
RH850/U2B Group

R01AN6572EJ0100
Rev.1.00

RSENT Application Note

Summary

This application note summarizes the operation example by using Single Edge Nibble Transmission (RSENT) for RH850/U2Bx.

The operation example described in this application note have been confirmed to operate, be sure to confirm the operation before using it.

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1. Introduction

This application note describes the usage of the single edge nibble transmission (RSENT) and the creation example of the software for RH850/U2Bx.

1.1 Use Function

The hardware function of the using RH850/U2Bx in this application note is shown below.

- Single Edge Nibble Transmission (RSENT)

1.2 Function Overview of RSENT

RSENT interface supports the following functions of the standard specification (SAE J2716_201604).

- Tripple Speed Expansion Tick Time Supporting: Clock Cycle (1 μ s to 90 μ s)
- Variable Data Transmission Rate
 - 24.7 kbps to 64.9 kbps: 3 Clock Rate 6 Nibble Data
 - 74.1 kbps to 194.7 kbps: 1 Clock Rate 6 Nibble Data
- Unidirectional Communication: Between Sensor and MCU
- Bidirectional Communication: Between Sensor and MCU (Support by SPC Mode)
- Single Edge Data Transmission: Encored by temporal distance between two consecutive detected falling edges on the data line.
- Up to 8 data nibbles + Status/Communication Nibble by Transmit Frame
- Data Transmission protected by CRC is possible.
- Calibration Phrase by Each Data Frame
- 1 Wire Interface
- Multiple sensors can be connected to the RSENT channel with standard extensions function.
- Receive data form each sensor is detected by software and DMA.
- Support timestamp function: Master/Slave Setting Enable

1.3 Communication Format

Figure 1-1 shows the communication format using in this operation example.

- 6 Data Nibble
- No Pose Pulse
- 1 tick = 3 μ s

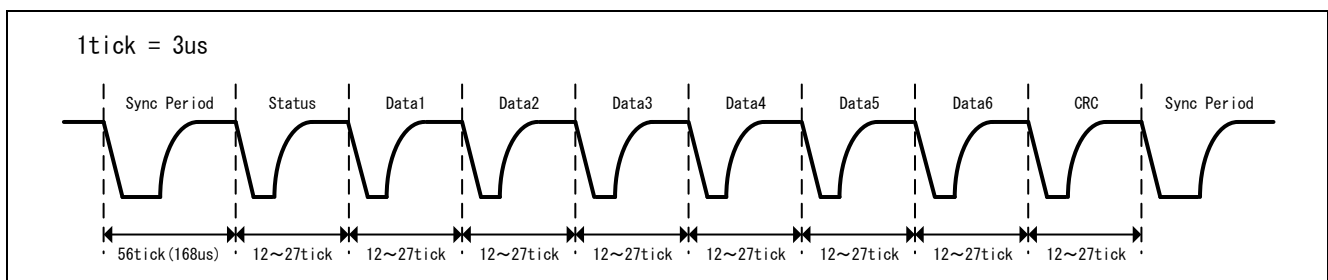


Figure 1-1 Communication Format

2. RSENT Operation Example

2.1 Specification Overview

Describe for the operation example by using RSENT0.

Allocate P02_8 pin to RSENT0RX, set enable to the receive interrupt, and set enable to the receive operation.

In receive interrupt, store the receive data to the variable.

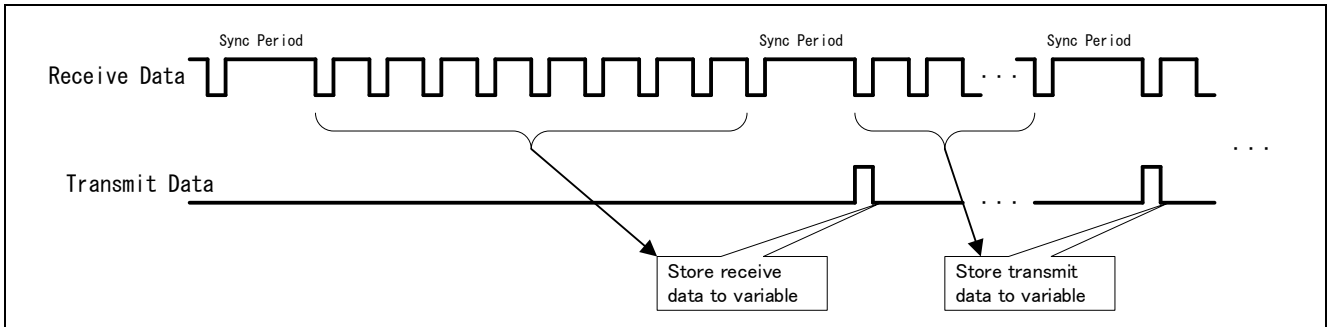


Figure 2-1 Receive Operation

2.2 System Configuration

Figure 2-2 shows the system configuration.

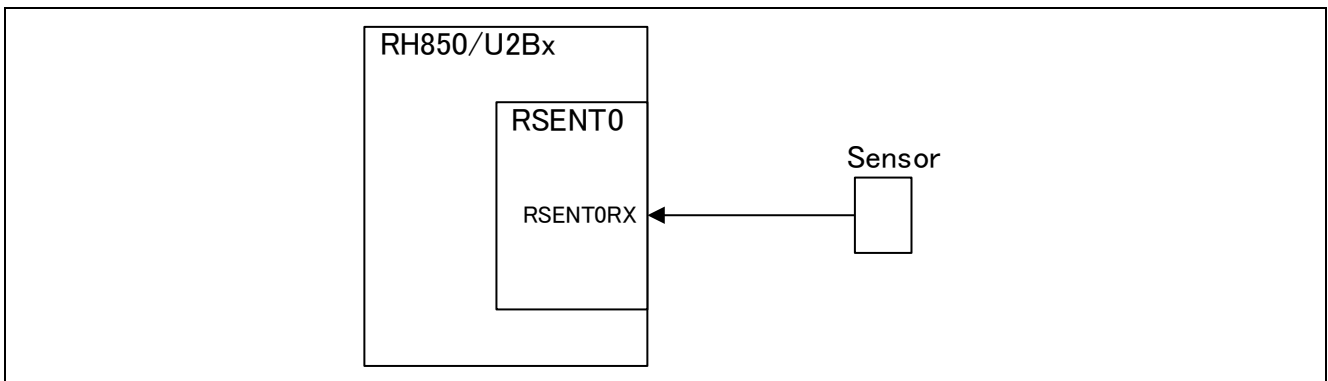


Figure 2-2 System Configuration

2.3 Software Explanation

- Module Explanation

The following shows the module list in this operation example.

Table 2-1 Module List

Module Name	Label Name	Function
Main routine	main_pe0	Perform each setting and application startup.
RSENT initialization routine	rsent_init	Perform RESEN0 initial setting.
Interrupt initialization routine	inic_init	Perform initial setting of interrupt function.
Port initialization routine	port_init	Perform port initial setting.
Interrupt processing routine	rsent0_int	Interrupt function. Store receive data to variable.

- Register Setting

The following shows the register setting of each function.

Table 2-2 RSENT0 Register Setting

Register Name	Setting Value	Function
MSRKCPROT	0xA5A5A501	Standby Register Write Protection Release
	0xA5A5A500	Standby Register Write Protection Enable
MSR_RSENT	0xFFFFFFFF	RSENT0 Standby Release
RSENT0MDC	0x00000001	Transfer to CONFIGURATION Mode Transfer to ACTIVE Mode
	↓ 0x00000005	
RSENT0CC	0x0000067A	Low-speed Channel CRC Check: Disable
		High-speed Channel CRC Check: Disable
		Serial Message Format: Short Serial Message Format
		Type Setting of Pause Pulse: Fixed
		Pause Pulse Setting: With Pause Pulse
		Number of Data Nibble: 6 Data Nibble
RSENT0BRP	0x00020400	Time Tick Integer: 3 μ s
		Sample Clock Division Value: 5
		Sample Clock Multiplication Value: 1
RSENT0IDE	0x00000001	High-speed Channel Receive Interrupt control: Interrupt enable

Table 2-3 Interrupt Register Setting

Register Name	Setting Value	Function
EIBD733	0x00000000	Bind the interrupt to PE0 (CPU0).
EIC733	0x0040	Table Reference/Priority Level 0

Table 2-4 Port Register Setting

Register Name	Setting Value	Function
PKCPROT	0xA5A5A501	Port Write Enable Register (PWE): Protection Release
	0xA5A5A500	Port Write Enable Register (PWE): Protection Enable
PWE	0x00000004	P02 Register Protection Release
	0x00000000	P02 Register Protection Enable
PCR02_8	0x00000054	P02_8 : RSENT0RX

- Operation Flow

The following shows the flowchart in this operation example.

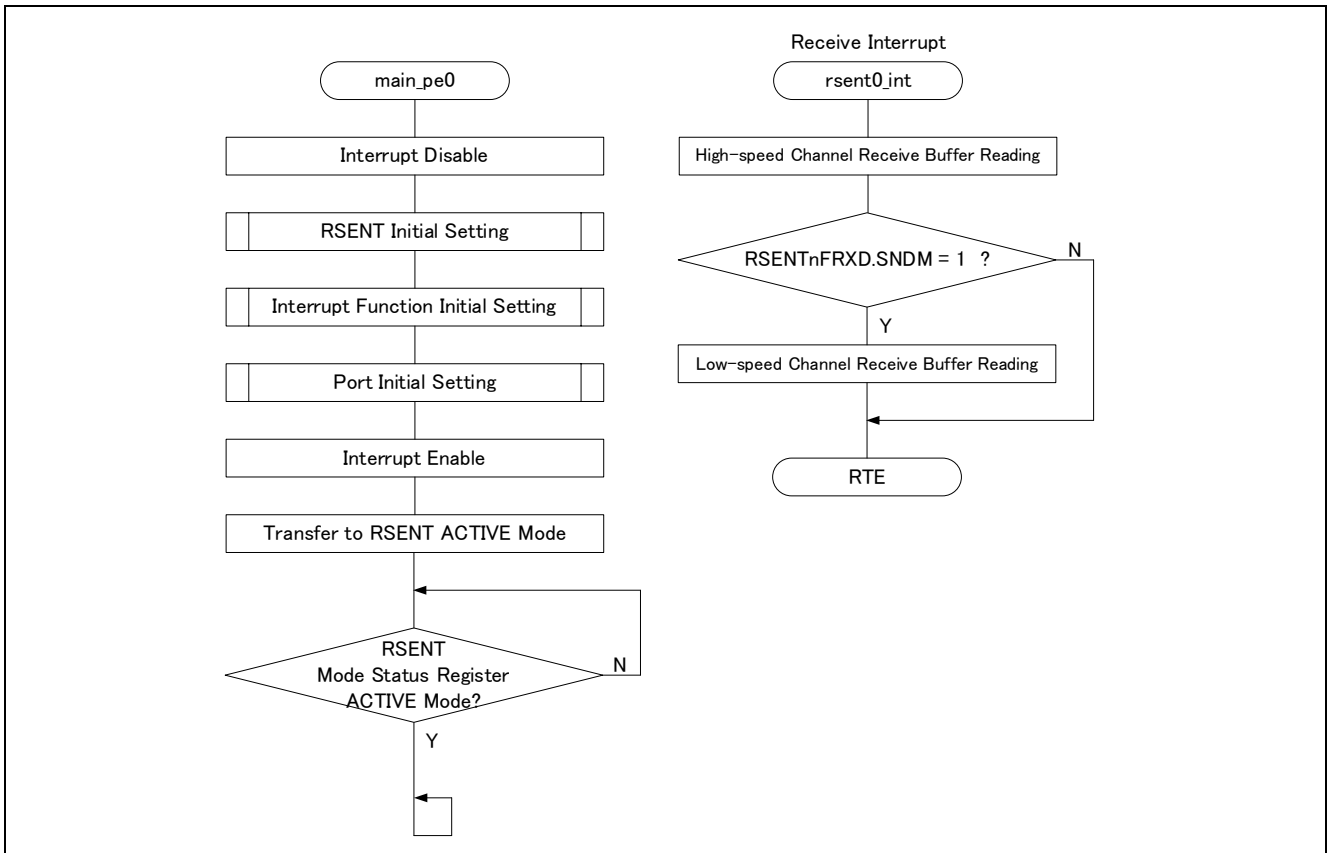


Figure 2-3 Flowchart

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Revision History

Rev.	Data	Description	
		Page	Summary
1.00	2023.10.5	-	First edition issued

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1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

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(Rev.5.0-1 October 2020)

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