User's Manual

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RL78/G1C Group

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

RENESAS MCU
RL78 Family / G1X Series

Renesas Electronics
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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 RL78/G1C 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.	RSKRL78G1C User's Manual	R20UT1986EG
Tutorial	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRL78G1C Tutorial Manual	R20UT1987EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRL78G1C Quick Start Guide	R20UT1988EG
Schematics	Full detail circuit schematics of the RSK.	RSKRL78G1C Schematics	R20UT1981EG
Hardware Manual	Provides technical details of the RL78/G1C microcontroller.	RL78/G1C Group Hardware Manual	R01UH0348EJ

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
KR	Key Return
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCU	Micro-controller Unit
n/a	Not applicable
n/c	Not connected
PC	Personal Computer
RSK	Renesas Starter Kit
SAU	Serial 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	J7 Setting	J9 Setting	Supply Source	Supply Input Voltages	Regulator IC Output
All open	Pin1-2 shorted	Pin1-2 shorted	Pin1-2 shorted	USB-VBUS	5V	None
Pin1-2 shorted	Pin1-2 shorted	Pin2-3 shorted	Pin1-2 shorted			3.3V
All open	Pin2-3 shorted	Pin1-2 shorted	Pin2-3 shorted	USB-Battery		None
Pin1-2 shorted	Pin2-3 shorted	Pin2-3 shorted	Pin2-3 shorted	USB-Battery		3.3V
All open	**All open**	**Pin1-2 shorted**	**All open**	**PWR connector, E1**		**None**
Pin1-2 shorted	All open	Pin2-3 shorted	All open	PWR connector		3.3V

Table **2-1**: Main Power Supply Requirements

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.

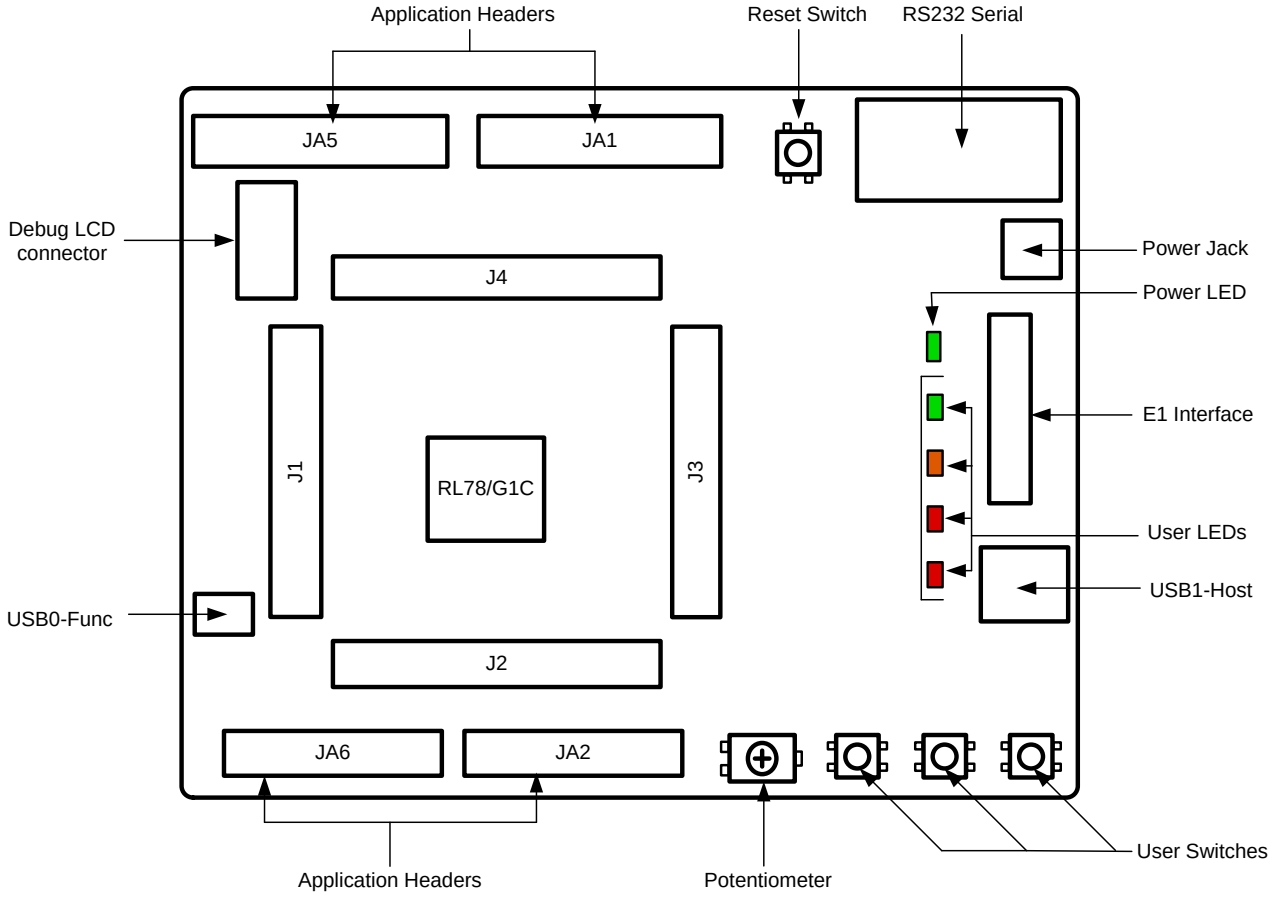


Figure 3-1: Board Layout

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.

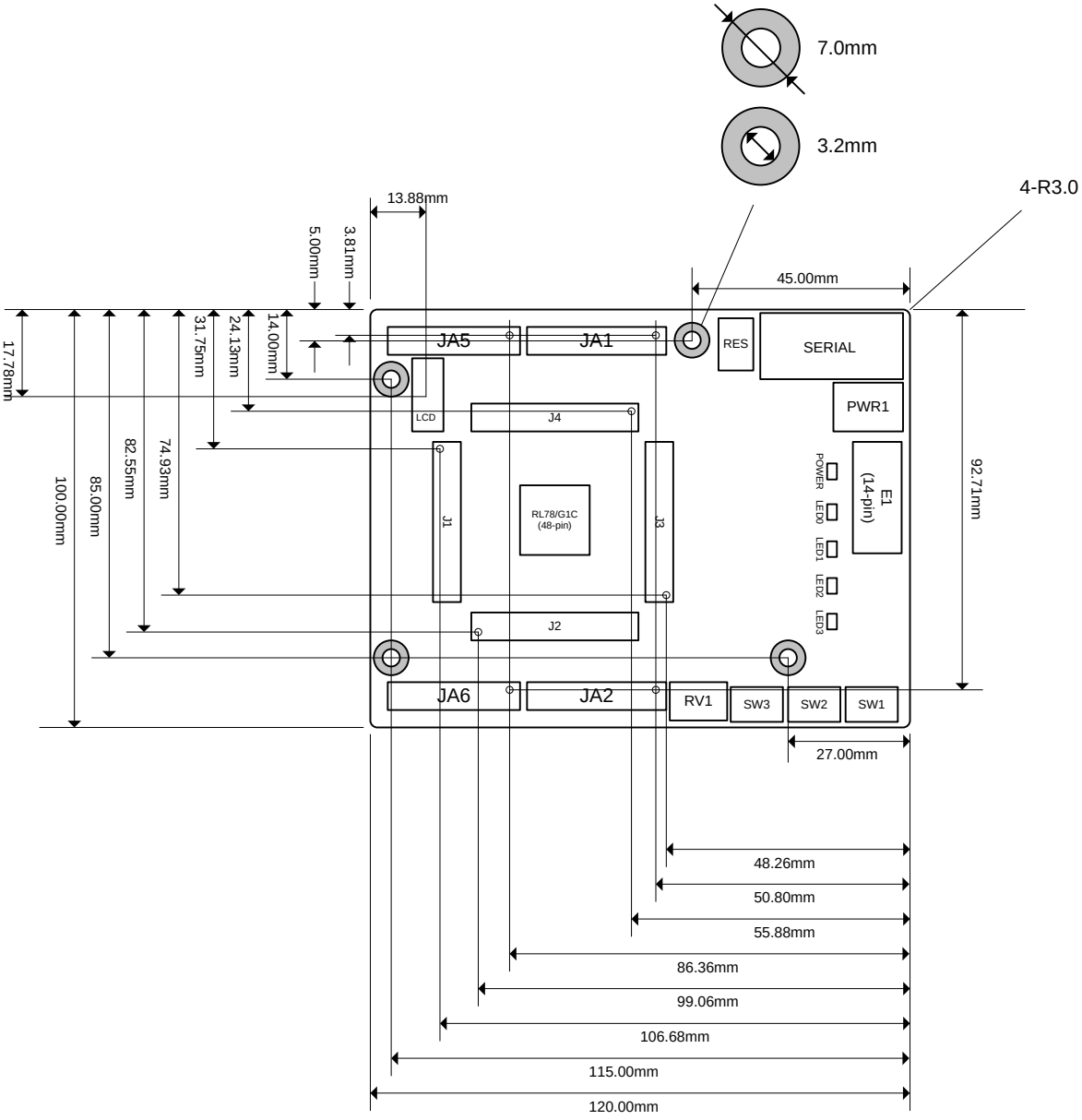


Figure 3-2: Board Dimensions

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.

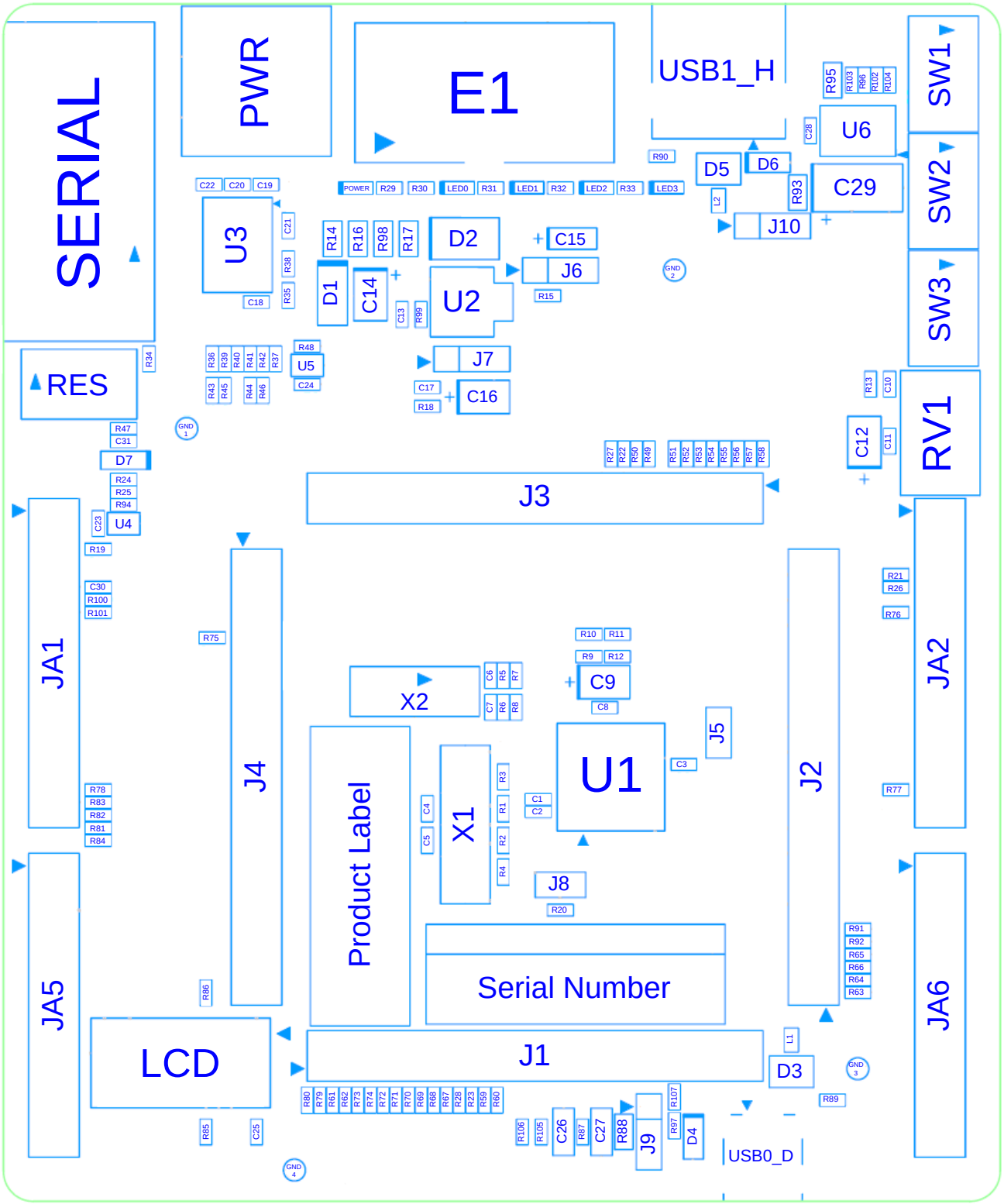


Figure 3-3: Top-Side Component Placement

4. Connectivity

4.1 Internal RSK Connections

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

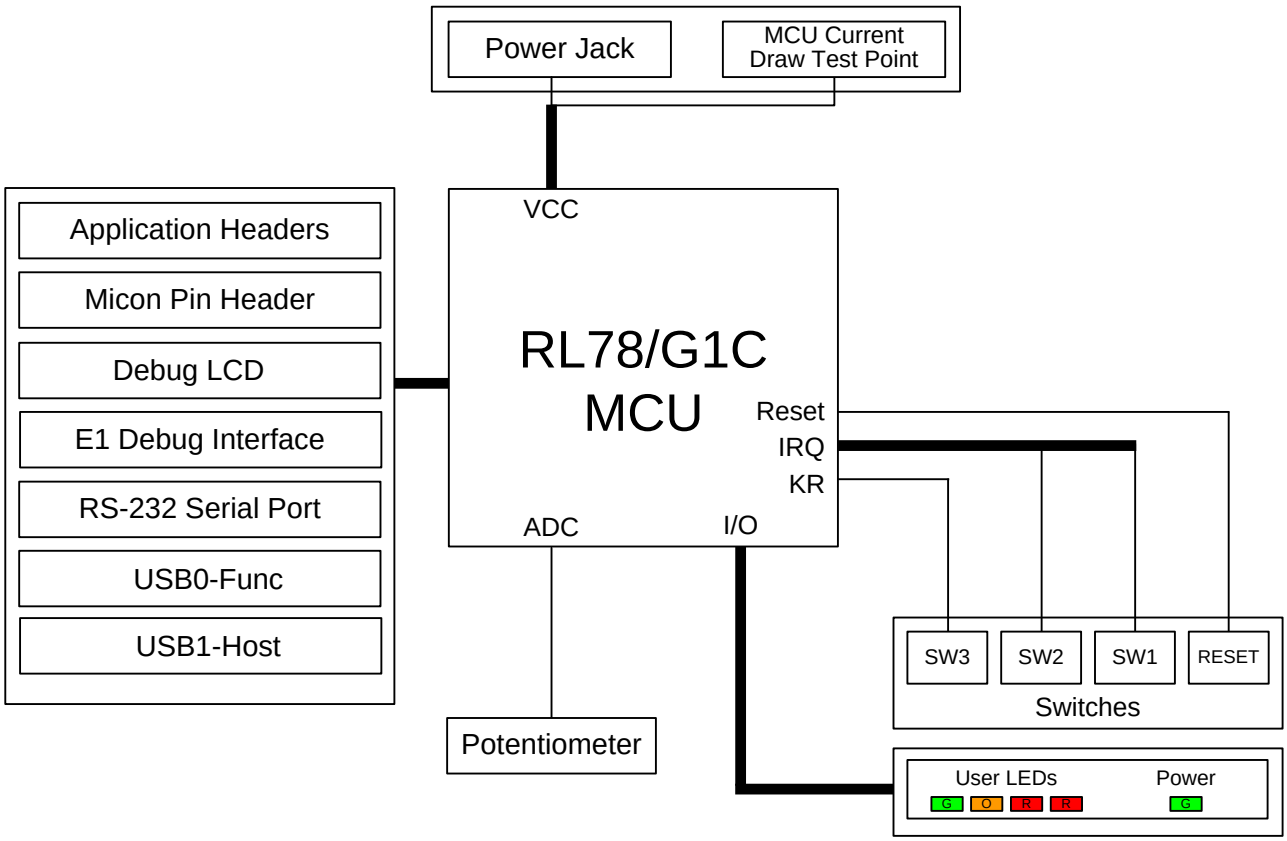


Figure 4-1: Internal RSK Block Diagram

4.2 Debugger Connections

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

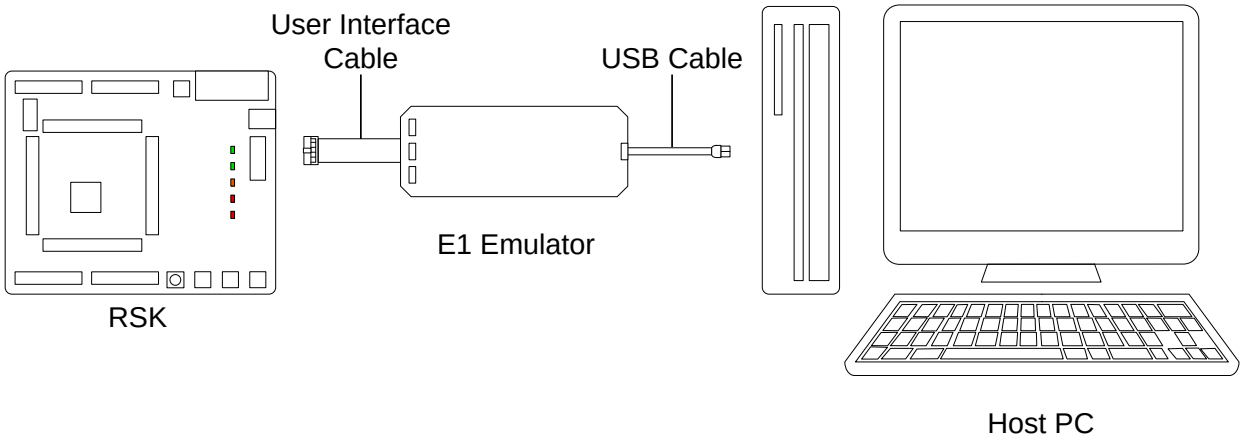


Figure 4-2: Debugger Connection Diagram

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 RL78/G1C 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 RL78/G1C Group Hardware Manual for details regarding the clock signal requirements, and the RSKRL78/G1C 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	12MHz	HC49/4U
X2	Sub MCU oscillator	Fitted	32.768kHz	90SMX

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	40
SW1	Connects to an IRQ input for user controls.	INTP0 (P137)	43
SW2	Connects to an IRQ input for user controls.	INTP6 (P140)	36
SW3	Connects to a Key input for user controls.	KR0 (P70)	11

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.	P01	34
LED1	Orange	User operated LED.	P72	9
LED2	Red	User operated LED.	P62	3
LED3	Red	User operated LED.	P63	4

Table 5-3: LED Connections

5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analog input ANI19, pin 37. 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 RL78/G1C Group Hardware Manual for further details.

5.6 Debug LCD Module

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

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**	**Circuit Net Name**	**MCU**	
		Port	**Pin**			**Port**	**Pin**
1	GROUND	-	-	2	Board_5V	-	-
3	No Connection	-	-	4	DLCDRS	P41	38
5	R/W (Pulled to ground)	-	-	6	DLCDE	P130	33
7	No Connection	-	-	8	No Connection	-	-
9	No Connection	-	-	10	No Connection	-	-
11	DLCDD4	P24	28	12	DLCDD5	P25	27
13	DLCDD6	P26	26	14	DLCDD7	P27	25

Table 5-4: LCD Header Connections

5.7 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 5-5** below.

Signal Name	Function	MCU		RS232 Connector Pin
		Signal	Pin	
TxD0	SAU0 Channel 0 Transmit Signal.	TxD0	14	2
RxD0	SAU0 Channel 0 Receive Signal	RxD0	13	3
RS232TX	External SCI Transmit Signal.	n/a		2*
RS232RX	External SCI Receive Signal.	n/a		3*

Table 5-5: Serial Port Connections

* This connection is a not available in the default RSK configuration - refer to §6.4 for the required modifications.

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 RSKRL78/G1C 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 RL78/G1C Group Hardware Manual and RSKRL78/G1C schematics for further information.

Primary Function	See Section(s)	Secondary Function	See Section(s)
RS232 with SAU0	6.4	RS232 to TOOL0 and RESET pins	6.3
LEDs	6.6	TAU outputs	6.6
LCD	6.2	ADC inputs	6.2
INTP4	6.6	TAU3 input	6.6
SAU0	6.4	I/O Ports	6.4, 6.6
SAU1	6.6	I/O Ports	6.6

Table 6-1: RSK Default Configuration by Function

6.2 ADC Configuration

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

Signal Name	MCU		Exclusive function			Header connection		
	Port	Pin	Signal	Fit	Remove	Header Pin	Fit	Remove
ANI0_AVREFP	P20	32	**ANI0**	**R10**	**R9**	**JA1, 9**	**R100**	-
			AVREFP	R9	R10	JA1, 7	Direct	-
ANI1_AVREFM	P21	31	**ANI1**	**R11**	**R12**	**JA1, 10**	Direct	-
			AVREFM	R12	R11	JA1, 6	Direct	-
ADPOT	P120	37	**ADPOT to RV1**	**R13**	n/a	J4, 1	Direct	-
			n/c		R13	J4, 1	Direct	-
DLCDD4_ANI4	P24	28	**DLCDD4**	**R51**	**R52**	-	-	-
			ANI4	R52	R51	JA5, 1	Direct	-
DLCDD5_ANI5	P25	27	**DLCDD5**	**R53**	**R54**	-	-	-
			ANI5	R54	R53	JA5, 2	Direct	-
DLCDD6_ANI6	P26	26	**DLCDD6**	**R55**	**R56**	-	-	-
			ANI6	R56	R55	JA5, 3	Direct	-
DLCDD7_ANI7	P27	25	**DLCDD7**	**R57**	**R58**	-	-	-
			ANI7	R58	R57	JA5, 4	Direct	-

Table 6-2: ADC Option Links

6.3 E1 Debugger Interface

Table 6-3 below details the function of the option links associated with E1 Debugger configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
RESETn	-	40	**T_RESETn to RESETn**	-	**-**	**-**	**E1, 6**	**R47**	-
			n/c		**-**	**-**	-	-	R47
RESETn	-	40	R2IN to RESETn	U4, 4	R94	**-**	-	-	-
			n/c	-	-	**R94**	-	-	-
TOOL0	P40	39	T1OUT to TOOL0	U3, 13	R40	R39	-	-	-
			RS232 as UART (§6.4)	-	**R39**	**R40**	-	-	-
TOOL0	P40	39	R1IN to TOOL0	U3, 15	R42	R41	-	-	-
			RS232 as UART (§6.4)	-	**R41**	**R42**	-	-	-

Table 6-3: E1 Debugger Interface Option Links

6.4 RS232 Serial Port Configuration

Table 6-4 below details the function of the option links associated with 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	R38	-	-	-	-
			n/c			**R38**		-	-
IO4_RXD0_SI00	P50	13	**RS232 IN to RXD0**	**U3, 13**	**R63**	**R64**	**JA2.8**	**R41, R46**	**R42, R44**
			IO4	-	R64	R63	JA1, 19	Direct	Direct
IO5_TXD0_SO00	P51	14	**RS232 OUT to TXD0**	**U3, 15**	**R65**	**R66**	**JA2.6**	**R39, R45**	**R40, R43**
			IO5	-	R66	R65	JA1, 20	Direct	Direct
RS232RX	-	-	RS232RX	U3.13	-	-	JA6.6	R41, R44	R42, R46
RS232TX	-	-	RS232TX	U3.15	-	-	JA6.5	R39, R43	R40, R45

Table 6-4: RS232 Serial Port Option Links

6.5 USB Configuration

Table 6-5 below details the function of the option links associated with USB configuration.

Signal Name	MCU Pin	Exclusive function				Header connection		
		Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
VBUS	-	Bus-powered	-	R15, R97[1]		-	-	-
		Self-powered	-		**R15, R97[1]**	-	-	-
ILIM	-	**0.52A Host Current Limit**	**U6, 4**	**R103**	**R104**	-	-	-
		1.625A Host Current Limit	U6, 4	R104	R103	-	-	-
UVBUS	22	**Connected to USB VBUS**	-	**R105**	**R106**	**J2.10**	**Direct**	**Direct**
		Connected to Board_5V	-	R106	R105	J2.10	Direct	Direct

Note:
1. Alternatively, use J6 and J9 as detailed in Table 6.6 below.

Table 6-5: USB Option Links

Table 6-6 below details the function of the option links associated with USB Option Links Jumpers.

Supply Source	Bus powered / Self powered	BC function	J5 setting	J6 setting	J7 setting	J9 setting
5V	Bus-powered	No Use	Open	Pin1-2 shorted	Pin1-2 shorted	Pin1-2 shorted
		Use	Open	Pin2-3 shorted	Pin1-2 shorted	Pin2-3 shorted
	Self-powered	**-**	**Open**	**Open**	**Pin1-2 shorted**	**Open**
3.3V	Bus-powered	No Use	Pin1-2 shorted	Pin1-2 shorted	Pin2-3 shorted	Pin1-2 shorted
		Use	Pin1-2 shorted	Pin2-3 shorted	Pin2-3 shorted	Pin2-3 shorted
	Self-powered	-	Pin1-2 shorted	Open	Pin2-3 shorted	Open

Table 6-6: USB Option Links Jumpers

6.6 IRQ & General I/O Pin Configuration

Table 6-7 below details the function of the option links associated with general I/O pin configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
LED0_TO00	P01	34	**LED0**	-	**R49**	**R50**	-	-	-
			TO00	-	R50	R49	JA2, 19	Direct	Direct
LED1_TO02	P72	9	**LED1**	-	**R67**	**R68**	-	-	-
			TO02	-	R68	R67	JA2, 20	Direct	Direct
INTP4_TI03	P31	5	**INTP4**	-	**R61**	**R62**	**JA2, 9**	Direct	Direct
			TIO3	-	R62	R61	JA2, 22	Direct	Direct
IO0_SCK01n	P75	6	**SCK01n**	-	**R73**	**R74**	**JA6, 11**	Direct	Direct
			IO0	-	R74	R73	JA1, 15	Direct	Direct
IO1_SI01	P74	7	**SI01**	-	**R71**	**R72**	**JA6, 12**	Direct	Direct
			IO1	-	R72	R71	JA1, 16	Direct	Direct
IO2_SO01	P73	8	**SO01**	-	**R69**	**R70**	**JA6, 9**	Direct	Direct
			IO2	-	R70	R69	JA1, 17	Direct	Direct
IO3_SCK00n	P30	12	**SCK00n**	-	**R59**	**R60**	**JA2, 10**	Direct	Direct
			IO3	-	R60	R59	JA1, 18	Direct	Direct
IO4_RXD0_SI00	P50	13	**RXD0_SI00**	§6.4	**R63**	**R64**	§6.4	§6.4	§6.4
			IO4	-	R64	R63	JA1, 19	Direct	Direct
IO5_TXD0_SO00	P51	14	**TXD0_SO00**	§6.4	**R65**	**R66**	§6.4	§6.4	§6.4
			IO5	-	R66	R65	JA1, 20	Direct	Direct

Table 6-7: General I/O Option Links

6.7 Power Supply Configuration

Table 6-8 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
VBUS	Bus-powered	-	-	R15, R97[1]	
	Self-powered	-	-	**R14**	**R15, R97[1]**
Board_5V	**Connect to VBUS/EXT PWR**	**U2, IN**	-	**R99**	
	Not connected to VBUS/EXT PWR	-	-		R99
Board_5V	**Supply USB Host Power**	**U6, 7. U6, 5**	-	**R95, R98**	
	No USB Host Power	-	-		R95, R98
Board_5V	**Connected to CON_5V**	**-**	**JA1, 1**	**R16**	
	Not connected to CON_5V	-			R16
Board_5V	Connected to Unregulated_VCC	**-**	JA6, 23	R17**-**	
	Not connected to Unregulated_VCC	-			**R17**
Board_VDD	**Connected to Board_5V / U2 OUT**	**U2.OUT**	**-**	**R18**	**R19**
	Connected to External 3.3V via header		JA1, 3	R19	R18
Board_VDD	**Bypass current probe (J8) for MCU**	**U1, 48**	**J4, 12**	**R20**	
	Enable current probe(J8) for MCU				R20

Note:
1. Alternatively, use J6 and J9 as detailed in **Table 2.1** in §2.1.

Table 6-8: 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**	**MCU Pin**	**Pin**	**Header Name**	**MCU Pin**
1	5V	-	2	0V	-
3	3V3	-	4	0V	-
5	AVCC	NC	6	AVSS	31
7	AVREF	32	8	ADTRG	NC
9	ADC0	32	10	ADC1	31
11	ADC2	30	12	ADC3	29
13	DAC0	NC	14	DAC1	NC
15	IO_0	6	16	IO_1	7
17	IO_2	8	18	IO_3	12
19	IO_4	13	20	IO_5	14
21	IO_6	17	22	IO_7	18
23	IRQ3/IRQAEC/M2_HSIN0	36	24	IIC_EX	NC
25	IIC_SDA	2	26	IIC_SCL	1

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**	**MCU Pin**	**Pin**	**Header Name**	**MCU Pin**
1	RESET	40	2	EXTAL	44
3	NMI	NC	4	Vss1	-
5	WDT_OVF	NC	6	SCIaTX	14
7	IRQ0/WKUP/M1_HSIN0	43/NC/NC	8	SCIaRX	13
9	IRQ1/M1_HSIN1	5/NC	10	SCIaCK	12
11	M1_UD	NC	12	CTSRTS	NC
13	M1_UP	NC	14	M1_UN	NC
15	M1_VP	NC	16	M1_VN	NC
17	M1_WP	NC	18	M1_WN	NC
19	TimerOut	34	20	TimerOut	9
21	TimerIn	35	22	TimerIn	5
23	IRQ2/M1_EncZ/M1_HSIN2	10/NC/NC	24	M1_POE	NC
25	M1_TRCCLK	NC	26	M1_TRDCLK	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**	**MCU Pin**	**Pin**	**Header Name**	**MCU Pin**
1	ADC4	28	2	ADC5	27
3	ADC6	26	4	ADC7	25
5	CAN1TX	NC	6	CAN1RX	NC
7	CAN2TX	NC	8	CAN2RX	NC
9	IRQ4/M2_EncZ/M2HSIN1	NC/NC/NC	10	IRQ5/M2_HSIN2	NC/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	**Header Name**	**MCU Pin**	**Pin**	**Header Name**	**MCU Pin**
1	DREQ	NC	2	DACK	NC
3	TEND	NC	4	STBYn	NC
5	RS232TX	NC	6	RS232RX	NC
7	SCIbRX	NC	8	SCIbTX	NC
9	SCIcTX	8	10	SCIbCK	NC
11	SCIcCK	6	12	SCIcRX	7
13	M1_Toggle	NC	14	M1_Uin	NC
15	M1_Vin	NC	16	M1_Win	NC
17	EXT_USB_VBUS	NC	18	Reserved	NC
19	EXT_USB_BATT	NC	20	Reserved	NC
21	EXT_USB_CHG	NC	22	Reserved	NC
23	Unregulated_VCC	NC	24	Vss	-

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	SCLA0	1	2	SDAA0	2
3	LED2	3	4	LED3	4
5	INTP4_TI03	5	6	IO0_SCK01n	6
7	IO1_SI01	7	8	IO2_SO01	8
9	LED1_TO02	9	10	INTP5	10
11	KR0	11	12	IO3_SCK00n	12
13	NC	-	14	NC	-
15	NC	-	16	NC	-
17	NC	-	18	NC	-
19	NC	-	20	NC	-
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

Table 7-7 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	IO4_RXD0_SI00	13	2	IO5_TXD0_SO00	14
3	UVBUSEN1	15	4	UOVRCUR1	16
5	IO6	17	6	IO7	18
7	NC	-	8	NC	-
9	UVDD	-	10	UVBUS	-
11	NC	-	12	NC	-
13	NC	-	14	NC	-
15	NC	-	16	NC	-
17	NC	-	18	NC	-
19	NC	-	20	NC	-
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, J2

Table 7-8 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	DLCDD7_ANI7	25	2	DLCDD6_ANI6	26
3	DLCDD5_ANI5	27	4	DLCDD4_ANI4	28
5	ANI3	29	6	ANI2	30
7	ANI1_AVREFM	31	8	ANI0_AVREFP	32
9	DLCDE	33	10	LED0_TO00	34
11	TI00	35	12	INTP6	36
13	NC	-	14	NC	-
15	NC	-	16	NC	-
17	NC	-	18	NC	-
19	NC	-	20	NC	-
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 7-8: Microcontroller Pin Header, J3

Table 7-9 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	ADPOT	37	2	DLCDRS	38
3	TOOL0	39	4	RESETn	40
5	CON_XT2	41	6	CON_XT1	42
7	INTP0	43	8	CON_X2	44
9	CON_X1	45	10	NC	-
11	GROUND	-	12	UC_VDD	-
13	NC	-	14	NC	-
15	NC	-	16	NC	-
17	NC	-	18	NC	-
19	NC	-	20	NC	-
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 7-9: 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/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 version of the compiler provided with this RSK is fully functional with no time restrictions, but requires registration before it can be used.

8.3 Mode Support

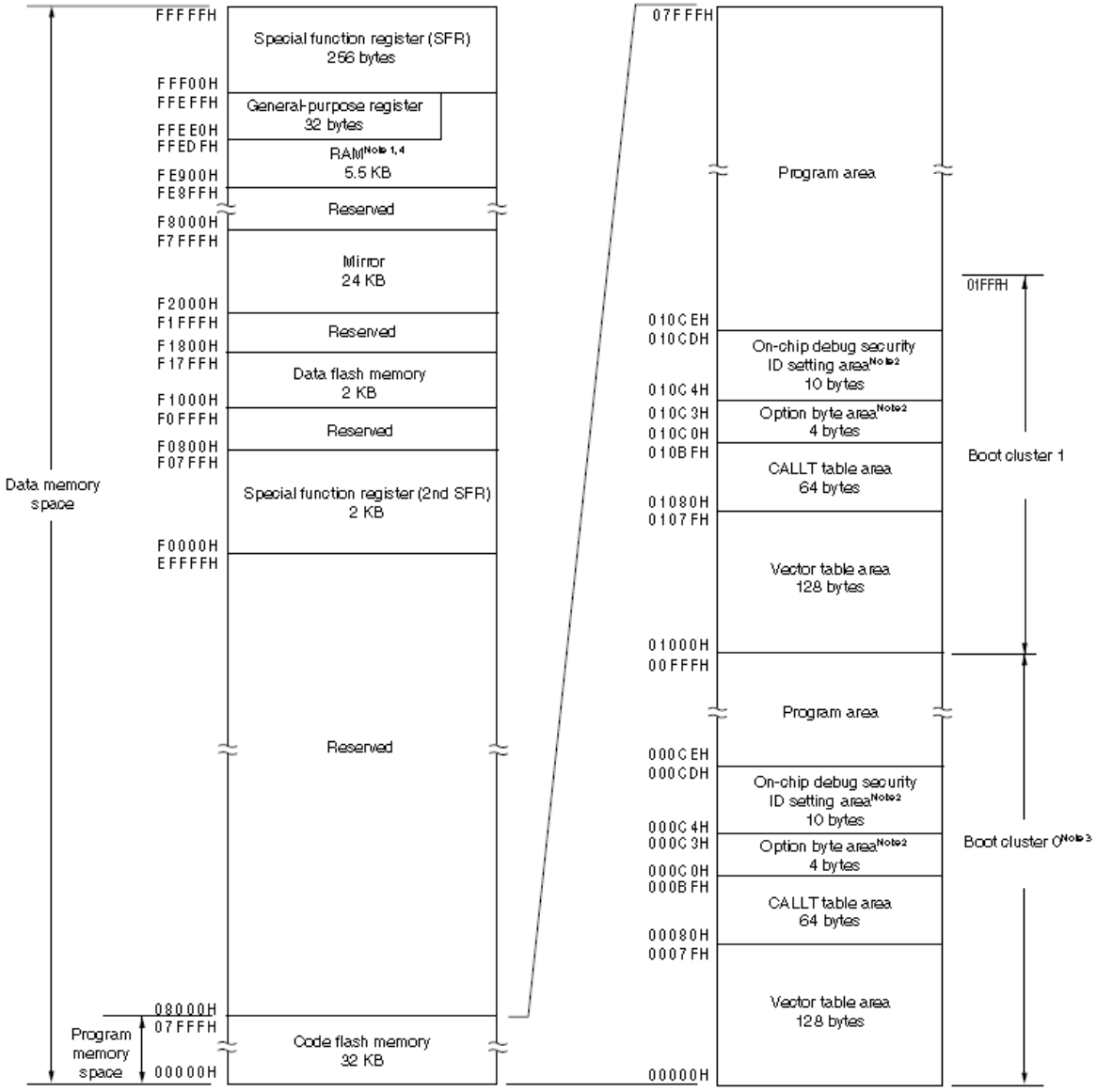
The RL78/G1C microcontroller only supports single-chip operating mode.

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.0.02. The MCU fitted to the RSK has 32KB of ROM. For further details, refer to the RL78/G1C Group Hardware Manual.



Notes 1. Instructions can be executed from the RAM area excluding the general-purpose register area.

2. 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.

3. Writing boot cluster 0 can be prohibited depending on the setting of security (see **26.6 Security Settings**).

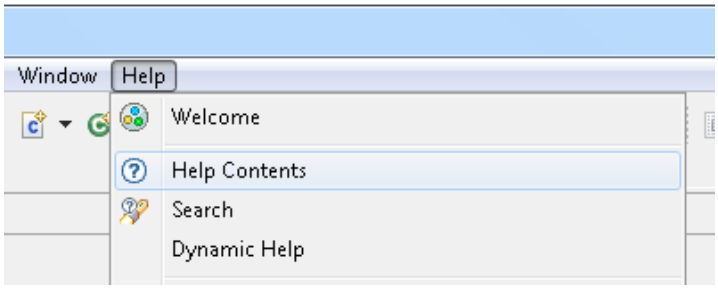
4. When the self-programming function and data flash function are used, the area, FE900H to FED09H, that the library uses as work area becomes prohibited.

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 e^{2}studio, refer to the help file by opening e^{2}studio, then selecting Help > Help Contents from the menu bar.



For information about the RL78/G1C series microcontrollers refer to the RL78/G1C 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 7 of the* "Quick Start Guide"**

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

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