RX600 Series

R21AN0004EJ0102
Rev.1.02
Sep 20, 2012

Usage of Renesas Starter Kit for RX610 Middleware Evaluation Board

Introduction

This application note provides information necessary to design an expansion circuit that allows the CPU board (hereafter referred to as RX610 CPU board, type: R0K556100C000BE) included in Renesas Starter Kit for RX610 (hereafter referred to as RSK, model name: R0K556100S000BE) to provide the functions below. In this application note, this expansion circuit is referred to as middleware evaluation board.

Section 1 describes the hardware specifications for the middleware evaluation board and also describes the necessary changes in the RX610 CPU Board.

Based on reference circuit diagrams of the middleware evaluation board, sections 2 to 7 explain and the RX610 CPU Board's expansion pins to be connected for each functions of the middleware.

In the Section 8, this application note explains connections that RX Family Renesas Starter Kit CPU board to Middleware Evaluation Board.

The following pieces of middleware are used to implement the functions explained in this application note.

- ADPCM audio compression/ decompression with M3S-S2-Tiny
  http://www.renesas.com/mw/s2
- Dial tone playback/recognition with M3S-DTMF-Tiny
  http://www.renesas.com/mw/dtmf
- FAT file system with M3S-TFAT-Tiny and MMC driver
  http://www.renesas.com/mw/tfat
- Original file system with M3S-TFS-Tiny and MMC driver
  http://www.renesas.com/mw/tfs

Please note that the board needs to be designed by the customer.

Please refer to the each application about usage of each middleware sample program.

Target Device

RX610

Contents

1. Hardware Specifications 3
2. ADPCM Audio Compression with M3S-S2-Tiny 4
3. ADPCM Audio Decompression with M3S-S2-Tiny 5
4. Dial Tone Playback with M3S-DTMF-Tiny 6
5. Dial Tone Recognition with M3S-DTMF-Tiny 7
6. FAT File System with M3S-TFAT-Tiny and MMC Driver 8
7. Original File System with M3S-TFS-Tiny and MMC Driver 9
8. How to connect other CPU board excluding RX610 CPU board 10

1. Hardware Specifications

The main hardware specifications for the middleware evaluation board are as follows:

Symbol	Name	Number
J3	Microphone input pin	1
J4	Headphone output pin	1
J5	Audio output pin	1
C30	Capacitor microphone	1
J1 + J2	Speaker	1
J6	MMC socket	1
U1	R1EX24256ASA00A (serial EEPROM for IIC) (*)	1
J7	EXT card (*)	1
SW1 / SW2 / SW3	Switch (*)	3

Note: * Not described in this application note.

The necessary changes in the RX610 CPU Board are as follows:

Make these changes appropriate to the functions to be used.

For the part names, etc., see the circuit diagram provided in the CD-ROM which is included in the RSK.

Function Name	Parts to be Removed	Parts to be Added	Reasons for Changes and References
ADPCM audio compression	R95	R96	AN0 is to be connected to the microphone input.
ADPCM audio decompression	—	—	—
Dial tone playback	—	—	—
Dial tone recognition	R95	R96	AN0 is to be connected to the microphone input.
TFAT & MMC	R65, R66	—	The MMC communication pins (TxD1, RxD1) are to be disconnected from the UART.
TFS & MMC	R65, R66	—	The MMC communication pins (TxD1, RxD1) are to be disconnected from the UART.

2. ADPCM Audio Compression with M3S-S2-Tiny

2.1 Hardware to be Used

Middleware Evaluation Board		RX610 CPU Board		RX610 CPU Board and Middleware Evaluation Board Interface
Function Name	**Pin Name**	**Function Name**	**Pin Name**	**Pin Name**
Power(3.3V)	3V3	3.3V	CON_3V3	JA1: Pin 3
GND	GND-3V3	GND	GROUND	JA1: Pin 4
Capacitor microphone	J3	A/D converter	AN0	JA1: Pin 9
Microphone input	C30			

Note: If the microphone input is connected, the capacitor microphone is disabled.

3. ADPCM Audio Decompression with M3S-S2-Tiny

3.1 Hardware to be Used

Middleware Evaluation Board		RX610 CPU Board		RX610 CPU Board and Middleware Evaluation Board Interface
Function Name	**Pin Name**	**Function Name**	**Pin Name**	**Pin Name**
Power(3.3V)	3V3	3.3V	CON_3V3	JA1: Pin 3
GND	GND-3V3	GND	GROUND	JA1: Pin 4
Headphone (*1)	J4	D/A (*2)	DA0	JA1: Pin 13
		PWM (*2)	TRIGb	JA2: Pin 22
Audio output (*1)	J5	D/A (*2)	DA0	JA1: Pin 13
		PWM (*2)	TRIGb	JA2: Pin 22
Speaker (*1)	J1 + J2	D/A (*2)	DA0	JA1: Pin 13
		PWM (*2)	TRIGb	JA2: Pin 22

Note: *1 When JP3 is set, the headphone is connected.
When JP4 is set, the audio output or speaker is connected.
If the audio output is connected, the speaker is disabled.
*2 When JP1 is set, D/A is connected.
When JP2 is set, PWM is connected.

4. Dial Tone Playback with M3S-DTMF-Tiny

4.1 Hardware to be Used

Middleware Evaluation Board		RX610 CPU Board		RX610 CPU Board and Middleware Evaluation Board Interface
Function Name	**Pin Name**	**Function Name**	**Pin Name**	**Pin Name**
Power(3.3V)	3V3	3.3V	CON_3V3	JA1: Pin 3
GND	GND-3V3	GND	GROUND	JA1: Pin 4
Headphone (*1)	J4	PWM (*2)	TRIGb	JA2: Pin 22
Audio output (*1)	J5	PWM (*2)	TRIGb	JA2: Pin 22
Speaker (*1)	J1 + J2	PWM (*2)	TRIGb	JA2: Pin 22

Note: *1 When JP3 is set, the headphone is connected.
When JP4 is set, the audio output or the speaker is connected.
If the audio output is connected, the speaker is disabled.
*2 When JP2 is set, the PWM is connected.
DTMF tone is not output from D/A.

5. Dial Tone Recognition with M3S-DTMF-Tiny

5.1 Hardware to be Used

Middleware Evaluation Board		RX610 CPU Board		RX610 CPU Board and Middleware Evaluation Board Interface
Function Name	**Pin Name**	**Function Name**	**Pin Name**	**Pin Name**
Power(3.3V)	3V3	3.3V	CON_3V3	JA1: Pin 3
GND	GND-3V3	GND	GROUND	JA1: Pin 4
Capacitor microphone	J3	A/D converter	AN0	JA1: Pin 9
Line input	C30			

Note: If the microphone input is connected, the capacitor microphone is disabled.

6. FAT File System with M3S-TFAT-Tiny and MMC Driver

The M3S-TFAT-Tiny can be used for USB flash drives and RAM devices as well as for MMCs and SD cards, but the driver needs to be prepared by the customer. In this application note, section 6.3 describes its use for MMC Driver.

6.1 Hardware to be Used

Middleware Evaluation Board		RX610 CPU Board		RX610 CPU Board and Middleware Evaluation Board Interface
Function Name	**Pin Name**	**Function Name**	**Pin Name**	**Pin Name**
Power(3.3V)	3V3	3.3V	CON_3V3	JA1: Pin 3
GND	GND-3V3	GND	GROUND	JA1: Pin 4
MMC socket	J6: CS	I/O port	IO0	JA1: Pin 15
	J6: DI	TXData pin 1	TXD1	JA2: Pin 6
	J6: CLK	Clock I/O pin	SCK1	JA2: Pin 10
	J6: DO	RxData pin 1	RXD1	JA2: Pin 8
	J6: CD	I/O port	IO1	JA1: Pin 16

7. Original File System with M3S-TFS-Tiny and MMC Driver

The M3S-TFS-Tiny can be used for USB flash drives and RAM devices as well as for MMCs and SD cards, but the driver needs to be prepared by the customer. This application note describes its use for an MMC.

7.1 Hardware to be Used

Middleware Evaluation Board		RX610 CPU Board		RX610 CPU Board and Middleware Evaluation Board Interface
Function Name	**Pin Name**	**Function Name**	**Pin Name**	**Pin Name**
Power(3.3V)	3V3	3.3V	CON_3V3	JA1: Pin 3
GND	GND-3V3	GND	GROUND	JA1: Pin 4
MMC socket	J6: CS	I/O port	IO0	JA1: Pin 15
	J6: DI	TXData pin 1	TXD1	JA2: Pin 6
	J6: CLK	Clock I/O pin	SCK1	JA2: Pin 10
	J6: DO	RxData pin 1	RXD1	JA2: Pin 8
	J6: CD	I/O port	IO1	JA1: Pin 16

8. How to connect other CPU board excluding RX610 CPU board

This section explains that how to connect RX62N/RX210 CPU board to Middleware Evaluation Board. Middleware Evaluation Board does not have compatibility for RX62N/RX210 CPU board. So user has to connect each CPU board pins to Middleware Evaluation Board pins manually.

8.1 RX62N CPU Board connection settings

This section shows settings for RX62N CPU Board(R0K5562N0C000BE) including in Renesas Starter Kit+ for RX62N(type: R0K5562N0S000BE) to Middleware Evaluation Board.

Middleware Evaluation Board			**RX62N CPU Board**		
Function Name	**Pin Name**	**Connector Pin No.**	**Extension Connect Pin No.**	**Pin Function**	**CPU Pin Name**
Power(3.3V)	3V3	JA1-3	JA1-3	Board_VCC	VCC
GND	GND-3V3	JA1-4	JA1-4	GROUND	VSS
MMC socket	J6: CS	JA1-15	J20-4	I/O Port	P90
	J6: DI	JA2-6	JA3-35	RSPI MOSI	PE6
	J6: CLK	JA2-10	JA3-34	RSPI RSPCK	PE5
	J6: DO	JA2-8	JA3-36	RSPI MISO	PE7
	J6: CD	JA1-16	J20-5	I/O Port	P91
Capacitor microphone	J3	JA1-9	JA1-9	A/D Converter	P40
Microphone input	C30				
Speaker / Headphone	J5	JA1-22	J3-1	PWM Output	PA0
	J4	JA1-13	JA1-13	D/A Output	P03
EEPROM	U1:SCL	JA1-26	JA1-26(*1)	IIC CLK	P12
	U1:SDA	JA1-25	JA1-25(*2)	IIC DAT	P13

(*1) Please close RX62N CPU Board J5-1 and J5-2
(*2) Please close RX62N CPU Board J6-1 and J6-2

And, these changes are needed for RX62N CPU Board.

Function Name	**Parts to be Removed**	**Parts to be Added**	**Reasons for Changes and References**
Speaker Output	R46	R47	DA0 is to be connected to the Speaker.
Microphone Input	R72	R73	AN0 is to be connected to the microphone input.

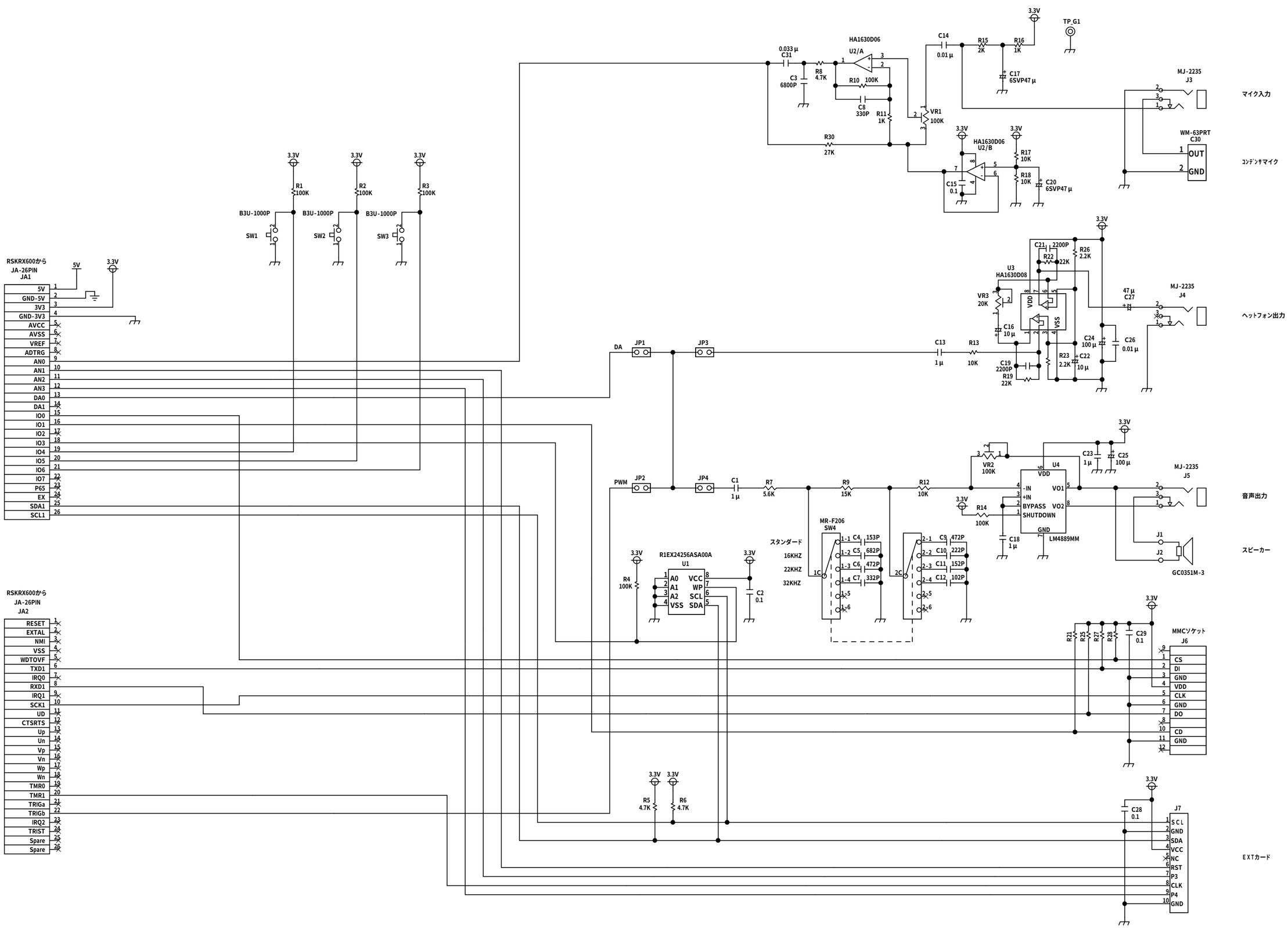
8.2 RX210 CPU Board connection settings

This section shows settings for RX210 CPU(R0K505210C000BE) board including in Renesas Starter Kit for RX210(type: R0K505210S000BE) to Middleware Evaluation Board.

Middleware Evaluation Board			**RX210 CPU Board**		
Function Name	**Pin Name**	**Connector Pin No.**	**Extension Connect Pin No.**	**Pin Function**	**CPU Pin Name**
Power(3.3V)	3V3	JA1-3	J17-3(*1)	Board_VCC	VCC
GND	GND-3V3	JA1-4	JA1-4	GROUND	VSS
MMC socket	J6: CS	JA1-15	J2-19	I/O Port	P50
	J6: DI	JA2-6	J3-14	RSPI MOSI	PA6
	J6: CLK	JA2-10	J3-15	RSPI RSPCK	PA5
	J6: DO	JA2-8	J3-13	RSPI MISO	PA7
	J6: CD	JA1-16	J2-18	I/O Port	P51
Capacitor microphone	J3	JA1-9	J4-14	A/D Converter	P45
Microphone input	C30				
Speaker / Headphone	J5	JA1-22	J1-24	PWM Output	P24
	J4	JA1-13	J1-2	D/A Output	P03
EEPROM	U1:SCL	JA1-26	JA1-26	IIC CLK	P12
	U1:SDA	JA1-25	JA1-25	IIC DAT	P13

(*1) Please close RX210 CPU Board J17 2-3. And Please open J15

In this case, there are no changes needed for RX210 CPU Board.



Title	RX600用デモ基板		Note {NOTE}
Size A3	DOC NO. {DOCNO}	Revision {REV}	
RX600用デモ基板変更.schfile	2010/09/14 11:39:12	{SHNO}	

Website and Support

Renesas Electronics Website
http://www.renesas.com/

Inquiries
http://www.renesas.com/contact/

Revision Record

		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	Feb 21, 2011	—	First edition issued
1.01	Feb 20, 2012	—	Added, example of middleware evaluation board schematic
1.02	Sep 20, 2012	—	Added Section 8. Deleted explanation of each middleware sample program.

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.

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.
   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc.
   Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.
6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, Renesas Electronics assumes no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

RENESAS

SALES OFFICES Renesas Electronics Corporation http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

Colophon 2.2