User's Manual

16

RL78/L13 Group

Renesas Starter Kit User's Manual For CubeSuite+

RENESAS MCU
RL78 Family / L1X Series

All information contained in these materials, including products and product specifications, represents information on the product at the time of publication and is subject to change by Renesas Electronics Corporation without notice. Please review the latest information published by Renesas Electronics Corporation through various means, including the Renesas Electronics Corporation website (http://www.renesas.com).

Renesas Electronics
www.renesas.com

Rev. 1.01 Mar 2014

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
5. Renesas Electronics products are classified according to the following two quality grades: “Standard” and “High Quality”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.

   “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.

   “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc.

   Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.
6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, Renesas Electronics assumes no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

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

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

Disclaimer

By using this Renesas Starter Kit (RSK), the user accepts the following terms:

The RSK is not guaranteed to be error free, and the entire risk as to the results and performance of the RSK is assumed by the User. The RSK is provided by Renesas on an “as is” basis without warranty of any kind whether express or implied, including but not limited to the implied warranties of satisfactory quality, fitness for a particular purpose, title and non-infringement of intellectual property rights with regard to the RSK. Renesas expressly disclaims all such warranties. Renesas or its affiliates shall in no event be liable for any loss of profit, loss of data, loss of contract, loss of business, damage to reputation or goodwill, any economic loss, any reprogramming or recall costs (whether the foregoing losses are direct or indirect) nor shall Renesas or its affiliates be liable for any other direct or indirect special, incidental or consequential damages arising out of or in relation to the use of this RSK, even if Renesas or its affiliates have been advised of the possibility of such damages.

Precautions

The following precautions should be observed when operating any RSK product:

This Renesas Starter Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures;

- ensure attached cables do not lie across the equipment
- reorient the receiving antenna
- increase the distance between the equipment and the receiver
- connect the equipment into an outlet on a circuit different from that which the receiver is connected
- power down the equipment when not in use
- consult the dealer or an experienced radio/TV technician for help NOTE: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken;

- The user is advised that mobile phones should not be used within 10m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Renesas Starter Kit does not represent an ideal reference design for an end product and does not fulfil the regulatory standards for an end product.

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 RL78L13 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.	RSKRL78L13 User's Manual	R20UT2125EG
Tutorial	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRL78L13 Tutorial Manual	R20UT2126EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRL78L13 Quick Start Guide	R20UT2127EG
Schematics	Full detail circuit schematics of the RSK.	RSKRL78L13 Schematics	R20UT2124EG
Hardware Manual	Provides technical details of the RL78L13 microcontroller.	RL78L13 Group Hardware Manual	R01UH0382EJ

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analog-to-Digital Converter
E1	On-chip Debugger
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
IIC	Philips™ Inter-Integrated Circuit Connection Bus
IRQ	Interrupt Request
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCU	Micro-controller Unit
n/a or NA	Not applicable
n/c or NC	Not connected
PC	Personal Computer
RSK	Renesas Starter Kit
SAU	Serial Array Unit
TAU	Timer Array Unit
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

Table of Contents

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

This RSK is supplied with an E1 debugger. The debugger is able to power the RSK board with up to 200mA. When the RSK is connected to another system then that system should supply power to the RSK. This board has an optional centre positive supply connector using a 2.0mm barrel power jack.

Details of the external power supply requirements for the RSK, and configuration are shown in **Table 2-1** below. The default RSK power configuration is shown in **bold, blue text.**

J5 Setting	J6 Setting	5V Supply Source	3.3V Supply Source	Board_5V	Board_VDD
Pin1-2 shorted	**Don't care**	**E1/PWR Connector**	**Not connected**	**5V**	**5V**
Pin2-3 shorted	All open	PWR connector	Not connected	5V	3.3V
Pin2-3 shorted	Pin1-2 shorted		Not connected	5V	1.8V
Pin2-3 shorted	Pin2-3 shorted		Not connected	5V	1.6V
All open	Don't care		E1(3.3V)	5V	3.3V
All open	Don't care	Not connected	E1(3.3V)	0V	3.3V

The main power supply connected to PWR1 should supply a minimum of 5W to ensure full functionality.

2.2 Power-Up Behaviour

When the RSK is purchased, the RSK board has the 'Release' or stand-alone code from the example tutorial software pre-programmed into the Renesas microcontroller. On powering up the board the LEDs will start to flash. After 200 flashes or after pressing any switch, the text on the LCD display will change and the LED's will begin to 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.

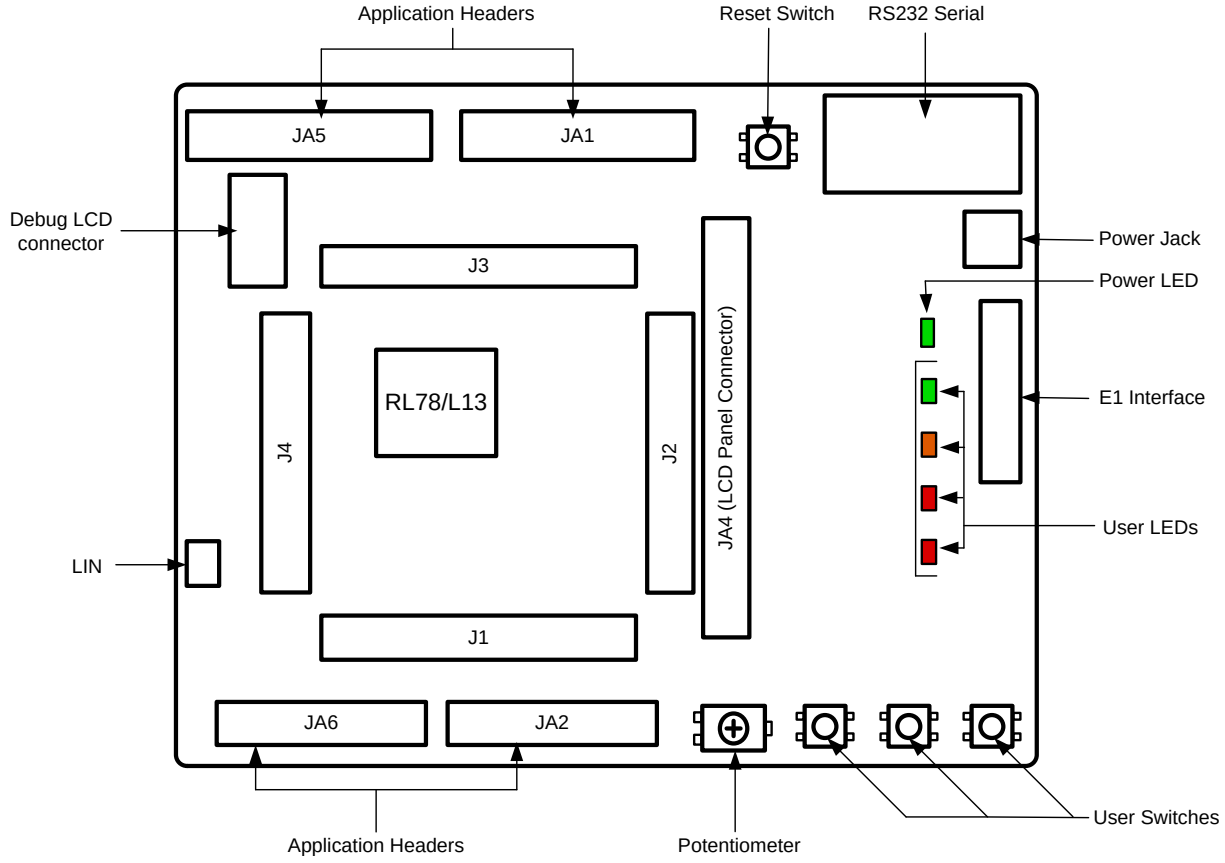


Figure 3-1: Board Layout

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.

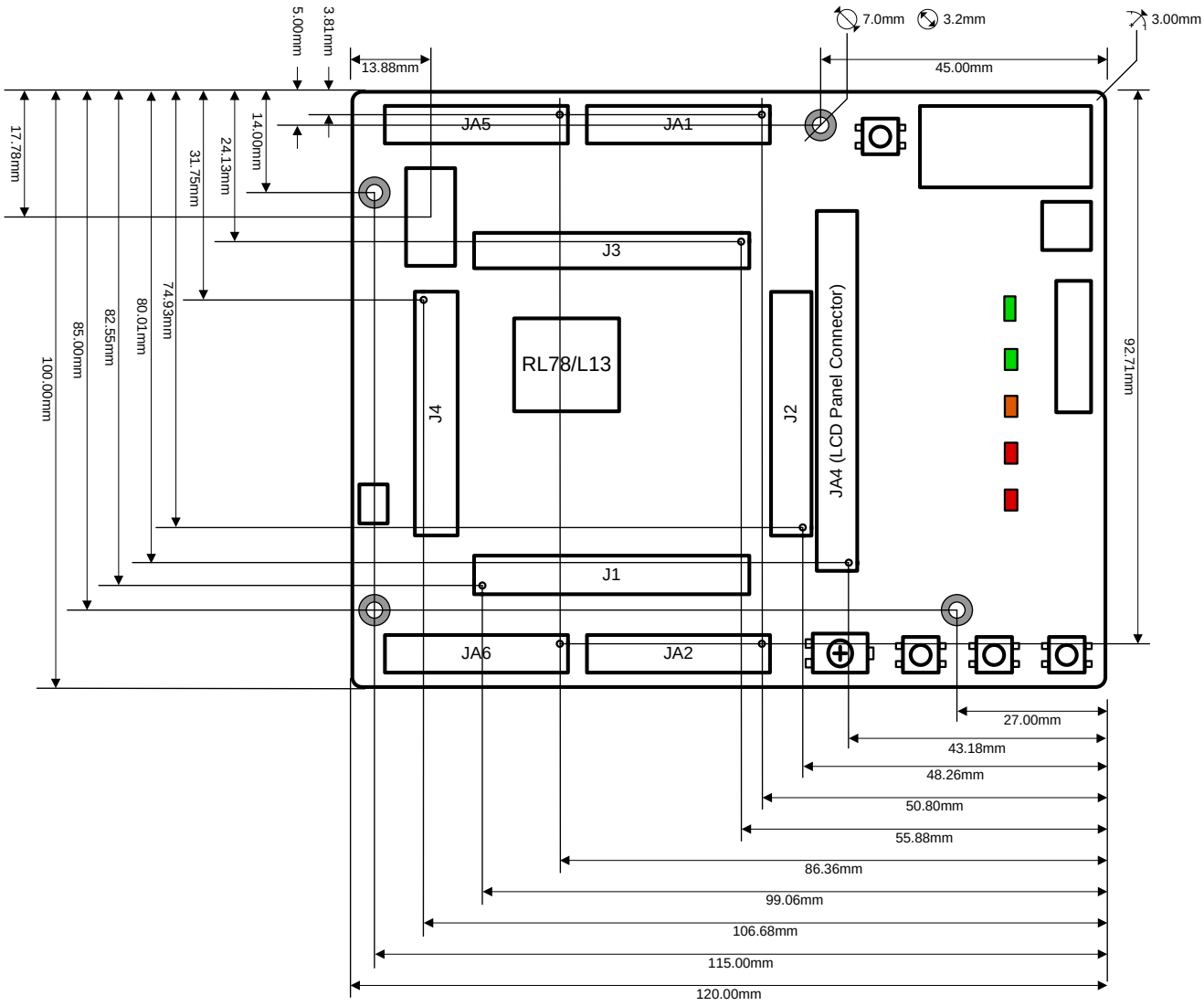


Figure 3-2: Board Dimensions

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.

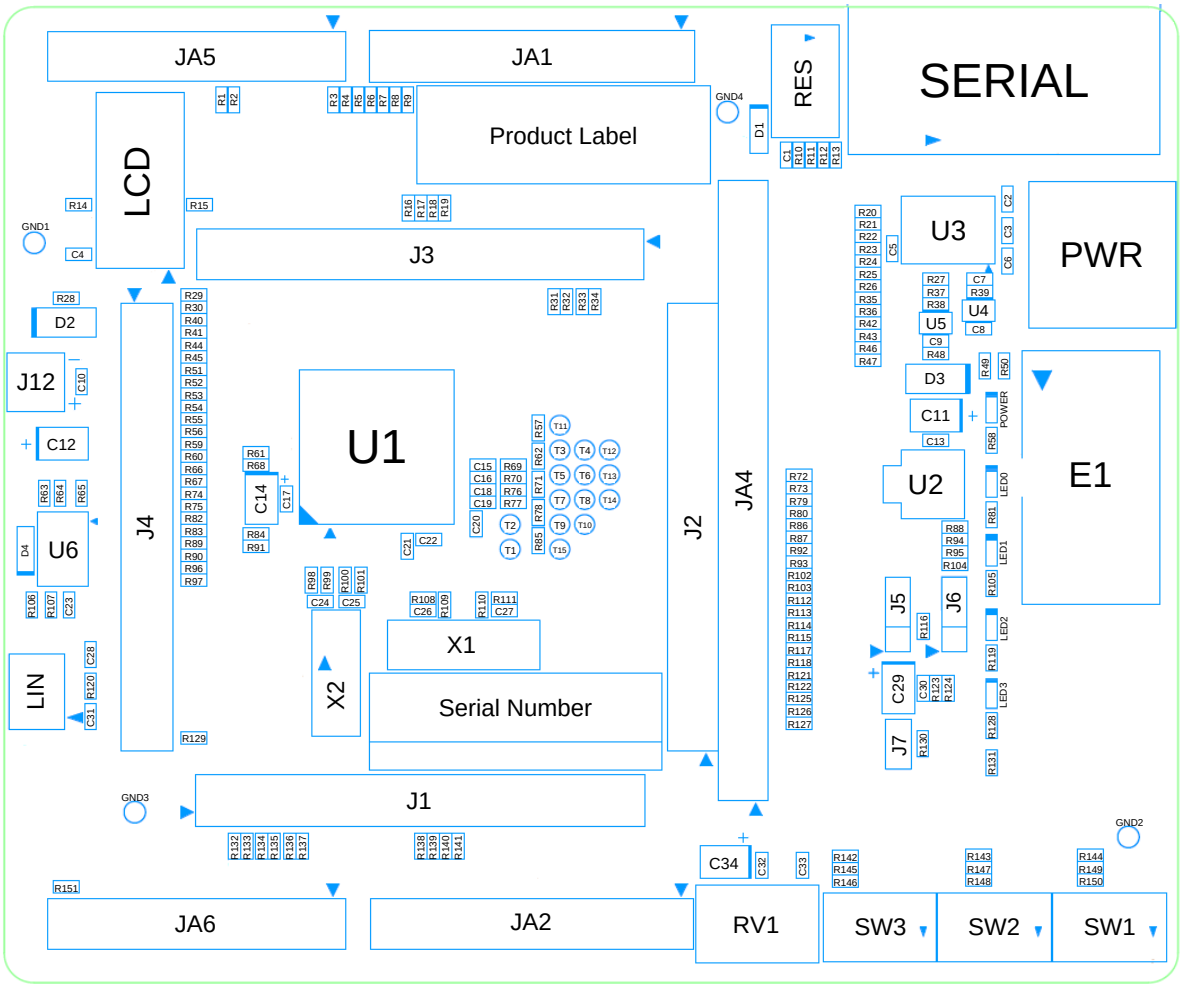


Figure 3-3: Top-Side Component Placement

4. Connectivity

4.1 Internal RSK Connections

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

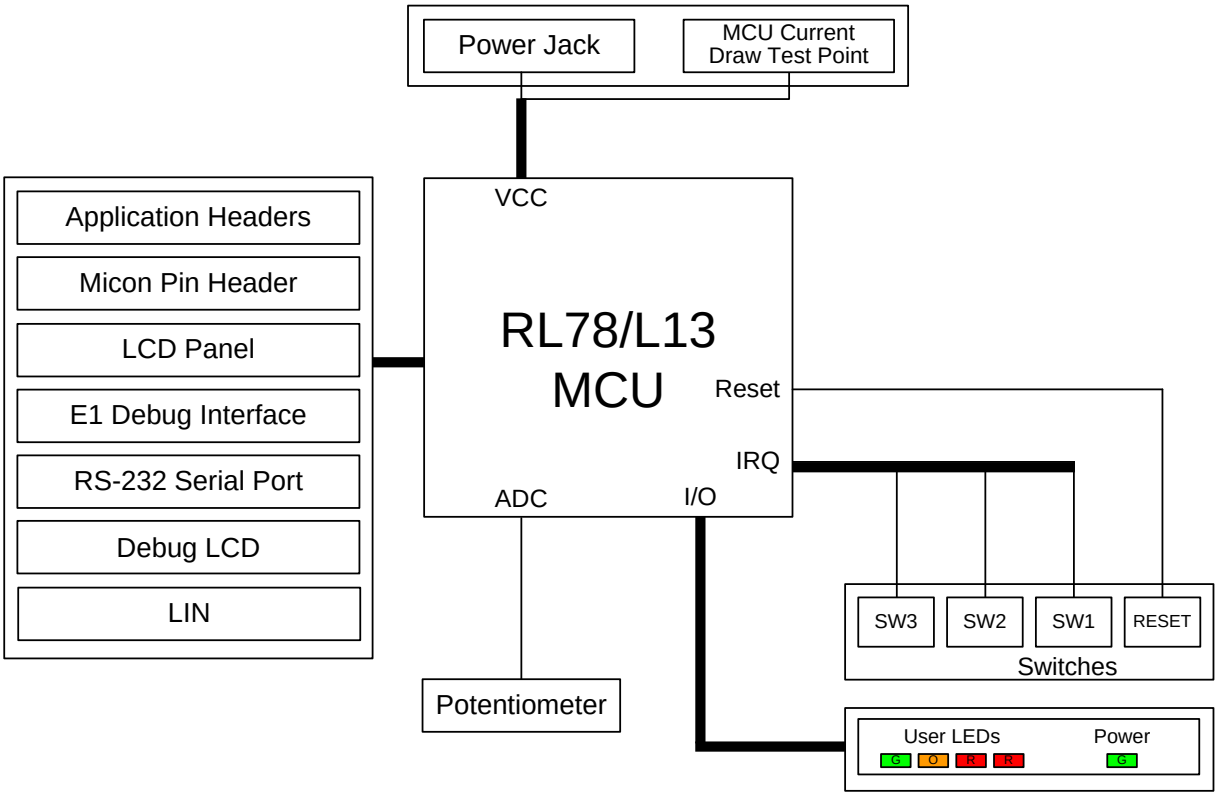


Figure 4-1: Internal RSK Block Diagram

4.2 Debugger Connections

The diagram below shows the connections between the RSK, E1 debugger and the host PC.

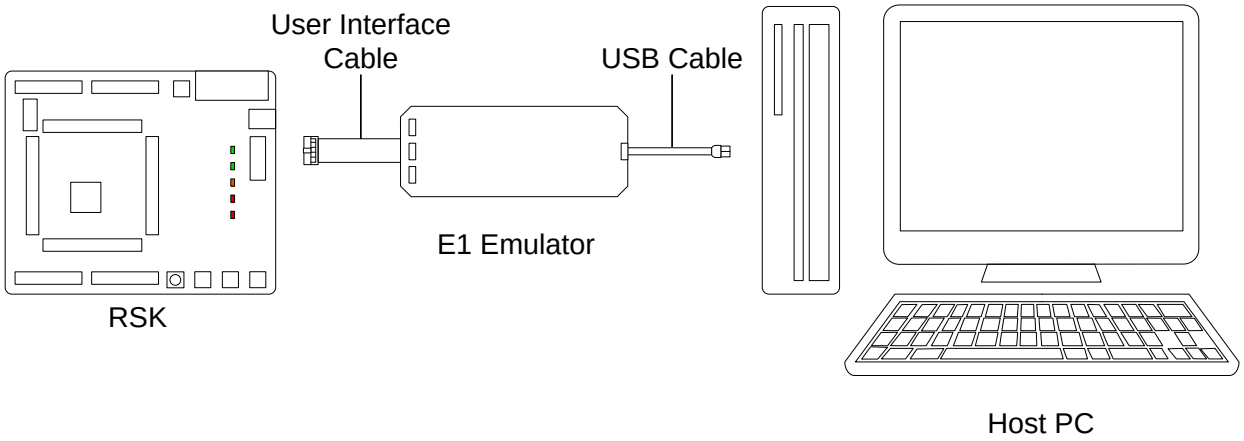


Figure 4-2: Debugger Connection Diagram

5. User Circuitry

5.1 Reset Circuit

A reset control circuit is fitted to the RSK to generate the required reset signal, and is triggered from the RES switch. Refer to the RL78L13 hardware manual for details regarding the reset signal timing requirements, and the RSK schematics for information regarding the reset circuitry in use on the board.

5.2 Clock Circuit

A clock circuit is fitted to the RSK to generate the required clock signal to drive the MCU, and associated peripherals. Refer to the RL78L13 Group Hardware Manual for details regarding the clock signal requirements, and the RSKRL78L13 board schematics for information regarding the clock circuitry in use on the RSK. 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	Encapsulated, SMT
X2	Sub MCU oscillator	Fitted	32.768kHz	Encapsulated, SMT

Table 5-1: Oscillators

5.3 Switches

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

Switch	Function	MCU	
		Port	Pin
RES	When pressed, the microcontroller is reset.	RESETn	10
SW1	Connects to an IRQ input for user controls.	INTP0 (P137)	13
SW2	Connects to an IRQ input for user controls.	INTP5 (P01)	63
SW3	Connects to an IRQ input for user controls.	INTP7 (P02)	62

Table 5-2: Switch Connections

5.4 LEDs

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

LED	Colour	Function	MCU	
			Port	Pin
POWER	Green	Indicates the status of the Board_VDD power rail.	-	-
LED0	Green	User operated LED.	P05	59
LED1	Orange	User operated LED.	P45	4
LED2	Red	User operated LED.	P15	67
LED3	Red	User operated LED.	P41	8

Table 5-3: LED Connections

5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analog input ANI0, pin 79. The potentiometer can be used to create a voltage between Board_VDD and ground.

The potentiometer is fitted to offer an easy method of supplying a variable analog input to the microcontroller. It does not necessarily reflect the accuracy of the controller's ADC. Refer to the RL78L13 Group Hardware Manual for further details.

5.6 LCD Panel

A versatile LCD display panel is supplied with the RSK, and should be connected to the JA4 header.
The panel is directly driven by circuitry inside the MCU. Connection information for the LCD panel is provided in table **Table 5-4** below.

LCD Panel Header (JA4)							
Pin	**Circuit Net Name**	**MCU**		**Pin**	**Circuit Net Name**	**MCU**	
		Port	**Pin**			**Port**	**Pin**
1	VL4	VL4	25	4	VL3	VL3	26
3	VL2	VL2	24	4	VL1	VL1	23
5	Ground	-	-	6	Ground		-
7	COM0	COM0	56	8	COM1	COM1	55
9	COM2	COM2	54	10	COM3	COM3	53
11	SEG0	SEG0	52	12	SEG1	SEG1	51
13	SEG2	SEG2	50	14	SEG3	SEG3	49
15	SEG4	SEG4	48	16	SEG5	SEG5	47
17	SEG6	SEG6	46	18	SEG7	SEG7	45
19	SEG8	SEG8	44	20	SEG9	SEG9	43
21	SEG10	SEG10	42	22	SEG11	SEG11	41
23	DLCDD4_SEG12	SEG12	40	24	DLCDD5_SEG13	SEG13	39
25	DLCDD6_SEG14	SEG14	38	26	DLCDD7_SEG15	SEG15	37
27	SEG16	SEG16	36	28	SEG17	SEG17	35
29	SEG18	SEG18	34	30	SEG19	SEG19	33
31	SEG20	SEG20	32	32	SEG21	SEG21	31
33	SEG22	SEG22	30	34	SEG23	SEG23	29
35	SEG24	SEG24	28	36	SEG25	SEG25	27
37	SEG26	SEG26	3	38	SEG27	SEG27	2
39	SEG28	SEG28	1	40	SEG29	SEG29	78
41	SEG30	SEG30	77	42	SEG31	SEG31	76
43	SEG32	SEG32	75	44	SEG33	SEG33	74
45	SEG34	SEG34	73	46	SEG35	SEG35	72
47	SEG36	SEG36	71	48	SEG37	SEG37	70
49	SEG38	SEG38	69	50	SEG39	SEG39	68

Table 5-4: LCD Header Connections

5.7 Debug LCD Module

A debug LCD header is fitted to the RSK; however the two-line debug LCD is not supplied with this kit. It is not possible to use the debug LCD and the LCD panel at the same time, and they should not both be fitted to the RSK.

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 5-5** below.

Debug LCD Header							
Pin	**Circuit Net Name**	**MCU**		**Pin**	**Circuit Net Name**	**MCU**	
		Port	**Pin**			**Port**	**Pin**
1	GROUND	-	-	2	Board_5V	-	-
3	No Connection	-	-	4	DLCDRS	P07	57
5	R/W (Pulled to ground)	-	-	6	DLCDE	P06	58
7	No Connection	-	-	8	No Connection	-	-
9	No Connection	-	-	10	No Connection	-	-
11	DLCDD4_SEG12	P70	40	12	DLCDD5_SEG13	P71	39
13	DLCDD6_SEG14	P72	38	14	DLCDD7_SEG15	P73	37

Table 5-5: LCD Header Connections

5.8 RS232 Serial Port

An RS232 serial port is fitted to the RSK and connected via a level shifter to the microcontroller Serial Array Unit (SAU). Connections between the RS232 header and the microcontroller are listed in **Table 5-6** below.

Signal Name	Function	MCU		RS232 Connector Pin
		Signal	Pin	
TXD2	SAU UART2 Transmit Signal.	TXD2	60	2
RXD2	SAU UART2 Receive Signal	RXD2	61	3
RS232TX	External SCI Transmit Signal.	n/a		2*
RS232RX	External SCI Receive Signal.	n/a		3*
SO00_TXD0	SAU UART0 Transmit Signal.	LINTXD_SO00_TXD0	64	2*
SI00_RXD0	SAU UART0 Receive Signal	LINRXD_SI00_RXD0	65	3*
SO10_TXD1	SAU UART1 Transmit Signal.	SO10_TXD1	7	2*
SI10_RXD1	SAU UART1 Receive Signal	SI10_RXD1_IVCMP1	6	3*

Table 5-6: Serial Port Connections

* This connection is a not available in the default RSK configuration - refer to §6.2 for the required modifications.

5.9 Local Interconnect Network (LIN)

A LIN transceiver IC is fitted to the RSK, and connected to the LIN MCU peripheral. For further details regarding the LIN protocol and supported modes of operation, please refer to the RL78L13 hardware manual. Connections between the LIN connector and the microcontroller are listed in **Table 5-7** below.

LIN Signal	Function	MCU	
		Port	Pin
LINTXD	LIN Transmit Signal	P00	64
LINRXD	LIN Receive Signal	P17	65
LINNSLP	LIN Transceiver Device Sleep Control	P16	66

Table 5-7: LIN Connections

6. Configuration

6.1 Modifying the RSK

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

Table 6-1 below shows the RSKRL78L13 default configuration with respect to the peripheral functionality. **Bold, blue text** indicates the default configuration that the RSK is supplied with. It is noted that certain peripheral functions are disabled by default, as shown in Table 6.1 in the column entitled **Secondary Function**. It is possible to activate these disabled peripherals, but at the expense of the default peripheral functions as shown in the Table. Refer to the sections cited in the Table in order to perform any required modifications.

The following sub-sections contain Tables illustrating which link resistors need to added/removed to enable/disable specific functions. A single horizontal line in the Table traces an individual signal path from the MCU on the left of the Table, through any intermediate connections, to any header connections on the right side of the Table. Each line in the Table thereby shows how the MCU signal can be configured for each of its multiplexed functions. Default RSK functional configurations are shown in **bold, blue text.**

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. Refer to the component placement diagram (§3.3) to locate the option links and jumpers.

When removing soldered components, always ensure that the RSK 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 RL78L13 Group Hardware Manual and RSKRL78L13 schematics for further information.

Primary Function	See §	Secondary Function	See §	Tertiary Function	See §
RS232 with UART2	6.2	RS232/LIN with UART0/1	6.2	Voltage Comparator/ E1 Debugger	6.2 6.3
Debug LCD	6.4	I/O Ports	6.4	N/A	6.4
LCD Panel	6.5	ADC	6.5	General	6.5
IIC	6.6	TAU	6.6	N/A	6.6
LED3	6.7	TAU input	6.7	N/A	6.7
On board Crystals	6.8	External clocks supplied	6.8	N/A	6.8

Table 6-1: RSK Default Configuration by Function

6.2 RS232 Serial Port Configuration

Table 6-2 below details the function of the option links associated with the serial port configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
SHDn	-	-	SHD GND	U3, 20	R37	-	-	-	-
			n/c			**R37**	-	-	-
TXD2	P04	60	**RS232 out to TXD2**	**U3, 13**	**R25** **R21**	**R23** **R24** **R26** **R20**	**JA6.8**	**Direct**	**Direct**
RXD2	P03	61	**RS232 in to RXD2**	**U3, 15**	**R42** **R36**	**R43** **R46** **R47** **R35**	**JA6.7**	**Direct**	**Direct**
LINTXD_SO00_TXD0	P00	64	**LINTXD**	**U6.4**	**R29**	**R30**	**LIN.2**	-	-
			SO00_TXD0				JA2.6	R30	R29
			RS232 out to SO00_TXD0	U3, 13	R30 R23 **R21**	R29 **R24** R25 **R26** **R20**	-	**-**	**-**
LINRXD_SI00_RXD0	P17	65	**LINRXD**	**U6.1**	**R44**	**R45**	**LIN.2**	-	-
			SI00_RXD0				JA2.8	R45	R44
			RS232 in to SI00_RXD0	U3, 15	R45 R43 **R36**	R44 R42 **R46** **R47** **R35**	-	**-**	**-**
LINNSLP_SCK00n	P16	66	**LINNSLP**	**U6.2**	**R40**	**R41**	**-**	-	-
			SCK00n	-			JA2.10	R41	R40
SO10_TXD1	P42	7	RS232 out to SO10_TXD1	U3, 13	R26 **R21**	**R23** **R24** R25 **R20**	**JA6.9**	**Direct**	**Direct**
SI10_RXD1_IVCMP1	P43	6	**SI10_RXD1**	**-**			**JA6.12**	**R135**	**R134**
			IVCMP1	-			J4.34	R134	R135
			RS232 out to SI10_RXD1	U3, 15	**R135** R47 **R36**	**R134** R42 **R43** **R46** **R35**	-	**-**	**-**
SCK10n_IVCMP0	P44	5	**SCK10n**	**-**			**JA6.11**	**R132**	**R133**
			IVCMP0	-			J4.33	R133	R132
RS232TX	-	-	RS232 out to RS232TXD	U3, 13	R24 **R21**	R23 R25 R26 **R20**	JA6.5	**-**	**-**
RS232RX	-	-	RS232 in to RS232RX	U3, 15	R46 **R36**	R42 R43 R47 **R35**	JA6.6	-	-

Table 6-2: RS232 Serial Port Option Links

6.3 E1 Debugger Interface

Table 6-3 below details the function of the option links associated with E1 Debugger configuration. The default configuration is for E1 debug/programming, but it is possible to enable Flash programming via the COM port.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
RESETn	-	10	**T_RESETn to RESETn**	-	**-**	**-**	**E1.6**	**R11**	-
			n/c		**-**	**-**	-	-	R11
RESETn	-	10	R2IN to RESETn	U4, 4	R39	**-**	-	-	-
			n/c	-	-	**R39**	-	-	-
TOOL0	P40	9	T1OUT to TOOL0	U3, 13	R20	R21	-	-	-
			RS232 as UART (§6.2)	-	**R21**	**R20**	-	-	-
TOOL0	P40	9	R1IN to TOOL0	U3, 15	R35	R36	-	-	-
			RS232 as UART (§6.2)	-	**R36**	**R35**	-	-	-

Table 6-3: E1 Debugger Interface Option Links

6.4 Debug LCD Configuration

Table 6-4 below details the function of the option links associated with the 2x8 character debug LCD header.

Signal Name	MCU		Header connection			
	Port	Pin	Signal	Header Pin	Fit	Remove
IO6_DLCDE	P06	58	**DLCDE**	**LCD.6**	**R17**	**R16**
			IO6	JA1.21	R16	R17
IO7_DLCRS	P07	57	**DLDRS**	**LCD.4**	**R19**	**R18**
			IO7	JA1.22	R18	R19

Table 6-4: Debug LCD Option Links

6.5 LCD Panel Configuration

Table 6-5 below details the function of the option links associated with the LCD Panel header.

Signal Name	MCU		Header connection			
	Port	Pin	Signal	Header Pin	Fit	Remove
SEG35_ANI22	P10	72	**SEG35**	**JA4.46**	**R53**	**R54**
			ANI22	JA5.3	R54	R53
SEG36_ANI23	P11	71	**SEG36**	**JA4.47**	**R55**	**R56**
			ANI23	JA5.4	R56	R55
SEG39_TO04	P14	68	**SEG39**	**JA4.50**	**R51**	**R52**
			TO04	JA2.20	R52	R51
SEG29_ANI16	P22	78	**SEG29**	**JA4.40**	**R89**	**R90**
			ANI16	JA1.9	R90	R89
SEG30_ANI17	P23	77	**SEG30**	**JA4.41**	**R96**	**R97**
			ANI17	JA1.10	R97	R96
SEG31_ANI18	P24	76	**SEG31**	**JA4.42**	**R74**	**R75**
			ANI18	JA1.11	R75	R74
SEG32_ANI19	P25	75	**SEG32**	**JA4.43**	**R82**	**R83**
			ANI19	JA1.12	R83	R82
SEG33_ANI20	P26	74	**SEG33**	**JA4.44**	**R59**	**R60**
			ANI20	JA5.1	R60	R59
SEG34_ANI21	P27	73	**SEG34**	**JA4.45**	**R66**	**R67**
			ANI21	JA5.2	R67	R66
IO0_SEG20	P30	32	IO0	JA1.15	R103	R102
			SEG20	**JA4.31**	**R102**	**R103**
IO1_SEG21	P31	31	IO1	JA1.16	R112	R113
			SEG21	**JA4.32**	**R113**	**R112**
IO2_SEG22	P32	30	IO2	JA1.17	R114	R115
			SEG22	**JA4.33**	**R115**	**R114**
IO3_SEG23_INTP4	P33	29	IO3	JA1.18	R118	R117, **R121**
			SEG23	**JA4.34**	**R117**	**R118, R121**
			INTP4	JA1.23	R121	R117, **R118**
IO4_SEG24	P34	28	IO4	JA1.19	R122	R125
			SEG24	**JA4.35**	**R125**	**R122**
IO5_SEG25	P35	27	IO5	JA1.20	R126	R127
			SEG25	**JA4.36**	**R127**	**R126**
SEG6_INTP1	P52	46	**SEG6**	**JA4.17**	**R32**	**R31**
			INTP1	JA2.9	R31	R32
SEG7_INTP2	P53	45	**SEG7**	**JA4.18**	**R34**	**R33**
			INTP2	JA2.23	R33	R34
SEG16_TKBO00	P74	36	**SEG16**	**JA4.27**	**R73**	**R72**
			TKBO00	J4.27	R72	R73
SEG17_TKBO01-2	P75	35	**SEG17**	**JA4.28**	**R79**	**R80**
			TKBO01-2	J4.30	R80	R79
SEG18_TKBO01-1	P76	34	**SEG18**	**JA4.29**	**R87**	**R86**
			TKBO01-1	J4.29	R86	R87
SEG19_TKBO01-0	P77	33	**SEG19**	**JA4.30**	**R93**	**R92**
			TKBO01-0	J4.28	R92	R93

Table 6-5: Debug LCD Option Links

6.6 IIC Pin Configuration

Table 6-6 below details the function of the option links associated with IIC pin configuration.

Signal Name	MCU		Header connection			
	Port	Pin	Signal	Header Pin	Fit	Remove
IIC Pull up	-	-	**Board_VDD**	**-**	**R5**	**R6**
			Board_5V		R6	R5
TO01_SCLA0	P60	19	TO01	JA2.19	R139	R138
			SCLA0	**JA1.26**	**R138**	**R139**
TI02_SDAA0	P61	20	TI02	JA2.21	R141	R140
			SDAA0	**JA1.25**	**R140**	**R141**

Table 6-6: IIC Option Links

6.7 LED3 Pin Configuration

Table 6-7 below details the function of the option links associated with LED3 pin configuration.

Signal Name	MCU		Header connection			
	Port	Pin	Signal	Header Pin	Fit	Remove
LED3_TI07	P41	8	**LED3**	**-**	**R137**	**R136**
			TIO7	JA2.22	R136	R137

Table 6-7: IIC Option Links

6.8 Clock Circuit Configuration

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

Signal Name	MCU		Header connection			
	Port	Pin	Connection	Header Pin	Fit	Remove
P121/X1	P121	15	**On board X1.2**	**-**	**R110**	**R111**
			External CON_X1	J1.15	R111	R110
P122/X2	P122	14	**On board X1.1**	**-**	**R109**	**R108**
			External CON_X2	J1.14 JA2.2	R108	R109
P123/XT1	P123	12	**On board X2.4**	**-**	**R100**	**R101**
			External CON_XT1	J1.12	R101	R100
P124/XT2	P124	11	**On board X2.1**	**-**	**R99**	**R98**
			External CON_XT2	J1.11	R98	R99

Table 6-8: Clock Circuit Option Links

6.9 Power Supply Configuration

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

Signal Name	Exclusive function		Header connection		
	Function	IC Pin	Header Pin	Fit	Remove
Board_5V	**Supply power through PWR connector**	**U2.IN**	-	**R50**	
	Do not supply power through PWR connector		-		R50
Board_5V	**Connected to CON_5V**	**U2.IN**	**JA1.1**	**R49**	
	Not connected to CON_5V				R49
Board_5V	Connected to Unregulated_VCC	**U2.IN**	JA6, 23	R151	
	Not connected to Unregulated_VCC				**R151**
Board_5V	Hardwired regulator bypass, +5V supply	**U2.IN**	**-**	R116[1]	
	No hardwired regulator bypass				**R116**
Board_VDD	**Connected to Board_5V / U2.OUT**	**U2.OUT**	**-**	**R123**	**R124**
	Connected to External 3.3V via header		JA1, 3	R124	R123
Board_VDD	**Bypass current probe (J7) for MCU**	**U1.18**	**J1.18**	**R130**	
	Enable current probe(J7) for MCU				R130

Note:
1. Alternatively, use J5 and J6 as detailed in **Table 2.1** in §2.1.

Table 6-9: Power Supply Option Links

`

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	**Header Name** **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** **Circuit Net Name**	**MCU Pin**
1	5V CON_5V	-	2	0V GROUND	-
3	3V3 CON_3V3	-	4	0V GROUND	-
5	AVCC NC	NC	6	AVSS AVREFM	80
7	AVREF AVREFP	79	8	ADTRG NC	NC
9	ADC0 ANI16	78	10	ADC1 ANI17	77
11	ADC2 ANI18	76	12	ADC3 ANI19	75
13	DAC0 NC	NC	14	DAC1 NC	NC
15	IO_0 IO0	32	16	IO_1 IO1	31
17	IO_2 IO2	30	18	IO_2 IO3	29
19	IO_4 IO4	28	20	IO_3 IO5	27
21	IO_6 IO6	58	22	IO_4 IO7	57
23	IRQ3/IRQAEC/M2_HSIN0 INTP4	29/NC/NC	24	IIC_EX NC	NC
25	IIC_SDA JA1_SDAA0	20	26	IIC_SCL JA1_SCLA0	19

Table 7-1: Application Header JA1 Connections

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

Application Header JA2					
Pin	**Header Name** / **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** / **Circuit Net Name**	**MCU Pin**
1	RESET / RESETn	10	2	EXTAL / CON_X2	14
3	NMI / NC	NC	4	Vss1 / GROUND	-
5	WDT_OVF / NC	NC	6	SCIaTX / SO00_TXD0	64
7	IRQ0/WKUP/M1_HSIN0 / INTP0	13/NC/NC	8	SCIaRX / SI00_RXD0	65
9	RQ1/M1_HSIN1 / INTP1	46/NC	10	SCKaCK / SCK00n	66
11	M1_UD / NC	NC	12	CTSRTS / NC	NC
13	M1_UP / NC	NC	14	M1_UN / NC	NC
15	M1_VP / NC	NC	16	M1_VN / NC	NC
17	M1_WP / NC	NC	18	M1_WN / NC	NC
19	TimerOut / TO01	19	20	TimerOut / TO04	68
21	TimerIn / TI02	20	22	TimerIn / TI07	8
23	IRQ2/M1_EncZ/M1_HSIN2 / INTP2	45/NC/NC	24	M1_POE / NC	NC
25	M1_TRCCLK / NC	NC	26	M1_TRDCLK / NC	NC

Table 7-2: Application Header JA2 Connections

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

Application Header JA5					
Pin	**Header Name** / **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** / **Circuit Net Name**	**MCU Pin**
1	ADC4 / ANI20	74	2	ADC5 / ANI21	73
3	ADC6 / ANI22	72	4	ADC6 / ANI23	71
5	CAN1TX / NC	NC	6	CAN1RX / NC	NC
7	CAN2TX / NC	NC	8	CAN2RX / NC	NC
9	IRQ4/M2_EncZ/M2HSIN1 / INTP5	63/NC/NC	10	IRQ5/M2_HSIN2 / INTP7	62/NC
11	M2_UD / NC	NC	12	M2_Uin / NC	NC
13	M2_Vin / NC	NC	14	M2_Win / NC	NC
15	M2_Toggle / NC	NC	16	M2_POE / NC	NC
17	M2_TRCCLK / NC	NC	18	M2_TRDCLK / NC	NC
19	M2_UP / NC	NC	20	M2_UN / NC	NC
21	M2_VP / NC	NC	22	M2_VN / NC	NC
23	M2_WP / NC	NC	24	M2_WN / NC	NC

Table 7-3: Application Header JA5 Connections

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

Application Header JA6					
Pin	**Header Name** **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** **Circuit Net Name**	**MCU Pin**
1	DREQ NC	NC	2	DACK NC	NC
3	TEND NC	NC	4	STBYn NC	NC
5	RS232TX RS232TX	NC	6	RS232RX RS232RX	NC
7	SCIbRX RXD2	61	8	SCIbTX TXD2	60
9	SCIcTX SO10_TXD1	7	10	SCIbCK NC	NC
11	SCIcCK SCK10n	5	12	SCIcRX SI10_RXD1	6
13	M1_Toggle NC	NC	14	M1_Uin NC	NC
15	M1_Vin NC	NC	16	M1_Win NC	NC
17	EXT_USB_VBUS NC	NC	18	Reserved NC	NC
19	EXT_USB_BATT NC	NC	20	Reserved NC	NC
21	EXT_USB_CHG NC	NC	22	Reserved NC	NC
23	Unregulated_VCC Unregulated_VCC	-	24	Vss GROUND	-

Table 7-4: Application Header JA6 Connections

7.2 Microcontroller Pin Headers

This RSK is fitted with MCU pin headers, which are used to access all the MCU's pins.

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

Microcontroller Pin Header J1					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	SEG28	1	2	SEG27	2
3	SEG26	3	4	LED1	4
5	SCK10n_IVCMP0	5	6	SI10_RXD1_IVCMP1	6
7	SO10_TXD1	7	8	LED3_TI07	8
9	TOOL0	9	10	RESETn	10
11	CON_XT2*	11	12	CON_XT1	12*
13	INTP0	13	14	CON_X2	14*
15	CON_X1*	15	16	NC	-
17	GROUND	-	18	UC_VDD	18
19	TO01_SCLA0	19	20	TI02_SDAA0	20
21	NC	-	22	NC	-
23	NC	-	24	NC	-
25	NC	-	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

* Note: Not a default connection to an MCU pin– requires modification of zero ohm links – refer to schematic.

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

Microcontroller Pin Header J2					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	CAPH	21	2	CAPL	22
3	VL1	23	4	VL2	24
5	VL4	25	6	VL3	26
7	IO5_SEG25	27	8	IO4_SEG24	28
9	IO3_SEG23_INTP4	29	10	IO2_SEG22	30
11	IO1_SEG21	31	12	IO0_SEG20	32
13	SEG19_TKBO01-0	33	14	SEG18_TKBO01-1	34
15	SEG17_TKBO01-2	35	16	SEG16_TKBO00	36
17	DLCDD7_SEG15	37	18	DLCDD6_SEG14	38
19	DLCDD5_SEG13	39	20	DLCDD4_SEG12	40
21	NC	-	22	NC	-
23	NC	-	24	NC	-
25	NC	-	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 Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	SEG11	41	2	SEG10	42
3	SEG9	43	4	SEG8	44
5	SEG7_INTP2	45	6	SEG6_INTP1	46
7	SEG5	47	8	SEG4	48
9	SEG3	49	10	SEG2	50
11	SEG1	51	12	SEG0	52
13	COM3	53	14	COM2	54
15	COM1	55	16	COM0	56
17	IO7_DLCDRS	57	18	IO6_DLCDE	58
19	LED0	59	20	TXD2	60
21	NC	-	22	NC	-
23	NC	-	24	NC	-
25	NC	-	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 Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	RXD2	61	2	INTP7	62
3	INTP5	63	4	LINTXD_SO00_TXD0	64
5	LINRXD_SI00_RXD0	65	6	LINNSLP_SCK00n	66
7	LED2	67	8	SEG39_TO04	68
9	SEG38	69	10	SEG37	70
11	SEG36_ANI23	71	12	SEG35_ANI22	72
13	SEG34_ANI21	73	14	SEG33_ANI20	74
15	SEG32_ANI19	75	16	SEG31_ANI18	76
17	SEG30_ANI17	77	18	SEG29_ANI16	78
19	ANI0_AVREFP	79	20	ANI1_AVREFM	80
21	NC	-	22	NC	-
23	INTP0	13	24	INTP1	46*
25	INTP2	45*	26	GROUND	-
27	TKBO00	36*	28	TKBO01-0	33*
29	TKBO01-1	34*	30	TKBO01-2	35*
31	Board_VDD	-	32	GROUND	-
33	IVCMP0	5*	34	IVCMP1	6*
35	ANI1	80	36	ANI0	79

Table 7-8: Microcontroller Pin Header, J4

* Note: Not a default connection to an MCU pin– requires modification of zero ohm links – refer to schematic.

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/E20 debugger. An E1 debugger is supplied with this RSK product.

For further information regarding the debugging capabilities of the E1/E20 debuggers, refer to E1/E20 Emulator Additional Document for User's Manual (R20UT1994EJ).

8.2 Compiler Restrictions

The compiler supplied with this RSK will build a maximum of 64k code and data. To use the compiler with programs greater than this size you need to purchase a compiler license from your Renesas supplier.

8.3 Mode Support

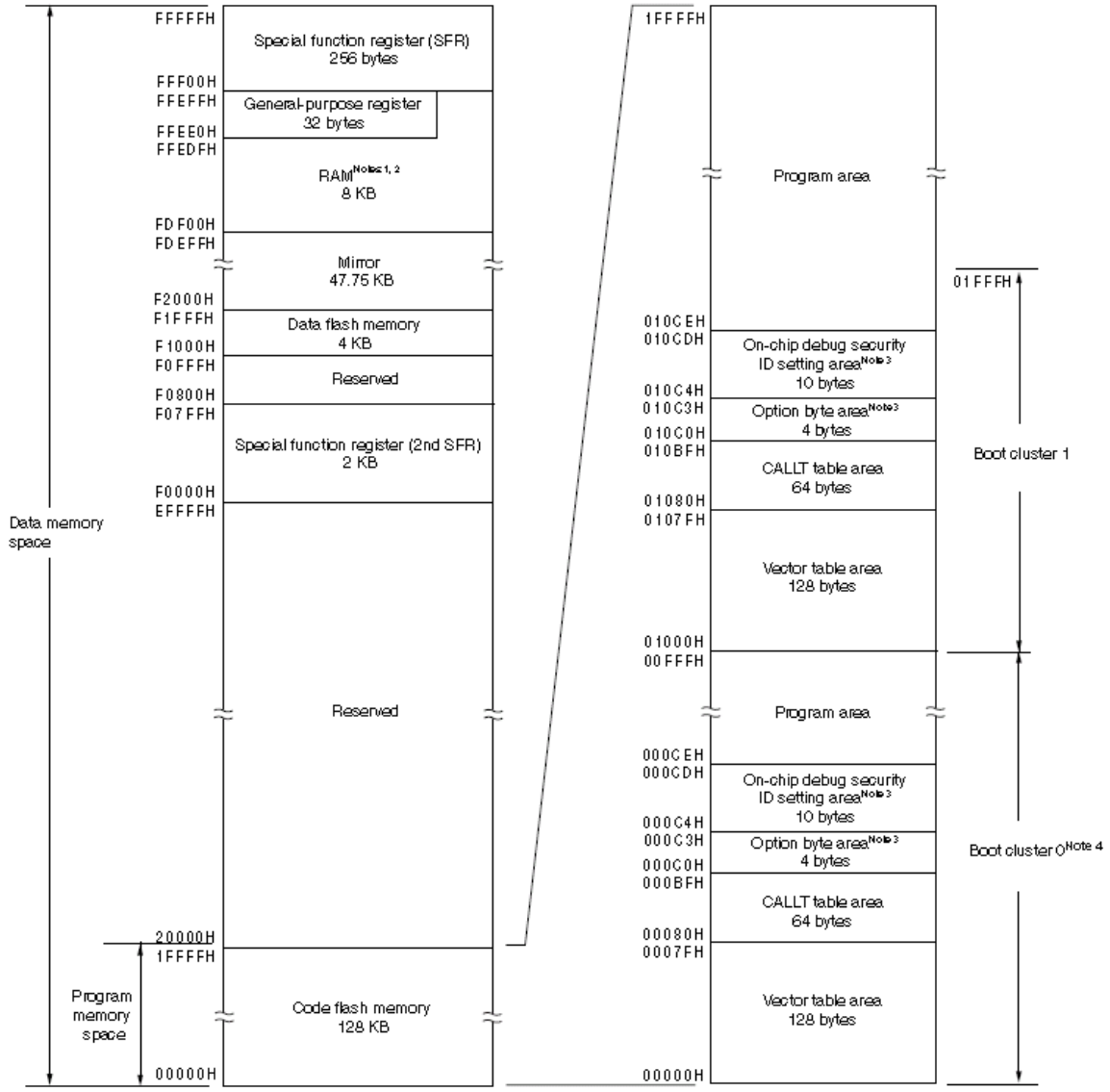
The RL78L13 microcontroller only supports single-chip operating mode.

8.4 Debugging 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/E20 Emulator User’s Manual (R20UT0398EJ).

8.5 Address Space

Figure 8-1 below details the address space of the MCU. This diagram is taken from the Hardware Manual Rev.1.00. The MCU fitted to the RSK has 128KB of ROM. For further details, refer to the RL78L13 Group Hardware Manual.



Notes 1. Use of the area FFE20H to FFEDFH and FDF00H to FE309H is prohibited when using the self-programming function and data flash function, because this area is used for self-programming library.

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

3. 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.

4. Writing boot cluster 0 can be prohibited depending on the setting of security (see **28.6 Security Setting**).

Caution When executing instructions from the RAM area while RAM parity error resets are enabled (RPERDIS = 0), be sure to initialize the used RAM area + 10 bytes.

Figure 8-1: MCU Address Space Diagram

9. Additional Information

Technical Support
For details on how to use CubeSuite+, refer to the manual available on the DVD or from the web site.

For information about the RL78L13 series microcontrollers refer to the RL78L13 Group Hardware Manual.

For information about the RL78 assembly language, refer to the RL78 Series Software Manual.

Technical Contact Details

Please refer to the contact details listed in section 9 of the "Quick Start Guide"

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

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

Copyright
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 Electronics Europe Limited.

© 2013 (2014) Renesas Electronics Europe Limited. All rights reserved.
© 2013 (2014) Renesas Electronics Corporation. All rights reserved.
© 2013 (2014) Renesas Solutions Corp. All rights reserved.

REVISION HISTORY	RSK RL78L13 User's Manual

Rev.	Date	Description	
		Page	Summary
1.00	Oct 07, 2013	—	First Edition issued
1.01	Mar 10, 2014	—	[2. List of Abbreviations and Acronyms] was updated.
		15	Header Pin.28 information of Table 5-4 was fixed. (MCU Port name: SEG19 to SEG17)
		19	Header connection information of Table 6-2 was fixed. (TXD2 and RXD2 header connection: none to Direct)
		22	Header Pin information of Table 6-6 was fixed. (Signal TO01_SCLA0: JA2.21 to JA2.19) (Signal TI02_SDAA0: JA2.23 to JA2.21)
		23	Notification of Table 6-9 was updated. (Jumper J6 was added to Note 1)
		24 to 27	Table format of Table 7-1 to 7-4 was updated. (Both Header Name and Circuit Net Name are indicated)
		28	Header Pin.18 information of Table 7-5 was fixed. (Circuit Net Name: NC to UC_VDD (MCU Pin.18))
		28, 29	Table numbering of Table 7-7 to 7-9 was fixed.
		29	Header Pin.31 and 32 of Table 7-8 was fixed. (Header Pin.31: MCU Pin.18 to Hyphenation) (Header Pin.32: MCU Pin.17 to Hyphenation)

Renesas Starter Kit Manual: User’s Manual

Publication Date: Rev. 1.01 Mar 10, 2014

Published by: Renesas Electronics Corporation

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

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

Renesas Electronics America Inc.
2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

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

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

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

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

Renesas Electronics Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Ku, Seoul, 135-920, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

© 2014 Renesas Electronics Corporation. All rights reserved.

Colophon 3.0

RL78/L13 Group

Renesas Electronics Corporation

R20UT2125EG0101