

RE01 Group

Evaluation Kit RE01 256KB (EK-RE01 256KB)

User's Manual

RE Family / RE0 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>).

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 or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving 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, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. 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 shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
6. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended 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; industrial robots; etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or 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 damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.

7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION ("Vulnerability Issues"). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
8. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, 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 and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. Renesas Electronics products and technologies shall 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 shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.5.0-1 October 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan

www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

Disclaimer

By using this Evaluation Kit, the user accepts the following terms:

The Evaluation Kit is not guaranteed to be error free, and the entire risk as to the results and performance of the Evaluation Kit is assumed by the User. The Evaluation Kit 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 Evaluation Kit. 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 Evaluation Kit, 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 Evaluation Kit product:

This Evaluation 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 Evaluation 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. Objective and Target Users

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

The manual comprises of an overview of the capabilities of the Evaluation Kit product, but does not intend to be a guide to embedded programming or hardware design.

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 Evaluation Kit for RE01 256KB. 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 Evaluation Kit hardware.	Evaluation Kit RE01 256KB User's Manual	R20UT4801EJ (This manual)
Quick Start Guide	Provides simple instructions setup the Evaluation Kit for RE01 256KB and run the first sample.	Evaluation Kit RE01 256KB Quick Start Guide	R20UT4808EJ
Schematics	Full detail circuit schematics of the Evaluation Kit Main Board.	Evaluation Kit RE01 256KB main board schematics	R20UT4802EJ
Schematics	Full detail circuit schematics of the MIP-LCD Expansion Board.	MIP-LCD expansion board schematics	R20UT4564EJ
Hardware Manual	Provides technical details of the RE01 device.	RE01 Group Products with 256-Kbyte Flash Memory User's Manual: Hardware RE01	R01UH0894JJ

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
BLE	Bluetooth Low Energy
DNF	Do Not Fit
E2	Renesas On-chip Debugging Emulator
EH	Energy Harvesting
EHC	Energy Harvesting Control Circuit
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
FPC	Flexible Printed Circuits
I-jet™	IAR System® JTAG Emulator
J-Link™	SEGGER debug probe
J-Link™ OB	SEGGER On-board debug probe
IRQ	Interrupt Request
LDO	Low Dropout
LED	Light Emitting Diode
MIP-LCD	Memory In Pixel - Liquid Crystal Display
MLCD	Memory In Pixel - Liquid Crystal Display
n/c (NC)	Not Connected
PC	Personal Computer
Pmod™	This is a Digilent Pmod™ Compatible connector. Pmod™ is registered to Digilent Inc. Digilent-Pmod_Interface_Specification
RAM	Random Access Memory
RFP	Renesas Flash Programmer
SCI	Serial Communications Interface
SPI	Serial Peripheral Interface
USB	Universal Serial Bus

All trademarks and registered trademarks are the property of their respective owners.

Table of Contents

1. Overview.....	9
1.1 Purpose.....	9
1.2 Kit Contents.....	9
1.3 Board Specifications.....	10
1.4 Board Exterior.....	12
2. Board Layout.....	14
2.1 Component Layout.....	14
2.2 Board Dimensions.....	15
2.3 Component Placement.....	17
2.4 Board Initial Settings.....	20
3. Internal Board Connections.....	21
4. Power Supply.....	24
4.1 Power Supply System.....	24
4.2 Power Supply Source.....	25
4.3 External Power Supply.....	26
5. Operation/Start-up Mode.....	32
5.1 Normal Operation.....	32
5.2 EHC Operation.....	33
5.3 RE01 Start-up Mode.....	42
6. Debug.....	43
6.1 J-Link™ OB.....	43
6.2 I-jet™, J-Link™.....	46
6.3 E2.....	49
6.4 Flash Programmer -Renesas Flash Programmer-.....	52
6.5 Flash Programmer -SEGGER J-Flash Lite-.....	57
6.6 Emulator connection in EHC mode.....	58
7. Current Measurement Circuit.....	60
7.1 Current measurement when using the on-board regulator 3.3V.....	60
7.2 Current measurement when not using on-board regulator 3.3V.....	62
7.3 Current measurement during EHC operation.....	63
8. User Circuitry.....	66
8.1 Reset Circuit.....	66
8.2 Clock Circuit.....	67
8.3 Switches.....	68
8.4 LED.....	69
8.5 Pmod™ Interface.....	70
8.6 USB Serial Conversion.....	75
8.7 MLCD (Memory In Pixel Liquid Crystal Display) Interface.....	77
8.8 Flash Memory.....	78
8.9 Arduino UNO Interface.....	79
8.10 External DC/DC Circuit.....	82
9. Headers.....	84
9.1 RE01 Headers.....	84
10. Code Development.....	88
10.1 Overview.....	88
10.2 Mode Support.....	88
10.3 Address Space.....	88

11. Additional Information	89
----------------------------------	----

1. Overview

1.1 Purpose

This Evaluation Kit is an evaluation tool for Renesas RE01 device. This manual describes the technical details of the Evaluation Kit hardware.

1.2 Kit Contents

Kit contents included in the Evaluation Kit are shown in **Table 1-1**.

Table 1-1: Kit Contents

No	Kit Contents	
1	Main board	Part No.: RTK70E0118C00001BJ
2	MIP-LCD Expansion board	Part No.: RTK70E015DB00000BJ
3	Solar panel	Part No.: AM-1815CA (Panasonic)
4	USB cable	Type-A male to micro-B male
5	IC clip	Red, Black

1.3 Board Specifications

Board specifications are shown in **Table 1-2**, **Table 1-3**.

Table 1-2: Board Specifications

Item	Specifications
Target Device	Part No.: R7F0E01182CFP
	Package: 100-pin LQFP
	On-chip memory: ROM 256KB, RAM 128KB
On-Board Memory	SPI Serial Flash: 64Mbit
Input Clock	RE01 Main: 32MHz
	RE01 Sub: 32.768kHz
Power Supply	Debugger: 5V Input
	Power Supply IC: 5V Input, 3.3V Output
	Power Supply IC: 2.6V Input, 3.3V Output (For peripheral circuit power supply when using energy harvesting function)
	Power Supply IC: 2.6V or 3.3V Input, 1.25V Output (external DC/DC)
Debug Interface*1	I-jet™ / J-Link™ / E2 20-pin box header
	USB Connector for J-Link™ OB
Slide Switch	Operation Mode Configuration: double-pole, double-throw x 4
	Start-up Mode Configuration: single-pole, double-throw x 2
	Internal LDO Configuration: double-pole, single-throw x 2
Push Switch	Reset Switch x 1
	User Switch x 2
	Discharge Switch x 2
LED	Power Indicator: (Green) x 1
	For users: (Orange) x 1, (Red) x 1
	J-Link™ OB Power Indicator: (Green) x 1
MLCD	FPC Connector: 0.3mm pitch, 19 pin x 1
	MIP-LCD ^{*5} : TN0104ANVAANN-GN00(KYOCERA)
USB Serial Converter Interface	Connector: USB-MicroB
	Driver: USB Interface IC (Part No. FT230XQ)
MIP-LCD Expansion Board Interface *2	2.54mm pitch: 12 pin x 1(PMOD1)
Pmod™	PMOD1 *2: Angle type, 12-pin connector
External Battery Interface	3.5mm pitch: 2 pin x 1*3
Solar Panel Interface	2.54mm pitch: 2 pin x 1
Arduino UNO Interface	2.54mm pitch: 10 pin x 1 (J6), 8 pin x 2 (J10, J18), 6 pin x 1 (J19)
RE01 Header*4	2.54mm pitch: 50 pin x 2 (J7, J8, J9, J21)

*1: Use each debugger exclusively. When using J-Link OB, do not connect to other emulators. When using another emulator, do not connect to J-Link OB.

*2: PMOD1 is used both for MIP-LCD Expansion Board and Pmod™.

*3: The external battery is not included in this product.

*4: The connector is not included in this product.

*5: The MIP-LCD is not included in this product.

Table 1-3: MIP-LCD Expansion Board Specification

Item	Specification
MIP-LCD	Part No.: TN0181ANVNANN-AN00 ^{*1} (KYOCERA)
	Size: 1.81 inch
	Resolution: 200dpi (256(H) x 256(V))
Main Board Interface	2.54mm pitch: 12 pin x 1(PMOD1)

*1: Please contact KYOCERA.

1.4 Board Exterior

The exterior of Evaluation Kit RE01 256KB is shown in this chapter. **Figure 1-1** and **Figure 1-2** show the exterior of the main board. **Figure 1-3** and **Figure 1-4** show the exterior of MIP-LCD expansion board.

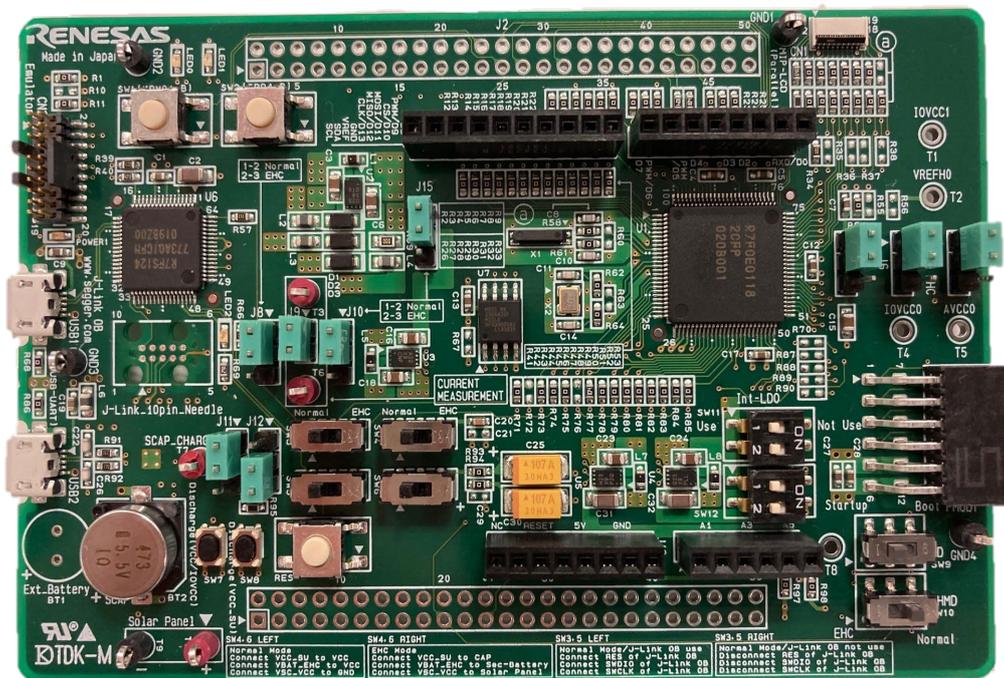


Figure 1-1: Main Board (Top)



Figure 1-2: Main Board (Bottom)



Figure 1-3: MIP-LCD Expansion Board (Top)



Figure 1-4: MIP-LCD Expansion Board (Bottom)

2. Board Layout

2.1 Component Layout

The component layout of Evaluation Kit are shown in **Figure 2-1** and **Figure 2-2**.

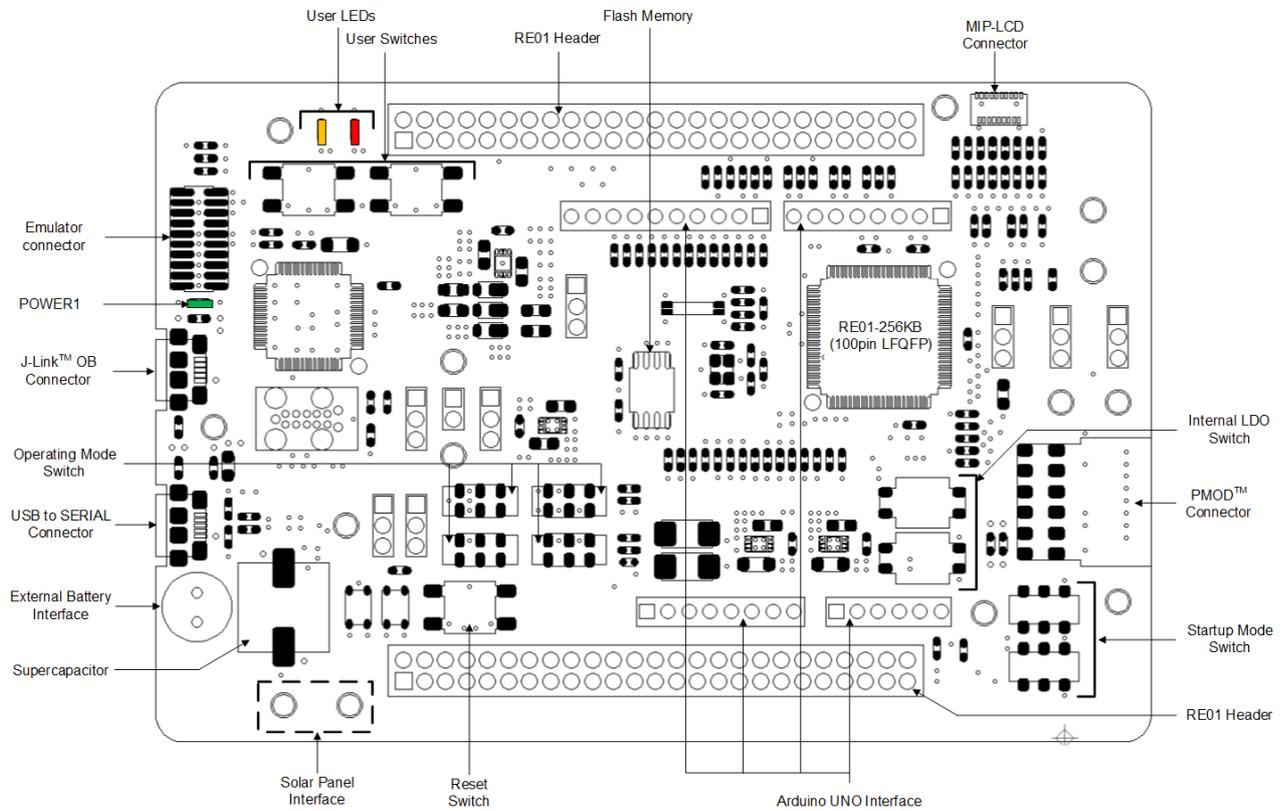


Figure 2-1: Main Board Layout

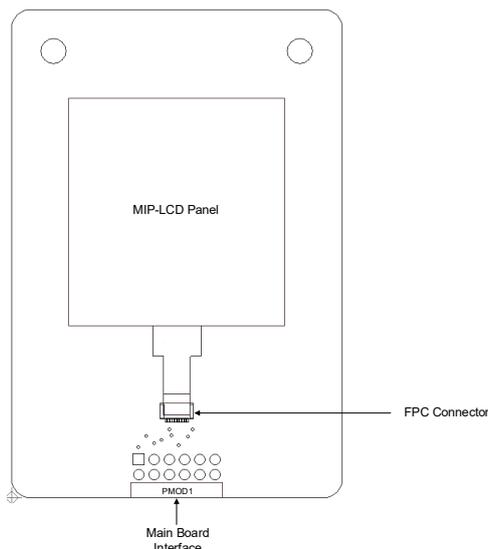


Figure 2-2: MIP-LCD Expansion Board Layout

2.2 Board Dimensions

Figure 2-3 and Figure 2-4 below show the board dimensions and connector positions. All the through-hole connectors are on a common 2.54 mm pitch grid for easy interfacing.

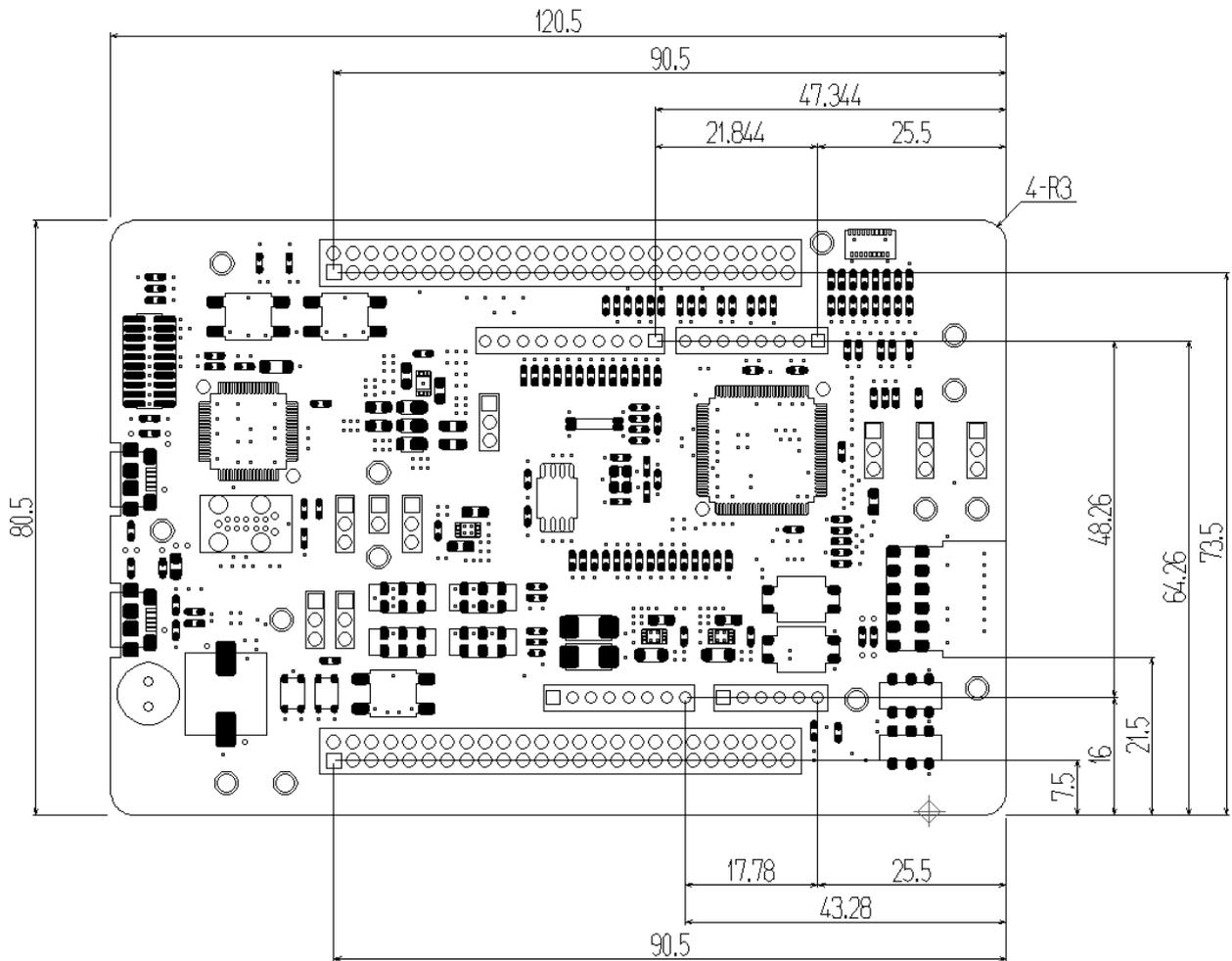


Figure 2-3: Main Board Dimensions (Unit: mm)

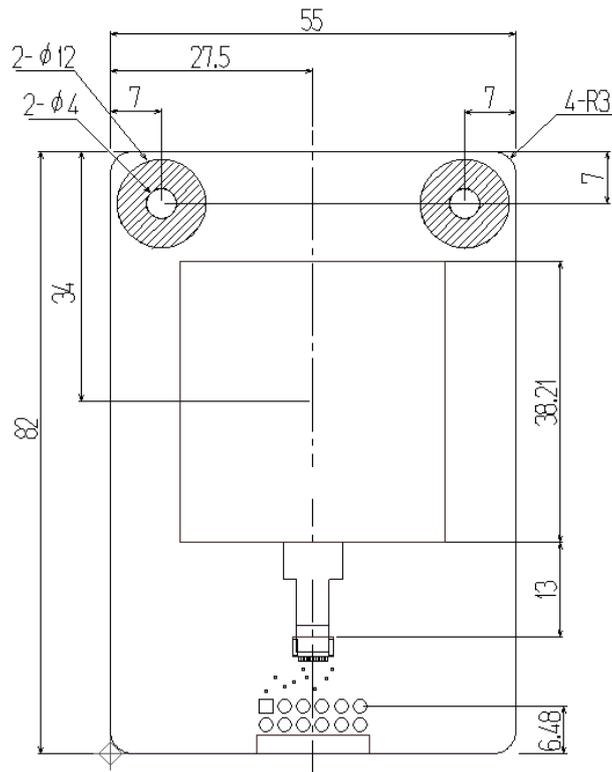


Figure 2-4: MIP-LCD Expansion Board Dimension (Unit: mm)

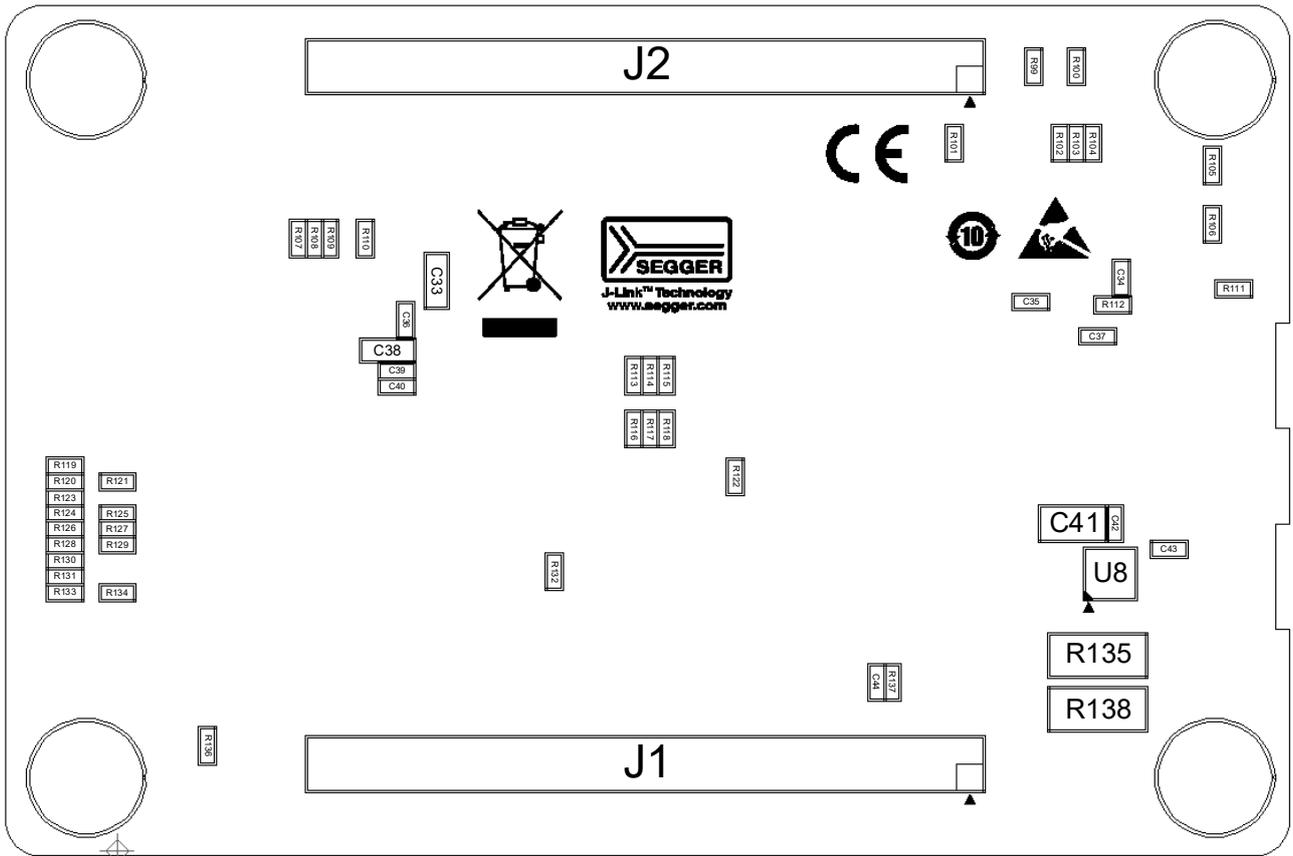


Figure 2-6: Main Board Component Placement (Bottom-Side View)

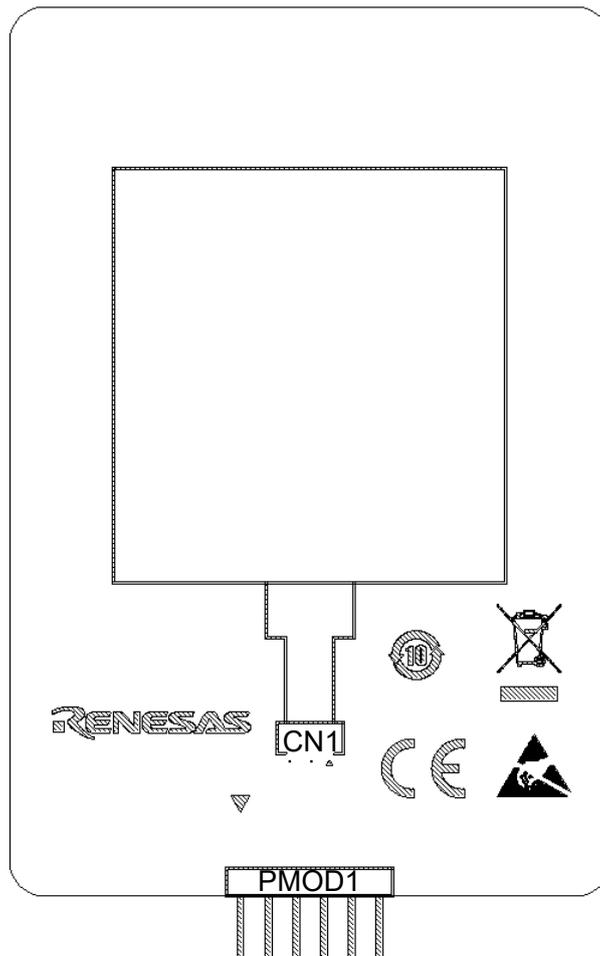


Figure 2-7: MIP-LCD Component Placement (Top-Side View)

2.4 Board Initial Settings

The switch settings of the default kit configuration are as follows. The component layout is shown in **Figure 2-8** and the detailed settings are shown in **Table 2-1**.

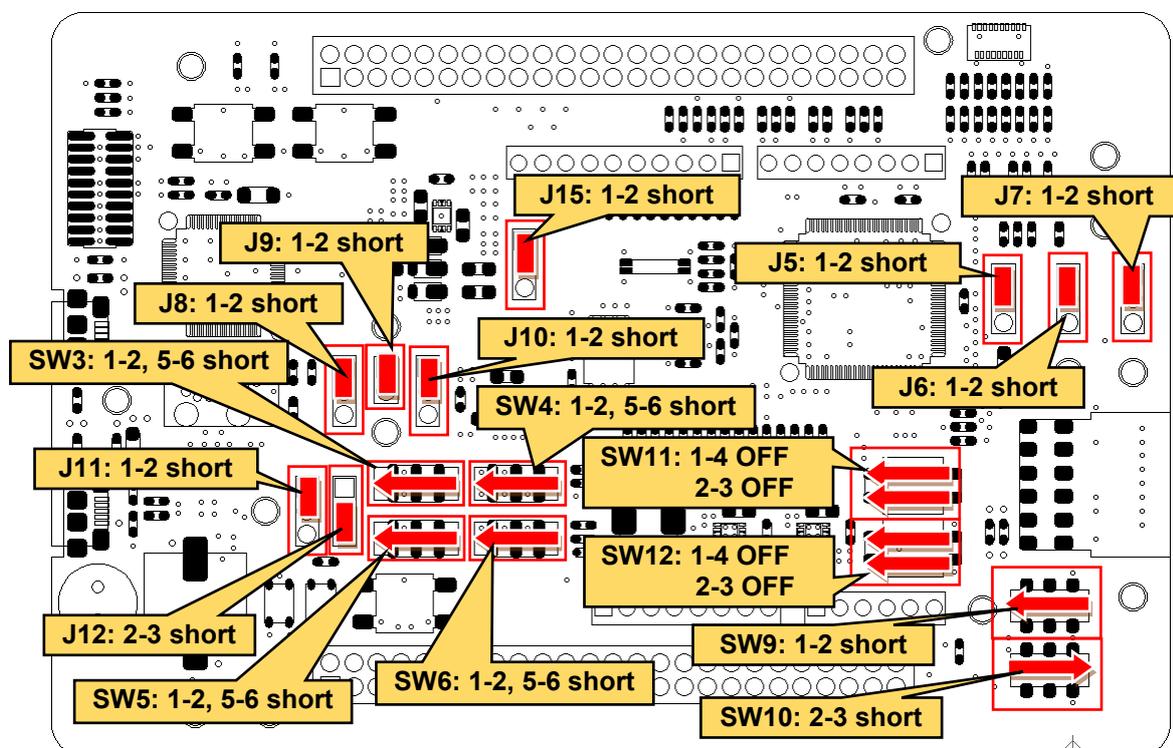


Figure 2-8: Component Layout and Settings

Table 2-1: Board Initial Settings

Item	Function	Setting	
SW3, SW5	Operation mode setting (Emulator setting)	1-2, 5-6: short	Normal mode (using J-Link™ OB)
SW4, SW6	Operation mode setting	1-2, 5-6: short	Normal mode
SW9	Start-up mode setting	1-2: short	Normal start-up
SW10		2-3: short	
SW11, SW12	Internal LDO setting	1-4: OFF 2-3: OFF	Internal LDO use
J5	Reference voltage generation circuit setting	1-2: short	Reference voltage generation circuit not used
J6	IOVCC0 power supply setting	1-2: short	Use output voltage from DCDC converter
J7	IOVCC1 power supply setting	1-2: short	Use output voltage from DCDC converter
J8	Operation mode setting	1-2: short	Normal operation
J9	Current measurement setting	1-2: short	Current measurement not performed
J10	Operation mode setting	1-2: short	Normal start-up
J11	Supercapacitor charging method selection	1-2: short	Charge from external power supply
J12	Secondary battery selection	2-3: short	Supercapacitor
J15	Operation mode setting	1-2: short	Normal start-up

3.Internal Board Connections

Figure 3-1 shows the connectivity between Evaluation Kit and RE01. The pin connections are listed in Table 3-1 and Table 3-2.

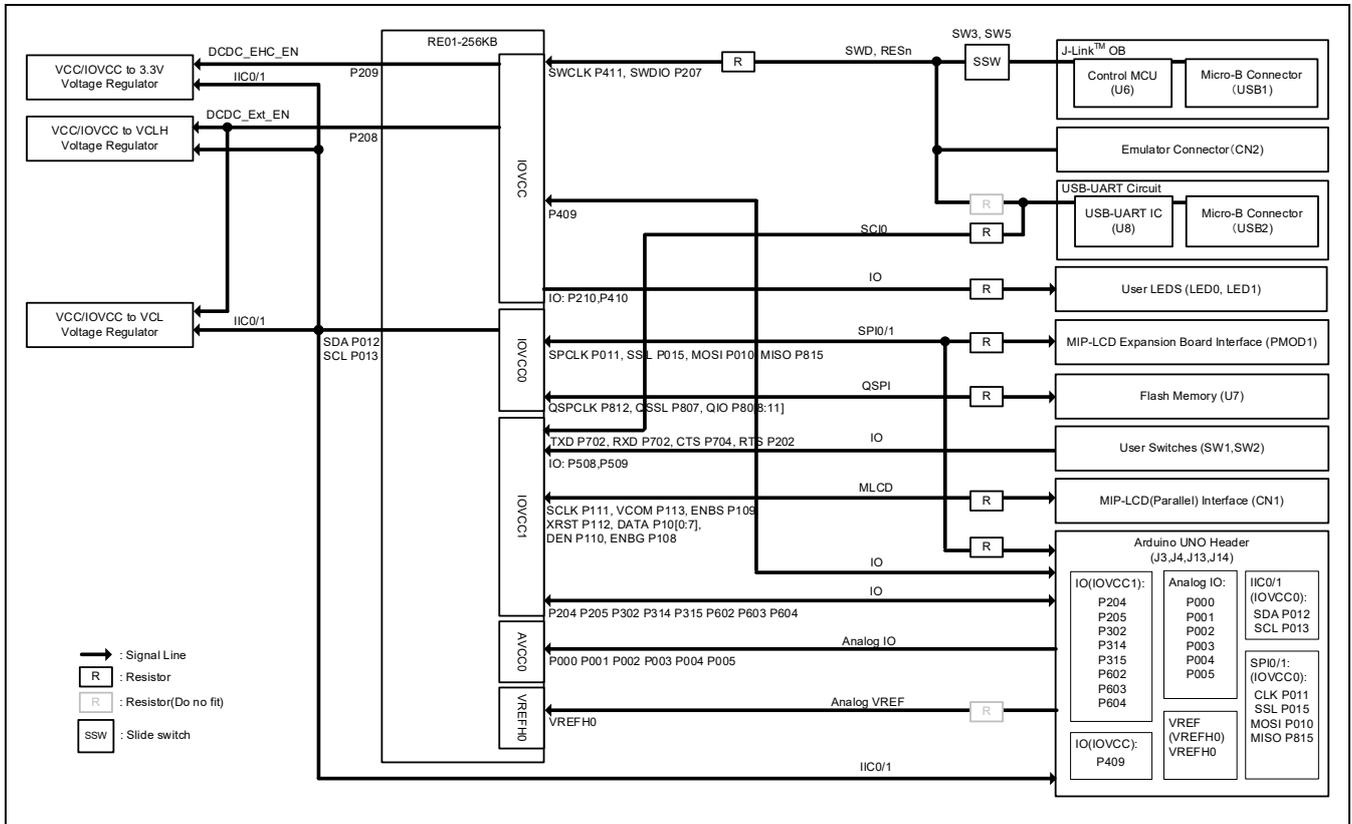


Figure 3-1: Internal Board Block Diagram

Table 3-1: List of RE01 functions, pin number and header connections(1/2)

Category	Function	Port	RE01 Pin No.	Main board Pin header	Power Domain
Clock	EXTAL	-	13	-	IOVCC
	XTAL	-	12	-	IOVCC
	XCIN	-	10	-	IOVCC
	XCOU	-	9	-	IOVCC
Switch	RES	RES#	23	J1-23	IOVCC
	SW1	P509	74	J2-24	IOVCC1
	SW2	P508	75	J2-25	IOVCC1
LED	LED0	P210	32	J1-32	IOVCC
	LED1	P410	17	J1-17	IOVCC
PMOD*	PMOD_SSLA1_B_P015	P015	92	J2-42	IOVCC0
	PMOD_MOSIA_B_P010	P010	97	J2-47	IOVCC0
	PMOD_MISOA_B_CTS4_C	P815	98	J2-48	IOVCC0
	PMOD_RSPCKA_B_P011	P011	96	J2-46	IOVCC0
	PMOD_INT_AGTWOA1_B_P814	P814	99	J2-49	IOVCC0
	PMOD_RESET_RXD4_C	P813	100	J2-50	IOVCC0
	PMOD_IO0_P014	P014	93	J2-43	IOVCC0
	PMOD_IO1	P806	7	J1-7	IOVCC0
USB-Serial	USB_SCI_TXD	P703	40	J1-40	IOVCC
	USB_SCI_RXD	P702	41	J1-41	IOVCC
	USB_SCI_CTS	P704	39	J1-39	IOVCC1
	USB_SCI_RTS	P202	38	J1-38	IOVCC1
MIP-LCD	MLCD_VCOM	P113	56	J2-6	IOVCC1
	MLCD_ENBS	P109	60	J2-10	IOVCC1
	MLCD_XRST	P112	57	J2-7	IOVCC1
	MLCD_SI7	P100	71	J2-21	IOVCC1
	MLCD_SI6	P101	70	J2-20	IOVCC1
	MLCD_SI5	P102	69	J2-19	IOVCC1
	MLCD_SI4	P103	68	J2-18	IOVCC1
	MLCD_SI3	P104	67	J2-17	IOVCC1
	MLCD_SI2	P105	66	J2-16	IOVCC1
	MLCD_SI1	P106	65	J2-15	IOVCC1
	MLCD_SI0	P107	64	J2-64	IOVCC1
	MLCD_DEN	P110	59	J2-9	IOVCC1
	MLCD_SCLK	P111	58	J2-8	IOVCC1
	MLCD_ENBG	P108	61	J2-11	IOVCC1

*: Please refer to Section 8.5 Pmod™ Interface for the relationship with the pin number of the PMOD connector.

Table 3-2: List of RE01 functions, pin number and header connections (2/2)

Category	Function	Port	RE01 Pin No.	Main board Pin header	Power Domain
Flash Memory	QSPI_QSSL_A	P807	6	J1-6	IOVCC0
	QSPI_QIO1_A	P810	3	J1-3	IOVCC0
	QSPI_QIO2_A	P809	4	J1-4	IOVCC0
	QSPI_QIO0_A	P811	2	J1-2	IOVCC0
	QSPI_QSPCLK_A	P812	1	J1-1	IOVCC0
	QSPI_QIO3_A	P808	5	J1-5	IOVCC0
Arduino UNO (J3)	ARDUINO_IO8	P409	18	J1-18/J3-1	IOVCC
	ARDUINO_IO9_GTI0C2A_B	P302	48	J1-48/J3-2	IOVCC1
	ARDUINO_SS1A1_B	P015	92	J2-42/J3-3	IOVCC0
	ARDUINO_MOSIA_B	P010	97	J2-47/J3-4	IOVCC0
	ARDUINO_MISOA_B	P815	98	J2-48/J3-5	IOVCC0
	ARDUINO_RSPCKA_B	P011	96	J2-46/J3-6	IOVCC0
	ARDUINO_VREF**	-	84	J3-8	VREFH0
	ARDUINO_SDA0*	P012	95	J2-45/J3-9	IOVCC0
	ARDUINO_SCL0*	P013	94	J2-44/J3-10	IOVCC0
Arduino UNO (J4)	ARDUINO_IO0_RXD5_B	P314	45	J1-45/J4-1	IOVCC1
	ARDUINO_IO1_TXD5_B	P315	44	J1-44/J4-2	IOVCC1
	ARDUINO_IO2_IRQ7_B	P204	36	J1-36/J4-3	IOVCC1
	ARDUINO_IO3_IRQ8_C	P205	35	J1-35/J4-4	IOVCC1
	ARDUINO_IO4	P602	53	J2-3/J4-5	IOVCC1
	ARDUINO_IO5_GTI0C5A_B	P603	52	J2-2/J4-6	IOVCC1
	ARDUINO_IO6_GTI0C5B_B	P604	51	J2-1/J4-7	IOVCC1
	ARDUINO_IO7	P300	50	J1-50/J4-8	IOVCC1
Arduino UNO (J13)	IOVCC0**/IOVCC1/AVCC0**	-	91/46/78	J13-1	IOVCC0/IOVCC1/ AVCC0
	LP_3V3	-	-	J13-2	-
	RESn	RES#	23	J1-23/ J13-3	IOVCC
	LP_3V3	-	-	J13-4	-
	Board_5V	-	-	J13-5	-
	VCC_MCU	-	14	J1-14/J13-8	IOVCC
Arduino UNO (J14)	ARDUINO_AN000	P000	89	J2-49/J14-1	AVCC0
	ARDUINO_AN001	P001	88	J2-48/J14-2	AVCC0
	ARDUINO_AN002	P002	87	J2-37/J14-3	AVCC0
	ARDUINO_AN003	P003	86	J2-36/J14-4	AVCC0
	ARDUINO_AN004	P004	85	J2-35/J14-5	AVCC0
	ARDUINO_AN005	P005	82	J2-32/J14-6	AVCC0

*: The default kit configuration uses a transfer rate of 50kbps or less. To increase the transfer rate, change the resistor values (R21, R22).

** : Not connected by default. Please change the resistor based on your application.

4. Power Supply

4.1 Power Supply System

Figure 4-1 shows power supply system diagram of Evaluation kit.

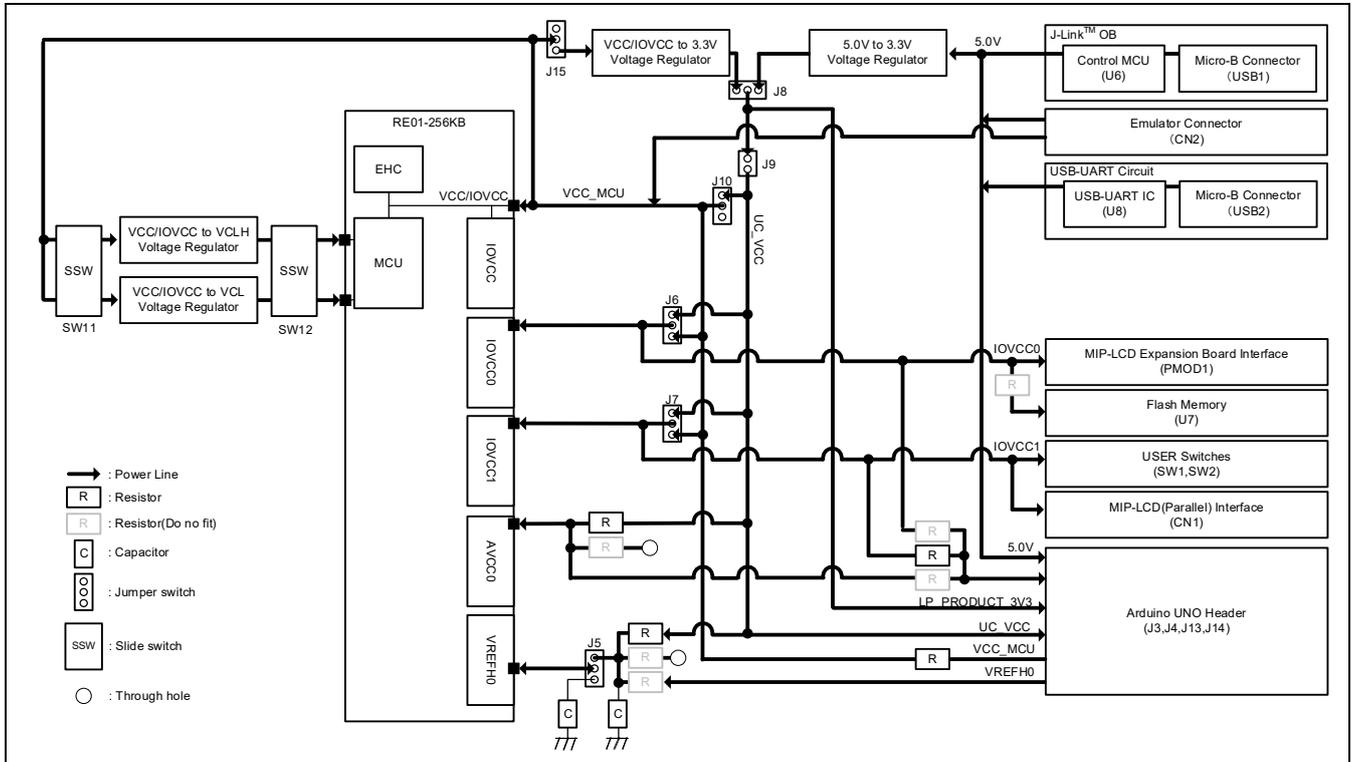


Figure 4-1: Power Supply System Diagram

4.2 Power Supply Source

Evaluation Kit is supplied by emulator through USB cable. The details of power supply components are shown in **Figure 4-2** and **Table 4-1**. When the Evaluation Kit is connected to another system then that system should supply power to the Evaluation Kit.

When operating in stand-alone mode, connect a USB cable to USB1 or USB2 and supply the voltage through VBUS. At that time, do not use J-Link™ OB or USB serial function.

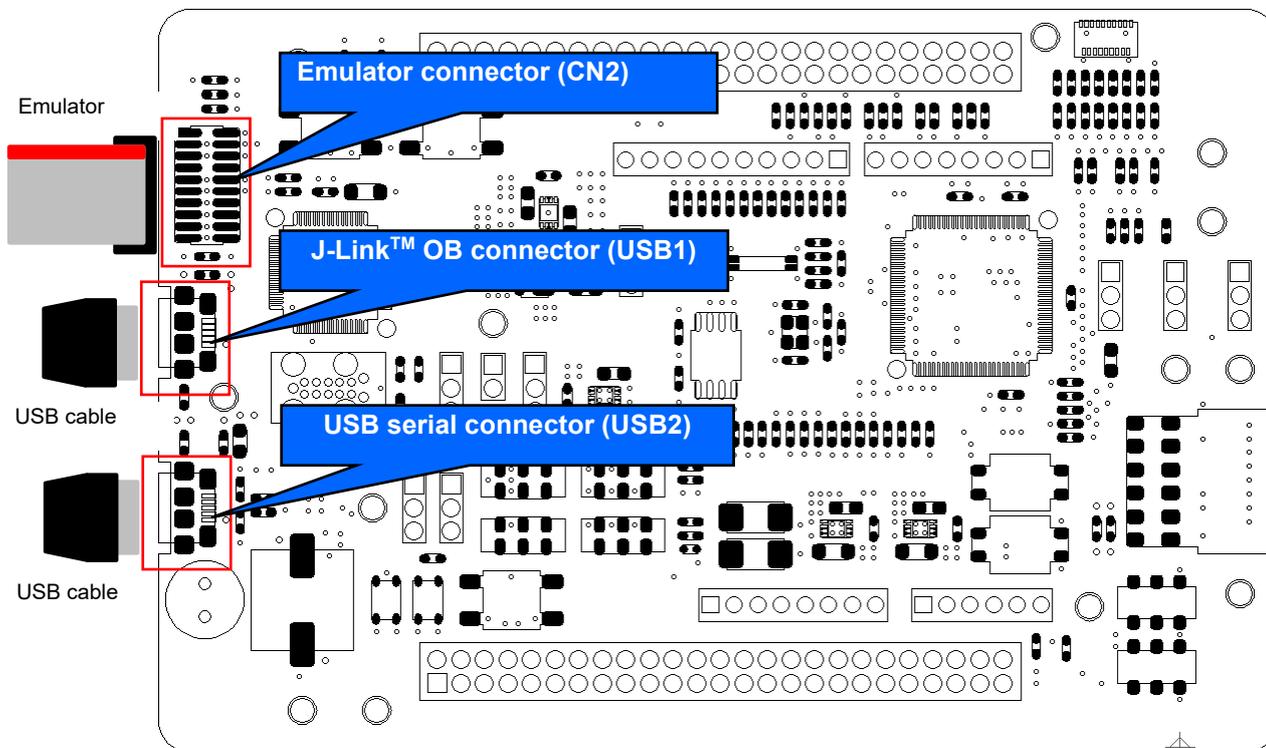


Figure 4-2: Components Layout (power supply)

Table 4-1: Power Supply Specifications

Source	Supply voltage	Supply current
I-jet™ (CN2)	5V	Maximum 420mA
J-Link™ OB (USB1)	5V	Maximum 500mA
J-Link™ (CN2)	5V	Maximum 300mA
E2 (CN2)	3.3V	Maximum 200mA
USB serial (USB2)	5V	Maximum 500mA

4.3 External Power Supply

It is possible to supply voltage to RE01 power terminal by using external power supply. This allows the entire or individual power domain to operate at any voltage (1.62 – 3.6V). Normally, the emulator supplies voltage equivalent to 3.3V, which is the voltage value after reduction by the regulator. (excluding device which can supply 3.3V)

4.3.1 All power pins

Figure 4-3 shows the component layout. Follow the steps below when supplying voltage from external power supply to all RE01 power pins:

1. Set SW3 and SW5 to EHC.
2. Open J8 jumper pin 1-2 and 2-3.
3. Supply voltage (1.62V-3.6V) from pin 2 of J8 or T6 using an external power supply.

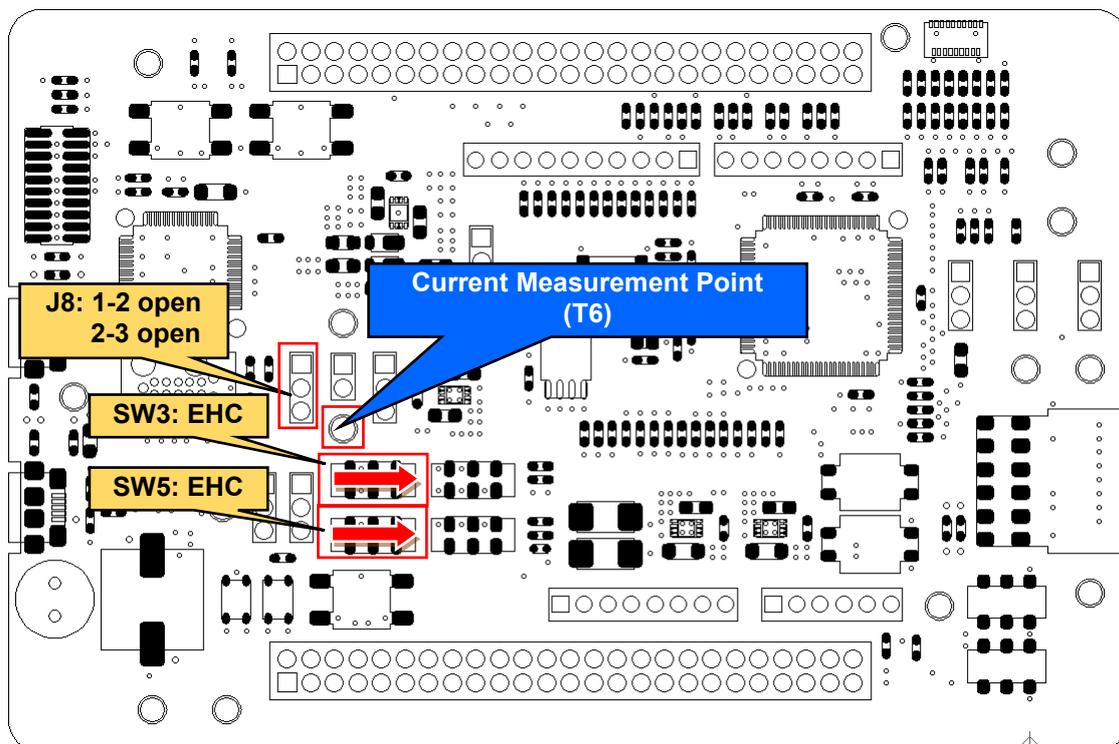


Figure 4-3: Component Layout and Setting (External Power Supply)

Keep the following in mind when using this feature:

- Debugging using J-Link OB is not possible. Please use another emulator. For details on the other emulators, refer to chapter 6 Debug.
- When using the E2 emulator, do not supply power from the emulator.

4.3.2 IOVCC0

Figure 4-4 shows the component layout. Follow the steps below when supplying voltage from external power supply to IOVCC0 pin:

1. Open J6 jumper pin 1-2 and 2-3.
2. Supply voltage (1.62V – 3.6V) to any power supply pins other than IOVCC0 pin.
3. Supply voltage to T4.

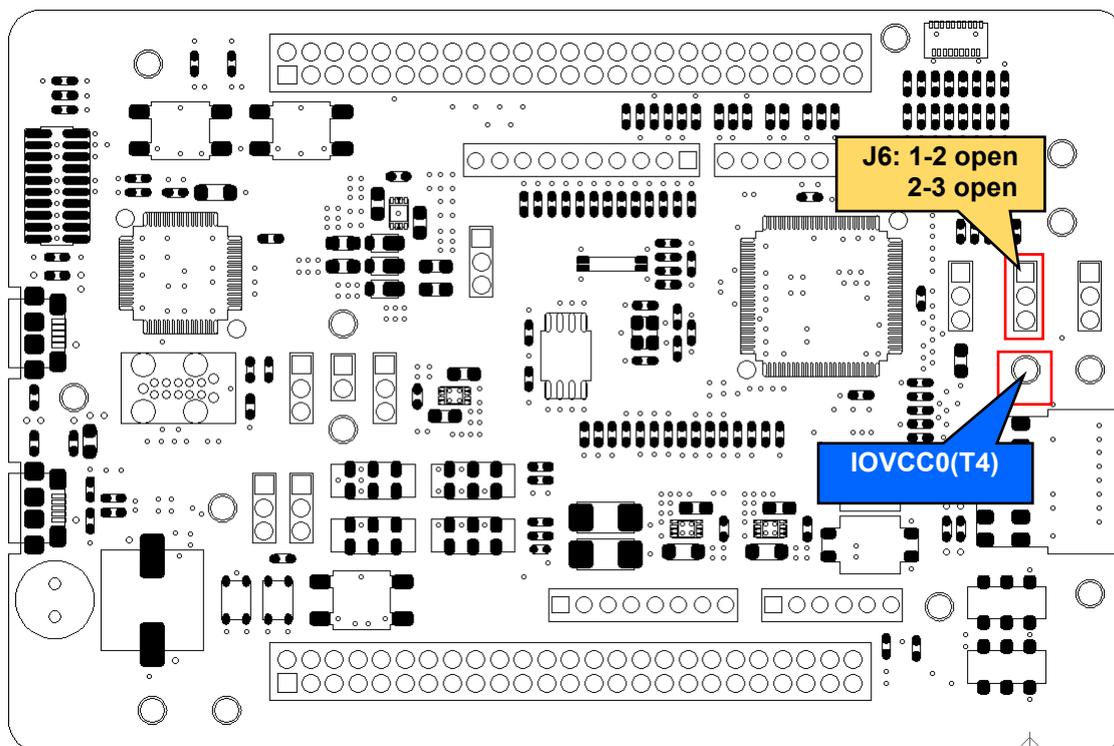


Figure 4-4: Component Layout and setting (External Power Supply)

4.3.3 IOVCC1

Figure 4-5 shows the component layout. Follow the steps below when supplying voltage from external power supply to IOVCC1 pin:

1. Open J7 jumper pin 1-2 and 2-3.
2. Supply voltage (1.62V – 3.6V) to any power supply pins other than IOVCC1 pin.
3. Supply voltage to T1.

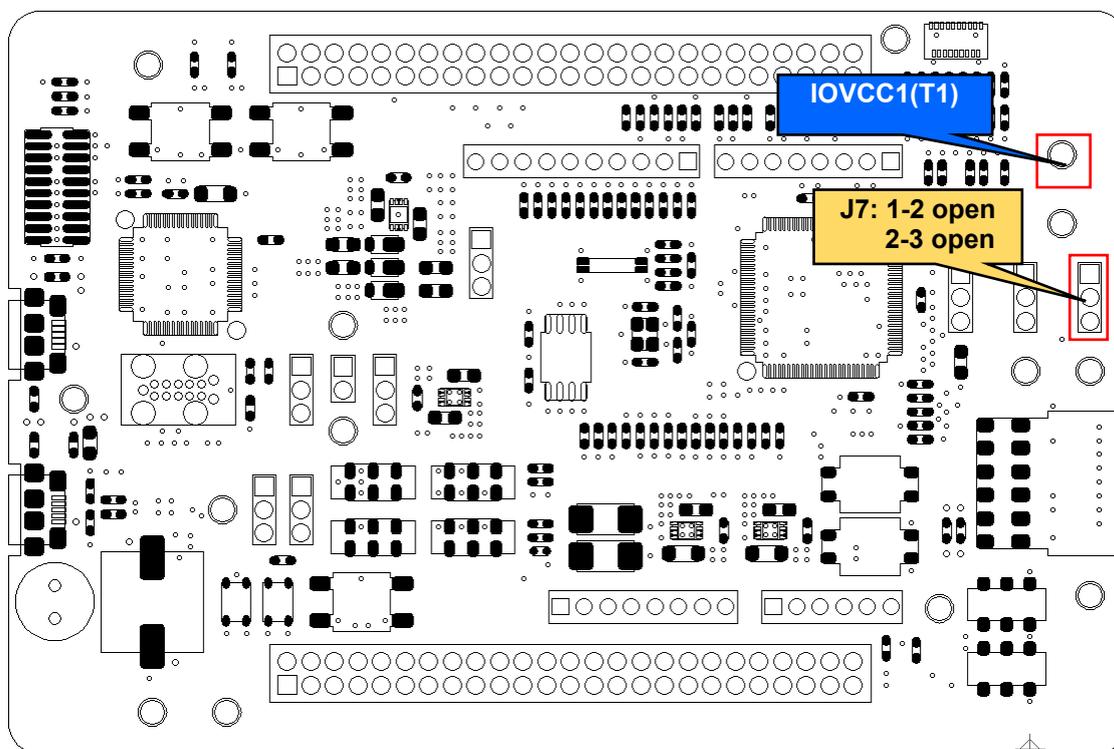


Figure 4-5: Component Layout and Setting (External Power Supply)

4.3.4 AVCC0

The component layout are shown in **Figure 4-6** and **Figure 4-7**. Follow the steps below when supplying voltage from external power supply to AVCC0 pin:

1. Remove R108.
2. Fit R107.
3. Supply voltage (1.62V – 3.6V) to any power supply pins other than AVCC0 pin.
4. Supply voltage to T5.

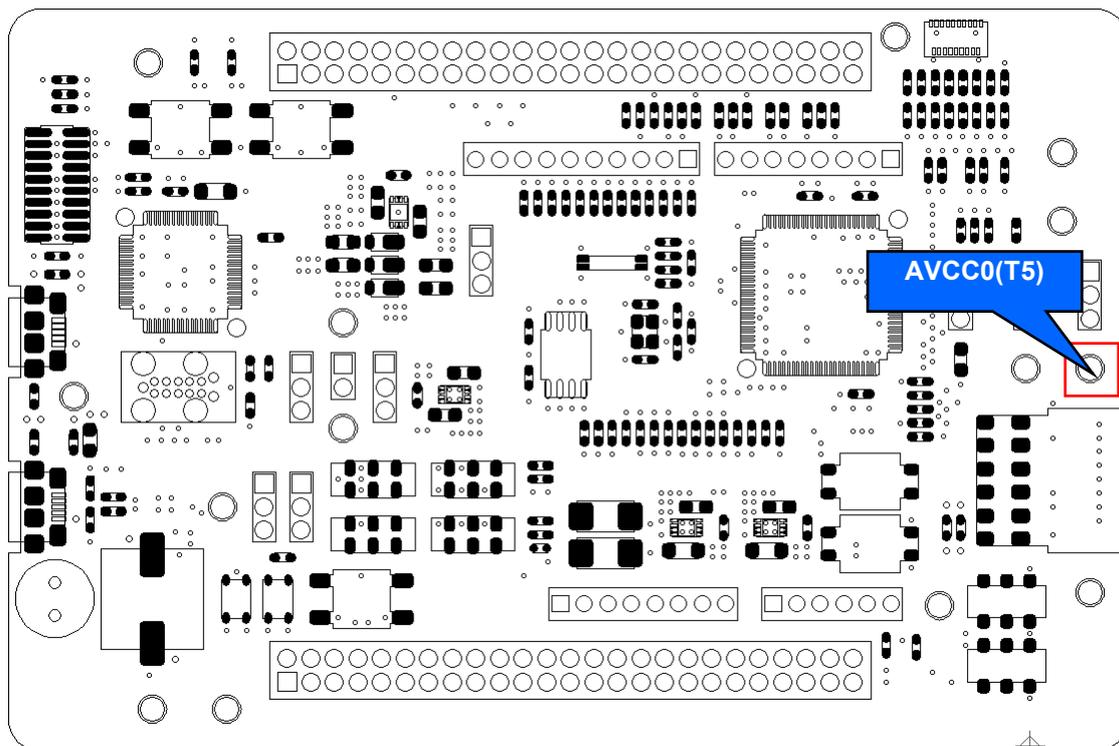


Figure 4-6: Component Layout (External Power Supply (Top))

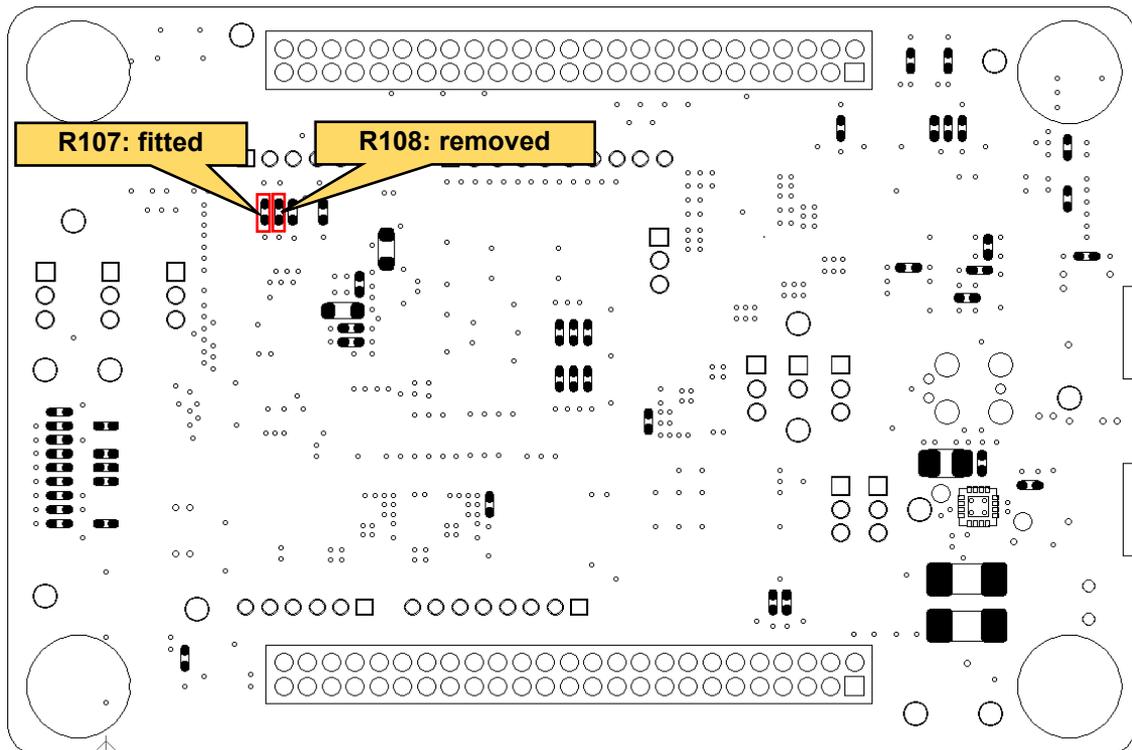


Figure 4-7: Component Layout (External Power Supply (Bottom))

4.3.5 VREFH0

The component layout and settings are shown in **Figure 4-8**. Follow the steps below when supplying voltage from external power supply to VREF0 pin:

1. Remove R54 and R55
2. Fit R56.
3. Short J5 jumper pin 1-2.
4. Supply voltage (1.62V – AVCC0) to any power supply pins other than VREF0 pin.
5. Supply voltage to T2.

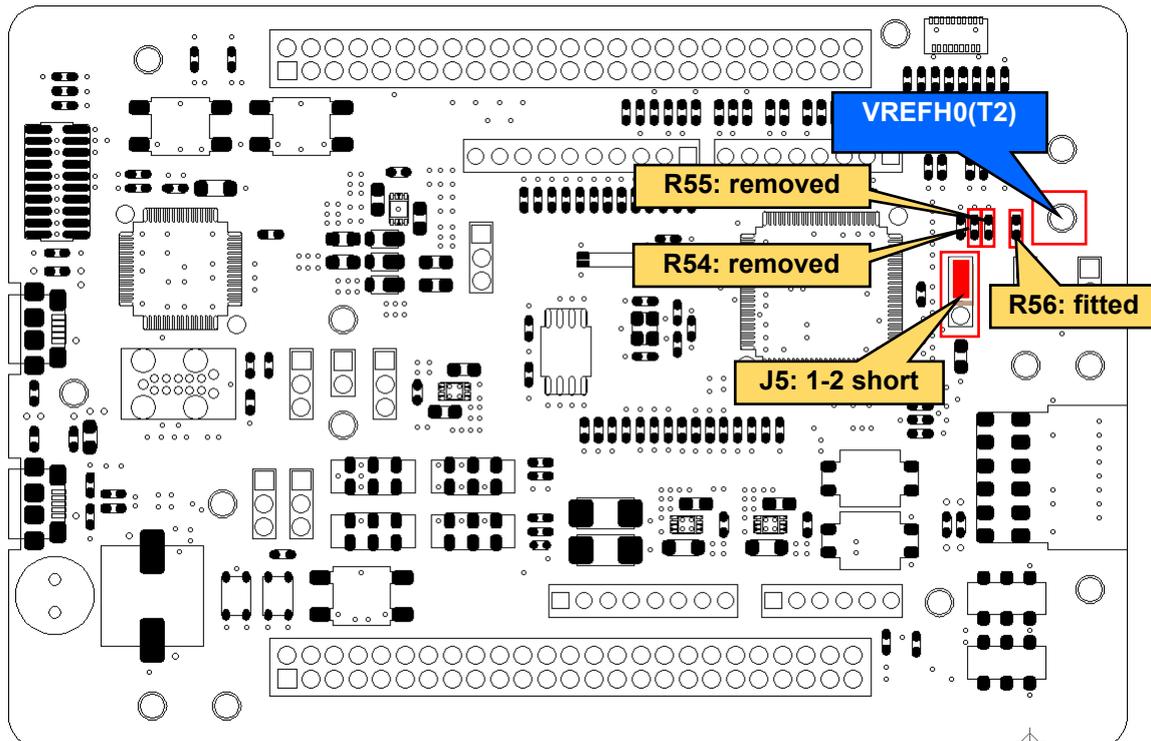


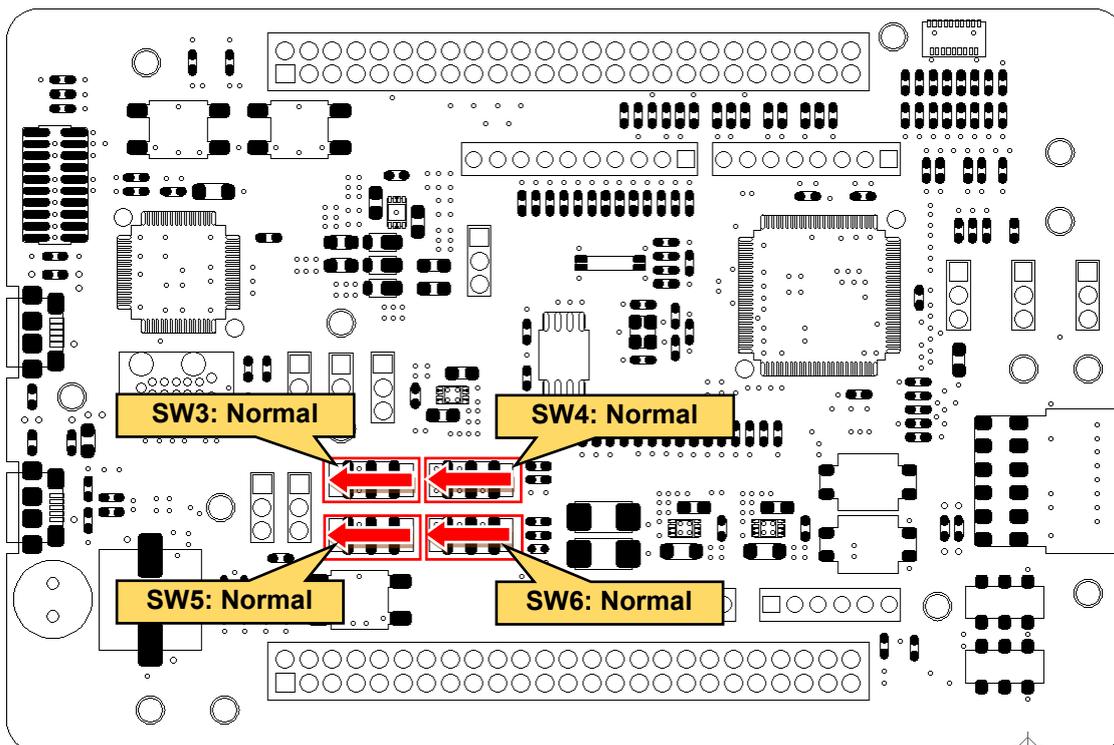
Figure 4-8: Component Layout and Settings (External Power Supply)

5. Operation/Start-up Mode

Evaluation Kit for RE01 supports 2 operation and start-up modes: normal and energy harvesting (hereinafter, EHC).

5.1 Normal Operation

In normal operation, power is supplied from emulator or external power supply. To use normal operation mode, several switch settings must be made. The layout and details of the switch setting are shown in **Figure 5-1** and **Table 5-1**.



Other settings will be as per the default kit configuration, as supplied.

Figure 5-1: Component Layout and Settings (Normal Operation)

Table 5-1: Configuration Details (Normal Operation)

Component Name	Setting	
SW3, SW5 ^{*1}	1-2, 5-6	Normal Operation ^{*2}
SW4, SW6	1-2, 5-6	Normal Operation ^{*2}

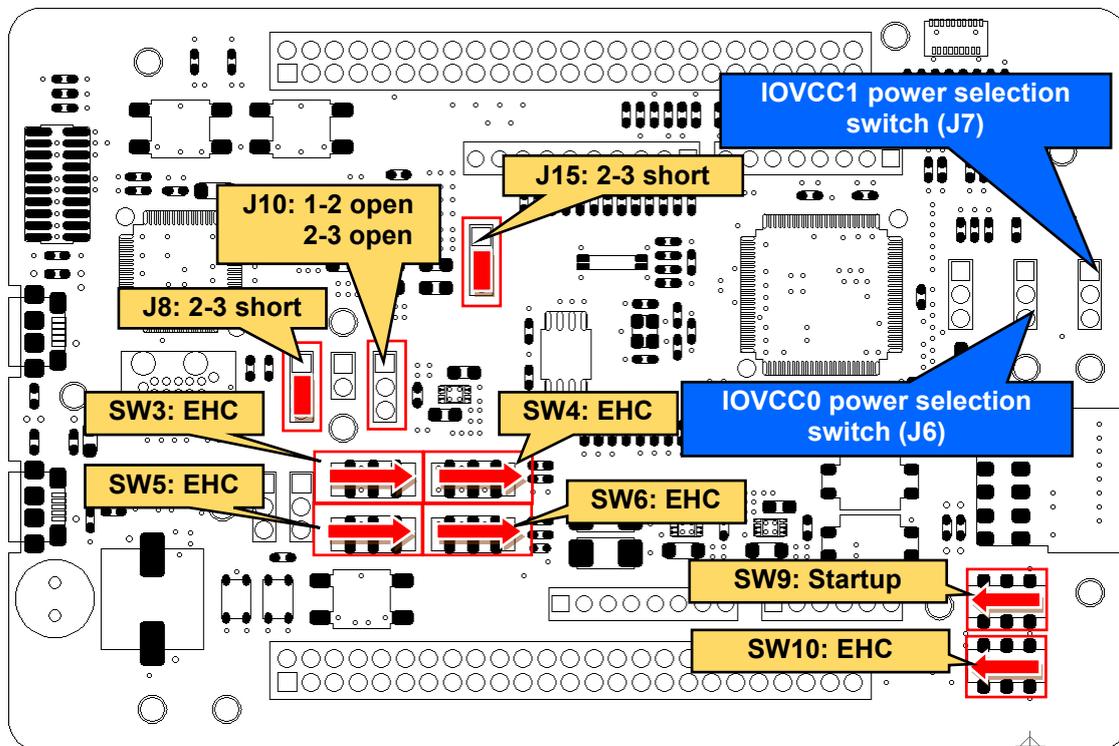
^{*1}: Also depends on debug function used. For more information, refer to Section 6. Debug.

^{*2}: The settings are supported in default configuration, as supplied.

5.2 EHC Operation

RE01 supports energy harvesting function. In EHC operation, the power is supplied from the included solar panel. User circuit can start operating when voltage is supplied to VSC_VCC pin of RE01.

Switch settings are required to operate the energy harvesting function. The related component layout and setting details are shown in **Figure 5-2**, **Table 5-2**, and **Table 5-3**. For more information of energy harvesting control circuit for RE01 specifications, refer to RE01 Group User's Manual's Hardware.



Other settings will be as per the default kit configuration, as supplied.

Figure 5-2: Component Layout and Settings (EHC Operation)

Table 5-2: Configuration Details (EHC Operation)

Component Name	Setting	
J8	2-3	short
J10	1-2, 2-3	open
J15	2-3	short
SW3–SW6	2-3, 6-7	EHC
SW9	1-2	Startup ^{*1}
SW10	1-2	EHC

^{*1}: The setting is supported in default configuration, as supplied.

Table 5-3: Switch Details (J6, J7)

Component Name	Settings	
J6	1-2	Supply voltage generated by DC/DC converter to IOVCC0 pin of RE01
	2-3	Supply voltage generated by VCC/IOVCC pin of RE01 to IOVCC0 pin of RE01
J7	1-2	Supply voltage generated by DC/DC converter to IOVCC1 pin of RE01
	2-3	Supply voltage generated by VCC/IOVCC pin of RE01 to IOVCC1 pin of RE01

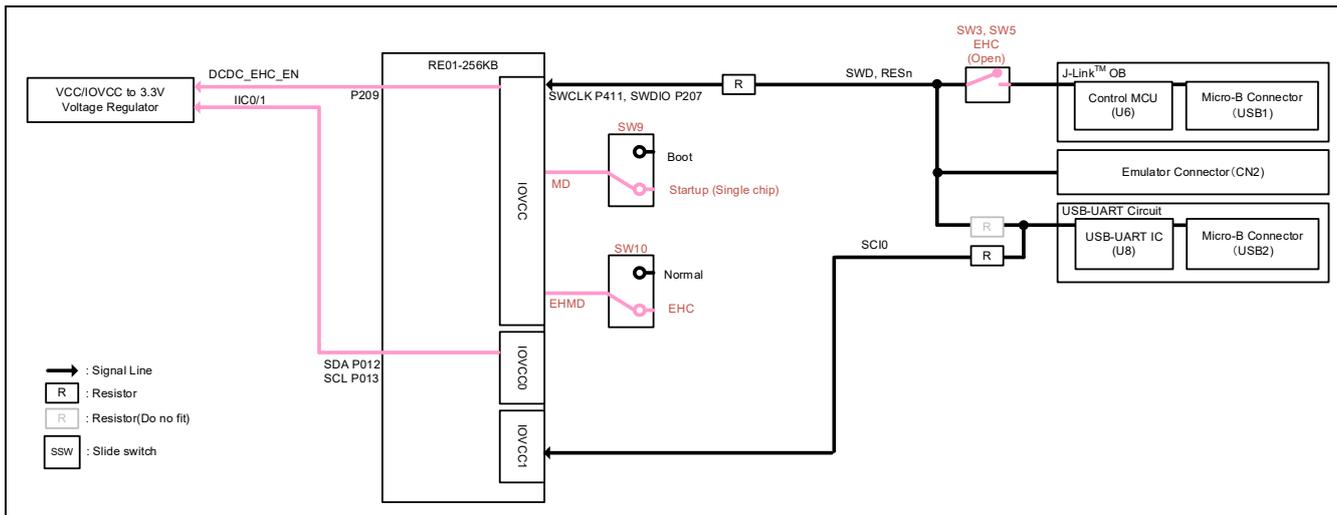


Figure 5-3: Block diagram of Signal line (EHC Operation)

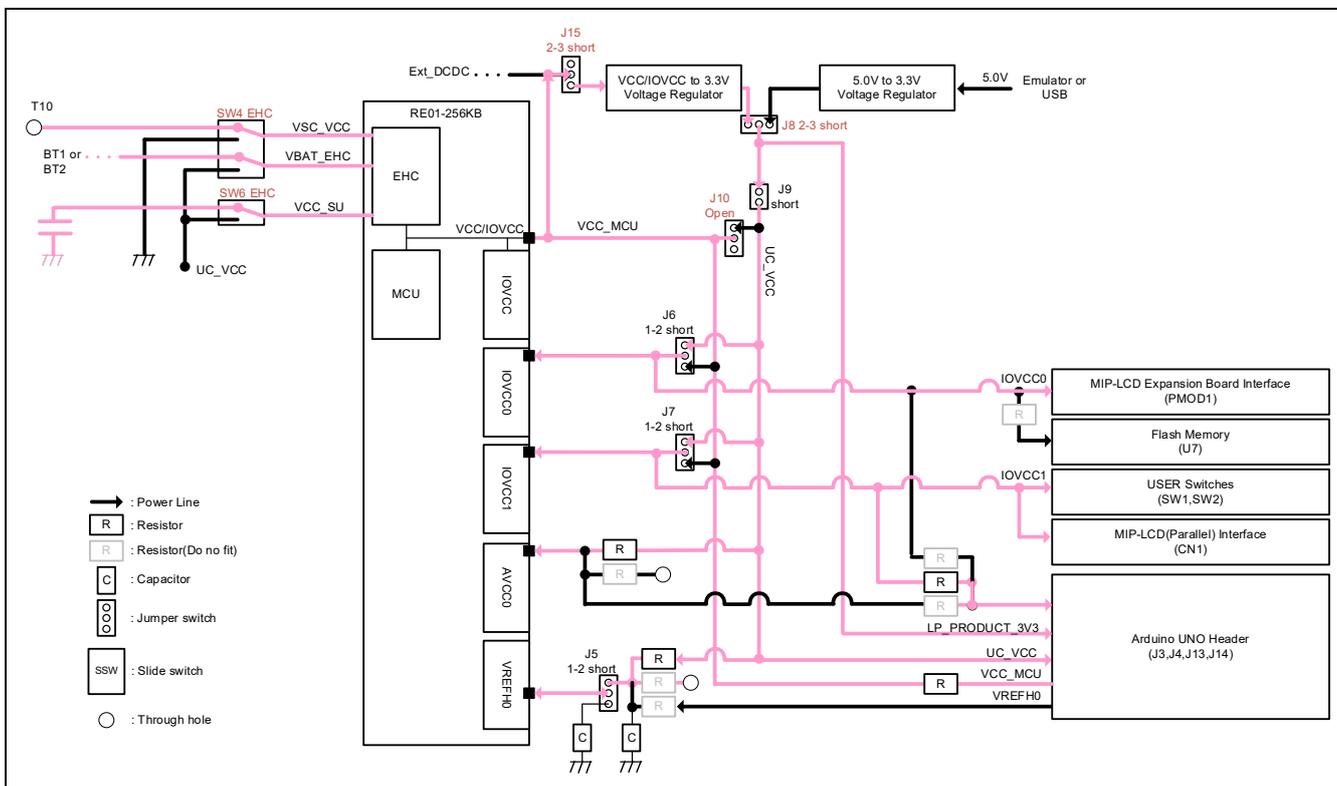


Figure 5-4: Block diagram of Power line (EHC Operation)

5.2.1 Solar Panel

This product is equipped with solar panel interface (T9, T10). The component layout and details are displayed in **Figure 5-5** and **Table 5-4**. Connect the included solar panel to T9 and T10 using the attached IC clip.

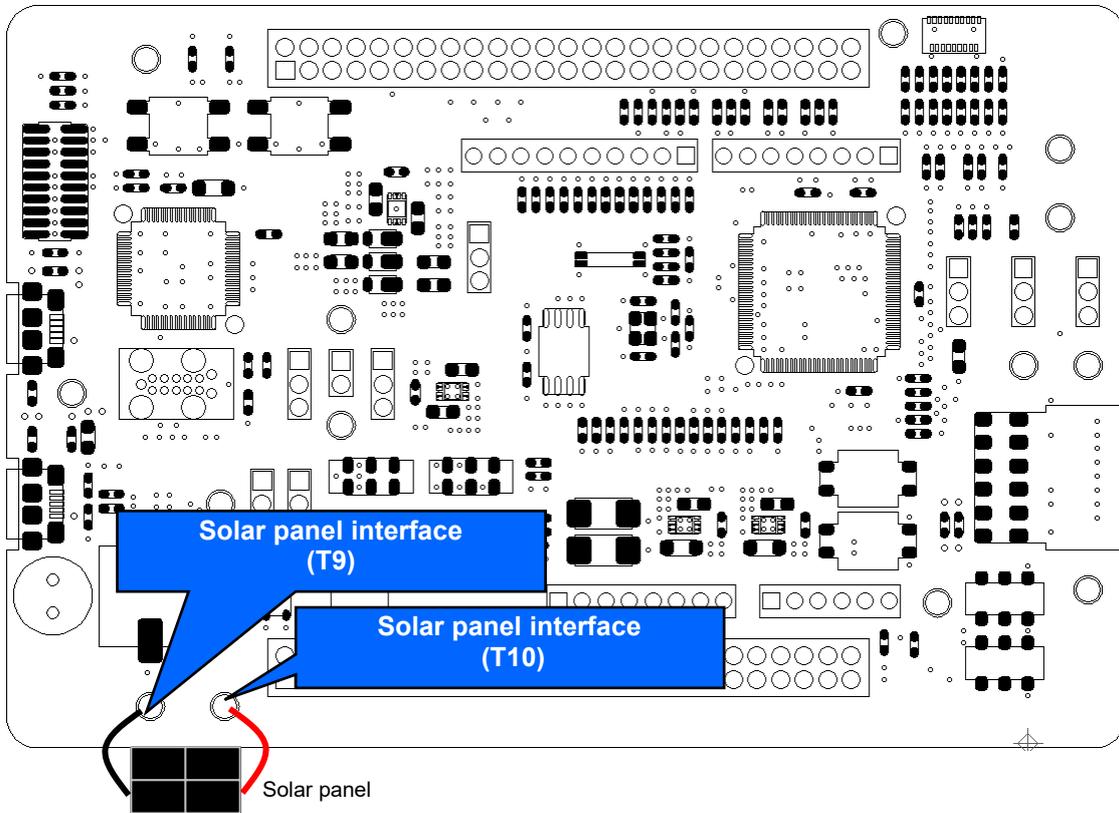


Figure 5-5: Component Layout (EHC Operation)

Table 5-4: Solar Panel Interface

Solar Panel Interface (T9, T10)							
Pin	Name	RE01		Pin	Name	RE01	
		Port	Pin			Port	Pin
T9	GROUND	-	-	T10	-	VSC_VCC	29

5.2.2 Supercapacitor / External Battery

Supercapacitor / external battery can be connected to VBAT_EHC pin in RE01. Switch settings are required in order to use supercapacitor / external battery. Component layout and configuration details are shown in **Figure 5-6** and **Table 5-5**.

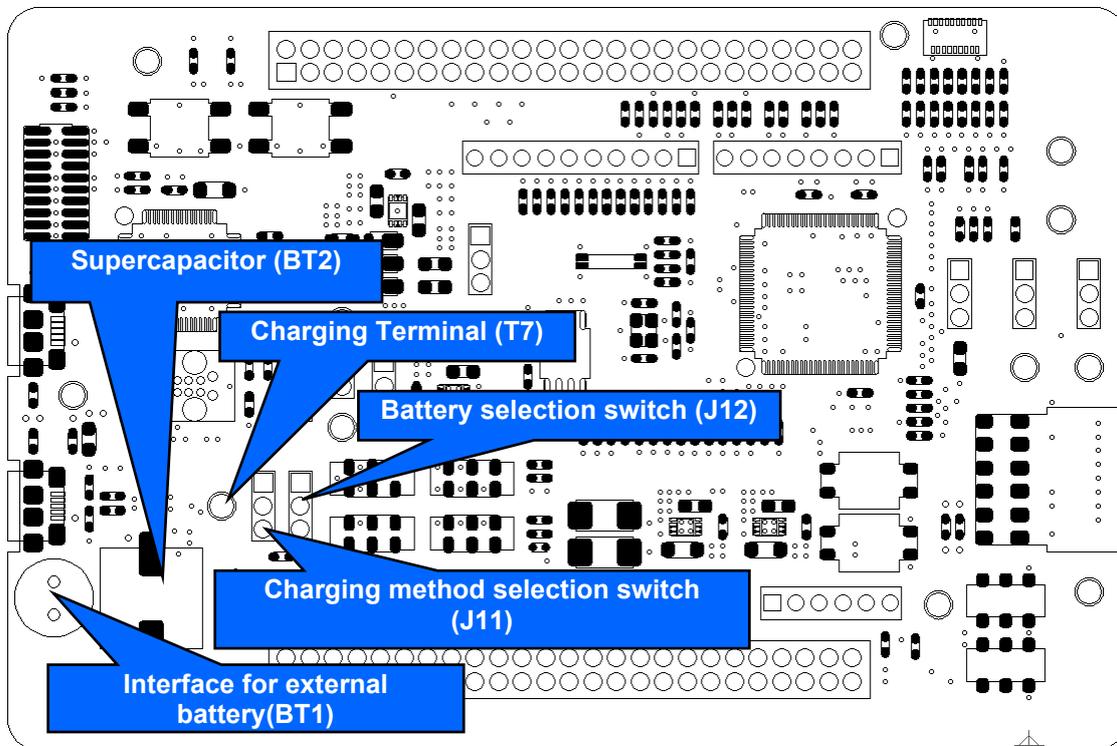


Figure 5-6: Component Layout (EHC Operation)

Table 5-5: Switch Configuration(J12)

Component Name	Setting	
J12	1-2	External battery
	2-3	Supercapacitor

When using supercapacitor, the supercapacitor itself may need to be charged because it may have been discharged. There are 2 charging methods that can be selected through switch setting. The related component layout and settings are shown in **Figure 5-6** and **Table 5-6**.

When charging, use J12 in the open setting.

- Charging from external power supply
Connect a stabilized power supply to the charging terminal (T7).
- Charging from the voltage converted on board supplied by an emulator
Connect an emulator to CN2 port or a USB cable to USB1/USB2 port.
Set the charging voltage (2.6V or 3.0V) to the value specified in Secondary Battery (VBAT) Charging Voltage Select Bit (VBATSEL) in Option Function Select Register 1 (OFS1).

Table 5-6: Switch Configuration(J11)

Component Name	Setting	
J11	1-2	Charging from external power supply
	2-3	Charge by using board voltage

Set J11 to 1-2 after charging is completed.

Make sure that the external battery is already installed before selecting the external battery. The component layout and setting are described in **Figure 5-6** and **Table 5-7**.

The recommended external battery is SLB Series (Nichicon). Because the included solar panel*1 generates 42μA, it might take time to charge the recommended external battery, depending on the operation setting of RE01. Depending on your evaluation content, consider charging before mounting.

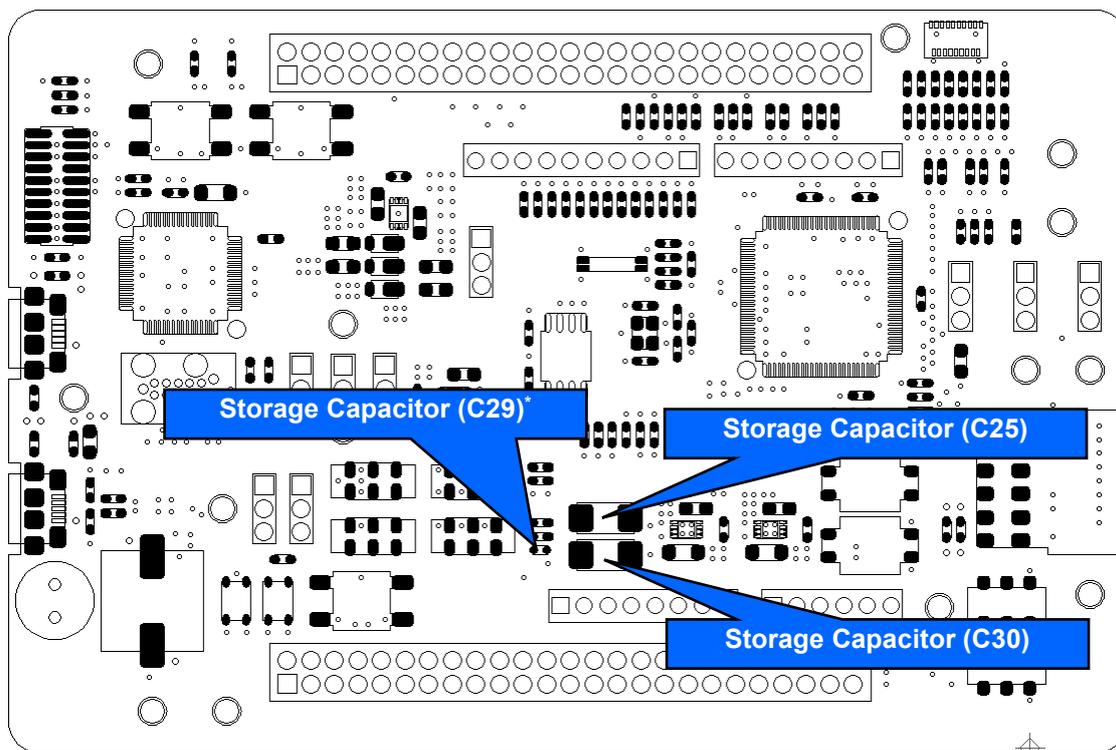
*1: Panasonic AM-1815CA operating voltage 3.0 V, operating current 42.0μA (white fluorescent lamp-200lx(25°C))

Table 5-7: External Battery (BT2)

External Battery (BT2)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	-	VBAT_EHC	28	2	GROUND	-	-

5.2.3 Storage Capacitor

RE01 has a 200uF capacitor connected to the VCC_SU pin. Depending on your board environment, it may be necessary to change the capacitor’s capacitance connected to VCC_SU pin. If necessary, mount a capacitor on C29 (size: 1608). Component layout is shown in **Figure 5-7**. For more information about storage capacitor specifications, refer to RE01 Group User’s Manual’s Hardware.



*: DNF

Figure 5-7: Component Layout (EHC Operation)

5.2.4 DC/DC Converter Control

DC/DC converter must be enabled to supply the voltage to the user circuit when using energy harvesting function. To enable DC/DC converter, output a high level from P209 and make sure that there is enough charging voltage in external battery/supercapacitor. This voltage equals to the value of VBATSEL setting (2.6V or 3.0V).

5.2.5 How to Use

5.2.5.1 When Operating Peripheral Circuits after Steady Operation Period

Follow the steps below to operate peripheral circuits after EHC steady operation period. The settings below are intended for the case where supercapacitor (charged) is used. The program has to be downloaded to RE01 internal flash memory in advance.

Sample code is also available on Renesas website, entitled “Maintenance free power management by RE energy harvesting controller (R01AN4837)”.

1. Follow the setting shown in **Figure 5-2** and **Table 5-2**.
2. Follow the setting shown in **Figure 5-8** and **Table 5-8**.
3. Connect the solar panel to the solar panel interface (T9 and T10).

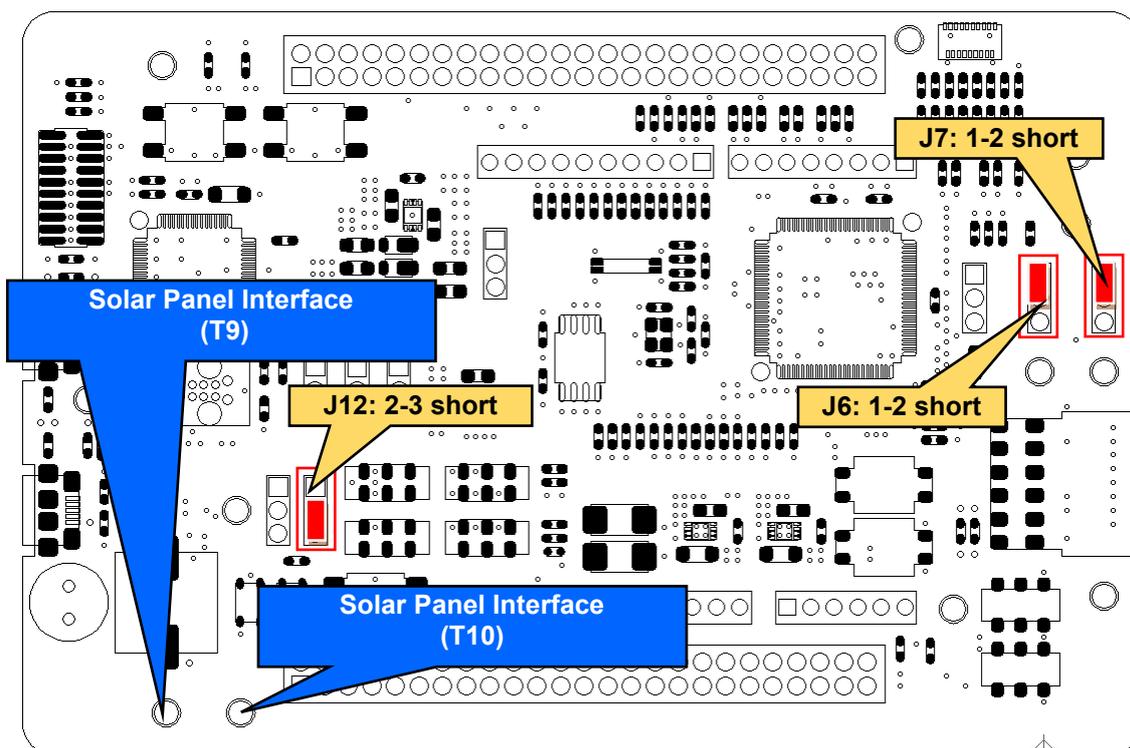


Figure 5-8: Component Layout and Settings (EHC Operation)

Table 5-8: Configuration Details (EHC Operation)

Component Name	Setting	
J6, J7	1-2	short
J12	2-3	short

The settings in the table above are supported in default configuration, as supplied.

5.2.5.2 When using the MIP-LCD Expansion Board During Secondary Battery Charging Period

Follow the steps below to operate MIP LCD expansion board during secondary battery charging period. The setting below are intended for the case where supercapacitor (charged) is used. The program has to be downloaded to RE01 internal flash memory in advance.

Sample code is also available on Renesas website, entitled “Energy harvesting launch operation and quick start SMIP display demo using Evaluation Kit RE01 256KB (R01AN5406)”.

1. Follow the settings shown in **Figure 5-2** and **Table 5-2**.
2. Follow the settings shown in **Figure 5-9** and **Table 5-9**.
3. Connect MIP-LCD expansion board to the PMOD connector (PMOD1). (Refer to Section 8.5.1 MIP-LCD Expansion Board for more details).
4. Connect the solar panel to solar panel interface (T9, T10).

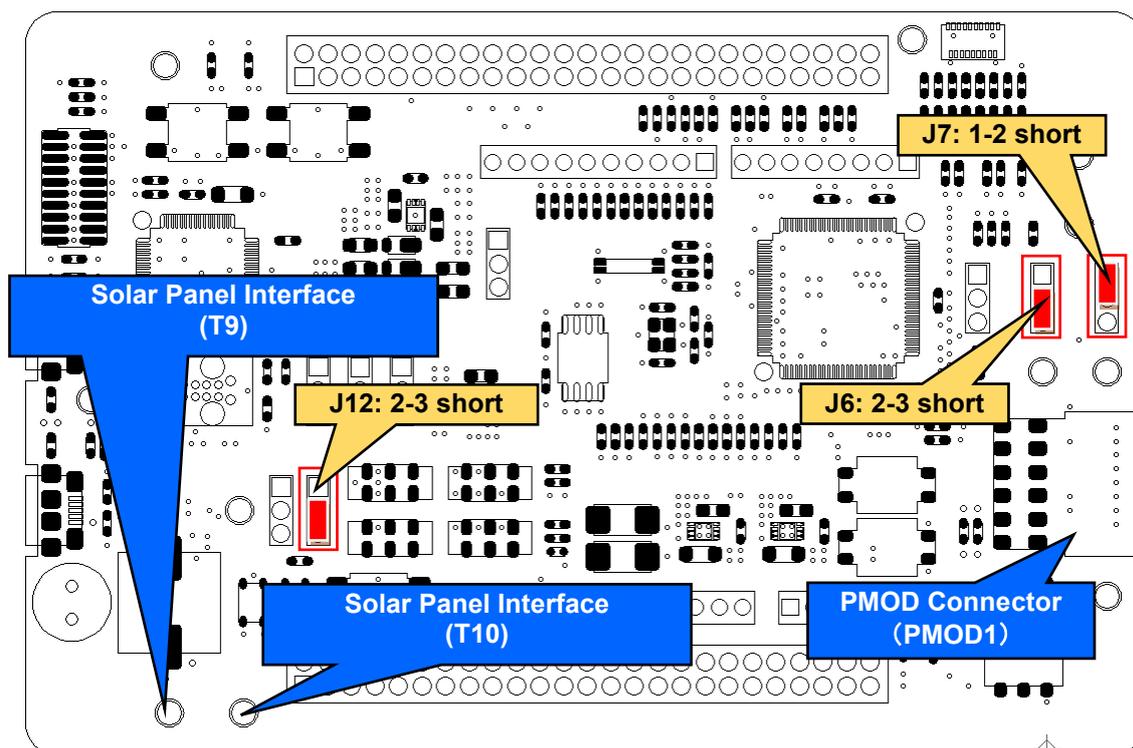


Figure 5-9: Component Layout and Settings (EHC Operation)

Table 5-9: Configuration Details (EHC Operation)

Component Name	Setting	
J6	2-3	short
J7	1-2	short ^{*1}
J12	2-3	short ^{*1}

^{*1}: The settings are supported in default configuration, as supplied.

5.2.5.3 When using Parallel MIP-LCD during Secondary Battery Charging Period

Follow the steps below to operate parallel MIP LCD during secondary battery charging period. The setting below are intended for the case where supercapacitor (charged) is used. The program has to be downloaded to RE01 internal flash memory in advance.

1. Follow the settings shown in **Figure 5-2** and **Table 5-2**.
2. Follow the settings shown in **Figure 5-10** and **Table 5-10**.
3. Connect parallel MIP-LCD to the MIP-LCD connector (CN1). (Refer to Section 8.7 MLCD (Memory In Pixel Liquid Crystal Display) Interface for more details).
4. Connect the solar panel to solar panel interface (T9, T10).

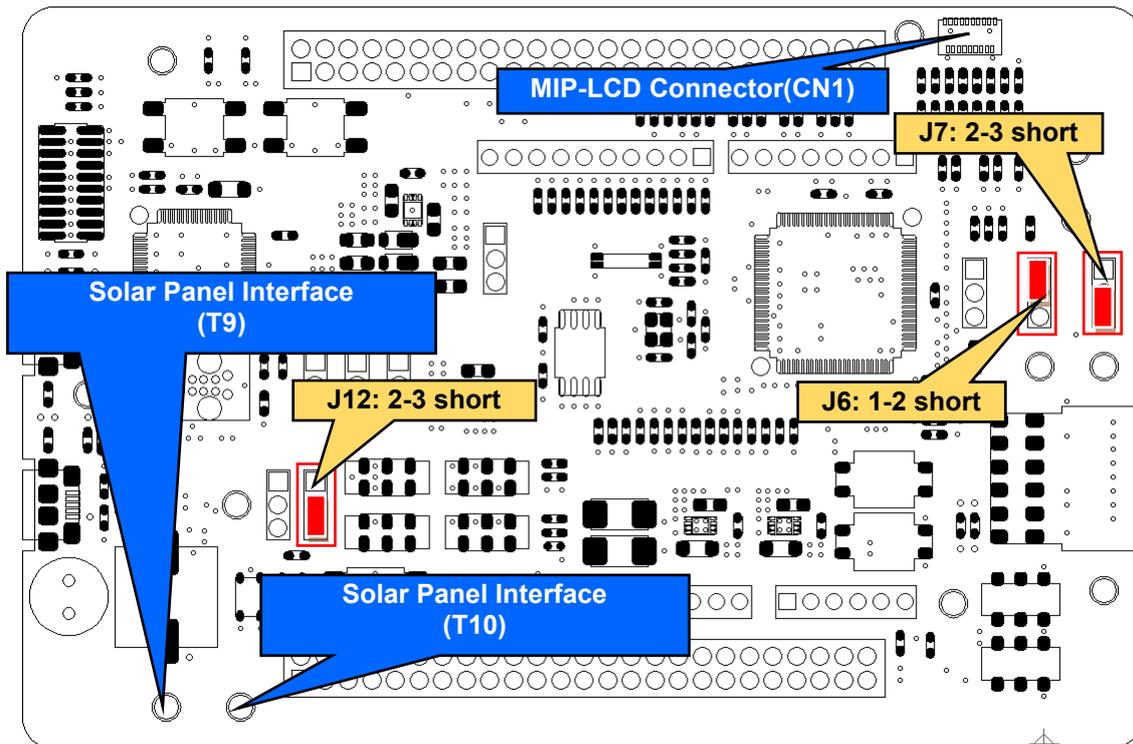


Figure 5-10: Component Layout and Settings (EHC Operation)

Table 5-10: Configuration Details (EHC Operation)

Component Name	Setting	
J6	1-2	short ^{*1}
J7	2-3	short
J12	2-3	short ^{*1}

^{*1}: The settings are supported in default configuration, as supplied.

5.2.5.4 Discharge Switch (SW7, SW8)

Discharge switches are included in the main board. SW7 is used to discharge RE01 VCC/IOVCC power supply line. SW8 is used to discharge storage capacitors (C25, C29, and C30). This discharge switches must be used when the user uses energy harvesting function, operate the main board, then restart the energy harvesting function again from the beginning. Press the discharge switches before using energy harvesting function every time the energy harvesting function is started up from the beginning. The discharge switches are shown in **Figure 5-11**.

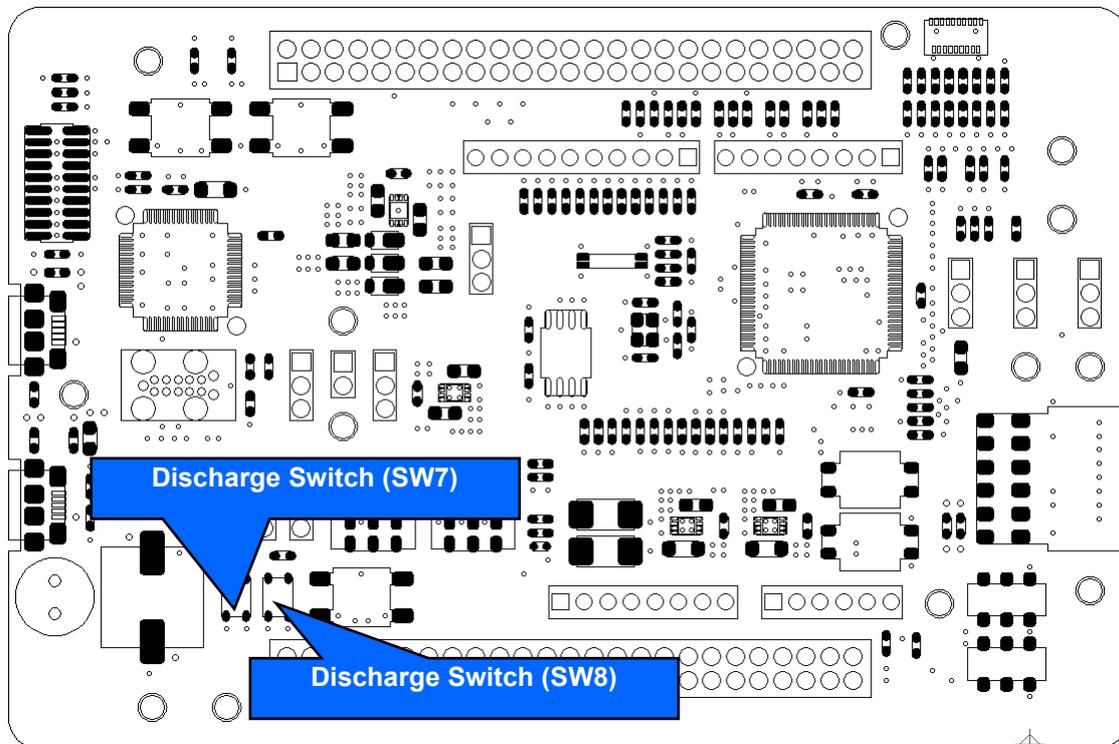


Figure 5-11: Component Layout (EHC Operation)

5.3 RE01 Start-up Mode

RE01 supports 3 start-up modes. Switch settings are necessary to select the start-up mode. Component layout and settings related to start-up modes are explained in **Figure 5-12** and **Table 5-11**. For more details of start-up modes for RE01, refer to RE01 Group User’s Manual’s Hardware.

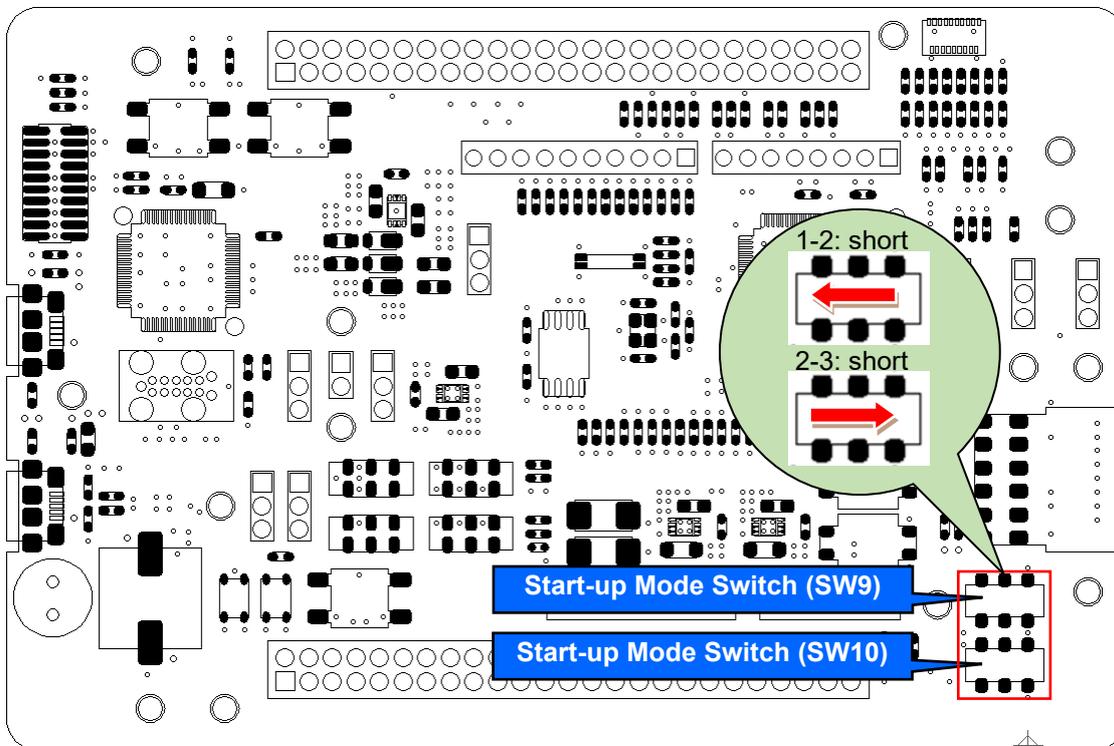


Figure 5-12: Component Layout (RE01 Start-up Mode)

Table 5-11: Configuration Details (RE01 Start-up Mode)

Switch Setting		Start-up Mode
MD (SW9)	EHMD (SW10)	
1-2: short	1-2: short	Energy Harvest Start-up Mode
1-2: short	2-3: short	Normal Start-up Mode ^{*1}
2-3: short	- ^{*2}	SCI/USB Boot Mode

^{*1}: The setting is supported in default configuration, as supplied.

^{*2}: Don't care

6. Debug

This board supports emulators as listed in **Table 6-1**.

Table 6-1: Supported Emulators

Supported Emulator	Chapter Reference
J-Link™ OB	6.1, 6.5
J-Link™	6.2, 6.5
I-Jet™	6.2
E2	6.3, 6.4

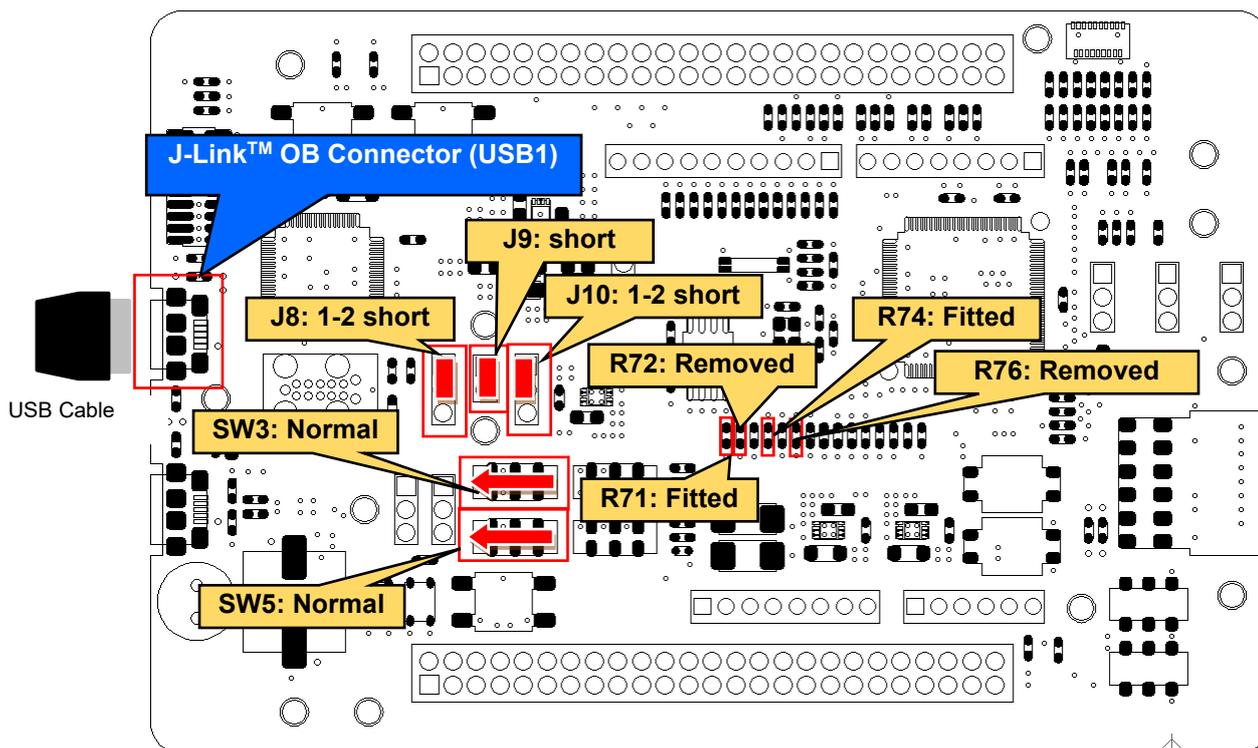
6.1 J-Link™ OB

This main board is equipped with Segger J-Link™ OB. RE01 debugging is possible by connecting the included USB cable to this board and host PC.

6.1.1 Component Layout and Settings when using J-Link™ OB

When using J-Link™ OB, several switch and resistor settings must be set. **Figure 6-1** and **Table 6-2** shows the component layout and detailed settings for using J-Link™ OB. This function is supported in the default configuration, as supplied.

Figure 6-2 and **Figure 6-3** show the connection relationship between the power supply and signals in this setting change.



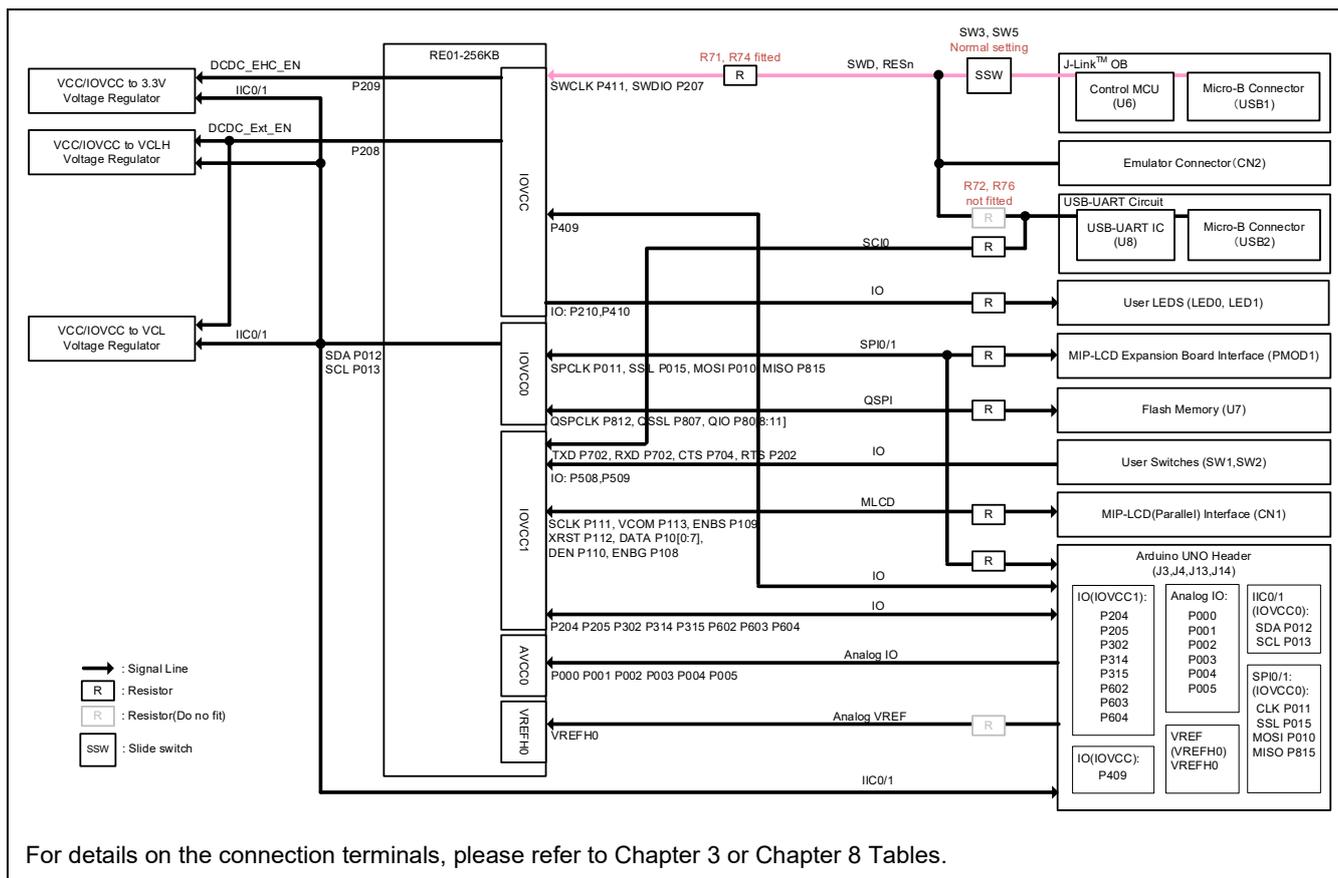
Other settings will be as per the default kit configuration, as supplied.

Figure 6-1: Component Layout and Settings (J-Link™ OB)

Table 6-2: Configuration Details (J-Link™ OB)

Component	Setting	
SW3, SW5	1-2, 5-6	Normal
J8	1-2	short
J9	-	short
J10	1-2	short
R71, R74	Fitted	
R72, R76	Removed	

The settings in the table above are supported in the default configuration, as supplied.



For details on the connection terminals, please refer to Chapter 3 or Chapter 8 Tables.

Figure 6-2: Block diagram of Signal line (J-Link™ OB)

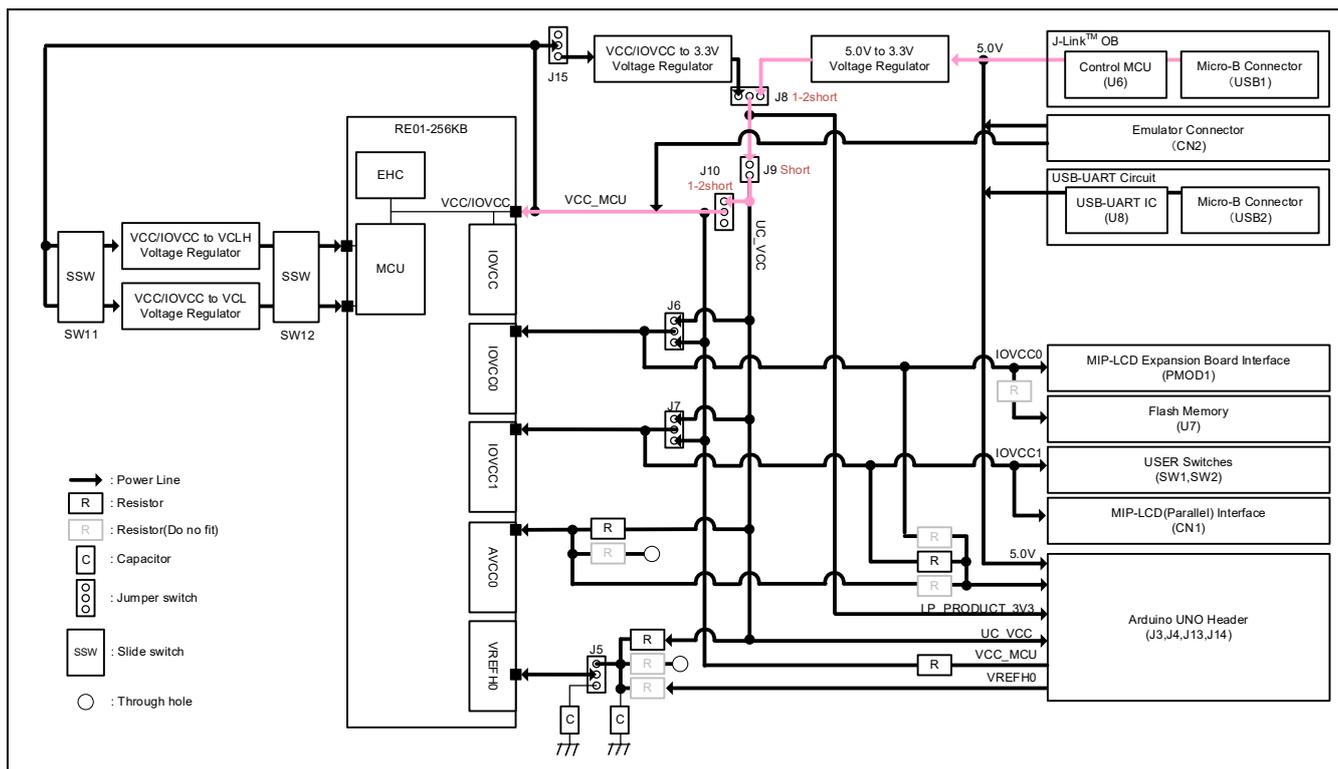


Figure 6-3: Block diagram of Power line (J-Link™ OB)

6.1.2 Debugger Connections

Figure 6-4 shows the connections between main board (J-Link OB) and host PC. When using J-Link OB, do not connect to other emulators.

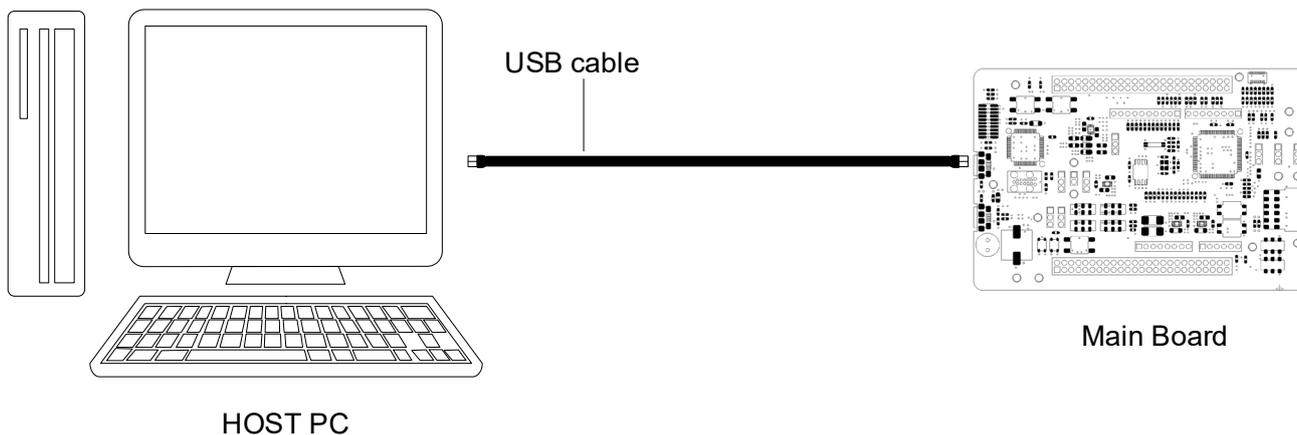


Figure 6-4: Debugger Connection Diagram (J-Link™ OB)

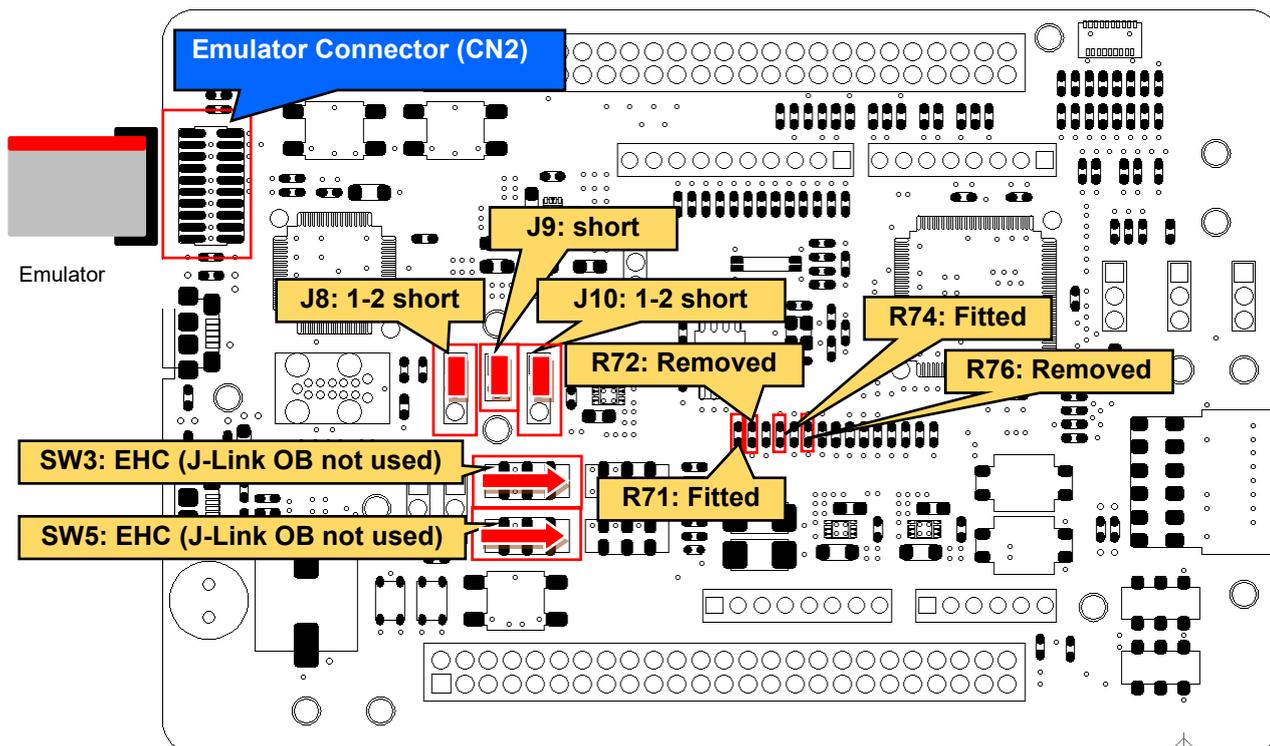
6.2 I-jet™, J-Link™

This main board can connect to IAR I-jet emulator or Segger J-Link™ emulator. RE01 can be debugged by using these emulators.

6.2.1 Component Layout and Settings when using I-jet™, J-Link™

When using the emulator, several switch and resistor settings must be set. **Figure 6-5** and **Table 6-3** shows the component layout and detailed settings. This function is not supported in the default configuration, as supplied.

Figure 6-6 and **Figure 6-7** show the connection relationship between the power supply and signals in this setting change.



Other settings will be as per the default kit configuration, as supplied.

Figure 6-5: Component Layout and Settings (I-jet™, J-Link™)

Table 6-3: Configuration Details (I-jet™, J-Link™)

Component	Setting	
SW3, SW5	2-3, 6-7	EHC (J-Link OB not used)
J8	1-2	short ^{*1}
J9	-	short ^{*1}
J10	1-2	short ^{*1}
R71, R74	Fitted ^{*1}	
R72, R76	Removed ^{*1}	

^{*1}: The settings are supported in default configuration, as supplied.

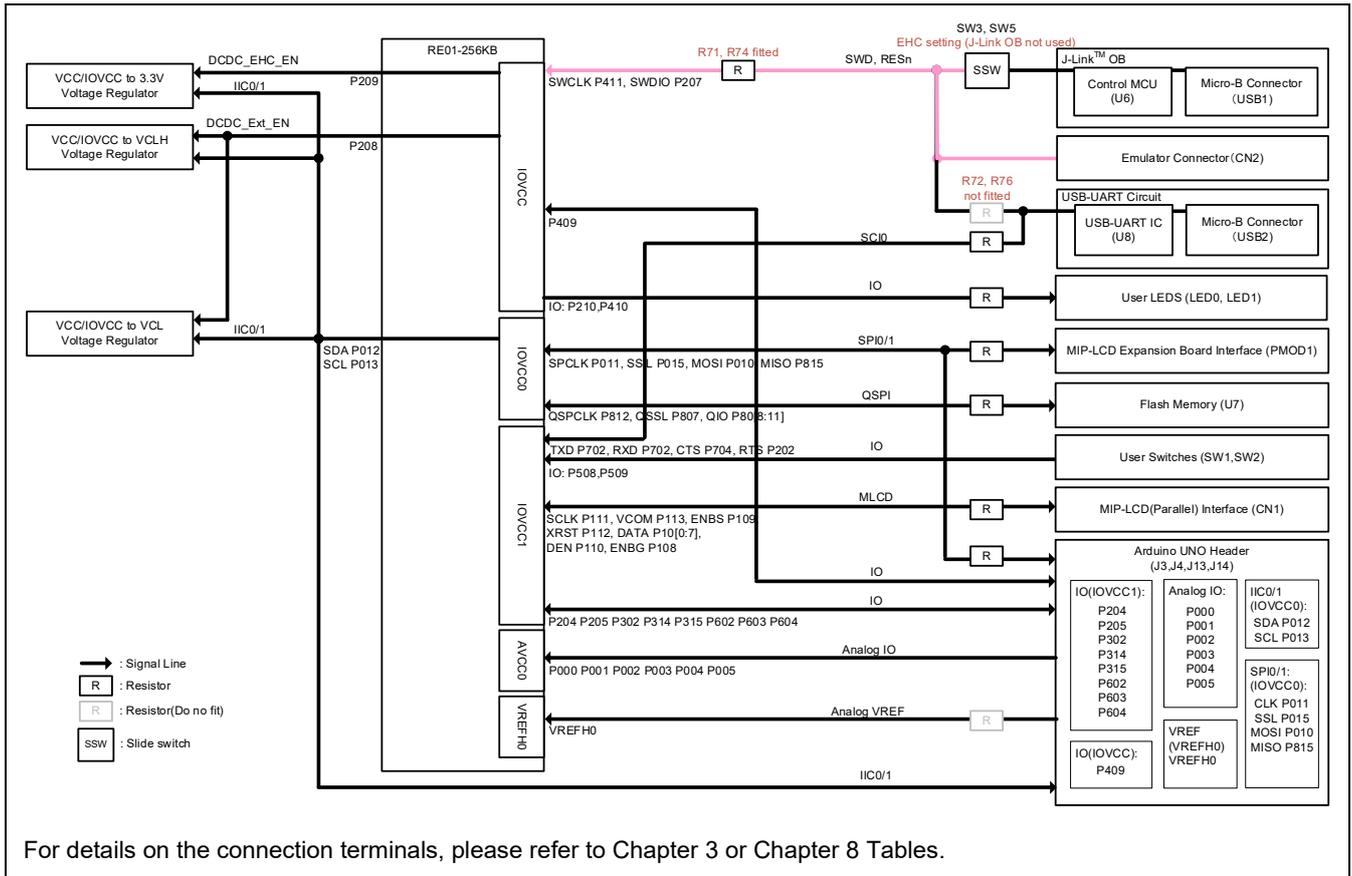


Figure 6-6: Block diagram of Signal line (I-jet™, J-Link™)

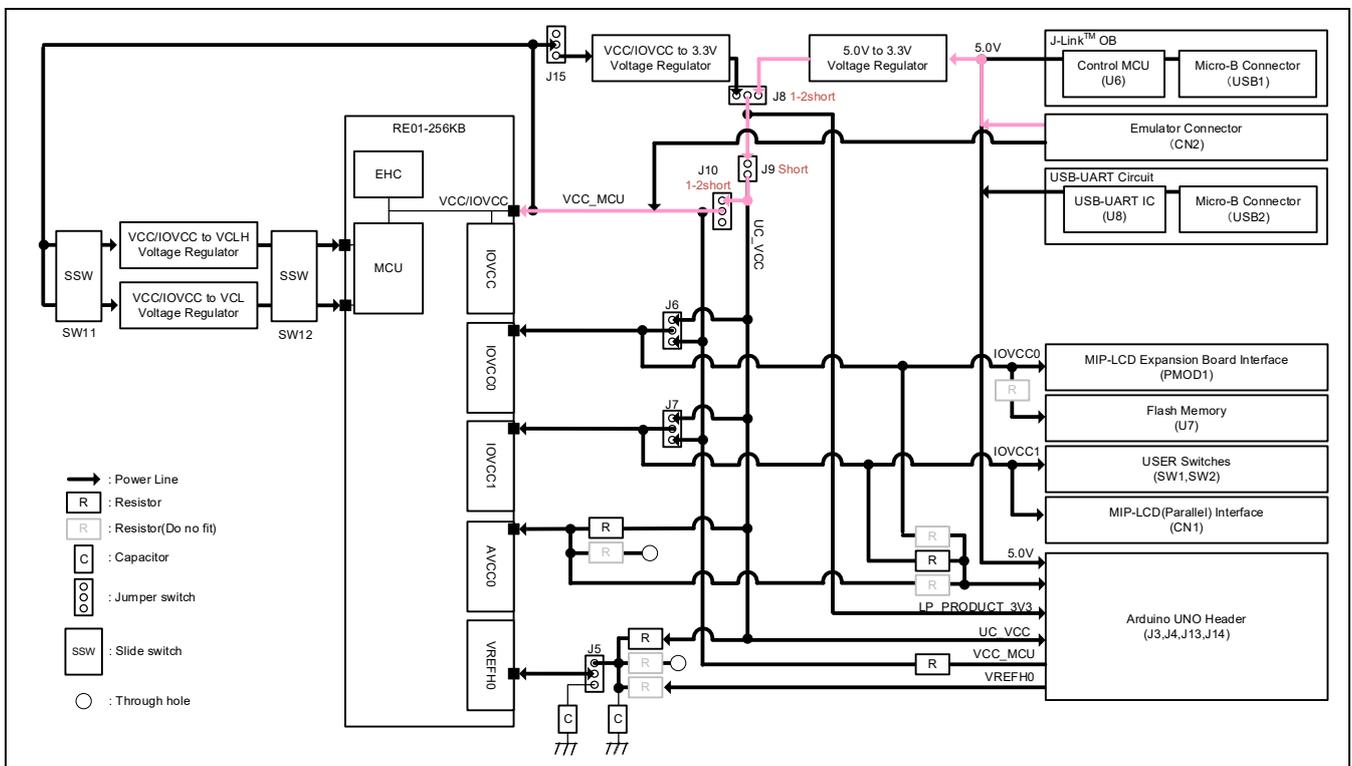


Figure 6-7: Block diagram of Power line (I-jet™, J-Link™)

6.2.2 Debugger Connections

Figure 6-8 shows the connections between main board, emulator, and host PC.

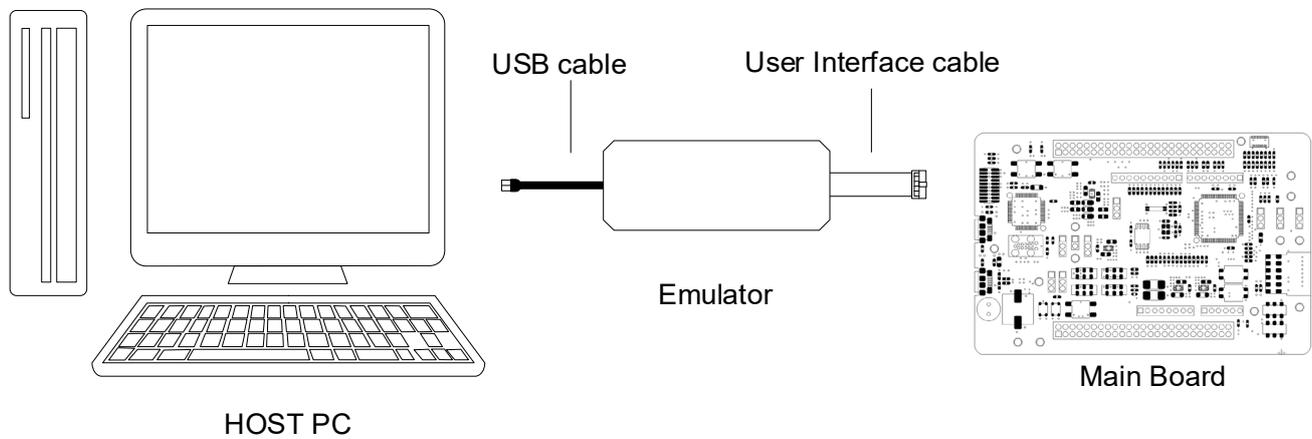


Figure 6-8: Debugger Connection Diagram (Excluding J-Link™ OB)

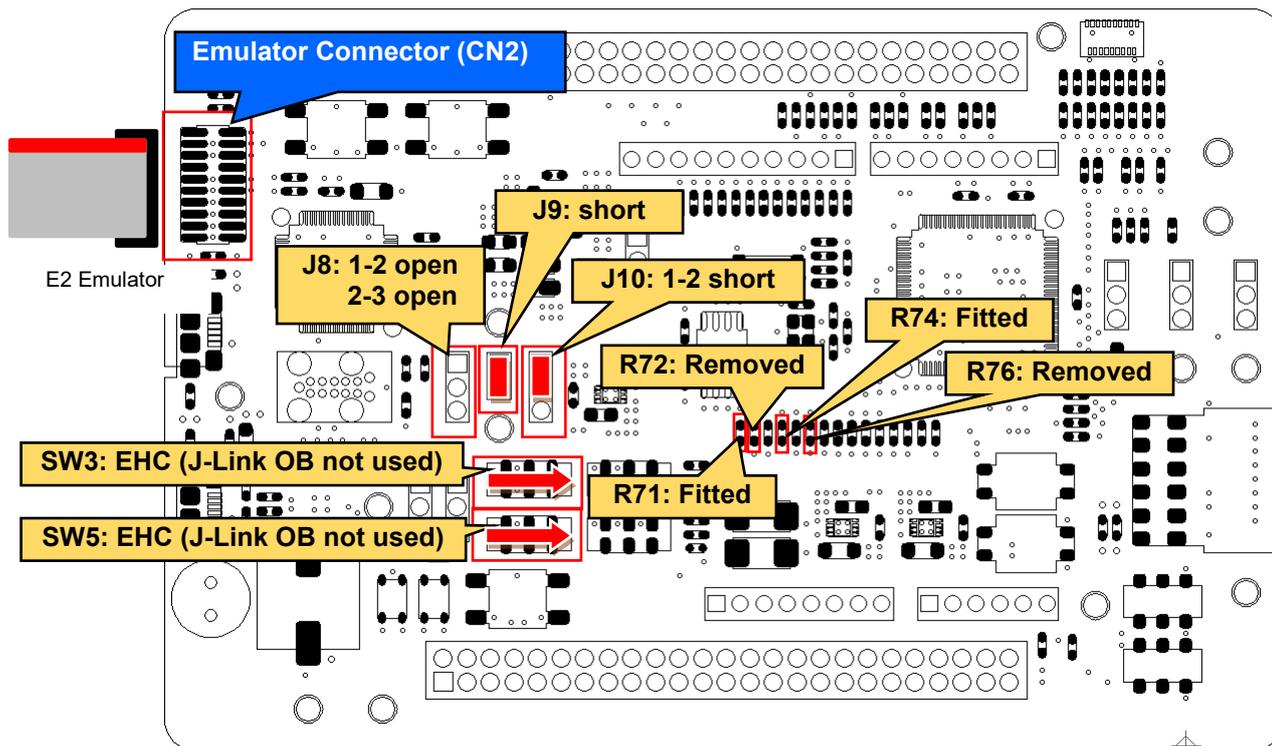
6.3 E2

This main board can connect to Renesas E2 emulator. RE01 can be debugged by using this emulator.

6.3.1 Component Layout and Settings when using E2

When using the emulator, several switch and resistor settings must be set. **Figure 6-9** and **Table 6-4** shows the component layout and detailed settings. This function is not supported in the default configuration, as supplied.

Figure 6-10 and **Figure 6-11** show the connection relationship between the power supply and signals in this setting change.



Other settings will be as per the default kit configuration, as supplied.

Figure 6-9: Component Layout and Settings (E2)

Table 6-4: Configuration Details (E2)

Component	Setting	
SW3, SW5	2-3, 6-7	EHC (J-Link OB not used)
J8	1-2, 2-3	open
J9	-	short ^{*1}
J10	1-2-	short ^{*1}
R71, R74	Fitted ^{*1}	
R72, R76	Removed ^{*1}	

^{*1}: The setting is supported in default configuration, as supplied.

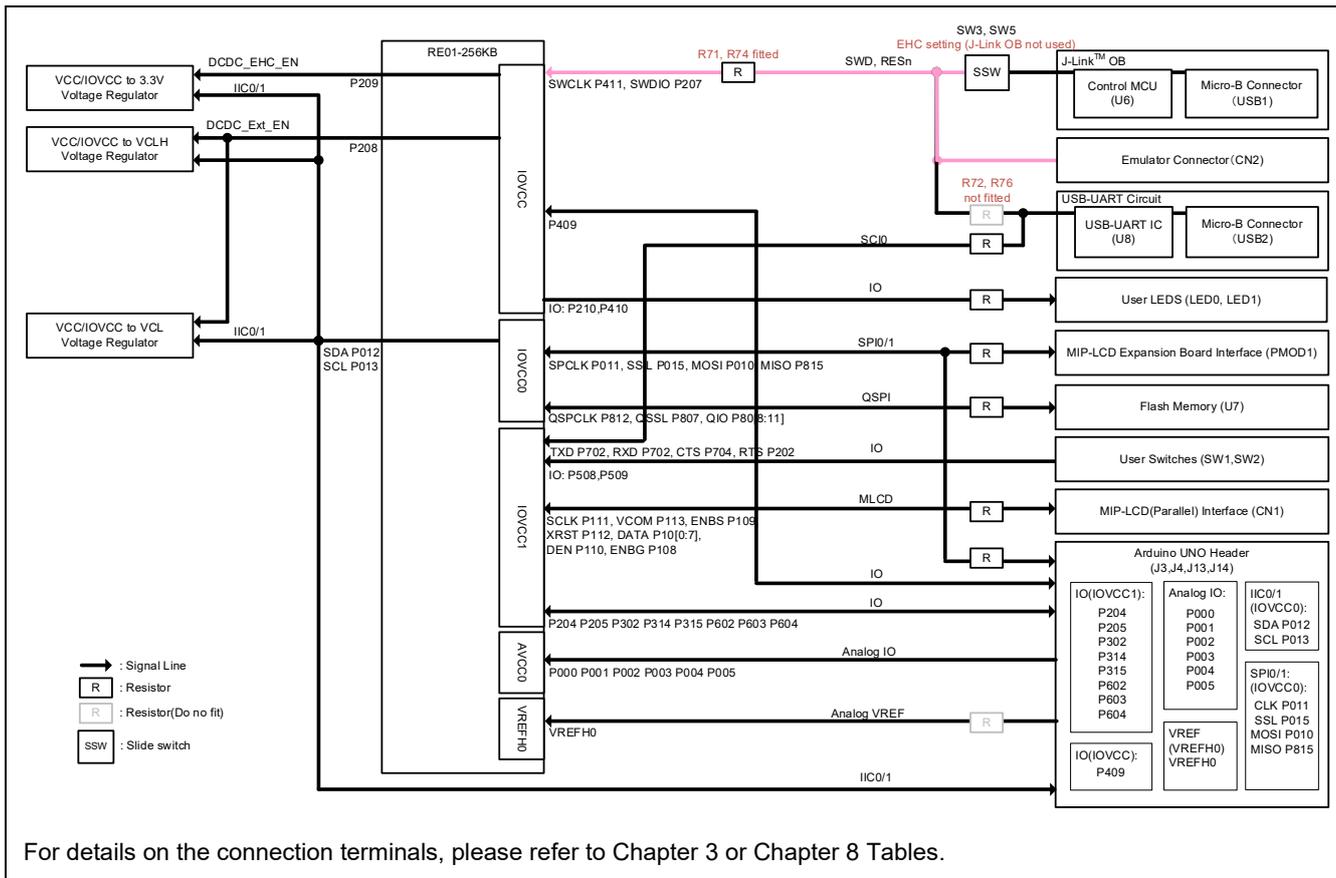


Figure 6-10: Block diagram of Signal line (E2)

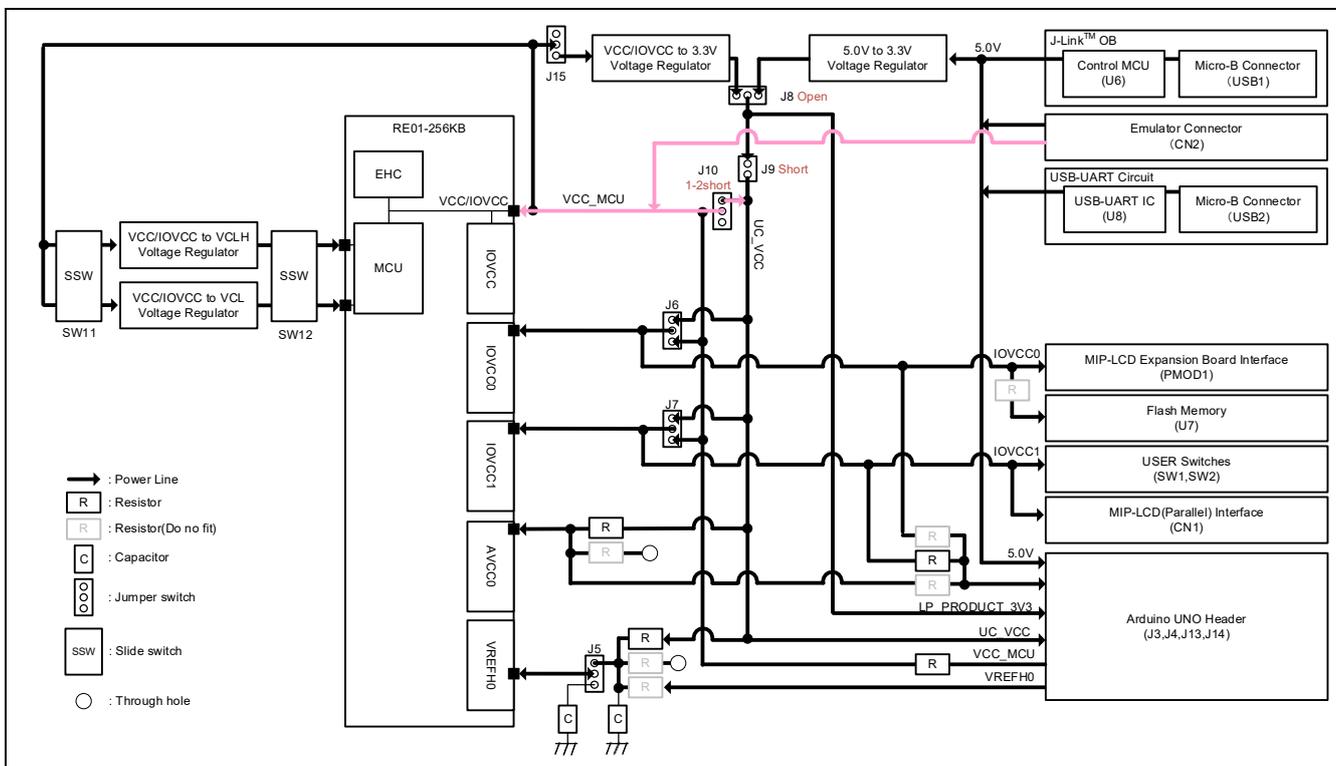


Figure 6-11: Block diagram of Power line (E2)

6.3.2 Debugger Connections

The connection between the main board, emulator, and host PC is the same as in **Figure 6-8**.

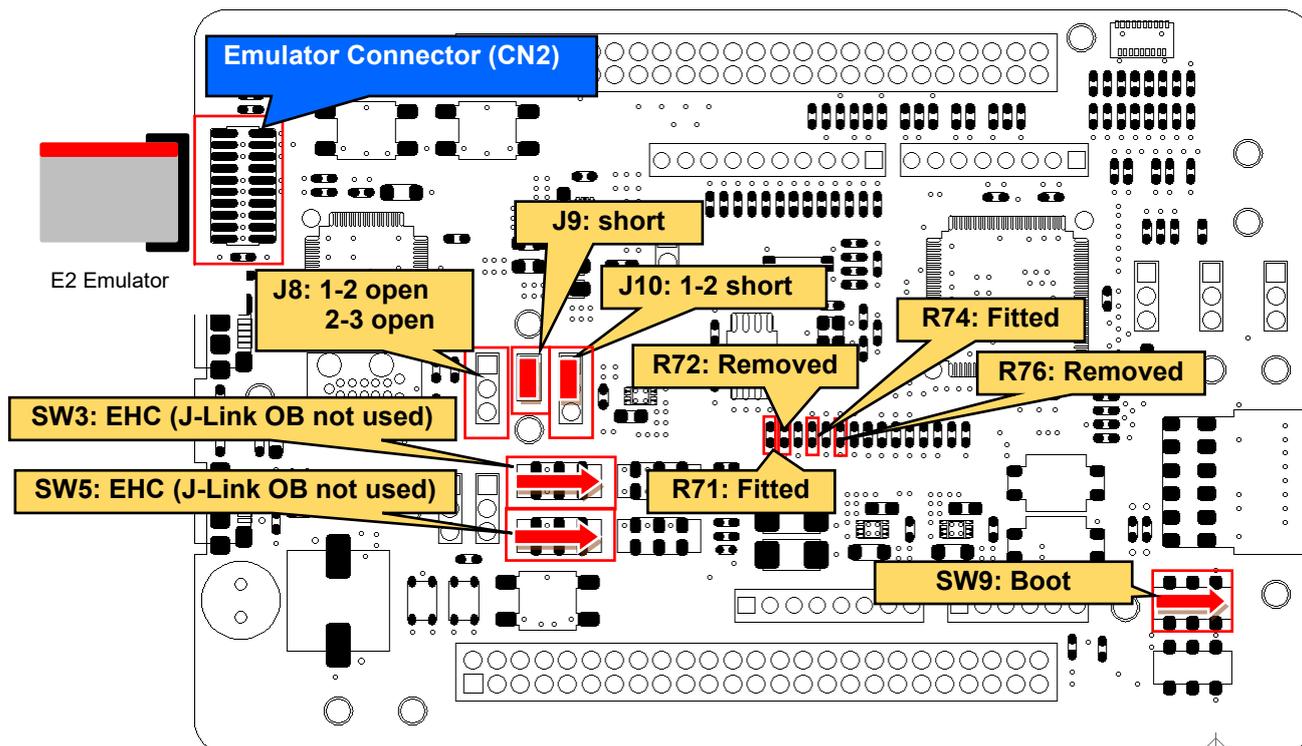
6.4 Flash Programmer -Renesas Flash Programmer-

This main board supports Renesas Flash Programmer (RFP) for writing programs to RE01's internal flash memory. Writing can be performed by using E2 emulator and an USB cable.

6.4.1 When using E2 Emulator

A program can be written from host PC to RE01's internal flash memory via E2 emulator. To use RFP, switch and resistor settings must be set. Component layout and detailed settings are shown in **Figure 6-12** and **Table 6-5**. This function is not supported in the default configuration, as supplied.

Figure 6-13 and **Figure 6-14** show the connection relationship between the power supply and signals in this setting change.



Other settings will be as per the default kit configuration, as supplied.

Figure 6-12: Component Layout and Settings (RFP with E2)

Table 6-5: Configuration Details (RFP with E2)

Component	Setting	
SW3, SW5	2-3, 6-7	EHC (J-Link OB not used)
SW9	2-3	Boot
J8	1-2, 2-3	open
J9	-	short ^{*1}
J10	1-2	short ^{*1}
R71, R74	Fitted ^{*1}	
R72, R76	Removed ^{*1}	

^{*1}: The settings are supported in default configuration, as supplied.

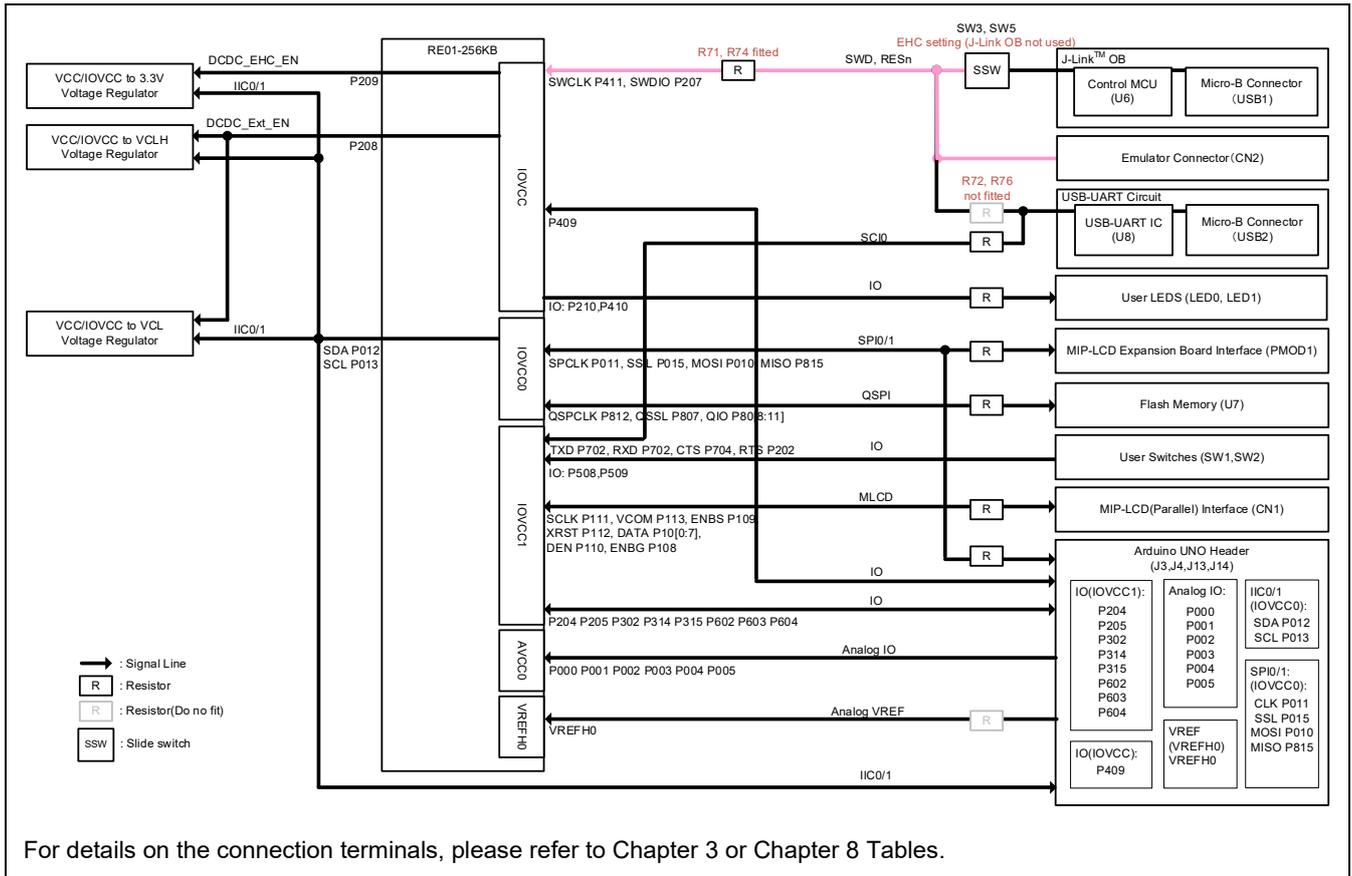


Figure 6-13: Block diagram of Signal line (RFP with E2)

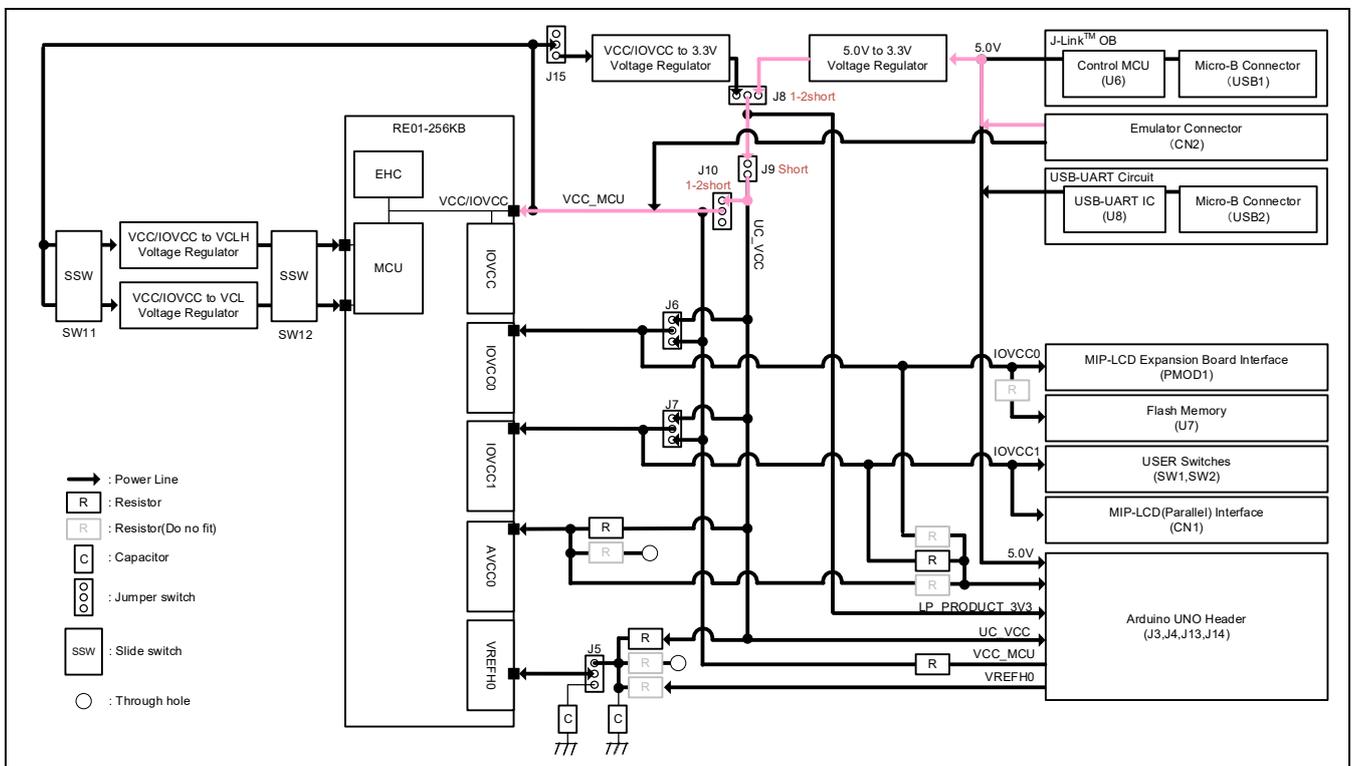
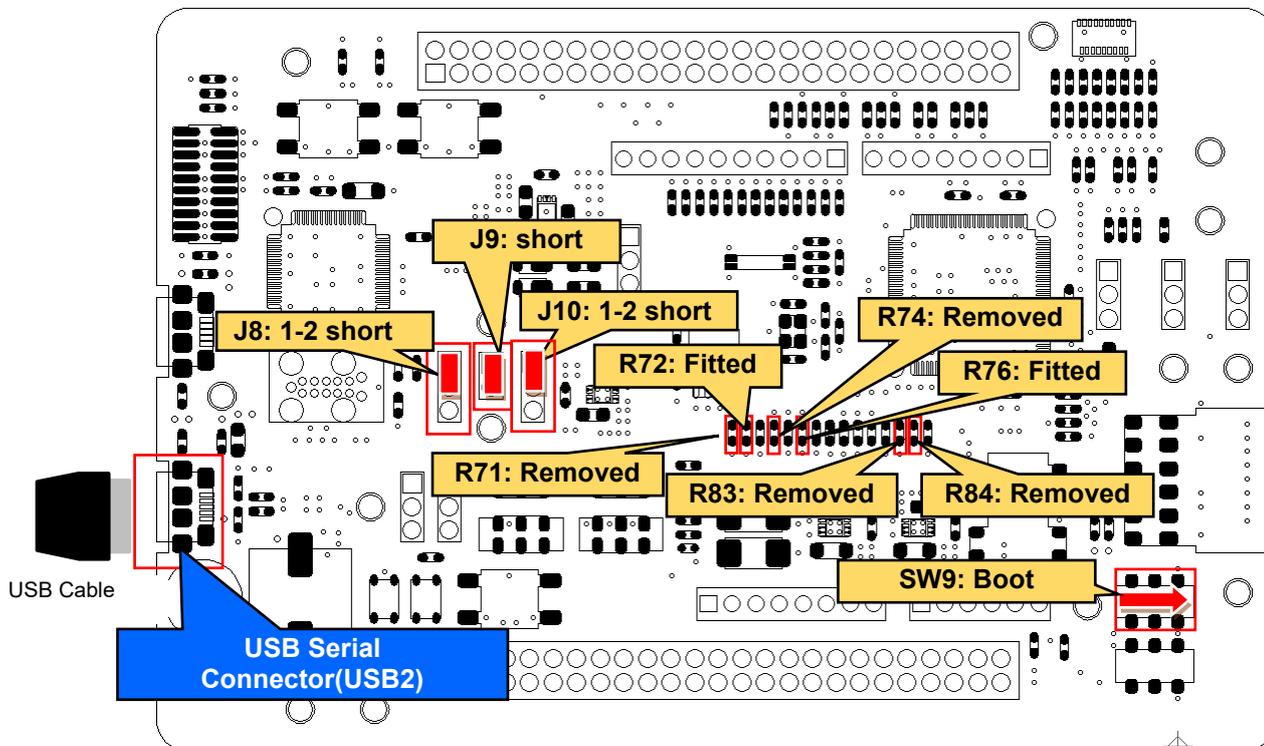


Figure 6-14: Block diagram of Power line (RFP with E2)

6.4.2 When using USB Cable (USB Serial)

A program can be written from host PC to RE01’s internal flash memory by using a USB cable. To use RFP, specific switch and resistor settings must be set. Component layout and detailed settings are shown in Figure 6-15 and Table 6-6. This function is not supported in the default configuration, as supplied.

Figure 6-16 and Figure 6-17 show the connection relationship between the power supply and signals in this setting change.



Other settings will be as per the default kit configuration, as supplied.

Figure 6-15: Component Layout and Settings (RFP with USB-Serial)

Table 6-6: Configuration Details (RFP with USB-Serial)

Component	Setting	
SW9	2-3	Boot
J8	1-2	short ^{*1}
J9	-	short ^{*1}
J10	1-2	short ^{*1}
R71, R74	Removed	
R72, R76	Fitted	
R83, R84	Removed	

*1: The settings are supported in default configuration, as supplied.

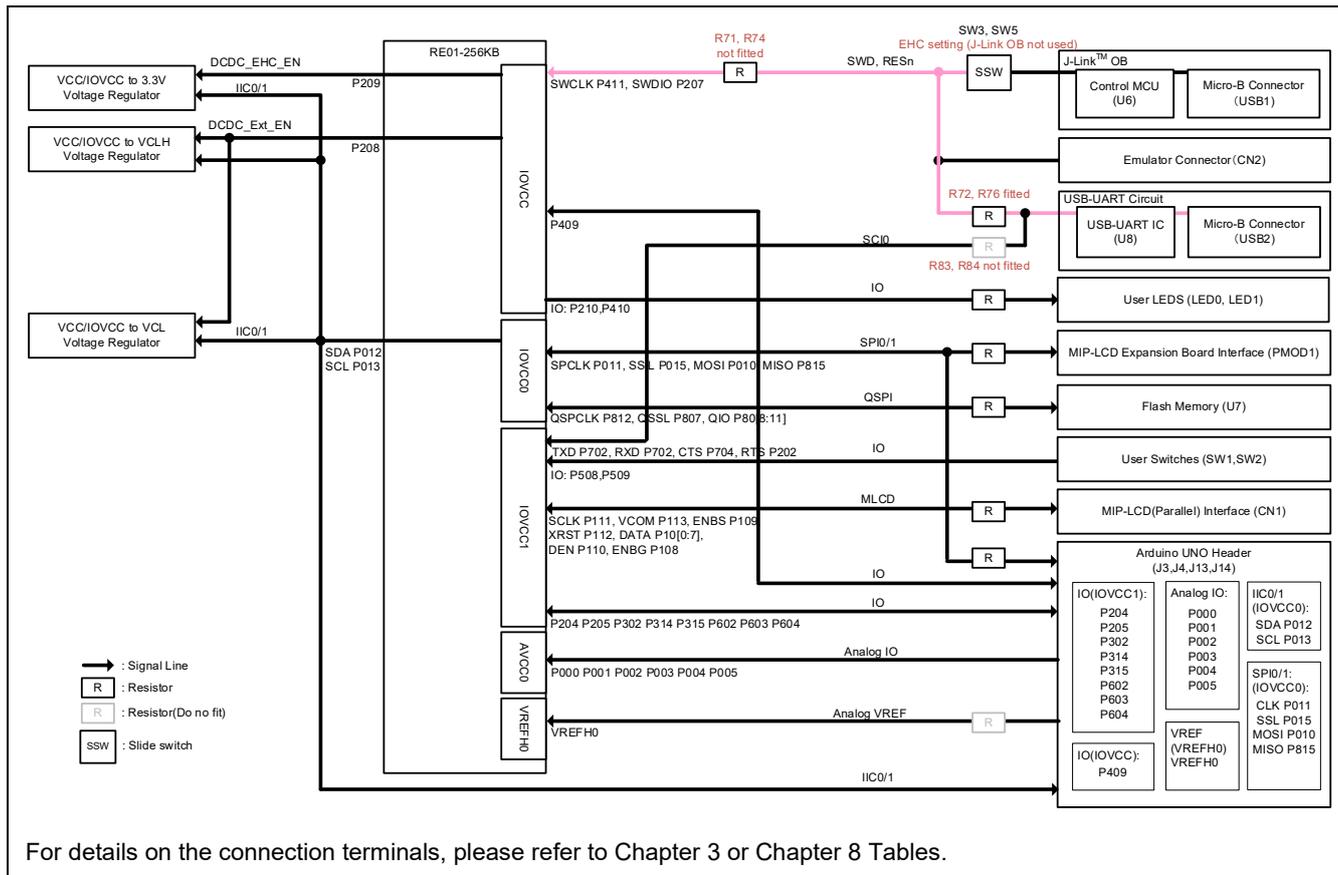


Figure 6-16: Block diagram of Signal line (RFP with USB-Serial)

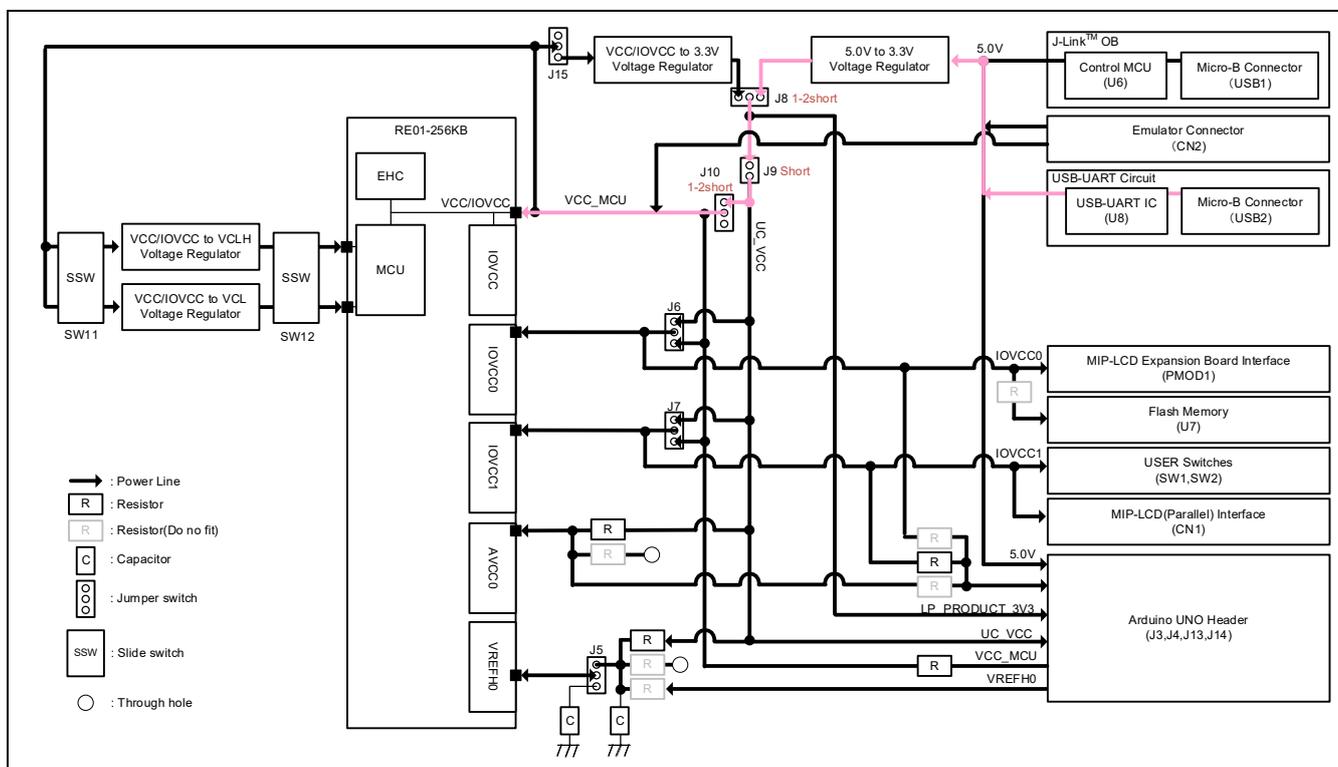


Figure 6-17: Block diagram of Power line (RFP with USB-Serial)

6.4.3 Debugger Connections

Figure 6-18 shows the connection between the main board, emulator, and host PC. When using flash programmer, do not connect emulators for purposes other than flash programming.

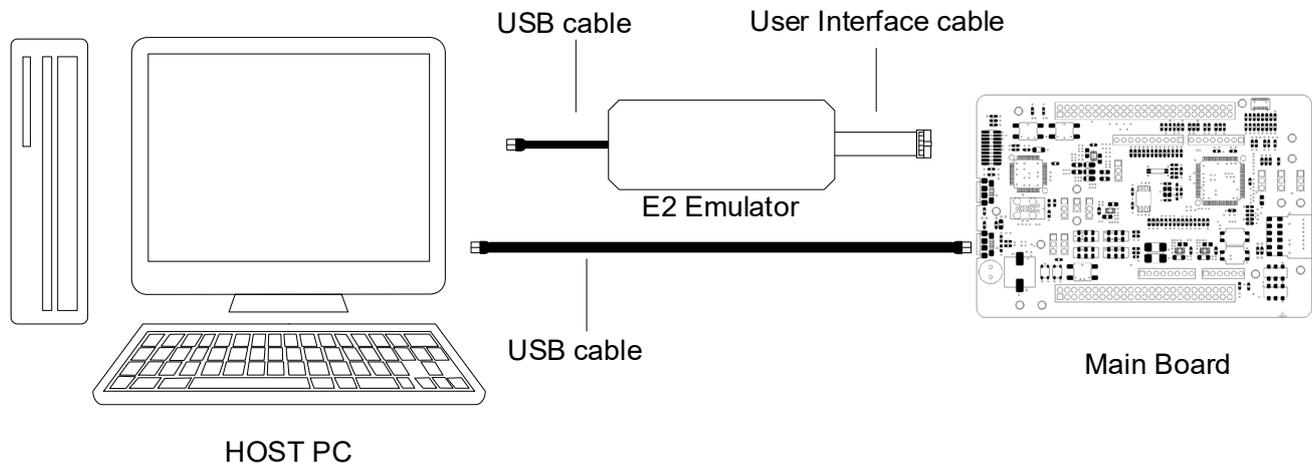


Figure 6-18: Debugger Connection Diagram (RFP)

6.4.4 How to Use

6.4.4.1 When using E2 Emulator

Follow the procedures below to supply power from E2 emulator.

1. Set the switches and resistors on the main board as shown in **Table 6-5**.
2. Connect the emulator connector (CN2) to host PC via E2 emulator.
3. Start RFP on host PC.
4. On RFP, choose File->New Project.
Insert new project name, and choose 3.3V under Power Supply in Tool Details.
5. Click the "Connect" button on the RFP.
6. When the connection is established, "Operation Completed" will be displayed on the screen.
7. Select the program to write.
8. Click the "Start" button on the RFP.
9. After writing is completed, "Operation Completed" will be displayed on the RFP.

6.4.4.2 When using USB Cable (USB Serial)

Follow the procedures below to supply power from a USB cable (USB Serial).

1. Set the switches and resistors as shown in **Table 6-6**.
2. Connect the USB serial connector (USB2) to host PC via USB cable.
3. Start RFP on host PC.
4. On RFP, choose File->New Project.
Insert new project name, and choose "USB Serial Port" in Tool Details.
5. Click the "Connect" button on the RFP.
6. When the connection is established, "Operation Completed" will be displayed on the screen.
7. Select the program to write.
8. Click the "Start" button on the RFP.
9. After writing is completed, "Operation Completed" will be displayed on the RFP.

6.5 Flash Programmer -SEGGER J-Flash Lite-

This main board supports SEGGER J-Flash Lite for writing programs to RE01's internal flash memory. Writing can be performed by using either the J-Link™ OB or J-Link™ emulator.

6.5.1 Connection and Settings

When using J-Link™ OB, please refer to **section 6.1.1**.

When use J-Link™ emulator, please refer to **section 6.2.1**.

6.5.2 How to use

Follow the procedures below

1. Set the switches and resistors on the main board according to the previous section.
2. Connect to the host PC with a USB cable. (When using the J-Link™ emulator, connect via the emulator)
3. Start J-Flash Lite on the host PC.
4. Select the Device you are using on the J-Flash Lite.
5. Make sure that Interface is selected as SWD, and press the "OK" button.
6. Select the file you want to write from the Data File.
7. Press the "Program Device" button.
8. When the writing is completed, "Downloading.... Done" will be displayed at the end of the log.

6.6 Emulator connection in EHC mode

When the RE01 is connected to an emulator, the internal debugging circuitry runs which increases the power consumption of the RE01. Therefore, when debugging in EHC mode, it is necessary to keep supplying enough power to run the device.

The following shows how to debug in EHC mode using a voltage source.

Note 1: This procedure assumes that a program to transition to the steady operation period in Chapter 13 EHC of the UM (the RE01 Group User's Manual: Hardware) has been constructed. Please write the program to transition to the steady operation in advance.

Note 2: The power supply from the emulator should be disabled.

6.6.1 Connection and Settings

After setting the board to EHC mode, connect the voltage source and the emulator as shown in **Figure 6-19**. For setting the EHC mode, refer to **Section 5.2 EHC Operation**.

Figure 6-19 shows the case where the on-board super capacitor (BT2) is used as the secondary battery. If an external secondary battery or super capacitor is used (BT1), connect a voltage source to J12 1pin.

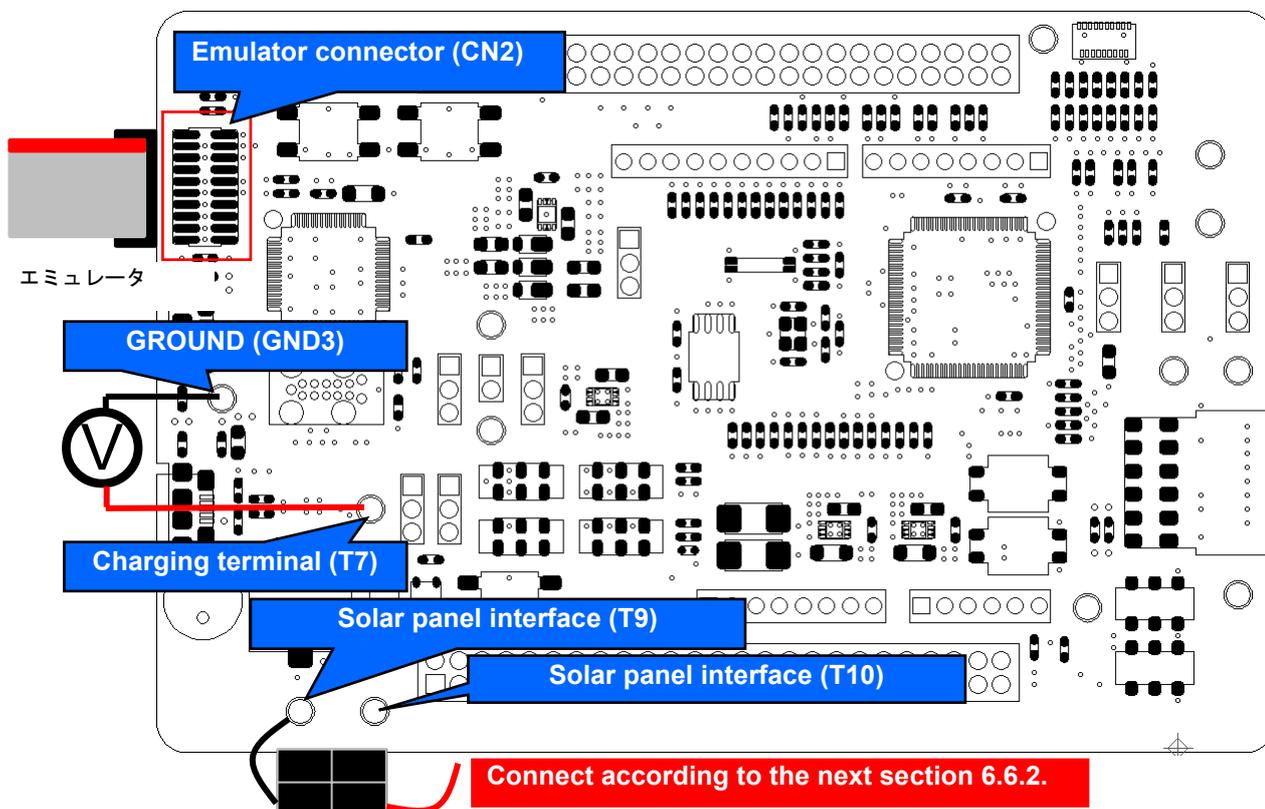


Figure 6-19: Connection for connecting an emulator in EHC mode

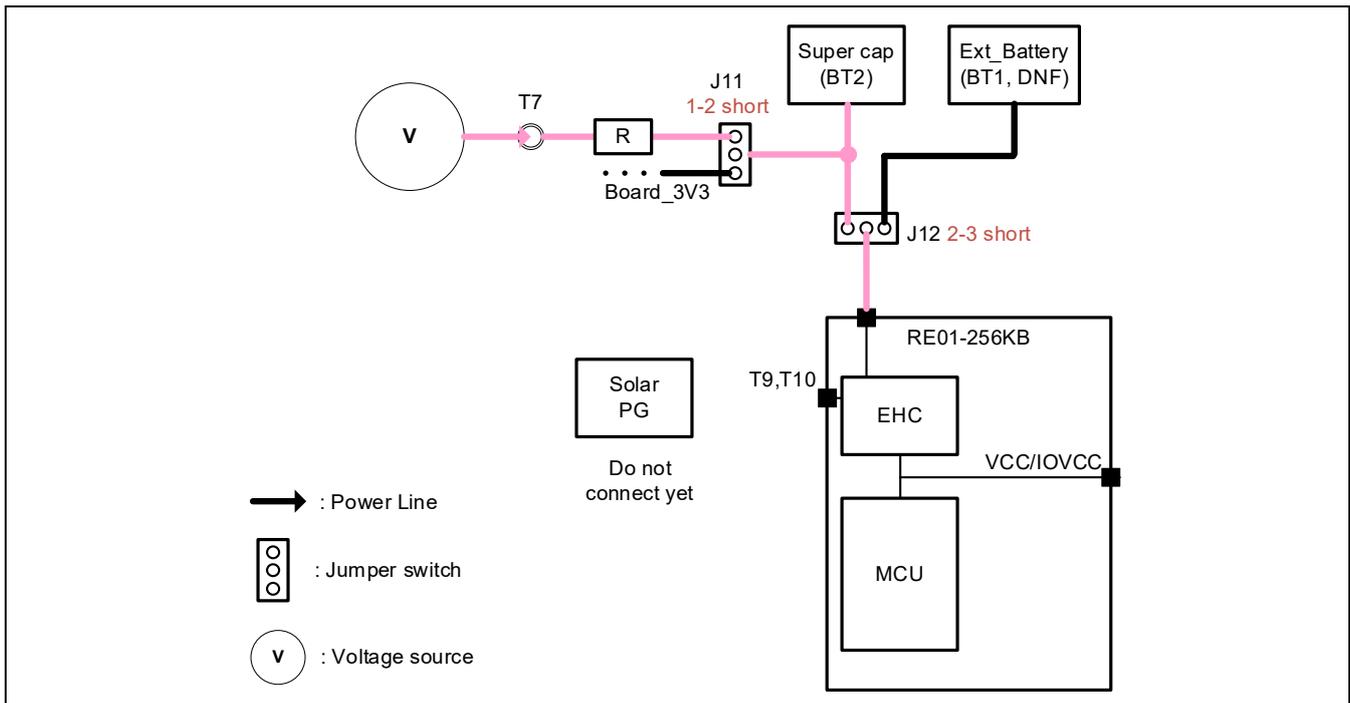


Figure 6-20: Schematic diagram of the connection

6.6.2 Debugging Procedure

Follow the steps below to debug.

1. Supply power from VSC_VCC (T10) to start RE01.
2. In order to transition from the secondary battery charging period to the steady operation period, apply a voltage higher than the software threshold voltage. (There is no problem if the voltage is applied before starting RE01.)
3. Operate the IDE to debug.

If the QUICKMODE bit of RE01 is changed from 1 to 0 after the transition to the steady state, the EHC circuit will be initialized and the power of RE01 will be turned off. If you wish to debug again, please follow the above procedure again.

7.Current Measurement Circuit

This main board allows the user to measure the current consumption of the RE01. **Figure 7-1** shows the current flow that can be measured with the default settings. Sample code is also available on Renesas website, entitled “RE01 256KB Group Low Power Mode Transition Example” (R01AN5337).

7.1 Current measurement when using the on-board regulator 3.3V

This section shows how to measure the current consumption in normal startup mode at 3.3V using the regulator mounted on the board. The current flow to be measured is shown in **Figure 7-1**.

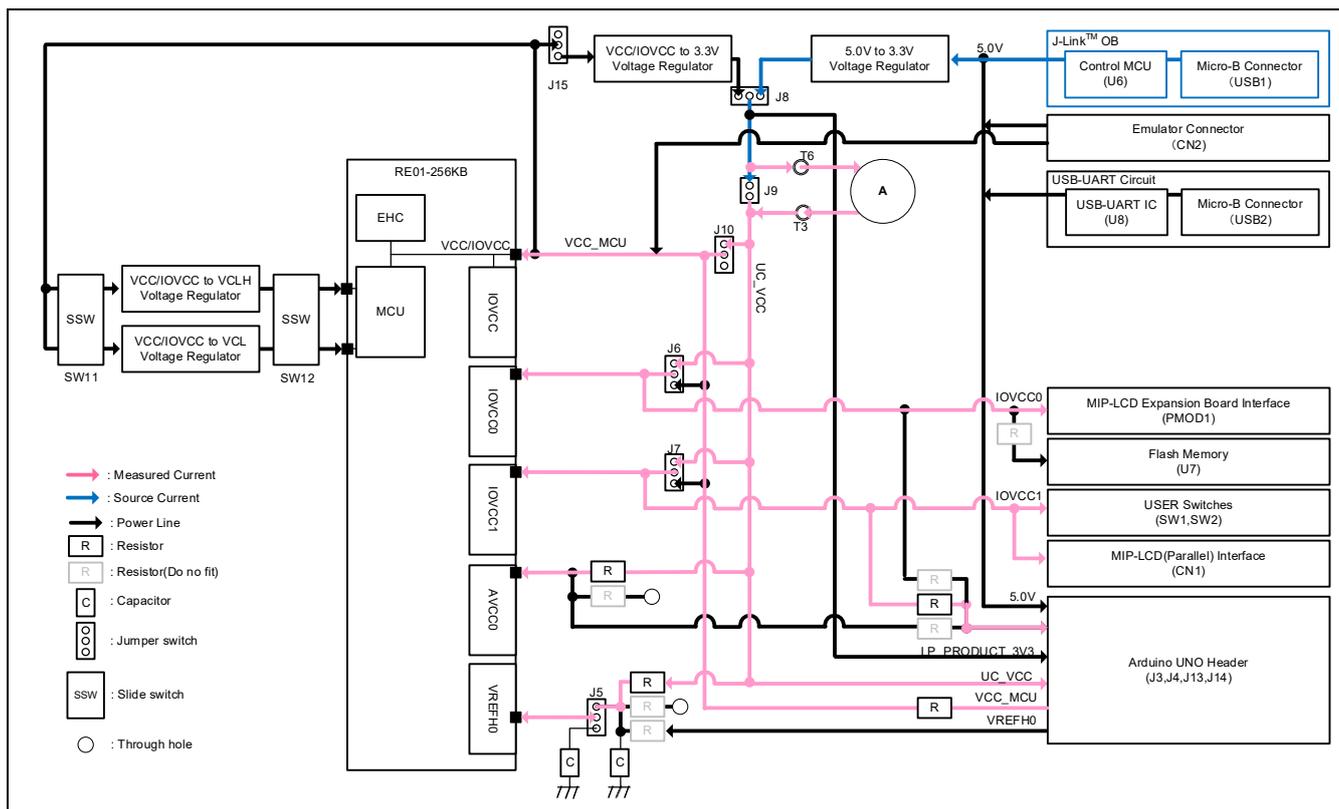
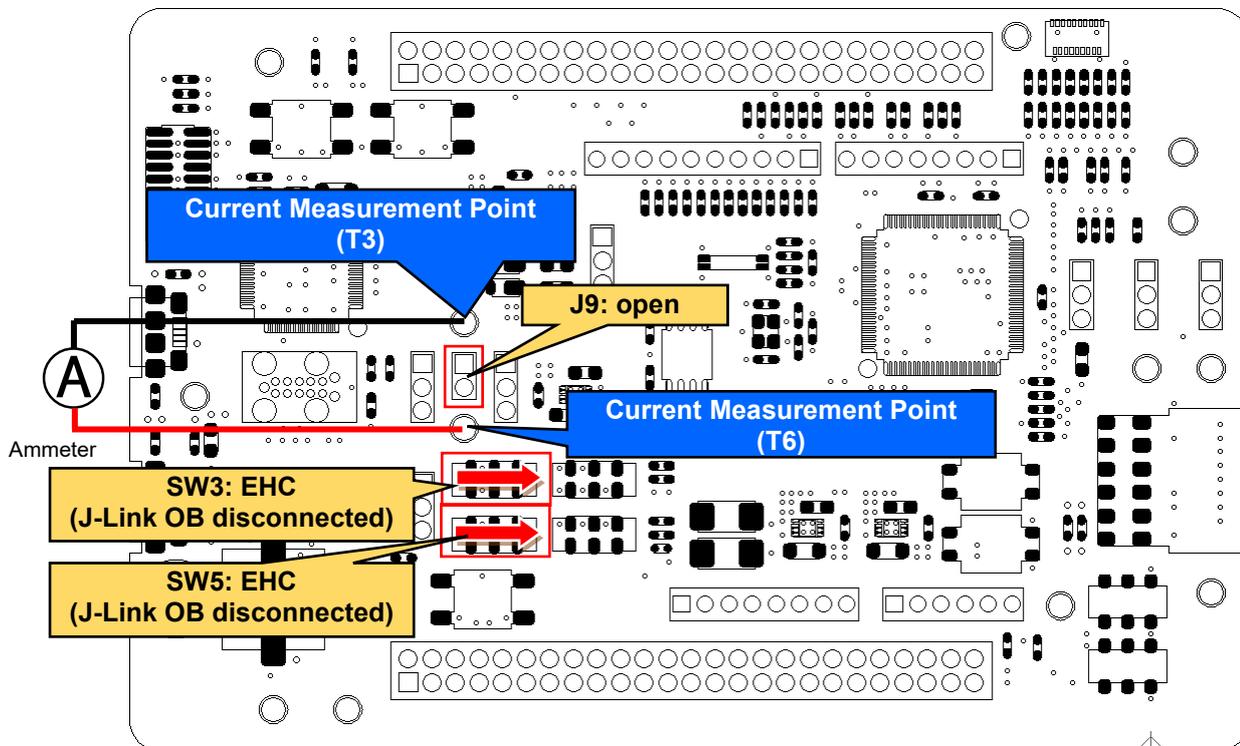


Figure 7-1: Current flow when using on-board regulator 3.3V

7.1.1 Settings for current measurement

Switch settings are required to measure the current. Details are shown in **Figure 7-2** and **Table 7-1**.



Other settings will be as per the default kit configuration, as supplied.

Figure 7-2: Component Layout and Setting (Current Measurement, using on-board regulator 3.3V)

Table 7-1: Configuration Details (Current Measurement, using on-board regulator 3.3V)

Component	Setting	
J9	-	open
SW3, SW5	2-3, 6-7	EHC (J-Link OB not used)

7.1.2 How to Use

Follow the steps shown below. Program must be downloaded into the internal flash memory of RE01 in advance.

1. Open J9.
2. Connect an ammeter to current measurement points (T3 and T6).
3. Supply the board by using stand-alone power supply.

7.2 Current measurement when not using on-board 3.3V regulator

In this section, the method to measure the current during normal startup without using the on-board regulator is described. The current flow to be measured is shown in **Figure 7-3**.

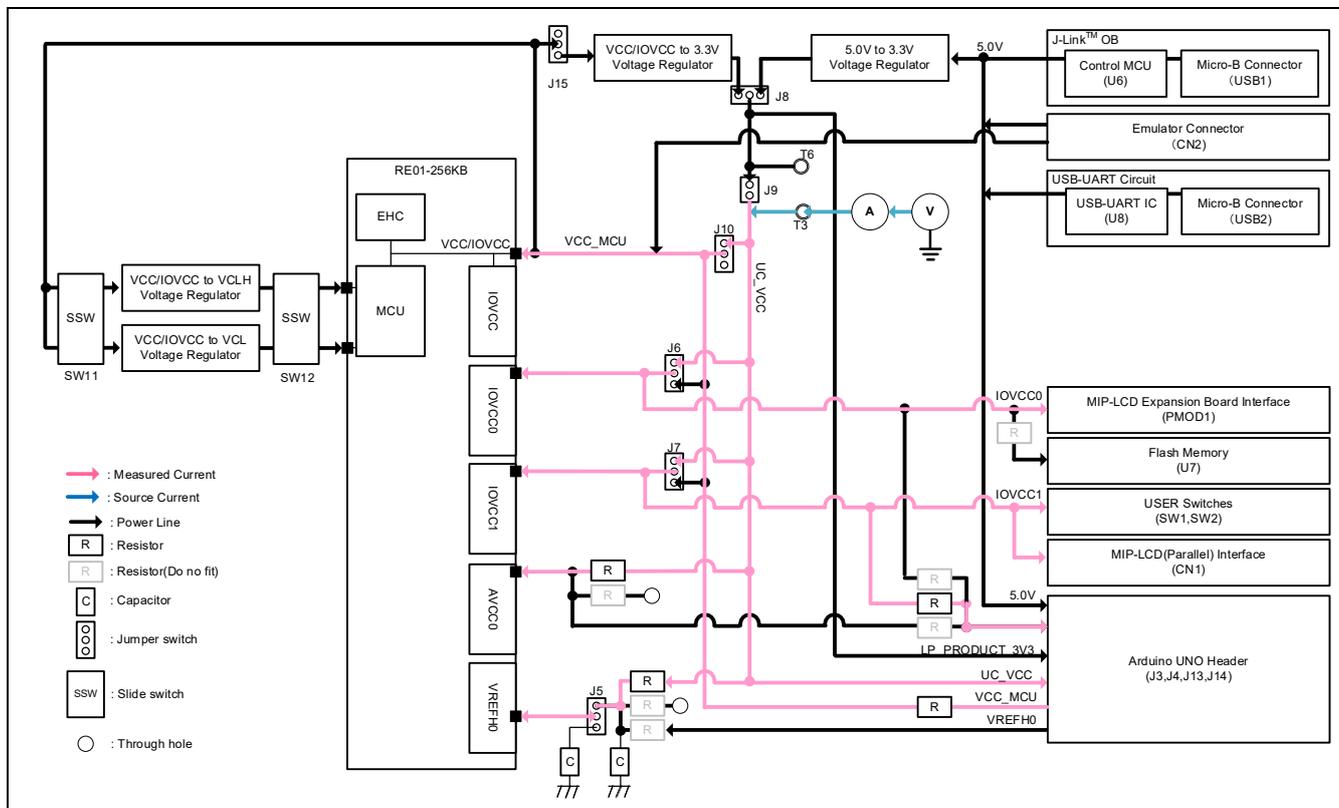
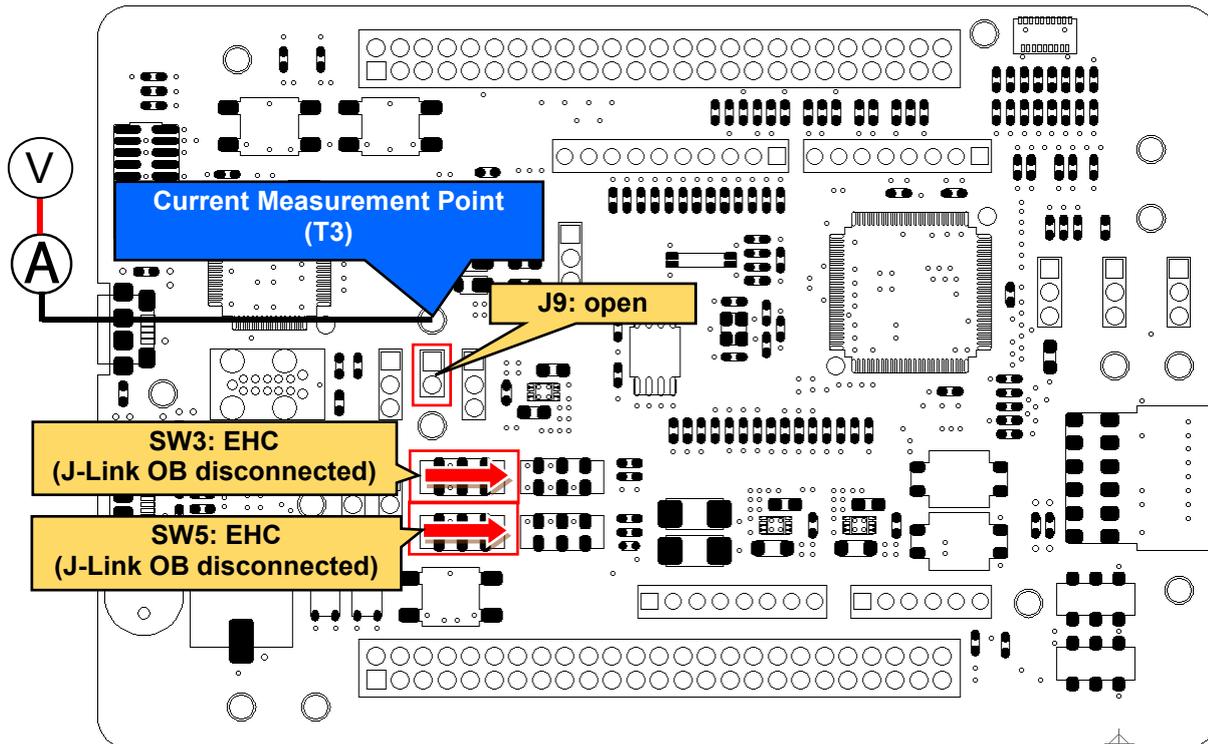


Figure 7-3: Current flow when on-board regulator 3.3V is not used

7.2.1 Settings for current measurement

Set up the board as shown in **Figure 7-4**, and connect the voltage source and the ammeter. If you want to supply voltage to the Arduino UNO interface, please supply voltage from T6 or J8 pin 2 separately.



Other settings will be as per the default kit configuration, as supplied.

Figure 7-4: Component Layout and Settings (Current Measurement, on-board regulator 3.3V not used)

Table 7-2: Configuration Details (Current Measurement, on-board regulator 3.3V not used)

Component	Setting	
J9	-	open
SW3, SW5	2-3, 6-7	EHC (J-Link OB not used)

7.2.2 How to use

Follow the steps shown below. Program must be downloaded into the internal flash memory of RE01 in advance.

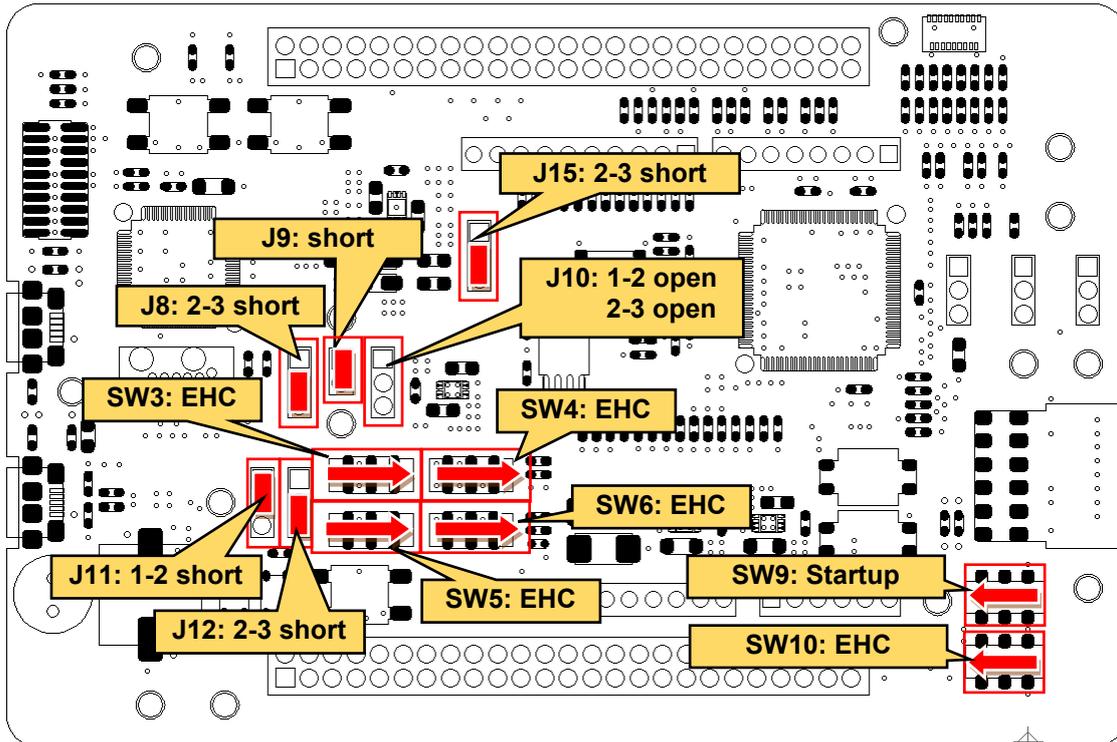
1. Open J9.
2. Connect an ammeter to current measurement points (T3 and T6).
3. Supply the board by using stand-alone power supply.

7.3 Current measurement during EHC operation

This board can measure the current of the entire system even in EHC mode. This section describes how to measure the current in EHC mode.

7.3.1 Settings for current measurement

Configure the board according to **Figure 7-5**, and connect the voltage source and ammeter according to **Figure 7-6**.



Other settings will be as per the default kit configuration, as supplied.

Figure 7-5: Component Layout and Settings (Current Measurement, EHC mode)

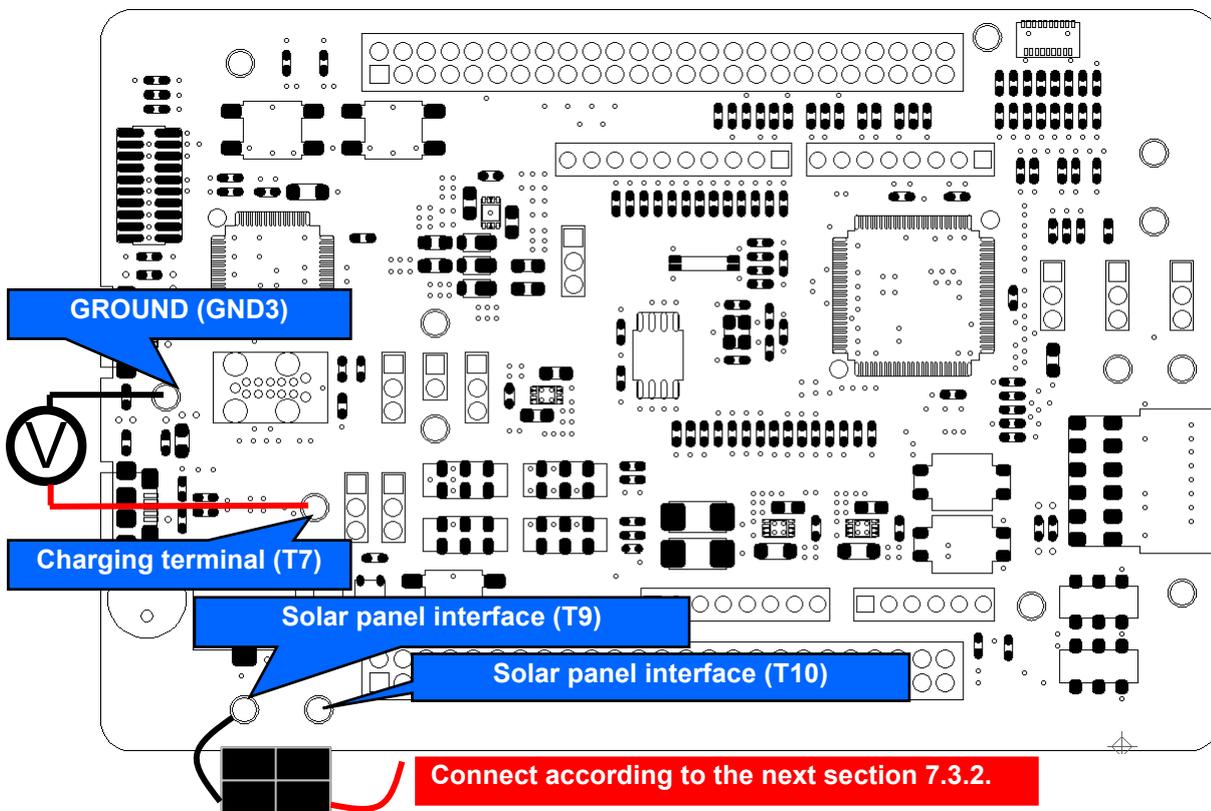


Figure 7-6: Connection for current measurement in EHC mode

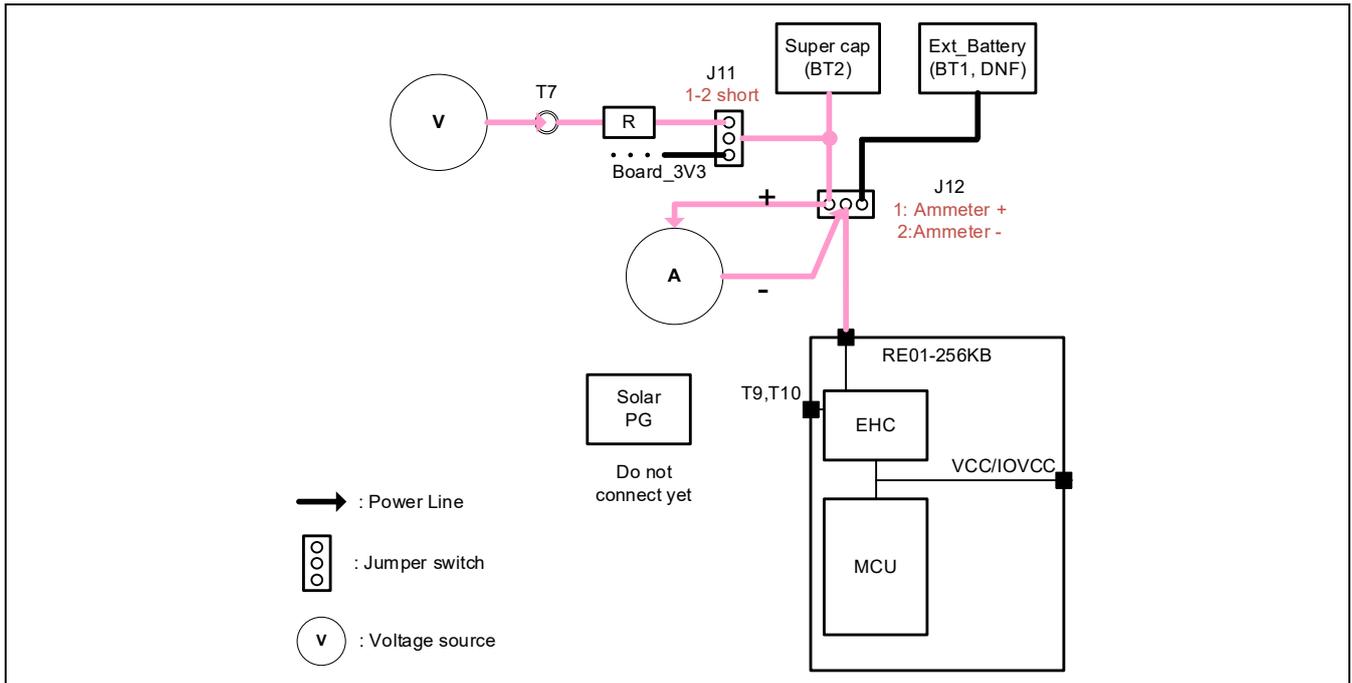


Figure 7-7: Block diagram of the connection current measurement in EHC mode (when using the super capacitor mounted on the board)

7.3.2 How to use

After setting up and connecting the voltage source and ammeter according to the previous section, measure the current according to the following procedure.

1. Apply a voltage to VBAT from a voltage power source that is higher than the threshold voltage for transition to steady state.
2. Supply power from VSC_VCC and allow the system to transition to steady state.
3. Turn off the supply of VSC_VCC so that the system can operate only with power from VBAT.
4. Measure the current consumption of the entire system with the connected ammeter.

When using an external rechargeable battery or super capacitor with BT1, connect the voltage source to J12 pin 3 and the ammeter to J12 pin 2 (-) and pin 3 (+).

8. User Circuitry

8.1 Reset Circuit

This main board has built-in power-on reset circuit and a reset circuit that is triggered by a switch press. When power is supplied, RE01 is reset by the built-in power-on reset circuit. Pressing RES switch also resets RE01.

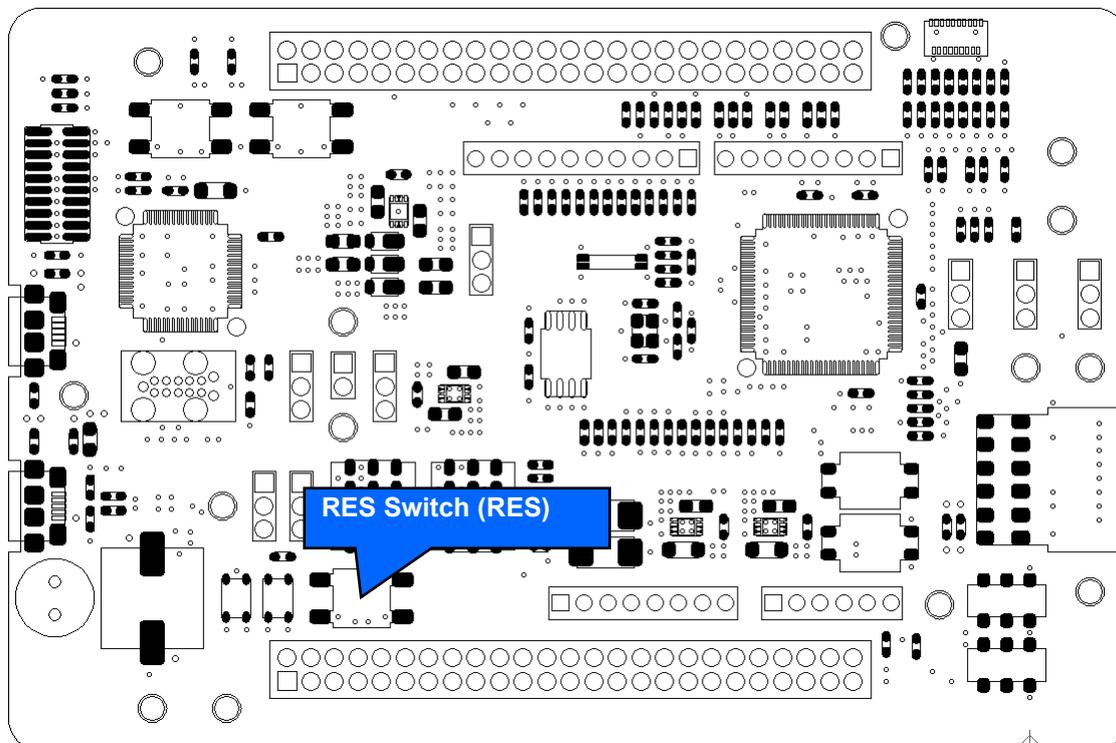


Figure 8-1: Component Layout (Reset Circuit)

8.2 Clock Circuit

The main board has clock circuit to supply clock to RE01. For details on the RE01 clock, refer to RE01 Group User's Manual Hardware. For details on the main board clock circuit, refer to the main board circuit diagram. **Figure 8-2** and **Table 8-1** shows the component layout and details.

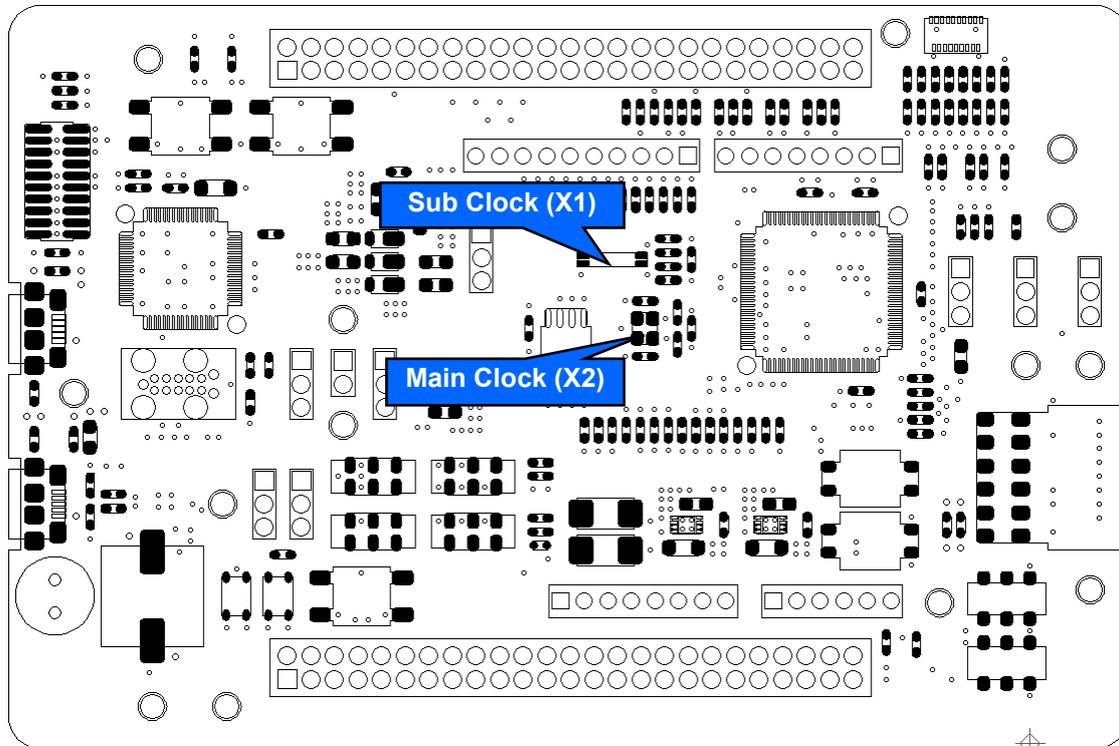


Figure 8-2: Component Layout (Clock Circuit)

Table 8-1: Crystal

Crystal	Function	Default Setting	Frequency	Device Package
X1	Sub Clock	Fitted	32.768kHz	Encapsulated, SMT
X2	Main Clock	Fitted	32MHz	Encapsulated, SMT

8.3 Switches

This main board has a total of 13 switches. **Figure 8-3** and **Table 8-2** show the layout and function of each switch.

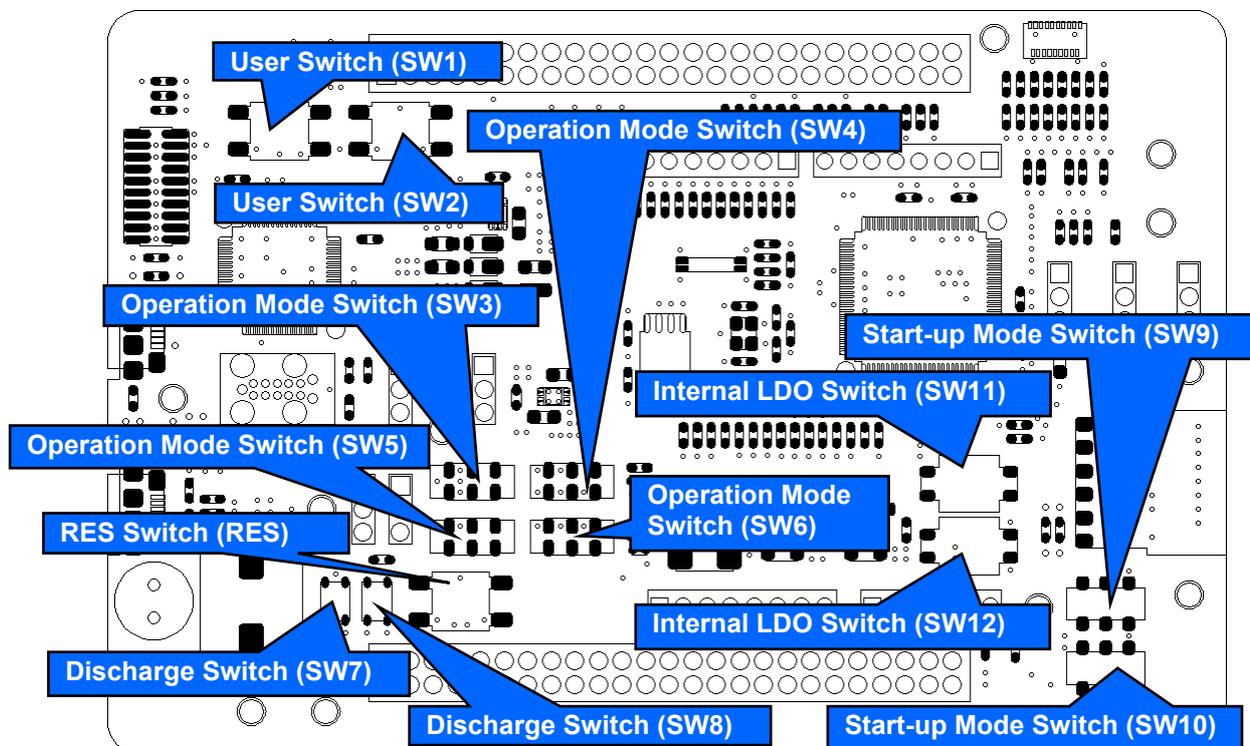


Figure 8-3: Component Layout (Switches)

Table 8-2: Switches

Switch	Function	RE01	
		Port	Pin
RES	Resets the main board.	RES#	23
SW1	Connects to KRM01_B for user controls.	P509	74
SW2	Connects to IRQ4_C for user controls.	P508	75
SW3,5	Selects normal mode or EHC mode. Selects to use/not to use J-Link™ OB.	P411 (SWCLK)	16
		P207 (SWDIO)	22
		RES#	23
SW4,6	Selects normal mode or EHC mode.	VCC_SU	27
		VBAT_EHC	28
		VSC_VCC	29
SW7	Discharge C36 capacitor.	VCC/IOVCC	14
SW8	Discharge VCC_SU storage capacitor (C25, C29, C30).	VCC_SU	27
SW9	Selects RE01 start-up mode.	MD	24
SW10		EHMD	19
SW11	Selects internal LDO or external DC/DC.	NC	NC
SW12		VCLH	8
		VCL	15

8.4 LED

There are 4 LEDs in this main board. **Figure 8-4** shows the component layout of the LEDs. **Table 8-3** shows the details of the LEDs.

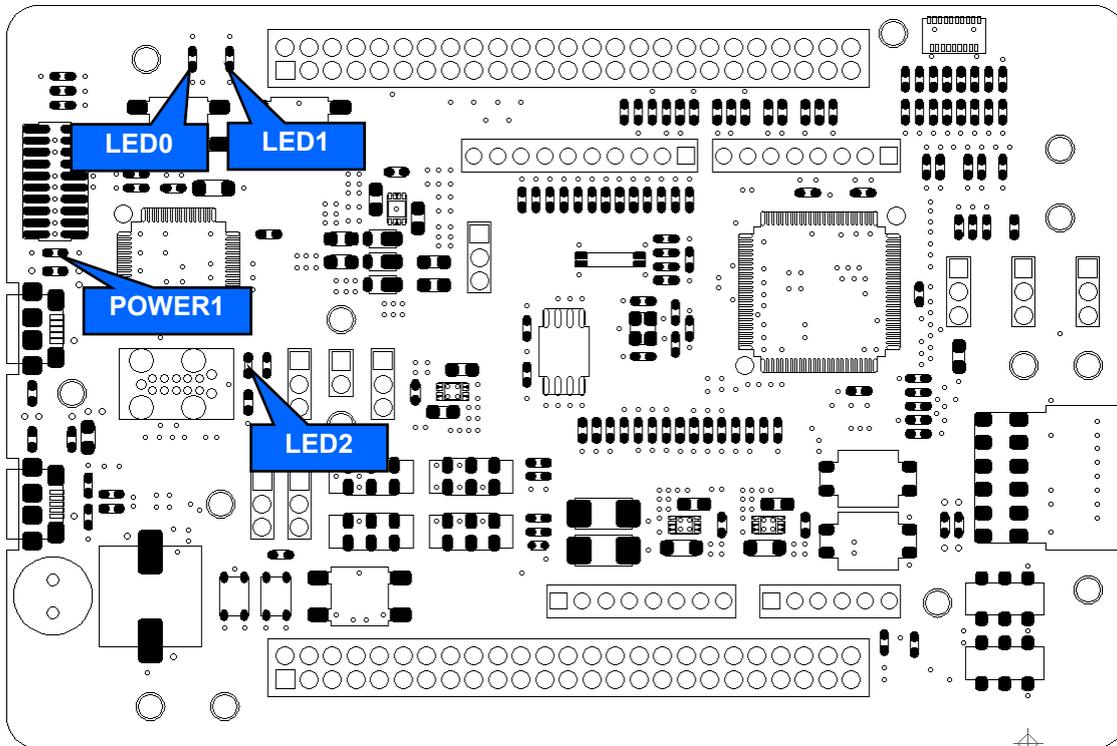


Figure 8-4: Component Layout (LED)

Table 8-3: LED

LED	Color	Function	RE01	
			Port	Pin
POWER1	Green	Board_5V power line indicator	NC	NC
LED0	Orange	User LED	P210 (IOVCC)	32
LED1	Red	User LED	P410 (IOVCC)	17
LED2	Green	J-Link™ OB Indicator	NC	NC

8.5 Pmod™ Interface

This main board has the connector for Pmod™ interface. **Table 8-4** shows compatible connection boards and **Figure 8-5** shows the pin assignment.

Table 8-4: Compatible Connection Boards

Compatible Boards	Reference Chapter
MIP-LCD Expansion Board	7.5.1
RL78/G1D BLE Module Expansion Board (RTKYRLG1D0B00000BJ)	7.5.2
Digilent Pmod™ Compatible Connector	7.5.3

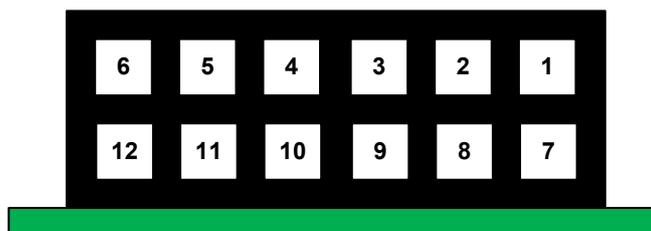


Figure 8-5: Pin Assignment

8.5.1 MIP-LCD Expansion Board

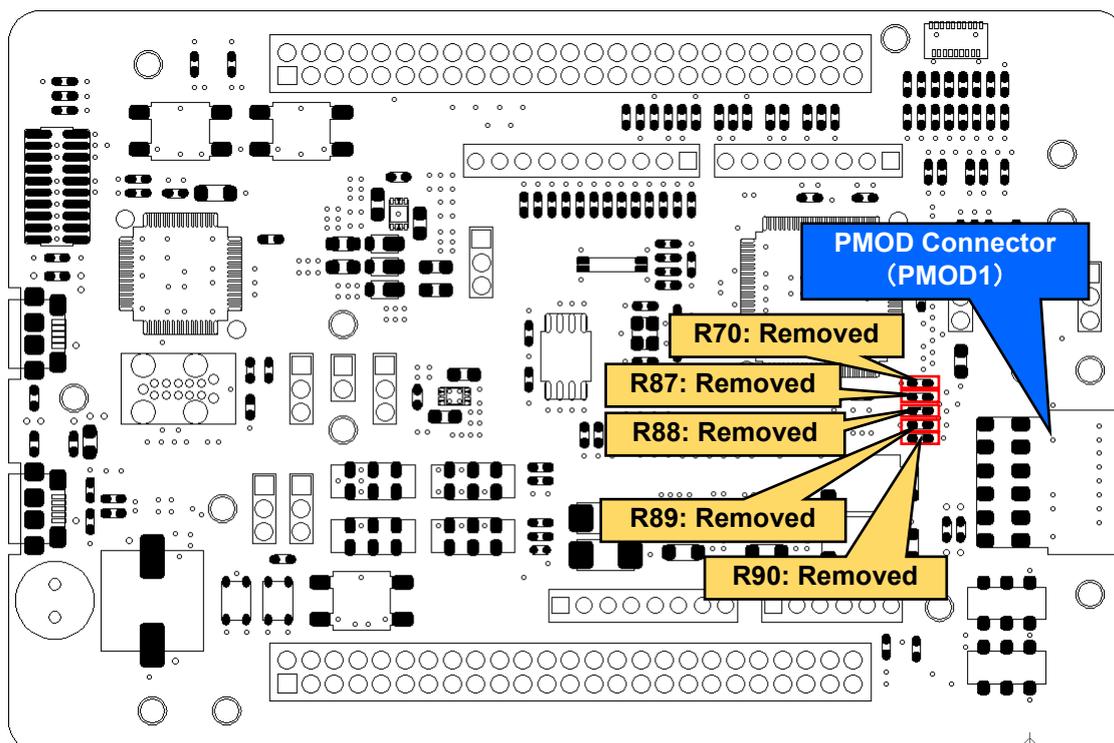
This main board has a connector for MIP-LCD expansion board interface. Connect the included MIP-LCD expansion board to the PMOD connector.

Connection with the MIP-LCD (TN0181ANVNANN-AN00 made by Kyocera*¹) that is mounted on MIP-LCD expansion board are done via RE01 built-in serial peripheral interface (SPI). **Figure 8-6** and **Figure 8-7** shows the component layout, while **Table 8-6** shows the details of PMOD connector.

This function is supported in default configuration, as supplied. To return to this setting from other settings, set the resistors as shown in **Figure 8-6**, **Figure 8-7**, and **Table 8-5**.

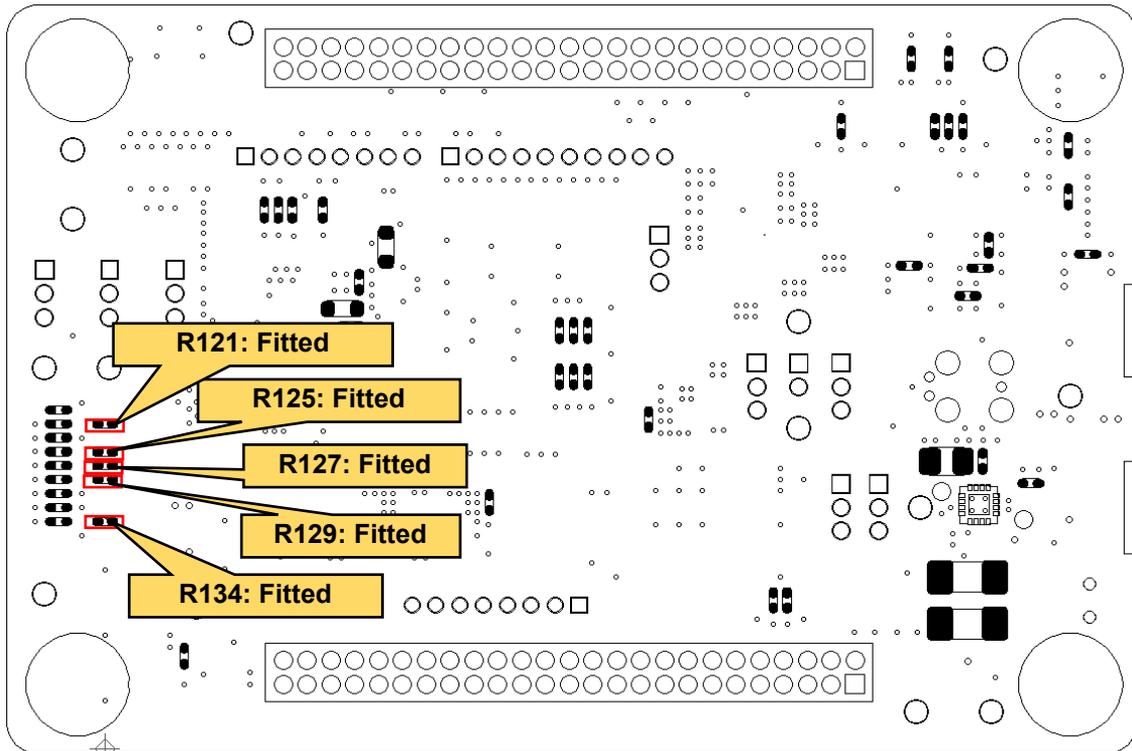
Sample code related to this expansion board is available on the Renesas website entitled “R_GDT Driver Sample Code (Using CMSIS Driver Package)” (R01AN4755).

*1: Please contact Kyocera.



Other settings will be as per the default kit configuration, as supplied.

Figure 8-6: Component Layout and Settings (MIP-LCD Expansion Board (Top))



Other settings will be as per the default kit configuration, as supplied.

Figure 8-7: Component Layout and Settings (MIP-LCD Expansion Board (Bottom))

Table 8-5: Configuration Details (MIP-LCD Expansion Board)

Component	Setting
R70, R87-R90	Removed
R121, R125, R127, R129, R134	Fitted

The settings in the table above are supported in default configuration, as supplied.

Table 8-6: PMOD Connector (MIP-LCD Expansion Board)

PMOD Connector (PMOD1)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	PMOD_SSLA1_B_P015	P015	92	7	PMOD_INT_AGTWOA1_B_P814	P814	99
2	PMOD_MOSIA_B_P010	P010	97	8	PMOD_RESET_RXD4_C	P813	100
3	PMOD_MISOA_B_CTS4_C	P815	98	9	PMOD_IO0_P014	P014	93
4	PMOD_RSPCKA_B_P011	P011	96	10	PMOD_IO1	P806	7
5	GROUND	-	-	11	GROUND	-	-
6	IOVCC0	-	-	12	IOVCC0	-	-

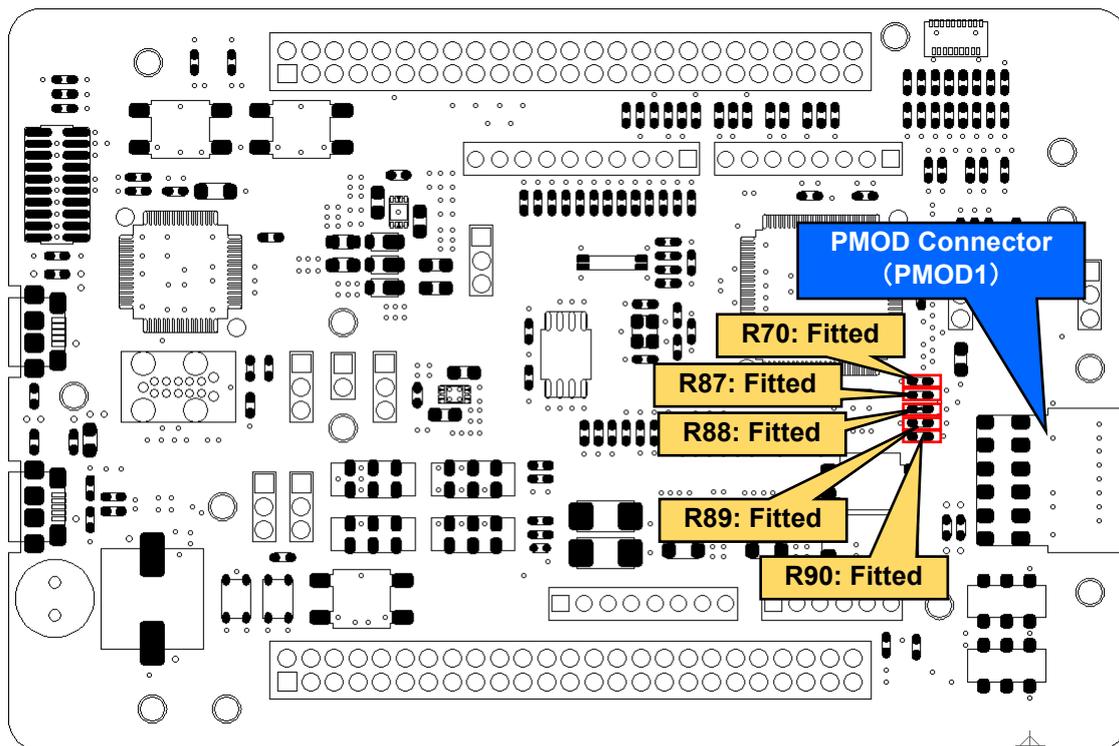
8.5.2 RL78/G1D BLE Module Expansion Board

This main board has a connector for the RL78/G1D BLE Module Expansion Board (BLE Evaluation Board). Connect the Renesas BLE Evaluation Board (sold separately) to the PMOD connector.

Connection with the RL78/G1D module that is mounted on BLE evaluation board are done via RE01 built-in serial communication interface (SCI). **Figure 8-8** and **Figure 8-9** show the component layout, while **Table 8-8** shows the details of PMOD connector.

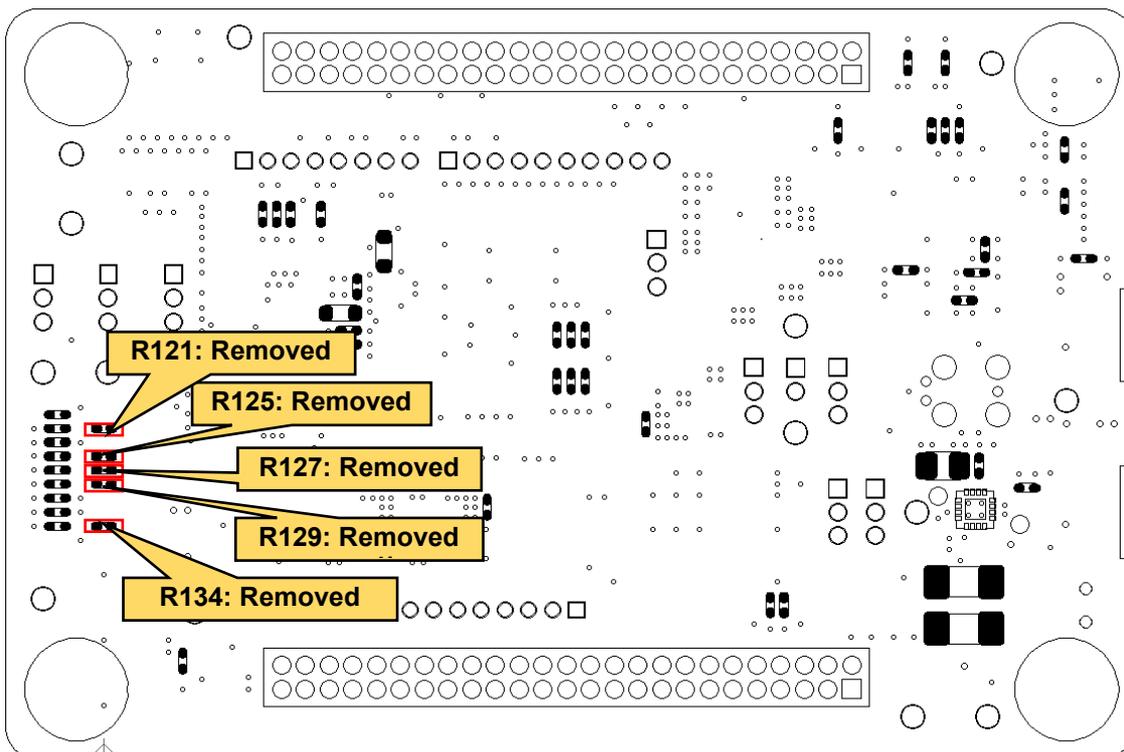
This function is not supported in default configuration, as supplied. Set the resistors as shown in **Figure 8-8**, **Figure 8-9**, and **Table 8-7**.

Sample code related to this expansion board is available on the Renesas website entitled “Bluetooth® Low Energy Protocol Stack Evaluation Kit RE01 256KB Host Sample” (R01AN5472).



Other settings will be as per the default kit configuration, as supplied.

Figure 8-8: Component Layout and Settings (RL78/G1D BLE Module Expansion Board (Top))



Other settings will be as per the default kit configuration, as supplied.

Figure 8-9: Component Layout and Settings (RL78/G1D BLE Module Expansion Board (Bottom))

Table 8-7: Configuration Details (RL78/G1D BLE Module Expansion Board)

Component	Setting
R70, R87-R90	Fitted
R121, R125, R127, R129, R134	Removed

Table 8-8: PMOD Connector (RL78/G1D BLE Module Expansion Board)

PMOD Connector (PMOD1)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	PMOD_MISOA_B_CTS4_C	P815	98	7	PMOD_INT_AGTWOA1_B_P814	P814	99
2	PMOD_TXD4_C	P812	1	8	PMOD_MOSIA_B_P010	P010	97
3	PMOD_RESET_RXD4_C	P813	100	9	PMOD_IO0_P014	P014	93
4	PMOD_RSPCKA_B_P011	P011	96	10	PMOD_SSLA1_B_P015	P015	92
5	GROUND	-	-	11	GROUND	-	-
6	IOVCC0	-	-	12	IOVCC0	-	-

8.5.3 Pmod™

This main board has a connector for Digilent Pmod™ interface. Connect a commercially available Digilent Pmod™ module (or other compatible module) to PMOD connector. Connection with the Digilent Pmod™ module is done via RE01 built-in SPI interface (RSPI).

Figure 8-6 and Figure 8-7 shows component layout, while Table 8-6 shows details of PMOD connector.

This function is not supported in default configuration, as supplied. To return to this setting from other settings, set the resistors as shown in Figure 8-6, Figure 8-7, and Table 8-5.

Not that Digilent Pmod™ pinouts are different from normal pinouts. Refer to the Digilent Pmod™ interface specifications for more details.

8.6 USB Serial Conversion

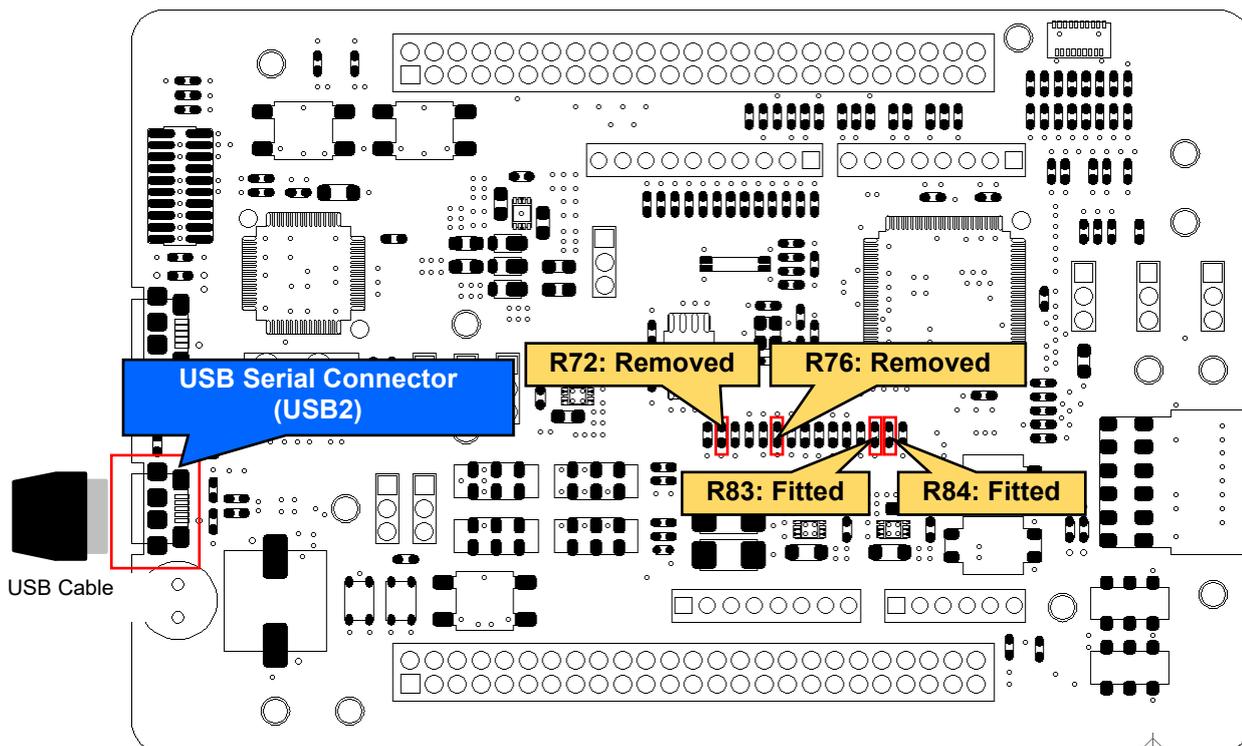
This main board has USB serial conversion circuit, which can be used as a virtual COM port by connecting to the host PC. Connect host PC to USB serial conversion connector (USB2) by using the included USB cable.

Connection with the host PC is done via RE01 built-in serial communication interface (SCI).

The component layout and details of USB serial connection are shown in **Figure 8-10** and **Table 8-10**.

This function is not supported in default configuration, as supplied. To return to this setting from other settings, set the resistors as shown in **Figure 8-10** and **Table 8-9**.

The related sample code is available on Renesas Website, entitled “USART Asynchronous Communication Sample Code (Using CMSIS Driver Package)” (R01AN4699).



Other settings will be as per the default kit configuration, as supplied.

Figure 8-10: Component Layout and Settings (USB Serial Conversion)

Table 8-9: Configuration Details (USB Serial Conversion)

Component	Setting
R72, R76	Removed
R83, R84	Fitted

The settings in the table above are supported in default configuration, as supplied.

Table 8-10: USB Serial

Signal Name	Function	RE01	
		Port	Pin
USB_SCI_TXD	SCI0 Transmit Signal	P703	40
USB_SCI_RXD	SCI0 Receive Signal	P702	41
USB_SCI_CTS	Input signal for controlling the start of transmission and reception	P704	39
USB_SCI_RTS	Output signal for controlling the start of transmission and reception	P202	38

Prepare the driver provided by FTDI chip before using this function. The necessary driver is listed below.

- VIRTUAL CON PORT(VCP) Drivers

Please download the driver installer from the following URL.

<http://www.ftdichip.com/Products/ICs/FT230X.html>

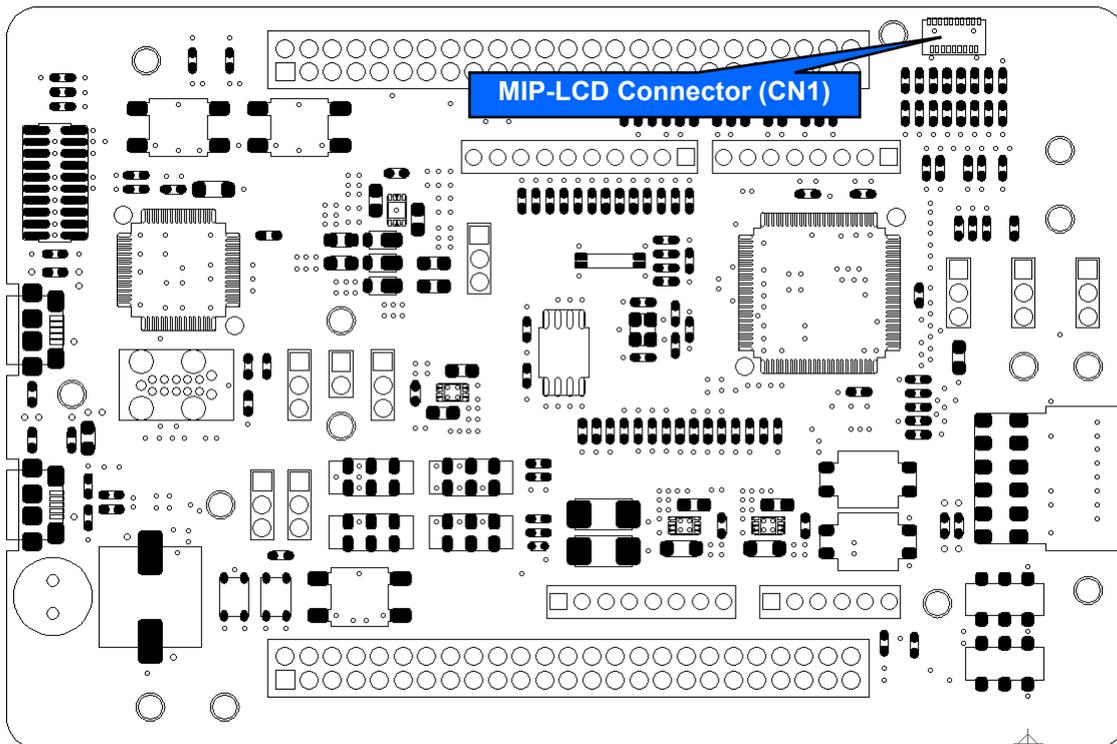
8.7 MLCD (Memory In Pixel Liquid Crystal Display) Interface

This main board has FPC connector (CN1), which can be connected to MIP-LCD (Kyocera TN0104ANVAANN-GN00^{*1}). Connection to MIP-LCD is done through RE01 built-in MIP LCD Controller (MLCD).

Component layout is shown in **Figure 8-11**, while MIP-LCD connection details is shown in **Table 8-11**. This function is supported in default configuration, as supplied.

Related sample code is available in Renesas Website, entitled “MLCD Transfer Sample Code (Using CMSIS Driver Package)” (R01AN4883).

^{*1}: Please contact Kyocera.



Other settings will be as per the default kit configuration, as supplied.

Figure 8-11: Component Layout and Setting (MLCD)

Table 8-11: MIP-LCD Connector

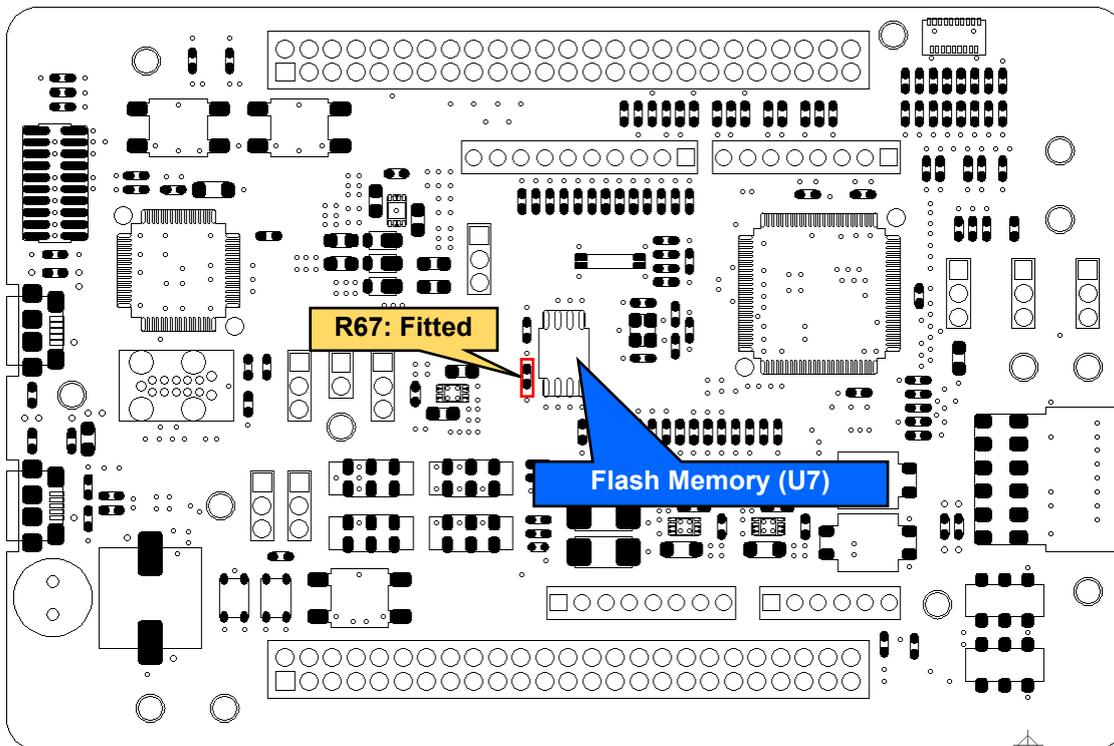
MIP-LCD Connector (CN1)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	MLCD_VCOM	P113	56	11	MLCD_SI2	P105	66
2	IOVCC1	-	-	12	MLCD_SI1	P106	65
3	GROUND	-	-	13	MLCD_SI0	P107	64
4	MLCD_ENBS	P109	60	14	MLCD_DEN	P110	59
5	MLCD_XRST	P112	57	15	MLCD_SCLK	P111	58
6	MLCD_SI7	P100	71	16	MLCD_ENBG	P108	61
7	MLCD_SI6	P101	70	17	GROUND	-	-
8	MLCD_SI5	P102	69	18	IOVCC1	-	-
9	MLCD_SI4	P103	68	19	MLCD_VCOM	P113	56
10	MLCD_SI3	P104	67	-	-	-	-

8.8 Flash Memory

This main board has a 64Mb flash memory made by Macronix (MX25R6435FM2IL0). Connection to the flash memory is done through RE01 built-in quad serial peripheral interface (QSPI).

Component layout is shown in **Figure 8-12**, while the details of flash memory connection is shown in **Table 8-13**.

This function is not supported in default configuration, as supplied. set the resistors as shown in **Figure 8-12** and **Table 8-12**.



Other settings will be as per the default kit configuration, as supplied.

Figure 8-12: Component Layout and Setting (Flash Memory)

Table 8-12: Configuration Details (Flash Memory)

Component	Setting
R67	Fitted

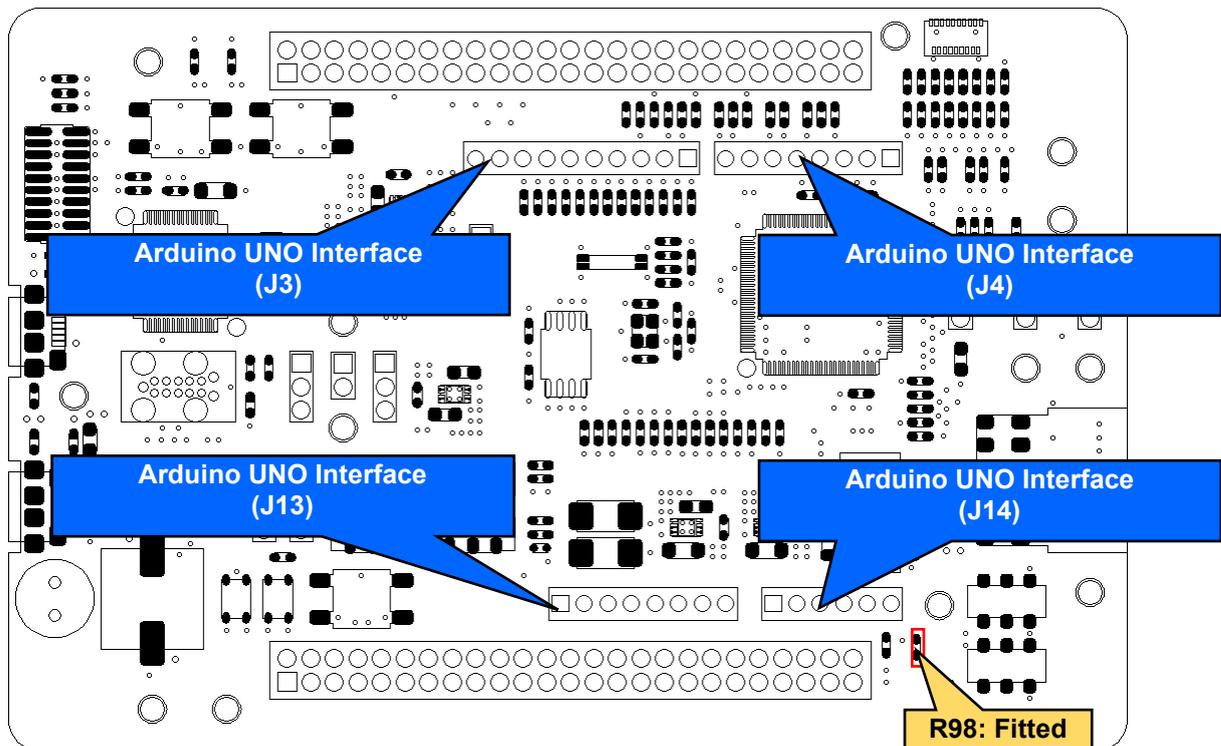
Table 8-13: Flash Memory

Flash Memory (U7)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	QSPI_QSSL_A	P807	6	5	QSPI_QIO0_A	P811	2
2	QSPI_QIO1_A	P810	3	6	QSPI_QSPCLK_A	P812	1
3	QSPI_QIO2_A	P809	4	7	QSPI_QIO3_A	P808	5
4	GROUND	-	-	8	IOVCC0	-	-

8.9 Arduino UNO Interface

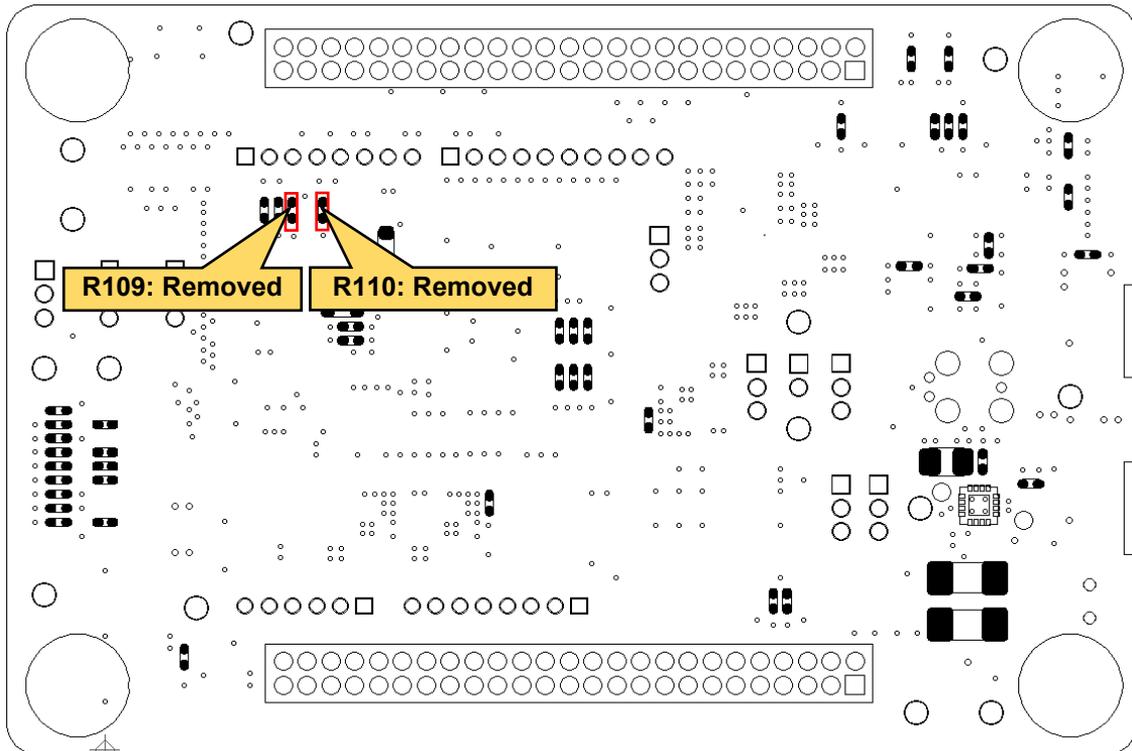
This main board has Arduino UNO interface and can be connected to various shields. Component layout and configuration details are shown in **Figure 8-13**, **Figure 8-14**, and **Table 8-14**. Details of Arduino UNO connections are shown in **Table 8-15**, **Table 8-16**, **Table 8-17**, and **Table 8-18**.

Voltage can be supplied to J13-1 pin from IOVCC0/IOVCC1/AVCC0. Select the power supply voltage by shorting any of R110, R98, or R109. To supply from IOVCC0, short only R110. To supply from IOVCC1, short only R98. To supply from AVCC0, short only R109. **Figure 8-13** and **Figure 8-14** shows the board's default resistor setting (supply from IOVCC1).



Other settings will be as per the default kit configuration, as supplied.

Figure 8-13: Component Layout and Setting (Arduino UNO Interface (Top))



Other settings will be as per the default kit configuration, as supplied.

Figure 8-14: Component Layout and Settings (Arduino UNO Interface (Bottom))

Table 8-14: Configuration Details (Arduino UNO Interface)

Component	Setting
R98	Fitted
R109, R110	Removed

The settings in the table above are supported in default configuration, as supplied.

Table 8-15: Arduino UNO Interface (1)

Arduino UNO Interface (J3)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	ARDUINO_IO8	P409 (IOVCC)	18	6	ARDUINO_RSPCKA_B	P011 (IOVCC0)	96
2	ARDUINO_IO9_GTI0C2A_B	P302 (IOVCC1)	48	7	GROUND	-	-
3	ARDUINO_SS1A1_B	P015 (IOVCC0)	92	8	ARDUINO_VREF	-	-
4	ARDUINO_MOSIA_B	P010 (IOVCC0)	97	9	ARDUINO_SDA0*	P012 (IOVCC0)	95
5	ARDUINO_MISOA_B	P815 (IOVCC0)	98	10	ARDUINO_SCL0*	P013 (IOVCC0)	94

*: The default kit configuration uses a transfer rate of 50kbps or less. To increase the transfer rate, change the resistor values (R21, R22).

Table 8-16: Arduino UNO Interface (2)

Arduino UNO Interface (J4)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	ARDUINO_IO0_RXD5_B	P314 (IOVCC1)	45	5	ARDUINO_IO4	P602 (IOVCC1)	53
2	ARDUINO_IO1_TXD5_B	P315 (IOVCC1)	44	6	ARDUINO_IO5_ GTIOC5A_B	P603 (IOVCC1)	52
3	ARDUINO_IO2_IRQ7_B	P204 (IOVCC1)	36	7	ARDUINO_IO6_ GTIOC5B_B	P604 (IOVCC1)	51
4	ARDUINO_IO3_IRQ8_C	P205 (IOVCC1)	35	8	ARDUINO_IO7	P300 (IOVCC1)	50

Table 8-17: Arduino UNO Interface (3)

Arduino UNO Interface (J13)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	IOVCC0*/IOVCC1/AVCC0*	-	-	5	Board_5V	-	-
2	LP_3V3	-	-	6	GROUND	-	-
3	RESn	RES# (IOVCC)	23	7	GROUND	-	-
4	LP_3V3	-	-	8	VCC_MCU	-	-

*: Not connected by default. Please change the resistor based on your application.

Table 8-18: Arduino UNO Interface (4)

Arduino UNO Interface (J14)							
Pin	Signal Name	RE01		Pin	Signal Name	RE01	
		Port	Pin			Port	Pin
1	ARDUINO_AN000	P000 (AVCC0)	89	4	ARDUINO_AN003	P003 (AVCC0)	86
2	ARDUINO_AN001	P001 (AVCC0)	88	5	ARDUINO_AN004	P004 (AVCC0)	85
3	ARDUINO_AN002	P002 (AVCC0)	87	6	ARDUINO_AN005	P005 (AVCC0)	82

8.10 External DC/DC Circuit

Normally, the internal power supply of RE01 uses a built-in regulator (LDO). However, RE01 can enable an even lower power consumption by supplying power to the internal power supply from an external DC/DC converter instead of the internal LDO. **Figure 8-15** shows an overview of operation when using a built-in regulator, and **Figure 8-16** shows an overview of operation when using an external DC / DC converter.

For external DC / DC, Renesas ISL9123 is mounted on the board and can be evaluated immediately.

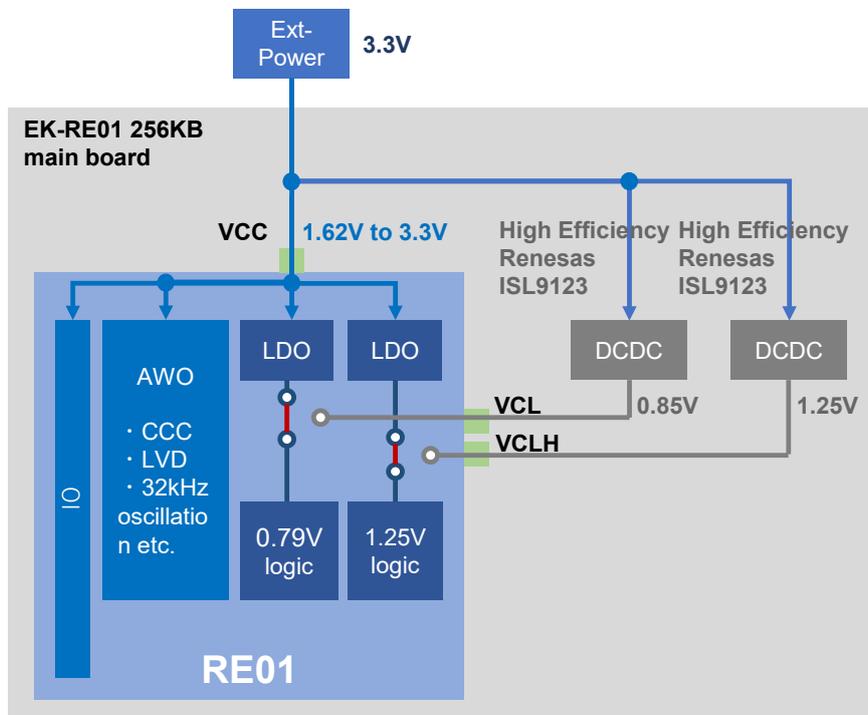


Figure 8-15: overview of operation when using a built-in regulator

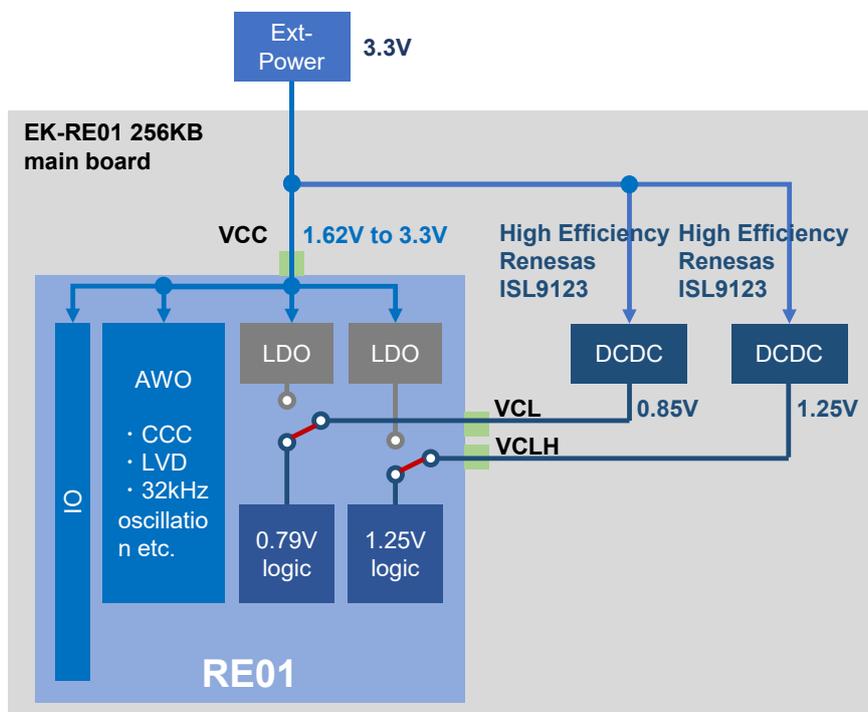


Figure 8-16: overview of operation when using an external DC/DC converter

Component layout is shown in **Figure 8-17**, while details are shown in **Figure 8-17** and **Table 8-19**. For details on the usage and benefits of external DC / DC, refer to the application note " RE01 256KB Group How to reduce power consumption by using the external DC/DC converter " (R01AN5424). The I²C bus interface is used to change the voltage of external DC/DC. The default kit configuration uses a transfer rate of 50kbps or less. To increase the transfer rate, change the resistor values (R21, R22).

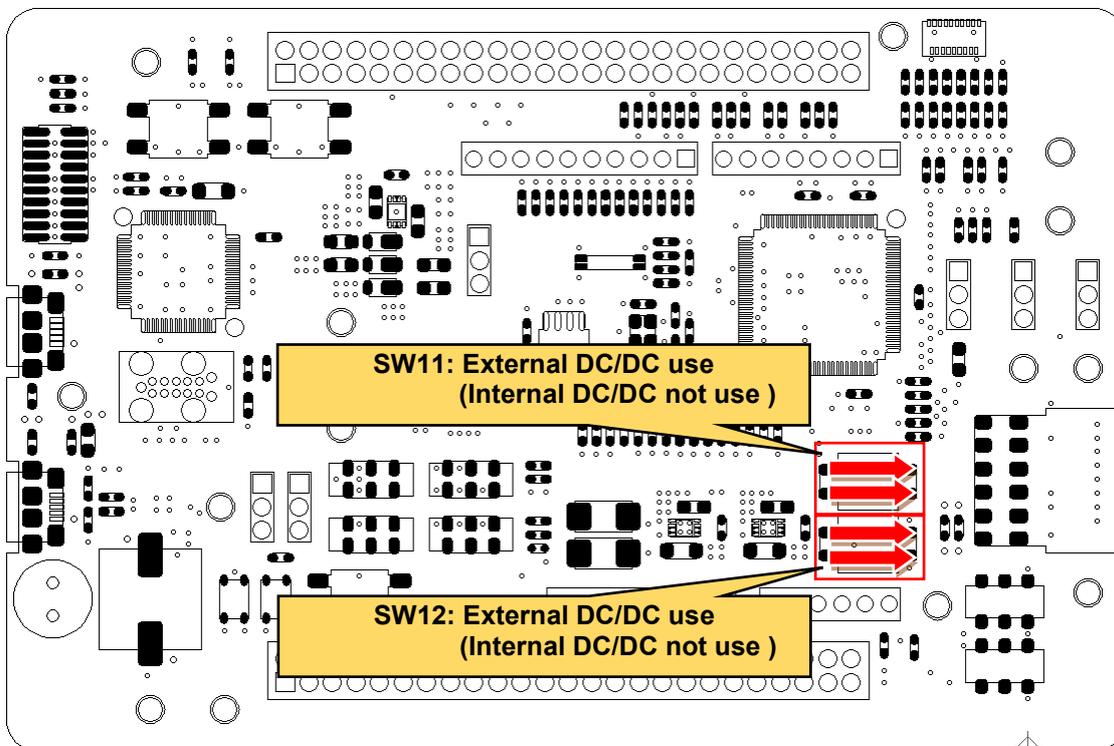


Figure 8-17: Component Layout and Settings (External DC/DC Circuit)

Table 8-19: Configuration Details (External DC/DC Circuit)

Component	Setting
SW11, SW12	1-4, 2-3 External DC/DC use (Internal DC/DC not use)

9. Headers

9.1 RE01 Headers

This main board has RE01 headers, which can be used to observe general I/O port. **Table 9-1** and **Table 9-2** shows the connections of RE01 header J1. **Table 9-3** and **Table 9-4** shows the connections of RE01 header J2.

Table 9-1: RE01 Header J1 Connections (1)

RE01 Header J1					
Pin	Function (General IO Port/Power)	RE01 Pin	Pin	Function (General IO Port/Power)	RE01 Pin
	Circuit Net Name			Circuit Net Name	
1	P812	1	2	P811	2
	J1_P812			J1_P811	
3	P810	3	4	P809	4
	J1_P810			J1_P809	
5	P808	5	6	P807	6
	J1_P808			J1_P807	
7	P806	7	8	Reserve	NC
	PMOD_IO1			NC	
9	Reserve	NC	10	Reserve	NC
	NC			NC	
11	GND	-	12	Reserve	NC
	GROUND			NC	
13	Reserve	NC	14	VCC/IOVCC	14
	NC			VCC_MCU	
15	Reserve	NC	16	P411	16
	NC			J1_P411	
17	P410	17	18	P409	18
	LED1			ARDUINO_IO8	
19	EHMD	19	20	Reserve	NC
	EHMD			NC	
21	Reserve	NC	22	P207	22
	NC			J1_P207	
23	RES#	23	24	MD	24
	RESn			MD	

Table 9-2: RE01 Header J1(2)

RE01 Header J1					
Pin	Function (General IO Port/Power)	RE01 Pin	Pin	Function (General IO Port/Power)	RE01 Pin
	Circuit Net Name			Circuit Net Name	
25	P200	25	26	GND	-
	J1_P200			GROUND	
27	VCC_SU	27	28	VBAT_EHC	28
	VCC_SU			VBAT_EHC	
29	VSC_VCC	29	30	GND	-
	VSC_VCC			GROUND	
31	Reserve	NC	32	P210	32
	NC			LED0	
33	P209	33	34	P208	34
	DCDC_EHC_EN			DCDC_Ext_EN	
35	P205	35	36	P204	36
	ARDUINO_IO3_IRQ8_C			ARDUINO_IO2_IRQ7_B	
37	P203	37	38	P202	38
	J1_P203			J1_P202	
39	P704	39	40	P703	40
	J1_P704			J1_P703	
41	P702	41	42	P701	42
	J1_P702			J1_P701	
43	P700	43	44	P315	44
	J1_P700			ARDUINO_IO1_TXD5_B	
45	P314	45	46	IOVCC1	46
	ARDUINO_IO0_RXD5_B			IOVCC1	
47	GND	-	48	P302	48
	GROUND			ARDUINO_IO9_GTI0C2A_B	
49	P301	49	50	P300	50
	J1_P301			ARDUINO_IO7	

Table 9-3: RE01 Header J2(1)

RE01 Header J2					
Pin	Function (General IO Port/Power)	RE01 Pin	Pin	Function (General IO Port/Power)	RE01 Pin
	Circuit Net Name			Circuit Net Name	
1	P604	51	2	P603	52
	ARDUINO_IO6_GTIOC5B_B			ARDUINO_IO5_GTIOC5A_B	
3	P602	53	4	P601	54
	ARDUINO_IO4			J2_P601	
5	P600	55	6	P113	56
	J2_P600			MLCD_VCOM	
7	P112	57	8	P111	58
	MLCD_XRST			MLCD_SCLK	
9	P110	59	10	P109	60
	MLCD_DEN			MLCD_ENBS	
11	P108	61	12	IOVCC1	62
	MLCD_ENBG			IOVCC1	
13	GND	-	14	P107	64
	GROUND			MLCD_SI0	
15	P106	65	16	P105	66
	MLCD_SI1			MLCD_SI2	
17	P104	67	18	P103	68
	MLCD_SI3			MLCD_SI4	
19	P102	69	20	P101	70
	MLCD_SI5			MLCD_SI6	
21	P100	71	22	P511	72
	MLCD_SI7			J2_P511	
23	P510	73	24	P509	74
	J2_P510			SW1	

Table 9-4: RE01 Header J2(2)

RE01 Header J2					
Pin	Function (General IO Port/Power)	RE01 Pin	Pin	Function (General IO Port/Power)	RE01 Pin
	Circuit Net Name			Circuit Net Name	
25	P508	75	26	P501	76
	SW2			J2_P501	
27	P500	77	28	AVCC0	78
	J2_P500			AVCC0	
29	GND	-	30	P007	80
	GROUND			J2_P007	
31	P006	81	32	P005	82
	J2_P006			ARDUINO_AN005	
33	GND	-	34	VREFH0	84
	GROUND			VREFH0	
35	P004	85	36	P003	86
	ARDUINO_AN004			ARDUINO_AN003	
37	P002	87	38	P001	88
	ARDUINO_AN002			ARDUINO_AN001	
39	P000	89	40	GND	-
	ARDUINO_AN000			GROUND	
41	IOVCC0	91	42	P015	92
	IOVCC0			J2_P015	
43	P014	93	44	P013	94
	PMOD_IO0_P014			J2_P013	
45	P012	95	46	P011	96
	J2_P012			J2_P011	
47	P010	97	48	P815	98
	J2_P010			J2_P815	
49	P814	99	50	P813	100
	PMOD_INT_AGTWOA1_B_P814			PMOD_RESET_RXD4_C	

10. Code Development

10.1 Overview

There are several ways to debug the code for this device:

- Connect Main Board to PC through IAR System® development tool I-jet™ emulator.
- Connect Main Board to PC through Segger development tool J-Link™ OB that is mounted on Main Board.
- Connect Main Board to PC through Segger development tool J-Link™ emulator.
- Connect Main Board to PC through Renesas development tool E2 emulator.

Refer to the manufacturer's website for more details about each emulator.

10.2 Mode Support

This Evaluation Kit supports several operation modes and start-up modes. The settings related to modes change are described in Section 5. Operation/Start-up Mode. Refer to RE01 Group User's Manual: Hardware for detailed information about RE01 start-up mode and registers.

Only change the RE01 operating mode when the Evaluation Kit is in reset or turned off. Otherwise, the RE01 may be damaged.

10.3 Address Space

For the RE01 address space details, refer to the 'Address Space' section of RE01 Group User's Manual: Hardware.

11. Additional Information

Technical Support

For information about the RE01 refer to the RE01 Group User's Manual: Hardware. (R01UH0894)

Trademarks

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

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 Corporation.

© 2021 Renesas Electronics Corporation. All rights reserved.

Revision History	RE01Group Evaluation Kit RE01 256KB User's Manual
------------------	--

Rev.	Date	Description	
		Page	Summary
1.00	Jul 07, 2020	–	First Edition issued.
1.01	Oct 02, 2020	8	Add chapter 1.2 Kit Contents.
		9	Change table 1-2.
		19	Add figure 2-8.
		21	Change figure 4-1.
		23	Add chapter 4.3.1 All power pins.
		24-28	Change figure titles.
			Add the voltage range that can be supplied.
		36	Change the connector name.
		47	Add figure 7-1.
			Change sentence.
		52	Add power domains to table 8-3.
63, 64	Add power domains from table 8-15 to table 8-18.		
1.02	Apr 16, 2021	21	Update the connection relationship on the board in Figure 3-1 to show the connection terminals.
		24	Correct numbering in the section 4.3.2. Add UC_VCC line to Figure 4-1 Power Supply System Diagram.
		26	Add SW3 and SW5 to Figure 4-3 Setting.
		22, 23	Add details of connection terminals in Table 3-1 and 3-2.
		34	Add Figure 5-3, 5-4 the connection relationship between signal lines and power lines.
		43 – 50	Add connection diagrams for signal lines and power lines for each setting.
		57	Add the J-Flash Lite program writing method.
		58, 59	Add Section 6.6 Emulator connection in EHC mode
		60 – 65	Add the method of measuring the current when the on-board regulator 3.3V is not used and in EHC mode.
82	Add Figure 8-15 and Figure 8-16 External DCDC circuit schematic diagram and revise the text.		

RE01 Group
Evaluation Kit RE01 256KB User's Manual

Publication Date: Rev. 1.02 Apr 16, 2021

Published by: Renesas Electronics Corporation

RE01 Group

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Renesas Electronics:](#)

[RTK70E0118S00000BJ](#)