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REG10J0109-0100

# **Renesas Starter Kit for SH2/7137**

## **User's Manual**

RENESAS SINGLE-CHIP MICROCOMPUTER  
SH2 FAMILY

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Renesas Technology Europe Ltd.  
[www.renesas.com](http://www.renesas.com)

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# Chapter 1. Preface

## Cautions

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## 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          |

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## 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.

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## 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.

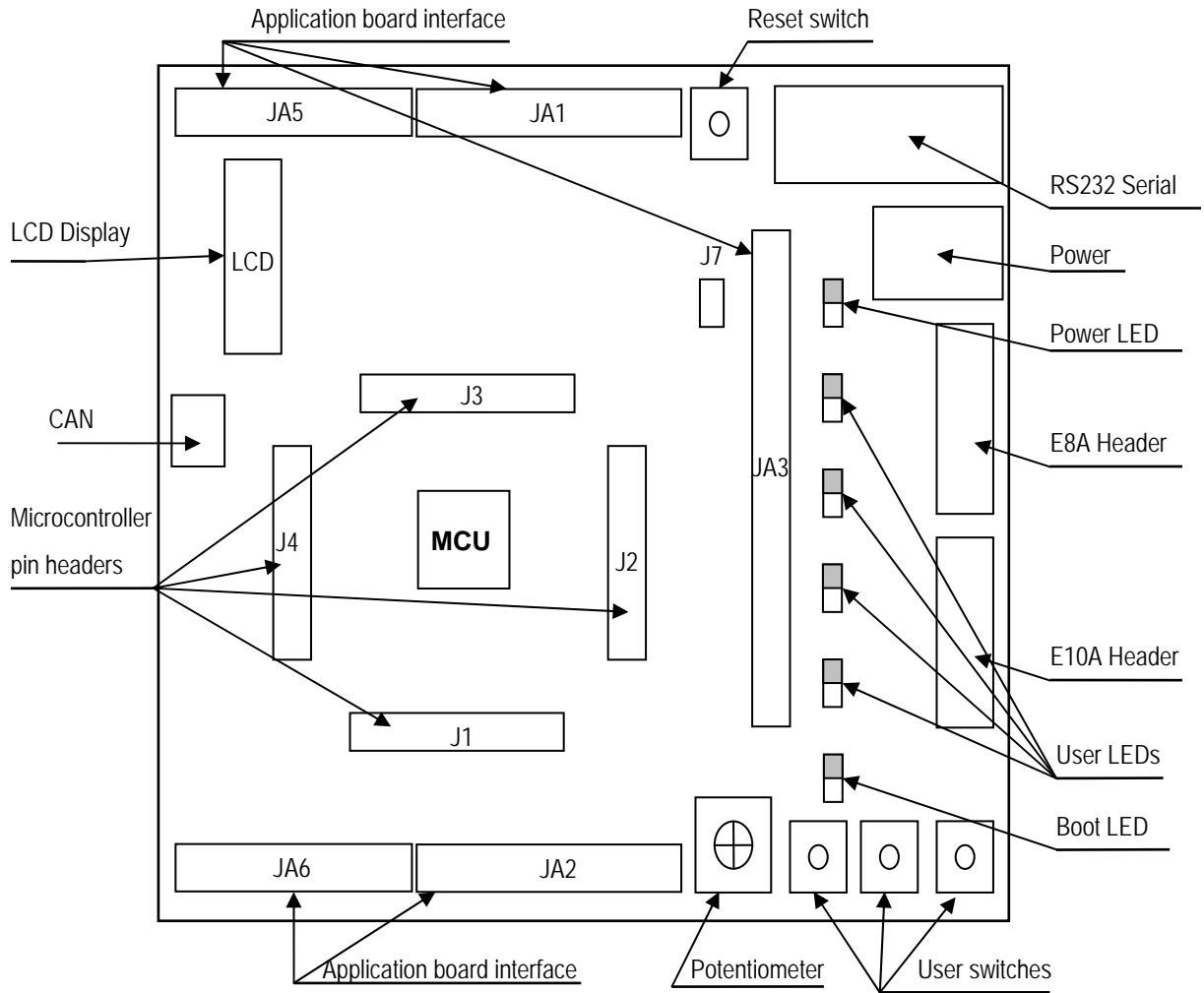


Figure 4-1: Board Layout

## 4.2. Board Dimensions

The following diagram gives the board dimensions and connector positions. All through hole connectors are on a common 0.1" grid for easy interfacing.

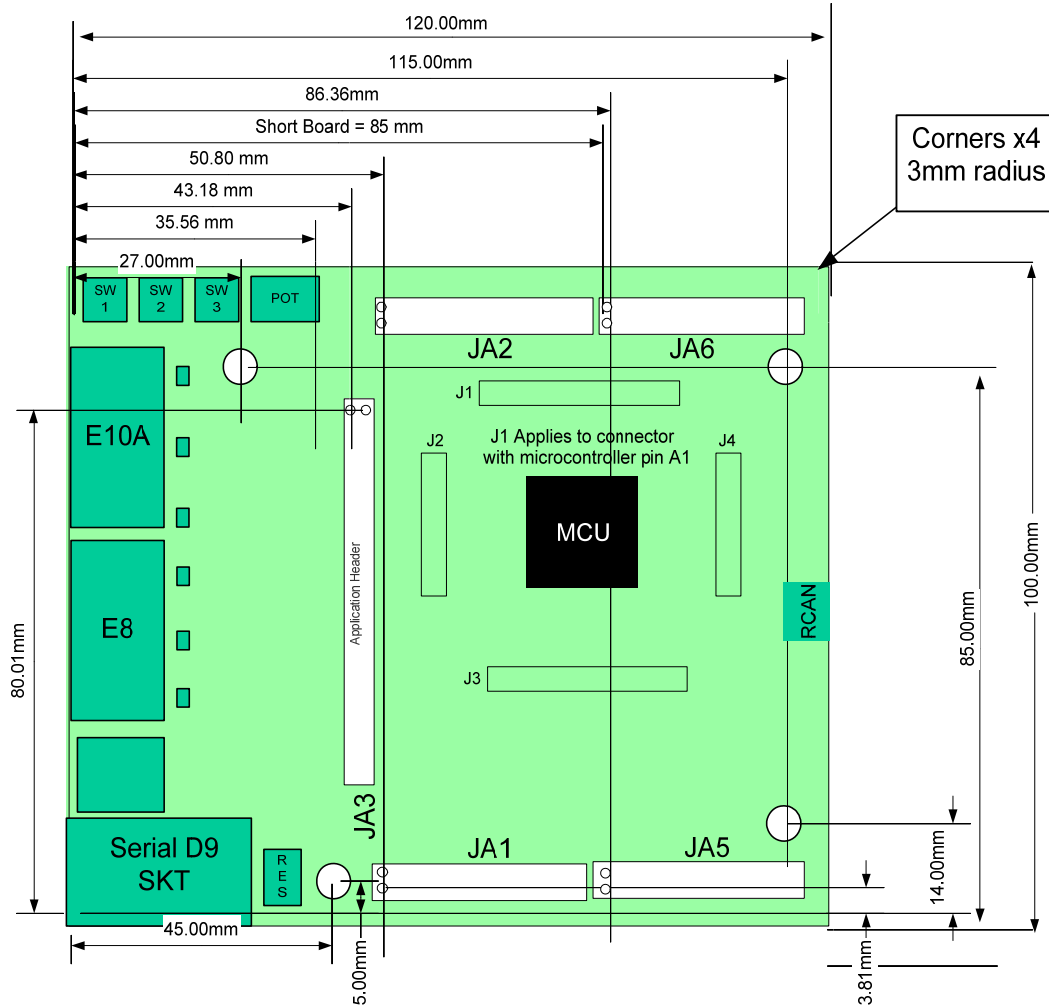


Figure 4-2: Board Dimensions

# Chapter 5. Block Diagram

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

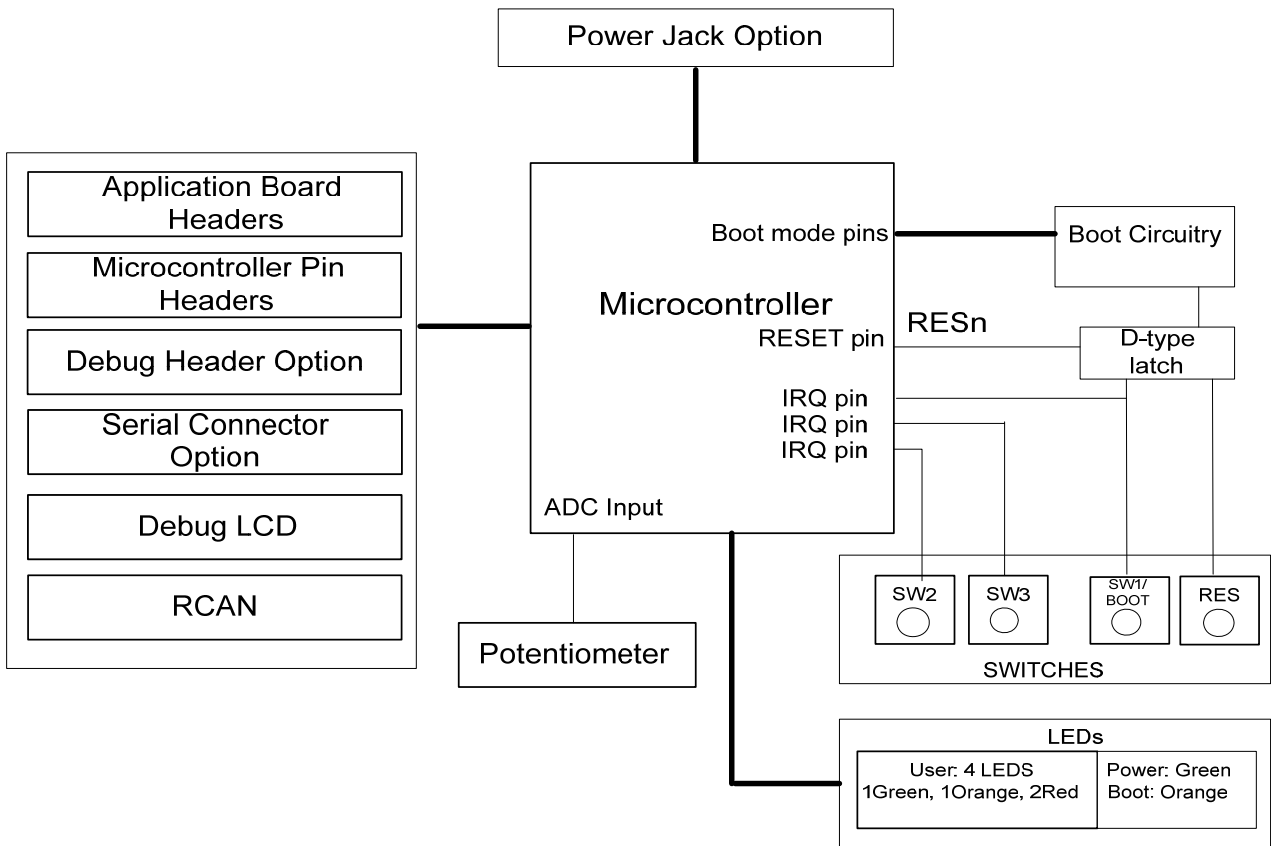


Figure 5-1: Block Diagram

Figure 5-2 shows the connections to the RSK.

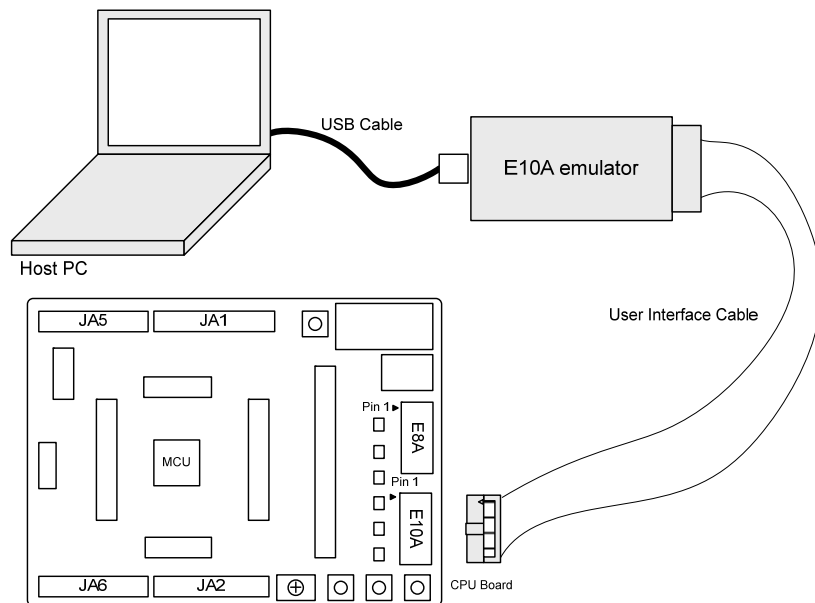


Figure 5-2: RSK Connections



---

# 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.<br>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<br>(Port B pin 2)  |
| SW2*      | Connects to an IRQ line for user controls.  | IRQ1, Pin 45<br>(Port B, pin 3) |
| SW3*      | Connects to the ADC trigger input. Option link allows connection to IRQ line.<br>The option is a pair of OR links. For more details on option links, please refer to Sec 6.6. | IRQ2, Pin 44<br>(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 | Use TMR0 of application board interface. | Use A11 of application board interface.                           | R98        |
| R98                  | Application board interface | Use A11 of application board interface.  | Use TMR0 of application board interface.                          | R100       |
| R59                  | Application board interface | Use to connect to onboard LED3.          | Use D3 of application board interface.                            | R58        |
| R58                  | Application board interface | Use D3 of application board interface.   | Use to connect to onboard LED3.                                   | R59        |
| R60                  | Application board interface | Use to connect to onboard LED2.          | Use D2 of application board interface.                            | R61        |
| R61                  | Application board interface | Use D2 of application board interface.   | Use to connect to onboard LED2.                                   | R60        |
| R76                  | Application board interface | Use to connect to onboard LED1.          | Use D1 of application board interface.                            | R75        |
| R75                  | Application board interface | Use D1 of application board interface.   | Use to connect to onboard LED1.                                   | R76        |
| R77                  | Application board interface | Use to connect to onboard LED0.          | Use D0 of application board interface.                            | R78        |
| R78                  | Application board interface | Use D0 of application board interface.   | Use to connect to onboard LED0.                                   | R77        |
| R62                  | Application board interface | Use CS1n of application board interface. | Use CRx0 for onboard RCAN module.                                 | R63        |
| R63                  | Application board interface | Use CRx0 for onboard RCAN module.        | Use CS1n of application board interface.                          | R62        |
| R65                  | Application board interface | Use CAN_STBN for onboard RCAN module.    | Use A19 of application board interface.                           | R64        |
| R64                  | Application board interface | Use A19 of application board interface.  | Use CAN_STBN for onboard RCAN module.                             | R65        |
| R79                  | Application board interface | Use IRQ2 for onboard SW3.                | Use A18 of application board interface.                           | R80        |
| R80                  | Application board interface | Use A18 of application board interface.  | Use IRQ2 for onboard SW3.   | R79        |
| R66                  | Application board interface | Use SDA of application board interface.  | Use IRQ1 for onboard SW2 "or" A17 of application board interface. | R67, R68   |
| R68                  | Application board interface | Use IRQ1 for onboard SW2.                | 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<br>Signal Name | Device<br>Pin | Pin | Generic Header Name | CPU board<br>Signal Name | Device<br>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<br>Signal Name | Device<br>Pin | Pin | Generic Header Name | CPU board<br>Signal Name | Device<br>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<br>Signal Name | Device<br>Pin | Pin | Generic Header Name | CPU board<br>Signal Name | Device<br>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<br>Signal Name | Device<br>Pin | Pin | Generic Header Name | CPU board<br>Signal Name | Device<br>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<br>Signal Name | Device<br>Pin | Pin | Generic Header Name | CPU board<br>Signal Name | Device<br>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

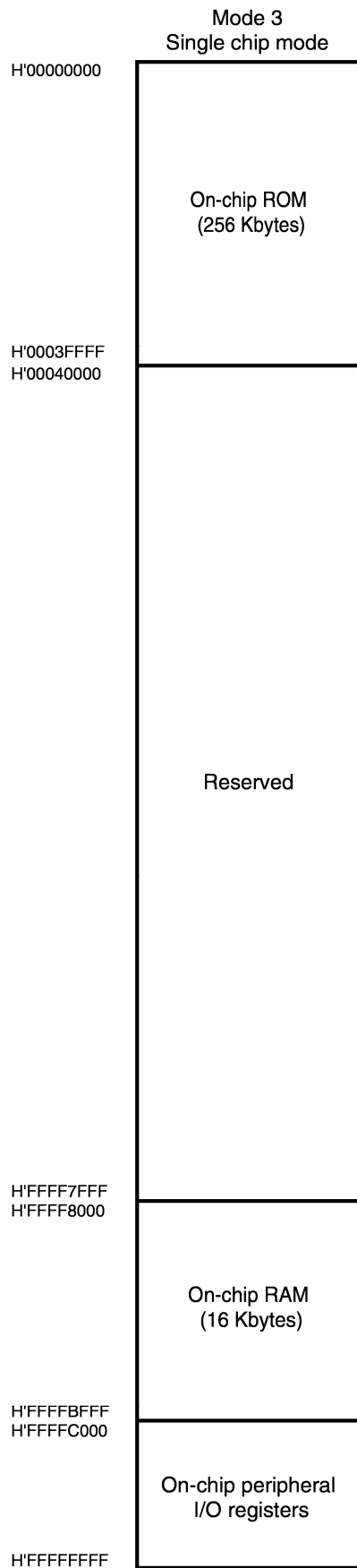


Figure 10-1: Memory Map



# Chapter 11. Component Placement

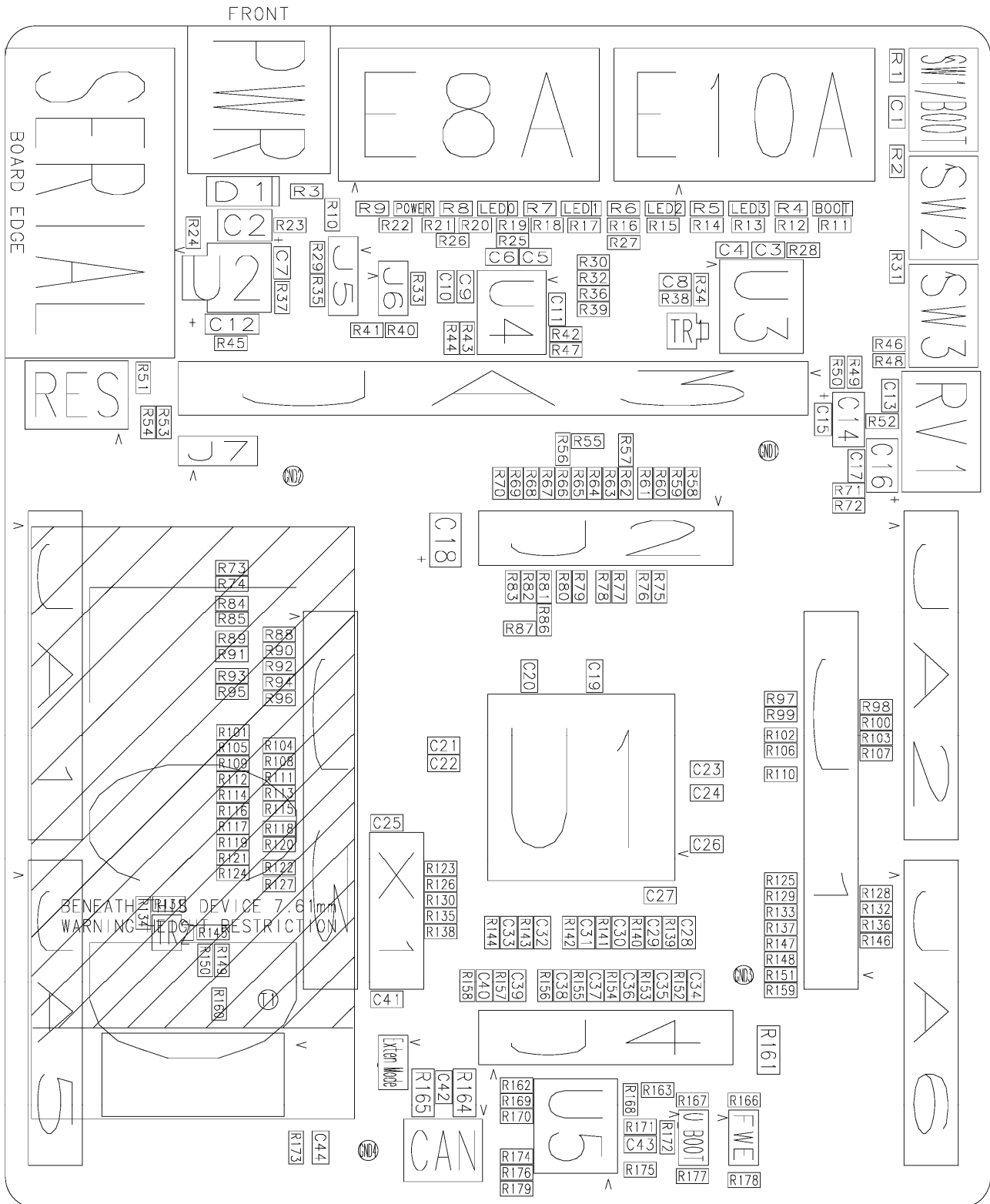


Figure 11-1: Component Placement – Front view

---

## 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

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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/>

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User's Manual

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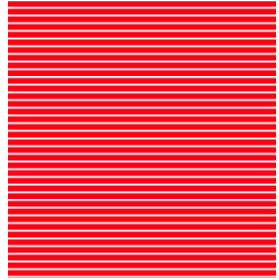
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User's Manual



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