User Manual

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RL78/G14 Group

Renesas Starter Kit User's Manual
For e^{2}studio

RENESAS MCU
RL78 Family / G1X Series

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筐体 Case	O	O	O	O	O	O
ボード Board	X	O	O	O	O	O
ケーブル Cable	X	O	O	O	O	O
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How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the RSK hardware functionality, and electrical characteristics. It is intended for users designing sample code on the RSK platform, using the many different incorporated peripheral devices.

The manual comprises of an overview of the capabilities of the RSK product, but does not intend to be a guide to embedded programming or hardware design. Further details regarding setting up the RSK and development environment can found in the tutorial manual.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the RL78/G14 Group. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the RSK hardware.	RSKRL78G14 User Manual	R20UT0789EG
Tutorial Manual	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRL78G14 Tutorial Manual	R20UT0790EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRL78G14 Quick Start Guide	R20UT0791EG
Schematics	Full detail circuit schematics of the RSK.	RSKRL78G14 Schematics	R20UT0784EG
Hardware Manual	Provides technical details of the RL78/G14 microcontroller.	RL78/G14 Group Hardware Manual	R01UH0186EJ

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analogue-to-Digital Converter
bps	bits per second
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DTC	Data Transfer Controller
E1	On-chip Debugger
ELC	Event Link Controller
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
IIC	Philips™ Inter-Integrated Circuit connection bus
IRQ	Interrupt Request
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LIN	Local Interconnect Network
MCU	Micro-controller Unit
PC	Program Counter
PWM	Pulse Width Modulation
RAM	Random Access Memory
SFR	Special Function Register
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

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1. Overview

1.1 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.

1.2 Features

This RSK provides an evaluation of the following features:

- Renesas microcontroller programming
- User code debugging
- User circuitry such as switches, LEDs and a potentiometer
- Sample application
- Sample peripheral device initialisation code

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

2. Power Supply

2.1 Requirements

An E1 emulator is able to power the RSKRL78G14 with up to 200mA. When the board is connected to another system then that system should supply power to the board. This board have an optional centre positive supply connector using a 2.0mm barrel power jack.

This RSKRL78G14 supports one external voltage input. Details of the external power supply connection are shown in **Table 2-1** below.

J5 Setting	J6 Setting	Supply Source	Supply Input Voltages	Regulator IC Output
Pin1-2 shorted	shorted / open	E1	5V / 3.3V	None
Pin1-2 shorted	shorted / open	PWR connector	5V	None
Pin2-3 shorted	open		5V	3.3V
Pin2-3 shorted	shorted		5V	1.8V

Table 2-1: Main Power Supply Requirements

This RSK should only be supplied with a regulated power supply.

2.2 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 any switch, the LEDs will flash at a rate controlled by the potentiometer.

3. Board Layout

3.1 Component Layout

Figure 3-1 below shows the top component layout of the board.

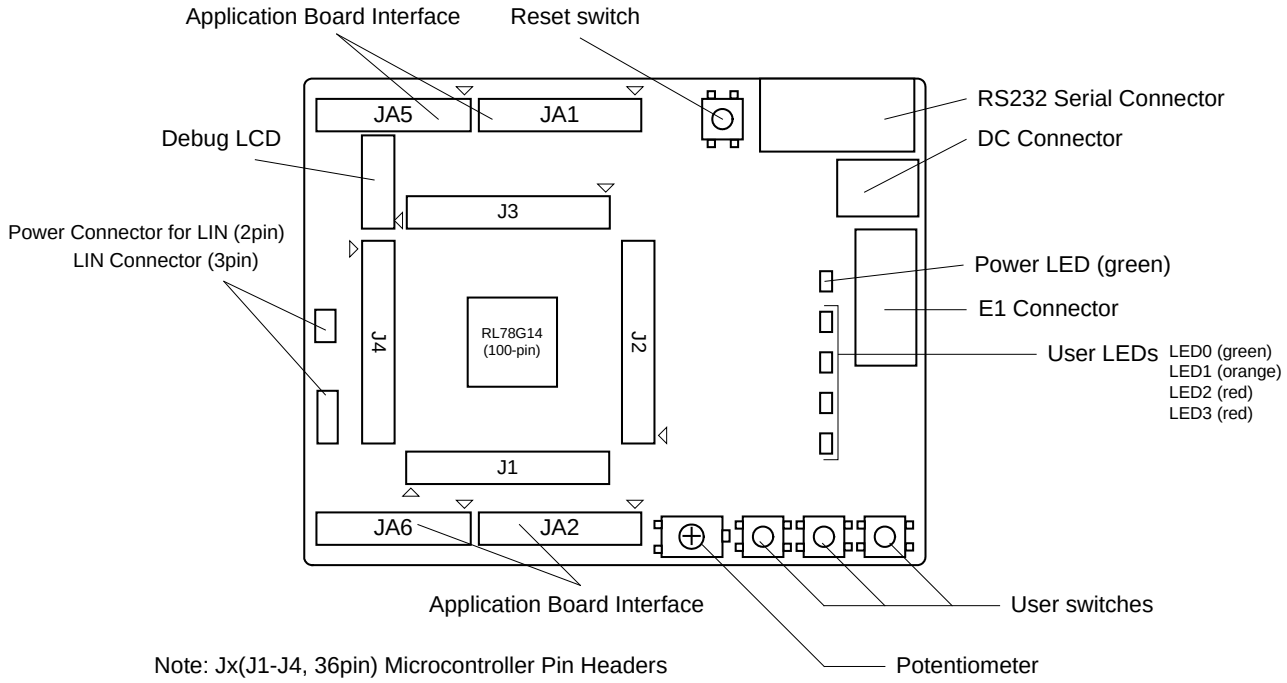


Figure 3-1: Board Layout

3.2 Board Dimensions

Figure 3-2 below gives the board dimensions and connector positions. All the through-hole connectors are on a common 0.1 inch grid for easy interfacing.

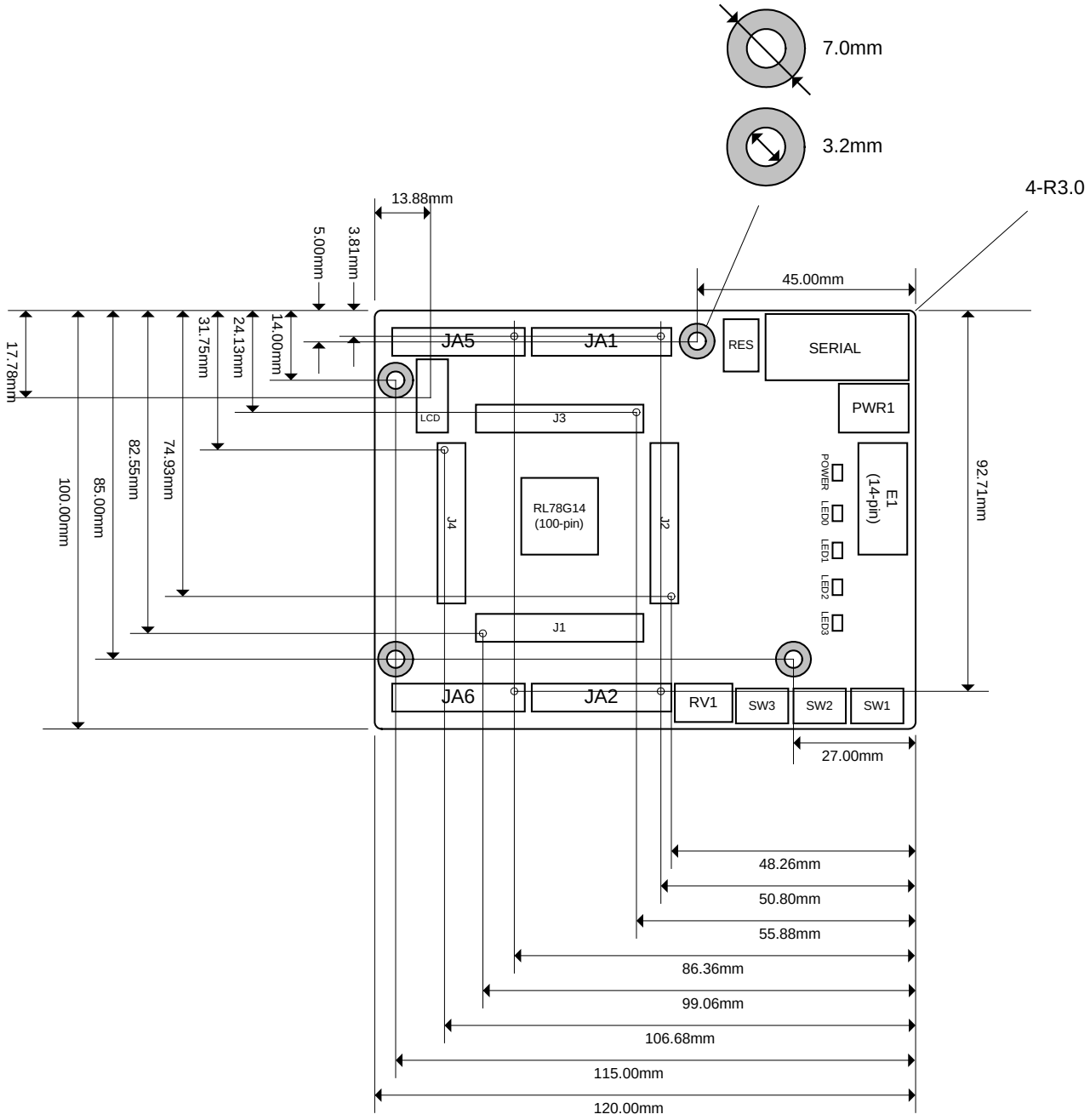


Figure 3-2: Board Dimensions

3.3 Component Placement

Figure 3-3 below shows placement of individual components on the top-side PCB. Component types and values can be looked up using the board schematics.

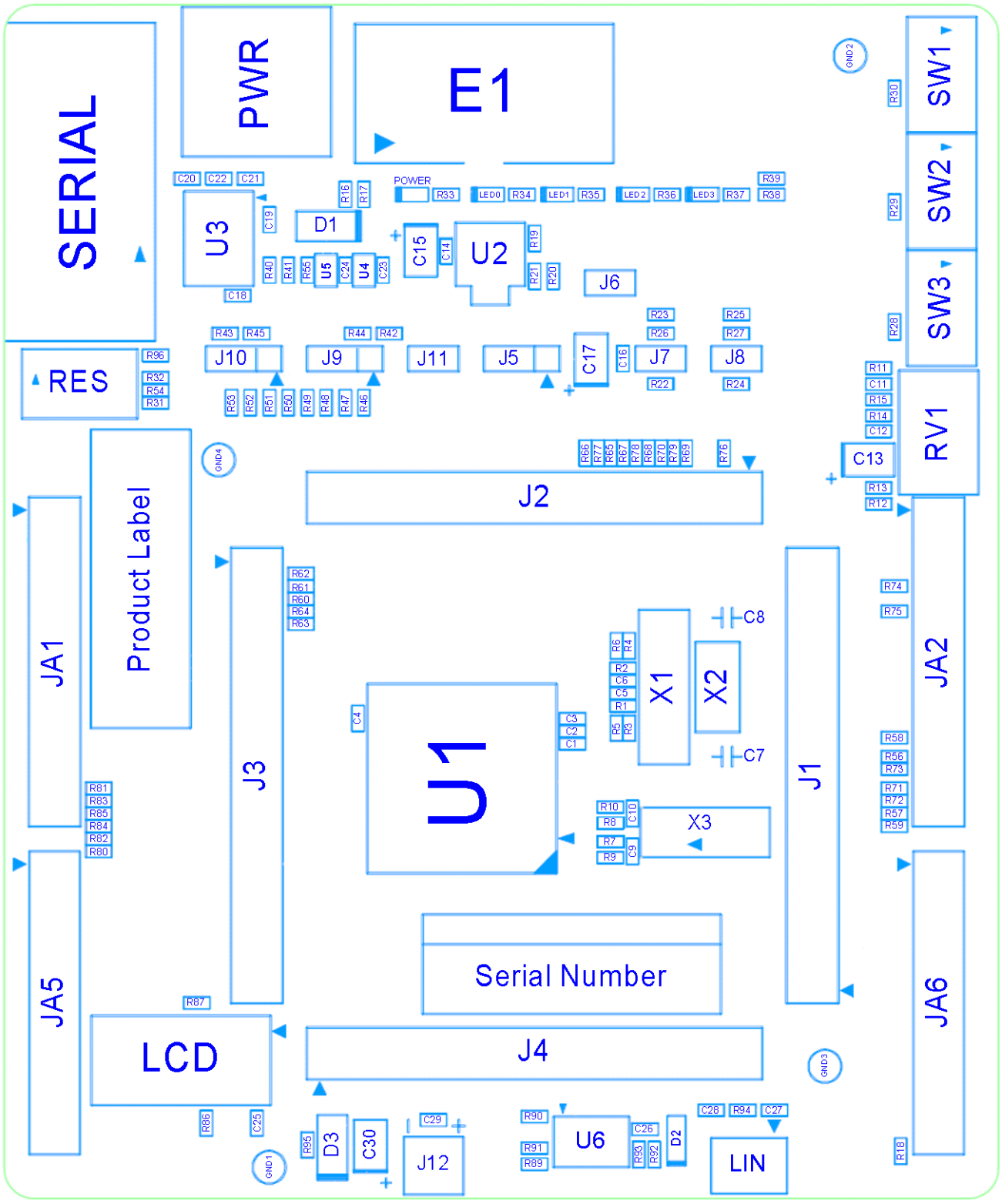


Figure 3-3: Top-Side Component Placement

4. Connectivity

4.1 Internal RSKRL78G14 Connections

The diagram below shows the RSKRL78G14 components and their connectivity to the MCU.

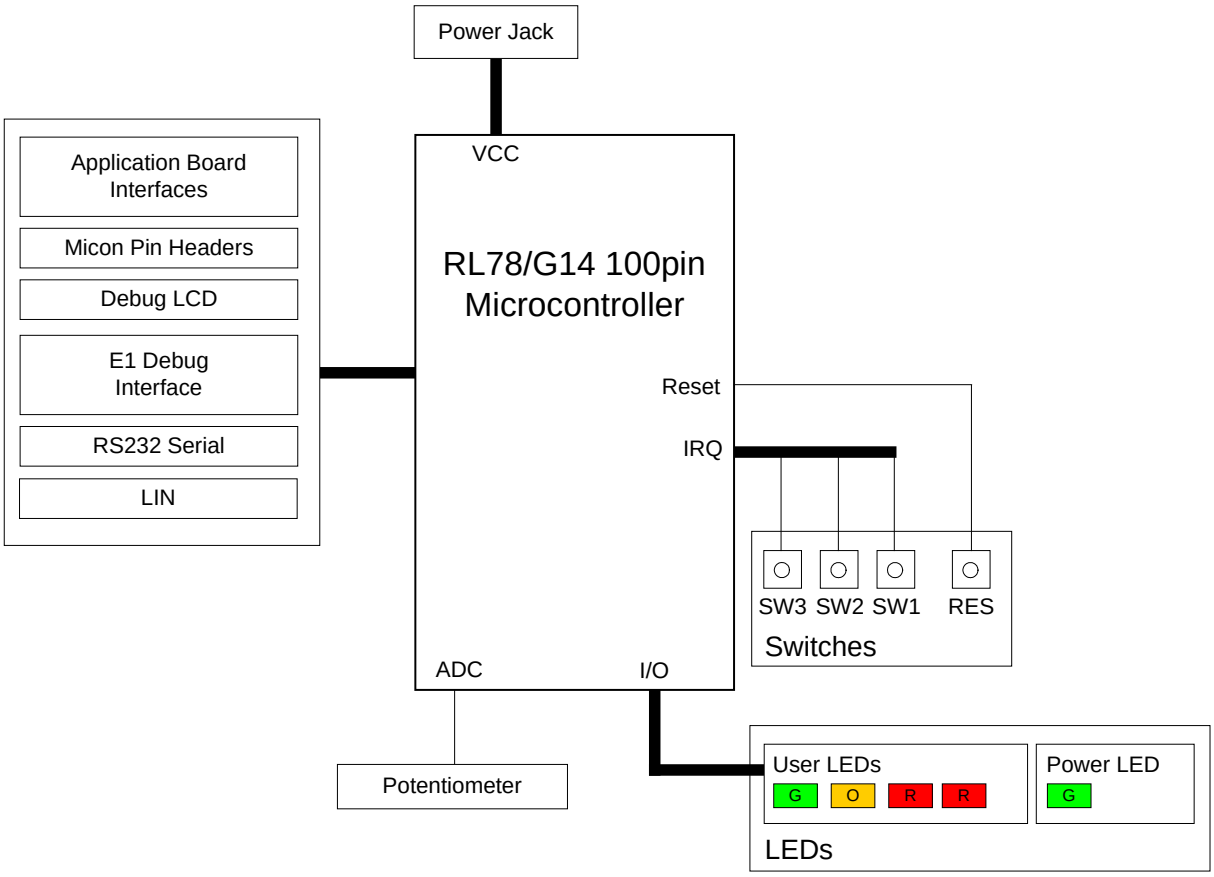


Figure 4-1: Internal Board Block Diagram

4.2 Debugger Connections

The diagram below shows the connections between the RSKRL78G14, E1 emulator and the host computer.

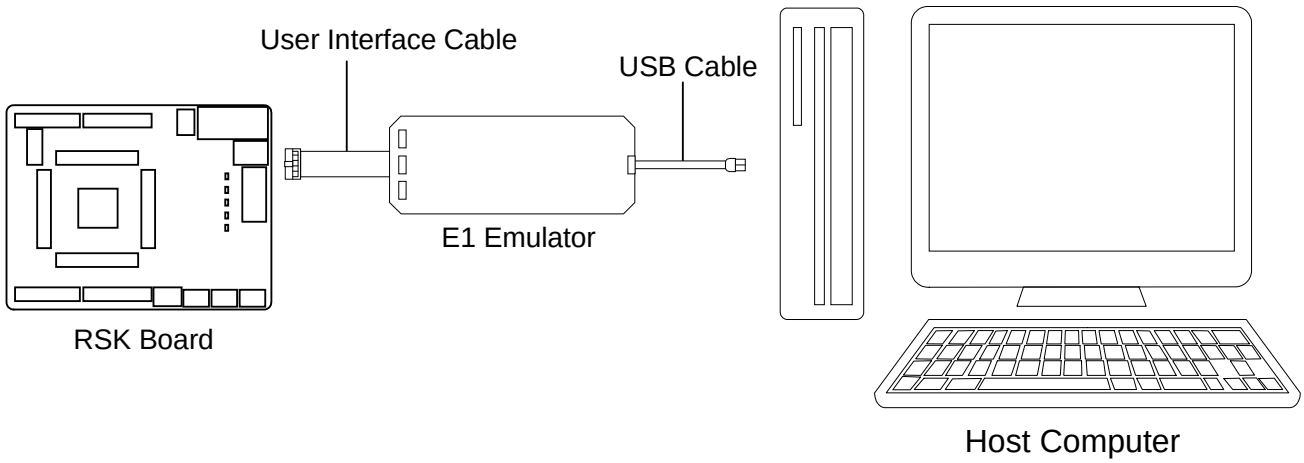


Figure 4-2: Debugger Connection Diagram

5. User Circuitry

5.1 Reset Circuit

A reset control circuit is fitted to the RSKRL78G14 to generate the required reset signal, and is triggered from the RES switch. Refer to the RL78/G14 hardware manual for details regarding the reset signal timing requirements, and the RSKRL78G14 schematics for information regarding the reset circuitry in use on the board.

5.2 Clock Circuit

A clock circuit is fitted to the RSKRL78G14 to generate the required clock signal to drive the MCU, and associated peripherals. Refer to the RL78/G14 hardware manual for details regarding the clock signal requirements, and the RSKRL78G14 schematics for information regarding the clock circuitry in use on the board. Details of the oscillators fitted to the board are listed in **Table 5-1** below.

Crystal	Function	Default Placement	Frequency	Device Package
X1	Main MCU oscillator.	Fitted	20MHz	HC49/4U
X2	Internal Board Testing Only	Unfitted	n/a	n/a
X3	Sub MCU oscillator	Fitted	32.768kHz	90SMX

Table 5-1: Oscillators

5.3 Switches

There are four switches located on the RSKRL78G14. The function of each switch and its connection is shown in **Table 5-2**. For further information regarding switch connectivity, refer to the RSKRL78G14 schematics.

Switch	Function	MCU Connection
RES	When pressed, the microcontroller is reset.	RESET#, Pin 13
SW1	Connects to an IRQ input for user controls.	INTP8, Pin 36 (P74)
SW2	Connects to an IRQ input for user controls.	INTP9, Pin 35 (P75)
SW3	Connects to an IRQ input for user controls.	INTP10, Pin 34 (P76)

Table 5-2: Switch Connections

5.4 LEDs

There are five LEDs on the RSKRL78G14. The function of each LED, its colour, and its connections are shown in **Table 5-3**.

LED	Colour	Function	MCU Connection
POWER	Green	Indicates the status of the Board_VDD power rail.	No Connection
LED0	Green	User operated LED.	P43, Pin 9
LED1	Orange	User operated LED.	P44, Pin 8
LED2	Red	User operated LED.	P62, Pin 26
LED3	Red	User operated LED.	P63, Pin 27

Table 5-3: LED Connections

5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analogue input ANI8 (P150, Pin 82).

The potentiometer is fitted to offer an easy method of supplying a variable analogue input to the microcontroller. It does not necessarily reflect the accuracy of the controller's ADC. Refer to the device hardware manual for further details.

5.6 Debug LCD Module

A debug LCD module is supplied with the RSKRL78G14 board, and should be connected to the LCD header, LCD1.

Care should be taken when installing the LCD module to ensure pins are not bent or damaged. The LCD module is vulnerable to electrostatic discharge (ESD); therefore appropriate ESD protection should be used.

The debug LCD module uses a 4-bit interface to reduce pin allocation. No contrast control is provided, as this is set by a resistor supplied on the display module. Connection information for the debug LCD module is provided in **Table 5-4** below.

Debug LCD Header					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	GROUND	-	2	Board_5V	-
3	No Connection	-	4	DLCDRS	P06, Pin 41
5	R/W (Pulled to ground)	-	6	DLCDE	P05, Pin 42
7	No Connection	-	8	No Connection	-
9	No Connection	-	10	No Connection	-
11	DLCDD4	P54, Pin 58	12	DLCDD5	P55, Pin 59
13	DLCDD6	P56, Pin 60	14	DLCDD7	P57, Pin 61

Table 5-4: LCD Header Connections

5.7 RS232 Serial Port

Serial port UART1 is connected to the standard RS232 header fitted to the RSKRL78G14. Alternatively, other serial port can be connected to the RS232 transceiver by making changes to the configurations to the jumpers and option links (refer to §6). Connections between the RS232 header and the microcontroller are listed in the **Table 5-5**.

SCI Signal	Function	MCU Connection	RS232 Connection
TxD0	UART0 Transmit Signal.	P51, Pin 55	Pin 2*
RxD0	UART0 Receive Signal.	P50, Pin 54	Pin 3*
TxD1	UART1 Transmit Signal.	P02, Pin 95	Pin 2
RxD1	UART1 Receive Signal.	P03, Pin 94	Pin 3
TxD3	UART3 Transmit Signal.	P144, Pin 99	Pin 2*
RxD3	UART3 Receive Signal.	P143, Pin 100	Pin 3*

Table 5-5: Serial Port Connections

* This connection is a not available in the default RSKRL78G14 configuration - refer to §6 for the required modifications.

5.8 Local-Interconnect Network (LIN)

A LIN transceiver IC is fitted to the RSKRL78G14, and connected to the LIN MCU peripheral. For further details regarding the LIN protocol and supported modes of operation, please refer to the RL78/G14 hardware manual.

The connections for the LIN microcontroller signals are listed in **Table 5-6** below.

LIN Signal	Function	MCU Connection
LINTXD	LIN Data Transmission.	P51, Pin 55
LINRXD	LIN Data Reception.	P50, Pin 54
LINNSLP	LIN Transceiver Device Sleep Control.	P52, Pin 56

Table 5-6: LIN Connections

6. Configuration

6.1 Modifying the RSK

This section lists the option links that are used to modify the way RSKRL78G14 operates in order to access different configurations. Configurations are made by modifying link resistors or headers with movable jumpers.

A link resistor is a 0Ω surface mount resistor, which is used to short or isolate parts of a circuit. Option links are listed in the following sections, detailing their function when fitted or removed. **Bold, blue text** indicates the default configuration that the RSKRL78G14 is supplied with. Refer to the component placement diagram (§3) to locate the option links and jumpers.

When removing soldered components, always ensure that the RSKRL78G14 is not exposed to a soldering iron for intervals greater than 5 seconds. This is to avoid damage to nearby components mounted on the board.

When modifying a link resistor, always check the related option links to ensure there is no possible signal contention or short circuits. Because many of the MCU's pins are multiplexed, some of the peripherals must be used exclusively. Refer to the RL78/G14 hardware manual and RSKRL78G14 schematics for further information.

6.2 MCU Configuration

Table 6-1 below details the option links associated with configuring the MCU's emulator support.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R54	**Connects E1 Debug Connector (pin 6) to RESETn (MCU, pin 13) via R54.**	Disconnects E1 Debug Connector (pin 6) from RESETn (MCU, pin 13).	R32

Table 6-1: MCU Option Links

6.3 ADC Configuration

Table 6-2 below details the function of the option links associated with the Analogue-to-Digital circuit.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R12	**Connects Board_VDD to analog circuit (positive-side).**	Disconnects UC_VDD from analog circuit.	R13
R13	Connects AVREFP (MCU, Pin90) to analog circuit (positive-side).	**Disconnects AVREFP from analog circuit.**	R12
R11	**Connects ANI8 (MCU, Pin82) to potentiometer RV1.**	Disconnects ANI8 from RV1.	-
R14	Connects analog circuit (negative-side) to GROUND.	**Disconnects analog circuit from GROUND.**	R15
R15	Connects AVREFM (MCU, Pin89) to analog circuit (negative-side).	**Disconnects AVREFM from analog circuit.**	R14

Table 6-2: ADC Option Links

6.4 RS232 Serial Port Configuration

Table 6-3 below details the function of the option links associated with serial port configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R46	Connects RS232TX (JA6.Pin5) to T1IN (U3.Pin13).	**Disconnects RS232TX from T1IN.**	R48, R50, R52
R47	Connects RS232RX (JA6.Pin6) to R1OUT (U3.Pin15).	**Disconnects RS232RX from R1OUT.**	R49, R51, R53
R48	Connects TxD0 (MCU, Pin55) to T1IN (U3.Pin13).	**Disconnects TxD0 from T1IN.**	R46, R50, R52
R49	Connects RxD0 (MCU, Pin54) to R1OUT (U2.Pin15).	**Disconnects RxD0 from R1OUT.**	R47, R51, R53
R50	**Connects TxD1 (MCU, Pin95) to T1IN (U3. Pin13).**	Disconnects TxD1 from T1IN.	R46, R48, R52
R51	**Connects RxD1 (MCU, Pin94) to R1OUT (U3.Pin15).**	Disconnects RxD1 from R1OUT.	R47, R49, R53
R52	Connects TxD3 (MCU, Pin99) to T1IN (U3.Pin13).	**Disconnects TxD3 from T1IN.**	R46, R48, R50
R53	Connects RxD3 (MCU, Pin100) to R1OUT (U3.Pin15).	**Disconnects RxD3 from R1OUT.**	R47, R49, R51

Table 6-3: RS232 Serial Port Option Links

Table 6-4 below details the different configurations and functions of the RS232 serial jumpers.

Reference	Position One	Position Two	Position Three	Related Ref.
J9*	Pins 1 and 2 shorted. Connects T1IN (U3, pin 13) to TxD0（MCU, Pin55）, TxD1(MCU, Pin95), TxD3(MCU, Pin99）or RS232TX（JA6.Pin5）.	Pins 2 and 3 shorted. Connects T1IN (U3, pin 13) to TOOL0 (MCU, Pin 12).	**All pins open. T1IN (U3, pin 13) is Disconnected.**	R44, R46, R48, R50, R52
J10*	Pins 1 and 2 shorted. Connects R1OUT (U3, pin 15) to RXD0 (MCU, pin 54), RXD1 (MCU, pin 94), RXD3 (MCU, pin 100) or RS232RX (JA6.Pin6).	Pins 2 and 3 shorted. Connects R1OUT (U3, pin 15) to U5 (pin 1).	**All pins open. R1OUT (U3, pin 15) is Disconnected.**	R45, R47, R49, R51, R53
J11*	Pins 1 and 2 shorted. Connects R2OUT (U3, pin 10) to RESETn (MCU, pin 13) via U4.	**All pins open. Disconnection.**		-

Table 6-4: RS232 Serial Port Jumpers

* By default, this jumper (J9) is not fitted to the RSK. R44 is fitted by default and TXD1 is connected to RS232 transceiver.
*By default, this jumper (J10) is not fitted to the RSK. R45 is fitted by default and RXD1 is connected to RS232 transceiver.
*By default, this jumper (J11) is not fitted to the RSK

6.5 IRQ & General I/O Pin Configuration

Table 6-5 below details the function of the option links associated with IRQ and general I/O pin configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R56	**Connects TI00_TRGCLKA (MCU, Pin97) to header JA2.Pin21.**	Disconnects TI00_TRGCLKA from JA2.Pin23.	R57
R57	Connects TI00_TRGCLKA (MCU, Pin97) to header JA2.Pin25	**Disconnects TI00_TRGCLKA from JA2.Pin25.**	R56
R58	**Connects TO00_TRGCLKB (MCU, Pin96) to header JA2.Pin19.**	Disconnects TO00_TRGCKLB from JA2.Pin19.	R59
R59	Connects TO00_TRGCLKB (MCU, Pin96) to header JA2.Pin26.	**Disconnects TO00_TRGCLKB from JA2.Pin26.**	R58
R60	**Connects LINRXD_RxD0_TRGIOA (MCU, Pin54) to U6.Pin1.**	Disconnects LINRXD_RxD0_TRGIOA from U6.Pin1	R61, R62
R61	Connects LINRXD_RxD0_TRGIOA (MCU, Pin54) to header JA6.Pin7 and U3.Pin15 (via R49).	**Disconnects LINRXD_RxD0_TRGIOA from JA6.Pin7 and U3.Pin15.**	R60, R62, R49
R62	Connects LINRXD_RxD0_TRGIOA (MCU, Pin54) to header JA2.Pin23 (via R72).	**Disconnects LINRXD_RxD0_TRGIOA from JA2.Pin23.**	R60, R61, R72
R63	**Connects LINTXD_TxD0 (MCU, Pin55) to connector U6.Pin4.**	Disconnects LINTXD_TxD0 from U6.Pin4.	R64
R64	Connects LINTXD_TxD0 (MCU, Pin55) to header JA6.Pin8 and U3.Pin13 (via R48).	**Disconnects LINTXD_TxD0 from JA6.Pin8 and U3.Pin13.**	R63, R48
R65	**Connects SW1_INTP8 (MCU, Pin36) to SW1.**	Disconnects SW1_INTP8 from SW1.	R66
R66	Connects SW1_INTP8 (MCU, Pin36) to header JA1.Pin23.	**Disconnects SW1_INTP8 from JA1.Pin23.**	R65
R67	**Connects SW2_INTP9 (MCU, Pin35) to SW2.**	Disconnects SW2_INTP8 from SW2.	R68
R68	Connects SW2_INTP9 (MCU, Pin35) to header JA5.Pin9.	**Disconnects SW2_INTP9 from JA5.Pin9.**	R67
R69	**Connects SW3_INTP10 (MCU, Pin34) to SW3.**	Disconnects SW3_INTP10 from SW3.	R70
R70	Connects SW3_INTP10 (MCU, Pin34) to JA5.Pin10.	**Disconnects SW3_INTP10 from JA5.Pin10.**	R69
R71	**Connects INPT4 (MCU, Pin28) to header JA2.Pin23.**	Disconnects INTP4 from JA2.Pin23.	R72
R72	Connects TRGIOA (MCU, Pin54) to header JA2.Pin23.	**Disconnects TRGIOA from JA2.Pin23.**	R71, R62

Table 6-5: IRQ & General I/O Option Links

6.6 Power Supply Configuration

Table 6-6 below details the function of the option links associated with power supply configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R16	**Connects Board_5V to the PWR connector.**	Disconnects Board_5V from PWR connector.	-
R17	**Connects CON_5V to Board_5V.**	Disconnects CON_5V from Board_5V.	-
R22	**Connects Board_5V or Regulator IC output to Board_VDD bypassing J5.**	Disconnects Board_5V or Regulator IC output from Board_VDD.	J5, R23
R24	**Connects Board_5V or Regulator IC output to Board_EVDD bypassing J15.**	Disconnects Board_5V or Regulator IC output from Board_EVDD.	J5, R25
R23	Connects CON_3V3 to Board_VDD.	**Disconnects CON_3V3 from Board_VDD.**	R22
R25	Connects CON_3V3 to Board_EVDD.	**Disconnects CON_3V3 from Board_EVDD0.**	R24
R26	**Connects Board_VDD to UC_VDD.**	Disconnects Board_VDD from UC_VDD.	R22, R23
R27	**Connects Board_EVDD to UC_EVDD.**	Disconnects Board_EVDD from UC_EVDD.	R24, R25
R38	Connects Board_5V to User LEDs. Note: When VDD volatage is not 5V, remove R38 and fit R39.	**Disconnects Board_5V from User LEDs.**	R39
R39	**Connects Board_EVDD to User LEDs.** **Note: When VDD voltage is not 5V, remove R38 and fit R39.**	Disconnects Board_EVDD from User LEDs.	R38

Table 6-6: Power Supply Option Links

Table 6-7 below details the different configurations and functions of the Power Supply jumpers.

J5 Setting	J6 Setting	Supply Source	Supply Input Voltages	Regulator IC Output
Pin1-2 shorted	**shorted** / open	E1	5V / 3.3V	None
Pin1-2 shorted	**shorted** / open	PWR connector	5V	None
Pin2-3 shorted	open		5V	3.3V
Pin2-3 shorted	shorted		5V	1.8V

Table 6-7: Power Supply Jumpers

6.7 Clock Configuration

Table 6-8 below details the function of the option links associated with clock configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R1	**Connects X2 (MCU, pin 17) to the crystal X1.**	Disconnects X2 (MCU, pin 17) from the crystal X1.	R3, R5
R2	**Connects X1 (MCU, pin 18) to the crystal X1.**	Disconnects X1 (MCU, pin 18) from the crystal X1.	R4, R6
R3	Connects X2 (MCU, pin 17) to the crystal X2.	**Disconnects X2 (MCU, pin 17) from the crystal X2.**	R1, R5
R4	Connects X1 (MCU, pin 18) to the crystal X2.	**Disconnects X1 (MCU, pin 18) from the crystal X2.**	R2, R6
R5	Connects signal X2 (MCU, pin 17) to crystal X1 (X2). (NEVER FIT crystal X1 and crystal X2 SIMULTANEOUSLY).	**Disconnects X1/X2 (MCU, pin 17) from CON_X2 (J1, pin 17).**	R1, R3
R6	Connects signal X1 (MCU, pin 18) to crystal X1 (X2). (NEVER FIT crystal X1 and X2 SIMULTANEOUSLY).	**Disconnects X1/X2 (MCU, pin 18) from CON_X1 (J1, pin 18).**	R2, R4
R7	**Connects XT2 (MCU, pin 14) to crystal X3.**	Disconnects XT2 (MCU, pin 14) from crystal X3.	R7
R8	**Connects XT1 (MCU, pin 15) to crystal X3.**	Disconnects XT1 (MCU, pin 15) from crystal X3.	R8
R9	Connects XT2 (MCU, pin14) to CON_XT2 (J1, pin 14)	**Disconnects XT2 (MCU, pin 14) from CON_XT1 (J1, pin 14).**	R9
R10	Connects XT2 (MCU, pin 15) to CON_XT1 (J1, pin 15)	**Disconnects XT1 (MCU, pin 15) from CON_XT2 (J1, pin 15).**	R10

Table 6-8: Clock Option Links

6.8 LIN Configuration

Table 6-9 below details the function of the option links associated with LIN configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R93	**When fitted in conjunction with R94, the LIN operates in master mode.**	When removed in conjunction with R94, the LIN operates in slave mode.	R94
R94	**When fitted in conjunction with R93, the LIN operates in master mode.**	When removed in conjunction with R93, the LIN operates in slave mode.	R93
R95	**Connects Board_5V to VBAT, bypassing J12.**	Disconnects Board_5V from VBAT.	J12

Table 6-9: LIN Option Links

Table 6-10 below details the different configurations and functions of the LIN jumpers.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
J12*	Connects external power to VBAT, bypassed by R95. Note: As for default setting, 5V is supplied to VBAT via R95	**Disconnects external power from VBAT.** **Note: When external power is supplied to VBAT , please be sure to remove R95**	R95

Table 6-10: LIN Port Jumpers

* By default, this jumper is not fitted to the RSK. R95 is fitted by default and Board_5V is connected to VBAT.

7. Headers

7.1 Application Headers

This RSK is fitted with application headers, which can be used to connect compatible Renesas application devices or as easy access to MCU pins.

Table 7-1 below lists the connections of the application header, JA1.

Application Header JA1					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	5V	-	2	0V	-
3	3V3	-	4	0V	-
5	AVCC	NC	6	AVSS	89
7	AVREF	90	8	ADTRG	NC
9	AD0	86	10	AD1	85
11	AD2	84	12	AD3	83
13	DA0	88	14	DA1	87
15	IO_0	44	16	IO_1	45
17	IO_2	46	18	IO_3	47
19	IO_4	48	20	IO_5	49
21	IO_6	50	22	IO_7	51
23	IRQ3/IRQAEC/M2_HSIN0	36/NC/NC	24	IIC_EX	NC
25	IIC_SDA	25	26	IIC_SCL	24

Table 7-1: Application Header JA1 Connections

Table 7-2 below lists the connections of the application header, JA2.

Application Header JA2					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	RESET	13	2	EXTAL	17
3	NMI	NC	4	Vss1	-
5	WDT_OVF	NC	6	SCIaTX	95
7	IRQ0/WKUP/M1_HSIN0	6/NC/NC	8	SCIaRX	94
9	IRQ1/M1_HSIN1	5/NC	10	SCIaCK	93
11	M1_UD	62	12	CTSRTS	NC
13	M1_Up	64	14	M1_UN	65
15	M1_Vp	66	16	M1_Vn	68
17	M1_Wp	67	18	M1_Wn	69
19	TimerOut	96	20	TimerOut	29
21	TimerIn	97	22	TimerIn	30
23	IRQ2/M1_EncZ/M1_HSIN2	28/54/NC	24	M1_POE	16
25	M1_TRCCLK	97	26	M1_TRDCLK	96

Table 7-2: Application Header JA2 Connections

Table 7-3 below lists the connections of the application header, JA5.

Application Header JA5					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	ADC4	79	2	ADC5	78
3	ADC6	77	4	ADC7	76
5	CAN1TX	NC	6	CAN1RX	NC
7	CAN2TX	NC	8	CAN2RX	NC
9	IRQ4/M2_EncZ/M2_HSIN1	35/NC/NC	10	IRQ5/M2_HSIN2	34/NC
11	M2_UD	NC	12	M2_Uin	NC
13	M2_Vin	NC	14	M2_Win	NC
15	M2_Toggle	NC	16	M2_POE	NC
17	M2_TRCCLK	NC	18	M2_TRDCLK	NC
19	M2_UP	NC	20	M2_UN	NC
21	M2_VP	NC	22	M2_VN	NC
23	M2_WP	NC	24	M2_WN	NC

Table 7-3: Application Header JA5 Connections

Table 7-4 below lists the connections of the application header, JA6.

Application Header JA6					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	DREQ	NC	2	DACK	NC
3	TEND	NC	4	STBYn	NC
5	RS232TX	NC	6	RS232RX	NC
7	SCIbRX	54	8	SCIbTX	55
9	SCIcTX	99	10	SCIbCK	52
11	SCIcCK	1	12	SCIcRX	100
13	M1_Toggle	63	14	M1_Uin	NC
15	M1_Vin	NC	16	M1_Win	NC
17	Reserved	NC	18	Reserved	NC
19	Reserved	NC	20	Reserved	NC
21	Reserved	NC	22	Reserved	NC
23	Unregulated_VCC	NC	24	Vss	-

Table 7-4: Application Header JA6 Connections

7.2 Microcontroller Pin Headers

Table 7-5 below lists the connections of the microcontroller pin header, J1.

Microcontroller Pin Header J1					
Pin	**Circuit name**	**MCU Pin**	**Pin**	**Circuit name**	**MCU Pin**
1	SCK30n	1	2	PIN2	2
3	PIN3	3	4	PIN4	4
5	INTP2	5	6	INTP1	6
7	PIN7	7	8	LED1	8
9	LED0	9	10	PIN10	10
11	PIN11	11	12	TOOL0	12
13	RESETn	13	14	CON_XT2	14
15	CON_XT1	15	16	INTP0	16
17	CON_X2	17	18	CON_X1	18
19	NC	-	20	GROUND	-
21	GROUND	-	22	UC_VDD	-
23	UC_EVDD	-	24	SCLA0	24
25	SDAA0	25	26	NC	-
27	NC	-	28	NC	-
29	NC	-	30	NC	-
31	NC	-	32	NC	-
33	NC	-	34	NC	-
35	NC	-	36	NC	-

Table 7-5: Microcontroller Pin Header, J1

Table 7-6 below lists the connections of the microcontroller pin header, J2.

Microcontroller Pin Header J2					
Pin	**Circuit name**	**MCU Pin**	**Pin**	**Circuit name**	**MCU Pin**
1	LED2	26	2	LED3	27
3	INTP4	28	4	TO10	29
5	TI11	30	6	PIN31	31
7	PIIN32	32	8	PIN33	33
9	SW3_INTP10	34	10	SW2_INTP9	35
11	SW1_INTP8	36	12	PIN37	37
13	PIN38	38	14	PIN39	39
15	PIN40	40	16	DLCDRS	41
17	DLCDE	42	18	GROUND	-
19	IO0	44	20	IO1	45
21	IO2	46	22	IO3	47
23	IO4	48	24	IO5	49
25	IO6	50	26	NC	-
27	NC	-	28	NC	-
29	NC	-	30	NC	-
31	NC	-	32	NC	-
33	NC	-	34	NC	-
35	NC	-	36	NC	-

Table 7-6: Microcontroller Pin Header, J2

Table 7-7 below lists the connections of the microcontroller pin header, J3.

Microcontroller Pin Header J3					
Pin	**Circuit name**	**MCU Pin**	**Pin**	**Circuit name**	**MCU Pin**
1	IO7	51	2	SCK00n	52
3	UC_EVDD	53	4	LINRXD_RxD0_TRGIOA	54
5	LINTXD_TxD0	55	6	LINNSLP	56
7	PIN57	57	8	DLCDD4	58
9	DLCDD5	59	10	DLCDD6	60
11	DLCDD7	61	12	TRDIOA0	62
13	TRDIOC0	63	14	TRDIOB0	64
15	TRDIOD0	65	16	TRDIOA1	66
17	TRDIOB1	67	18	TRDIOC1	68
19	TRDIOD1	69	20	PIN70	70
21	PIN71	71	22	PIN72	72
23	PIN73	73	24	PIN74	74
25	PIN75	75	26	NC	-
27	NC	-	28	NC	-
29	NC	-	30	NC	-
31	NC	-	32	NC	-
33	NC	-	34	NC	-
35	NC	-	36	NC	-

Table 7-7: Microcontroller Pin Header, J3

Table 7-8 below lists the connections of the microcontroller pin header, J4.

Microcontroller Pin Header J4					
Pin	**Circuit name**	**MCU Pin**	**Pin**	**Circuit name**	**MCU Pin**
1	ANI14	76	2	ANI13	77
3	ANI12	78	4	ANI11	79
5	PIIN80	80	6	PIN81	81
7	ADPOT	82	8	ANI7	83
9	ANI6	84	10	ANI5	85
11	ANI4	86	12	ANO1	87
13	ANO0	88	14	AVREFM	89
15	AVREFP	90	16	PIN91	91
17	PIN92	92	18	SCK10n	93
19	RxD1	94	20	TxD1	95
21	TO00_TRGCLKB	96	22	TI00_TRGCLKA	97
23	PIN98	98	24	TxD3	99
25	RxD3	100	26	NC	-
27	NC	-	28	NC	-
29	NC	-	30	NC	-
31	NC	-	32	NC	-
33	NC	-	34	NC	-
35	NC	-	36	NC	-

Table 7-8: Microcontroller Pin Header, J4

8.Code Development

8.1 Overview

For all code debugging using Renesas software tools, the RSK board must be connected to a PC via an E1 debugger. An E1 debugger is supplied with this RSK product.

For further information regarding the debugging capabilities of the E1 debuggers, refer to the E1 Emulator User's Manual (R20UT0398EJ).

8.2 Compiler Restrictions

The compiler supplied with this RSK is fully functional from first use but requires registration in order to use it.

8.3 Mode Support

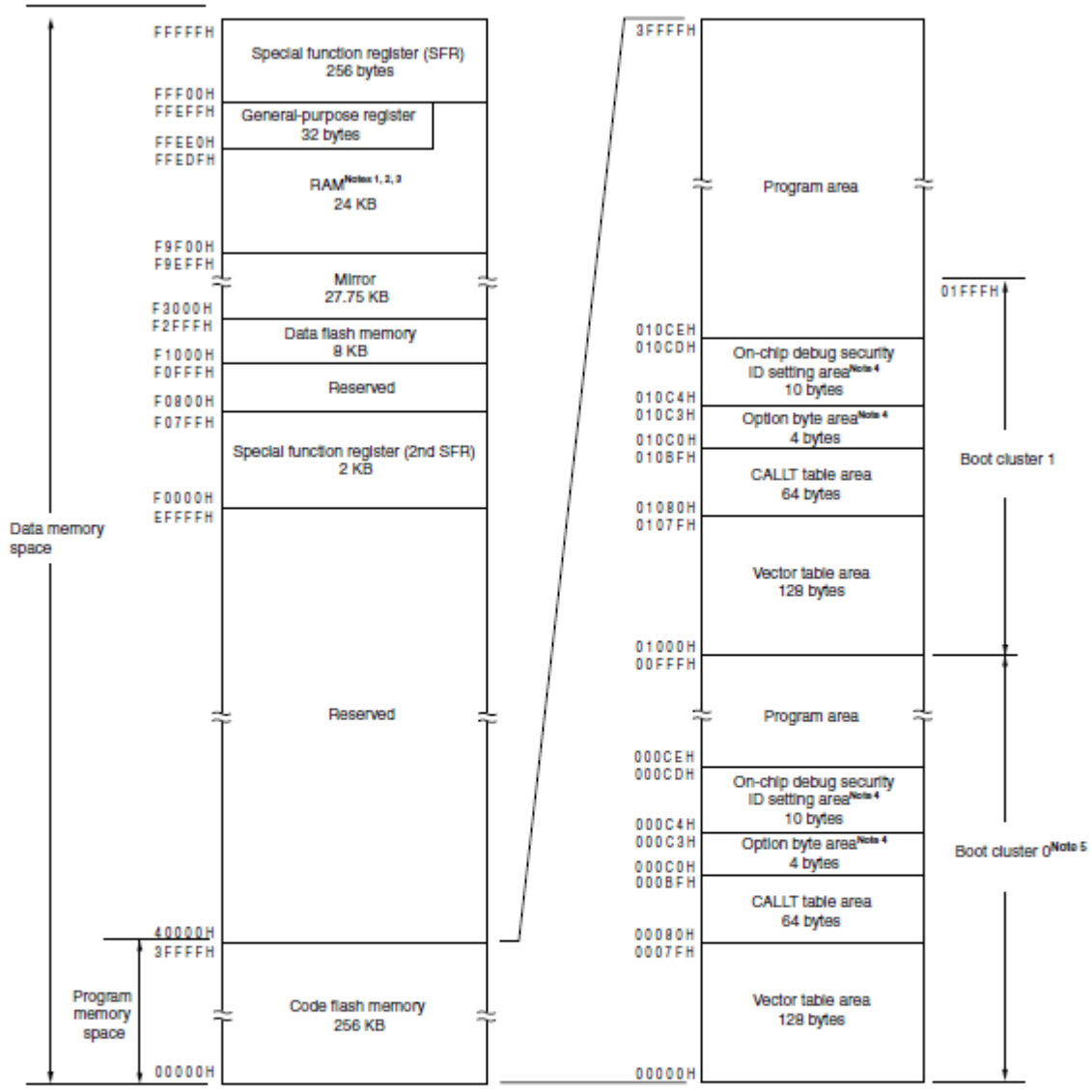
The RL78/G14 microcontroller only supports single-chip operating mode.

8.4 Debug Support

The E1 emulator (as supplied with this RSK) supports hardware break points, software break points and basic trace functionality. For further details, refer to the E1 Emulator User's Manual (R20UT0398EJ).

8.5 Address Space

Figure 8-1 below details the address space of MCU in its different operating modes. For further details, refer to the RL78/G14 group hardware manual.



Notes 1. Use of the area F9F00H to FA309H that is used as a work area for the library is prohibited when using the self-programming and data flash functions.

2. Use of the area FA300H to FA6FFH is prohibited when using the on-chip debugging trace function.

3. Instructions can be executed from the RAM area excluding the general-purpose register area.

4. When boot swap is not used: Set the option bytes to 000C0H to 000C3H, and the on-chip debug security IDs to 000C4H to 000CDH.

When boot swap is used: Set the option bytes to 000C0H to 000C3H and 010C0H to 010C3H, and the on-chip debug security IDs to 000C4H to 000CDH and 010C4H to 010CDH.

5. Writing boot cluster 0 can be prohibited depending on the setting of security (see **30.6 Security Setting**).

Figure 8-1: MCU Address Space Diagram

9. Additional Information

Technical Support
For information about the RL78/G14 microcontrollers refer to the RL78/G14 hardware manual.

Online technical support and information is available at:
http://www.renesas.com/rskrl78g14
http://japan.renesas.com/rskrl78g14

Technical Contact Details
America: techsupport.america@renesas.com
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GNURL78 Compiler Support: www.kpitgnutools.com

General information on Renesas Microcontrollers can be found on the Renesas website at:
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