# RZV2M SMARC SOM

Start-Up Guide

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1. Overview

tbd

1.1 Features

tbd

2. Operating environment

The recommended environment for the RZV2M SMARC SOM is shown in Figure 1.

![Figure 1. Recommended environment](image)

The equipment and software are listed in Table 1.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZV2M SMARC MODULE</td>
<td>System On Module with RZV2M MPU</td>
</tr>
<tr>
<td>SMARC 2.0/2.1 Carrier Board</td>
<td>Any SMARC 2.0/2.1 Compatible Carrier Board</td>
</tr>
<tr>
<td>Linux PC</td>
<td>Used as build/debug environment.</td>
</tr>
<tr>
<td></td>
<td>Minimum 100GB free space on HDD is necessary.</td>
</tr>
<tr>
<td></td>
<td>OS Ubuntu 16.04 LTS.</td>
</tr>
<tr>
<td></td>
<td>64bit OS must be used.</td>
</tr>
<tr>
<td>Windows PC</td>
<td>Used as debug environment, control with terminal software.</td>
</tr>
<tr>
<td></td>
<td>OS Windows 10 is recommended.</td>
</tr>
<tr>
<td>Terminal Software</td>
<td>Used for controlling the serial console of the target.</td>
</tr>
<tr>
<td></td>
<td>Tera Term (latest version) is recommended.</td>
</tr>
<tr>
<td></td>
<td>Available at <a href="https://ttssh2.osdn.jp/index.html.en">https://ttssh2.osdn.jp/index.html.en</a></td>
</tr>
</tbody>
</table>
### RS232 to USB Cable
Serial communication (RS232) between the RZV2M SMARC SOM and Windows/Linux PC.

### Micro SDHC Card
Used to boot the system, store applications for the RZV2M etc..

### HDMI Cable
HDMI communication between RZV2M SMARC SOM and HDMI Display.

### HDMI Display
Display used to show the acquired images from MIPI-CSI Interface.

### MIPI-CSI Camera
MIPI-CSI Camera for image acquisition. For the moment only IMX415 SONY Camera IC are supported.

### GBE Cable
Gigabit ethernet cable for ethernet connection.

### Power Supply
AC to DC adapter for the SMARC Carrier Board. Depending on the carrier board, the current and voltage outputs can differ. The RZV2M SMARC SOM will be powered by the carrier board.

## 3. Carrier Boards
The RZV2M SMARC SOM cannot be used as an independent module. It must be used in conjunction with SMARC Carrier boards. The RZV2M SMARC SOM is compatible with any SMARC 2.0/2.1 carrier board available on the market.

### 3.1 TQ-Group Carrier Board
The SMARC 2.0/2.1 carrier board developed by TQ Group (MB-SMARC-2SMARC 2.0/2.1) is compatible with short and large SMARC 2.0/2.1 modules. The MB-SMARC-2SMARC 2.0/2.1 is shown in Figure 2. Additional information can be found at [https://www.tq-group.com/de/produkte/tq-embedded/mb-smarc-2/](https://www.tq-group.com/de/produkte/tq-embedded/mb-smarc-2/).

![Figure 2. MB-SMARC-2SMARC 2.0/2.1 carrier board](image-url)
3.2  *Congatec Carrier Board*

tbd.

3.3  *Kontron Carrier Board*

tbd.

4.  **How to run the SMARC Module**

Plug in the RZV2M SMARC SOM into the SMARC 2.0/2.1 carrier board and fix the mechanical connection by using the proper screws. The connection of the RZV2M SMARC SOM to TQ’s MB-SMARC-2SMARC 2.0/2.1 carrier board is shown in Figure 3.

![Figure 3. RZV2M SMARC SOM connected to MB-SMARC-2SMARC 2.0/2.1 carrier board](image-url)
4.1 SMARC SOM Settings

4.1.1 SMARC SOM Switch Settings

Confirm the switch settings shown in the red frame in Figure 4.

![RZV2M Switch Settings](image)

Figure 4. RZV2M Switch Settings

4.1.2 SMARC SOM MIPI-CSI Settings

Connect the MIPI-CSI Camera (FRAMOS IMX415 module or any equivalent) to SOM’s camera interface as highlighted in Figure 5. Additional information about FRAMOS IMX415 can be found at [www.framos.com](http://www.framos.com).

*Note that the connection must be pin to pin, please be aware at pin number 1. Wrong cable orientation will lead to permanent damage of the sensor module or adapters.*
4.2 Carrier Board Settings

4.2.1 MB-SMARC-2SMARC 2.0/2.1 Carrier board

Confirm the switch S3 settings shown in the red frame in Figure 6.
4.3 Cable Settings

4.3.1 Debugging cable settings
Connect the debugging DB9 cable adapter to X39 connector of the MB-SMARC-2SMARC 2.0/2.1 carrier board (X39 is available on the bottom side of the carrier board). SER0-RS232 interfaces in highlighted in Figure 7.

![Figure 7. MB-SMARC-2SMARC 2.0/2.1 Carrier board debugging cable connection](image)

4.3.2 Terminal software
Any terminal software can be used for console communication. Tera Term is recommended, and it is available for download at [https://ttssh2.osdn.jp/index.html.en](https://ttssh2.osdn.jp/index.html.en).

4.3.3 Serial port settings
Serial connection settings of the terminal software should be set to the values below:
- Baud rate: 115200 [bps]
- Data bit: 8
- Parity bit: None
- Stop bit: 1
- Flow control: None

In case Tera Term is used, set the serial connection settings as follows:
A. Menu -> Setup -> Serial port

![Terminal software settings](image1)

Figure 8. Terminal software settings

B. Menu -> Setup -> Terminal

![Terminal software settings](image2)

Figure 9. Terminal software settings
4.4 SD Card Settings

Plug in the uSD card on the SD CARD slot (X16) of the MB-SMARC-2SMARC 2.0/2.1 Carrier. X16 interface is highlighted in Figure 10.

![Figure 10. MB-SMARC-2SMARC 2.0/2.1 Carrier board uSD Card Interface](image)

4.5 GBE Settings

Plug in the GBE cable on the GBE0 interface (X11) as depicted in Figure 11. Please note that the RXV2M SAMRC SOM has only one GBE interface available on GBE0.

![Figure 11. MB-SMARC-2SMARC 2.0/2.1 Carrier board GBE0 Interface](image)
4.6 HDMI Settings

Plug in the HDMI Monitor cable on the HDMI interface (X6) as shown in Figure 12.

![Figure 12. MB-SMARC-2SMARC 2.0/2.1 Carrier board HDMI Interface](image)

4.7 Power Supply Settings

MB-SMARC-2SMARC 2.0/2.1 Carrier board can be supplied with a DC voltage between 14VDC to 36VDC either on X13 or on X12. The X12 and X13 connectors are highlighted in Figure 13.

![Figure 13. MB-SMARC-2SMARC 2.0/2.1 Carrier board Power Supply](image)
4.8 Startup

Power on the carrier board and boot the RZ/V2M SMARC SOM. After booting, check the serial console on the PC.

*Note that the SD card should be inserted before powering on the SMARC Carrier Board.

The root file system is booted after Linux kernel initializing. The red line in Figure 14 will appear after the initialization of root file system. Enter “root” command in the login screen.

4.8.1 Run the Sample Applications

4.8.1.1 Run the MIPI-CSI to HDMI Application

The sample application for displaying images acquired by the MIPI-CSI camera on the HDMI Display runs with the commands shown below and in Figure 15.

```
root$ cd /eAI/app_tinyyolov2_mipi_hdmi/exe/
root$ ./sample_app_tinyyolov2_cam_hdmi
```

Figure 15. Linux commands to run the tinyyolov2_mipi_hdmi application

*Note: to stop the application press any key, don’t use CTRL + C!

4.8.1.2 Run the MIPI-CSI to VCD Application

The MIPI-CSI to VCD sample application builds up a network connection and sends the camera stream data to the VLC Media Player Program on a PC.

The VLC Media Player can be installed from [https://www.videolan.org/](https://www.videolan.org/).

In order to setup the system, the following information is needed:

- The IP of the PC where VLC media player is running.
- The IP of the RZ/V2M SMARC SOM module.
Session Description Protocol (SDP) file for VLC multimedia session. Also, some additional settings are needed for the VLC Media Player.

### 4.8.1.2.1 Configuration of the VLC Media Player

After installing the VLC Media Player, please make the below settings:

a) Open preferences window from Tools -> Preferences or Ctrl + P as shown in Figure 16.

![Figure 16. Open Simple Preference VLC window](image)

b) Enable All settings in order to switch to Advanced Preferences as shown in Figure 16.

![Figure 16. Switch to Advance Preference VLC window](image)

c) By selecting the Input/Codes set the Network caching (ms) and Clock jitter to 0, respectively 500, as shown in Figure 17.
d) Save the configuration, as shown in Figure 18.

4.8.1.2.2 Create the SDP file

For SDP file creation, the RZV2M SMARC SOM IP is needed. The IP can be found by typing `ifconfig` in the serial terminal window as shown in Figure 19.
Create a new file on the PC and save it with .sdp extension, e.g. RTP264.sdp. Write the following content into the file and replace the RZV2M SMARC SOM IP with the correct one obtained above.

For H265 encoding, the content of the file shall be as below.

```
V=0
o=- 0 IN IP4 192.168.10.76
s=No Name
c=IN IP4 192.168.10.76
t=0 0
m=video 5004 RTP/AVP 96
a=rtpmap:96 H264/90000
```

4.8.1.2.3 Start the MIPI-CSI to VCD application on RZV2M SMARC SOM.
For starting the `mipi` to `vcd` Linux application we will need the PC’s IP as parameter. In order to find the PC’s IP, run the `ipconfig` Windows command in a Command Prompt as shown in Figure 20.
**Figure 20.** Find PC’s IP using `ipconfig`.

To start the `mipi to vcd` application run the commands shown below and in Figure 21. The parameters of the application shall be the PC’s IP found above and the coding type used in the `*scd` file.
4.8.1.2.4 Play the video stream on VLC

In order to play the RZV2M SMARC SOM camera stream on VLC either double click on the *sdp* file created in Chapter 4.8.1.2.2 or open the VLC Media Player, go to menu Media -> Open File (or CTRL + O) and load the file created in Chapter 4.8.1.2.2, as shown in Figure 22.

![Loading the sdp file into VLC Media Player](image)

**Figure 22.** Loading the *sdp* file into VLC Media Player

4.8.2 Shutdown

To power down the RZ/V2M Evaluation Board, send the following command at first:

```
root$ poweroff
```

Turn off the SMARC Carrier board.
References
## Revision History

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Page</th>
<th>Description</th>
<th>Summary</th>
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<td>1.0</td>
<td>06.09.2021</td>
<td></td>
<td>Initial version.</td>
<td></td>
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<tr>
<td>1.1</td>
<td>07.09.2021</td>
<td>2</td>
<td>Add MIPI-CSI Camera Interface.</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>13.09.2021</td>
<td>1, 11</td>
<td>Add mipi to vcd application start-up in chapter 4.8.1.</td>
<td></td>
</tr>
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   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.

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   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.

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   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.

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   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.).

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