RE01 1500KB, 256KB Group SPI Communication (Low Level Code)

SCI Simple SPI Mode Communication Sample Code

Introduction

This application note explains the SCI sample code which does not use the RE01 1500KB Group, 256KB Group CMSIS driver function.

In this sample code, the registers of Peripheral modules are directly accessed.

This sample code is intended for users who need to:

- Improve performance by eliminating overhead code in the driver.
- Reduce ROM/RAM size.
- Develop simple, easy-to-understand code.
- Implement features not supported by the driver.

Target Device

RE01 1500KB Group

RE01 256KB Group

Contents

Description of Project

The following sample code projects are provided with this application note.

Sample code project for RE01 1500KB group : r01an5147_re_spi_LLCode

Sample code project for RE01 256KB group : r01an5147_re_spi_LLCode_256kb

The r01an5147_re_spi_LLCode project has been tested using the Evaluation Kit RE01 1500KB. This project is configured to match the settings of R7F0E015D2CFB mounted on the Evaluation Kit RE01 1500KB.

The r01an5147_re_spi_LLCode_256kb project has been tested using the Evaluation Kit RE01 256KB. This project is configured to match the settings of R7F0E01182CFP mounted on the Evaluation Kit RE01 256KB.

When using another device, change the device settings in the project to those of the target device.

1. Specifications

This sample code performs simple SPI communication by using the SCI.

The operation of the sample code is shown below.

- After releasing reset, initialize SCI as follows:

  [For RE01 1500KB group]

  Master: SCI1 Simple SPI master mode, communication speed 500kbps

  Slave 1: SCI2 Simple SPI slave mode, Use P607 for the SS pin,

  Slave 2: SCI3 Simple SPI slave mode, Use P807 for the SS pin,

  [For RE01 256KB group]

  Master: SCI0 Simple SPI master mode, communication speed 500kbps

  Slave 1: SCI4 Simple SPI slave mode, Use P205 for the SS pin,

  Slave 2: SCI3 Simple SPI slave mode, Use P807 for the SS pin,

- Input “L” to the SS pin of slave1 and “H” to the SS pin of slave2, and transmit and receive 3 bytes between master and slave1.
- Input “H” to the SS pin of slave1 and “L” to the SS pin of slave2, and transmit and receive 3 bytes between master and slave2.
- Master and slave1 send and receive 3 bytes, and master and slave2 send and receive 3 bytes again.
- SCI end processing
- Pressing SW2 resets SCI and starts communication between master and slave1.

1.1 Sample Code Information

Table 1-1. Sample Code Information For RE01 1500KB Group

Item	Description	Remarks
Peripheral Function	SCI ch1 (Master transmission / reception) SCI ch2 (Slave transmission / reception) SCI ch3 (Slave transmission / reception)	Simple SPI mode 500bps
Interrupt	SCI_TXI1 SCI_RXI1 SCI_TEI1 SCI_ERI1 SCI_TXI2 SCI_RXI2 SCI_TEI2 SCI_ERI2 SCI_TXI3 SCI_RXI3 SCI_TEI3 SCI_ERI3 IRQ4	 SW2
Pins	P305 -> P607(SS2) P304 -> P807(SS3) P312 (MISO1) - P608(MISO2) - P808(MISO3) P313 (MOSI1) - P609(MOSI2) - P809(MOSI3) P310(SCK1) - P606(SCK2) - P810(SCK3) P508(IRQ4)	Input to SS2 Input to SS3 SW2 input
Environment (IDE, Compiler)	IDE: IAR Embedded Workbench for ARM Version 8.40.2 C compiler：IAR C/C++ Compiler for ARM Version 8.40.2	-
	IDE: Renesas e² studio Version 7.6.0 C Compiler：GCC ARM Embedded Version 6.3.1.20170620GNU 6-2017-q2-update	-
Target Board	Evaluation Kit RE01 1500KB (RTK70E015DSXXXXXBE)	-
I/O header Version	Rev1.01	-
Sample code Version	Rev1.00	-

Table 1-2. Sample Code Information For RE01 256KB Group

Item	Description	Remarks
Peripheral Function	SCI ch0 (Master transmission / reception) SCI ch4 (Slave transmission / reception) SCI ch3 (Slave transmission / reception)	Simple SPI mode 500bps
Interrupt	SCI_TXI0 SCI_RXI0 SCI_TEI0 SCI_ERI0 SCI_TXI4 SCI_RXI4 SCI_TEI4 SCI_ERI4 SCI_TXI3 SCI_RXI3 SCI_TEI3 SCI_ERI3 IRQ4	 SW2
Pins	P701 - P815(SS4) P107 - P807(SS3) P105(MISO0) - P813(MISO4) - P808(MISO3) P106(MOSI0) - P812(MOSI4) - P012(MOSI3) P104(SCK0) - P814(SCK4) - P013(SCK3) P508(IRQ4)	Input to SS4 Input to SS3 SW2 input
Environment (IDE, Compiler)	IDE: IAR Embedded Workbench for ARM Version 8.40.2 C compiler：IAR C/C++ Compiler for ARM Version 8.40.2	-
	IDE: Renesas e² studio 2020-07 C Compiler：GCC ARM Embedded Version 6.3.1.20170620GNU 6-2017-q2-update	-
Target Board	Evaluation Kit RE01 256KB (RTK70E0118CXXXXXBJ)	-
I/O header Version	Rev1.00	-
Sample code Version	Rev1.03	-

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Dec.26.2019	-	First edition issued
1.01	Feb.14.2020	-	Add RE01 256KB group.
1.02	Mar.27.2020	1,4 Program (256KB)	RE01 256KB group target board changed to Evaluation Kit RE01 256KB. Replaced CMSIS Driver Package - RE01 256KB: CMSIS Driver Package Rev.0.80
1.03	Jun.01.2020	1 4 - Program (256KB)	Change the name of the sample code project Updated " Sample Code Information " Correct the used terminals according to the program Clerical corrections Replaced CMSIS Driver Package - RE01 256KB: CMSIS Driver Package Rev.1.00 Change the terminals used as follows P704 → P107 P702 (MISO0) → P105 (MISO0) P813(MISO4)→P813(MISO4) P703 (MOSI) → P106 (MOSI0) P202 (MOSI) → P812 (MOSI4) P700 (SCK0) → P104 (SCK0) P204 (SCK4) → P814 (SCK4)

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

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.).
7. Prohibition of access to reserved addresses

   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
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   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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