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

SCI Simple SPI Mode Communication (Using FIFO and DMA) 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 the specific 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 : r01an5146_re_spi_LLCode

Sample code project for RE01 256KB group : r01an5146_re_spi_LLCode_256kb

The r01an5146_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 r01an5146_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, it also uses FIFO mode. The DMAC is used to write transmit data and get receive data.

The operation of the sample code is shown below.

- Press the communication start SW(SW2) to perform the following processing

  (1) If the SCI is stopped, initialize the SCI.

  SCIn(*1): Simple SPI master mode, using the FIFO, communication speed 4Mbps

  DMAC0: Burst mode, transfer from RAM(Increment data) to Fix address(FTDRL register)

  DMAC1: Burst mode, transfer from Fix address(FRDRL register) to RAM(Increment data)

  (2) The SS pin(*2) outputs “L” and starts transmitting and receiving 1024bytes.

  (3) After transmission / reception is completed, output the SS pin to “H”.

- Press the SCI stop SW (*3) to stop SCI1.

Note1. For RE01 1500KB group, the SCIn is the SCI1. For RE01 256KB group, the SCIn is the SCI0.

Note2. For RE01 1500KB group, the SS pin is P305. For RE01 256KB group, the SS pin is the P107.

Note3. For RE01 1500KB group, use SW3. For RE01 256KB group, use SW1.

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) DMAC0 DMAC1	Simple SPI mode 4Mbps For sending data writing For reading received data
Interrupt	DMAC1_INT SCI_ERI1 IRQ4 IRQ2	 SW2 SW3
Pins	P305 P313(MISO1) - P312(MOSI1) P310(SCK1) P508(IRQ4) P410(IRQ2)	SS output (port control) SW2 input SW3 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) DMAC0 DMAC1	Simple SPI mode 4Mbps For sending data writing For reading received data
Interrupt	DMAC1_INT SCI_ERI0 IRQ4 KEY_INTKR	 SW2 SW1
Pins	P107 P105(MISO0) - P106(MOSI0) P104(SCK0) P508(IRQ4) P410(KRM01)	SS output (port control) SW2 input SW1 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	1,3 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 3 Program (256KB)	Change the name of the sample code project Updated " Sample Code Information " Correct the used terminals according to the program Replaced CMSIS Driver Package - RE01 256KB: CMSIS Driver Package Rev.1.00 Change the terminals used as follows P704 → P107 P702 (MISO0) → P105 (MISO0) P703 (MOSI0) → P106 (MOSI0) P700 (SCK0) → P104 (SCK0)

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.
8. Differences between products

   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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