RISC-V

Method of Setting Flash Read Protection

Introduction

This application note describes the flash read protection function of the RISC-V.

Target Device

RISC-V

When applying the sample program covered in this application note to another microcomputer, modify the program according to the specifications for the target microcomputer and conduct an extensive evaluation of the modified program.

Contents

1. Overview

This application note describes flash read protection in regard to functions, usage, and other items.

The flash read protection function disables read accesses to a specified area in the code flash area. However, it enables instruction fetch by the CPU.

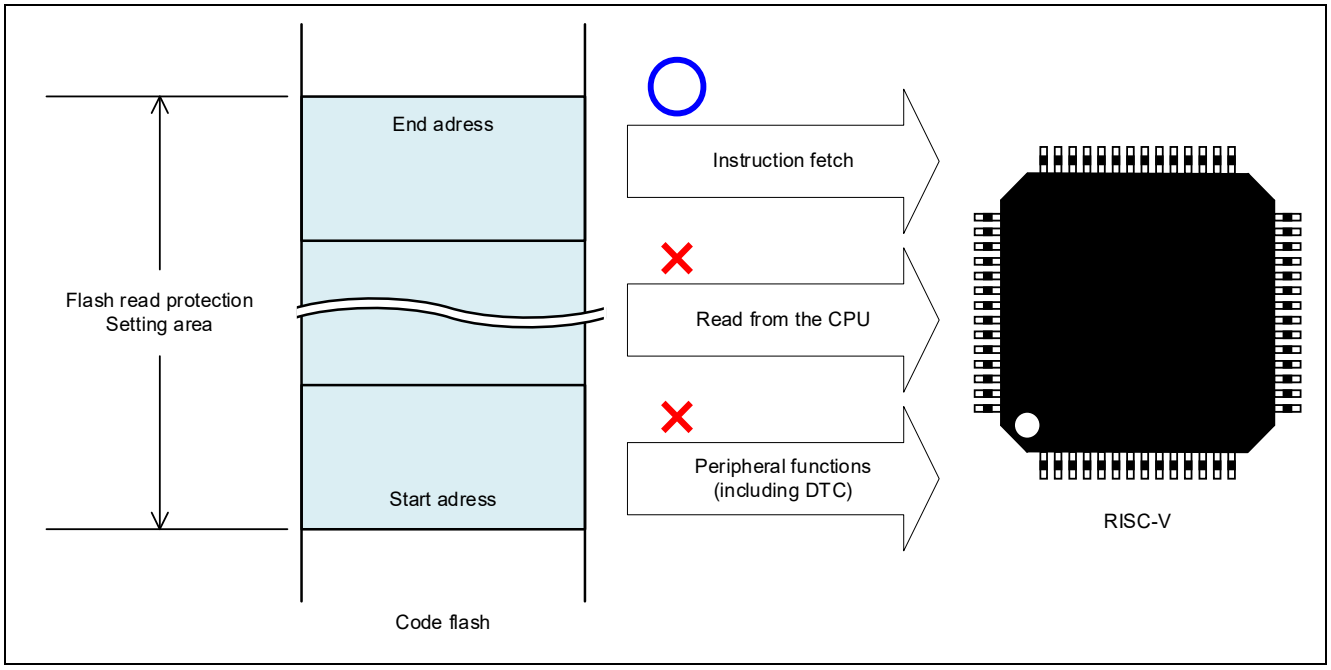

Figure Overview of Flash Read Protection

2. Description of Functions

2.1 Setting of Flash Read Protection

To protect the code flash area by the flash read protection function, set the area to be protected in the flash read protection registers. Code flash areas within the ranges specified by the settings for the flash read protection start address and the flash read protection end address cannot be read. If a read-access disabled area is read, all values are read as 00H.

All flash read protection registers are option-setting memory. Option-setting memory refers to a set of registers that are available for selecting the state of the microcontroller after a reset. The option-setting memory is allocated in the code flash.

2.2 Checking the Flash Read Protection Setting

Read the flash read protection settings from the following register.

- Flash Read Protection Start Address Register (FLRPROTS)
- Flash Read Protection End Address Register (FLRPROTE)
- Flash Read Protection Access Control Register (FLRPROTAC)

2.3 Releasing the Flash Read Protection Setting

The flash read protection setting can be released by erasing the code flash area.

2.4 Notes on the Use of a Debugger

Programs placed in read-access disabled areas cannot be debugged if the flash read protection function is enabled. Disable the flash read protection when debugging a program. On-chip debug is only valid when Flash Read Protection Access Control Register (FLRPROTAC) is 0xFFFF_FFFF.

3. Software Settings

3.1 Placing a Program or Data in the Specific Area

Use section specification to place a program in the specific code flash area. Set the address in the .text declaration line of the linker script so that the .text section (program code sections) are placed in a read-access disabled area.

- An example of section setting when an area (0x0000_4000 to 0x0000_6000) is set as a read-access disabled area

```
.text 0x4000:
```

3.2 Referencing Functions or Subroutines Placed in Read-Access Disabled Areas

Functions or subroutines placed in read-access disabled areas can be called as usual.

4. Setting Procedures

4.1 Programming by flash writer

As the flash writer for this microcontroller is currently under development, the following describes how to set the registers relevant of flash read protection.

Perform the following procedure to set flash read protection using flash writer.

(1) Set the Flash Read Protection Start Address to the FLRPROTS 23-0 bit of the Flash Read Protection Start Address Register (FLRPROTS).
   — The value range is from 0x0000_0000 to 0x000F_FFFC, excluding reserved areas.
   — The lower 2 bits are read as 0. When programming to the code flash, the lower 2 bits write value should be 0.

(2) Set the Flash Read Protection End Address to the FLRPROTE 23-0 bit of the Flash Read Protection End Address Register (FLRPROTE).
   — The value range is from 0x0000_0003 to 0x000F_FFFF, excluding reserved areas.
   — The lower 2 bits are read as 1. When programming to the code flash, the lower 2 bits write value should be 1.

(3) To enable Flash Read Protection, assign 0 to the DIS bit of the Flash Read Protection Access Control Register (FLRPROTAC).

(4) Read the data allocated in flash read protection registers in (1) to (3), from an object file or Motorola S-format file generated by the compiler and write the data to the MCU. If using the GUI interface of the tool, program the same data as allocated in (1) to (3).

5. Reference Documents

RISC-V User's Manual: Hardware (R01UH1036EJ)

The latest versions can be downloaded from the Renesas Electronics website.

Technical update

The latest versions can be downloaded from the Renesas Electronics website.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Mar.18.24	-	First Edition

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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