

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

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## 38D5 Group

### Serial I/O 1 (Asynchronous Serial I/O (UART) Mode)

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#### 1. Abstract

The following article introduces and shows an example of how to use the Serial I/O 1 (Clock Asynchronous Serial I/O (UART) Mode) on the 38D5 Group device.

#### 2. Introduction

The application explained in this document applies to the following MCU and parameter(s):

Applicable MCU: 38D5 Group

Oscillation frequency: 4.9152 MHz

This sample program may include operations of unused bit functions for the convenience of the SFR bit layout. Set the values according to the operational conditions of the user system.

3. Contents

3.1 Communication Using Asynchronous Serial I/O 1 (UART) (Transmit/Receive)

Outline: 2-byte data is transmitted and received using UART  
Port P51 is used for communication control

Specifications:

- Serial I/O 1 (UART mode) is used.
- Transfer bit rate: 9600 bps ( $f(XIN) = 4.9152 \text{ MHz divided by } 512$ )
- Communication is controlled by port P51 (output level of P51 is controlled by a program).
- 2-byte data is transferred from the transmitting side to the receiving side at 10 ms intervals (generated by a timer).

Figure 3.1 shows the Connection Diagram, Figure 3.2 shows the Timing Chart, Figure 3.3 shows the Register Settings Relevant to Transmitting Side, Figure 3.4 shows the Register Settings Relevant to Receiving Side, Figure 3.5 shows the Control Procedure of Transmitting Side, and Figure 3.6 shows the Control Procedure of Receiving Side.

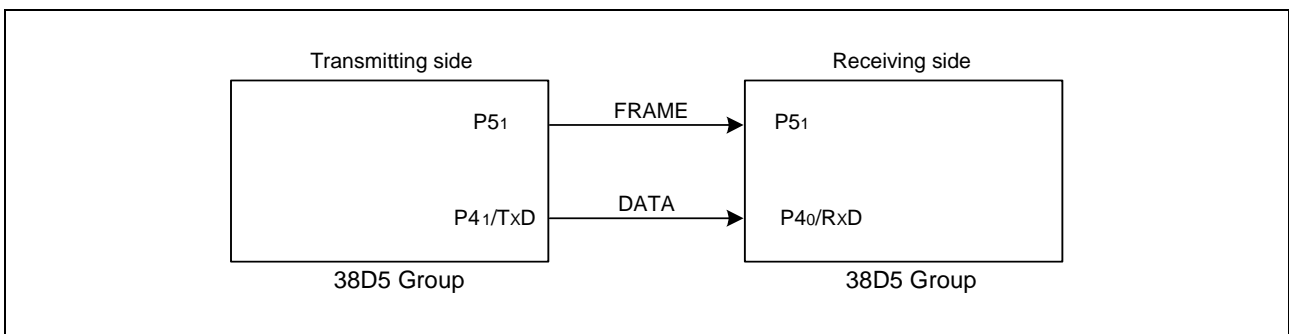


Figure 3.1 Connection Diagram

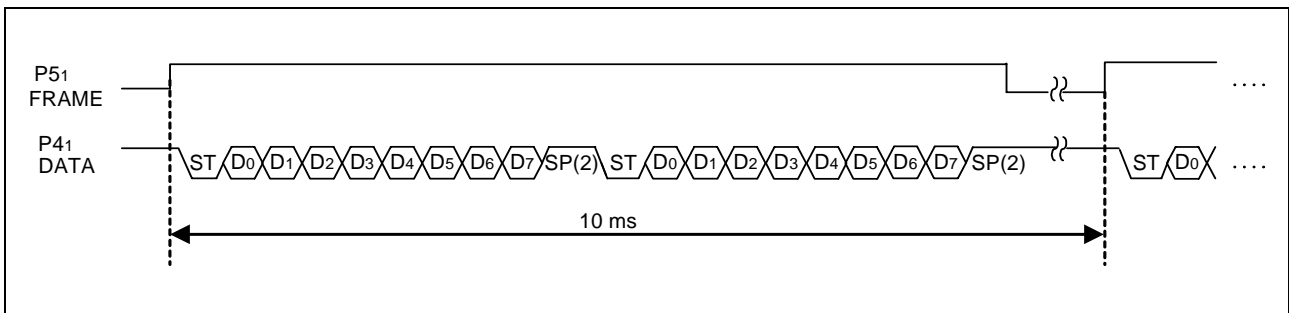


Figure 3.2 Timing Chart

Table 3.1 lists an Example of Baud Rate Generator Set Value and Transfer Bit Rate Selection, Figure 3.3 shows the Register Settings Relevant to the Transmitting Side, Figure 3.4 shows the Register Settings of Receiving Side, Figure 3.5 shows the Control Procedure of Transmitting Side, and Figure 3.6 shows the Control Procedure of Receiving Side.

Table 3.1 Example of Baud Rate Generator Set Value and Transfer Bit Rate Selection

BRG Count Source (Note 1)	BRG Setting Value	Transfer Bit Rate (bps) (Note 2)	
		f(XIN) = 4.9152MHz	f(XIN) = 8MHz
f(XIN)/4	255(FFh)	300	488.28125
f(XIN)/4	127(7Fh)	600	976.5625
f(XIN)/4	63(3Fh)	1200	1953.125
f(XIN)/4	31(1Fh)	2400	3906.25
f(XIN)/4	15(0Fh)	4800	7812.5
f(XIN)/4	7(07h)	9600	15625
f(XIN)/4	3(03h)	19200	31250
f(XIN)/4	1(01h)	38400	62500
f(XIN)	3(03h)	76800	125000
f(XIN)	1(01h)	153600	250000
f(XIN)	0(00h)	307200	500000

Notes:

1. The BRG count source is selected by bit 0 at the serial I/O 1 control register (address: 001Ah).
2. Calculating formula of the transfer bit rate

$$\text{Transfer bit rate (bps)} = \frac{f(XIN)}{(\text{BRG set value} + 1) \times 16 \times m}$$

m : When bit 0 at the serial I/O 1 control register = 0, m = 1  
 When bit 0 at the serial I/O 1 control register = 1, m = 4

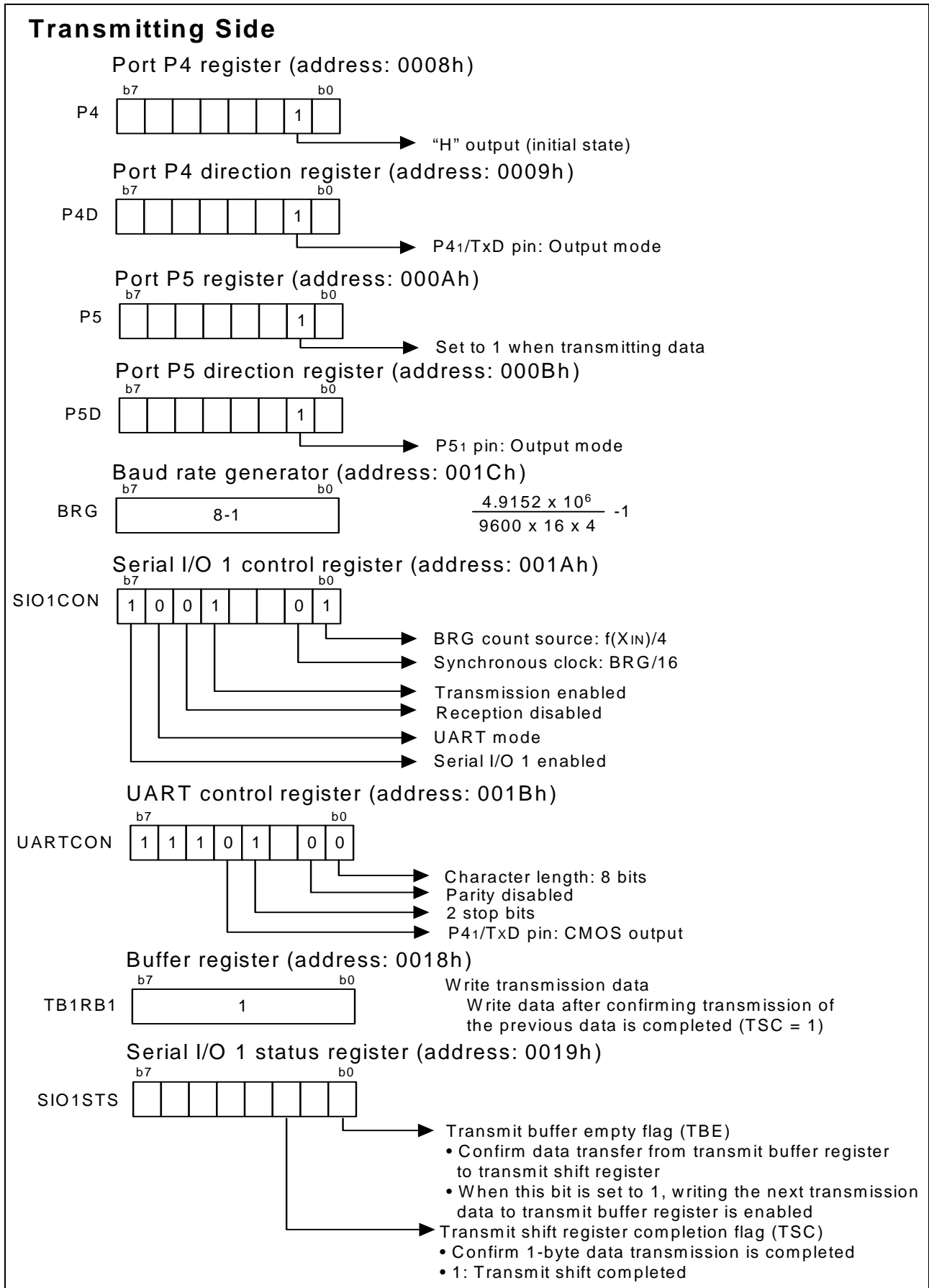


Figure 3.3 Register Settings Relevant to the Transmitting Side



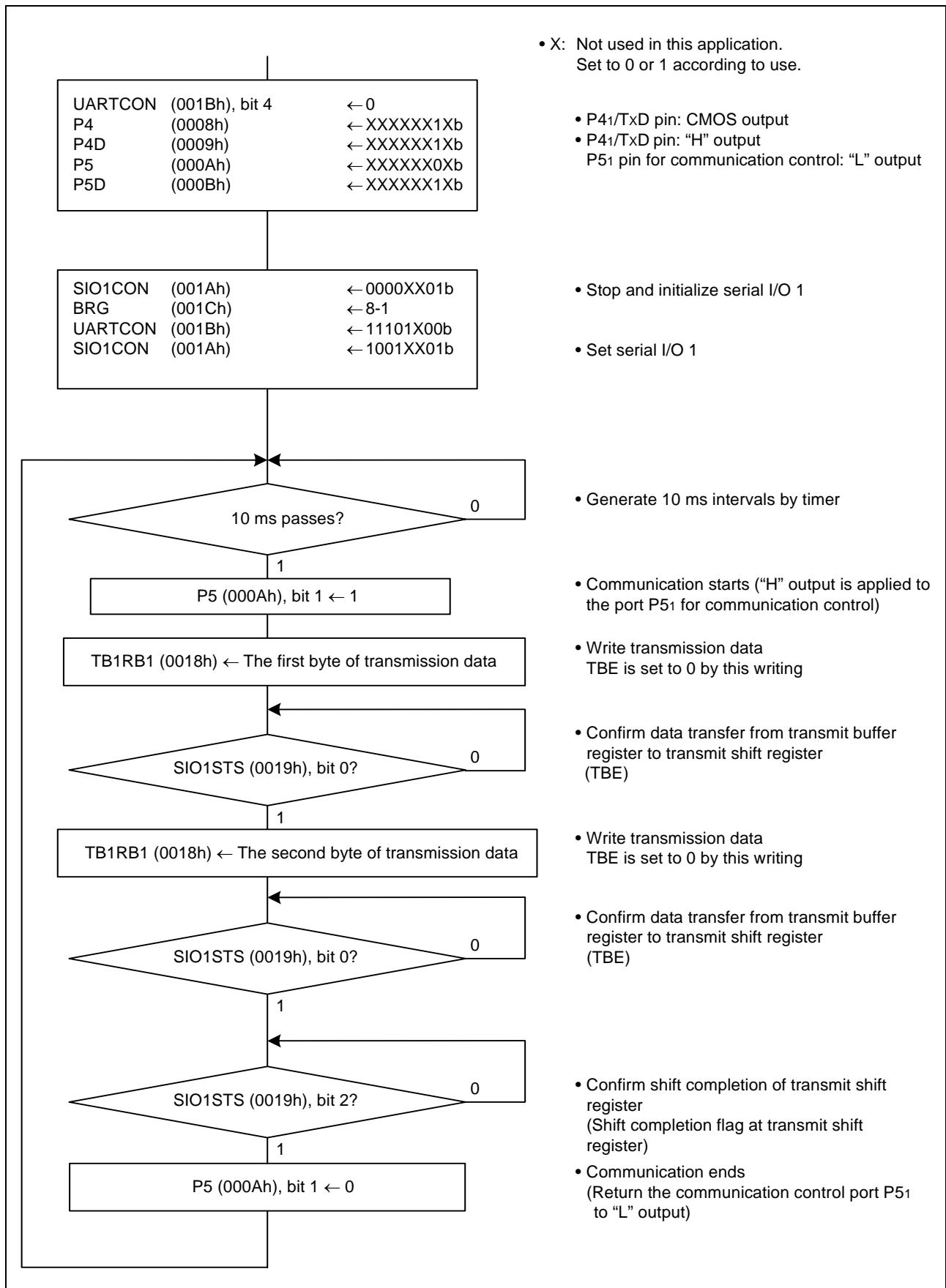


Figure 3.5 Control Procedure of Transmitting Side



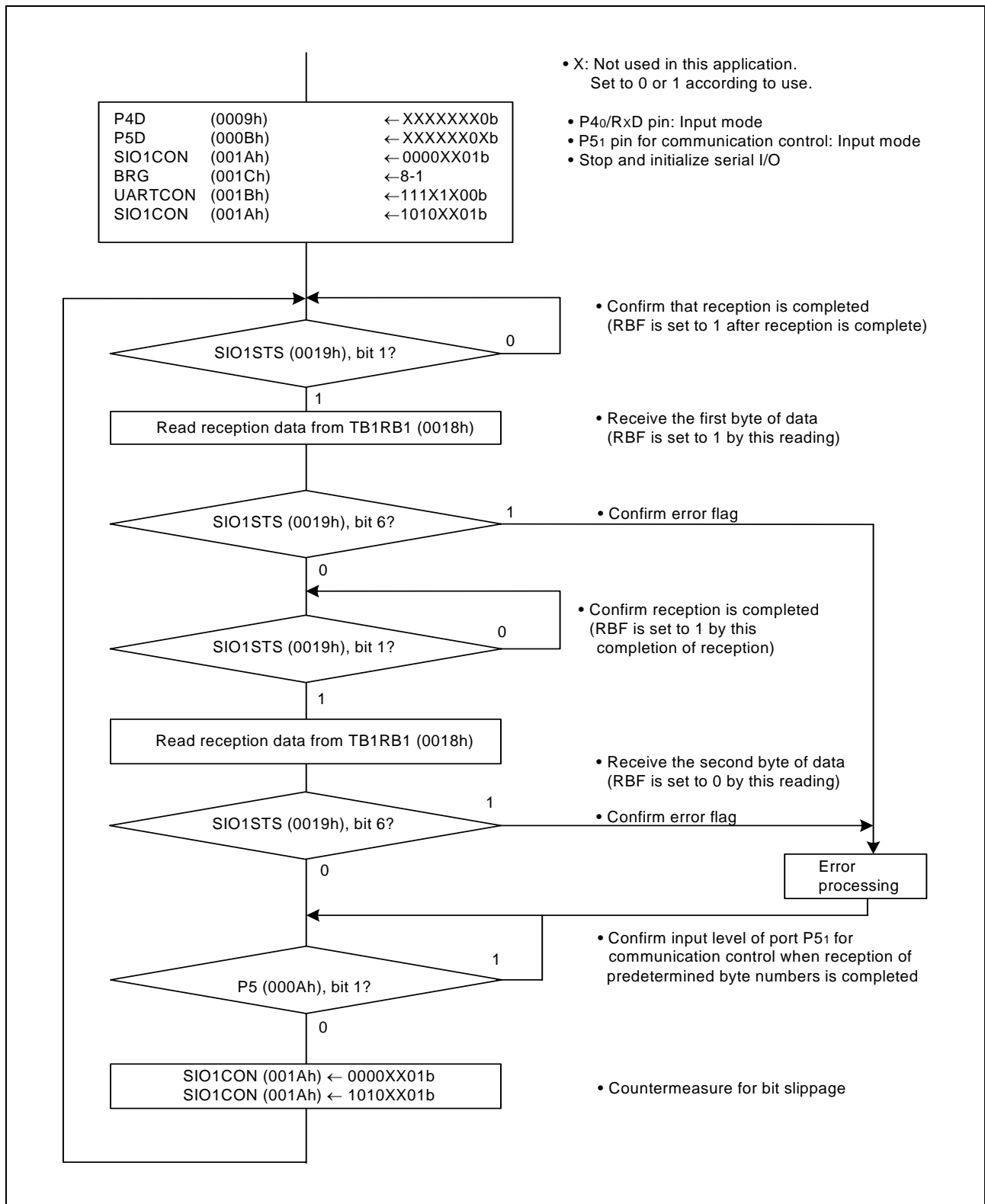


Figure 3.6 Control Procedure of Receiving Side

#### 4. Sample Programming Code

Download a sample program from the Renesas Technology website.  
To download, click “Application Notes” in the left side menu on the page of the 38D5 Group.

#### 5. Reference Document

Datasheet  
38D5 Group Datasheet  
Download the latest version from the Renesas Technology website.

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REVISION HISTORY	38D5 Group Serial I/O 1 (Asynchronous Serial I/O (UART) Mode)
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Rev.	Date	Description	
		Page	Summary
1.00	Sep 15, 2006	–	First Edition issued

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