

Introduction

This document provides a guide to prepare RZ/G2L, RZ/G2LC and RZ/V2L reference boards to boot up with the RZ/G2L and RZ/V2L Group Board Support Package. Especially, procedures to write the bootloaders to each board are explained.

Bootloaders are written to the Flash ROM on the board using the Flash Writer tool provided by Renesas through the minimonitor utility. This document explains the way to write these files using the Flash Writer.

Target

RZ/G2L reference board

- RZ/G2L Evaluation Board Kit PMIC version (smarc-rzg2l-pmic) (*)
 - RZ/G2L SMARC Module Board
 - RZ SMARC Series Carrier Board

RZ/G2LC reference board

- RZ/G2LC Evaluation Board Kit PMIC version (smarc-rzg2lc-pmic) (**)
 - RZ/G2LC SMARC Module Board
 - RZ SMARC Series Carrier Board

RZ/V2L reference board

- RZ/V2L Evaluation Board Kit PMIC version (smarc-rzv2l-pmic) (***)
 - RZ/V2L SMARC Module Board
 - RZ SMARC Series Carrier Board

(*) “RZ/G2L Evaluation Board Kit PMIC” includes the RZ/G2L SMARC Module Board and the RZ SMARC Series Carrier Board.

(**) “RZ/G2LC Evaluation Board Kit PMIC” includes the RZ/G2LC SMARC Module Board and the RZ SMARC Series Carrier Board.

(***) “RZ/V2L Evaluation Board Kit PMIC” includes the RZ/V2L SMARC Module Board and the RZ SMARC Series Carrier Board.

RZ/G2L and RZ/V2L Group Board Support Package version 1.3 or later.

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1. Preparing Flash Writer

Flash Writer is built automatically when building BSP by bitbake command. Please refer to the Release Note of the RZ/G2L and RZ/V2L Group Board Support Package to obtain a binary file of Flash Writer.

If you need latest one, please get source code from the GitHub repository and build it according to the following instructions. In general, new revision of reference boards requires latest Flash Writer.

1.1 Preparing cross compiler

FlashWriter runs on target boards. Please get cross compiler built by Linaro or setup a Yocto SDK.

ARM toolchain:

```
$ cd ~/
$ wget https://developer.arm.com/-/media/Files/downloads/gnu-a/10.2-2020.11/binrel/gcc-arm-10.2-2020.11-x86_64-aarch64-none-elf.tar.xz
$ tar xvf gcc-arm-10.2-2020.11-x86_64-aarch64-none-elf.tar.xz
```

Yocto SDK:

Build an SDK according to Release Notes and install it to a Linux Host PC. Then, enable the SDK as below.

```
$ source /opt/poky/3.1.5/environment-setup-aarch64-poky-linux
```

1.2 Building Flash Writer

Get source codes of Flash Writer from the GitHub repository and checkout the branch rz_g2l.

```
$ cd ~/
$ git clone https://github.com/renesas-rz/rzg2_flash_writer.git
$ cd rzg2_flash_writer
$ git checkout rz_g2l
```

Build Flash Writer as an s-record file by the following commands. Please specify a target board by “BOARD” option.

ARM toolchain:

```
$ export PATH=$PATH:~/gcc-arm-10.2-2020.11-x86_64-aarch64-none-elf/bin
$ export CROSS_COMPILE=aarch64-none-elf-
$ export CC=${CROSS_COMPILE}gcc
$ export AS=${CROSS_COMPILE}as
$ export LD=${CROSS_COMPILE}ld
$ export AR=${CROSS_COMPILE}ar
$ export OBJDUMP=${CROSS_COMPILE}objdump
$ export OBJCOPY=${CROSS_COMPILE}objcopy

$ make clean
$ make BOARD=<board>
```

Yocto SDK:

```
$ make clean
$ make BOARD=<board>
```

Please replace *<board>* to a proper option according to this table.

Target board	BOARD option	Image to be generated
smarc-rzg2l-pmic	RZG2L_SMARC_PMIC	Flash_Writer_SCIF_RZG2L_SMARC_PMIC_DDR4_2GB_1PCS.mot
smarc-rzg2lc-pmic	RZG2LC_SMARC_PMIC	Flash_Writer_SCIF_RZG2LC_SMARC_PMIC_DDR4_1GB_1PCS.mot
smarc-rzv2l-pmic	RZV2L_SMARC_PMIC	Flash_Writer_SCIF_RZV2L_SMARC_PMIC_DDR4_2GB_1PCS.mot

2. Renesas SMARC RZ/G2L Evaluation kit PMIC (smarc-rzg2l-pmic), RZ/G2LC Evaluation kit PMIC (smarc-rzg2lc-pmic) and RZ/V2L Evaluation kit PMIC (smarc-rzv2l-pmic)

2.1 Preparation before startup

2.1.1 Preparation

The following power supply environment is used in the evaluation.

Hardware preparation:

- USB Type-C cable “AK-A8485011” (manufactured by Anker)
- USB PD Charger Anker “PowerPort III 65W Pod” (manufactured by Anker)
- USB Type-microAB cable (Any cables)
- Micro HDMI cable (Any cables)
- PC Installed FTDI VCP driver and Terminal software (Tera Term)

Note: Please install the FTDI driver that can be following website (<https://www.ftdichip.com/Drivers/VCP.htm>).

Software preparation:

RZ/G2L Evaluation Board Kit PMIC version

- Flash_Writer_SCIF_RZG2L_SMARC_PMIC_DDR4_2GB_1PCS.mot (flash writer)
- bl2_bp-smarc-rzg2l_pmic.srec (boot loader)
- fip-smarc-rzg2l_pmic.srec (boot loader)
- Image-smarc-rzg2l.bin (Linux kernel)
- r9a07g044l2-smarc.dtb (Device tree file)

RZ/G2LC Evaluation Board Kit PMIC version

- Flash_Writer_SCIF_RZG2LC_SMARC_PMIC_DDR4_1GB_1PCS.mot (flash writer)
- bl2_bp-smarc-rzg2lc_pmic.srec (boot loader)
- fip-smarc-rzg2lc_pmic.srec (boot loader)
- Image-smarc-rzg2lc.bin (Linux kernel)
- r9a07g044c2-smarc.dtb (Device tree file)

RZ/V2L Evaluation Board Kit PMIC version

- Flash_Writer_SCIF_RZV2L_SMARC_PMIC_DDR4_2GB_1PCS.mot (flash writer)
- bl2_bp-smarc-rzv2l_pmic.srec (boot loader)
- fip-smarc-rzv2l_pmic.srec (boot loader)
- Image-smarc-rzv2l.bin (Linux kernel)
- r9a07g054l2-smarc.dtb (Device tree file)

Hereafter, RZ/V2L Evaluation Board Kit PMIC version picture is used as a representative.

If you will use RZ/G2L, RZ/G2LC Evaluation Board Kit PMIC version, Connectors on same location as RZ/V2L Evaluation Board Kit PMIC version can be used.

2.1.2 How to set boot mode and input voltage

Please set the SW11 settings as follows.

- Pin no1 to no3 of the SW11 is used to control boot mode of RZ/G2L, RZ/G2LC and RZ/V2L.
- Pin no4 of the SW11 is used to control the input voltage from power charger to 5V or 9V. Please use a 5V setting as initial setting.



SW11-1	OFF
SW11-2	ON
SW11-3	OFF
SW11-4	ON

Please select boot mode as below figures! Currently we support 2 modes in 4 modes: SCIF Download mode and QSPI Boot mode.

SCIF Download Mode(*1)	QSPI Boot (1.8V) Mode																
<table border="1"> <tr><td>SW11-1</td><td>OFF</td></tr> <tr><td>SW11-2</td><td>ON</td></tr> <tr><td>SW11-3</td><td>OFF</td></tr> <tr><td>SW11-4</td><td>ON</td></tr> </table>	SW11-1	OFF	SW11-2	ON	SW11-3	OFF	SW11-4	ON	<table border="1"> <tr><td>SW11-1</td><td>OFF</td></tr> <tr><td>SW11-2</td><td>OFF</td></tr> <tr><td>SW11-3</td><td>OFF</td></tr> <tr><td>SW11-4</td><td>ON</td></tr> </table>	SW11-1	OFF	SW11-2	OFF	SW11-3	OFF	SW11-4	ON
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SW11-3	OFF																
SW11-4	ON																
eMMC Boot (1.8V) Mode	eSD Boot Mode																
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SW11-4	ON																
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SW11-2	ON																
SW11-3	OFF																
SW11-4	ON																

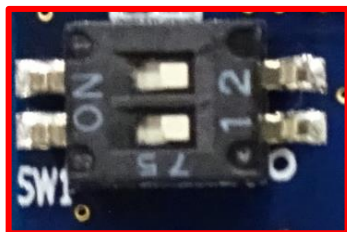
Please select input voltage setting as below.

SW1-4	Input voltage selection
OFF	Input 9V
ON	Input 5V

2.1.3 How to set SW1.

Please set the SW1 settings to follows.

- Pin no1 of the SW1 is used to select the JTAG debug mode or not.
JTAG is not used, so set SW1-1 to normal operation mode.
- Pin no2 of the SW1 is used to select the eMMC or microSD mode. Please set SW1-2 to eMMC mode.



SW1-1	OFF
SW1-2	OFF

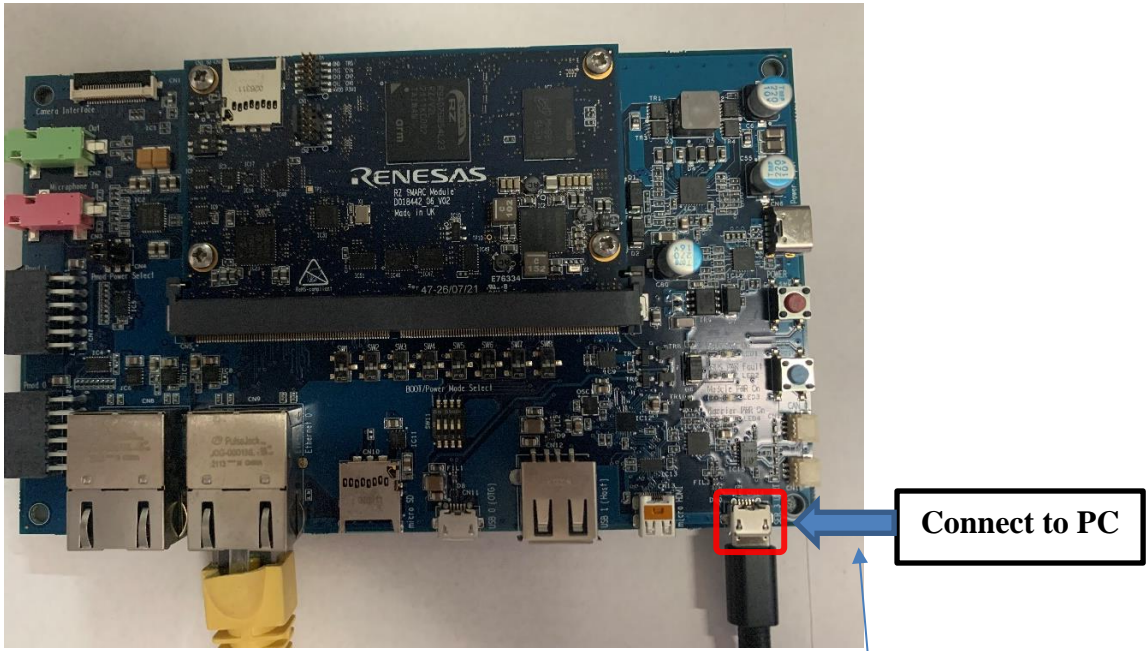
SW1-1	DEBUGEN
OFF	JTAG debug mode
ON	Normal operation

SW1-2	MicroSD/eMMC selection
OFF	Select eMMC on RTK9744L23C01000BE
ON	Select microSD slot on RTK9744L23C01000BE

The selection of microSD slot and eMMC on the SMARC module is exclusive

2.1.4 How to use debug serial (console output)

Please connect USB Type-microAB cable to CN14.

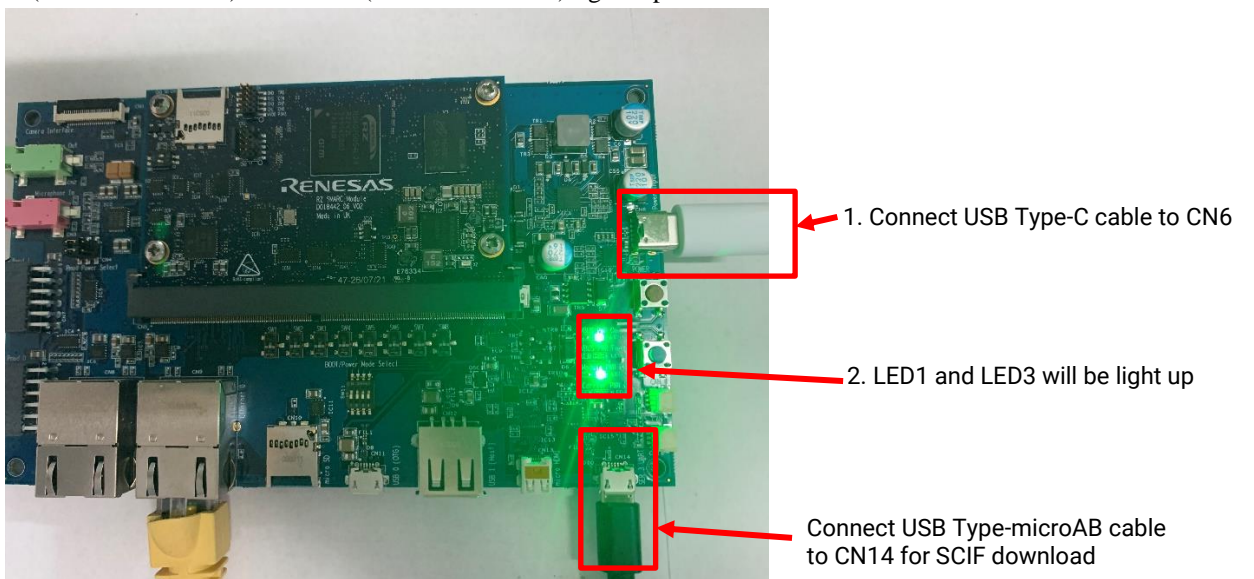


CN14:USB Type-microAB Connector

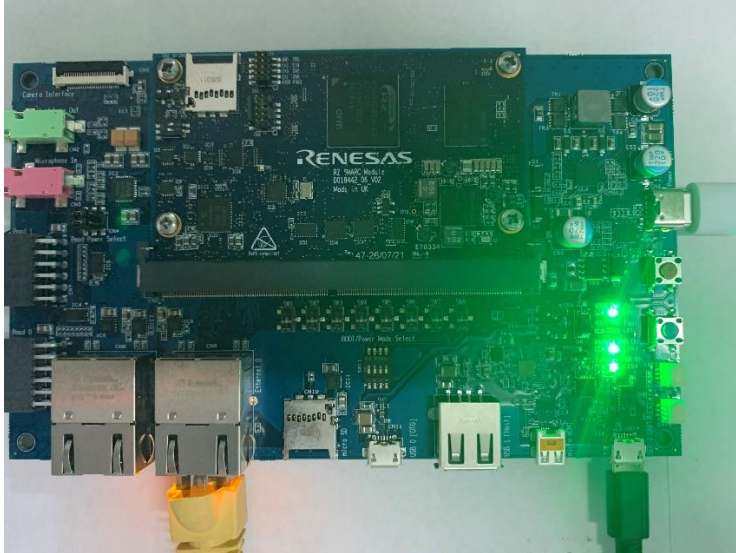
2.2 Startup Procedure

2.2.1 Power supply

1. Connect USB-PD Power Charger to USB Type-C Connector (CN6).
2. LED1(VBUS Power ON) and LED3 (Module PWR On) lights up.



3. Press the power button(SW9) to turn on the power.
Note: When turn on the power, press and hold the power button for 1 second.
When turn off the power, press and hold the power button for 2 seconds
4. LED4(Carrier PWR On) lights up.



2.2.2 Building files to write

This board uses the files below as a bootloader. Please build them according to the Release Note and copy these files to a PC which runs serial terminal software.

RZ/G2L Evaluation Board Kit PMIC version

- bl2_bp-smarc-rzg2l_pmic.srec (boot loader)
- fip-smarc-rzg2l_pmic.srec (boot loader)

RZ/G2LC Evaluation Board Kit PMIC version

- bl2_bp-smarc-rzg2lc_pmic.srec (boot loader)
- fip-smarc-rzg2lc_pmic.srec (boot loader)

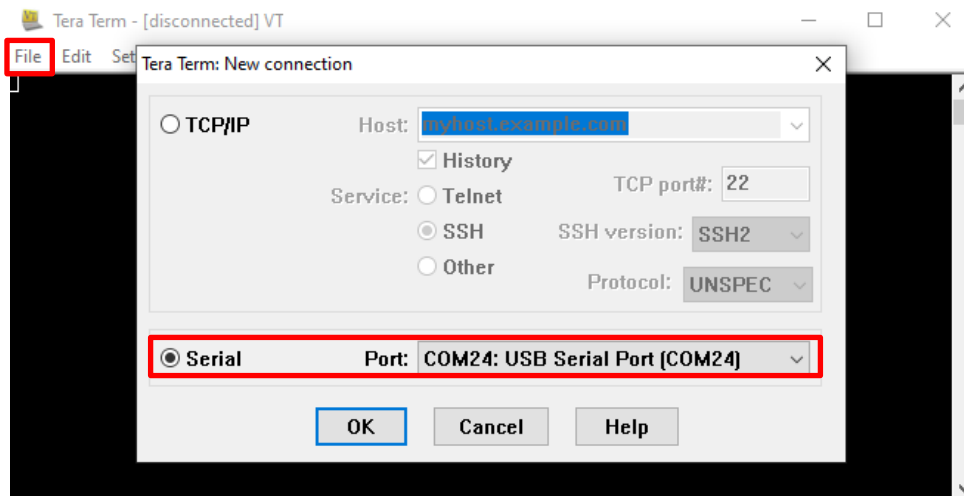
RZ/V2L Evaluation Board Kit PMIC version

- bl2_bp-smarc-rzv2l_pmic.srec (boot loader)
- fip-smarc-rzv2l_pmic.srec (boot loader)

2.2.3 Settings

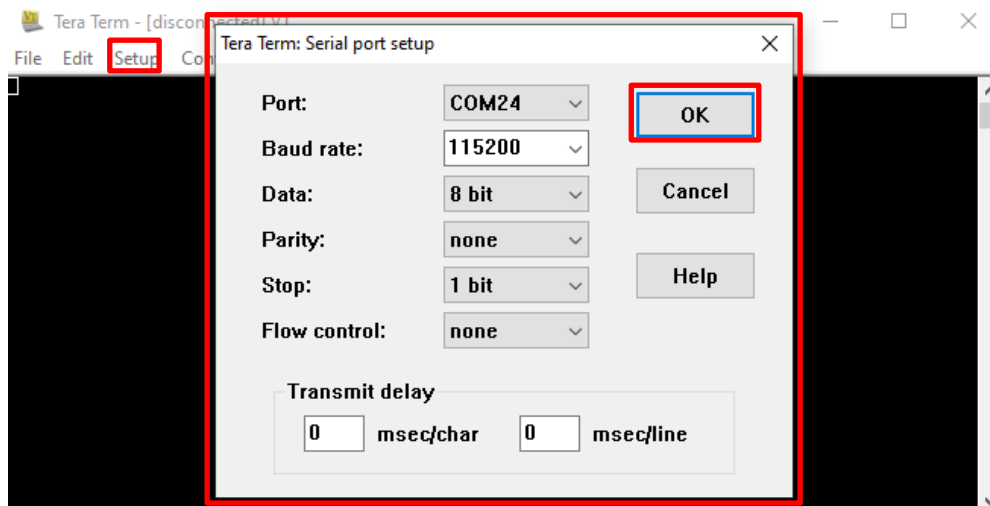
Connect between the board and a control PC by USB serial cable according to the Release Note.

1. Bring up the terminal software and select the “File” > “New Connection” to set the connection on the software.



2. Select the “Setup” > “Serial port” to set the settings about serial communication protocol on the software. Set the settings about serial communication protocol on a terminal software as below:

- Speed: 115200 bps
- Data: 8bit
- Parity: None
- Stop bit: 1bit
- Flow control: None



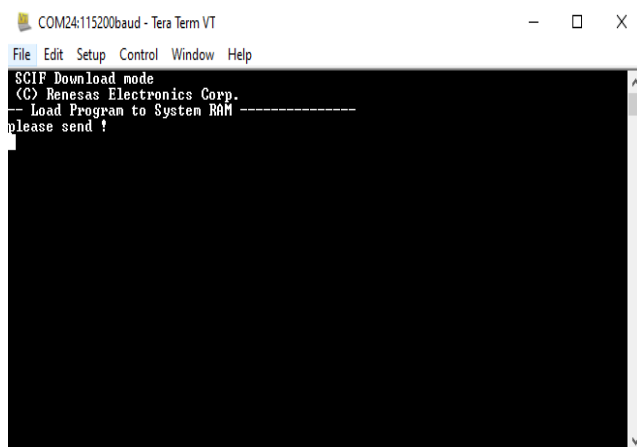
- To set the board to SCIF Download mode, set the SW11 as below (please refer 2.1.2):



SW11

1	2	3	4
OFF	ON	OFF	ON

- After finished all settings, when pressed the reset button SW10, the messages below are displayed on the terminal.



3. Press the Blue button

2.3 Booting Flash Writer

Turn on the power of the board by pressing SW9. The messages below are shown on the terminal.

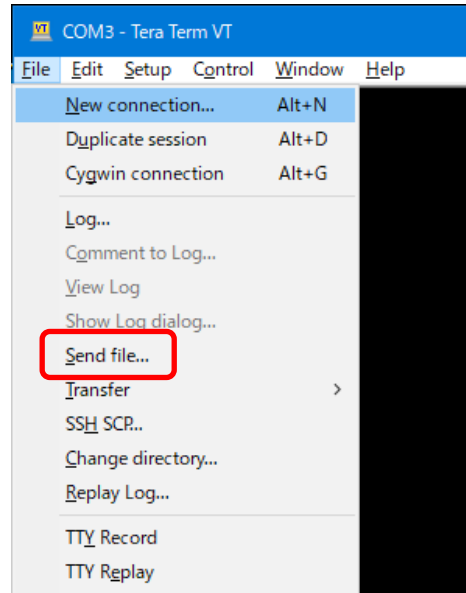
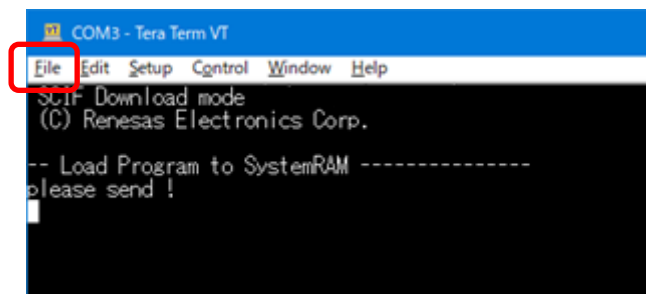
```
SCIF Download mode
(C) Renesas Electronics Corp.

-- Load Program to SystemRAM -----
please send !
```

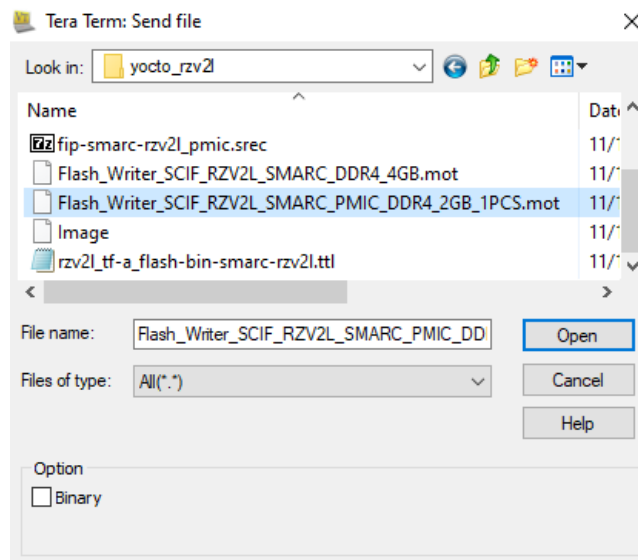
Send an image of Flash Writer (If you will use RZ/G2L Evaluation Board Kit PMIC version, “Flash_Writer_SCIF_RZG2L_SMARC_PMIC_DDR4_2GB_1PCS.mot” should be used. If you will use RZ/G2LC Evaluation Board Kit PMIC version, “Flash_Writer_SCIF_RZG2LC_SMARC_PMIC_DDR4_1GB_1PCS.mot” should be used. If you will use RZ/V2L Evaluation Board Kit PMIC version, “Flash_Writer_SCIF_RZV2L_SMARC_PMIC_DDR4_2GB_1PCS.mot” should be used.) using terminal software after the message “please send !” is shown.

Below is a sample procedure with Tera Term.

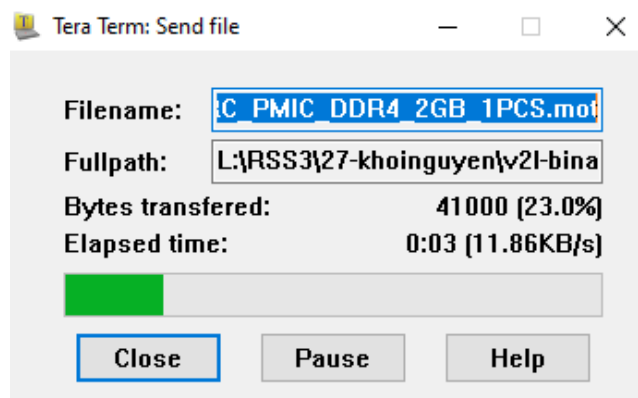
Open a “Send file” dialog by selecting “File” → “Sendfile” menu.



Then, select the image to be send and click “Open” button.



The image will be sent to the board via serial connection.



After successfully downloading the binary, Flash Writer starts automatically and shows a message like below on the terminal.

```
Flash writer for RZ/V2 Series V1.00 Sep.17,2021
Product Code : RZ/V2L
>
```

2.4 Writing Bootloader

“XLS2” command of Flash Writer is used to write binary files. This command receives binary data from the serial port and writes the data to a specified address of the Flash ROM with information where the data should be loaded on the address of the main memory.

This is an example of writing “bl2_bp-smarc-rzv2l_pmic.srec” which should be loaded to 11E00h of the main memory and 000000h of the Flash ROM.

```
>XLS2
===== Qspi writing of RZ/G2 Board Command =====
Load Program to Spiflash
Writes to any of SPI address.
  Micron : MT25QU512
Program Top Address & Qspi Save Address
===== Please Input Program Top Address =====
  Please Input : H'11E00

===== Please Input Qspi Save Address =====
  Please Input : H'00000
Work RAM(H'50000000-H'53FFFFFF) Clear....
please send ! ( '.' & CR stop load)
```

Send the data of “bl2_bp-smarc-rzv2l_pmic.srec” (If you are using RZ/G2L Evaluation Board Kit PMIC version, “bl2_bp-smarc-rzg2l_pmic.srec” should be used. If you are using RZ/G2LC Evaluation Board Kit PMIC version, “bl2_bp-smarc-rzg2lc_pmic.srec” should be used. If you are using RZ/V2L Evaluation Board PMIC version, “bl2_bp-smarc-rzv2l_pmic.srec” should be used.) from terminal software after the message “please send !” is shown.

After successfully download the binary, messages like below are shown on the terminal.

```
SPI Data Clear(H'FF) Check :H'00000000-0000FFFF Erasing..Erase Completed
SAVE SPI-FLASH.....
===== Qspi Save Information =====
  SpiFlashMemory Stat Address : H'00000000
  SpiFlashMemory End Address  : H'00007A60
=====
```

```
SPI Data Clear(H'FF) Check : H'00000000-0000FFFF, Clear OK? (y/n)
```

In case a message to prompt to clear data like above, please enter “y”.

Write all necessary files using the addresses listed at Table 1 and turn off the power of the board by changing the SW11.

Table 1. Addresses for each file

RZ/G2L Evaluation Board Kit PMIC version

File name	Address to load to RAM	Address to save to ROM
bl2_bp-smarc-rzg2l_pmic.srec	0001_1E00	00000
fip-smarc-rzg2l_pmic.srec	0000_0000	1D200

RZ/G2LC Evaluation Board Kit PMIC version

File name	Address to load to RAM	Address to save to ROM
bl2_bp-smarc-rzg2lc_pmic.srec	0001_1E00	00000
fip-smarc-rzg2lc_pmic.srec	0000_0000	1D200

RZ/V2L Evaluation Board Kit PMIC version

File name	Address to load to RAM	Address to save to ROM
bl2_bp-smarc-rzv2l_pmic.srec	0001_1E00	00000
fip-smarc-rzv2l_pmic.srec	0000_0000	1D200

2.5 Setting U-boot

To set the board to SPI Boot mode, set the SW11 as below:

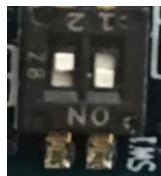


SW11

1	2	3	4
OFF	OFF	OFF	ON

Note:-

Set the SW1 on SoM module to eMMC mode.



Turn on the power of the board by pressing the reset button SW10.

```
U-Boot 2020.10 (Sep 16 2021 - 07:58:18 +0000)

CPU: Renesas Electronics E rev 16.15
Model: smarc-rzv2l
DRAM: 1.9 GiB
MMC: sh-sdhi: 0, sh-sdhi: 1
Loading Environment from MMC... OK
In: serial@1004b800
Out: serial@1004b800
Err: serial@1004b800
Net: eth0: ethernet@11c20000
Hit any key to stop autoboot: 0
=>
```

Following the messages above, many warning messages will be shown. These warnings are eliminated by setting correct environment variables. Please set default value and save them to the Flash ROM.

```
=> env default -a
## Resetting to default environment
=> saveenv
Saving Environment to MMC... Writing to MMC(0)...OK
=>
```

In case booting from micro SD card on SMARC carrier board, set environment variables using the commands below. The commands below are for the RZ/V2L board. Please replace the file names in “bootcmd” according to the Release Note when you use other boards.

```
=> setenv bootargs 'root=/dev/mmcblk1p2 rootwait'
=> setenv bootcmd 'mmc dev 1;fatload mmc 1:1 0x48080000 Image-smarc-rzv2l.bin;
fatload mmc 1:1 0x48000000 r9a07g05412-smarc.dtb; booti 0x48080000 - 0x480000
00'
=> saveenv
Saving Environment to MMC... Writing to MMC(0)...OK
```

Note) The setting above assumes the SD card has two partitions and stores data as below:

First partition: formatted as FAT, includes Image-smarc-rzv2l.bin and r9a07g05412-smarc.dtb

Second partition: formatted as ext4, rootfs image is expanded

Note) "saveenv" command on u-boot sometime fails.

Workaround: Turn off/on or reset the board and retry the command again.

Now the board can bootup normally. Please turn off and on the power again to boot up the board.

Website and Support

Renesas Electronics Website

<http://www.renesas.com/>

Inquiries

<http://www.renesas.com/contact/>

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3. Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Apr. 09, 2021	-	First edition issued.
1.01	Jul. 15, 2021	-	No modification, keep version to keep consistent with other documents.
1.02	Sep. 30, 2021	-	Add description about "RZ/G2LC Evaluation Board Kit"
1.03	Oct. 26, 2021	7	Corrected description of SW1-1.
1.04	Nov. 30, 2021	-	Add description about "RZ/V2L Evaluation Board Kit"