Renesas Electronics America Inc - R5F72867N100FP#U2 Datasheet

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Not For New Designs
Core Processor	SH2A
Core Size	32-Bit Single-Core
Speed	100MHz
Connectivity	CANbus, I²C, SCI, SSU, USB
Peripherals	DMA, PWM, WDT
Number of I/O	101
Program Memory Size	1MB (1M x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	32K x 8
Voltage - Supply (Vcc/Vdd)	3V ~ 5.5V
Data Converters	A/D 12x12b, 2x8b
Oscillator Type	External
Operating Temperature	-20°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	176-LQFP
Supplier Device Package	176-LFQFP (24x24)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f72867n100fp-u2

2.1.2 Control Registers

The control registers consist of four 32-bit registers: the status register (SR), the global base register (GBR), the vector base register (VBR), and the jump table base register (TBR).

The status register indicates instruction processing states.

The global base register functions as a base address for the GBR indirect addressing mode to transfer data to the registers of on-chip peripheral modules.

The vector base register functions as the base address of the exception handling vector area (including interrupts).

The jump table base register functions as the base address of the function table area.

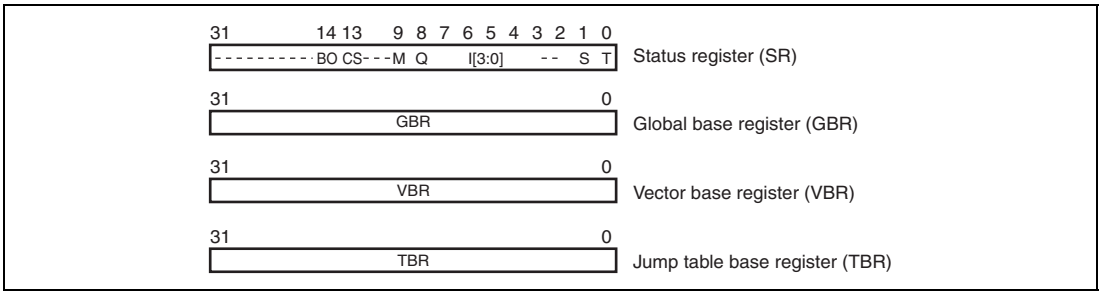


Figure 2.2 Control Registers

(1) Status Register (SR)

Bit:	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Initial value:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R/W:	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

Bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	BO	CS	-	-	-	M	Q	I[3:0]				-	-	S	T
Initial value:	0	0	0	0	0	0	-	-	1	1	1	1	0	0	-	-
R/W:	R	R/W	R/W	R	R	R	R/W	R/W	R/W	R/W	R/W	R/W	R	R	R/W	R/W

5.2 Resets

5.2.1 Types of Reset

A reset is the highest-priority exception handling source. There are two kinds of reset, power-on and manual. As shown in table 5.5, the CPU state is initialized in both a power-on reset and a manual reset. On-chip peripheral module registers are initialized by a power-on reset, but not by a manual reset.

Table 5.5 Exception Source Detection and Exception Handling Start Timing

	Conditions for Transition to Reset State			Internal States		
Type	**$\overline{\text{RES}}$ or $\overline{\text{MRES}}$**	**H-UDI Command**	**WDT Overflow**	**CPU**	**On-Chip Peripheral Modules, I/O Port**	**WRCSR of WDT, FRQCR of CPG**
Power-on reset	Low	—	—	Initialized	Initialized	Initialized
	High	H-UDI reset assert command is set	—	Initialized	Initialized	Initialized
	High	Command other than H-UDI reset assert is set	Power-on reset	Initialized	Initialized	Not initialized
Manual reset	Low	—	—	Initialized	Not initialized*	Not initialized
	High	—	Manual reset	Initialized	Not initialized*	Not initialized

Note: * The BN bit in IBNR of the INTC is initialized.

7.6 Usage Notes

1. The CPU can read from or write to the UBC registers via the I bus. Accordingly, during the period from executing an instruction to rewrite the UBC register till the new value is actually rewritten, the desired break may not occur. In order to know the timing when the UBC register is changed, read from the last written register. Instructions after then are valid for the newly written register value.
2. The UBC cannot monitor access to the C bus and I bus cycles in the same channel.
3. When a user break and another exception occur at the same instruction, which has higher priority is determined according to the priority levels defined in table 5.1 in section 5, Exception Handling. If an exception with a higher priority occurs, the user break does not occur.
4. Note the following when a break occurs in a delay slot.

   If a pre-execution break is set at a delay slot instruction, the break is not generated until immediately before execution of the branch destination.
5. User breaks are disabled during UBC module standby mode. Do not read from or write to the UBC registers during UBC module standby mode; the values are not guaranteed.
6. Do not set an address within an interrupt exception handling routine whose interrupt priority level is at least 15 (including user break interrupts) as a break address.
7. Do not set break after instruction execution for the SLEEP instruction or for the delayed branch instruction where the SLEEP instruction is placed at its delay slot.
8. When setting a break for a 32-bit instruction, set the address where the upper 16 bits are placed. If the address of the lower 16 bits is set and a break before instruction execution is set as a break condition, the break is handled as a break after instruction execution.

8.7.2 Chain Transfer when Transfer Counter = 0

By executing a second data transfer and performing re-setting of the first data transfer only when the counter value is 0, it is possible to perform 256 or more repeat transfers.

An example is shown in which a 128-Kbyte input buffer is configured. The input buffer is assumed to have been set to start at lower address H'0000. Figure 8.19 shows the chain transfer when the counter value is 0.

1. For the first transfer, set the normal transfer mode for input data. Set the fixed transfer source address, CRA = H'0000 (65,536 times), CHNE = 1, CHNS = 1, and DISEL = 0.
2. Prepare the upper 8-bit addresses of the start addresses for 65,536-transfer units for the first data transfer in a separate area (in ROM, etc.). For example, if the input buffer is configured at addresses H'200000 to H'21FFFF, prepare H'21 and H'20.
3. For the second transfer, set repeat transfer mode (with the source side as the repeat area) for re-setting the transfer destination address for the first data transfer. Use the upper eight bits of DAR in the first transfer information area as the transfer destination. Set CHNE = DISEL = 0. If the above input buffer is specified as H'200000 to H'21FFFF, set the transfer counter to 2.
4. Execute the first data transfer 65536 times by means of interrupts. When the transfer counter for the first data transfer reaches 0, the second data transfer is started. Set the upper eight bits of the transfer source address for the first data transfer to H'21. The lower 16 bits of the transfer destination address of the first data transfer and the transfer counter are H'0000.
5. Next, execute the first data transfer the 65536 times specified for the first data transfer by means of interrupts. When the transfer counter for the first data transfer reaches 0, the second data transfer is started. Set the upper eight bits of the transfer source address for the first data transfer to H'20. The lower 16 bits of the transfer destination address of the first data transfer and the transfer counter are H'0000.
6. Steps 4 and 5 are repeated endlessly. As repeat mode is specified for the second data transfer, no interrupt request is sent to the CPU.

Bit	Bit Name	Initial Value	R/W	Description
6	WM	0	R/W	External Wait Mask Specification Specifies whether or not the external wait input is valid. The specification by this bit is valid even when the number of access wait cycle is 0. 0: External wait input is valid 1: External wait input is ignored
5 to 2	—	All 0	R	Reserved These bits are always read as 0. The write value should always be 0.
1, 0	HW[1:0]	00	R/W	Delay Cycles from $\overline{RD}$, $\overline{WRxx}$ Negation to Address, $\overline{CS4}$ Negation Specify the number of delay cycles from $\overline{RD}$ and $\overline{WRxx}$ negation to address and $\overline{CS4}$ negation. 00: 0.5 cycles 01: 1.5 cycles 10: 2.5 cycles 11: 3.5 cycles

9.5.8 SRAM Interface with Byte Selection

The SRAM interface with byte selection is for access to an SRAM which has a byte-selection pin ($\overline{\text{WRxx}}$). This interface has 16-bit data pins and accesses SRAMs having upper and lower byte selection pins, such as UB and LB.

When the BAS bit in CSnWCR is cleared to 0 (initial value), the write access timing of the SRAM interface with byte selection is the same as that for the normal space interface. While in read access of a byte-selection SRAM interface, the byte-selection signal is output from the $\overline{\text{WRxx}}$ pin, which is different from that for the normal space interface. The basic access timing is shown in figure 9.36. In write access, data is written to the memory according to the timing of the byte-selection pin ($\overline{\text{WRxx}}$). For details, please refer to the Data Sheet for the corresponding memory.

If the BAS bit in CSnWCR is set to 1, the $\overline{\text{WRxx}}$ pin and RD/$\overline{\text{WR}}$ pin timings change. Figure 9.37 shows the basic access timing. In write access, data is written to the memory according to the timing of the write enable pin (RD/$\overline{\text{WR}}$). The data hold timing from RD/$\overline{\text{WR}}$ negation to data write must be acquired by setting the HW1 and HW0 bits in CSnWCR. Figure 9.38 shows the access timing when a software wait is specified.

10.3.3 DMA Transfer Count Registers (DMATCR)

The DMA transfer count registers (DMATCR) are 32-bit readable/writable registers that specify the number of DMA transfers. The transfer count is 1 when the setting is H'00000001, 16,777,215 when H'00FFFFFF is set, and 16,777,216 (the maximum) when H'00000000 is set. During a DMA transfer, these registers indicate the remaining transfer count.

The upper eight bits of DMATCR are always read as 0, and the write value should always be 0. To transfer data in 16 bytes, one 16-byte transfer (128 bits) counts one.

DMATCR is initialized to H'00000000 by a reset and retains the value in software standby mode and module standby mode.

Bit:	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Initial value:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R/W:	R	R	R	R	R	R	R	R	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Initial value:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R/W:	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

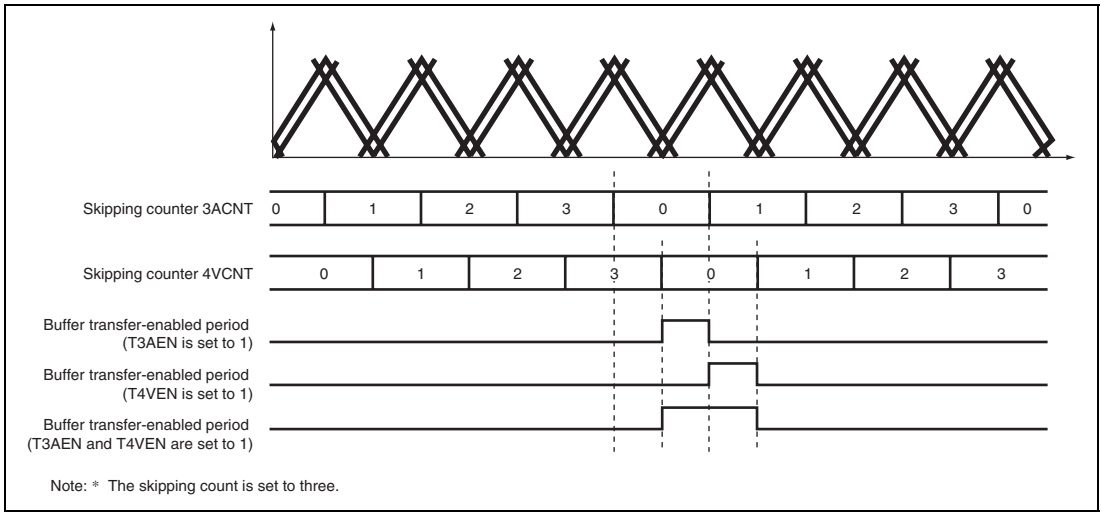


Figure 11.78 Relationship between Bits T3AEN and T4VEN in TITCR and Buffer Transfer-Enabled Period

(4) Complementary PWM Mode Output Protection Function

Complementary PWM mode output has the following protection functions.

(a) Register and Counter Miswrite Prevention Function

With the exception of the buffer registers, which can be rewritten at any time, access by the CPU can be enabled or disabled for the mode registers, control registers, compare registers, and counters used in complementary PWM mode by means of the RWE bit in the timer read/write enable register (TRWER). The applicable registers are some (21 in total) of the registers in channels 3 and 4 shown in the following:

- TCR_3 and TCR_4, TMDR_3 and TMDR_4, TIORH_3 and TIORH_4, TIORL_3 and TIORL_4, TIER_3 and TIER_4, TCNT_3 and TCNT_4, TGRA_3 and TGRA_4, TGRB_3 and TGRB_4, TOER, TOCR, TGCR, TCDR, and TDDR.

This function enables miswriting due to CPU runaway to be prevented by disabling CPU access to the mode registers, control registers, and counters. When the applicable registers are read in the access-disabled state, undefined values are returned. Writing to these registers is ignored.

11.7.13 Counter Value during Complementary PWM Mode Stop

When counting operation is suspended with TCNT_3 and TCNT_4 in complementary PWM mode, TCNT_3 has the timer dead time register (TDDR) value, and TCNT_4 is held at H'0000.

When restarting complementary PWM mode, counting begins automatically from the initialized state. This explanatory diagram is shown in figure 11.132.

When counting begins in another operating mode, be sure that TCNT_3 and TCNT_4 are set to the initial values.

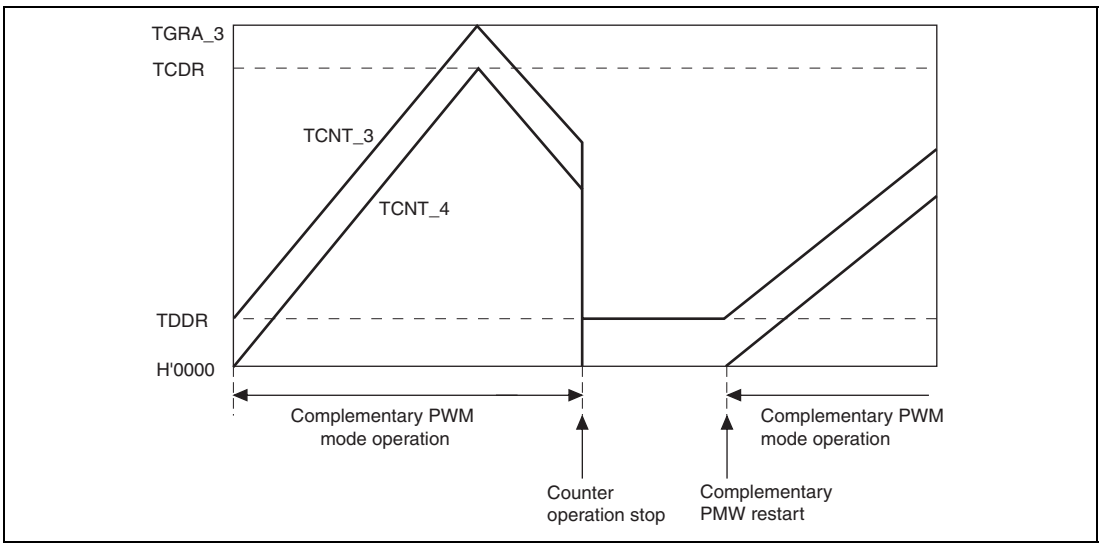


Figure 11.132 Counter Value during Complementary PWM Mode Stop

11.7.14 Buffer Operation Setting in Complementary PWM Mode

In complementary PWM mode, conduct rewrites by buffer operation for the PWM cycle setting register (TGRA_3), timer cycle data register (TCDR), and duty setting registers (TGRB_3, TGRA_4, and TGRB_4).

In complementary PWM mode, channel 3 and channel 4 buffers operate in accordance with bit settings BFA and BFB of TMDR_3. When TMDR_3's BFA bit is set to 1, TGRC_3 functions as a buffer register for TGRA_3. At the same time, TGRC_4 functions as the buffer register for TGRA_4, and TCBR functions as the TCDR's buffer register.

Section 16 Serial Communication Interface (SCI)

This LSI has four channels (SH7286 and SH7285) or two channels (SH7243) of independent serial communication interface (SCI). The SCI can handle both asynchronous and clock synchronous serial communication. In asynchronous serial communication mode, serial data communication can be carried out with standard asynchronous communication chips such as a Universal Asynchronous Receiver/Transmitter (UART) or Asynchronous Communication Interface Adapter (ACIA). A function is also provided for serial communication between processors (multiprocessor communication function).

16.1 Features

- Choice of asynchronous or clock synchronous serial communication mode
- Asynchronous mode:
  - Serial data communication is performed by start-stop in character units. The SCIF can communicate with a universal asynchronous receiver/transmitter (UART), an asynchronous communication interface adapter (ACIA), or any other communications chip that employs a standard asynchronous serial system. There are twelve selectable serial data communication formats.
  - Data length: 7 or 8 bits
  - Stop bit length: 1 or 2 bits
  - Parity: Even, odd, or none
  - Multiprocessor communications
  - Receive error detection: Parity, overrun, and framing errors
  - Break detection: Break is detected by reading the RXD pin level directly when a framing error occurs.
- Clock synchronous mode:
  - Serial data communication is synchronized with a clock signal. The SCIF can communicate with other chips having a clock synchronous communication function.
  - Data length: 8 bits
  - Receive error detection: Overrun errors
- Full duplex communication: The transmitting and receiving sections are independent, so the SCI can transmit and receive simultaneously. Both sections use double buffering, so high-speed continuous data transfer is possible in both the transmit and receive directions.
- On-chip baud rate generator with selectable bit rates
- Internal or external transmit/receive clock source: From either baud rate generator (internal clock) or SCK pin (external clock)

Section 18 Synchronous Serial Communication Unit (SSU)

This LSI (SH7286 or SH7285) has an independent synchronous serial communication unit (SSU) channel. The SSU has master mode in which this LSI outputs clocks as a master device for synchronous serial communication and slave mode in which clocks are input from an external device for synchronous serial communication. Synchronous serial communication can be performed with devices having different clock polarity and clock phase.

18.1 Features

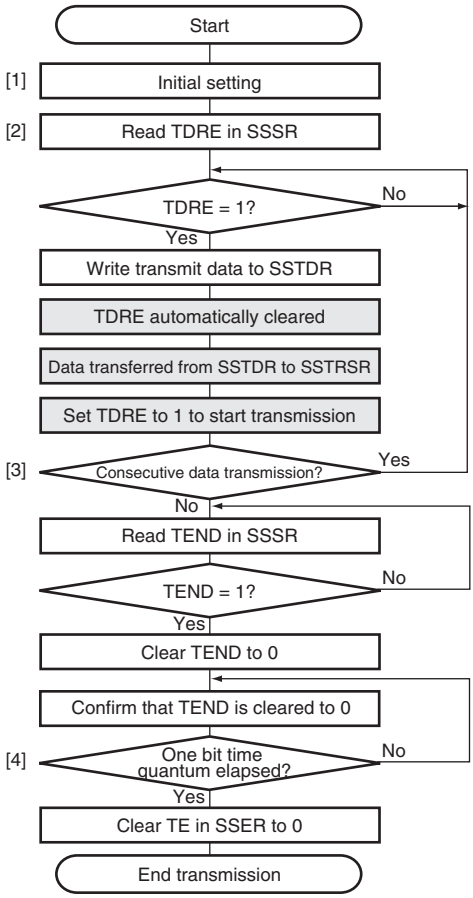
- Choice of SSU mode and clock synchronous mode
- Choice of master mode and slave mode
- Choice of standard mode and bidirectional mode
- Synchronous serial communication with devices with different clock polarity and clock phase
- Choice of 8/16/32-bit width of transmit/receive data
- Full-duplex communication capability

  The shift register is incorporated, enabling transmission and reception to be executed simultaneously.
- Consecutive serial communication
- Choice of LSB-first or MSB-first transfer
- Choice of a clock source

  Pϕ/4, Pϕ/8, Pϕ/16, Pϕ/32, Pϕ/64, Pϕ/128, Pϕ/256, or an external clock
- Five interrupt sources

  Transmit end, transmit data register empty, receive data full, overrun error, and conflict error.

  The data transfer controller (DTC) can be activated by a transmit data register empty request or a receive data full request to transfer data.
- Module standby mode can be set



[1] Initial setting:
Specify the transmit data format.

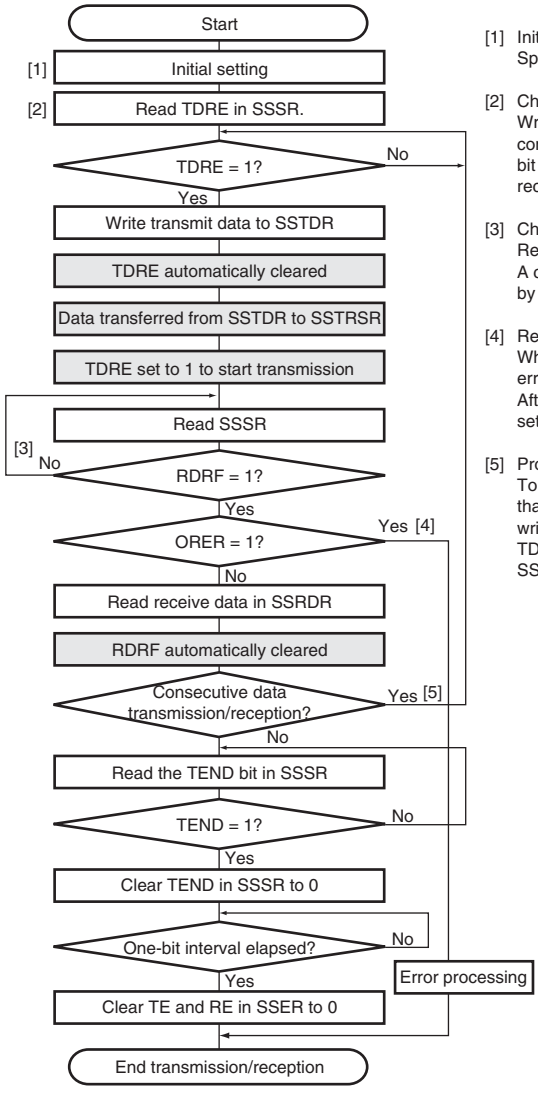
[2] Check that the SSU state and write transmit data:
Write transmit data to SSTDR after reading and confirming that the TDRE bit is 1. The TDRE bit is automatically cleared to 0 and transmission is started by writing data to SSTDR.

[3] Procedure for consecutive data transmission:
To continue data transmission, confirm that the TDRE bit is 1 meaning that SSTDR is ready to be written to. After that, data can be written to SSTDR. The TDRE bit is automatically cleared to 0 by writing data to SSTDR.

[4] Procedure for data transmission end:
To end data transmission, confirm that the TEND bit is cleared to 0. After completion of transmitting the last bit, clear the TE bit to 0.

Note: Hatching boxes represent SSU internal operations.

Figure 18.6 Flowchart Example of Data Transmission (SSU Mode)



[1] Initial setting:
Specify the transmit/receive data format.

[2] Check the SSU state and write transmit data:
Write transmit data to SSTDR after reading and confirming that the TDRE bit in SSSR is 1. The TDRE bit is automatically cleared to 0 and transmission/reception is started by writing data to SSTDR.

[3] Check the SSU state:
Read SSSR confirming that the RDRF bit is 1.
A change of the RDRF bit (from 0 to 1) can be notified by RXI interrupt.

[4] Receive error processing:
When a receive error occurs, execute the designated error processing after reading the ORER bit in SSSR. After that, clear the ORER bit to 0. While the ORER bit is set to 1, transmission or reception is not resumed.

[5] Procedure for consecutive data transmission/reception:
To continue serial data transmission/reception, confirm that the TDRE bit is 1 meaning that SSTDR is ready to be written to. After that, data can be written to SSTDR. The TDRE bit is automatically cleared to 0 by writing data to SSTDR.

Note: Hatching boxes represent SSU internal operations.

Figure 18.9 Flowchart Example of Simultaneous Transmission/Reception (SSU Mode)

18.6.5 Note on Master Transmission and Master Reception Operations in SSU Mode

To perform master transmission or reception in SSU mode, perform one of the following operations:

- After the TDRE flag in SSSR is set to 1, store the next byte of transmit data in SSTDR before transmission of the second to last bit starts.
- Store the next byte of transmit data in SSTDR after confirming that the TEND flag in SSSR has been set to 1.
- Use the SSU with the TENDSTS bit in SSCR2 cleared to 0, or with both the TENDSTS and SCSATS bits in SSCR2 set to 1.

18.6.6 Note on DTC Transfers

When a DTC transfer occurs with SSTXI as the activation source, TDRE is not cleared when the transfer counter reaches H'0000 but communication operation starts anyway.

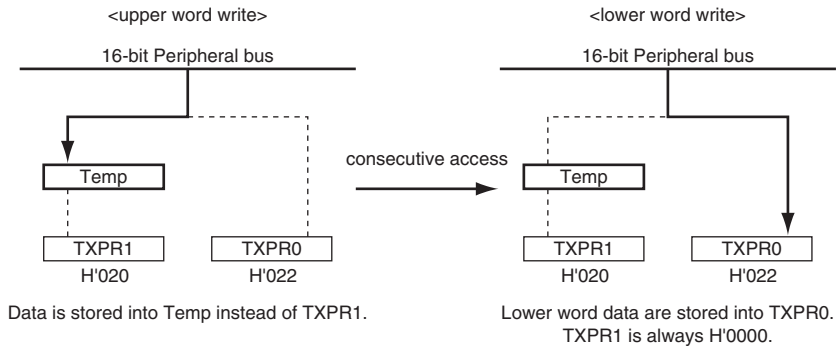
When using the SSTXI interrupt to clear the flag, perform interrupt handling first.

However, do not clear the flag within the SSTXI interrupt handler when the initial value of the DTC's transfer counter is set to H'0001 and the DISEL bit is set to 1. In this case, clearing the flag by the interrupt handler may cause the SSU to start communication operation a second time.

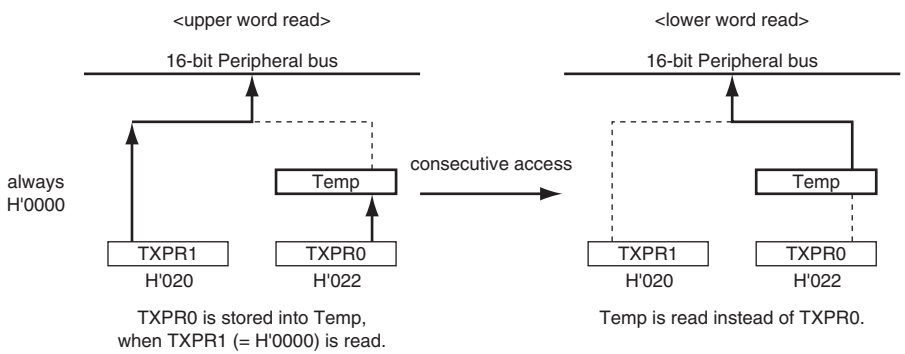
(1) Transmit Pending Register (TXPR1, TXPR0)

The concatenation of TXPR1 and TXPR0 is a 32-bit register that contains any transmit pending flags for the CAN module. In the case of 16-bit bus interface, Long Word access is carried out as two consecutive word accesses.

<Longword Write Operation>



<Longword Read Operation>



The TXPR1 register cannot be modified and it is always fixed to ‘0’. The TXPR0 controls Mailbox-15 to Mailbox-1. The CPU may set the TXPR bits to affect any message being considered for transmission by writing a '1' to the corresponding bit location. Writing a '0' has no effect, and TXPR cannot be cleared by writing a ‘0’ and must be cleared by setting the corresponding TXCR bits. TXPR may be read by the CPU to determine which, if any, transmissions are pending or in progress. In effect there is a transmit pending bit for all Mailboxes except for the Mailbox-0. Writing a '1' to a bit location when the mailbox is not configured to transmit is not allowed.

Bit	Bit Name	Initial Value	R/W	Description
2 to 0	PB12MD[2:0]	000*	R/W	PB12 Mode Select the function of the PB12/$\overline{CS1}$/$\overline{CS7}$/IRQ1/TXD2/$\overline{CS3}$ pin. 000: PB12 I/O (port) 001: $\overline{CS1}$ output (BSC) 010: $\overline{CS7}$ output (BSC) 011: IRQ1 input (INTC) 100: Setting prohibited 101: TXD3 output (SCI) 110: Setting prohibited 111: $\overline{CS3}$ output (BSC)

Note: * The initial value is 1 during the on-chip ROM disabled external extension mode.

- Port B Control Register L3 (PBCRL3)

Bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	PB11MD[2:0]			-	-	-	-	-	-	-	-	-	PB8MD[2:0]		
Initial value:	0	0	0	0*	0	0	0	0	0	0	0	0	0	0	0	0*
R/W:	R	R/W	R/W	R/W	R	R	R	R	R	R	R	R	R	R/W	R/W	R/W

Note: * The initial value is 1 during the on-chip ROM disabled external extension mode.

Bit	Bit Name	Initial Value	R/W	Description
15	—	0	R	Reserved This bit is always read as 0. The write value should always be 0.

23.1.9 Port C Pull-Up MOS Control Register L (PCPCRL)

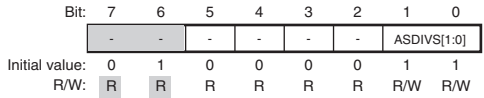
PCPCRL controls on/off of the input pull-up MOS of port C in bits.

Bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	PC15 PCR	PC14 PCR	PC13 PCR	PC12 PCR	PC11 PCR	PC10 PCR	PC9 PCR	PC8 PCR	PC7 PCR	PC6 PCR	PC5 PCR	PC4 PCR	PC3 PCR	PC2 PCR	PC1 PCR	PC0 PCR
Initial value:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R/W:	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Bit	Bit Name	Initial Value	R/W	Description
15	PC15PCR	0	R/W	The corresponding input pull-up MOS turns on when one of these bits is set to 1.
14	PC14PCR	0	R/W	
13	PC13PCR	0	R/W	
12	PC12PCR	0	R/W	
11	PC11PCR	0	R/W	
10	PC10PCR	0	R/W	
9	PC9PCR	0	R/W	
8	PC8PCR	0	R/W	
7	PC7PCR	0	R/W	
6	PC6PCR	0	R/W	
5	PC5PCR	0	R/W	
4	PC4PCR	0	R/W	
3	PC3PCR	0	R/W	
2	PC2PCR	0	R/W	
1	PC1PCR	0	R/W	
0	PC0PCR	0	R/W	

Module Name	Register Name	Abbreviation	Number of Bits	Address	Access Size
MTU2	Timer A/D converter start request cycle set buffer register B_4	TADCOBRB_4	16	H'FFFE424A	16
	Timer control register U_5	TCRU_5	8	H'FFFE4084	8
	Timer control register V_5	TCRV_5	8	H'FFFE4094	8
	Timer control register W_5	TCRW_5	8	H'FFFE40A4	8
	Timer I/O control register U_5	TIORU_5	8	H'FFFE4086	8
	Timer I/O control register V_5	TIORV_5	8	H'FFFE4096	8
	Timer I/O control register W_5	TIORW_5	8	H'FFFE40A6	8
	Timer interrupt enable register_5	TIER_5	8	H'FFFE40B2	8
	Timer status register_5	TSR_5	8	H'FFFE40B0	8
	Timer start register_5	TSTR_5	8	H'FFFE40B4	8
	Timer counter U_5	TCNTU_5	16	H'FFFE4080	16
	Timer counter V_5	TCNTV_5	16	H'FFFE4090	16
	Timer counter W_5	TCNTW_5	16	H'FFFE40A0	16
	Timer general register U_5	TGRU_5	16	H'FFFE4082	16
	Timer general register V_5	TGRV_5	16	H'FFFE4092	16
	Timer general register W_5	TGRW_5	16	H'FFFE40A2	16
	Timer compare match clear register	TCNTCMPCLR	8	H'FFFE40B6	8
	Timer start register	TSTR	8	H'FFFE4280	8
	Timer synchronous register	TSYR	8	H'FFFE4281	8
	Timer counter synchronous start register	TCSYSTR	8	H'FFFE4282	8
	Timer read/write enable register	TRWER	8	H'FFFE4284	8
	Timer output master enable register	TOER	8	H'FFFE420A	8
	Timer output control register 1	TOCR1	8	H'FFFE420E	8, 16
	Timer output control register 2	TOCR2	8	H'FFFE420F	8
	Timer gate control register	TGCR	8	H'FFFE420D	8
	Timer cycle control register	TCDR	16	H'FFFE4214	16, 32
	Timer dead time data register	TDDR	16	H'FFFE4216	16
	Timer subcounter	TCNTS	16	H'FFFE4220	16, 32
	Timer cycle buffer register	TCBR	16	H'FFFE4222	16
	Timer cycle buffer register	TITCR	8	H'FFFE4230	8, 16
	Timer interrupt skipping counter	TITCNT	8	H'FFFE4231	8
	Timer buffer transfer set register	TBTER	8	H'FFFE4232	8
	Timer dead time enable register	TDER	8	H'FFFE4234	8

Module Name	Register Name		Abbreviation	Number of Bits	Address	Access Size
RCAN-ET	MB[12].	CONTROL0H	—	16	H'FFFFD280	16, 32
		CONTROL0L	—	16	H'FFFFD282	16
		LAFMH	—	16	H'FFFFD284	16, 32
		LAFML	—	16	H'FFFFD286	16
		MSG_DATA[0]	—	8	H'FFFFD288	8, 16, 32
		MSG_DATA[1]	—	8	H'FFFFD289	8
		MSG_DATA[2]	—	8	H'FFFFD28A	8, 16
		MSG_DATA[3]	—	8	H'FFFFD28B	8
		MSG_DATA[4]	—	8	H'FFFFD28C	8, 16, 32
		MSG_DATA[5]	—	8	H'FFFFD28D	8
		MSG_DATA[6]	—	8	H'FFFFD28E	8, 16
		MSG_DATA[7]	—	8	H'FFFFD28F	8
		CONTROL1H	—	8	H'FFFFD290	8, 16
		CONTROL1L	—	8	H'FFFFD291	8
	MB[13].	CONTROL0H	—	16	H'FFFFD2A0	16, 32
		CONTROL0L	—	16	H'FFFFD2A2	16
		LAFMH	—	16	H'FFFFD2A4	16, 32
		LAFML	—	16	H'FFFFD2A6	16
		MSG_DATA[0]	—	8	H'FFFFD2A8	8, 16, 32
		MSG_DATA[1]	—	8	H'FFFFD2A9	8
		MSG_DATA[2]	—	8	H'FFFFD2AA	8, 16
		MSG_DATA[3]	—	8	H'FFFFD2AB	8
		MSG_DATA[4]	—	8	H'FFFFD2AC	8, 16, 32
		MSG_DATA[5]	—	8	H'FFFFD2AD	8
		MSG_DATA[6]	—	8	H'FFFFD2AE	8, 16
		MSG_DATA[7]	—	8	H'FFFFD2AF	8
		CONTROL1H	—	8	H'FFFFD2B0	8, 16
		CONTROL1L	—	8	H'FFFFD2B1	8

Item	Page	Revision (See Manual for Details)
4.4.3 AD Clock Frequency Control Register (ACLKCR)	85	Amended  **Bit** / **Bit Name** / **Initial Value** / **R/W** / **Description** 7 / — / 0 / R / Reserved This bit is always read as 0. The write value should always be 0. 6 / — / 1 / R / Reserved This bit is always read as 1. The write value should always be 1.
4.5 Changing the Frequency	87	Amended Selecting division ratios for the frequency divider can change the frequencies of the internal clock, bus clock, peripheral clock, MTU2S clock, and AD clock under the software control through the frequency control register (FRQCR), MTU2S clock frequency control register (MCKCR), and AD clock frequency control register (ACLKCR). The following describes how to specify the frequencies.
4.7 Oscillation Stop Detection	90	Added ... In addition, the high-current ports (multiplexed pins to which the TIOC3B, TIOC3D, and TIOC4A to TIOC4D signals in the MTU2, the TIOC3BS, TIOC3DS, and TIOC4AS to TIOC4DS in the MTU2S are assigned) can be placed in high-impedance state regardless of the OSCERS bit and PFC settings. For details, refer to appendix A, Pin States.
Figure 4.5 Example of Connecting a Ceramic Resonator	91	Amended Ceramic resonator: CSTCW48M0X11***-R0 (Murata Manufacturing Co., Ltd.) Contact your Renesas Electronics sales agency for details of Rf and Rd values. Ta = 0 to +70°C