6  = 0xff;           // P6 is an output port.
pd8  = 0x1f;           // P8_0-P8_4 output
p0   = 0;              //
p6   = 0;              //
p8   = 0;              //

ta1_init();           //

dm0sl = 0x03;          // (1) A setup of DM0SL(TA1)
dm0con = 0x13;         // (2) A setup of DM0CON
                        //   DMA0 inhibit,8bit,repeat,fixed->forward)

                        // (3) A setup of SAR0(DMA0 source pointer)
sar0_addr.byte.low  = (char)&data0;
sar0_addr.byte.mid  = (char)((unsigned long)&data0 >> 8);
sar0_addr.byte.high = (char)((unsigned long)&data0 >> 16);
                        // (4) A setup of DAR0(DMA0 destination pointer)
dar0_addr.byte.low  = (char)&p0;
dar0_addr.byte.mid  = (char)((unsigned long)&p0 >> 8);
dar0_addr.byte.high = (char)((unsigned long)&p0 >> 16);
tcr0  = 0x07;          // (5) A setup of TCR0(DMA0 transfer count)
dm0ic = 0x04;          // (6) A setup of DM0IC(DMA0 interrupt control register)
dm0con = 0x1B;         // (7) A setup of DM0CON
                        //   DMA0 permission,8bit,repeat,fixed->forward)

asm("fset I");        // (8) Interruption permission.

tabsr = 0x02;         // (9) Operation of the circumference function of a DMA demand factor
is permitted.

while(1)
{
    p8_1 = !p8_1;      // test end.
}
}

/*****/

```



```

/*  Timer-A1 initialization          */
/*****/
void ta1_init(void)
{
    ta1mr = 0x80;           // Timer-mode(f32)
    ta1   = 0x8fff;        // Timer value setup

}

```

```

/*****/
/*  DMA0 interrupt routine          */
/*****/
#pragma INTERRUPT/B dma0_int
void dma0_int(void)
{
    p6_0 = !p6_0;         //

}

```

## 5.0 Reference

Datasheet

Refer to M16C/62Group datasheet

(Acquire the most current version from Renesas web-site)

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### REVISION HISTORY

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| 1.10 | Nov 14, 2003 | -           | First edition issued |
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