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EB-RE01B
Hardware Manual

Ver 1.04 (2021/8/3)

Change history

Version	Date	Description
1.00	2021/1/28	Initial version
1.01	2021/3/17	Changed P4, P7
1.02	2021/3/22	Power supply setting explanations are added
1.03	2021/6/11	Power line configuration diagram added Signal wiring diagram added Other material updates
1.04	2021/8/3	Comply with overseas certifications

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- Please handle this product as you would a CMOS device. The user should be particularly careful to protect himself/herself from accumulated static electricity when using this product.
- Make sure all test and measurement equipment, including the work station, are properly grounded.
- The user should wear an ESD wrist strap to prevent any buildup of static electricity.
- Do not touch connectors or device pins with bare hands

[COMMON WARNING & NOTICE]

- **ESD warning (Electrostatic sensitive)**

This equipment should be handled like a CMOS semiconductor device. The user must take all precautions to avoid build-up of static electricity while working with this equipment. All test and measurement tool including the workbench must be grounded. The user/operator must be grounded using the wrist strap. The connectors and/or device pins should not be touched with bare hands.

[FCC WARNING & NOTICE]

- **FCC Part15 compliance information**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

- **Class B statement**

NOTE:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the

receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help.

- **Modifications**

Any modifications made to this device may void the authority granted to the user by the FCC to operate this equipment.

[ISED WARNING & NOTICE]

- **ICES-003 Class B Notice - Avis NMB-003, Classe B**

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

- **Innovation, Science and Economic Development Canada (ISED) compliance information**

This device contains licence-exempt transmitter/receiver that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

- **Innovation, des Sciences et du développement économique (ISED) conformité Renseignements**

L'émetteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) L'appareil ne doit pas produire de brouillage;
(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

[CE, European Union WARNING & NOTICE]

- Information and notification for safety use

This kit intends to use for develop a wireless communication software or evaluate RF characteristics.
Be careful with the handling of the kit, the projections possibly hurt your body.
The board is an open PCB without any casing as it is quite common in development and

evaluation environment. such equipment is likely to be damaged by ESD.
Please use this product only ESD-safe environment, same as a semiconductor.
Please use the built in antennas for radio communication.
This kit has acquired CE certification, using the dedicated software made by Renesas.
Please note that the use of software other than the dedicated software made by Renesas, or the operation by software modification will not conform to the certification.

- **WEEE**

The WEEE (Waste Electrical and Electronic Equipment) regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the European Union only. This equipment (including all accessories) is not intended for household use. After use the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled and disposed of in an environmentally sound manner. Renesas Electronics Europe GmbH can take back end of life equipment, register for this service at http://www.renesas.eu/weee

Contents

1. Board overview

The EB-RE01B board provides an environment for the evaluation of the RE01B microcomputer including it's energy harvest control function with Ultra-low current consumption operation and also allows for the evaluation of the on-chip Bluetooth Low Energy（BLE）function.

1.1. purpose

The EB-RE01B board is an evaluation board for RE01B MCU operating at ultra-low supply current. It provides for the evaluation if the Energy harvest control function, Bluetooth Low Energy (BLE) evaluation, current consumption measurement, and allows for the development of user software.

1.2. Included items

The contents of this evaluation board is shown in Table 1-1. Debuggers (e.g. E2, J-link) used in software development, energy harvesting elements (such as solar panels) and secondary batteries or super capacitors used as power storage elements for evaluating energy harvest solutions are not included.

Table 1-1 Bundles

No	Included items	
1	Main board	Model No. EB-RE01B
2	spacers × 5, screws × 5,	
3	Notes	

Table 1-2: What needs to be prepared separately.

No	Things that need to be prepared separately	
1	USB cable × 1	Used for powering or writing the Renesas Flash Programmer (RFP)
2	Energy Harvest Elements (solar panels, etc.)	Used in Energy Harvest Evaluation
3	wires with alligator clip × 2	Used to connect energy harvest elements to evaluation boards
4	Super capacitor / Secondary Battery	Used in Energy Harvest Evaluation
5	emulator	Used in debug evaluation

For component selection in energy harvesting evaluations, please refer to RE01 1500KB, 256KB Group Battery Maintenance Free Energy Harvesting System Power Management (R01NA4837).

1.3. Board appearance

The EB-RE01B appearance diagram is shown in Figures 1-1 and 1-2.
The size of the board is 110.0mm in height and 156mm in width.

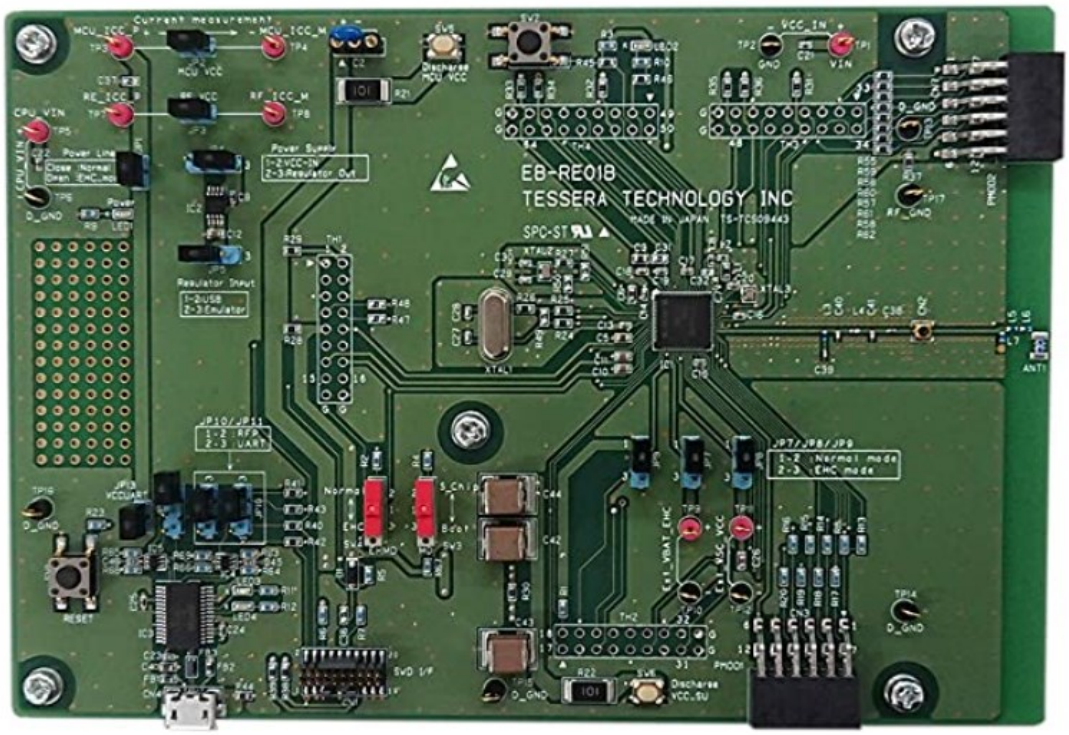

Figure 1-1: Board Appearance (TOP)

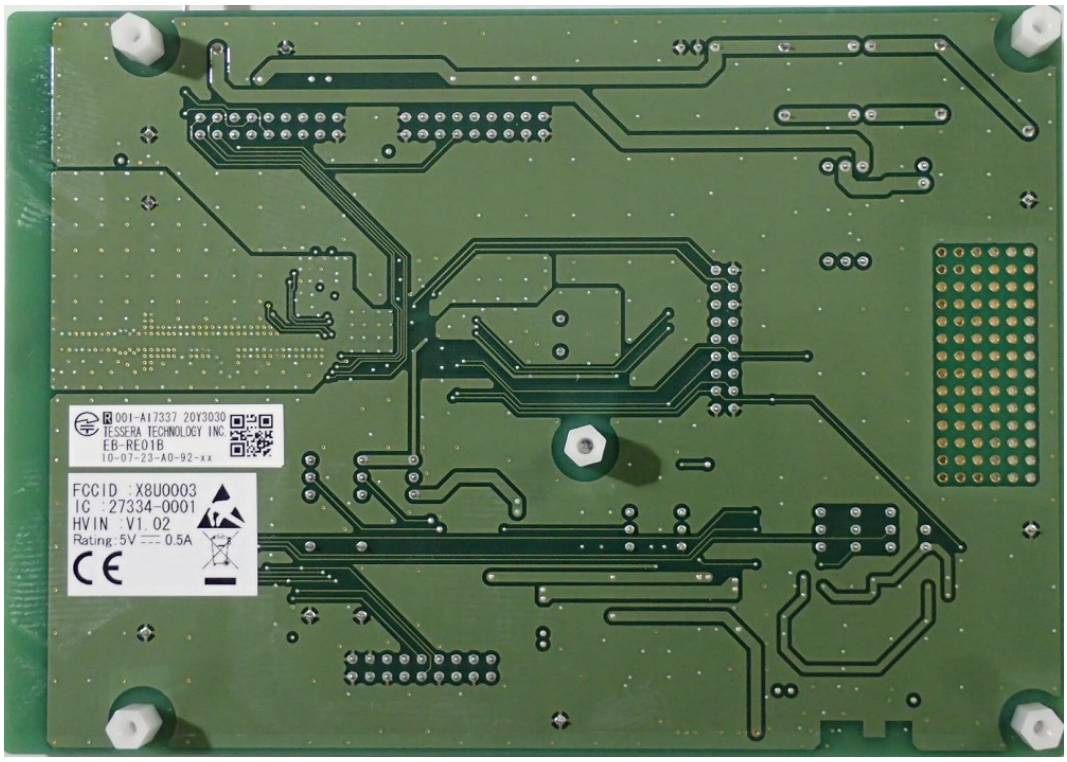

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Figure1-2: Board Appearance (Bottom)

1.4. Component placement

The mounted components are shown in Figure 1-3.

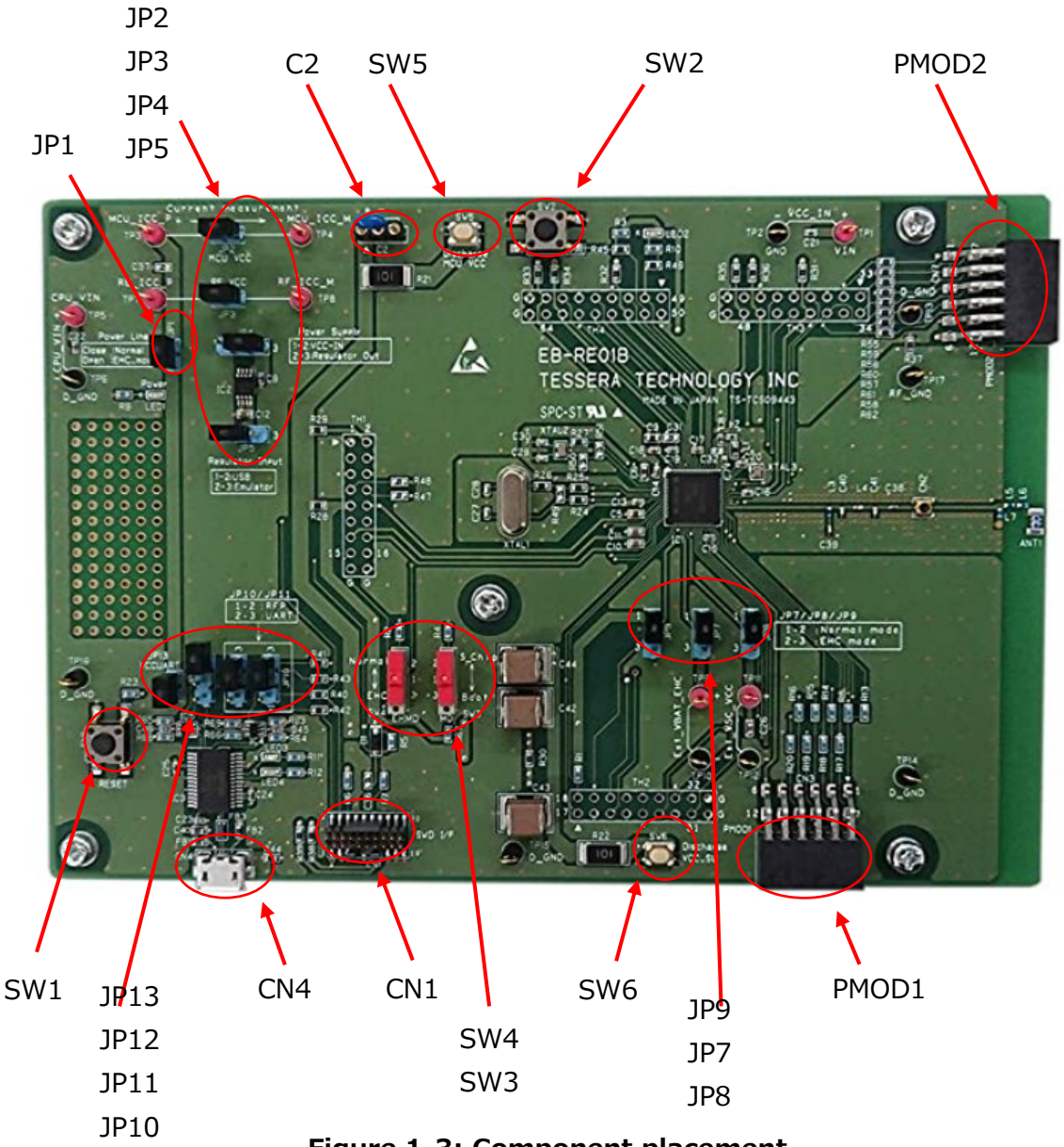


Figure 1-3: Component placement

1.5. Factory pin settings

The component layout of the EB-RE01B board as shipped from the factory is shown in Figure 1-4 and the configuration in Table 1-2.

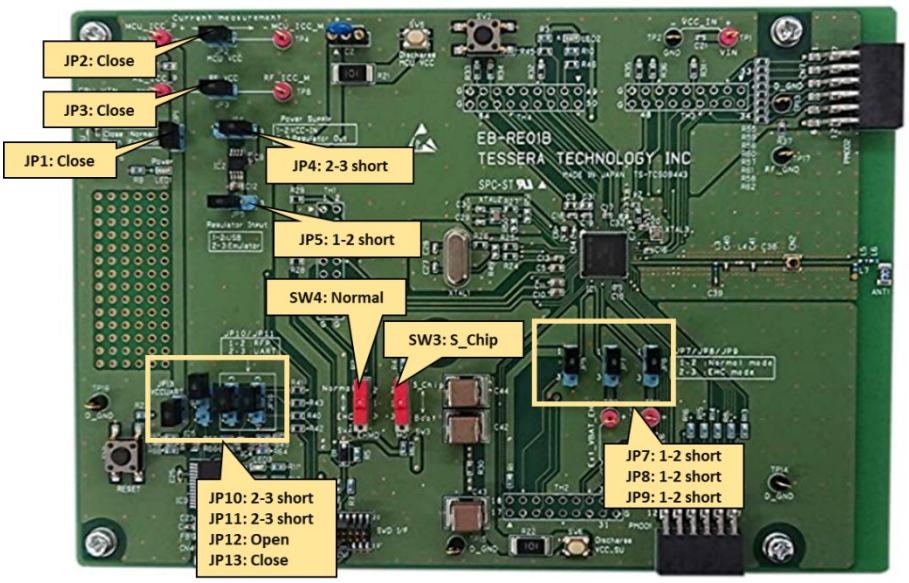


Figure 1-4 Factory Part Placement and Settings (Board)

Table 1-2 : Factory Part Placement and Settings (Table)

Reference	function	Settings	
SW3	Operating mode settings	S_Chip	Single Chip Mode
SW4	Operating mode settings	Normal	Normal operation
JP1	Operating mode settings	Close	Normal operation
JP2	MCU power line	Close	Power applied
JP3	BLE Power Line	Close	Power applied
JP4	Operating mode settings	2-3 short	Regulator Out
JP5	Operating mode settings	1-2 short	USB
JP7	Operating mode settings	1-2 short	Normal operation
JP8	Operating mode settings	1-2 short	Normal operation
JP9	Operating mode settings	1-2 short	Normal operation
JP10	RFP/UART switching	2-3 short	UART settings
JP11	RFP/UART switching	2-3 short	UART settings
JP12	UART CTS/RTS Switching	Open	Not set
JP13	Operating mode settings	Close	UART available

2. Specification

The board specifications are given in Table 2-1.

Table 2-1: Evaluation Board Specification Table

MCU	RE01B 64pin, Flash1.5MB, RAM256KB（R7F0E01BD2DNB）
MCU voltage	VCC ：1.62～3.6V VCC_RF ：1.8～3.6V
Internal voltage regulator	Output voltage 3.3V (USB CN4, SWD CN1 (11/13Pin) supply)
Main external oscillator	32MHz Crystal oscillator
Sub-external oscillator	32.768kHz Crystal oscillator
BLE external oscillator	32MHz Crystal oscillator
I/F	USB connector (USB-Serial conversion, general purpose UART/programming) SWD 20pin 1.27mm Pitch Connector (19pin Cortex-M) pmod™ connector x2 PMOD1(12Pin SPI), PMOD2 (12Pin UART)
switch	Reset switch × 1 General Purpose Momentary Switch ×1 2 MCU mode configuration switches 2 power discharge switches
LED	Power supply LED ×1 General Purpose LED × 1 Two USB-Serial LED
Radio standards	Bluetooth 5.0 Low Energy single mode compliant
Radio Law Standards	2.4GHz Band Advanced Low Power Data Communication System
Output frequency	2402MHz～2480MHz
Transmit power	Approx. +4dBm
antenna	Dielectric chip antenna

For more information about MCUs, see Hardware Annual, RE01B Group (Products with 1.5M Byte Flash Memory) User's Manual Hardware Edition (R01UH0903).

2.1. Connection relationships inside the board

The connection between the components of the EB-RE01B board and the RE01B is shown in Figure 2-1. A list of the connection terminals is shown in Table 2-2 to Table 2-8.

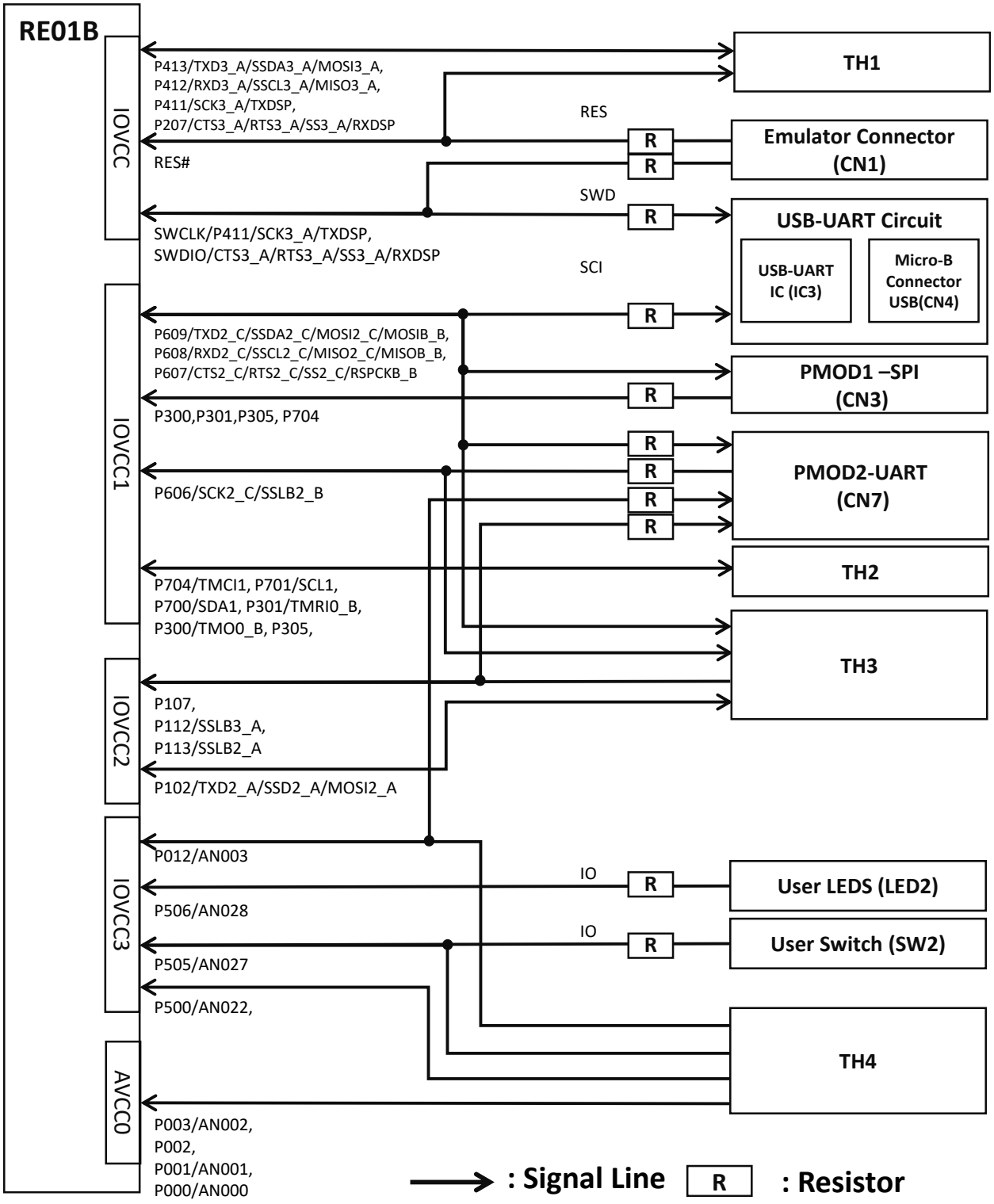


Figure 2-1: Connection relationships on board

Table 2-2: List of connection terminals with each function (1/2)

classification	function	port	RE01B pin number	board header pin	power domain
CLOCK	EXTAL	P412	8		IOVCC
	XTAL	P413	7		IOVCC
	XCIN		5		IOVCC
	XCOUT		4		IOVCC
	XTAL2_RF		44		
	XTAL1_RF		45		
SWITCH	SW1 (RES#)		16		IOVCC
	SW2	P505	52		IOVCC3
	SW3 (MD)	P201	17		IOVCC
	SW4 (EHMD)		12		IOVCC
LED	LED2	P506	51		IOVCC3
PMOD1 (SPI)	SS (SCK2_C/SSLB2_B)	P606	36	CN3-1	ICVCC1
	MOSI (TXD2_C/SSDA2_C/MOSI2_C/MOSIB_B)	P609	33	CN3-2	IOVCC1
	MISO (RXD2_C/SSCL2_C/MISO2_C/MISOB_B)	P608	34	CN3-3	ICVCC1
	SCK (CTS2_C/RTS2_C/SS2_C/RSPCKB_B)	P607	35	CN3-4	IOVCC1
	GPIO (P300 has low initial output)	P300	31	CN3-7	IOVCC1
	GPIO (P301 has an initial low output)	P301	30	CN3-8	IOVCC1
	GPIO	P305	27	CN3-9	IOVCC1
	GPIO	P704	24	CN3-10	IOVCC1

Table 2-3: List of connection terminals with each function (2/2)

classification	function	port	RE01B pin number	board header pin	power domain
PMOD2 (UART)	RTS/CTS (CTS2_C/RTS2_C/SS2_C/RSPCKB_B)	P607	35	CN7-1	IOVCC1
	TXD (TXD2_C/SSDA2_C/MOSI2_C/MOSIB_B)	P609	33	CN7-2	IOVCC1
	RXD (RXD2_C/SSCL2_C/MISO2_C/MISOB_B)	P608	34	CN7-3	IOVCC1
	GPIO (SCK2_C/SSLB2_B)	P606	36	CN7-4	IOVCC1
	GPIO (IRQ7_A)	P107	42	CN7-7	IOVCC2
	GPIO (SSLB3_A)	P112	39	CN7-8	IOVCC2
	GPIO (SSLB2_A)	P113	38	CN7-9	IOVCC2
	GPIO	P012	56	CN7-10	IOVCC3
USB-Serial	TXD2_C/SSDA2_C/MOSI2_C/MOSIB_B	P609	33	CN4-2	IOVCC1
	RXD2_C/SSCL2_C/MISO2_C/MISOB_B	P608	34	CN4-3	ICVCC1
SWD I/F	SWDIO/CTS3_A/RTS3_A/SS3_A/RXDSP	P207	15	CN1-2	IOVCC
	SWCLK/SCK3_A/TXDSP	P411	11	CN1-4	IOVCC
	RES #		16	CN1-10	IOVCC

Table 2-4: Test Pins (TH1)

classification	function	port	RE01B Pin number	board Header pin	power domain
TH1	VSS	-	1	TH1-1	
	IOVCC0	-	2	TH1-2	
	VCLH	-	3	TH1-3	
	D_GND	-	-	TH1-4	
	D_GND	-	-	TH1-5	
	VSS	-	6	TH1-6	
	TXD3_A/SSDA3_A/MOSI3_A	P413	7	TH1-7	IOVCC
	RXD3_A/SSCL3_A/MISO3_A	P412	8	TH1-8	IOVCC
	VCC/IOVCC	-	9	TH1-9	
	VCL	-	10	TH1-10	
	SCK3_A/TXDSP	P411	11	TH1-11	IOVCC
	EHMD	-	12	TH1-12	
	VBN	-	13	TH1-13	
	VBP	-	14	TH1-14	
	CTS3_A/RTS3_A/SS3_A/RXDSP	P207	15	TH1-15	IOVCC
	RES #	-	16	TH1-16	IOVCC
	D_GND	-	-	TH1-17	
	D_GND	-	-	TH1-18	

Table 2-5: Test Pins (TH2)

classification	function	port	RE01B Pin number	board Header pin	power domain
TH2	TMRI0_A	P201	17	TH2-1	IOVCC
	TMO0_A	P200	18	TH2-2	IOVCC
	VSS	-	19	TH2-3	
	VCC_SU	-	20	TH2-4	
	VBAT_EHC	-	21	TH2-5	
	VSC_VCC	-	22	TH2-6	
	VSS	-	23	TH2-7	
	TMCI1	P704	24	TH2-8	IOVCC1
	SCL1	P701	25	TH2-9	IOVCC1
	SDA1	P700	26	TH2-10	IOVCC1
	P305	P305	27	TH2-11	IOVCC1
	IOVCC1	-	28	TH2-12	
	VSS	-	29	TH2-13	
	TMRI0_B	P301	30	TH2-14	IOVCC1
	TMO0_B	P300	31	TH2-15	IOVCC1
	D_GND	-	-	TH2-16	
	D_GND	-	-	TH2-17	
	D_GND	-	-	TH2-18	

Table 2-6: Test Pins (TH3)

classification	function	port	RE01B Pin number	board Header pin	power domain
TH3	TXD2_C/SSDA2_C/MOSI2_C/MOSIB_B	P609	33	TH3-1	IOVCC1
	RXD2_C/SSCL2_C/MISO2_C/MISOB_B	P608	34	TH3-2	IOVCC1
	CTS2_C/RTS2_C/SS2_C/RSPCKB_B	P607	35	TH3-3	IOVCC1
	SCK2_C/SSLB2_B	P606	36	TH3-4	IOVCC1
	D_GND	-	-	TH3-5	
	SSLB2_A	P113	38	TH3-6	IOVCC2
	SSLB3_A	P112	39	TH3-7	IOVCC2
	IOVCC2	-	40	TH3-8	
	VSS	-	-	TH3-9	
	P107	P107	42	TH3-10	IOVCC2
	P102/TXD2_A/SSD2_A/MOSI2_A	P102	43	TH3-11	IOVCC2
	D_GND	-	-	TH3-12	
	D_GND	-	-	TH3-13	
	AVCC_RF	-	46	TH3-14	
	D_GND	-	-	TH3-15	
	VCCRF	-	48	TH3-16	
	D_GND	-	-	TH3-17	
	D_GND	-	-	TH3-18	

Table 2-7: Test Pins (TH4)

classification	function	port	RE01B Pin number	board Header pin	power domain
TH4	D_GND	-	-	TH4-1	
	D_GND	-	-	TH4-2	
	AN028	P506	51	TH4-3	IOVCC3
	AN027	P505	52	TH4-4	IOVCC3
	AN022	P500	53	TH4-5	IOVCC3
	IOVCC3	-	54	TH4-6	
	VSS	-	-	TH4-7	
	AN003	P012	56	TH4-8	IOVCC3
	AN002	P003	57	TH4-9	AVCC0
	P002	P002	58	TH4-10	AVCC0
	VREFL0	-	-	TH4-11	
	AN001	P001	60	TH4-12	AVCC0
	AN000	P000	61	TH4-13	AVCC0
	VREFH0	-	62	TH4-14	
	AVCC0	-	63	TH4-15	
	AVSS0	-	64	TH4-16	
	D_GND	-	-	TH4-17	
	D_GND	-	-	TH4-18	

Table 2-8: Terminals with initial output

Terminal name	Initial value
P300	Low output
P301	Low output
P704	High output

3. Description of the power supply

Table Table 3-1 shows the various ways that power can be supplied to the board. There is a normal power supply operation mode that supplies the board's internal power supply and an EH (Energy Harvest) power supply operating mode that uses the Energy Harvest Control Circuit (EHC) to supply the MCU VCC from the power generation element. The EHC enables the MCU to be activated with a very small input current and provides protection against secondary battery overcharging and over discharge. For more information about EHC functionality, see Chapter 13 of the RE01B Group (1.5M Flash Memory Products) User's Manual Hardware Edition (R01UH0903).

Table 3-1: How to Supply Power

power Operating mode	power Supply source	explanation
Normal power supply behavior	External power supply (VCC-IN terminal)	The power supply inside the board is supplied directly from the stabilized power supply, etc.
	USB	Generates internal power on the board using USB bus power
	Emulator E2	Power the inside of the board directly from the E2 emulator
	Emulator J-Link	Generate the internal power supply of the board using the power supplied by the J-Link emulator, etc.
EH Power behavior	Power Generation Elements (VSC_VDD)	Supply MCU VCC from power generation elements via EHC

The block diagram and power wiring Figure 3-1

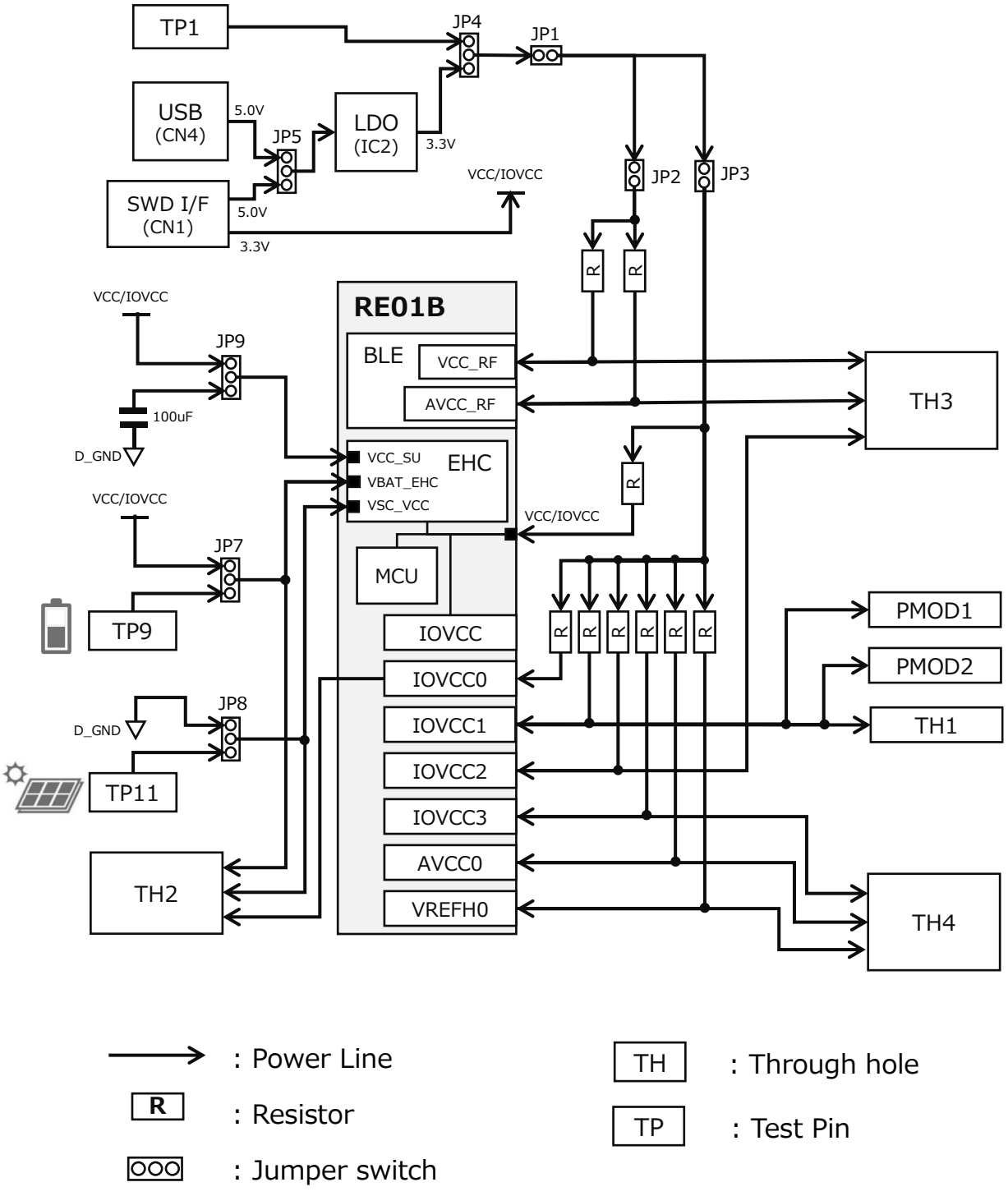


Figure 3-1: Block diagrams and power wiring

3.1. VCC-IN Supply Normal Power Supply Operation

The power supply inside the board is supplied directly from the stabilized power supply, etc. The supply lines on the power supply are shown in Figure 3-2

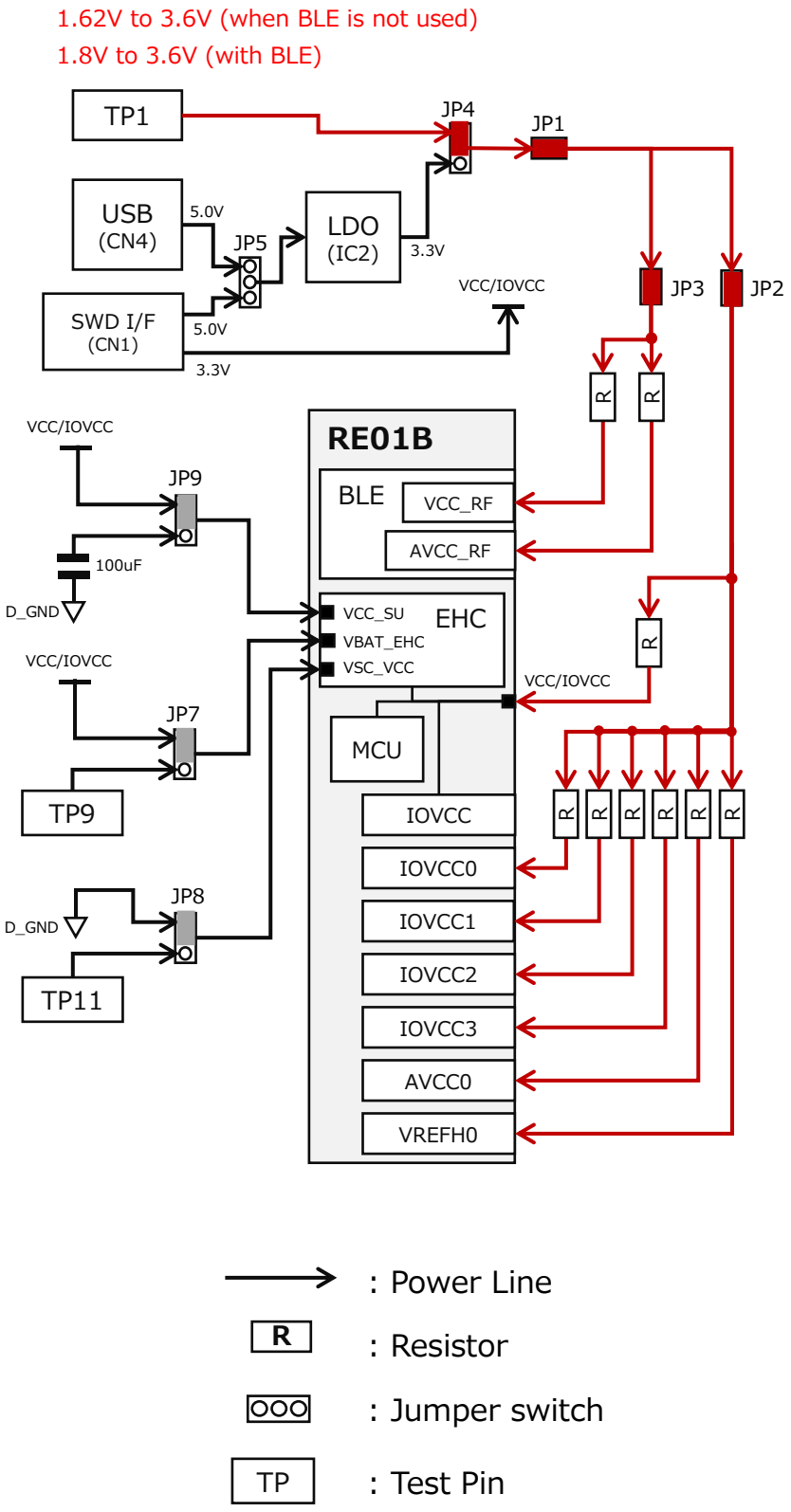


Figure 3-2: Power Lines supplied by VCC-IN

Set the jumper pin switch as Table 3-2, Figure 3-3, and add the voltage to supply the MCU, etc. to TP1(+) TP2(-).

Table 3-2: VCC-IN supply (table)

reference	establishment
SW3	S_Chip（Single chip mode)
SW4	Normal

reference	establishment
JP1	Close
JP2	Close
JP3	Close
JP4	1-2（VCC-IN)
JP5	Open
JP7	1-2（Normal mode)
JP8	1-2（Normal mode)
JP9	1-2（Normal mode)
JP10	-（Don't care)
JP11	-（Don't care)
JP12	Open
JP13	-（Don't care)

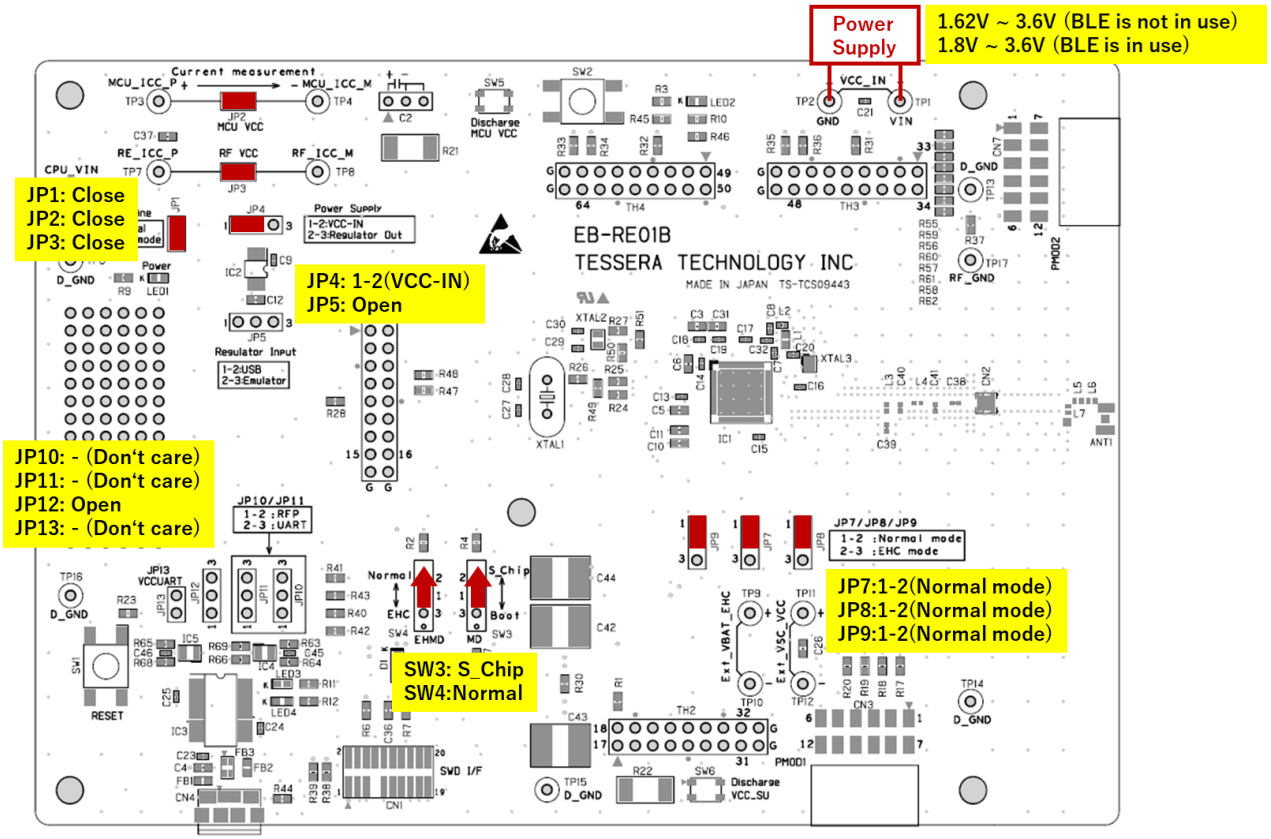


Figure 3-3: Settings supplied by VCC-IN (Board)

3.2. USB-Pass Power Supply Normal Power Supply Operation

USB-Pass power is used to generate the internal power supply of the board. The supply lines on the power wiring Figure 3-4

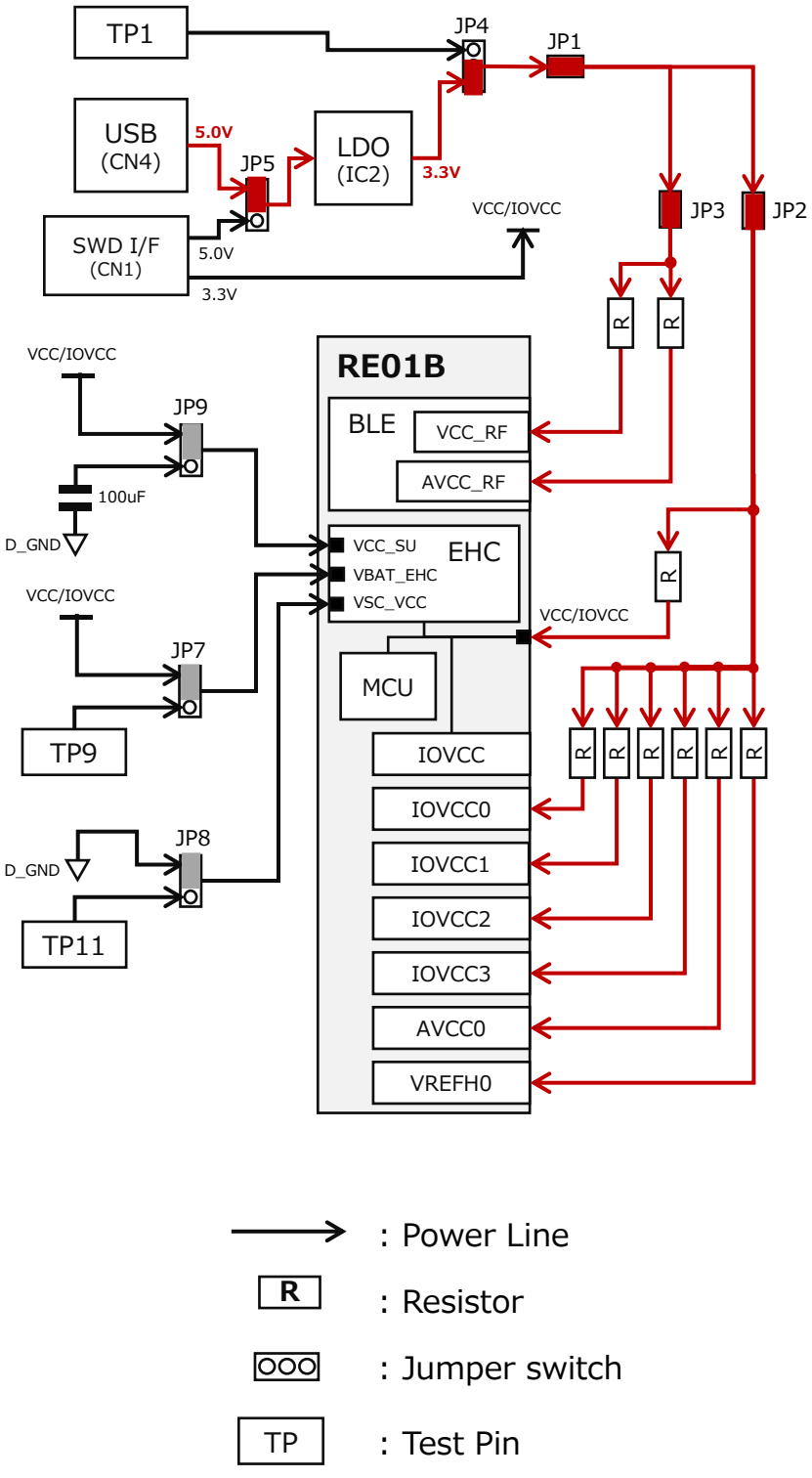


Figure 3-4: Power lines with USB supply

Set the jumper pin and switch as shown Table 3-3, Figure 3-5 and connect the USB cable to the USB connector (CN4).

Table 3-3: settings with USB supply (table)

reference	establishment
SW3	S_Chip （Single chip mode)
SW4	Normal

reference	establishment
JP1	Close
JP2	Close
JP3	Close
JP4	2-3 （Regulator Out)
JP5	1-2 （USB)
JP7	1-2 （Normal mode)
JP8	1-2 （Normal mode)
JP9	1-2 （Normal mode)
JP10	- （Don't care)
JP11	- （Don't care)
JP12	Open
JP13	- （Don't care)

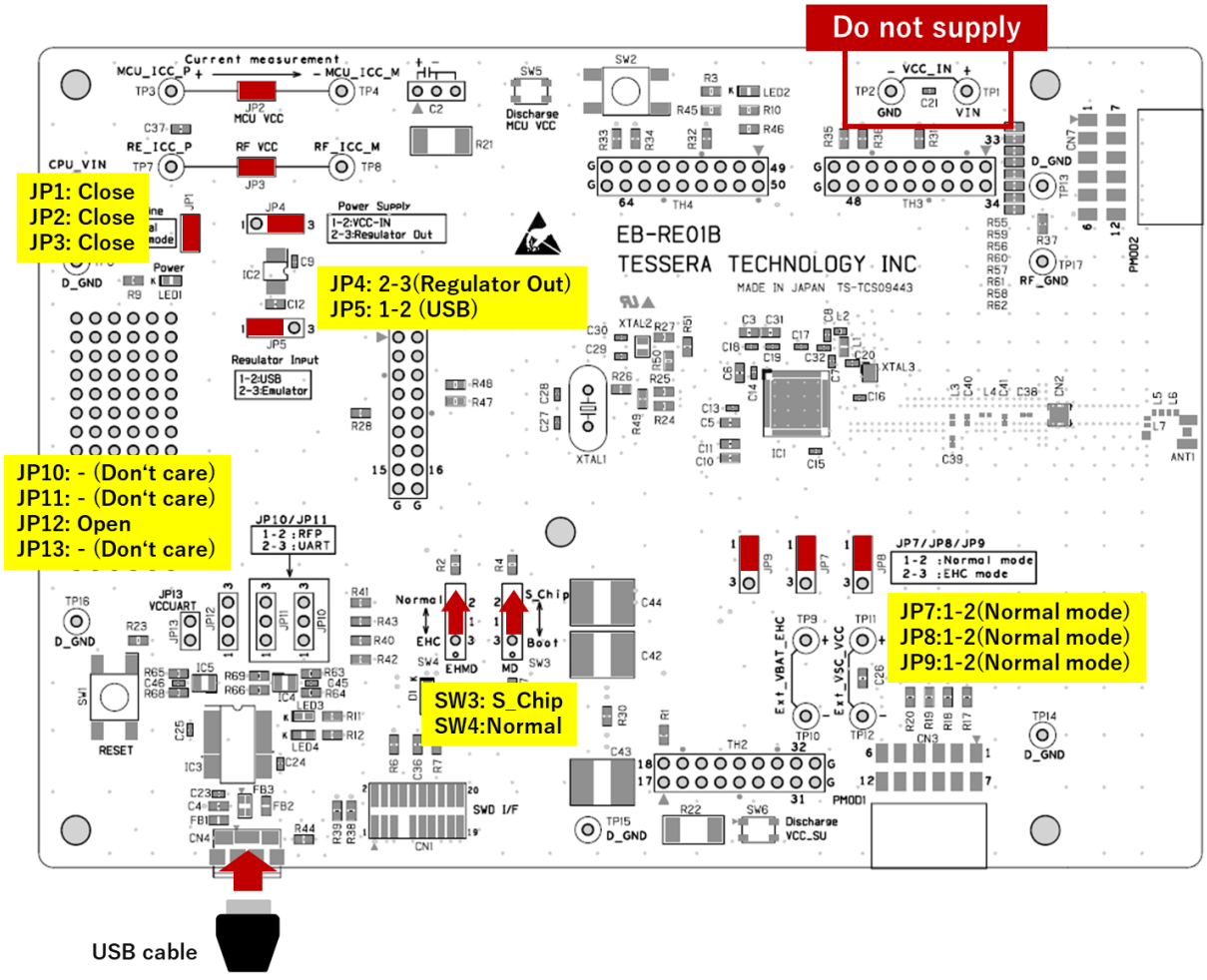


Figure 3-5: Settings with USB Supply (Board)

3.3. Emulator E2 Supply Normal Power Operation

Power inside the board is supplied directly from the E2 emulator (E2 emulator Lite).
The supply lines on the power are shown in Figure 3-6.

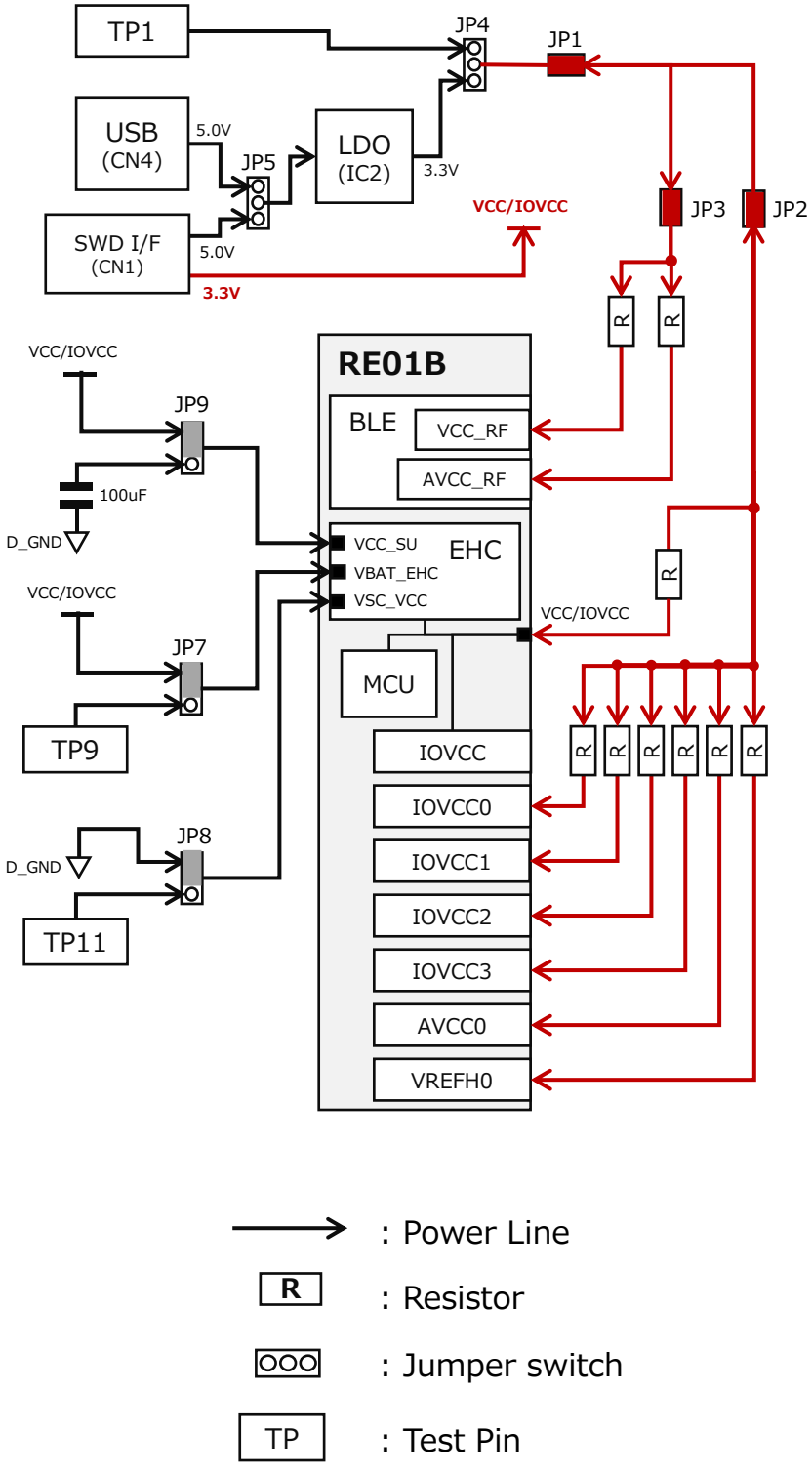


Figure 3-6: Emulator E2 Supply

Set the jumper pin and switch as shown Table 3-4, Figure 3-7 and connect the E2 emulator to SWD I/F (CN1).

Table 3-4: Settings in Emulator E2 Supply (Table)

reference	establishment
SW3	S_Chip (Single chip mode)
SW4	Normal

reference	establishment
JP1	Close
JP2	Close
JP3	Close
JP4	Open
JP5	Open
JP7	1-2 (Normal mode)
JP8	1-2 (Normal mode)
JP9	1-2 (Normal mode)
JP10	- (Don't care)
JP11	- (Don't care)
JP12	Open
JP13	- (Don't care)

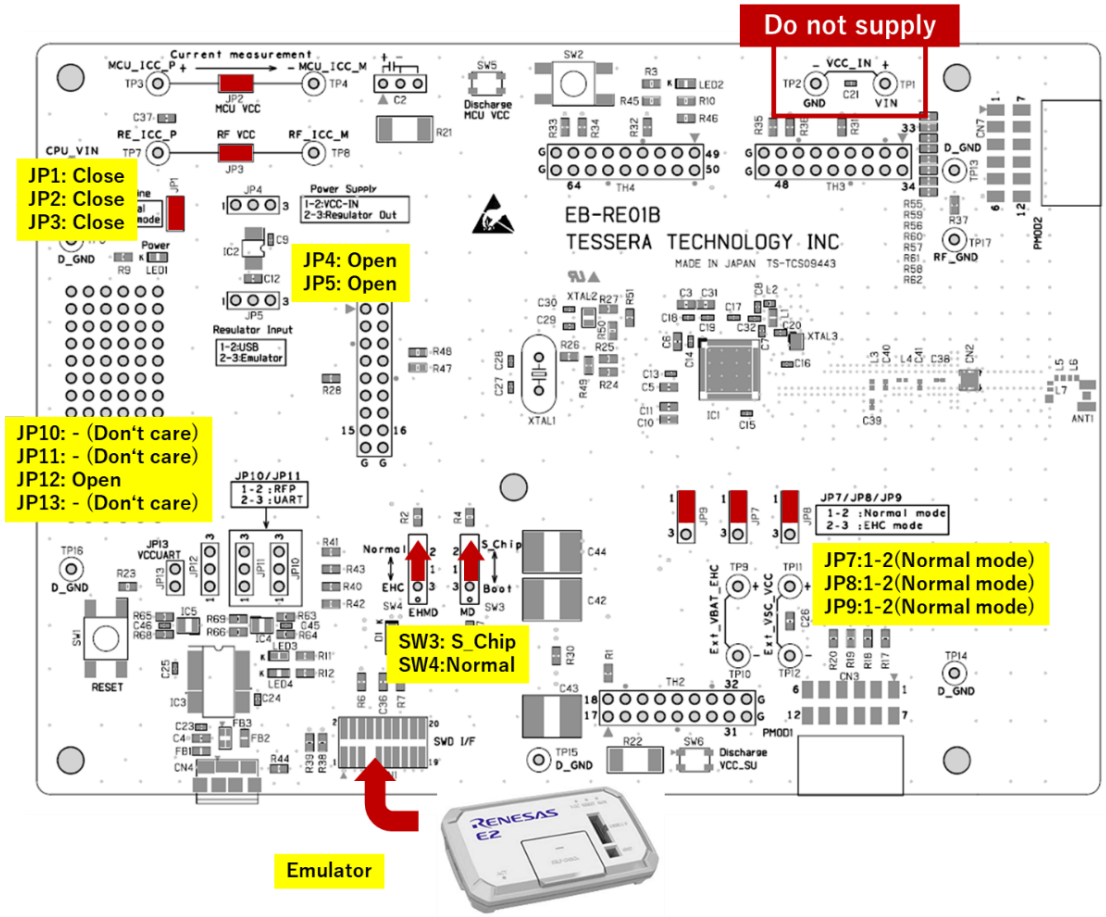


Figure 3-7: Settings in EmulatorE2 Supply (Board)

Please set the power supply of "e2 studio" to output 3.3V from the E2 emulator as shown in Figure 3-8.

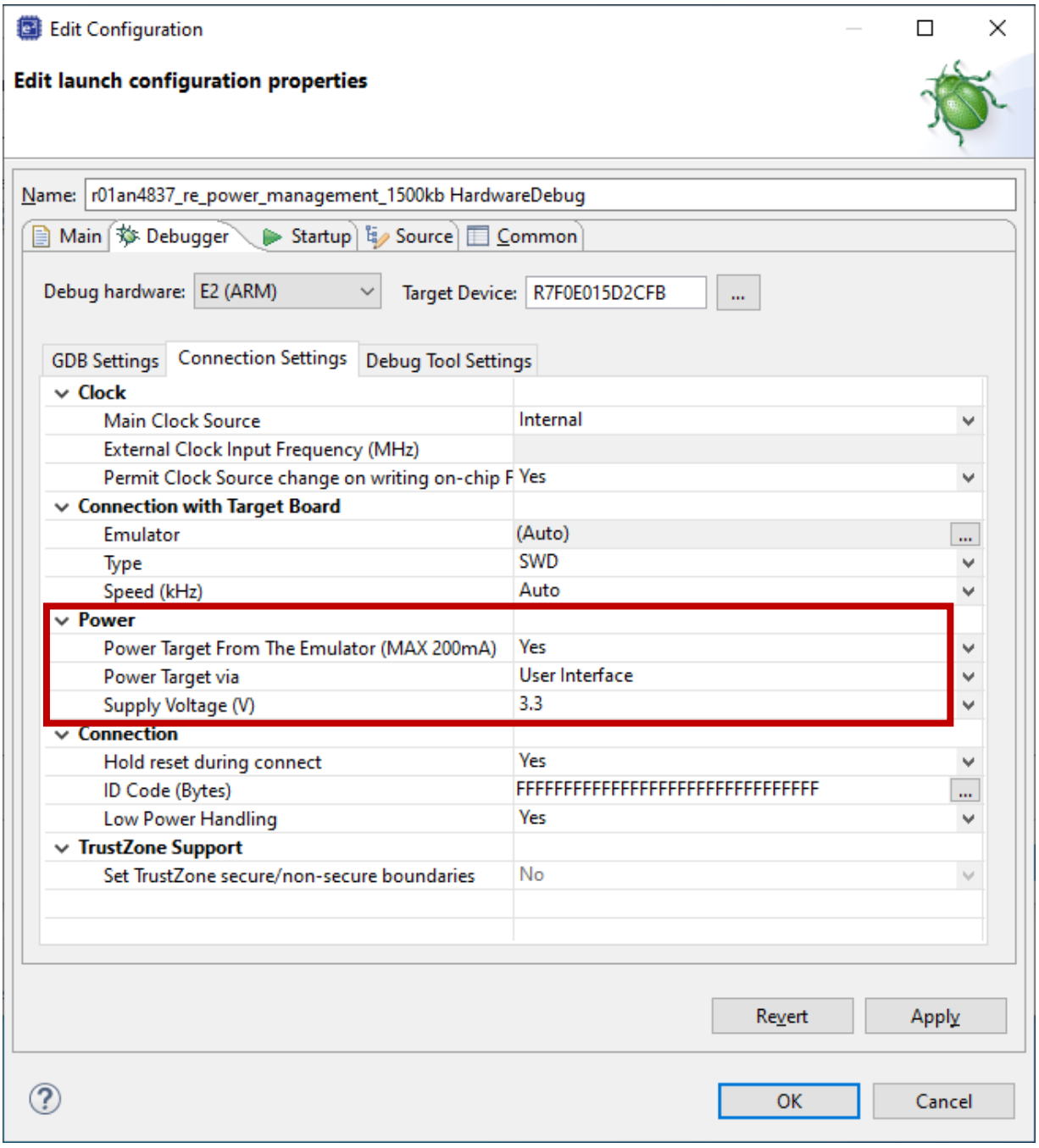


Figure 3-8: "e2 studio" power supply setting screen

3.4. Emulator J-Link/I-jet Supply Normal Power Operation

The board's internal power supply is generated using the power supplied by the J-Link and I-jet emulators.
The supply lines on the power supply wiring are shown in Figure 3-9.

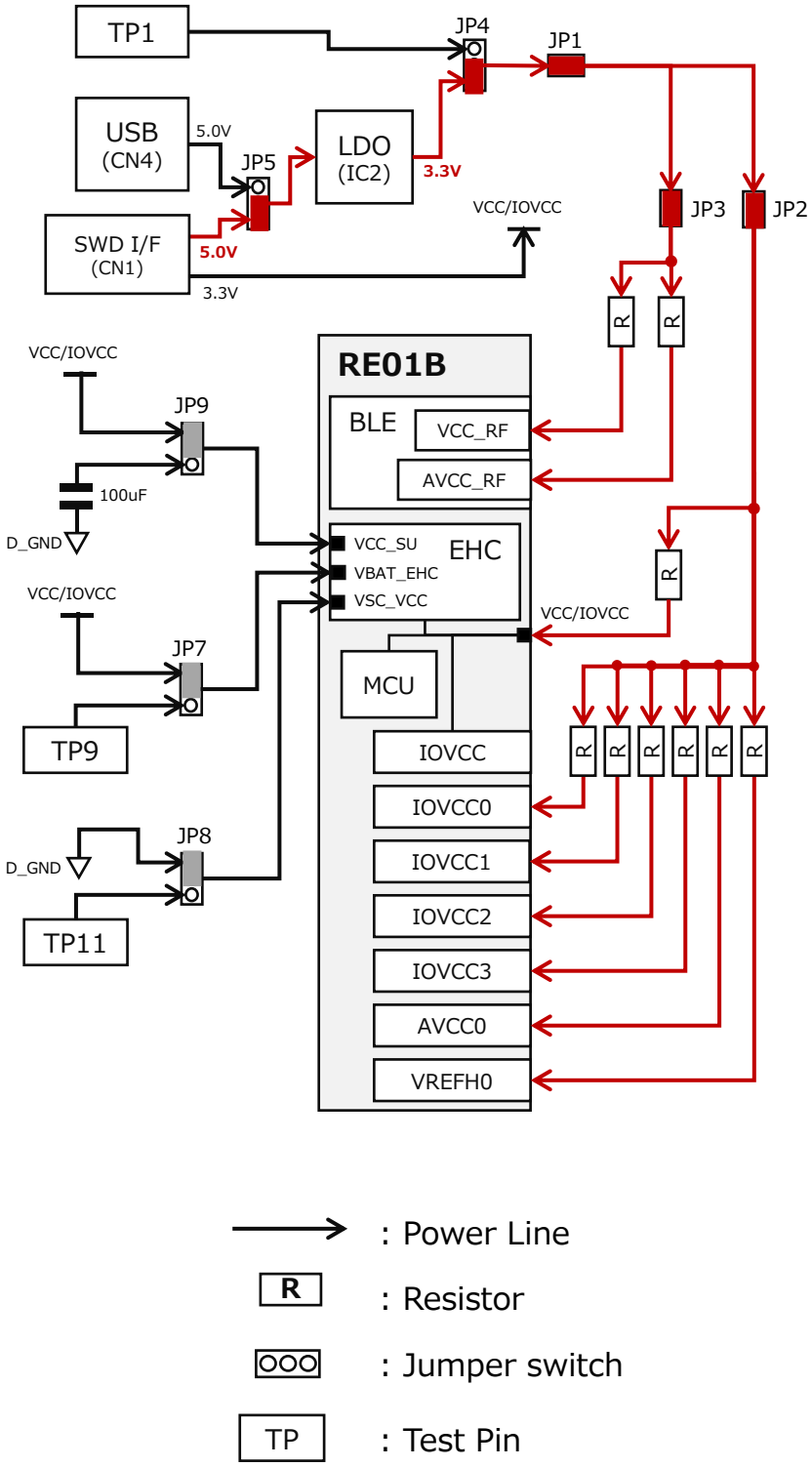


Figure 3-9: supplied by Emulator J-link

Set the jumper pin Table 3-5Figure 3-10-10 and connect the J-Link emulator, etc. to SWD I/F (CN1) via"19Pin J-Link Adapter". Generate the board's internal power supply using 5.0V supplied to CN1 11 pin and 13 pin from J-Link emulators, etc.

Table 3-5: Settings for Emulator J-link/I-jet Supply (Table)

reference	establishment
SW3	S_Chip（Single chip mode)
SW4	Normal

reference	establishment
JP1	Close
JP2	Close
JP3	Close
JP4	2-3（Regulator Out)
JP5	2-3（Emulator)
JP7	1-2（Normal mode)
JP8	1-2（Normal mode)
JP9	1-2（Normal mode)
JP10	-（Don't care)
JP11	-（Don't care)
JP12	Open
JP13	-（Don't care)

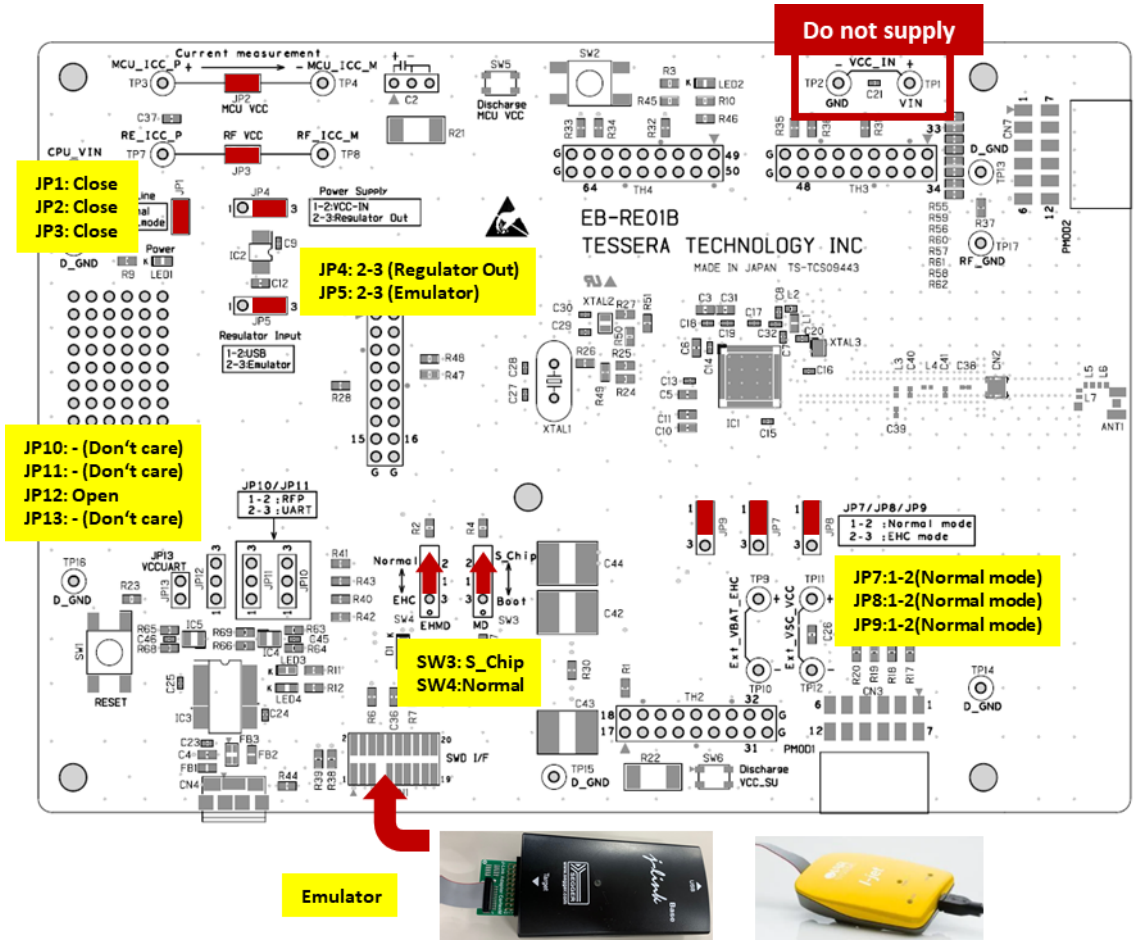


Figure 3-10: Jumper pin and switch settings for Emulator J-link/I-jet supply (board)

3.5. EH (Energy Harvest) Power Operating Mode

3.5.1. Hardware settings

Power is supplied from the power generation element to the MCU VCC via the Energy Harvesting Controller (EHC). The supply lines on the power are shown in Figure 3-11.

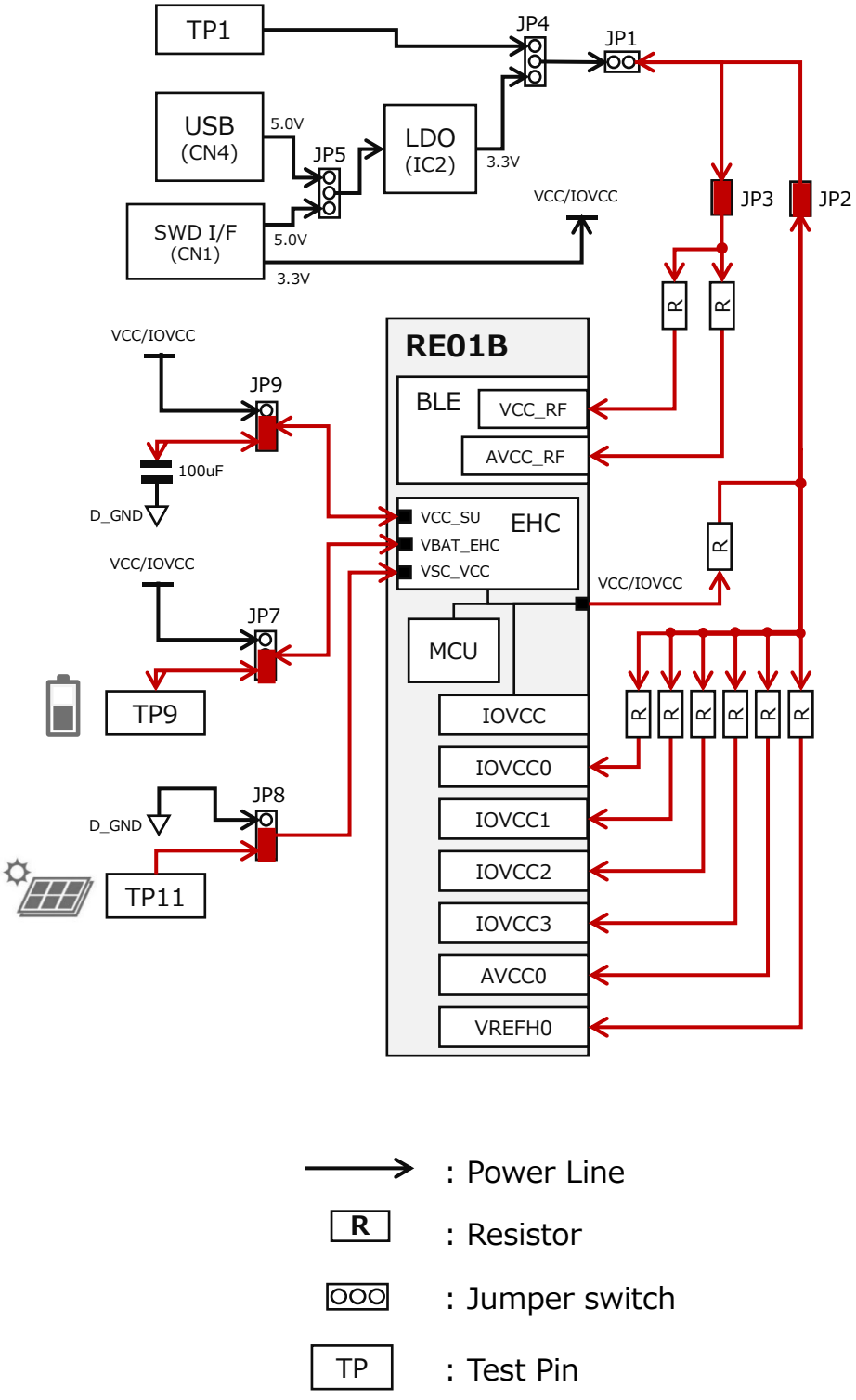


Figure 3-11: EH Power Supplies

Set the jumper pins/switches as shown below and connect a generator element etc. to TP11 (+) TP12 (-) (VSC_VCC).

Table 3-6: Settings for EH Power Supply (Table)

reference	establishment
SW3	S_Chip（Single chip mode)
SW4	EHC

reference	establishment
JP1	Open
JP2	Close
JP3	Close
JP4	Open
JP5	Open
JP7	2-3（EHC mode)
JP8	2-3（EHC mode)
JP9	2-3（EHC mode)
JP10	Open
JP11	Open
JP12	Open
JP13	Open

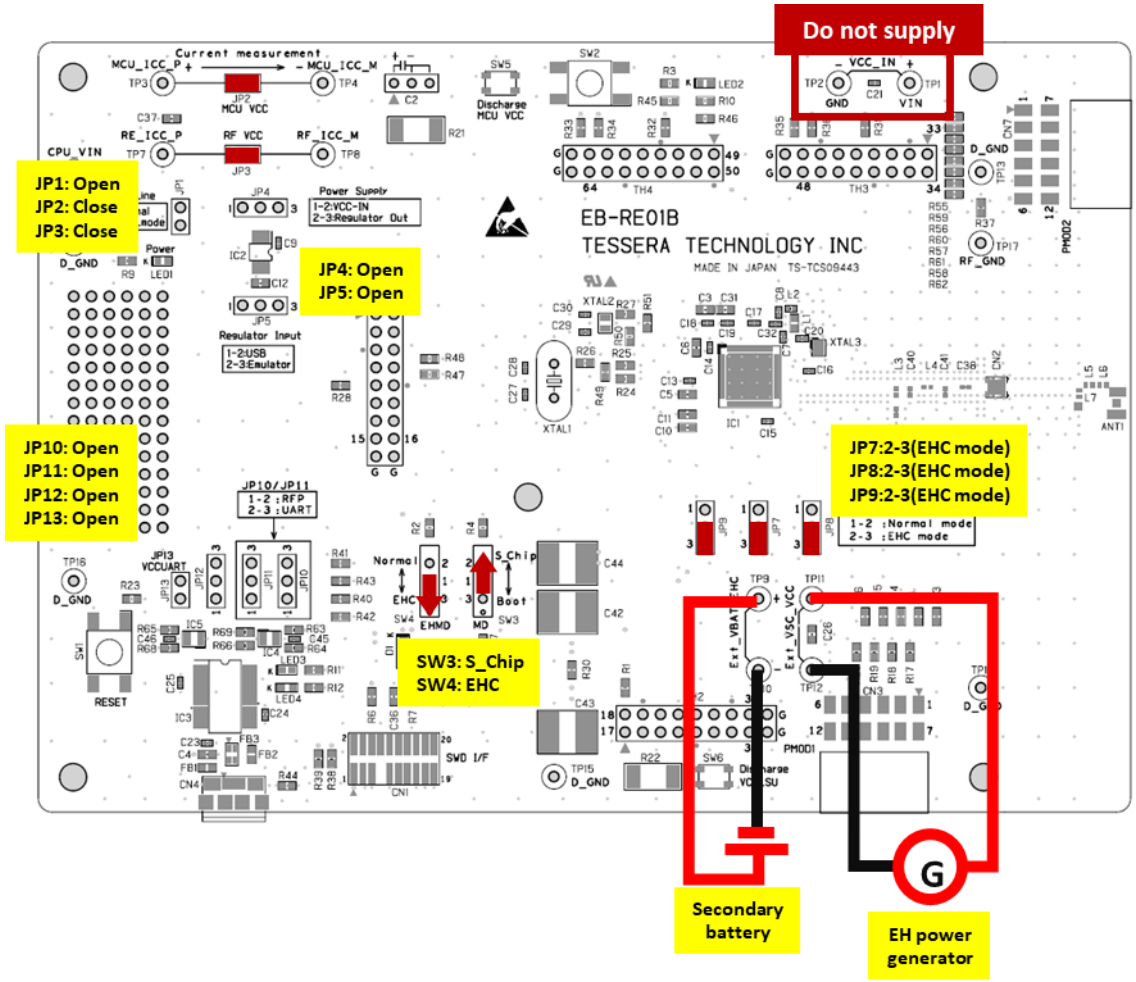


Figure 3-12: Settings for EH Power Supply (Board)

Connect a VBAT_EHC or electric double-layer capacitor to the EHC's battery (TP9(+)TP10 (-).
Connect MCU_VCC (10μF) supplied with C2 (10μF).
The supply VSC_VCC EHC(EHC) is limited to 4.0V/10mA or less.
The EHC' VCC_SU" (storage capacitor) is connected to a capacitor of about 100μF.
For more information on starting up using EHC, see section 4.3 Energy harvesting start-up mode.

3.5.2. Software settings

The firmware definition expression SYSTEM_CFG_EHC_MODE must be set to 1 (EHC mode). This definition expression is defined in the r_core_cfg.h file.
The location of the r_core_cfg.h file can be found, for example, in the sample code RE01B Group Bluetooth Low Energy sample code (using CMSIS Driver Package) AN5606 published by Renesas Electronics, It is stored under Device > Config.

```
/***********************************************************************************************
#define SYSTEM_CFG_PCKB_DIV             (0)
/***********************************************************************************************
 * @brief Power control mode select@n
 *        0 = Boost mode (BOOST)@n
 *        1 = Normal mode (High-speed) (NORMAL) (Default)@n
 *        2 = Normal mode (Low-speed) (NORMAL)@n
 *        3 = Normal mode (Subosc-speed) (NORMAL)@n
 *        4 = Low-Leakage-Current mode (VBB)@n
 ***********************************************************************************************
#define SYSTEM_CFG_POWER_CONTROL_MODE   (1)
/***********************************************************************************************
 * @brief  EHC operating mode select@n
 *         0 = Normal mode (Default)@n
 *         1 = EHC mode (EHMD=1)@n
 ***********************************************************************************************
#define SYSTEM_CFG_EHC_MODE             (0)
/***********************************************************************************************
 * @name OFS_SECURITR_MPU_REGISTER
 ***********************************************************************************************
/* @[ */
#define SYSTEM_CFG_OFS0                 (0xFFFFFFFF)    /* OFS0 register          */
#define SYSTEM_CFG_OFS1                 (0xFFFFFFFF)    /* OFS1 register          */
#define SYSTEM_CFG_SECMPU_PC0_START     (0xFFFFFFFF)    /* SECMPU PC0 START       */
#define SYSTEM_CFG_SECMPU_PC0_END       (0xFFFFFFFF)    /* SECMPU PC0 END         */
#define SYSTEM_CFG_SECMPU_PC1_START     (0xFFFFFFFF)    /* SECMPU PC1 START       */
```

Figure 3-13 r_core_cfg.h File EH Settings

```
#define SYSTEM_CFG_SECMPU_REGION0_START (0xFFFFFFFF)    /* SECMPU REGION0 START   */
#define SYSTEM_CFG_SECMPU_REGION0_END   (0xFFFFFFFF)    /* SECMPU REGION0 END     */
#define SYSTEM_CFG_SECMPU_REGION1_START (0xFFFFFFFF)    /* SECMPU REGION1 START   */
#define SYSTEM_CFG_SECMPU_REGION1_END   (0xFFFFFFFF)    /* SECMPU REGION1 END     */
#define SYSTEM_CFG_SECMPU_REGION2_START (0xFFFFFFFF)    /* SECMPU REGION2 START   */
#define SYSTEM_CFG_SECMPU_REGION2_END   (0xFFFFFFFF)    /* SECMPU REGION2 END     */
#define SYSTEM_CFG_SECMPU_CONTROL_SETTING (0xFFFF)      /* SECMPU CONTROL SETTING */
/* @] */
```

4. Boot mode

The start-up modes are shown in Table 4-1. 4 different start-up modes are available. The starting mode can be selected using the EHMD switch (SW4) and the MD switch (SW3) as shown in Figure 4-1.

Table 4-1: Four Startup Modes

Boot mode	Switch settings		explanation
	EHMD (SW4)	MD (SW3)	
Normal start-up	Normal (Low)	S_Chip (Low)	User programs written to code flash memory Stand-alone execution.
SWD Debugging			Make emulator connections using the SWD interface.
Energy Harvest Launch	EHC (High)		Mode used when operating with EHC.
SCI boot mode	Don't Care	Boot (High)	Using the Renesas Flash Programmer (RFP), Program the flash memory with a USB connection.

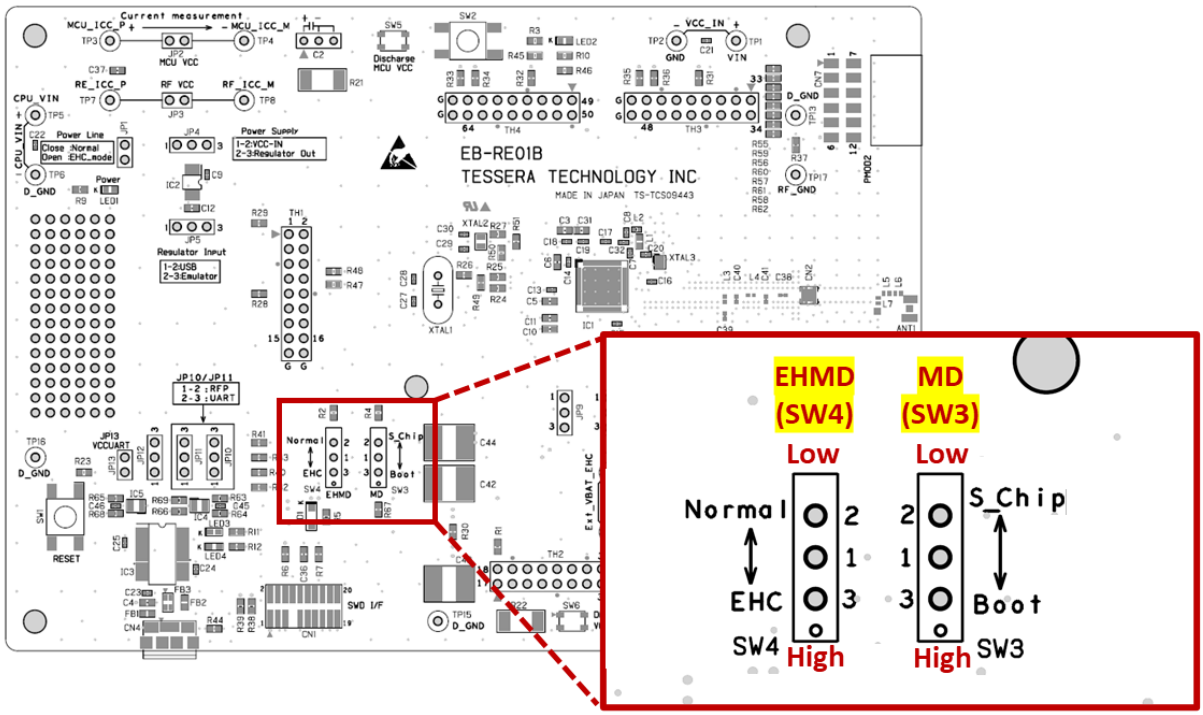


Figure 4-11: EHMD switch (SW4) and MD switch (MD3) on the boat

4.1. Normal boot mode operation description

When the switch is set as shown below and the reset is released, the user program written in the code flash memory is executed. Set the switch as shown in Table 4-2 and use in normal power supply operation mode.

Table 4-2 : Normal Boot Mode Switch Settings

reference	establishment
MD（SW3）	S_Chip（Single chip mode） (Low)
EHMD（SW4）	Normal (Low)

4.2. Serial Wire Debugging (SWD) Mode Operation Description

When the switch is set as follows and an emulator etc. is connected to "SWD I/F (CN1)", the emulator connection using the SWD interface is possible. Set the switch as shown in Table 4 3 and use it in normal power supply operation mode.

It is possible to connect E2 Emulator, E2 Emulator Lite, IAR I-jet and SEGGER J-Link as emulator.

Table 4-3: SWD Mode Switch Settings (Table)

reference	establishment
MD (SW3)	S_Chip (Low)
EHMD (SW4)	Normal (Low)

reference	establishment
JP1	Close
JP2	Close
JP3	Close
JP4	2-3 Regulator Out
JP5	2-3 Emulator for E2/E2 lite Open for J-link I-jet
JP7	1-2（Normal mode）
JP8	1-2（Normal mode）
JP9	1-2（Normal mode）
JP10	Don’t care
JP11	Don’t care
JP12	Open
JP13	Don’t care

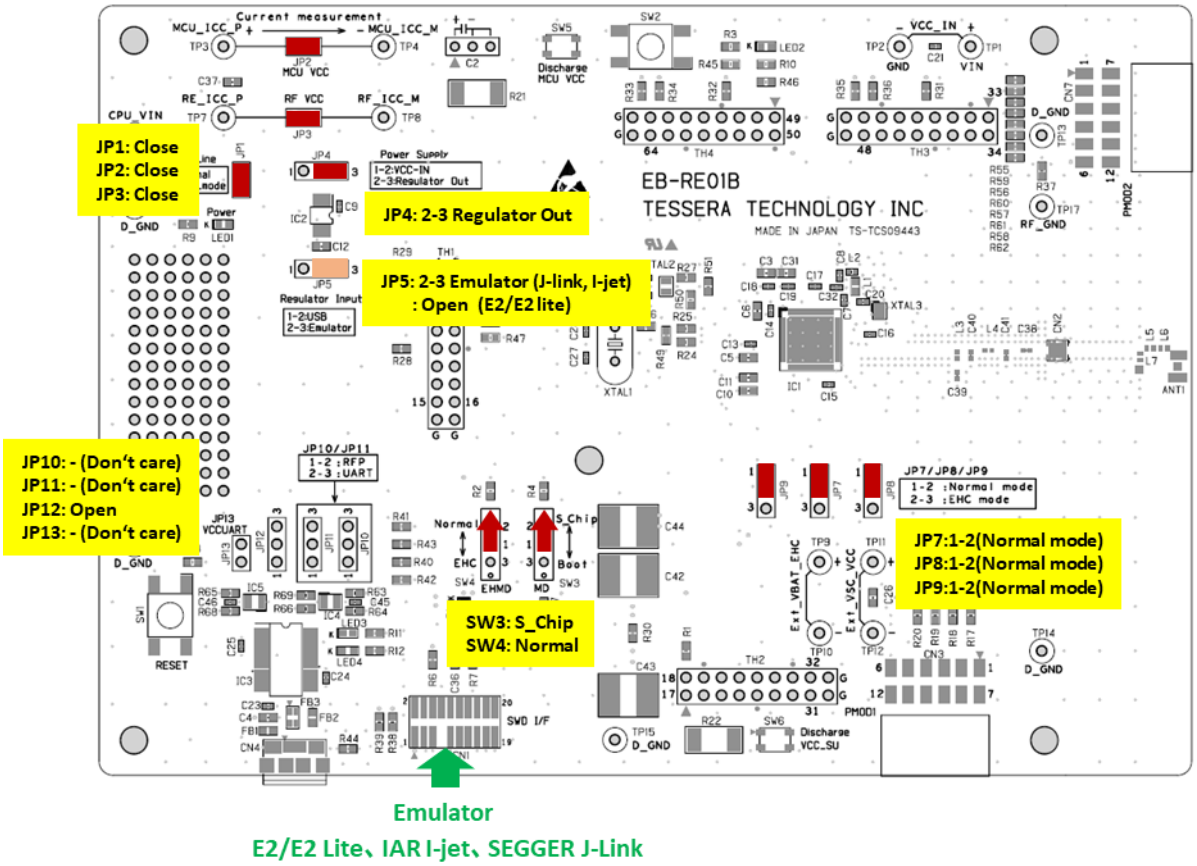


Figure 4-2 : SWD Mode Jumper Pin Switch Settings (Board)

The device must be able to transition to the On-Chip Debug (OCD) mode, but there are some modes in which the device cannot directly transition to the OCD mode, such as EXFPWON NORMAL, MINPWON NORMAL and VBB. In order to debug in EXFPWON, NORMAL, MINPWON NORMAL or VBB, please make transition to OCD mode while operating in ALLPWON NORMALL, and then transition to EXFPWON NORMAL, MINPWON NORMAL or VBB. For more details, please refer to 2.7.2 "Limitation of emulator connection" of RE01B group (product with 1.5M byte flash memory) User's Manual Hardware Edition (R01UH0903).

4.3. Energy Harvest Launch Mode

This mode is used when the EHC is used for operation. See section "3.5EH (Energy Harvesting) Power Supply Mode" for jumper pin and switch settings for EH power supply mode.

After charging the VCC_SU capacitor from the generator connected to VSC_VCC, the EHC will start to supply power to VCC. When the reset is released by a power-on reset, the back bias voltage control (VBBC) circuit is initialized, and the user program written in the code flash memory is executed.

Table 4-4 : Energy Harvest Start Mode Switch Settings

reference	establishment
MD（SW3）	S_Chip（Single chip mode） (Low)
EHMD（SW4）	EHC (High)

4.4. SCI boot mode

4.4.1. SCI boot mode settings

Serial programming of flash memory is possible by using RFP (Renesas Flash Programmer). There are two ways to send the data to be written to the flash memory, one is through USB (CN4) and the other is through E2 emulator (CN1).

4.4.2. SCI boot mode settings (via USB)

Connect the USB cable to the “USB connector (CN4)”. Make the switch and jumper settings as shown in Table 4-5 and use the device in normal power supply operation mode.

Table 4-5: SCI boot (via USB) Jumper Pin Switch Settings (Table)

reference	Establishment
SW3	Boot（SCI boot mode）
SW4	-（Don’t care）

reference	establishment
JP1	Close
JP2	Close
JP3	Close
JP4	2-3 Regulator Out
JP5	1-2（USB）
JP7	1-2（Normal mode）
JP8	1-2（Normal mode）
JP9	1-2（Normal mode）
JP10	1-2（RFP）
JP11	1-2（RFP）
JP12	Open
JP13	Close

RFP connection If connection is not possible using the normal procedure, please follow the steps below.

1. make the connections in Table 4 5. Connect the USB port (CN4) of the EB-RE01B board to the PC with a USB cable. (Power will be supplied via USB).
2. start RFP on the PC.
3. go to File > Create New Project, select Microcontroller as RE, name the project and make sure that "USB Serial Port" is selected in Tools.
4. press SW1 on the EB-RE01B board once. (Board reset)
5. select "Connect" on the RFP. 6.
6. the RFP will display "Operation successful." is displayed on the RFP.
7. Press SW1 on the EB-RE01B board once. (Board reset)
8. select the program file to be written.
9. Press the "Start" button on the RFP.
10. When writing is completed on the RFP, the message "Operation successful. is displayed on the RFP.

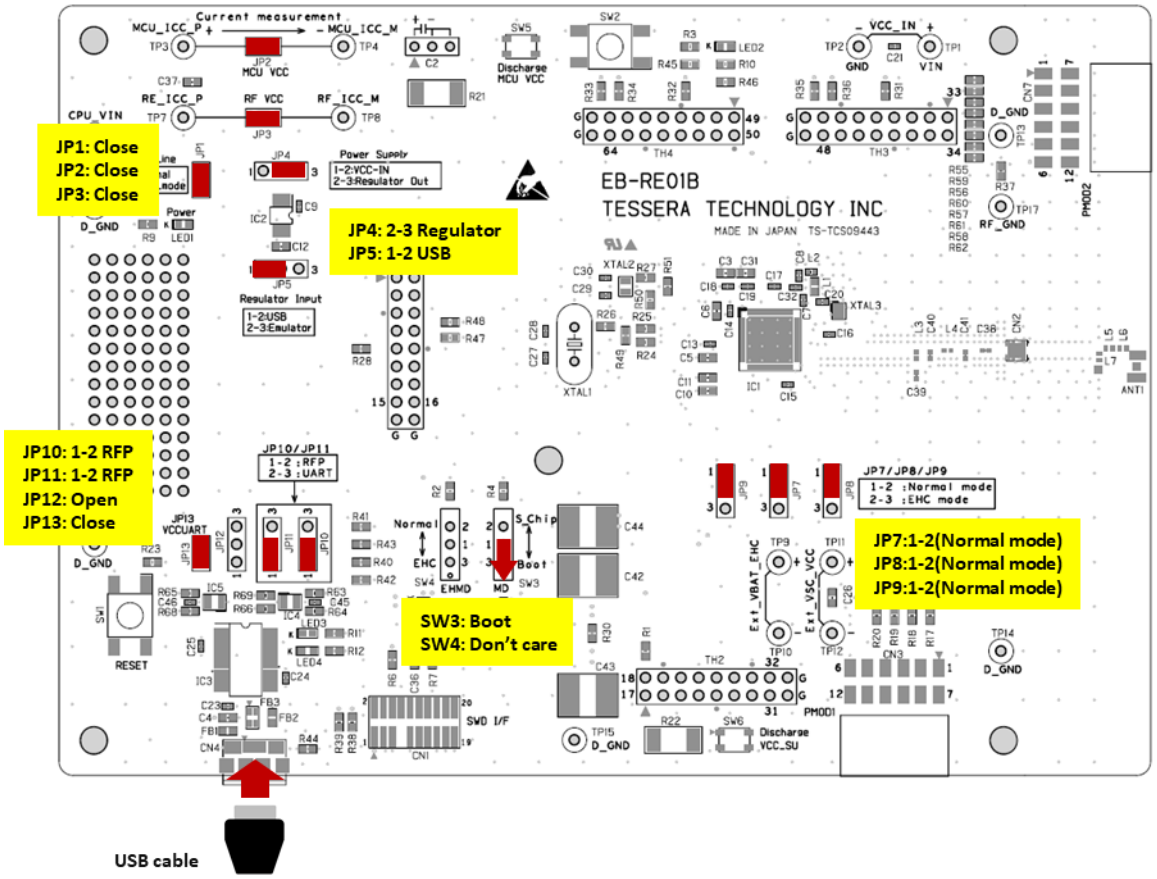


Figure 4-3: Sci boot (via USB) Jumper Pin Switch Settings (Board)

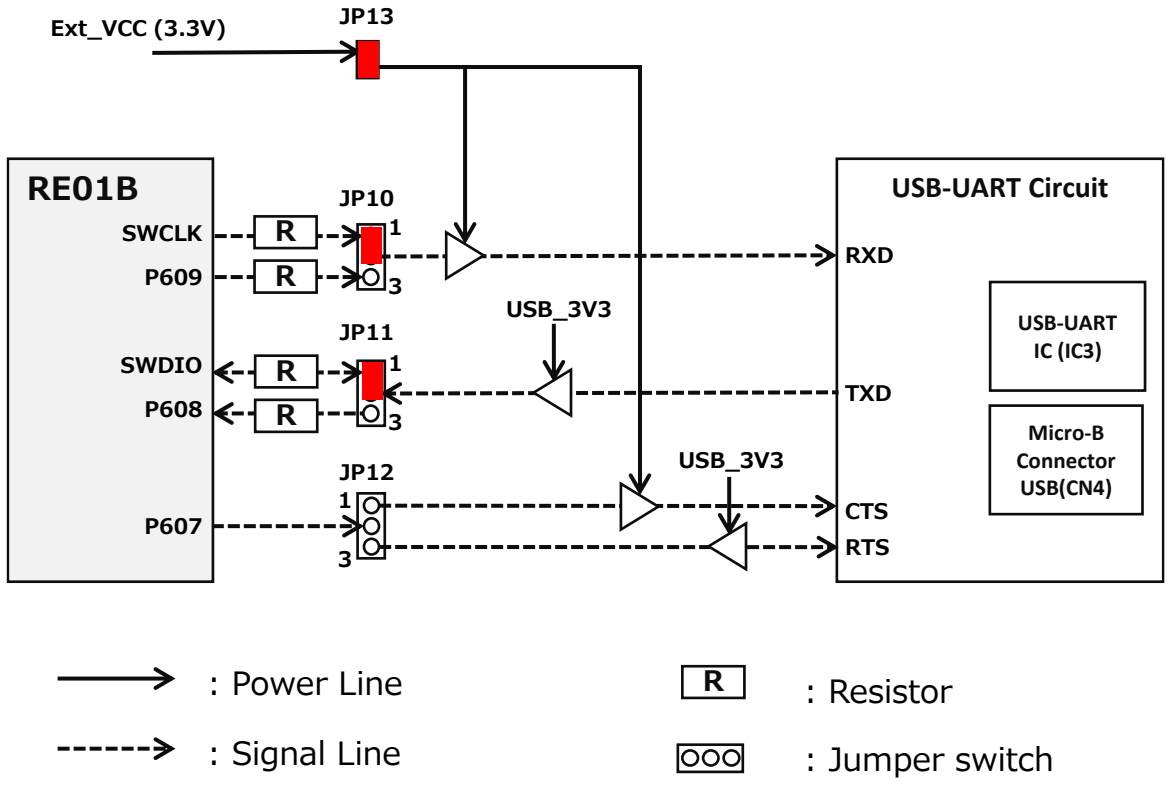


Figure 4-4: SCI boot (via USB) Power and Signal Lines

4.4.3. SCI boot mode settings (via E2 emulator)

Connect the E2 emulator to the connector for the emulator (CN 1). Switch settings be selected as shown in Table 4-6 and are typically used in power operating mode.

Table 4-6: SWD Mode (via Emulator) Switch Settings (Table)

reference	establishment
SW3	Boot（SCI boot mode）
SW4	-（Don’t care）

reference	establishment
JP1	Close
JP2	Close
JP3	Close
JP4	Open
JP5	Open
JP7	1-2（Normal mode）
JP8	1-2（Normal mode）
JP9	1-2（Normal mode）
JP10	Don’t care
JP11	Don’t care
JP12	Open
JP13	Open

RFP connection If the connection cannot be made using the normal procedure, please follow the steps below.

1. Make the connection as shown in Table 4-6, Figure 4-5, Connect the emulator connector (CN4) of the EB-RE01B board to the PC with an emulator.
2. start RFP on the PC. 3.
3. go to File > Create New Project, select Microcontroller as RE, name the project and select "E2 emulator" in Tools. Make sure that 3.3V is selected in the tool details. See Figure 4-6.
4. select "Connect" on the RFP.
5. the RFP will show "Operation successful. is displayed on the RFP.
6. select the program file to be written.
7. Press the "Start" button on the RFP.
8. When the RFP has completed writing, the message "Operation successful. is displayed on the RFP.

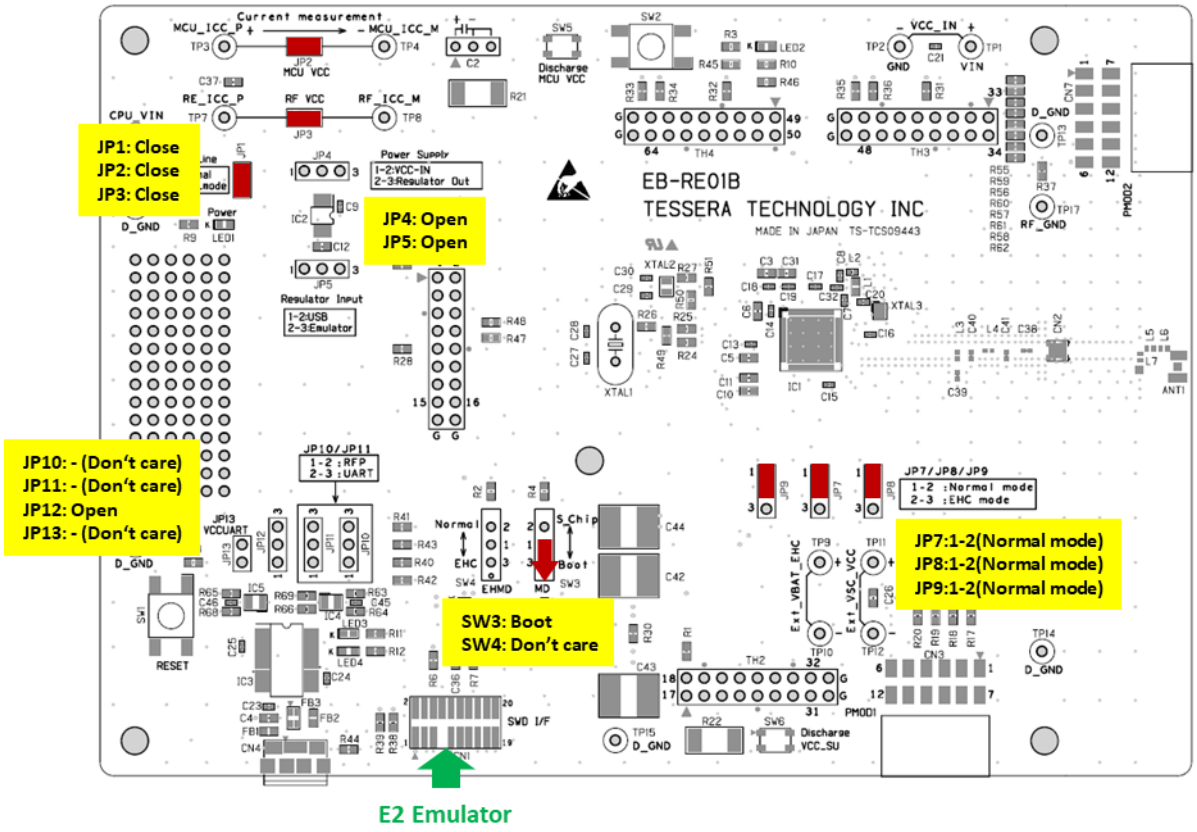


Figure 4-5: SCI boot (via E2 emulator) Jumper pin switch settings (board)

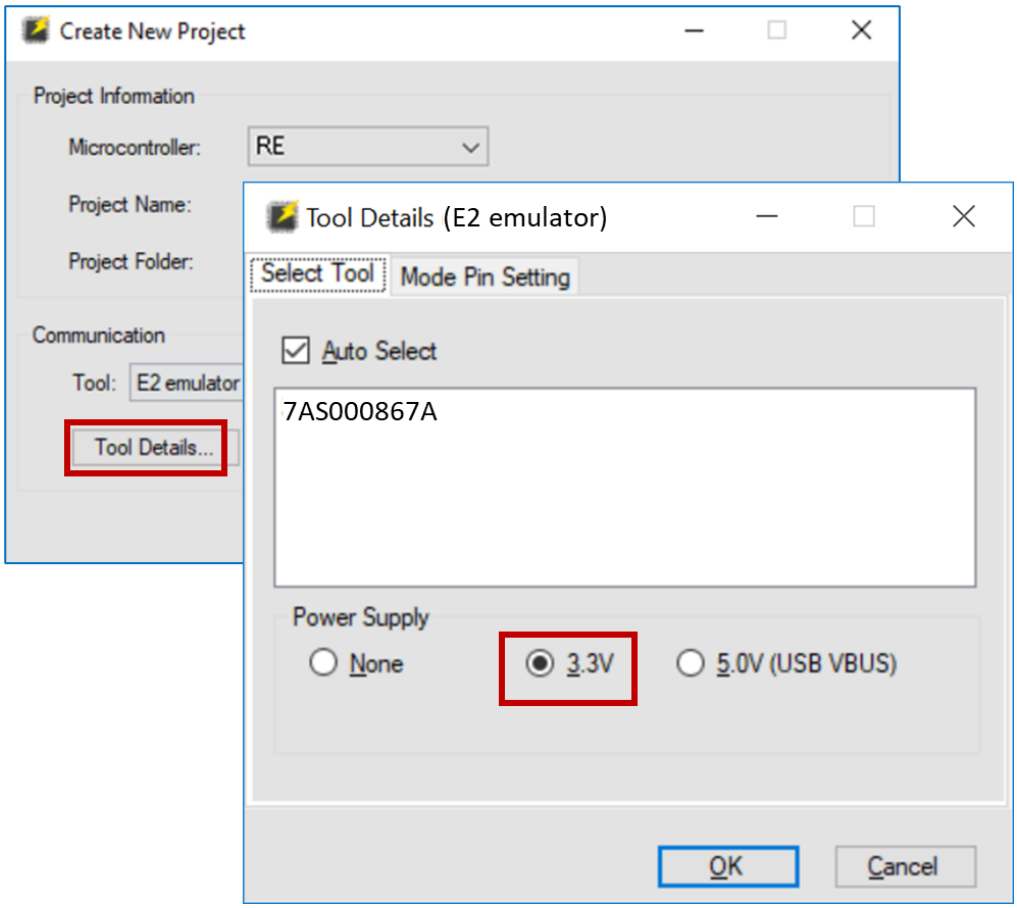


Figure 4-6: Select 3.3V in the tool details on the RFP screen

5. Description of each part

5.1. LED

Reference name	connection	explanation
LED1	CPU_VIN	Lights up when the MCU is supplied with an internal voltage.
LED2	MCU P506	General purpose LED. Low output from P506 lights up.
LED3	FT232RL Tx	Flashes when the USBconnector (CN4) communicates to USB-Serial.
LED4	FT232RL Rx	

5.2. Switch

5.2.1. Mode setting switch

Reference name	connection	explanation
SW3	MD/P201	Toggle Single Chip Mode / SCI boot mode.
SW4	EHMD	Switch between Normal Mode / EHC Mode.

5.2.2. Momentary Switch

Reference name	connection	explanation
SW1	RES #	MCU reset.
SW2	P505/IRQ1_C	General purpose push switch. Connect to GND when pressed.
SW5	(MCU_VCC)	MCU_VCC discharges the battery.
SW6	(VCC_SU)	VCC_SU discharges the battery.

5.3. External clock description

Reference name	connection	explanation
XTAL1	Main Clock Oscillator(MOSC)	32MHz Crystal Resynthes
XTAL2	Subclock oscillator(SOSC)	32.768kHz Crystal Resynthes
XTAL3	Bluetooth Oscillator (BLELK)	32MHz Crystal Resynthes

The subclock oscillator drive capability (SODRV, SODRV0) should be set to "low CL4" as follows.

SODRV = 1、SODRV0 = 0

5.4. I/F Connector

5.4.1. SWD I/F（CN1）

Connect E2 emulator, E2emulatorLite, IAR I-jet, SEGGER J-Link, and debugger in SWD debug mode.
A 20pin 1.27mm Pitch connector is implemented.
"19pin Cortex-M Adapter" etc. may be required.
Please do not set JP10 and JP11 to "1-2 (RFP)" when using the I/F connector.

Connector signal connection

Pin	connection		Pin	connection
1	VCC (internal voltage)		2	SWDIO
3	GND		4	SWCLK
5	GND		6	Pull-Up
7	-		8	N.C.
9	GND		10	RESET
11	5V (Voltage regulator input)		12	Pull-Down
13	5V (Voltage regulator input)		14	N.C.
15	GND		16	N.C.
17	GND		18	N.C.
19	GND		20	N.C.

5.4.2. USB Connector (CN4)

It is connected to a USB-Serial conversion IC and is recognized by the PC as a virtual COM port.
The USB driver can be downloaded from the following URL.
URL : http://www.ftdichip.com/
Normally, the USB driver is installed automatically when connected to a Windows PC.

Serial programming in general-purpose UART and SCI boot modes is possible.
Please connect JP13 when using.

When serial programming in SCI boot mode, set it as follows.

Reference name	establishment
JP10	1-2（RFP）
JP11	1-2（RFP）
JP12	Open
JP13	Close

Do not connect the emulator to SWD I/F (CN1) when using in SCI boot mode (via USB).

When serial communication is performed using UART, set it as follows.

Reference name	establishment	connection
JP10	2-3（UART）	P609（TXD2_C）
JP11	2-3（UART）	P608（RXD2_C）
JP12	1-2（CTS） 2-3（RTS）	P607
JP13	Close	

Do not connect anything to the Pmod™ connector (CN3, CN7) when used with UART connections.

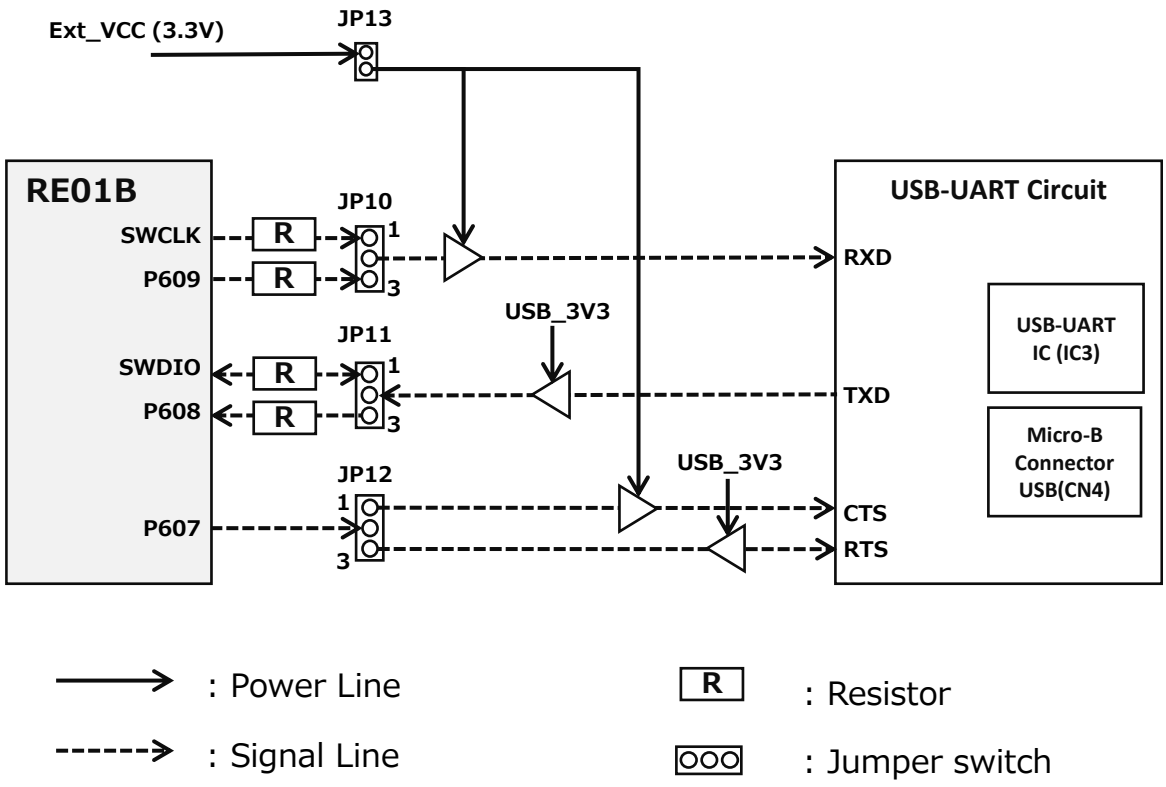


Figure 4-7: Wiring connections for JP10, 11, 12 and 13

5.4.3. Pmod™ Connector (CN3)

This is a Digilent Pmod™ compatible connector with 12Pin SPI connection.
When using it, please set JP10 and JP11 to Open and do not connect anything to the Pmod™ connector (CN7).

Pin	connection		Pin	
1	P606		7	P300
2	P609		8	P301
3	P608		9	P305
4	P607		10	P704
5	D_GND		11	D_GND
6	IOVCC1		12	IOVCC1

5.4.4. Pmod™ Connector (CN7)

Digilent Pmod™ compatible connector with 12Pin UART connection.
Set JP10 and JP11 to Open and do not connect anything to the Pmod ™ connector (CN3).

Pin	connection		Pin	connection
1	P607		7	P107
2	P609		8	P112
3	P608		9	P113
4	P606		10	P012
5	D_GND		11	D_GND
6	IOVCC1		12	IOVCC1

5.5. Current measurement

Current measurement of Microcontroller is possible, excluding the current consumed but other circuitry around the board.

By connecting a current-meter between the TP3-TP4 and setting JP2 to open, it is possible to measure the current of the microcomputer (other than BLE). By connecting a current-meter between the TP7-TP8 and setting JP3 to open, it is possible to measure the current of the microcomputer (BLE only).

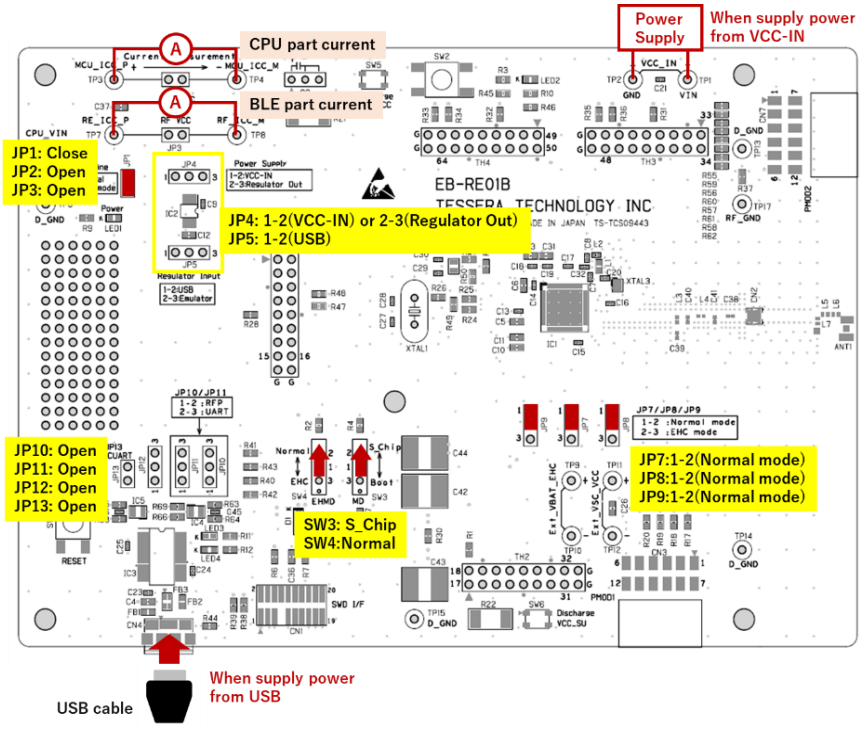
Operate Microcontroller on its operating unit and power it from a USB or VCC-IN terminal.

At 3.5EH (Energy Harvest) Power Operating Mode, Current consumption cannot be evaluated correctly.

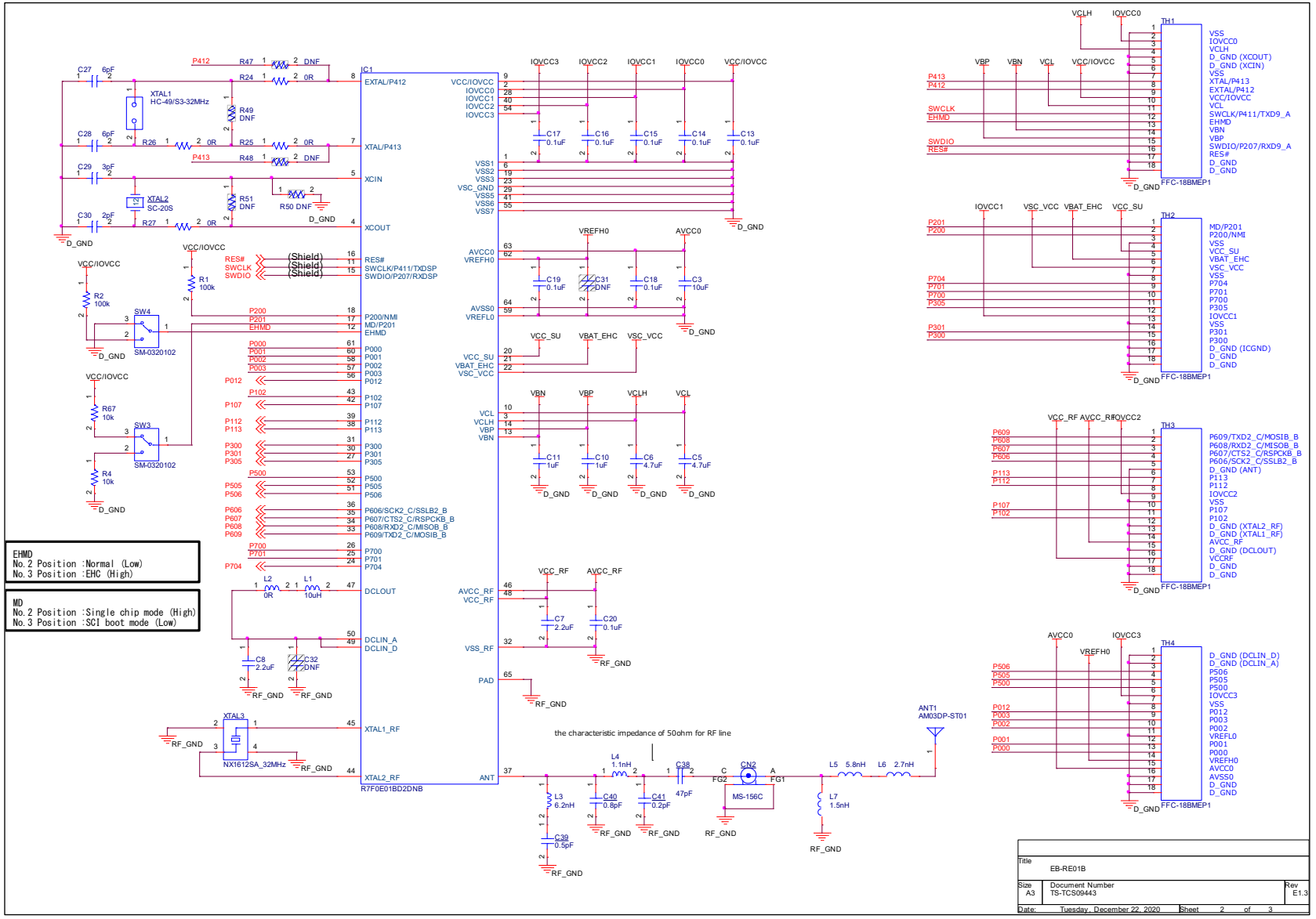
Jumper pin switch settings

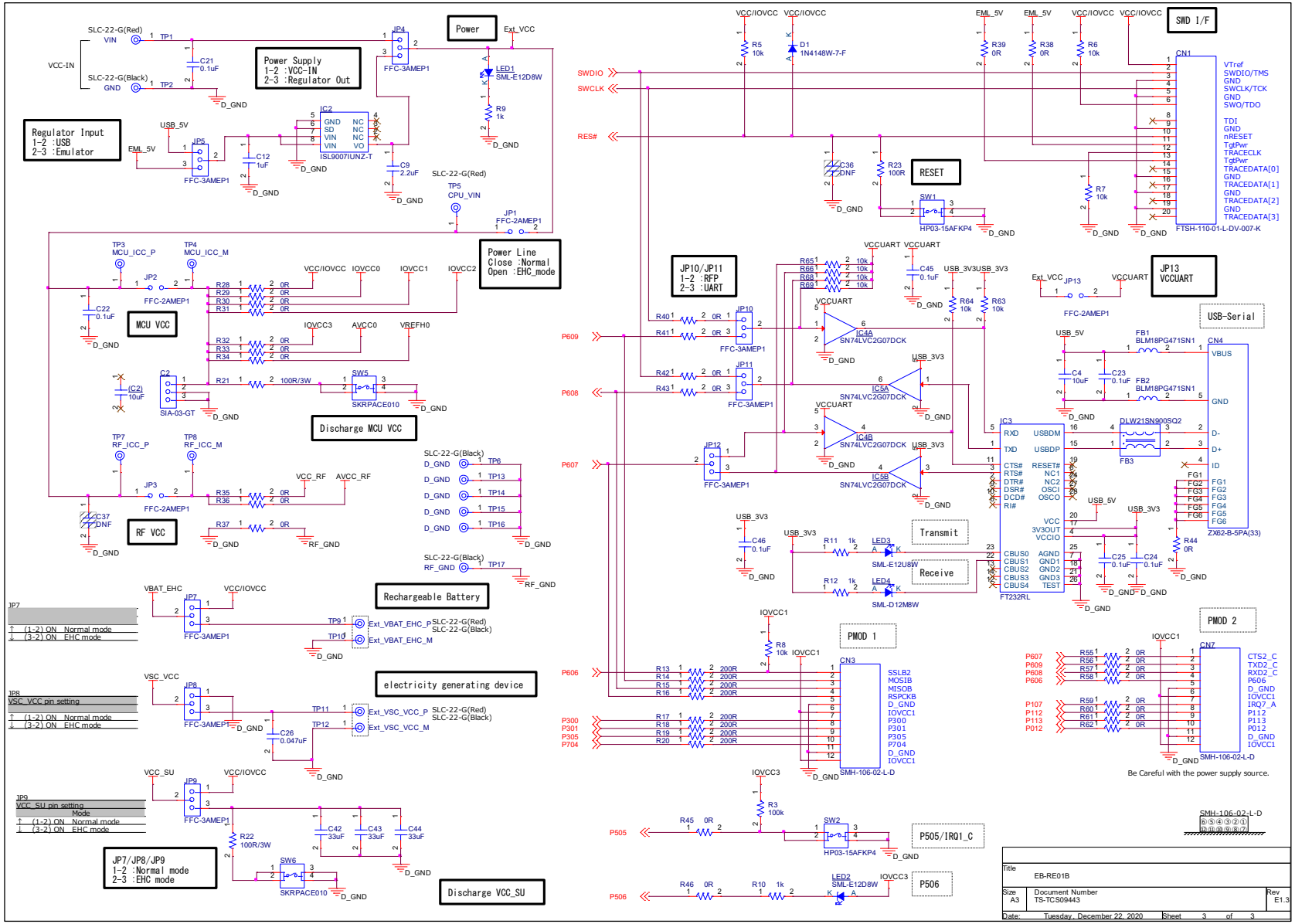
reference	establishment
SW3	S_Chip（Single chip mode)
SW4	Normal

reference	establishment
JP1	Close
JP2	Open
JP3	Open
JP4	1-2(VCC-IN) or 2-3(USB)
JP5	1-2（USB)
JP7	1-2（Normal mode)
JP8	1-2（Normal mode)
JP9	1-2（Normal mode)
JP10	Open
JP11	Open
JP12	Open
JP13	Open



6. Schematics




Power
Power Supply
1-2 :VCC-IN
2-3 :Regulator Out
Regulator Input
1-2 :USB
2-3 :Emulator
Power Line
Close :Normal
Open :EHC_mode
MCU VCC
RF VCC
Discharge MCU VCC
Rechargeable Battery
electricity generating device
Discharge VCC_SU
JP7/JP8/JP9
1-2 :Normal mode
2-3 :EHC mode
JP10/JP11
1-2 :RFP
2-3 :UART
JP13
VCCUART
SWD I/F
RESET
USB-Serial
Transmit
Receive
PMOD 1
PMOD 2
P505/IRQ1_C
P506
Be Careful with the power supply source.
Title
EB-RE01B
Size
A3
Document Number
TS-TCS09443
Rev
E1.3
Date:
Tuesday, December 22, 2020
Sheet
3
of
3

7. Notes on construction design certification

When using this product, please use the built-in antenna.
Please note that the use of software other than the dedicated software made by Renesas, or the operation by software modification will not conform to the construction design certification.