

To our customers,

---

## Old Company Name in Catalogs and Other Documents

---

On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

Send any inquiries to <http://www.renesas.com/inquiry>.

## Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. 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.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. 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.
5. When exporting the 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. You should not use Renesas Electronics products or the 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. 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.
6. 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.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. 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 categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. 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 an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
  - “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.
  - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
  - “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. 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.
9. 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 system manufactured by you.
10. 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.
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 Starter Kit for SH2/7137

User's Manual

RENEASAS SINGLE-CHIP MICROCOMPUTER  
SH2 FAMILY

---

# Table of Contents

Chapter 1. Preface .....	3
Chapter 2. Purpose .....	4
Chapter 3. Power Supply.....	5
3.1. Requirements.....	5
3.2. Power – Up Behaviour .....	5
Chapter 4. Board Layout .....	6
4.1. Component Layout.....	6
4.2. Board Dimensions.....	7
Chapter 5. Block Diagram .....	8
Chapter 6. User Circuitry.....	9
6.1. Switches.....	9
6.2. LEDs .....	9
6.3. Potentiometer.....	9
6.4. Serial port.....	9
6.5. RCAN-ET .....	10
6.6. Debug LCD Module.....	10
6.7. Option Links .....	12
6.8. Oscillator Sources .....	20
6.9. Reset Circuit.....	20
Chapter 7. Modes .....	21
7.1. Boot mode.....	21
7.2. User Boot mode .....	21
7.3. User Program mode.....	21
7.4. Single chip mode.....	21
7.5. MCU extension mode 0.....	22
7.6. MCU extension mode 2.....	22
Chapter 8. Programming Methods .....	23
Chapter 9. Headers .....	24
9.1. Microcontroller Headers .....	24
9.2. Application Headers .....	27
Chapter 10. Code Development .....	31
10.1. Overview .....	31
10.2. Compiler Restrictions .....	31
10.3. Mode Support.....	31
10.4. Breakpoint Support .....	31
10.5. Memory Map .....	32
Chapter 11. Component Placement .....	33
Chapter 12. Additional Information .....	34

---

# Chapter 1. Preface

## Cautions

This document may be, wholly or partially, subject to change without notice.

All rights reserved. Duplication of this document, either in whole or part is prohibited without the written permission of Renesas Technology Europe Limited.

## Trademarks

All brand or product names used in this manual are trademarks or registered trademarks of their respective companies or organisations.

## Copyright

© Renesas Technology Europe Ltd. 2008. All rights reserved.

© Renesas Technology Corporation. 2008. All rights reserved.

© Renesas Solutions Corporation. 2008. All rights reserved.

Website: <http://www.eu.renesas.com/>

## Glossary

CPU	Central Processing Unit	HEW	High-performance Embedded Workshop
LED	Light Emitting Diode	RSK	Renesas Starter Kit
PC	Program Counter	E10A	On-chip debugger module for starter kits
LCD	Liquid Crystal Display	RCAN	Renesas Controller Area Network

---

## Chapter 2. Purpose

This RSK is an evaluation tool for Renesas microcontrollers.

This manual describes the technical details of the RSK hardware. The Quick Start Guide and Tutorial Manual provide details of the software installation and debugging environment.

Features include:

- Renesas Microcontroller Programming.
- User Code Debugging.
- User Circuitry such as Switches, LEDs and potentiometer.
- User or Example Application.
- Sample peripheral device initialisation code.

The RSK board contains all the circuitry required for microcontroller operation.

---

## Chapter 3. Power Supply

### 3.1. Requirements

This RSK operates from a 5V power supply.

A diode provides reverse polarity protection only if a current limiting power supply is used.

All RSK boards are supplied with an E10A debugger.

All RSK boards have an optional centre positive supply connector using a 2.0mm barrel power jack.

#### Warning

**The RSK is neither under nor over voltage protected. Use a centre positive supply for this board.**

### 3.2. Power – Up Behaviour

When the RSK is purchased the RSK board has the 'Release' or stand alone code from the example tutorial code pre-programmed into the Renesas microcontroller. On powering up the board the user LEDs will start to flash. After 200 flashes, or after pressing a switch the LEDs will flash at a rate controlled by the potentiometer.

# Chapter 4. Board Layout

## 4.1. Component Layout

The following diagram shows top layer component layout of the board.

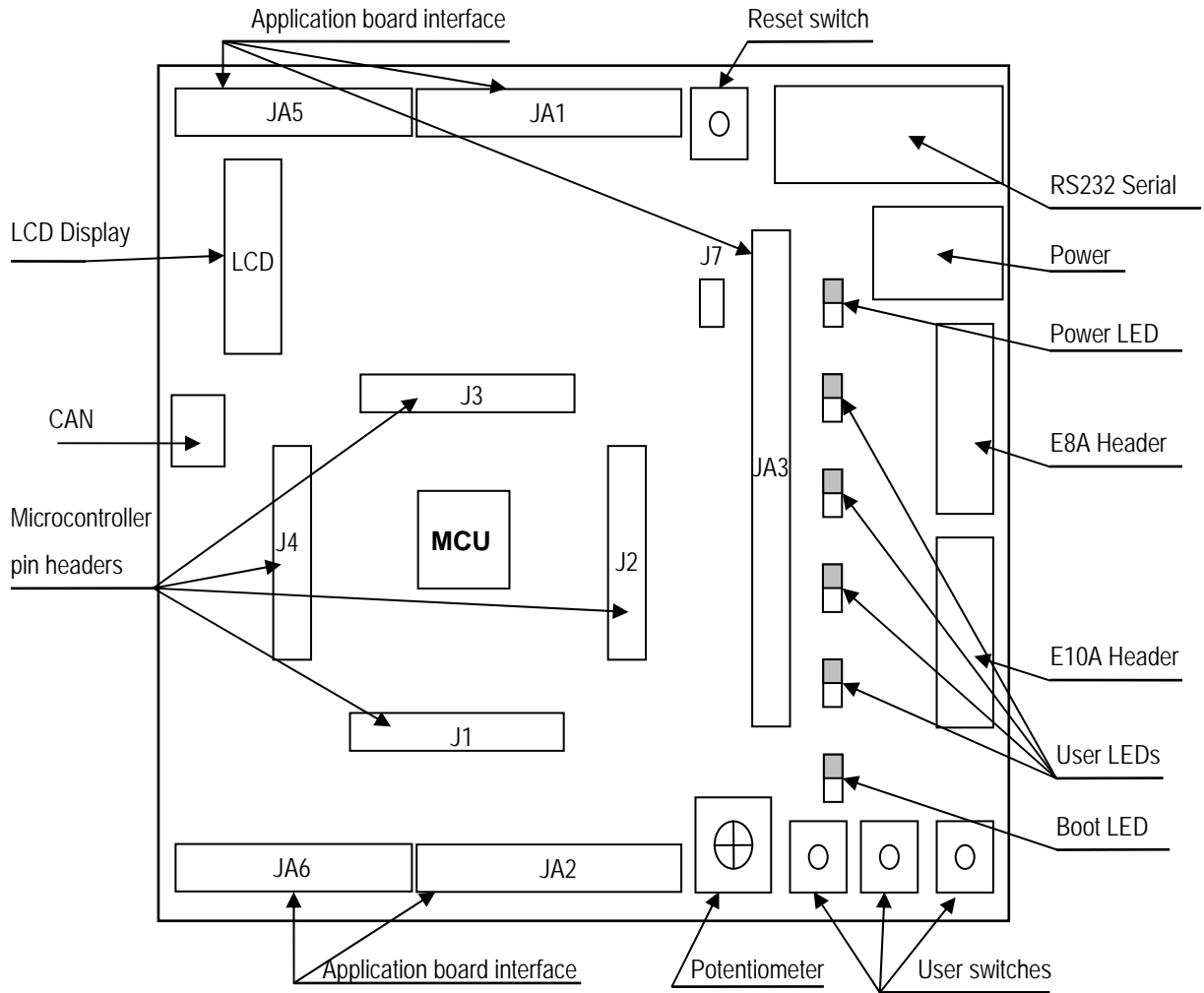


Figure 4-1: Board Layout



# Chapter 5. Block Diagram

Figure 5-1 shows the CPU board components and their connectivity.

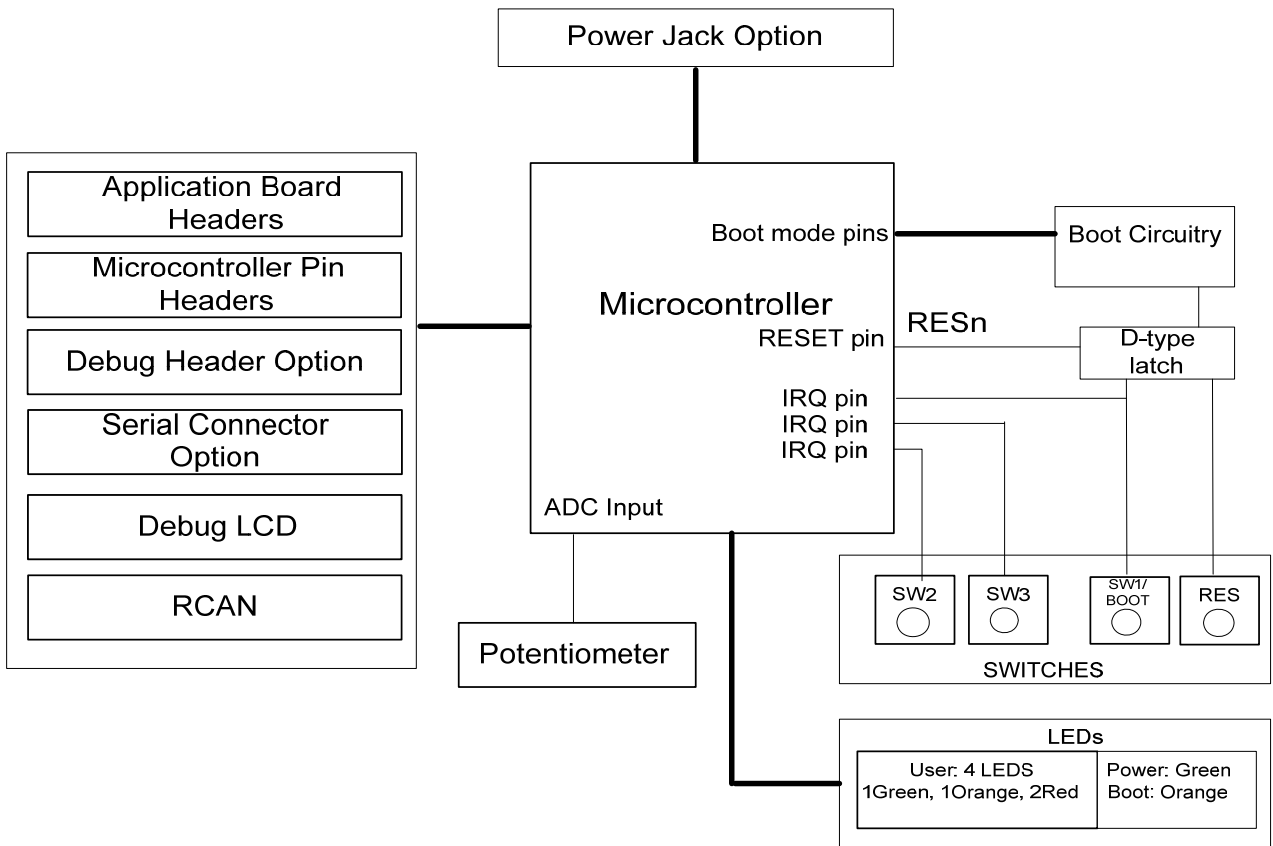


Figure 5-1: Block Diagram

Figure 5-2 shows the connections to the RSK.

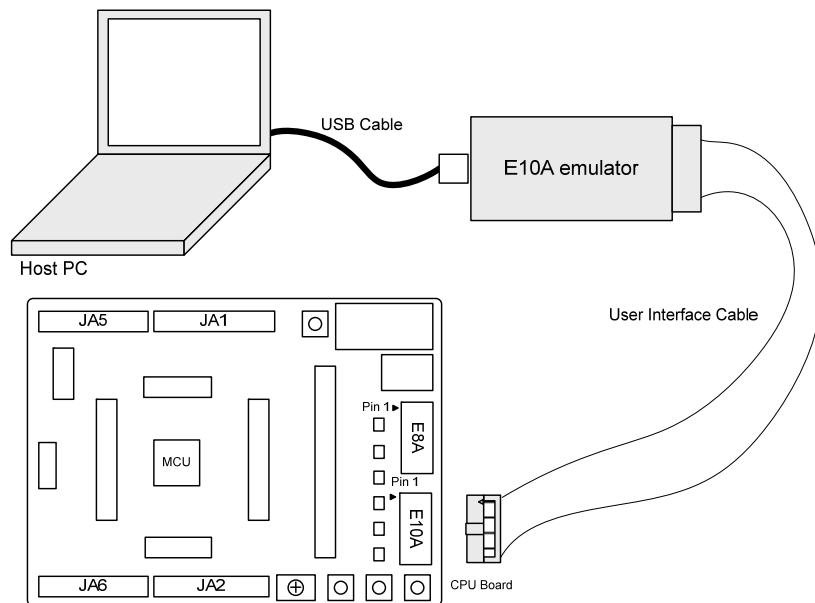


Figure 5-2: RSK Connections

---

# Chapter 6. User Circuitry

## 6.1. Switches

There are four switches located on the CPU board. The function of each switch and its connection are shown in Table 6-1.

Switch	Function	Microcontroller
RES	When pressed, the RSK microcontroller is reset.	RESn, Pin 70(*)
SW1/BOOT*	Connects to an IRQ input for user controls. The switch is also used in conjunction with the RES switch to place the device in BOOT mode when not using the E10A debugger.	IRQ0, Pin 46 (Port B pin 2)
SW2*	Connects to an IRQ line for user controls.	IRQ1, Pin 45 (Port B, pin 3)
SW3*	Connects to the ADC trigger input. Option link allows connection to IRQ line. The option is a pair of OR links. For more details on option links, please refer to Sec 6.6.	IRQ2, Pin 44 (Port B, pin 4)

Table 6-1: Switch Functions

\*Refer to schematic for detailed connectivity information.

## 6.2. LEDs

There are six LEDs on the RSK board. The green 'POWER' LED lights when the board is powered. The orange BOOT LED indicates the device is in BOOT mode when lit. The four user LEDs are connected to an IO port and will light when their corresponding port pin is set low.

Table 6-2, below, shows the LED pin references and their corresponding microcontroller port pin connections.

LED Reference (As shown on silkscreen)	Colour	Microcontroller Port Pin	Microcontroller Pin Number
LED0	Green	Port D0	40
LED1	Orange	Port D1	38
LED2	Red	Port D2	37
LED3	Red	Port D3	35

Table 6-2: LED Port

## 6.3. Potentiometer

A single turn potentiometer is connected to channel AN8 (PF8) of the microcontroller. This may be used to vary the input analogue voltage value to this pin between AVCC and Ground.

## 6.4. Serial port

Serial port SCI2 is connected to the standard RS232 header. Serial port SCI0 can optionally be connected to the RS232 header. The connections to be fitted are listed in the Table 6-3.

Description	Function	Microcontroller Port Pin	Fit for RS232	Remove for RS232
SCI2	Default serial port	58	R30	R53
SCI2	Default serial port	60	R39	R54
SCI0	Spare Serial Port	68	R53	R30
SCI0	Spare Serial Port	69	R54	R39

Table 6-3: Serial Port settings

The SCI2 port is also available on J3 and JA6. The SCI0 port is available on J3 and JA2.

## 6.5. RCAN-ET

The RCAN module can be used for RCAN communication.

Table 6-4 contains details of the signal descriptions and pin connections.

Description	Function	Microcontroller Pin Number	Header Pins
CTx0	Transmit data input	42	J2-12
CRx0	Receive data output; reads out data from the bus lines	41	J2-11
CAN_EN	Enable control input	49	J2-19
CAN_ERRn	Error and power-on indication output	63	J3-13
CAN_STBn	Standby control input	43	J2-13

Table 6-4: CAN module settings

## 6.6. Debug LCD Module

A debug LCD module is supplied to be connected to the connector LCD. This should be fitted so that the debug LCD module lies over J3. Care should be taken to ensure the pins are inserted correctly into LCD. The debug LCD module uses a 4 bit interface to reduce the pin allocation. No contrast control is provided; this is set by a resistor on the supplied display module. The module supplied with the RSK only supports 5V operation.

Table 6-5 shows the pin allocation and signal names used on this connector.

LCD					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	Ground	-	2	5V Only	-
3	No Connection	-	4	DLCDRS (PD10)	28
5	R/W (Wired to Write only)	-	6	DLCDE + 100k pull down to ground (PD9)	29
7	No Connection	-	8	No connection	-
9	No Connection	-	10	No connection	-
11	DLCDD4 (PE0)	27	12	DLCDD5 (PE1)	26
13	DLCDD6 (PE2)	25	14	DLCDD7 (PE3)	24

Table 6-5 Debug LCD Module Connections

## 6.7. Option Links

Table 6-6 below describes the function of the option links contained on this RSK board and associated with Serial Port Configuration. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R54	Serial Port Configuration	Connects serial port SCI0 (Tx) to D-type connector (SERIAL).	<b>Disconnects serial port SCI0 (Tx) from D-type connector (SERIAL).</b>	R53
R53	Serial Port Configuration	Connects serial port SCI0 (Rx) to D-type connector (SERIAL).	<b>Disconnects serial port SCI0 (Rx) from D-type connector (SERIAL).</b>	R54
R47	Serial Port configuration	Disables RS232 Serial Transceiver	<b>Enables RS232 Serial Transceiver</b>	R42
R42	Serial Port configuration	<b>Enables RS232 Serial Transceiver</b>	Disables RS232 Serial Transceiver	R47
R53	Serial Port Configuration	Connects serial port SCI2 (Tx) to D-type connector (SERIAL).	<b>Disconnects serial port SCI2 (Tx) from D-type connector (SERIAL).</b>	R54
R39	Serial Port Configuration	<b>Routes serial port SCI2 (Rx) to microcontroller pins.</b>	Disconnects serial port SCI2 (Rx) from microcontroller pins.	R25, R26, R30, R32, R36
R30	Serial Port Configuration	<b>Routes serial port SCI2 (Tx) to microcontroller pins.</b>	Disconnects serial port SCI2 (Tx) from microcontroller pins.	R25, R26, R32, R36, R39
R32	Serial Port Configuration	Routes serial port to JA6 pins.	<b>Disconnects serial port from JA6 pins.</b>	R25, R26, R30, R36, R39
R36	Serial Port Configuration	Routes serial port to JA6 pins.	<b>Disconnects serial port from JA6 pins.</b>	R25, R26, R30, R32, R39
R25	Serial Port Configuration	Connects microcontroller programming pin(PTRX) to D-type connector (SERIAL).	<b>Disconnects microcontroller programming pin (PTRX) from D-type connector (SERIAL).</b>	R26, R30, R32, R36, R39
R26	Serial Port Configuration	Connects microcontroller programming pin(PTTX) to D-type connector (SERIAL).	<b>Disconnects microcontroller programming pin(PTTX) from D-type connector (SERIAL).</b>	R25, R30, R32, R36, R39

Table 6-6: Serial port configuration links.

Table 6-7 below describes the function of the option links associated with application board interface. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R159	Application board interface	Use TRSTn of E10A debugger interface.	Use M2_Wn of application board interface.	R151
R151	Application board interface	Use M2_Wn of application board interface.	Use TRSTn of E10A debugger interface.	R159
R148	Application board interface	Use TMS of E10A debugger interface	Use M2_Vn of application board interface.	R147
R147	Application board interface	Use M2_Vn of application board interface.	Use TMS of E10A debugger interface	R148
R146	Application board interface	Use TDO of E10A debugger interface	Use M2_Wp of application board interface.	R136
R136	Application board interface	Use M2_Wp of application board interface.	Use TDO of E10A debugger interface	R146
R137	Application board interface	Use TDI of E10A debugger interface	Use M2_Vp of application board interface.	R133
R133	Application board interface	Use M2_Vp of application board interface.	Use TDI of E10A debugger interface	R137
R128	Application board interface	Use TCK of E10A debugger interface	Use M2_Un of application board interface.	R132
R132	Application board interface	Use M2_Un of application board interface.	Use TCK of E10A debugger interface	R128
R129	Application board interface	Use ASEBRKn of E10A debugger interface	Use M2_Up of application board interface.	R125
R125	Application board interface	Use M2_Up of application board interface.	Use ASEBRKn of E10A debugger interface	R129
R102	Application board interface	Use TRIGb of application board interface.	Use A14 of application board interface.	R106
R106	Application board interface	Use A14 of application board interface.	Use TRIGb of application board interface.	R102
R107	Application board interface	Use TRIGa of application board interface.	Use A13 of application board interface.	R103
R103	Application board interface	Use A13 of application board interface.	Use TRIGa of application board interface.	R107
R99	Application board interface	Use TMR1 of application board interface.	Use A12 of application board interface.	R97
R97	Application board interface	Use A12 of application board interface.	Use TMR1 of application board interface.	R99

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R100	Application board interface	<b>Use TMR0 of application board interface.</b>	Use A11 of application board interface.	R98
R98	Application board interface	Use A11 of application board interface.	<b>Use TMR0 of application board interface.</b>	R100
R59	Application board interface	<b>Use to connect to onboard LED3.</b>	Use D3 of application board interface.	R58
R58	Application board interface	Use D3 of application board interface.	<b>Use to connect to onboard LED3.</b>	R59
R60	Application board interface	<b>Use to connect to onboard LED2.</b>	Use D2 of application board interface.	R61
R61	Application board interface	Use D2 of application board interface.	<b>Use to connect to onboard LED2.</b>	R60
R76	Application board interface	<b>Use to connect to onboard LED1.</b>	Use D1 of application board interface.	R75
R75	Application board interface	Use D1 of application board interface.	<b>Use to connect to onboard LED1.</b>	R76
R77	Application board interface	<b>Use to connect to onboard LED0.</b>	Use D0 of application board interface.	R78
R78	Application board interface	Use D0 of application board interface.	<b>Use to connect to onboard LED0.</b>	R77
R62	Application board interface	Use CS1n of application board interface.	<b>Use CRx0 for onboard RCAN module.</b>	R63
R63	Application board interface	<b>Use CRx0 for onboard RCAN module.</b>	Use CS1n of application board interface.	R62
R65	Application board interface	<b>Use CAN_STBN for onboard RCAN module.</b>	Use A19 of application board interface.	R64
R64	Application board interface	Use A19 of application board interface.	<b>Use CAN_STBN for onboard RCAN module.</b>	R65
R79	Application board interface	<b>Use IRQ2 for onboard SW3.</b>	Use A18 of application board interface.	R80
R80	Application board interface	Use A18 of application board interface.	<b>Use IRQ2 for onboard SW3.</b>	R79
R66	Application board interface	Use SDA of application board interface.	<b>Use IRQ1 for onboard SW2 "or" A17 of application board interface.</b>	R67, R68
R68	Application board interface	<b>Use IRQ1 for onboard SW2.</b>	Use SDA "or" A17 of application board interface.	R66, R67

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R67	Application board interface	Use A17 of application board interface.	Use SDA of application board interface "or" IRQ1 for onboard SW2.	R66, R68
R81	Application board interface	Use SCL of application board interface.	Use IRQ0 for onboard SW1 "or" A16 of application board interface.	R82, R83
R83	Application board interface	Use IRQ0 for onboard SW1.	Use SCL "or" A16 of application board interface.	R81, R82
R82	Application board interface	Use A16 of application board interface.	Use SCL of application board interface "or" IRQ0 for onboard SW1.	R81, R83
R70	Application board interface	Use UD of application board interface.	Use CAN_EN for onboard RCAN module.	R69
R69	Application board interface	Use CAN_EN for onboard RCAN module.	Use UD of application board interface.	R70
R74	Application board interface	Use IO6 of application board interface.	Use A10 of application board interface.	R73
R73	Application board interface	Use A10 of application board interface.	Use IO6 of application board interface.	R74
R88	Application board interface	Use IO5 of application board interface.	Use A9 of application board interface.	R90
R90	Application board interface	Use A9 of application board interface.	Use IO5 of application board interface.	R88
R84	Application board interface	Use IO4 of application board interface.	Use A8 of application board interface.	R85
R85	Application board interface	Use A8 of application board interface.	Use IO4 of application board interface.	R84
R92	Application board interface	Use ADTRGn of application board interface.	Use A7 "or" IO3 of application board interface.	R94, R96
R94	Application board interface	Use A7 of application board interface.	Use ADTRGn "or" IO3 of application board interface.	R92, R96
R96	Application board interface	Use IO3 of application board interface.	Use ADTRGn "or" A7 of application board interface.	R92, R94
R91	Application board interface	Use A6 of application board interface.	Use IO2 of application board interface.	R89
R89	Application board interface	Use IO2 of application board interface.	Use A6 of application board interface.	R91

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R93	Application board interface	Use TXD2 for onboard RS232 module.	Use IO1 of application board interface.	R95
R95	Application board interface	Use IO1 of application board interface.	Use TXD2 for onboard RS232 module.	R93
R112	Application board interface	Use RXD2 for onboard RS232 module.	Use WRLn, WRn "or" IO0 of application board interface.	R101, R105, R109
R105	Application board interface	Use WRLn of application board interface.	Use RXD2 for onboard RS232 module "or" WRn "or" IO0 of application board interface.	R101, R109, R112
R109	Application board interface	Use WRn of application board interface.	Use RXD2 for onboard RS232 module "or" WRLn "or" IO0 of application board interface.	R101, R105, R112
R101	Application board interface	Use IO0 of application board interface.	Use RXD2 for onboard RS232 module "or" WRLn "or" WRn of application board interface.	R105, R109, R112
R108	Application board interface	Use IRQ3 of application board interface.	Use of CAN_ERRn for onboard RCAN module "or" A5 application board interface.	R104, R111
R111	Application board interface	Use CAN_ERRn for onboard RCAN module.	Use IRQ3 "or" A5 of application board interface.	R104, R108
R104	Application board interface	Use A5 of application board interface.	Use CAN_ERRn for onboard RCAN module "or" IRQ3 of application board interface.	R108, R111
R115	Application board interface	Use PTTX of E8A debugger interface.	Use A4 of application board interface.	R113
R113	Application board interface	Use A4 of application board interface.	Use PTTX of E8A debugger interface.	R115
R114	Application board interface	Use PTRX of E8A debugger interface.	Use A3 of application board interface.	R116
R116	Application board interface	Use A3 of application board interface.	Use PTRX of application board interface.	R114
R117	Application board interface	Use SCK0 of application board interface.	Use A2 of application board interface.	R119
R119	Application board interface	Use A2 of application board interface.	Use SCK0 of application board interface.	R117
R120	Application board interface	Use TXD0 for onboard RS232 module.	Use A1 of application board interface.	R118

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R118	Application board interface	Use A1 of application board interface.	Use TXD0 for onboard RS232 module.	R120
R124	Application board interface	<b>Use RXD0 for onboard RS232 module.</b>	Use A0 of application board interface.	R121
R121	Application board interface	Use A0 of application board interface.	<b>Use RXD0 for onboard RS232 module.</b>	R124

Table 6-7: Application board interface links.

Table 6-8 below describes the function of the option links associated with E8A and E10A debuggers. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R178	E8A	If FWE or R178 is fitted the Flash is protected from writing.	<b>If both FWE and R178 are removed, writing to Flash is enabled.</b>	

Table 6-8: E8A and E10A debugger links.

Table 6-9 below describes the function of the option links associated with power source. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R33	MCU power supply	<b>Supply to MCU.</b>	CPU current can be measured across R33	
R161	Ground	<b>Connects Analog &amp; Digital grounds together.</b>	Separates Analog & Digital grounds.	
R23	Power source	<b>5V source signal will be powered from E8A_VCC.</b>	5V source signal will not be powered from E8A_VCC.	R3, R10, R24
R24	Power source	<b>CON_5V source signal will be powered from E8A_VCC.</b>	CON_5V source signal will not be powered from E8A_VCC.	R3, R10, R23
R10	Power source	<b>E8A_VCC will be used as external source.</b>	E8A_VCC will not be used as external source.	R3, R10, R23
R3	Power source	<b>Enables external power to board from PWR connector.</b>	Disable external power to board from PWR connector.	R10, R23, R24
R29	Power source	<b>Board_VCC = 5V (or J5 1-2)</b>	Board_VCC = 3V3 (or J5 2-3)	R24, R35
R24	Power source	CON_3V3 source signal will be powered from E8A_VCC.	<b>CON_3V3 source signal will not be powered from E8A_VCC.</b>	R29, R35
R35	Power source	Board_VCC = 3V3 (or J5 2-3)	<b>Board_VCC = 5V (or J5 1-2)</b>	R24, R29
R40	Power source	<b>Board_VCC source signal will be powered from E8A_VCC.</b>	Board_VCC source signal will not be powered from E8A_VCC.	

Table 6-9: Power configuration links.

Table 6-10 below describes the function of the option links associated with clock configuration. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R123	Clock Oscillator	External Clock Source	<b>On-board Clock Source</b>	R126, R135, R138
R130	Clock Oscillator	Parallel resistor for a crystal	<b>Not fitted</b>	
R138	Clock Oscillator	External Clock Source	<b>On-board Clock Source</b>	R123, R126, R135
R135	Clock Oscillator	<b>On-board clock source is used</b>	External clock source is used	R123, R126, R138
R126	Clock Oscillator	<b>On-board clock source is used</b>	External clock source is used	R123, R135, R138

Table 6-10: Clock configuration links.

Table 6-11 below describes the function of the option links associated with reference voltage source. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R49	Voltage Reference Source	<b>Voltage Reference set to board Vcc signal.</b>	Voltage Reference taken from external connector (JA1 pin 7).	R50
R50	Voltage Reference Source	Voltage Reference is taken from external connector (JA1 pin 7).	<b>Voltage Reference set to board Vcc signal.</b>	R49

Table 6-11: Voltage reference links.

Table 6-12 below describes the function of the option links associated with analog power supply. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R52	Analog Voltage Source	Analog Ground from external connector.	<b>Analog Ground from on board Vcc.</b>	
R72	Analog Voltage Source	Analog voltage source from external connector.	<b>Analog voltage source from on-board AVcc.</b>	R71
R71	Analog Voltage Source	<b>Analog voltage source from on-board AVcc.</b>	Analog Voltage Source from external connector.	R72

Table 6-12: Analog power supply links.

Table 6-13 below describes the function of the option links associated with MCU modes. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R150	MCU Mode	MCU Extended Mode 0 enabled, also can be enabled by fitting jumper in Exten_Mode	<b>MCU Extended Mode 2 enabled</b>	R172, R178
R172	MCU Mode	MCU User Boot Mode enabled, also can be enabled by fitting jumper in U_BOOT	<b>MCU User Boot mode disabled</b>	R150, R178

Table 6-13: MCU mode links.

Table 6-14 below describes the function of the option links associated with switches configuration. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R46	Switches configuration	SW3 can be used for ADTRGn	SW3 can not be used for ADTRGn	R48
R48	Switches configuration	SW3 can be used for IRQ2	SW3 can not be used for IRQ2	R46

Table 6-14: Switches configuration links.

## 6.8. Oscillator Sources

A crystal oscillator is fitted on the RSK and used to supply the main clock input to the Renesas microcontroller. Table 6-15 details the oscillators that are fitted and alternative footprints provided on this RSK:

Component		
Crystal (X1)	Fitted	10 MHz (HC49/4H package)

Table 6-15: Oscillators / Resonators

## 6.9. Reset Circuit

The CPU Board includes a simple latch circuit that links the mode selection and reset circuit. This provides an easy method for swapping the device between Boot Mode and User mode. This circuit is not required on customer's boards as it is intended for providing easy evaluation of the operating modes of the device on the RSK. Please refer to the hardware manual for more information on the requirements of the reset circuit.

The Reset circuit operates by latching the state of the boot switch on pressing the reset button. This control is subsequently used to modify the mode pin states as required.

**The mode pins should change state only while the reset signal is active to avoid possible device damage.**

The reset is held in the active state for a fixed period via a resistor/capacitor delay circuit. Please check the reset requirements carefully to ensure the reset circuit on the user's board meets all the reset timing requirements.

---

## Chapter 7. Modes

This RSK supports Boot mode, User Boot mode, User Program Mode and User mode.

Details of programming the FLASH memory is described in the SH2/7137 Group Hardware Manual.

### 7.1. Boot mode

The boot mode settings for this RSK are shown in Table 7-1: Boot Mode pin settings below:

FWE	MD2n	MD1	LSI State after Reset End
1	0	0	Boot Mode

Table 7-1: Boot Mode pin settings

The software supplied with this RSK supports debugging with E10A which does not need Boot mode. To enter the Boot mode manually, do not connect the E10A in this case. Press and hold the SW1/BOOT. The BOOT LED will be illuminated to indicate that the microcontroller is in boot mode.

### 7.2. User Boot mode

Refer to SH2/7137 Group Hardware Manual for details of User Boot Mode. The user mode settings for this RSK are shown in Table 7-2: user Mode pin settings below:

FWE	MD2n	MD1	LSI State after Reset End
1	0	1	User Boot Mode

Table 7-2: User Boot Mode pin settings

### 7.3. User Program mode

Refer to SH2/7137 Group Hardware Manual for details of User Program Mode. The User Program Mode settings for this RSK are shown in Table 7-3: User Program Mode pin settings below:

FWE	MD2n	MD1	LSI State after Reset End
1	1	0	User Program Mode

Table 7-3: User Program Mode pin settings

### 7.4. Single chip mode

All ports can be used in this mode, however the external address cannot be used. The Single Chip Mode settings for this RSK are shown in Table 7-4: Single Chip Mode pin settings below:

FWE	MD2n	MD1	LSI State after Reset End
0	1	1	Single Chip Mode

Table 7-4: Single Chip Mode pin settings

---

## 7.5. MCU extension mode 0

CS0 space becomes external memory spaces with 8-bit bus width in SH7137. The MCU Extension Mode 0 settings for this RSK are shown in Table 7-5: MCU Extension Mode 0 pin settings below:

FWE	MD2n	MD1	LSI State after Reset End
0	0	0	MCU Extension Mode 0

Table 7-5: MCU Extension Mode 0 pin settings

## 7.6. MCU extension mode 2

CS0 space becomes external memory spaces with 8-bit bus width in SH7137. The MCU Extension Mode 2 settings for this RSK are shown in Table 7-6: MCU Extension Mode 2 pin settings below:

FWE	MD2n	MD1	LSI State after Reset End
0	1	0	MCU Extension Mode 2

Table 7-6: MCU Extension Mode 2 pin settings

---

## Chapter 8. Programming Methods

The board is intended for use with HEW and the supplied E10A debugger. Refer to SH2/7137 Group Hardware Manual for details of programming the microcontroller without using these tools.

---

# Chapter 9. Headers

## 9.1. Microcontroller Headers

Table 9-1 to Table 9-4 show the microcontroller pin headers and their corresponding microcontroller connections. The header pins connect directly to the microcontroller pin unless otherwise stated.

J1					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	GROUND	-	2	TRSTn_M2_Wn	2
3	UC_VCC	-	4	TMS_M2_Vn	4
5	TDO_M2_Wp	5	6	TDI_M2_Vp	6
7	TCK_M2_Un	7	8	ASEBRKn_M2_Up	8
9	M1_Wn	9	10	M1_Vn	10
11	UC_VCC	-	12	M1_Wp	12
13	M1_Vp	13	14	GROUND	-
15	M1_Un	15	16	NC	-
17	M1_Up	17	18	CS0n	18
19	A15	19	20	A14_TRIGb	20
21	A13_TRIGa	21	22	A12_TMR1	22
23	A11_TMR0	23	24	DLCDD7	24
25	DLCDD6	25	26	DLCDD5	26
27	DLCDD4	27	28	DLCDRS	28
29	DLCDE	29	30	TRISTn	30

Table 9-1: J1

J2					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	D7	31	2	D6	32
3	D5	33	4	D4	34
5	D3_LED3	35	6	UC_VCC	-
7	D2_LED2	37	8	D1_LED1	38
9	GROUND	39	10	D0_LED0	40
11	CS1n_CRx0	41	12	CTx0	42
13	A19_CAN_STBn	43	14	A18_IRQ2	44
15	A17_IRQ1_SDA	45	16	A16_IRQ0_SCL	46
17	M2_TRISTn	47	18	UC_VCC	-
19	UD_CAN_EN	49	20	GROUND	-

Table 9-2: J2

J3					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	IO7	51	2	A10_IO6	52
3	A9_IO5	53	4	A8_IO4	54
5	A8_ADTRGn_IO3	55	6	A6_IO2	56
7	UC_VCC	-	8	TXD2_IO1	58
9	NC	-	10	WRLn_WRn_RXD2_IO0	60
11	SCK2	61	12	RDn	62
13	A5_IRQ3_CAN_ERRn	63	14	GROUND	-
15	A4_PTTX	65	16	A3_PTRX	66
17	A2_SCK0	67	18	A1_TXD0	68
19	A0_RXD0	69	20	RESn	70
21	CON_XTAL	71	22	CON_EXTAL	72
23	NMI	73	24	FWE	74
25	NC	-	26	ASEMD0n	76
27	MD1	77	28	MD0	78
29	CON_AVSS	79	30	AN15	80

Table 9-3: J3

J4					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	AN14	81	2	AN13	82
3	AN12	83	4	PIN84	84
5	PIN85	85	6	PIN86	86
7	ADPOT	87	8	CON_AVREF	88
9	AN7	89	10	AN6	90
11	AN5	91	12	AN4	92
13	CON_AVSS	93	14	AN3	94
15	AN2	95	16	AN1	96
17	AN0	97	18	CON_AVCC	98
19	UC_VCC	99	20	WDT_OVF <sub>n</sub>	100

Table 9-4: J4

## 9.2. Application Headers

Table 9-5 to Table 9-9 below show the standard application header connections.

JA1							
Pin	Generic Header Name	CPU board Signal Name	Device Pin	Pin	Generic Header Name	CPU board Signal Name	Device Pin
1	5V	CON_5V	-	2	0V	GROUND	-
3	3V3	CON_3V3	-	4	0V	GROUND	-
5	AVCC	CON_AVCC	98	6	AVss	CON_AVSS	79
7	AVref	CON_AVREF	88	8	ADTRG	ADTRGn	55
9	AD0	AN0	97	10	AD1	AN1	96
11	AD2	AN2	95	12	AD3	AN3	94
13	DAC0	NC	-	14	DAC1	NC	-
15	IO_0	IO0	60	16	IO_1	IO1	58
17	IO_2	IO2	56	18	IO_3	IO3	55
19	IO_4	IO4	54	20	IO_5	IO5	53
21	IO_6	IO6	52	22	IO_7	IO7	51
23	IRQ3	IRQ3	63	24	IIC_EX	NC	-
25	IIC_SDA	SDA	45	26	IIC_SCL	SCL	46

Table 9-5: JA1 Standard Generic Header

JA2							
Pin	Generic Header Name	CPU board Signal Name	Device Pin	Pin	Generic Header Name	CPU board Signal Name	Device Pin
1	RESn	RESn	70	2	EXTAL	CON_EXTAL	72
3	NMIIn	NMI	73	4	VSS1	GROUND	-
5	WDT_OVF	WDT_OVFn	100	6	SClaTX	TxD0	68
7	IRQ0	IRQ0	46	8	SClaRX	RxD0	69
9	IRQ1	IRQ1	45	10	SClaCK	SCK0	67
11	UD	UD	49	12	CTSRTS	NC	-
13	Up	M1_Up	17	14	Un	M1_Un	15
15	Vp	M1_Vp	13	16	Vn	M1_Vn	10
17	Wp	M1_Wp	12	18	Wn	M1_Wn	9
19	TMR0	TMR0	23	20	TMR1	TMR1	22
21	TRIGa	TRIGa	21	22	TRIGb	TRIGb	20
23	IRQ2	IRQ2	44	24	TRISTn	TRISTn	30
25	-	NC	-	26	-	NC	-

Table 9-6: JA2 Standard Generic Header

JA5							
Pin	Generic Header Name	CPU board Signal Name	Device Pin	Pin	Generic Header Name	CPU board Signal Name	Device Pin
1	AD4	AN4	92	2	AD5	AN5	91
3	AD6	AN6	90	4	AD7	AN7	89
5	CAN1TX	CTx0	42	6	CAN1RX	CRx0	41
7	CAN2TX	NC	-	8	CAN2RX	NC	-
9	AD8	AN12	83	10	AD9	AN13	82
11	AD10	AN14	81	12	AD11	AN15	80
13	TIOC0A	NC	-	14	TIOC0B	NC	-
15	TIOC0C	NC	-	16	M2_TRISTn	M2_TRISTn	47
17	TCLKC	NC	-	18	TCLKD	NC	-
19	M2_Up	M2_Up	8	20	M2_Un	M2_Un	7
21	M2_Vp	M2_Vp	6	22	M2_Vn	M2_Vn	4
23	M2_Wp	M2_Wp	5	24	M2_Wn	M2_Wn	2

Table 9-7: JA5 Standard Generic Header

JA6							
Pin	Generic Header Name	CPU board Signal Name	Device Pin	Pin	Generic Header Name	CPU board Signal Name	Device Pin
1	DREQ	NC	-	2	DACK	NC	-
3	TEND	NC	-	4	STBYn	NC	-
5	RS232TX	RS232TX	-	6	RS232RX	RS232RX	-
7	SCIbRX	NC	-	8	SCIbTX	NC	-
9	SClTX	TXD2	58	10	SCIbCK	NC	-
11	SClCK	SCK2	61	12	SClRX	RXD2	60
13	-	-	-	14	-	-	-
15	-	-	-	16	-	-	-
17	-	-	-	18	-	-	-
19	-	-	-	20	-	-	-
21	-	-	-	22	-	-	-
23	-	-	-	24	-	-	-

Table 9-8: JA6 Standard Generic Header

JA3							
Pin	Generic Header Name	CPU board Signal Name	Device Pin	Pin	Generic Header Name	CPU board Signal Name	Device Pin
1	A0	A0	69	2	A1	A1	68
3	A2	A2	67	4	A3	A3	66
5	A4	A4	65	6	A5	A5	63
7	A6	A6	56	8	A7	A7	55
9	A8	A8	54	10	A9	A9	53
11	A10	A10	52	12	A11	A11	23
13	A12	A12	22	14	A13	A13	21
15	A14	A14	20	16	A15	A15	19
17	D0	D0	40	18	D1	D1	38
19	D2	D2	37	20	D3	D3	35
21	D4	D4	34	22	D5	D5	33
23	D6	D6	32	24	D7	D7	31
25	RDn	RDn	62	26	WRn	WRn	60
27	CS0n	CS0n	18	28	CS1n	CS1n	41
29	D8	NC	-	30	D9	NC	-
31	D10	NC	-	32	D11	NC	-
33	D12	NC	-	34	D13	NC	-
35	D14	NC	-	36	D15	NC	-
37	A16	A16	46	38	A17	A17	45
39	A18	A18	44	40	A19	A19	43
41	A20	NC	-	42	A21	NC	-
43	A22	NC	-	44	SDCLK	NC	-
45	CS2n	NC	-	46	ALE	NC	-
47	WRHn	NC	-	48	WRLn	WRLn	60
49	CASn	NC	-	50	RASn	NC	-

Table 9-9: JA3 Standard Generic Header

---

# Chapter 10. Code Development

## 10.1. Overview

Note: For all code debugging using Renesas software tools, the RSK board must be connected to a PC USB port via an E10A. An E10A pod is supplied with the RSK product.

## 10.2. Compiler Restrictions

The compiler supplied with this RSK is fully functional for a period of 60 days from first use. After the first 60 days of use have expired, the compiler will default to a maximum of 256K code and data. To use the compiler with programs greater than this size you need to purchase the full tools from your distributor.

Warning: The protection software for the compiler will detect changes to the system clock. Changes to the system clock back in time may cause the trial period to expire prematurely.

## 10.3. Mode Support

HEW connects to the Microcontroller and programs it via the E10A. Mode support is handled transparently to the user.

## 10.4. Breakpoint Support

HEW supports breakpoints on the user code, both in RAM and ROM.

Double clicking in the breakpoint column in the code sets the breakpoint. Breakpoints will remain unless they are double clicked to remove them.

---

## 10.5. Memory Map

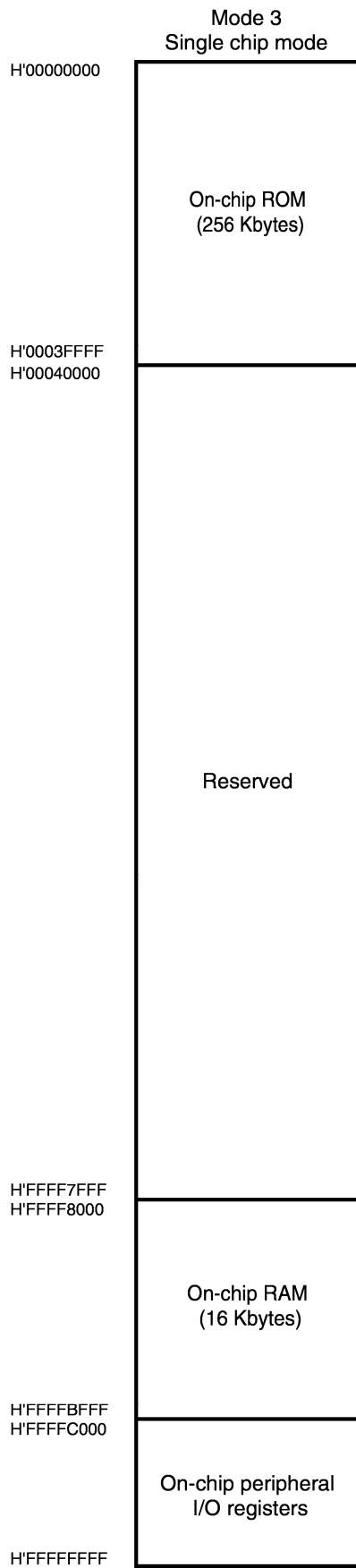


Figure 10-1: Memory Map

# Chapter 11. Component Placement

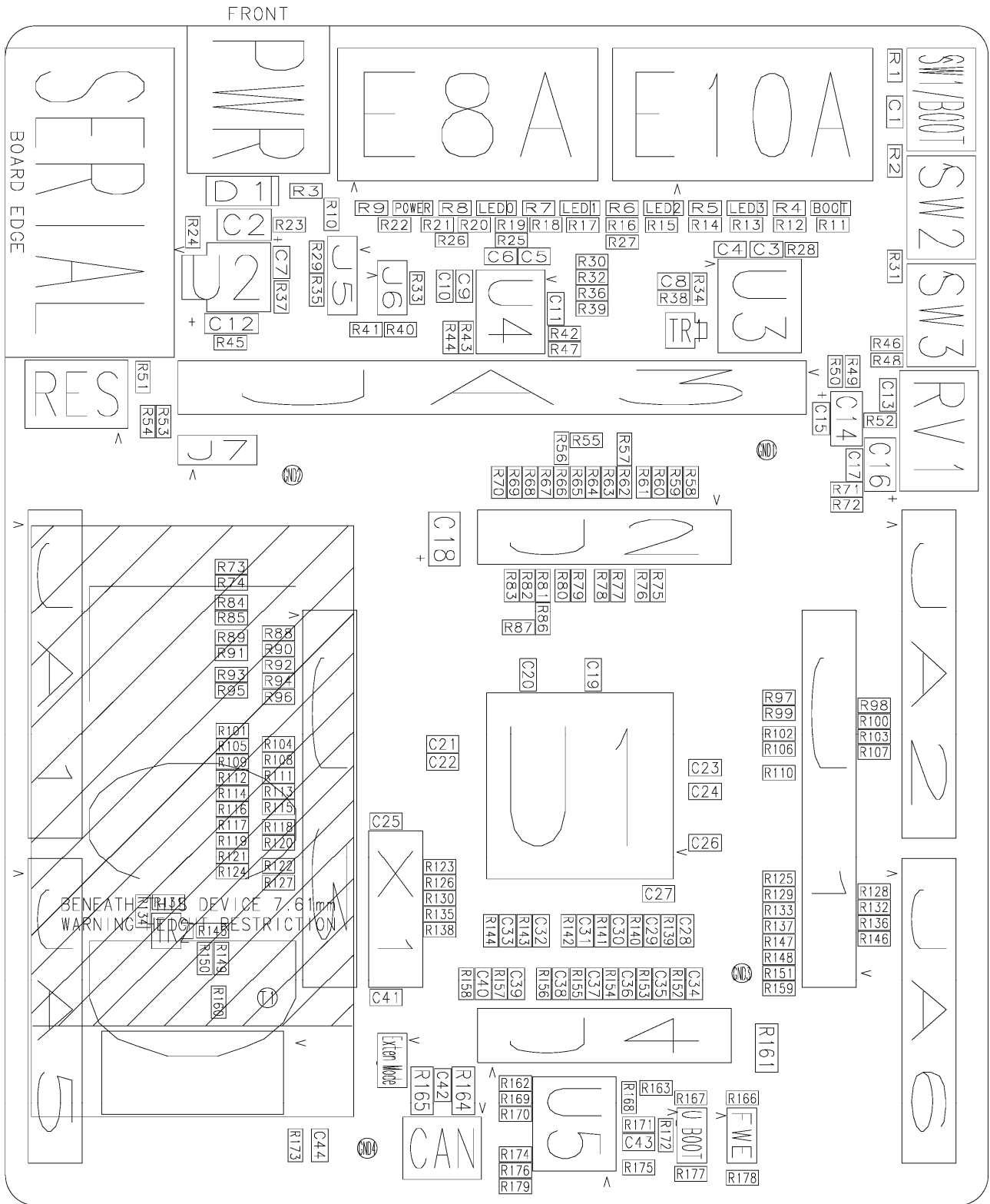


Figure 11-1: Component Placement – Front view

---

## Chapter 12. Additional Information

For details on how to use High-performance Embedded Workshop (HEW, refer to the HEW manual available on the CD or from the web site.

For information about the SH2/7137 series microcontrollers refer to the SH7137 Group hardware manual.

For information about the SH2/7137 assembly language, refer to the SH2 Series Software Manual.

Online technical support and information is available at: [http://www.renesas.com/renesas\\_starter\\_kits](http://www.renesas.com/renesas_starter_kits)

### Technical Contact Details

America: [techsupport.rta@renesas.com](mailto:techsupport.rta@renesas.com)

Europe: [tools.support.eu@renesas.com](mailto:tools.support.eu@renesas.com)

Japan: [csc@renesas.com](mailto:csc@renesas.com)

General information on Renesas Microcontrollers can be found on the Renesas website at: <http://www.renesas.com/>

---

Renesas Starter Kit for SH2/7137

User's Manual

Publication Date Rev.1.00 14.02.2008

Published by: Renesas Technology Europe Ltd.

Duke's Meadow, Millboard Road, Bourne End

Buckinghamshire SL8 5FH, United Kingdom

---

©2008 Renesas Technology Europe and Renesas Solutions Corp., All Rights Reserved.

# Renesas Starter Kit for SH2/7137 User's Manual



Renesas Electronics Corporation

1753, Shimonumabe, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8668 Japan

REG10J0109-0100