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RENESAS TECHNICAL UPDATE

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Product Category	MPU & MCU		Document No.	TN-16C-A205A/E	Rev.	1.00
Title	Descriptions changed in M16C/5L Group, M16C/56 Group User's Manual		Information Category	Technical Notification		
Applicable Product	M16C/5L and M16C/56 Groups	Lot No. —	Reference Document			

Some specifications of the M16C/5L and M16C/56 Groups have been changed. MCU usage and setting procedures have also been added or changed.

➔: Indicates the titles in the M16C/5L Group, M16C/56 Group User's Manual: Hardware Rev.1.10.

1. Specification Changes

1.1 G1BT Register in Timer S

➔ 18.2.5 Base Timer Register (G1BT)

Do not write to this register.

The G1BT register becomes 0000h when the BTS bit in the G1BCR1 register is set to 0 (base timer reset). This function works same as before without any change.

2. Changes on Usage Note

2.1 Interrupt Request When Selecting Time Measurement Function

➔ 18.5.6 Interrupt Request When Selecting Time Measurement Function

When the FSCj bit (j = 0 to 7) in the G1FS register is set to 1 (time measurement function selected), and the IFEj bit in the G1FE register is also set to 1, the G1IRj bit in the G1IR register, or the IR bit in the ICOCiIC register (i = 0, 1) or ICOCHjIC register (j = 0 to 3) may become 1 (interrupt requested) after a maximum of two fBT1 cycles.
When using the IC/OC interrupt i or IC/OC channel j interrupt, set bits FSCj and IFEj to 1, then perform the following.

(1) Wait for two or more fBT1 cycles.
(2) Set the IR bit in the ICOCiIC register and/or ICOCHjIC register to 0.
(3) Wait for three or more fBT1 cycles after the time measurement function is selected. Set the G1IR register to 00h after the IR bit in the ICOCiIC register is set to 0.

3. Additions and Changes on Usage and Setting Procedures

3.1 Flash Memory

3.1.1 User Boot Mode Program

➔ 26.11.4.1 User Boot Mode Program in Notes on Flash Memory

Following notes have been added to the user boot mode description:

- When using user boot mode, make sure to allocate the program to be executed to program ROM 2.
- The LVDAS bit in the OFS1 address and bits WDTRCS1 and WDTRCS0 in the OFS2 address are disabled in boot mode.
- When restarting the MCU in user boot mode after starting it in user boot mode, RAM becomes undefined.
- If addresses 13FF8h to 13FFBh are all 00h, the MCU does not enter standard serial I/O mode. Therefore, the programmer or on-chip debugger cannot be connected.
- As the reset sequence differs, the time necessary for starting the program is longer than in single-chip mode.
- Functions in user boot mode cannot be debugged by the on-chip debugging emulator or full spec emulator.
- While using user boot mode, do not change the input level of the pin used for user boot entry. However, if there is a possibility that the input level may change, perform the necessary processes in user boot mode, then restart the MCU in single-chip mode before the input level changes.
- To use user boot mode after standard serial I/O mode, turn off the power when exiting standard serial I/O mode, and then turn on the power again (cold start). The MCU enters user boot mode under the right conditions.

3.1.2 Procedures When Suspend Function is Enabled

➔ 26.8.1.1 Suspend Function (EW0 Mode), 26.8.2.1 Suspend Function (EW1 Mode)

The procedure for enabling the suspend function has been modified. The modified figures and modifications are shown below. Post modification and premodification examples of the program flowcharts in EW0 mode are shown on the next page.

Modified Figures

- Program Flowchart in EW0 Mode (Suspend Function Enabled)
- Block Erase Flowchart in EW0 Mode (Suspend Function Enabled)
- Lock Bit Program Flowchart in EW0 Mode (Suspend Function Enabled)

Modifications

- The timing to set the I flag to 1 (interrupt enabled) has been changed.
- The determination flag used in maskable interrupt routine has been changed from bits FMR32 or FMR33 to the FMR00 bit.

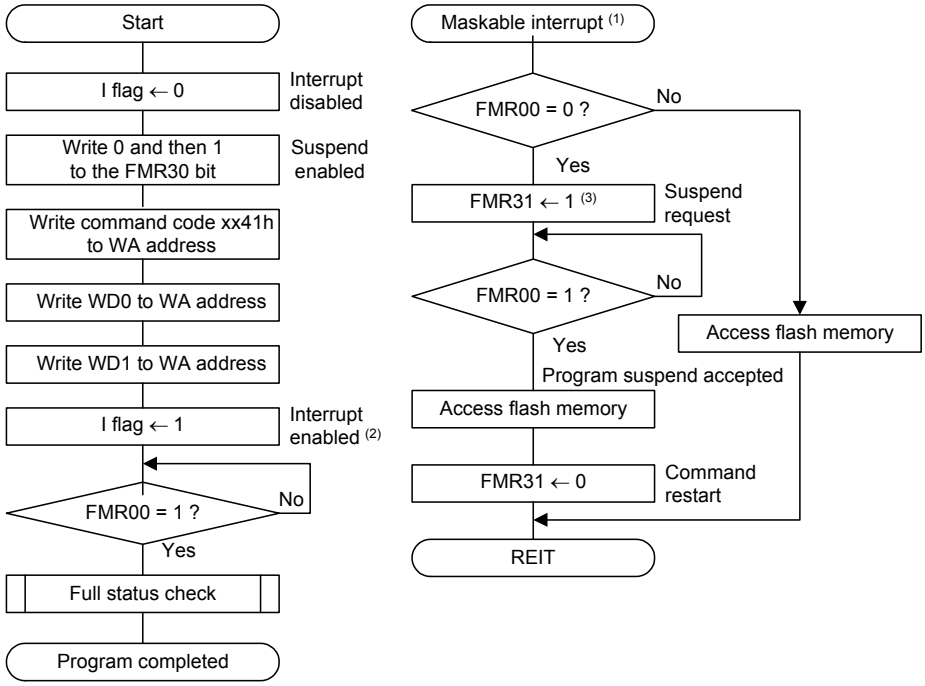
Modified figures

- Program Flowchart in EW1 Mode (Suspend Function Enabled)
- Block Erase Flowchart in EW1 Mode (Suspend Function Enabled)
- Lock Bit Program Flowchart in EW1 Mode (Suspend Function Enabled)

Modification

- The timing to set the I flag to 1 (interrupt enabled) has been changed.

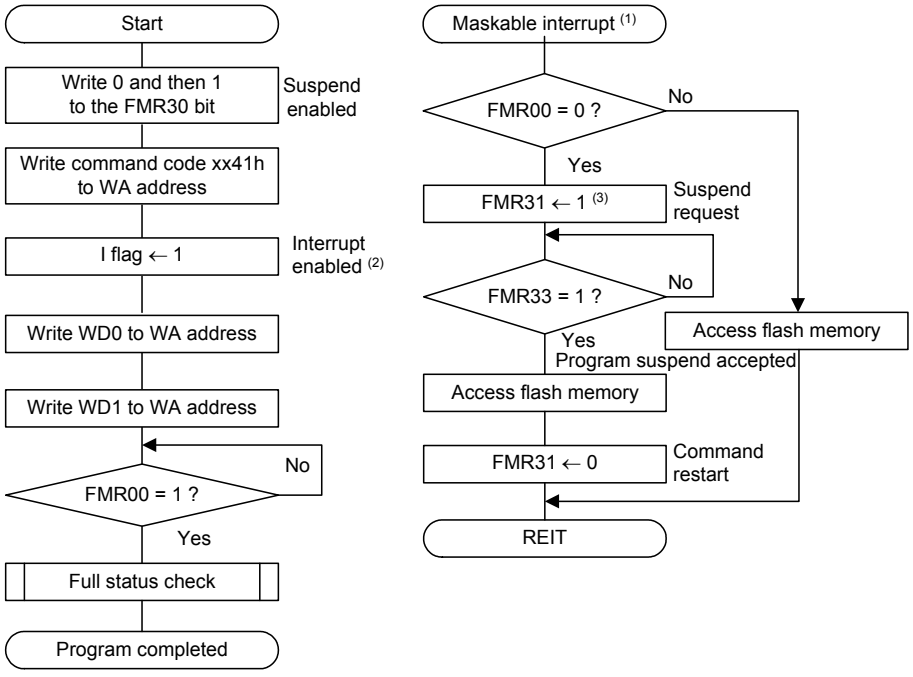
Post modification



Notes:
1. In EW0 mode, set the interrupt vector table for interrupts to be used and the interrupt routine in areas other than flash memory.
2. When interrupts are not used, an instruction to enable interrupts is not necessary.
3. Program is not suspended until td(SR-SUS) elapses after the FMR31 bit is set to 1.

Program Flowchart in EW0 Mode (Suspend Function Enabled)

Premodification



Notes:
1. In EW0 mode, set the interrupt vector table for interrupts to be used and the interrupt routine in areas other than flash memory.
2. When interrupts are not used, an instruction to enable interrupts are not necessary.
3. Program is not suspended until td(SR-SUS) elapses after the FMR31 bit is set to 1.

Program Flowchart in EW0 Mode (Suspend Function Enabled)

4. Additions and Changes on Electrical Characteristics

4.1 Voltage Detector 2

➔ 27.1.5 Voltage Detector and Power Supply Circuit Electrical Characteristics,
27.4.5 Voltage Detector and Power Supply Circuit Electrical Characteristics

The characteristics of Vdet2_0 to Vdet2_3, and Vdet2_5 to Vdet2_7 for voltage detector 2 have been added.

Symbol	Parameter	Condition	Standard			Unit
			Min.	Typ.	Max.	
Vdet2_0	Voltage detection level Vdet2_0	When V_{CC} is falling		3.21		V
Vdet2_1	Voltage detection level Vdet2_1			3.36		V
Vdet2_2	Voltage detection level Vdet2_2			3.51		V
Vdet2_3	Voltage detection level Vdet2_3			3.66		V
Vdet2_5	Voltage detection level Vdet2_5			3.96		V
Vdet2_6	Voltage detection level Vdet2_6			4.10		V
Vdet2_7	Voltage detection level Vdet2_7			4.25		V

4.2 Oscillator

➔ 27.1.6 Oscillator Electrical Characteristics, 27.4.6 Oscillator Electrical Characteristics

The characteristic of the dedicated 125 kHz on-chip oscillator for the watchdog timer has been added.

Symbol	Characteristic	Standard			Unit
		Min.	Typ.	Max.	
f_{WDT}	Dedicated 125 kHz on-chip oscillator for the watchdog timer oscillation frequency	100	125	150	kHz

4.3 Hysteresis V_{T+}-V_{T-} for TA0IN and others

➔ 27.2.1 Electrical Characteristics, 27.5.1 Electrical Characteristics (VCC = 5 V)

The maximum value of the following V_{T+}-V_{T-} hysteresis has been changed.

Symbol	Parameter		Measuring Condition	Standard				Unit
				Min.	Typ.	Max.		
						Before	After	
V_{T+}-V_{T-}	Hysteresis	TA0IN to TA4IN, TB0IN to TB2IN, $\overline{INT0}$ to $\overline{INT5}$, $\overline{NMI}$, $\overline{ADTRG}$, $\overline{CTS0}$ to $\overline{CTS3}$, SCL2, SDA2, CLK0 to CLK4, TA0OUT to TA4OUT, $\overline{KI0}$ to $\overline{KI3}$, RXD0 to RXD4, ZP, IDU, IDW, IDV, SD, INPC1_0 to INPC1_7, CRX0		0.2		2.5	$0.4V_{CC}$	V

➔ 27.3.1 Electrical Characteristics, 27.6.1 Electrical Characteristics (VCC = 3 V)

The maximum value of the following V_{T+}-V_{T-} hysteresis has been changed.

Symbol	Parameter		Measuring Condition	Standard				Unit
				Min.	Typ.	Max.		
						Before	After	
V_{T+}-V_{T-}	Hysteresis	TA0IN to TA4IN, TB0IN to TB2IN, $\overline{INT0}$ to $\overline{INT5}$, $\overline{NMI}$, $\overline{ADTRG}$, $\overline{CTS0}$ to $\overline{CTS3}$, SCL2, SDA2, CLK0 to CLK4, TA0OUT to TA4OUT, $\overline{KI0}$ to $\overline{KI3}$, RXD0 to RXD4, ZP, IDU, IDW, IDV, SD, INPC1_0 to INPC1_7, CRX0				1.8	$0.4V_{CC}$	V

4.4 P_d in Absolute Maximum Rating

➔ 27.4.1 Absolute Maximum Rating

The rated value of P_d for 85°C < T_{opr} ≤ 125°C in K-version has been changed.

Symbol	Characteristic	Condition	Rated Value		Unit
			Before	After	
P_d	Power consumption	85°C < T_{opr} ≤ 125°C	200	250	mW

4.5 I_{CC} in Electrical Characteristics

➔ 27.6.1 Electrical Characteristics

The typical values have been changed for the I_{CC} in the 3 V K-version when the following measuring conditions apply.

Symbol	Parameter	Measuring Condition		Standard				Unit
				Min.	Typ.		Max.	
					Before	After		
I_{CC}	Power supply current (V_{CC} = 3.0 V to 3.6 V) In single-chip mode, the output pins are open and other pins are V_{SS}	125 kHz on-chip oscillator mode	Main clock stopped 40 MHz on-chip oscillator stopped 125 kHz on-chip oscillator operating Divide-by-8 FMR22 = FMR23 = 1 (Low-current consumption read mode)		160	150	500	µA
		Low power mode	$f_{(BCLK)}$ = 32 kHz On ROM FMR22 = FMR23 = 1 (Low-current consumption read mode)		450	160		µA

5. Other

5.1 Two-Phase Pulse in Timer S

➔ 1.5 Pin Assignments and others

Two-phase pulse input pins for timer S have been named. Accordingly, the pins are described as follows.

P8_0/TA4OUT/U/TSUDA

P8_1/TA4IN/$\overline{U}$/TSUDB

Symbols and names in the timing requirements are described as follows. No changes have been made to the standard.

➔ 27.2.2.5 Timer S Input, 27.3.2.5 Timer S Input, 27.5.2.5 Timer S Input, 27.6.2.5 Timer S Input

Before		After	
Symbol	Parameter	Symbol	Parameter
$t_{w(TSH)}$	P8_0 (A-phase), P8_1 (B-phase) Input HIGH Pulse Width	$t_{w(TSH)}$	TSUDA, TSUDB input high pulse width
$t_{w(TSL)}$	P8_0 (A-phase), P8_1 (B-phase) Input LOW Pulse Width	$t_{w(TSL)}$	TSUDA, TSUDB input low pulse width
$t_{su(P8\_0\text{-}P8\_1)}$	P8_1 (B-phase) Input Setup Time	$t_{su(TSUDA\text{-}TSUDB)}$	TSUDB input setup time
$t_{su(P8\_1\text{-}P8\_0)}$	P8_0 (A-phase) Input Setup Time	$t_{su(TSUDB\text{-}TSUDA)}$	TSUDA input setup time