

# RE01 1500KB, 256KB Group QSPI Write to external flash memory (Low Level Code)

## QSPI Write to external flash memory Sample Code

### Introduction

This application note explains the QSPI 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

### Description of Project

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

Sample code project for RE01 1500KB group : r01an5153\_re\_qspi\_write\_LLCode

Sample code project for RE01 256KB group : r01an5153\_re\_qspi\_write\_LLCode\_256kb

The r01an5153\_re\_qspi\_write\_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 r01an5153\_re\_qspi\_write\_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.

**Note: RE01 256KB Group To operate with the Evaluation Kit RE01 256KB, which is the target board for the sample code, the modification described in "2 Modification of Evaluation Kit RE01 256KB" is required.**

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## 1. Specifications

This sample code uses the QSPI function to write and read to an external flash memory (MX25R6435F) on the Evaluation Kit. The simple code uses the QSPI direct communication mode to write to the external flash memory and the ROM access communication mode to read data.

The operation of the sample code is shown below.

- After reset release, press SW2 to initialize QSPI in ROM access communication mode.
- Writes 10-bytes of external flash memory in direct communication mode. (note)
- Reads 10-byte data written to external flash memory in ROM access communication mode.
- When the written value matches the read value, LED0 is turned on.
- Writes 10 bytes of external flash memory in direct communication mode (a value different from the rewritten data). (note)
- Reads 10-byte data written to external flash memory in ROM access communication mode.
- When the written value matches the read value, LED1 is turned on.
- Stop QSPI.
- Press SW2 again to reset QSPI and start rewriting external flash

Note. Figure 1.1 shows the external flash memory rewrite sequence.

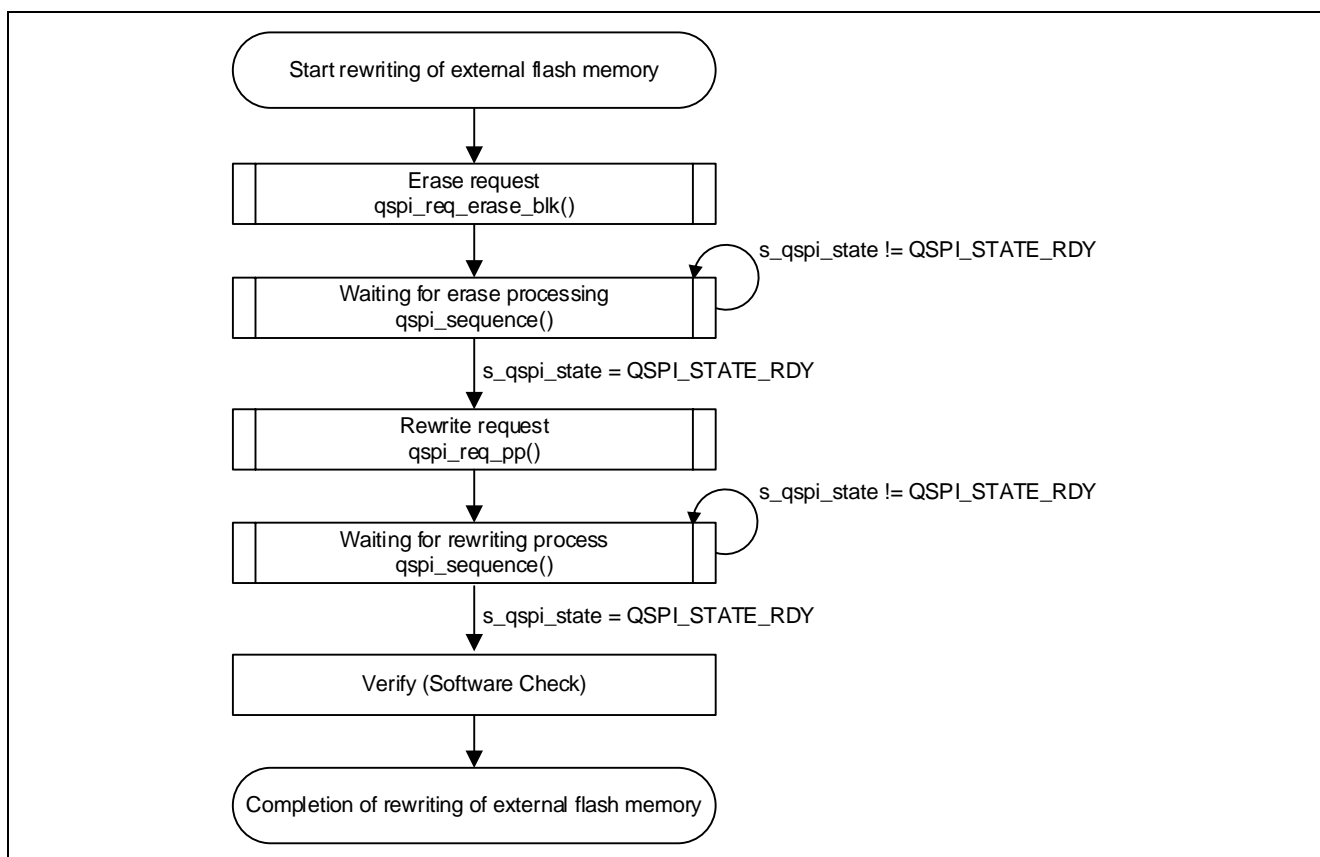


Figure 1.1 External flash memory rewrite sequence

## 1.1 Sample Code Information

**Table 1. Sample Code Information for 1500KB Group**

Item	Description	Remarks
Peripheral Function	QSPI	Fast read Quad I/O 16MHz
Interrupt	IRQ4	SW2 input
Pins	P602(QSPCLK) P601(QSSL) P500(QIO0) P015(QIO1) P014(QIO2) P013(QIO3) P508(IRQ4) P009(LED0) P008(LED1)	SCLK CS SI/SIO0 SO/SIO1 WP/SIO2 RESET/SIO3 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 e <sup>2</sup> 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 (RTK70E015DSXXXXBE)	
External flash memory	MX25R6435F (included in Evaluation Kit)	
I/O header Version	Rev1.10	-
Sample code Version	Rev1.02	-

**Table 2. Sample Code Information for 256KB Group**

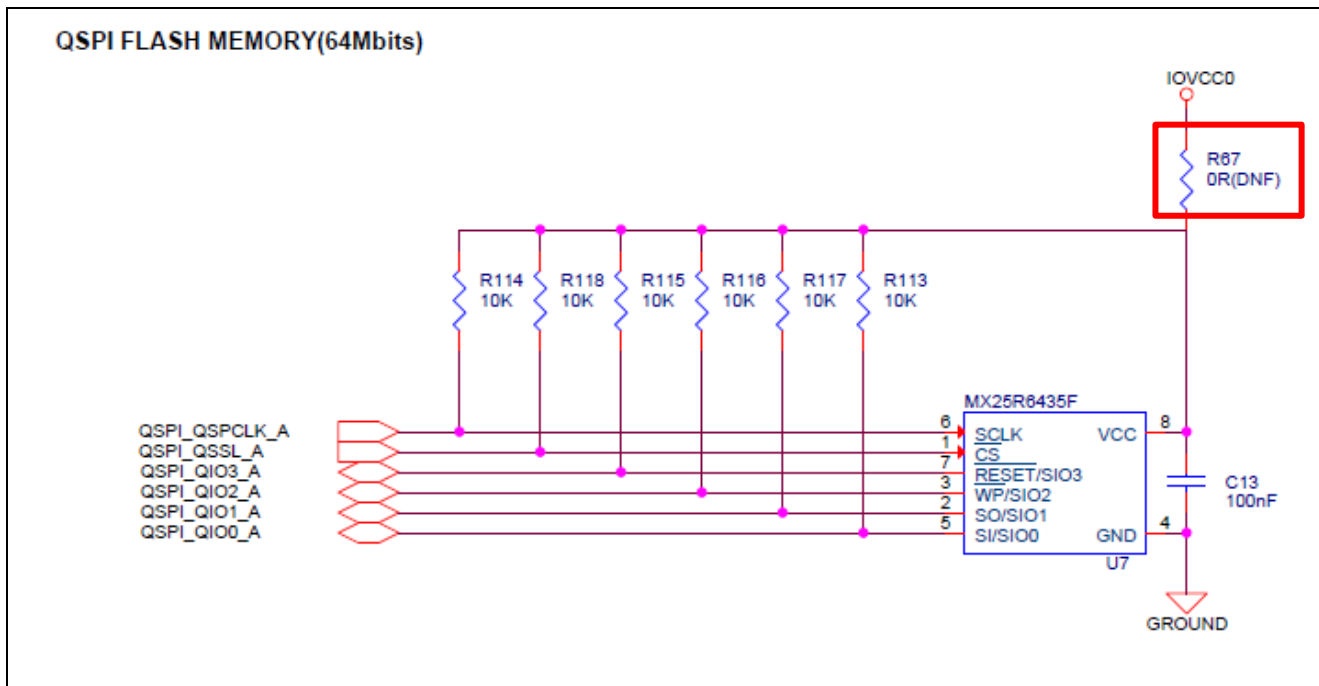
Item	Description	Remarks
Peripheral Function	QSPI	Fast read Quad I/O 16MHz
Interrupt	IRQ4	SW2 input
Pins	P812(QSPCLK) P807(QSSL) P811(QIO0) P810(QIO1) P809(QIO2) P808(QIO3) P508(IRQ4) P210(LED0) P410(LED1)	SCLK CS SI/SIO0 SO/SIO1 WP/SIO2 RESET/SIO3 SW2 input
Environment (IDE, Compiler)	IDE: IAR Embedded Workbench for ARM Version 8.40.2 C compiler : IAR C/C++ Compiler for ARM Version 8.40.2	
	IDE: Renesas e <sup>2</sup> studio 2020-07 C Compiler : GCC ARM Embedded Version 6.3.1.20170620GNU 6-2017-q2-update	
Target Board	Evaluation Kit RE01 256KB (RTK70E0118CXXXXBJ)	
External flash memory	MX25R6435F (included in Evaluation Kit)	
I/O header Version	Rev1.00	-
Sample code Version	Rev1.03	-

## 2. Modification of Evaluation Kit RE01 256KB

With the default settings of the Evaluation Kit RE01 256KB mainboard, the Flash memory (MX25R6435F) cannot be used. When using the flash memory included in the board, a 0Ω resistor is used on R67 of the main board as shown in Table 3. For details, refer to the user's manual: Evaluation Kit RE01 256KB main board layout.

**Table 3. Evaluation Kit RE01 256KB main board modifications**

Modification point	Detail
R67	Solder a 0Ω resistor to R67



**Figure 2.1 Schematic diagram of Evaluation Kit RE01 256KB main board (R67 part)**

**Revision History**

Rev.	Date	Description	
		Page	Summary
1.00	Dec.26.2019	-	First edition issued
1.01	Jan.16.2020	-	Add RE01 256KB group.
1.02	Mar.19.2020	1,2,4  Program (1500KB, 256KB)	RE01 256KB group target board changed to Evaluation Kit RE01 256KB. Evaluation Kit RE01 Modification of program according to 256KB LED specification. Change to start operation by SW2 input during initial operation. Replaced CMSIS Driver Package - RE01 1500KB: CMSIS Driver Package Rev.1.10 - RE01 256KB: CMSIS Driver Package Rev.0.80
1.03	Jun.01.2020	1 4 1,5  Program (256KB)	Change the name of the sample code project Updated " Sample Code Information " Added the description of the modification of Evaluation Kit RE01 256KB. Replaced CMSIS Driver Package - RE01 256KB: CMSIS Driver Package Rev.1.00

# 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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(Rev.4.0-1 November 2017)

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