User's Manual

RZ/V2MA SoC

VIDEO CODEC INTEGRATION GUIDE

RENESAS SOC
RZ Family / RZ/V Series

Renesas Electronics
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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.

Table of Contents

1. Overview

1.1 Introduction

This document is the integration manual of Codec library for Linux.

1.2 Features

This software supports the following features.

- Support for H.264 decoding and encoding
- Support for H.265 decoding and encoding

2. Required Environment

2.1 Hardware requirement

Please refer to the document *RZ/V Verified Linux Package Start-up Guide for RZ/V2MA*.

2.2 Software requirement

RZ/V Verified Linux Package V3.0.4 is required as a base software layer.
To integrate the libraries for Codec to the Linux Package, the below archives is required.

- RTK0EF0131F02000SJ-v0.97.zip

Table 2-1. RZ/V2MA Video Codec package contents

Contents	File	Explanation
Recipe files, libraries, and source code	meta-rz-features.tar.gz	Files needed to build Linux package with Codec libraries.
Binary	Codec_Bin.bin	Codec support binary.
Document	r01us0600ej0097-rz-v2ma.pdf	Describes how to build and use Codec libraries.

This Codec library uses DRPB. Please apply the following package to use DRPB.

- r11an0592ej0740-rzv2ma-drpai-sp.zip

Table 2-2. RZ/V2MA DRP-AI Support Package

Contents	File	Explanation
Recipe files	meta-rz-drpai.tar.gz	Files needed to build Linux package with DRP-AI and DRPB.
Document	r11an0592ej0740-rzv2ma-drpai-sp.pdf	Describes how to build and use DRP-AI function.

Note: When using RZ/V2MA OpenCV Accelerator Support Package, DRPB is shared by Video Codec software and OpenCV Accelerator. Please refer to the documentation included in the RZ/V2MA OpenCV Accelerator Support Package for more information.

3. Install in Linux Package

3.1 Preparations

Prepare the following packages and document.

A) r01us0578ej0120-rz-v(StartUp_Guide_V2MA).pdf (included RTK0EF0045Z0024AZJ-v3.0.4.zip)
B) RZ/V2MA Video Codec Package V0.9.7 (RTK0EF0131F02000SJ-v0.97.zip)
C) RZ/V2MA DRP-AI Support Package Version.7.40 (r11an0592ej0740-rzv2ma-drpai-sp.zip)

3.2 Copy files to Linux PC

Copy the following files included in the packages B) and C) to </home/user/> on your Linux PC.

- The file included in B)
  - meta-rz-features.tar.gz

- The file in rzv2ma_drpai-driver directory included in C)
  - meta-rz-drapi.tar.gz

3.3 Building BSP

Refer to the document A) chapter **2. Building Instructions.**

After **Step 5. Decompress OSS files to "build" directory (Optional)** in A), running the following command.

```
$ cd $WORK
$ unzip ~/RTK0EF0131F02000SJ-v0.97.zip
$ tar zxvf ./RTK0EF0131F02000SJ-v0.97/meta-rz-features.tar.gz
$ unzip ~/r11an0592ej0740-rzv2ma-drpai-sp.zip
$ tar zxvf ./rzv2ma_drpai-driver/meta-rz-drpai.tar.gz
$ cd build
$ bitbake-layers add-layer ../meta-rz-features/meta-rzv2ma-codec
$ bitbake-layers add-layer ../meta-rz-features/meta-rz-drpai/
```

Note: RZ/V2MA Video Codec Package supports ORC to accelerate Encode processing. This function is no effect as a default. To decide whether to use it according to your system.

(How To enable ORC library)
Add the following setting in $(WORK)/build/conf/local.conf

```
# Configuration for ORC 0.4.33
USE_ORC_0.4.33 ?= "1"
```

To set core-image-bsp as <core-image-target> at **Step 5. Start the build** in A).

3.4 Prepare for booting from SD card

Basically, it is the same with RZ/V Verified Linux Package. Refer to the document A) chapter **3. Preparations.**

3.1.3 Files for SD card booting in A), add Codec_Bin.bin in Partition No.1 of SD card.

Table 3-1. SD card boot files and partitions

Partition No.	Size	File system format	File name	Description
1	128MB or more	FAT	Image-rzv2ma.bin	Linux kernel image.
			r9a09g055ma3gbgevaluation-board.dtb*	Device tree binary.
			Codec_Bin.bin	**Codec support binary.**
2	The rest	Ext4	core-image-bsp-rzv2ma.tar.bz2	Root file system image.

3.1.5 Set U-Boot environment variables in A), add the setting of using Codec_Bin.bin to u-boot.

```
=> env default -a
=> setenv codaddr 0x7FD00000
=> setenv codbin Codec_Bin.bin
=> setenv bootsd 'run bootargs_sd;fatload mmc 0:1 ${codaddr} ${codbin};fatload mmc 0:1 ${loadadd
r} ${kernel};fatload mmc 0:1 ${fdt_addr} ${fdt_file};booti ${loadaddr} - ${fdt_addr}'
=> saveenv
=> run bootsd
```

3.5 Run on the Board

It is the same with RZ/V Verified Linux Package. Refer to the document A) chapter **5. Run on the Board.**

3.6 Building SDK

It is the same with RZ/V Verified Linux Package. Refer to the document A) chapter **6. Building SDK.**

4. Encoding and decoding procedure example

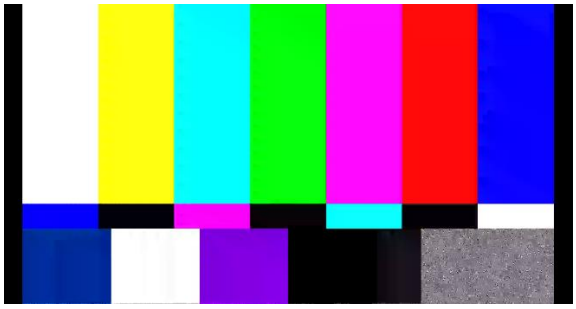
This chapter describes examples of encoding and decoding procedure. It uses GStreamer included in the previous steps.

4.1 H.264 encode

Running gst-launch at the following command to encode H.264 data.

```
# gst-launch-1.0 -e videotestsrc num-buffers=300 ! video/x-raw, width=1920, height=1080, framerat
e=30/1 ! omxh264enc ! video/x-h264,level=\(string\)4.2, profile=high ! h264parse ! mp4mux ! files
ink location=264.mp4
```

When playing 264.mp4 by some kind of Media player, can see the following image.



4.2 H.264 decode

Running gst-launch at the following command to decode H.264 data.

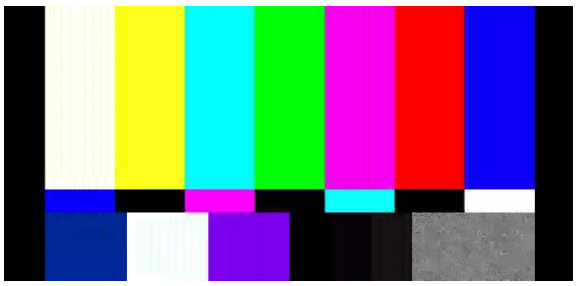
```
# gst-launch-1.0 -e filesrc location=264.mp4 ! qtdemux ! h264parse ! omxh264dec ! video/x-raw,for
mat=I420 ! filesink location=264.yuv
```

4.3 H.265 encode

Running gst-launch at the following command to encode H.265 data.

```
# gst-launch-1.0 -e videotestsrc num-buffers=300 ! video/x-raw, width=1920, height=1080, framerat
e=30/1 ! omxh265enc ! video/x-h265,profile=main,tier=main,level=\(string\)5 ! h265parse ! mp4mux
 ! filesink location=265.mp4
```

When playing 265.mp4 by some kind of Media player, can see the following image.



4.4 H.265 decode

Running gst-launch at the following command to decode H.265 data.

```
# gst-launch-1.0 -e filesrc location=265.mp4 ! qtdemux ! h265parse ! omxh265dec ! video/x-raw,for
mat=I420 ! filesink location=265.yuv
```

Revision History	Video Codec Integration Guide

Rev.	Date	Description	
		Page	Summary
0.90	22 Jul, 2022	—	Preliminary Edition issued
0.95	22 Sep, 2022	1	Add H.265 function
		2	Update table 2-1. based on the released package.
		3	Update based on V0.9.5 Codec Library and change 3.3, 3.4 and 3.5 to refer to Linux Package document.
		4	Change how to use encoding and decoding procedure.
0.96	25 Jan, 2023	2, 3	Change BSP version to 1.1.0
		3	Update based on V0.9.6 Codec Library.
		3, 4	Add how to integrate DRP-AI functions.
		3, 4	Add how to integrate Codec_Bin.bin.
		5	Change how to use encoding and decoding procedure.
0.97	19 Jul. 2023	2, 3	Change based package to RZ/V Verified Linux Package V3.0.4.
		2, 3	Update based on V0.9.7 Codec Library.
		2, 3	Update based on DRP-AI functions to Version.7.40.
		3	3.3 Building BSP Updated the building steps.

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