RZ/V2L OpenCV Accelerator Support Package Version.1.10

R11AN0845EJ0110
Version.1.10
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Release Note

Introduction

This release note describes the contents of the RZ/V2L OpenCV Accelerator Support Package and how to construct its operating environments.

Contents

1. Release Items

The release items in the RZ/V2L OpenCV Accelerator Support Package are as follows.

- **Name and Version**

  RZ/V2L OpenCV Accelerator Support Package Version.1.10

- **Target Board**

  RZ/V2L Evaluation Board Kit

  Note: For the settings of RZ/V2L Evaluation Board Kit, please refer to the RZ/V Verified Linux Package Start-Up Guide for RZ/V2L (R01US0617).

- **Features**

  1. RZ/V2L OpenCV Accelerator

     This is a Linux Package Recipe to use OpenCV Accelerator on RZ/V2L.

- **File Contents**

  Table 1-1 shows the list of contents in this package.

Table 1-1 Contents list

Contents	Explanation
r11an0845ej0110-rzv2l-opencv-accelerator-sp.pdf	This document.
meta-rz-features.tar.gz	Recipe to add OpenCV Accelerator to Linux Package.
r11uz0346ej0110-rzv2l-opencv-accelerator-users-manual.pdf	OpenCV Accelerator User's manual.
r11an0846ej0110-rzv2l-opencv-accelerator-application-note.pdf	OpenCV Accelerator Application Note.
OpenCV_sample.zip	OpenCV Accelerator Sample Application.
OpenCV_Bin_v1.10.bin	Circuit data for OpenCV
rzv2l-opencva-vlp3.0.5-v1.10.patch	OpenCV Accelerator patch file for RZ/V2L.

- **Related Packages**

  1. RZ/V2 Verified Linux Package Version 3.0.5
  2. RZ MPU Graphics Library Version 1.2.0
  3. RZ/V2L DRP-AI Support Package Version.7.41

- **Related Documents**

  1. RZ/V Verified Linux Package Release Note (R01US0565)
  2. RZ/V Verified Linux Package Start-Up Guide for RZ/V2L (R01US0617)
  3. RZ/V2L DRP-AI Support Package Release Note (R11AN0549)
  4. RZ/V2L OpenCV Accelerator User's Manual (R11UZ0346)
  5. RZ/V2L OpenCV Accelerator Application Note(R11AN0846)

- **Restrictions**

  None

2. Build

This chapter will explain the procedure to deploy OpenCV Accelerator to RZ/V2L Linux Package.

Before reading this chapter, please setup RZ/V2L Linux Package as explained in the RZ/V2 Verified Linux Package Start-Up Guide for RZ/V2L (R01US0617).

This environment uses graphics packages and OSS files. Follow the steps described in chapter “2.Build Instructions”.

Also, please set up the RZ/V2L DRP-AI Support Package as explained in the RZ/V2L DRP-AI Support Package Release Note (R11AN0549).

This chapter uses meta-rz-features.tar.gz, which content is shown below.

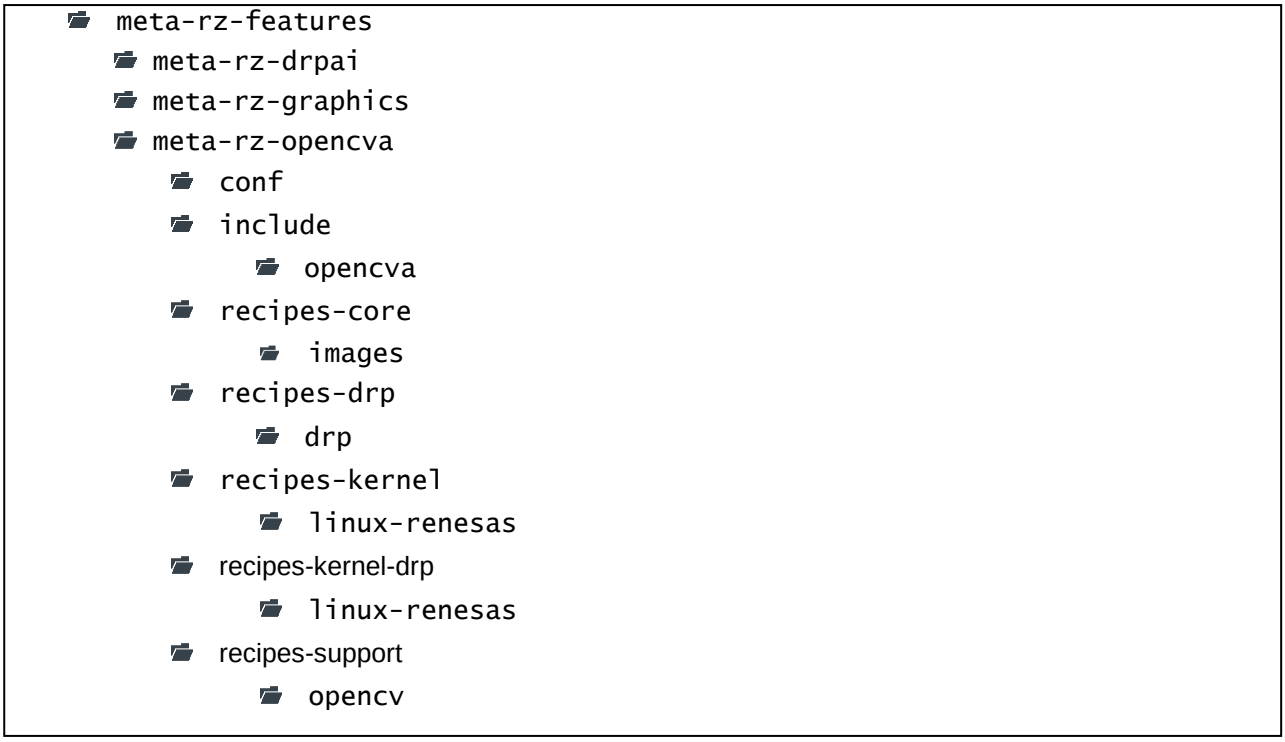


Figure 2-1 Directory Structure of Recipe

2.1 Build Instructions

2.2 Add the Environmental Variable

As in the RZ/V Verified Linux Package Start-Up Guide for RZ/V2L (R01US0617), set the working directory as the environmental variable.

```
$ export WORK=/home/user/user_work
```

Note: Specify the working directory in red above according to your machine. Example above uses “user/user_work”.

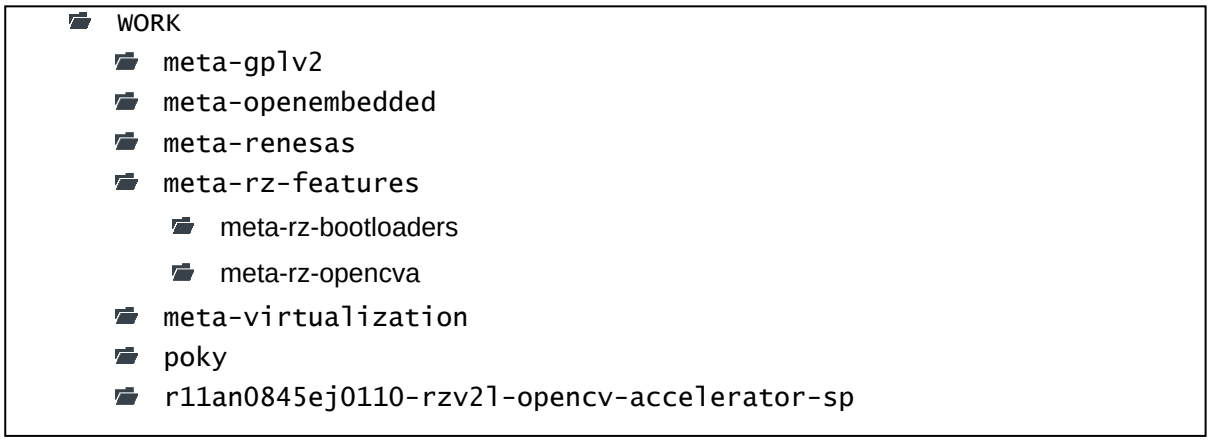
2.3 Unzip the OpenCV Accelerator Support Package Recipe

Place the r11an0845ej0110-rzv2l-opencv-accelerator-sp.zip to the working directory and run the following command.

```
$ cd $WORK
$ unzip ./r11an0845ej0110-rzv2l-opencv-accelerator-sp.zip
$ tar -zxvf ./r11an0845ej0110-rzv2l-opencv-accelerator-sp/\
meta-rz-features.tar.gz
```

After executed the command, ‘meta-rz-opencva’ directory is created under ‘meta-rz-features’ directly.

This figure shows an example of the folder directory structure after executed this command.



2.4 Add Patch file

Copy the patch file and run the patch.

```
$ cd $WORK
$ cp r11an0845ej0110-rzv2l-opencv-accelerator-sp/\
rzv2l-opencva-vlp3.0.5-v1.10.patch ./meta-rz-features/\
meta-rz-opencva/recipes-support/opencv/opencv
$ patch -p1 < ./meta-rz-features/meta-rz-opencva/\
recipes-support/opencv/opencv/rzv2l-opencva-vlp3.0.5-v1.10.patch
```

2.5 Set the Build Environment Variable

Run the following command to set the environment variable for the build.

Note: The environmental variable will be reset if the terminal is closed. Please run the command for each time you open the terminal.

```
$ cd $WORK
$ TEMPLATECONF=$PWD/meta-renesas/meta-rzv2l/docs/template/conf/ \
source poky/oe-init-build-env build
$ bitbake-layers add-layer ../meta-rz-features/meta-rz-opencva
```

2.6 Build

Run the bitbake command to build the Linux Package.

```
$ cd $WORK/build
$ MACHINE=smarc-rzv2l bitbake core-image-weston
```

After the Build, following files will be generated under `$WORK/build/tmp/deploy/images/smarc-rzv2l`.

Table 2-1 Generated Files after Build

Filename	Name
Image-smrac-rzv2l.bin	Linux Kernel Image
Image-r9a07g054l2-smarc.dtb	Linux Device Tree File
core-image-weston-smarc-rzv2l.tar.bz2	A set of root filesystem

3. Network Booting

This chapter will explain the procedure for the Network Booting.

Network Booting is a booting method that mount the server on Ubuntu PC to access the files which are extracted to memory on the RZ/V2L Evaluation Board Kit.

3.1 Hardware Configuration

Figure 3-1 shows the hardware configuration for the Network Booting.

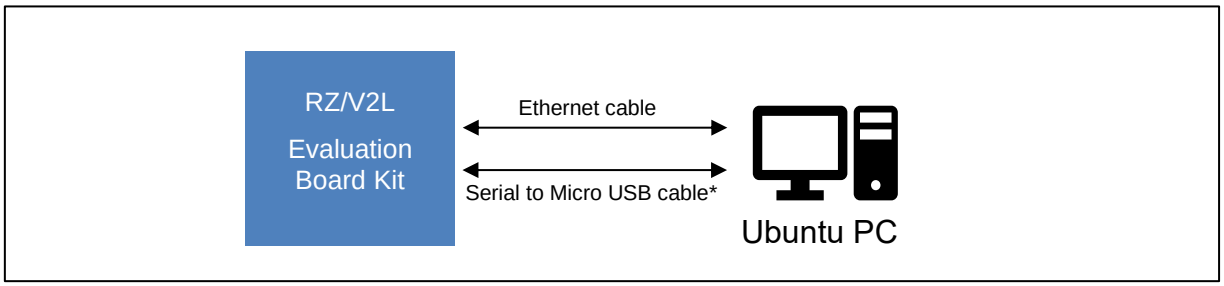


Figure 3-1 Hardware Configuration

*Serial to Micro USB cable can also be connected to Windows PC. (See Chapter 4.2.1 for details)

3.2 Preparation

3.2.1 Equipment

Necessary equipment for Network Booting is as follows.

Table 3-1 Necessary Equipment for Network Booting

Equipment	Details
RZ/V2L Evaluation Board Kit	Evaluation board kit for RZ/V2L. For board setup and other information, see RZ/V Verified Linux Package Start-Up Guide for RZ/V2L (R01US0617).
Linux PC	Used as build/debug environment for RZ/V2L Linux software. 100GB of free space on HDD is necessary.
- OS	Ubuntu 20.04 LTS. Use a 64bit OS.
- TFTP server	Used for downloading the Linux kernel to board.
- NFS server	Used for mounting rootfs via NFS.
Serial to Micro USB Cable	Used for serial communication between PC and board.
Ethernet cable	Used for ethernet communication between Linux PC and board.

3.2.2 Files for Booting

Table 3-2 shows the necessary files for booting and their mounted server.

Table 3-2 Necessary Files for Network Booting

Filename	Description	Mounted Server
Image-smrac-rzv2l.bin	Linux Kernel Image (The boot program)	TFTP server on Ubuntu PC
Image-r9a07g054l2-smarc.dtb	Linux Device Tree File (The configuration file for booting)	TFTP server on Ubuntu PC
OpenCV_Bin_v1.10.bin	Circuit data for OpenCV	TFTP server on Ubuntu PC
core-image-weston-smarc-rzv2l.tar.bz2	A set of root filesystem	NFS server on Ubuntu PC

Note1: Image-smrac-rzv2l.bin, Image-r9a07g054l2-smarc.dtb, and core-image-weston-smarc-rzv2l.tar.bz2 are created in the “2. Build”.

Note2: ”OpenCV_Bin_v1.10.bin” is contained in “r11an0845ej0110-rzv2l-opencv-accelerator-sp.zip”. When setting the U-boot environment variable, delete “_v1.10” of “OpenCV_Bin_v1.10.bin” to “OpenCV_Bin.bin”.

Necessary files listed above will be mounted to RZ/V2L Evaluation Board Kit as described below.

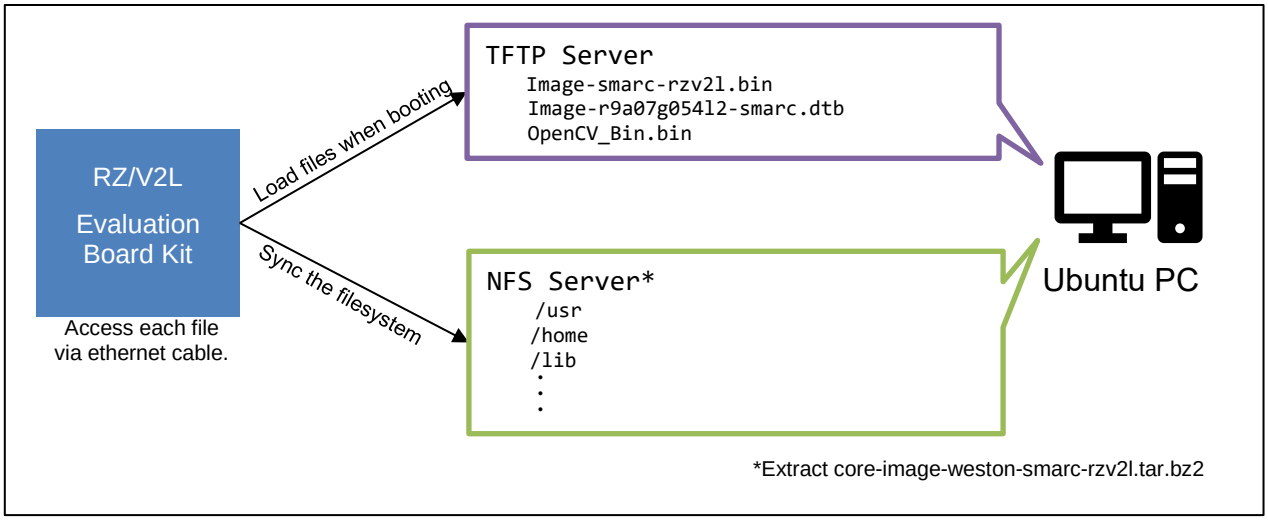


Figure 3-2 Network Booting Overview

3.2.3 Software Package

Refer to the "RZ/V2L DRP-AI Support Package Release Note", and follow the steps described in the "4.2.3 Software Package".

3.3 Setup

Refer to the "RZ/V2L DRP-AI Support Package Release Note", and follow the steps described in the "4.3 Setup".

When copying Image-smrac-rzv2l.bin and Image-r9a07g054l2-smarc.dtb, copy OpenCV_Bin.bin at the same time.

```
$ sudo cp <PATH_to_FILE>/Image-smrac-rzv2l.bin /tftpboot
$ sudo cp <PATH_to_FILE>/Image-r9a07g054l2-smarc.dtb /tftpboot
$ sudo cp $WORK/r11an0845ej0110-rzv2l-opencv-accelerator-sp/OpenCV_Bin.bin \
 /tftpboot
```

3.4 Boot

Refer to the "RZ/V2L DRP-AI Support Package Release Note", and follow the steps described in the "4.4 Boot".

When using OpenCV Accelerator for the first time with RZ/V2L Evaluation Board Kit, change the U-boot environment variable as below.

Please execute the "setenv boot_tftp" command in one line without line break.

[Use OpenCV Accelerator]

```
=> env default -a
=> setenv ipaddr 192.168.1.11
=> setenv serverip 192.168.1.10
=> setenv netmask 255.255.255.0
=> setenv ethaddr 02:11:22:33:44:55
=> setenv boot_tftp 'tftpboot 0x48080000 Image-smarc-rzv2l.bin; tftpboot
0x48000000 Image-r9a07g054l2-smarc.dtb; tftpboot 0xb7000000 OpenCV_Bin.bin;
booti 0x48080000 - 0x48000000'
=> setenv bootargs root=/dev/nfs rw nfsroot=${serverip}:/nfs/rzv2l,nfsvers=3
ip=${ipaddr}:${serverip}::${netmask}:rzv2l:eth0
=> setenv bootcmd run boot_tftp
=> saveenv
=> boot
```

Details of above setting are as follow.

ipaddr : IP address of RZ/V2L Evaluation Board Kit

serverip : IP address of Ubuntu PC (IP address defined in 4.3.5 Setup the Static IP Address)

bootcmd : boot command

4. SD Card Booting

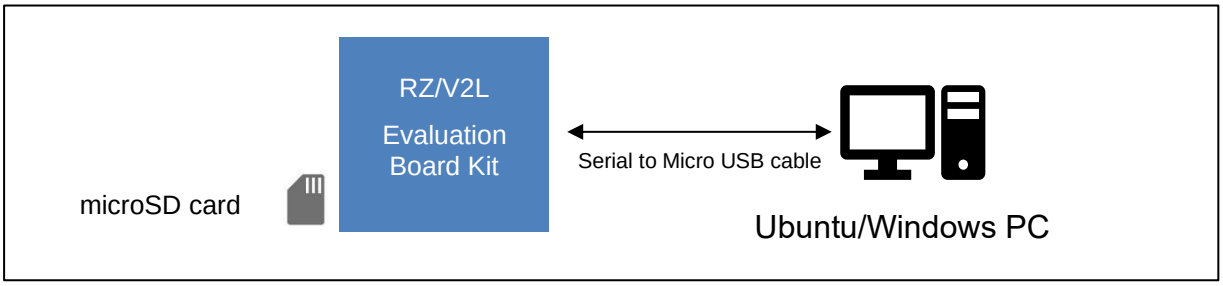
This chapter will explain about the SD Card Booting.

SD Card Booting is a booting method that mount the microSD card to access the files which are extracted to memory on the RZ/V2L Evaluation Board Kit.

4.1 Hardware Configuration

Figure 4-1 shows the hardware configuration for SD Card Booting.

Figure 4-1 Hardware Configuration



4.2 Preparation

4.2.1 Equipment

Necessary equipment for SD Card Booting is as follows.

Table 4-1 Necessary Equipment for SD Card Booting

Equipment	Details
RZ/V2L Evaluation Board Kit	Evaluation board kit for RZ/V2L. For board setup and other information, see RZ/V Verified Linux Package Start-Up Guide for RZ/V2L (R01US0617).
Linux PC	Used for creating microSD card. 100GB of free space on HDD is necessary.
- OS	Ubuntu 20.04 LTS. Use a 64bit OS.
- SD card reader	Used for creating microSD card.
Windows PC	Used for Serial communication display.
- OS	Windows 10
- Terminal software	Used for controlling serial console of the target board. Operation Environment: Tera Term
- Serial port driver	Virtual COM Port driver which enables to communicate Windows PC and the target board via USB which is virtually used as serial port.
Serial to Micro USB Cable	Used for serial communication between PC and board.
microSD card	Used for SD Card Booting. For microSD card formatting and other information, see "RZ/V Verified Linux Package Startup Guide for RZ/V2L" (R01US0617). Only SDHC is supported. Operation Environment: Transcend USH-I microSD 300S 16GB

4.2.2 Files for Booting

Table 4-2 shows the necessary files for SD Card Booting and their mounted partition on microSD card.

Table 4-2 Necessary Files for SD Card Booting

Filename	Description	Mounted Server
Image-smrac-rzv2l.bin	Linux Kernel Image (The boot program)	Partition 1
Image-r9a07g054l2-smarc.dtb	Linux Device Tree File (The configuration file for booting)	Partition 1
OpenCV_Bin_v1.10.bin	Circuit data for OpenCV	Partition 1
core-image-weston-smarc-rzv2l.tar.bz2	A set of root filesystem	Partition 2

Note1: Image-smrac-rzv2l.bin, Image-r9a07g054l2-smarc.dtb, and core-image-weston-smarc-rzv2l.tar.bz2 are created in the “2. Build”.

Note2: “OpenCV_Bin_v1.10.bin” is contained in “r11an0845ej0110-rzv2l-opencv-accelerator-sp.zip”. When writing to microSD card, delete “_v1.10” of “OpenCV_Bin_v1.10.bin” to “OpenCV_Bin.bin”.

4.2.3 Software Package

Refer to the "RZ/V2L DRP-AI Support Package Release Note", and follow the steps described in the "5.2.3 Software Package”.

4.3 Setup

Refer to the "RZ/V2L DRP-AI Support Package Release Note", and follow the steps described in the "5.3 Setup".

When copying Image-smarc-rzv2l.bin and Image-r9a07g054l2-smarc.dtb, copy OpenCV_Bin.bin at the same time.

```
$ sudo mkdir -p /mnt/sd
$ sudo mount /dev/sdb1 /mnt/sd
$ sudo cp <PATH_to_FILE>/Image-smarc-rzv2l.bin /mnt/sd
$ sudo cp <PATH_to_FILE>/Image-r9a07g054l2-smarc.dtb /mnt/sd
$ sudo cp $WORK/r11an0845ej0110-rzv2l-opencv-accelerator-sp/OpenCV_Bin.bin \
 /mnt/sd
$ sync
$ sudo umount /dev/sdb1
```

The message above shows the card associated with the `/dev/sdb1`. Be careful that the device name may be different from sdb1.

4.4 Boot

Refer to the "RZ/V2L DRP-AI Support Package Release Note", and follow the steps described in the "5.4 Boot".

When using OpenCV Accelerator for the first time with RZ/V2L Evaluation Board Kit, change the U-boot environment variable as below.

Please execute the "setenv bootcmd" command in one line without line break.

[Use OpenCV Accelerator]

```
=> env default -a
=> 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 Image-r9a07g054l2-smarc.dtb; fatload
mmc 1:1 0xb7000000 OpenCV_Bin.bin; booti 0x48080000 - 0x48000000'
=> saveenv
=> boot
```

Details of above setting are as follow.

bootcmd: boot command

5. SDK

Refer to the "RZ/V2L DRP-AI Support Package Release Note", and follow the steps described in the "6. SDK".

Version History

Ver.	Date	Description	
		Page	Summary
1.00	18 Jan. 2024	-	First Edition issued.
1.10	5 Feb. 2024	3,5,8,10,12,13	Changed the version of each file name.
		10,13	Changed the address setting of “OpenCV_Bin.bin” from 0xb4000000 to 0xb7000000
		13	Added “fatload” to boot commands.

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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.

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