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

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# MESOC TECHNICAL NEWS No. M16C-55-0006

## M16C Family

### Cautions Using Data Registers that Include Write Only Bits

#### 1. Affected devices

- M16C Family

#### 2. Cautions

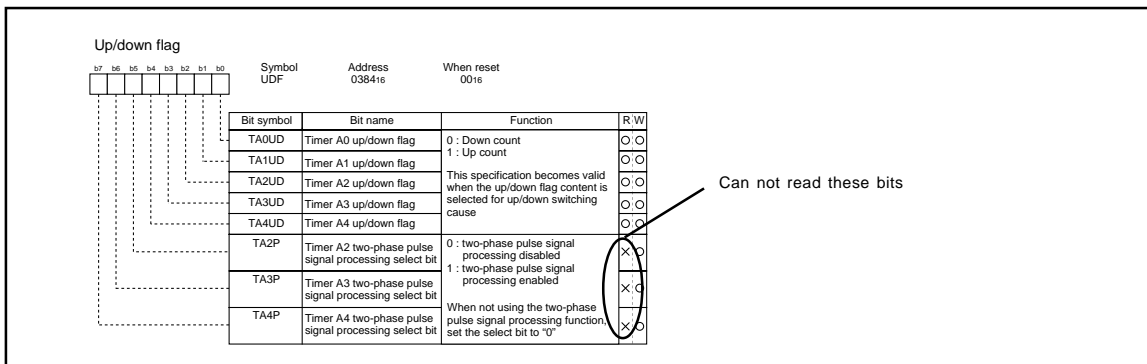
The registers shown in the table on the following page contain bits that will result in unknown data when read.

If performing a read-modify-write sequence of instructions to a register with write only bits, please reset the write only bits to their previous values before writing back to the register.

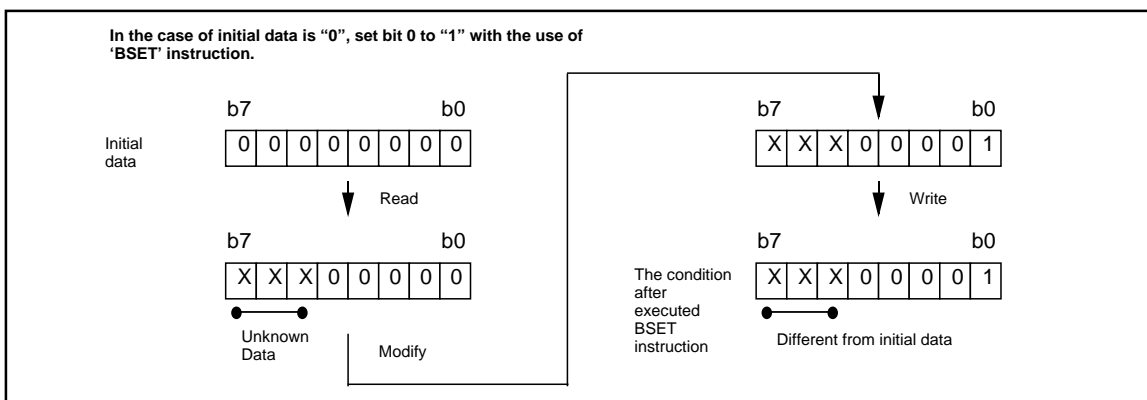
If your software accesses these registers frequently, please use a temporary RAM area to change the value, and then transfer it to the register.

Figure 1 shows an example of a register structure. If you execute a 'Read Modify Write' instruction like BSET, BCLR, AND or OR, the values of bits 5-7 may change. (Please see Figure 2)

'Table 10' show instruction table for Read Modify Write.



**Figure 1. Example of a register structure**



**Figure 2. Example of a register change**

**Table 1. Affected register (M16C/80 group)**

Register name	Symbol	Address
UART4 bit rate generator	U4BRG	02F9 <sub>16</sub>
UART4 transmit buffer register	U4TB	02FB <sub>16</sub> , 02FA <sub>16</sub>
Dead time timer	DTT	030C <sub>16</sub>
Timer B2 interrupt occurrences frequency set counter	ICTB2	030D <sub>16</sub>
UART3 bit rate generator	U3BRG	0329 <sub>16</sub>
UART3 transmit buffer register	U3TB	032B <sub>16</sub> , 032A <sub>16</sub>
UART2 bit rate generator	U2BRG	0339 <sub>16</sub>
UART2 transmit buffer register	U2TB	033B <sub>16</sub> , 033A <sub>16</sub>
Up/down flag	UDF	0344 <sub>16</sub>
Timer A0 register (Note)	TA0	0347 <sub>16</sub> , 0346 <sub>16</sub>
Timer A1 register (Note)	TA1	0349 <sub>16</sub> , 0348 <sub>16</sub>
Timer A2 register (Note)	TA2	034B <sub>16</sub> , 034A <sub>16</sub>
Timer A3 register (Note)	TA3	034D <sub>16</sub> , 034C <sub>16</sub>
Timer A4 register (Note)	TA4	034F <sub>16</sub> , 034E <sub>16</sub>
UART0 bit rate generator	U0BRG	0361 <sub>16</sub>
UART0 transmit buffer register	U0TB	0363 <sub>16</sub> , 0362 <sub>16</sub>
UART1 bit rate generator	U1BRG	0369 <sub>16</sub>
UART1 transmit buffer register	U1TB	036B <sub>16</sub> , 036A <sub>16</sub>

Note: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 2. Affected register (M16C/61 group)**

Register name	Symbol	Address
UART2 bit rate generator	U2BRG	0379 <sub>16</sub>
UART2 transmit buffer register	U2TB	037B <sub>16</sub> , 037A <sub>16</sub>
Up/down flag	UDF	0384 <sub>16</sub>
Timer A0 register (Note)	TA0	0387 <sub>16</sub> , 0386 <sub>16</sub>
Timer A1 register (Note)	TA1	0389 <sub>16</sub> , 0388 <sub>16</sub>
Timer A2 register (Note)	TA2	038B <sub>16</sub> , 038A <sub>16</sub>
Timer A3 register (Note)	TA3	038D <sub>16</sub> , 038C <sub>16</sub>
Timer A4 register (Note)	TA4	038F <sub>16</sub> , 038E <sub>16</sub>
UART0 bit rate generator	U0BRG	03A1 <sub>16</sub>
UART0 transmit buffer register	U0TB	03A3 <sub>16</sub> , 03A2 <sub>16</sub>
UART1 bit rate generator	U1BRG	03A9 <sub>16</sub>
UART1 transmit buffer register	U1TB	03AB <sub>16</sub> , 03AA <sub>16</sub>

Note: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 3. Affected register (M16C/62 group)**

Register name	Symbol	Address
Dead time timer	DTT	034C <sub>16</sub>
Timer B2 interrupt occurrences frequency set counter	ICTB2	034D <sub>16</sub>
SI/O3 bit rate generator	S3BRG	0363 <sub>16</sub>
SI/O4 bit rate generator	S4BRG	0367 <sub>16</sub>
UART2 bit rate generator	U2BRG	0379 <sub>16</sub>
UART2 transmit buffer register	U2TB	037B <sub>16</sub> , 037A <sub>16</sub>
Up/down flag	UDF	0384 <sub>16</sub>
Timer A0 register (Note)	TA0	0387 <sub>16</sub> , 0386 <sub>16</sub>
Timer A1 register (Note)	TA1	0389 <sub>16</sub> , 0388 <sub>16</sub>
Timer A2 register (Note)	TA2	038B <sub>16</sub> , 038A <sub>16</sub>
Timer A3 register (Note)	TA3	038D <sub>16</sub> , 038C <sub>16</sub>
Timer A4 register (Note)	TA4	038F <sub>16</sub> , 038E <sub>16</sub>
UART0 bit rate generator	U0BRG	03A1 <sub>16</sub>
UART0 transmit buffer register	U0TB	03A3 <sub>16</sub> , 03A2 <sub>16</sub>
UART1 bit rate generator	U1BRG	03A9 <sub>16</sub>
UART1 transmit buffer register	U1TB	03AB <sub>16</sub> , 03AA <sub>16</sub>

Note: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 4. Affected register (M16C/6H group)**

Register name	Symbol	Address
Display RAM address control register	CA	0203 <sub>16</sub> , 0202 <sub>16</sub>
Font RAM address control register	FA	0207 <sub>16</sub> , 0206 <sub>16</sub>
SYRAM address control register	YA	020B <sub>16</sub> , 020A <sub>16</sub>
Slice RAM address control register	SA	020F <sub>16</sub> , 020E <sub>16</sub>
VBIRAM address control register	EA	0213 <sub>16</sub> , 0212 <sub>16</sub>
Address control register for expansion register	DA	0217 <sub>16</sub> , 0216 <sub>16</sub>
SI/O3 bit rate generator	S3BRG	0363 <sub>16</sub>
SI/O4 bit rate generator	S4BRG	0367 <sub>16</sub>
UART2 bit rate generator	U2BRG	0379 <sub>16</sub>
UART2 transmit buffer register	U2TB	037B <sub>16</sub> , 037A <sub>16</sub>
Up/down flag	UDF	0384 <sub>16</sub>
Timer A0 register (Note)	TA0	0387 <sub>16</sub> , 0386 <sub>16</sub>
Timer A1 register (Note)	TA1	0389 <sub>16</sub> , 0388 <sub>16</sub>
Timer A2 register (Note)	TA2	038B <sub>16</sub> , 038A <sub>16</sub>
Timer A3 register (Note)	TA3	038D <sub>16</sub> , 038C <sub>16</sub>
Timer A4 register (Note)	TA4	038F <sub>16</sub> , 038E <sub>16</sub>
UART0 bit rate generator	U0BRG	03A1 <sub>16</sub>
UART0 transmit buffer register	U0TB	03A3 <sub>16</sub> , 03A2 <sub>16</sub>
UART1 bit rate generator	U1BRG	03A9 <sub>16</sub>
UART1 transmit buffer register	U1TB	03AB <sub>16</sub> , 03AA <sub>16</sub>

Note: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 5. Affected register (M16C/6K group)**

Register name	Symbol	Address
SI/O3 bit rate generator	S3BRG	0363 <sub>16</sub>
SI/O4 bit rate generator	S4BRG	0367 <sub>16</sub>
UART2 bit rate generator	U2BRG	0379 <sub>16</sub>
UART2 transmit buffer register	U2TB	037B <sub>16</sub> , 037A <sub>16</sub>
Up/down flag	UDF	0384 <sub>16</sub>
Timer A0 register (Note)	TA0	0387 <sub>16</sub> , 0386 <sub>16</sub>
Timer A1 register (Note)	TA1	0389 <sub>16</sub> , 0388 <sub>16</sub>
Timer A2 register (Note)	TA2	038B <sub>16</sub> , 038A <sub>16</sub>
Timer A3 register (Note)	TA3	038D <sub>16</sub> , 038C <sub>16</sub>
Timer A4 register (Note)	TA4	038F <sub>16</sub> , 038E <sub>16</sub>
UART0 bit rate generator	U0BRG	03A1 <sub>16</sub>
UART0 transmit buffer register	U0TB	03A3 <sub>16</sub> , 03A2 <sub>16</sub>
UART1 bit rate generator	U1BRG	03A9 <sub>16</sub>
UART1 transmit buffer register	U1TB	03AB <sub>16</sub> , 03AA <sub>16</sub>
Comparator control register	CMPCON	03DE <sub>16</sub>

Note: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 6. Affected register (M16C/6N group)**

Register name	Symbol	Address
Dead time timer	DTT	01CC <sub>16</sub>
Timer B2 interrupt occurrences frequency set counter	ICTB2	01CD <sub>16</sub>
SI/O3 bit rate generator	S3BRG	01E3 <sub>16</sub>
UART2 bit rate generator	U2BRG	01F9 <sub>16</sub>
UART2 transmit buffer register	U2TB	01FB <sub>16</sub> , 01FA <sub>16</sub>
Up/down flag	UDF	0384 <sub>16</sub>
Timer A0 register (Note)	TA0	0387 <sub>16</sub> , 0386 <sub>16</sub>
Timer A1 register (Note)	TA1	0389 <sub>16</sub> , 0388 <sub>16</sub>
Timer A2 register (Note)	TA2	038B <sub>16</sub> , 038A <sub>16</sub>
Timer A3 register (Note)	TA3	038D <sub>16</sub> , 038C <sub>16</sub>
Timer A4 register (Note)	TA4	038F <sub>16</sub> , 038E <sub>16</sub>
UART0 bit rate generator	U0BRG	03A1 <sub>16</sub>
UART0 transmit buffer register	U0TB	03A3 <sub>16</sub> , 03A2 <sub>16</sub>
UART1 bit rate generator	U1BRG	03A9 <sub>16</sub>
UART1 transmit buffer register	U1TB	03AB <sub>16</sub> , 03AA <sub>16</sub>

Note: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 7. Affected register (M16C/6V group)**

Register name	Symbol	Address
Processor mode register 1	PM1	0005 <sub>16</sub>
OSD reserved register 3	OR3	027B <sub>16</sub>
UART2 bit rate generator	U2BRG	0379 <sub>16</sub>
UART2 transmit buffer register	U2TB	037B <sub>16</sub> , 037A <sub>16</sub>
Up/down flag	UDF	0384 <sub>16</sub>
Timer A0 register (Note 1)	TA0	0387 <sub>16</sub> , 0386 <sub>16</sub>
Timer A1 register (Note 1)	TA1	0389 <sub>16</sub> , 0388 <sub>16</sub>
Timer A2 register (Note 2)	TA2	038B <sub>16</sub> , 038A <sub>16</sub>
Timer A3 register (Note 2)	TA3	038D <sub>16</sub> , 038C <sub>16</sub>
Timer A4 register (Note 1)	TA4	038F <sub>16</sub> , 038E <sub>16</sub>
UART0 bit rate generator	U0BRG	03A1 <sub>16</sub>
UART0 transmit buffer register	U0TB	03A3 <sub>16</sub> , 03A2 <sub>16</sub>
Port P6 register	P6	03EC <sub>16</sub>
Port P8 register	P8	03F0 <sub>16</sub>
Port P9 register	P9	03F1 <sub>16</sub>

Note 1: It is affected only in one-shot timer mode.

Note 2: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 8. Affected register (M30201 group)**

Register name	Symbol	Address
Up/down flag	UDF	0384 <sub>16</sub>
Timer A0 register (Note)	TA0	0387 <sub>16</sub> , 0386 <sub>16</sub>
Timer X0 register (Note)	TX0	0389 <sub>16</sub> , 0388 <sub>16</sub>
Timer X1 register (Note)	TX1	038B <sub>16</sub> , 038A <sub>16</sub>
Timer X2 register (Note)	TX2	038D <sub>16</sub> , 038C <sub>16</sub>
UART0 bit rate generator	U0BRG	03A1 <sub>16</sub>
UART0 transmit buffer register	U0TB	03A3 <sub>16</sub> , 03A2 <sub>16</sub>
UART1 bit rate generator	U1BRG	03A9 <sub>16</sub>
UART1 transmit buffer register	U1TB	03AB <sub>16</sub> , 03AA <sub>16</sub>

Note: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 9. Affected register (M30218 group)**

Register name	Symbol	Address
Up/down flag	UDF	0384 <sub>16</sub>
Timer A0 register (Note)	TA0	0387 <sub>16</sub> , 0386 <sub>16</sub>
Timer A1 register (Note)	TA1	0389 <sub>16</sub> , 0388 <sub>16</sub>
Timer A2 register (Note)	TA2	038B <sub>16</sub> , 038A <sub>16</sub>
Timer A3 register (Note)	TA3	038D <sub>16</sub> , 038C <sub>16</sub>
Timer A4 register (Note)	TA4	038F <sub>16</sub> , 038E <sub>16</sub>
UART0 bit rate generator	U0BRG	03A1 <sub>16</sub>
UART0 transmit buffer register	U0TB	03A3 <sub>16</sub> , 03A2 <sub>16</sub>
UART1 bit rate generator	U1BRG	03A9 <sub>16</sub>
UART1 transmit buffer register	U1TB	03AB <sub>16</sub> , 03AA <sub>16</sub>

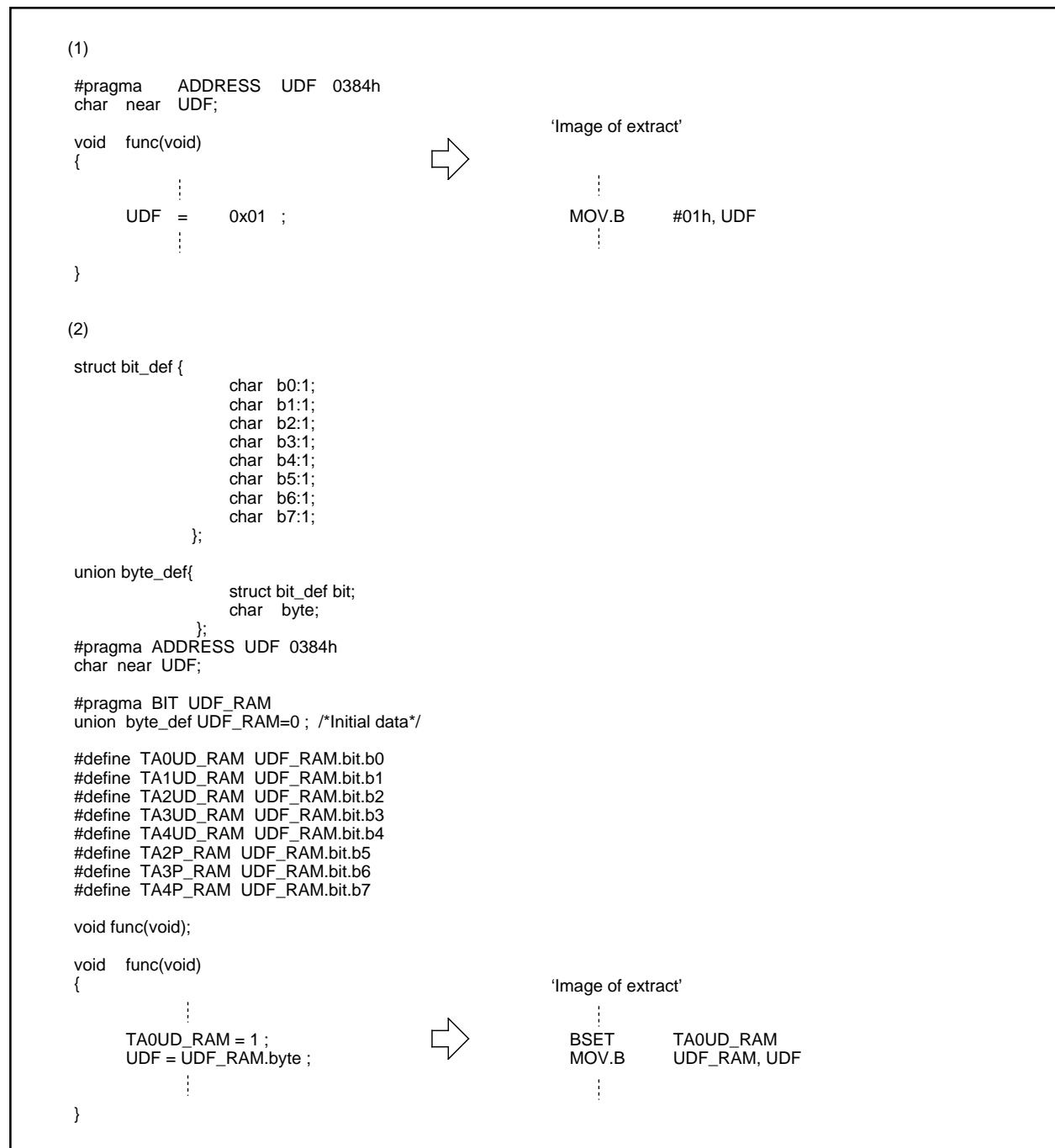
Note: It is affected only in one-shot timer mode and pulse width modulation mode.

**Table 10. Instruction table for Read Modify Write**

Function	Mnemonic
Bit manipulation	BCLR, BNOT, BSET, BTSTC, BTSTS
Shift	ROLC, RORC, ROT, SHA, SHL
Arithmetic	ABS, ADC, ADCF, ADD, DEC, EXTS, INC, MUL, MULU, NEG, SBB, SUB
Logical	AND, NOT, OR, XOR
Jump	ADJNZ, SBJNZ

### 3. C language programming

Figure 3 shows an example using C programming

**Figure 3. Example for C programming**