RX630, RX631, and RX63N Groups

Pin Control at Startup

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Abstract

This application note describes the specifications of operating mode control pins and how to handle these pins on the chip at startup for the RX630, RX631, and RX63N Groups.

Products

RX630, RX631, and RX63N Groups

When using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

Contents

1. Settings at Startup

This chapter describes the specifications of the MCU operating mode control pins. Refer to 2. Example of Pin Processing for actual processing on the chip.

Table 1.1 lists the Pin Settings for Each Mode.

Table 1.1 Pin Settings for Each Mode

No.	Mode			Pin Setting			
				PC7	MD	EMLE	BSCANP
1	Startup in single-chip mode			High/low/open	High	Low	Low
2	Startup in boot mode			Low	Low	Low	Low
3	Startup in USB boot mode (1)			High	Low	Low	Low
4	Startup in user boot mode (2)			High	Low	Low	Low
5	Debugger (OCD) startup	Debug the user area	FINE	Low	Low	Low	Low
6			JTAG	High/low/open	High	High	Low
7		Debug the user boot area	FINE	Low	Low	Low	Low
8			JTAG	High	Low	High	Low

Notes:
1. The USB boot program is stored in the user boot area when the product is shipped. The MCU will start up in USB boot mode if the USB boot program is not erased. The MCU cannot be started up in USB boot mode after the USB boot program is erased.
2. In user boot mode, UB code A for the option-setting memory must be set to "5573 6572h, 426F 6F74h", and UB code B for the option-setting memory must be set to "FFFF FF07h, 0008 C04Ch".

1.1 Startup in Single-Chip Mode

Table 1.2 lists the Pins Used and Their Functions. Table 1.3 lists the Setting Values in the Option-Setting Memory.

Table 1.2 Pins Used and Their Functions

Pin Name	Pin Status	Explanation
PC7	High/low/open	Set this pin to select the operating mode. After starting up in single-chip mode, this pin can be used for input or output as a general port.
MD	High	Set this pin to select the operating mode. After starting up in single-chip mode, drive this pin high.
EMLE	Low	On-chip emulator enable pin. Drive this pin low when not using the on-chip emulator.
BSCANP	Low	Boundary scan enable pin. Drive this pin low when not using the boundary scan mode.

Table 1.3 Setting Values in the Option-Setting Memory

Option-Setting Memory	Address	Setting Value	Contents
UB code A	FF7F FFE8h to FF7F FFEFh	—	Do not rewrite UB code A.
UB code B	FF7F FFF0h to FF7F FFF7h	—	Do not rewrite UB code B.
Endian select register B	FF7F FFF8h to FF7F FFFBh	—	—
Endian select register S	FFFF FF80h to FFFF FF83h	FFFF FFFFh (little endian) FFFF FFF8h (big endian)	Endian select register S is used when setting the endian in single-chip mode.

1.2 Startup in Boot Mode

Table 1.4 lists the Pins Used and Their Functions. Table 1.5 lists the Setting Values in the Option-Setting Memory.

Table 1.4 Pins Used and Their Functions

Pin Name	Pin Status	Explanation
PC7	Low	Set this pin to select the operating mode. When starting up in boot mode, drive this pin low.
MD	Low	Set this pin to select the operating mode. When starting up in boot mode, drive this pin low.
EMLE	Low	On-chip emulator enable pin. Drive this pin low when not using the on-chip emulator.
BSCANP	Low	Boundary scan enable pin. Drive this pin low when not using the boundary scan mode.

Table 1.5 Setting Values in the Option-Setting Memory

Option-Setting Memory	Address	Setting Value	Contents
UB code A	FF7F FFE8h to FF7F FFEFh	—	Do not rewrite UB code A.
UB code B	FF7F FFF0h to FF7F FFF7h	—	Do not rewrite UB code B.
Endian select register B	FF7F FFF8h to FF7F FFFBh	—	—
Endian select register S	FFFF FF80h to FFFF FF83h	—	—

1.3 Startup in USB Boot Mode

Table 1.6 lists the Pins Used and Their Functions. Table 1.7 lists the Setting Values in the Option-Setting Memory.

Table 1.6 Pins Used and Their Functions

Pin Name	Pin Status	Explanation
PC7	High	Set this pin to select the operating mode. When starting up in USB boot mode, drive this pin high.
MD	Low	Set this pin to select the operating mode. When starting up in USB boot mode, drive this pin low.
EMLE	Low	On-chip emulator enable pin. Drive this pin low when not using the on-chip emulator.
BSCANP	Low	Boundary scan enable pin. Drive this pin low when not using the boundary scan mode.

Table 1.7 Setting Values in the Option-Setting Memory

Option-Setting Memory	Address	Setting Value	Contents
UB code A	FF7F FFE8h to FF7F FFEFh	—	Do not rewrite UB code A.
UB code B	FF7F FFF0h to FF7F FFF7h	—	Do not rewrite UB code B.
Endian select register B	FF7F FFF8h to FF7F FFFBh	—	—
Endian select register S	FFFF FF80h to FFFF FF83h	—	—

1.4 Startup in User Boot Mode

Table 1.8 lists the Pins Used and Their Functions. Table 1.9 lists the Setting Values in the Option-Setting Memory.

Table 1.8 Pins Used and Their Functions

Pin Name	Pin Status	Explanation
PC7	High	Set this pin to select the operating mode. When starting up in user boot mode, drive this pin high.
MD	Low	Set this pin to select the operating mode. When starting up in user boot mode, drive this pin low.
EMLE	Low	On-chip emulator enable pin. Drive this pin low when not using the on-chip emulator.
BSCANP	Low	Boundary scan enable pin. Drive this pin low when not using the boundary scan mode.

Table 1.9 Setting Values in the Option-Setting Memory

Option-Setting Memory	Address	Setting Value	Contents
UB code A	FF7F FFE8h to FF7F FFEFh	5573 6572h (upper) 426F 6F74h (lower)	UB code A is necessary when using user boot mode. Set UB code A in 32-bit units.
UB code B	FF7F FFF0h to FF7F FFF7h	FFFF FF07h (upper) 0008 C04Ch (lower)	UB code B is necessary when using user boot mode. Set UB code B in 32-bit units.
Endian select register B	FF7F FFF8h to FF7F FFFBh	FFFF FFFFh (little endian) FFFF FFF8h (big endian)	Endian select register B is used when setting the endian in user boot mode.
Endian select register S	FFFF FF80h to FFFF FF83h	—	—

1.5 Debugger (OCD) Startup and Debugging the User Area Using the FINE Interface

Table 1.10 lists the Pins Used and Their Functions. Table 1.11 lists the Setting Values in the Option-Setting Memory.

Table 1.10 Pins Used and Their Functions

Pin Name	Pin Status	Explanation
PC7	Low	Set this pin to select the operating mode. When debugging the user area using the FINE interface, drive this pin low.
MD	Low	Set this pin to select the operating mode. When debugging the user area using the FINE interface, drive this pin low.
EMLE	Low	On-chip emulator enable pin. Drive this pin low when using the on-chip emulator with the FINE interface.
BSCANP	Low	Boundary scan enable pin. Drive this pin low when not using the boundary scan mode.

Table 1.11 Setting Values in the Option-Setting Memory

Option-Setting Memory	Address	Setting Value	Contents
UB code A	FF7F FFE8h to FF7F FFEFh	—	Do not rewrite UB code A.
UB code B	FF7F FFF0h to FF7F FFF7h	—	Do not rewrite UB code B.
Endian select register B	FF7F FFF8h to FF7F FFFBh	—	—
Endian select register S	FFFF FF80h to FFFF FF83h	—	—

1.6 Debugger (OCD) Startup and Debugging the User Area Using the JTAG Interface

Table 1.12 lists the Pins Used and Their Functions. Table 1.13 lists the Setting Values in the Option-Setting Memory.

Table 1.12 Pins Used and Their Functions

Pin Name	Pin Status	Explanation
PC7	High/low/open	Set this pin to select the operating mode. When debugging the user area using the JTAG interface, this pin can be used as a general-purpose port when necessary.
MD	High	Set this pin to select the operating mode. When debugging the user area using the JTAG interface, drive this pin high.
EMLE	High	On-chip emulator enable pin. Drive this pin high when using the on-chip emulator with the JTAG interface.
BSCANP	Low	Boundary scan enable pin. Drive this pin low when not using the boundary scan mode.

Table 1.13 Setting Values in the Option-Setting Memory

Option-Setting Memory	Address	Setting Value	Contents
UB code A	FF7F FFE8h to FF7F FFEFh	—	Do not rewrite UB code A.
UB code B	FF7F FFF0h to FF7F FFF7h	—	Do not rewrite UB code B.
Endian select register B	FF7F FFF8h to FF7F FFFBh	—	—
Endian select register S	FFFF FF80h to FFFF FF83h	—	—

1.7 Debugger (OCD) Startup and Debugging the User Boot Area Using the FINE Interface

Table 1.14 lists the Pins Used and Their Functions. Table 1.15 lists the Setting Values for the Option-Setting Memory.

Table 1.14 Pins Used and Their Functions

Pin Name	Pin Status	Explanation
PC7	Low	Set this pin to select the operating mode. When debugging the user boot area using the FINE interface, drive this pin low.
MD	Low	Set this pin to select the operating mode. When debugging the user boot area using the FINE interface, drive this pin low.
EMLE	Low	On-chip emulator enable pin. Drive this pin low when using the on-chip emulator with the FINE interface.
BSCANP	Low	Boundary scan enable pin. Drive this pin low when not using the boundary scan mode.

Table 1.15 Setting Values for the Option-Setting Memory

Option-Setting Memory	Address	Setting Value	Contents
UB code A	FF7F FFE8h to FF7F FFEFh	—	Do not rewrite UB code A.
UB code B	FF7F FFF0h to FF7F FFF7h	—	Do not rewrite UB code B.
Endian select register B	FF7F FFF8h to FF7F FFFBh	—	—
Endian select register S	FFFF FF80h to FFFF FF83h	—	—

1.8 Debugger (OCD) Startup and Debugging the User Boot Area Using the JTAG Interface

Table 1.16 lists the Pins Used and Their Functions. Table 1.17 lists the Setting Values for the Option-Setting Memory.

Table 1.16 Pins Used and Their Functions

Pin Name	Pin Status	Explanation
PC7	High	Set this pin to select the operating mode. When debugging the user boot area using the JTAG interface, drive this pin high.
MD	Low	Set this pin to select the operating mode. When debugging the user boot area using the JTAG interface, drive this pin low.
EMLE	High	On-chip emulator enable pin. Drive this pin high when using the on-chip emulator with the JTAG interface.
BSCANP	Low	Boundary scan enable pin. Drive this pin low when not using the boundary scan mode.

Table 1.17 Setting Values for the Option-Setting Memory

Option-Setting Memory	Address	Setting Value	Contents
UB code A	FF7F FFE8h to FF7F FFEFh	—	Do not rewrite UB code A.
UB code B	FF7F FFF0h to FF7F FFF7h	—	Do not rewrite UB code B.
Endian select register B	FF7F FFF8h to FF7F FFFBh	—	—
Endian select register S	FFFF FF80h to FFFF FF83h	—	—

2. Example of Pin Processing

Table 2.1 lists an example of pin processing for startup using multiple modes. Flash programmers used for startup in boot mode and emulators assume that E1/E20 is used.

Table 2.1 Example of Pin Processing for Startup Using Multiple Modes

Mode					Pin Handling			
Startup in single-chip mode	Boot		Emulator		PC7 (UB)	MD	EMLE	BSCANP
	Startup in boot mode	Startup in USB boot mode or user boot mode	JTAG	FINE				
Used	Used	Used	Used (U/UB)	Used (U/UB)	See Note 3	See Note 2	See Note 4	Pull-down
Used	Used	Used	Not used	Used (U/UB)	See Note 3	See Note 2	Pull-down	Pull-down
Used	Used	Used	Not used	Not used	See Note 3	See Note 2	Pull-down	Pull-down
Used	Used	Not used	Used (U)	Used (U)	Pull-down	See Note 3	See Note 4	Pull-down
Used	Used	Not used	Not used	Used (U)	Pull-down	See Note 3	Pull-down	Pull-down
Used	Used	Not used	Not used	Not used	Pull-down	See Note 3	Pull-down	Pull-down
Used	Not used	Used	Used (U/UB)	Used (U/UB)	See Note 3	See Note 2	See Note 4	Pull-down
Used	Not used	Used	Not used	Used (U/UB)	See Note 3	See Note 2	Pull-down	Pull-down
Used	Not used	Used	Not used	Not used	Pull-up	See Note 1	Pull-down	Pull-down
Used	Not used	Not used	Not used	Used (U)	Pull-down	See Note 3	Pull-down	Pull-down
Used	Not used	Not used	Used (U)	Not used	Circuit not necessary	Pull-up	See Note 4	Pull-down
Used	Not used	Not used	Not used	Not used	Circuit not necessary	Pull-up	Pull-down	Pull-down

Legend:
(U/UB) = User area or user boot area can be debugged; (U) = Only the user area can be debugged
Set the pull-up/pull-down resistor value to 4.7 kΩ

Note 1: Pull-up/pull-down select circuit
Note 2: Pull-up/pull-down select circuit + connecting circuit to E1/E20
Note 3: Pull-up + circuit connecting to E1/E20
Note 4: Pull-down + circuit connecting to E1/E20

The above pin processing example assumes the following:

(A) Do not hot swap with the E1/E20 emulator.

(B) A circuit that does not connect to the E1/E20 emulator and EMLE/MD/PC7 pin should be allotted.

(C) PC7 is not used as a general-purpose port (when using PC7 as a general-purpose port, it is necessary to have an additional circuit to disconnect the pull-up and pull-down resistors after startup is completed).

3. Reference Documents

User's Manual: Hardware

RX630 Group User's Manual: Hardware Rev.1.50 (R01UH0040EJ)

RX63N Group, RX631 Group User's Manual: Hardware Rev.1.50 (R01UH0041EJ)

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

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Rev.	Date	Description	
		Page	Summary
1.00	Feb. 1, 2013	—	First edition issued
1.01	Apr. 1, 2013	1, 3	Added the reference information to 2. Example of Pin Processing.

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU 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. Handling of Unused Pins

   Handle unused pins in accord 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment 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 moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has 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. Moreover, 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.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of an MPU or MCU in the same group but having a different part number may differ in terms of the 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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