USB Power Delivery Controller

VIDWriter 1.2.1.0 Instruction Manual

Introduction

VIDWriter 1.2.1.0 is an instructional tool that generates flash memory image data for Renesas USB Power Delivery turnkey solutions: RTK-G015-EPRSinkCharger.

Target Device

140W USB Type-C® Charger or MAX 140W Power Bank: RTK-G015-EPRSinkCharger-140W

48V USB-C Port Controller (SPR/EPR TCPC): RAA489400

USB-C Port Manager (TCPM): R9A02G0151

On-Board Charger: RAA489118

Target VIDWriter

VIDWriter 1.2.1.0 version: 1.2.1.0

Related Document

Use this document in combination with the following documents.

The related documents mentioned in this publication may include preliminary versions. However, preliminary versions are not marked as such.

- RAA489400 Data Sheet: R16DS0292EU
- R9A02G0151 Data Sheet: R19DS0101EJ
- E1 Emulator E20 Emulator User's Manual: R20UT0398EJ
- E2 Emulator Lite User's Manual: R20UT3240EJ
- E1/E20 Emulator, E2 Emulator Lite Additional Document for User's Manual (Notes on Connection of RL78): R20UT1994EJ
- Renesas Flash Programmer V3.13 Flash memory programming software User's Manual: R20UT5312EJ

- R9A02G015 RTK-G015-EPRSinkCharger Instruction Manual: R19AN0293EJ

- RAA489118 Short-Form Data Sheet: R16DO0024EU

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FIGURES

TABLES

1. Overview

1.1 Functions

- Change VID and PID parameters in FW if need.
- Generate Flash memory image data.
- Indicates the HW configuration required after feature selection.

1.2 Operating Environment

1.2.1 Host PC

- Processor: 1 GHz or faster
- Main memory: At least 1 Gbyte
- Display: Resolution of 1024 x 768 or higher and 65,536 or more colors

1.2.2 Supported OS

- Windows 10 (32-bit or 64-bit)
- Windows 11 (32-bit or 64-bit)

Remark:
Microsoft.NET Framework 4.6.1 or later has to be installed.

2. Operation Method

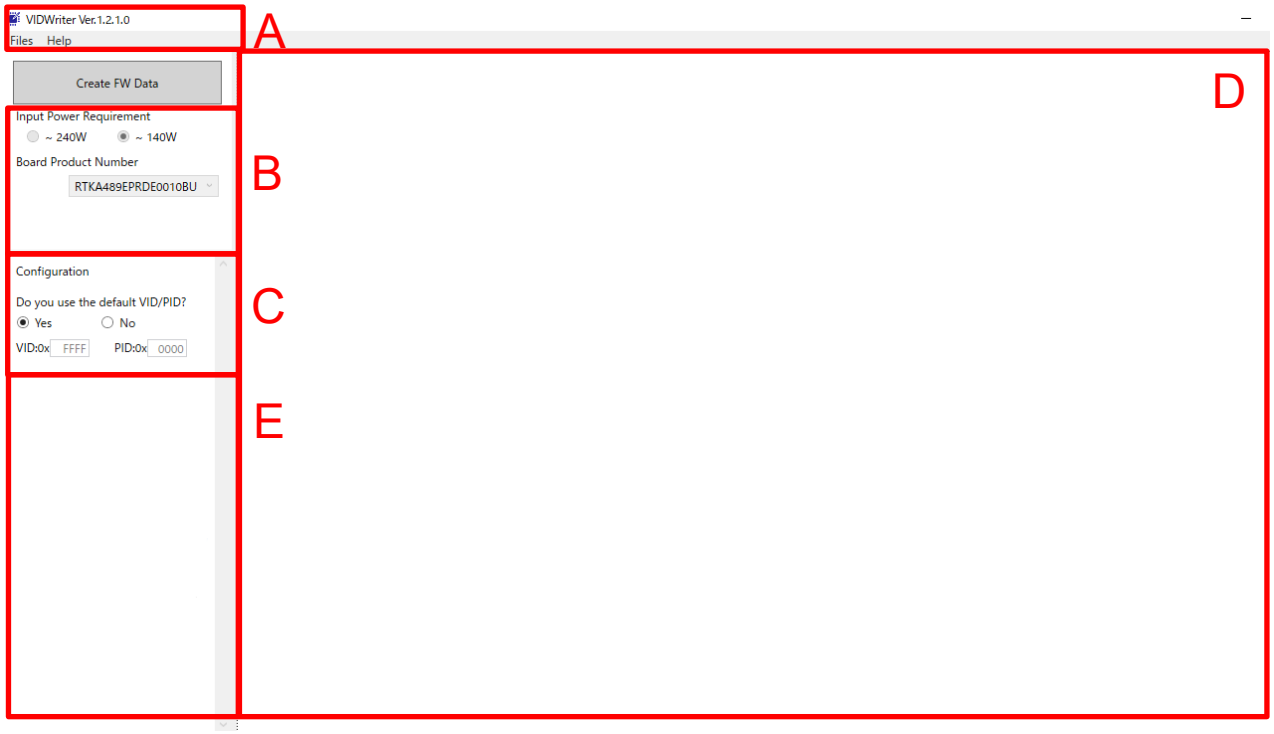
2.1 Setup the VIDWriter

1) Install Microsoft .NET Framework 4.6.1 or later.
2) Uses exe file including in this unzip directory.
   This tool can work without installation. DO NOT change directory structure in the unzipped data.

2.2 View Description

When you run VIDWriter 1.2.1.0, the window as shown Figure 2-1 will display.

Figure 2-1 Main window for VIDWriter 1.2.1.0

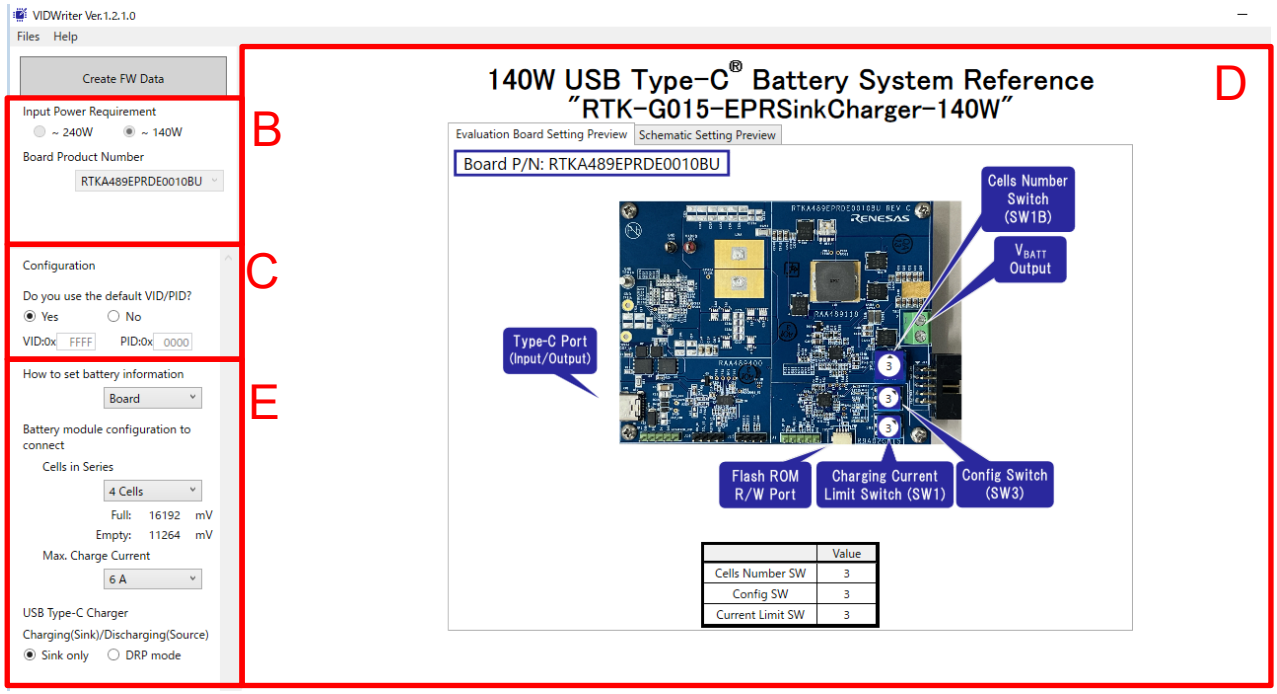


1) Menu Bar
   You can check Tool version and FW package version in “Help” -> “About”.
2) Field B to select the required feature
   Choose the features that match your required function in this field. Once selected, the recommended turnkey solution will be displayed in Field D and the possible configurations will be shown in Field E.
3) Field C to set VID/PID number.
   If you want to use your own hexadecimal VID and PID numbers instead of the default VID/PID(0xFFFF/0x0000) numbers set in this field, overwrite your own numbers to this field. Otherwise, leave VID: FFFF and PID: 0000.
4) Window for the Renesas recommended turnkey solution
   The appropriate RTK-G015-EPRSinkCharger will be displayed as Renesas recommended turnkey solution in Field D.

Table 2-1 Evaluation boards for each project

	Maximum power		
	~100 W	~ 140 W	~ 240 W
w/ Battery	RTK-251-SinkCharger-RAA489118 is supported by VIDWriter 1.1.x.x. RTK-251-SinkCharger-ISL9238C is supported by VIDWriter 1.0.x.x.	RTK-G015-EPRSinkCharger is supported by VIDWriter 1.2.1.0.	Under development
w/o Battery	JP214 / RTK-251-SinkAdapter is supported by VIDWriter 1.0.x.x	-	-

Figure 2-2 Main window for VIDWriter 1.2.1.0 after Product Configuration

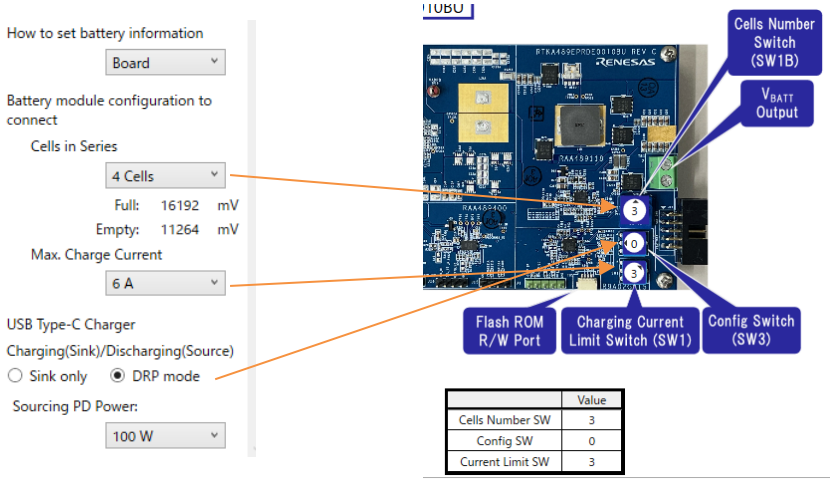


5) Field E configures the turnkey solution recommended by Renesas.
Field E is used to set the Full, Empty, Max Charging Current, and Max sourcing PDP (DRP mode). There are three operating modes: "Board", "BMS", and "Manual". The default firmware uses “Board” and “BMS” mode, in which the switches on the board configure the EVB parameters. "BMS" sets EVB parameters by battery status information from BMS. "Manual" can set EVB parameters directly using the VIDwriter. After setting in Field E, Field D indicates the appropriate physical settings on the EVB. Next, set the switches on the board according to this picture.

Note: In order to use “Board” DRP, or “BMS” DRP, “Manual” modes, FW on the board must be rewritten by this VIDWriter 1.2.1.0-generated FW. If operating mode is changed to “Board” from “BMS” or “Manual”, FW on the board also must be rewritten by this VIDWriter 1.2.1.0-generated FW.

Note: The RTK-G015-EPRSinkCharger does not have a battery protection circuit on the board, so, Renesas strongly recommends using a battery module with Renesas’ Battery Management System to avoid over-discharging under the power bank mode. RTK-G015-EPRSinkCharger can support power bank mode as long as the battery module uses protection circuit to avoid over-discharge, over-temperature, etc. However, this should be done at user’s own risk.

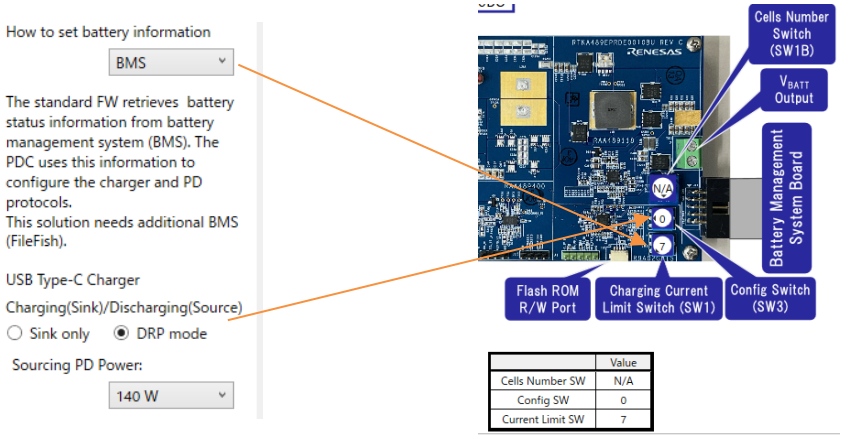
Figure 2-3 The Field E and the EVB setting vs "Board" configuration



"Full" indicates the maximum battery charging voltage. "Empty" indicates the voltage at which the charger will trickle charge the battery at a low current level if VBAT is below that value.

If the user wants to achieve power bank function with RTK-G015-EPRSinkCharger, please select DRP mode. Otherwise, select Sink only. In the sourcing mode of Power Bank operating, the user selects the sourcing PD Power from the drop-down list. Because default FW on board supports the maximum sourcing PD Power that board can support with current configuration, if the user wants to support other sourcing PD Power, the user should rewrite the FW on the board with this VIDWriter 1.2.1.0-generated FW. See Section 2.3 about how to set maximum sourcing PDP.

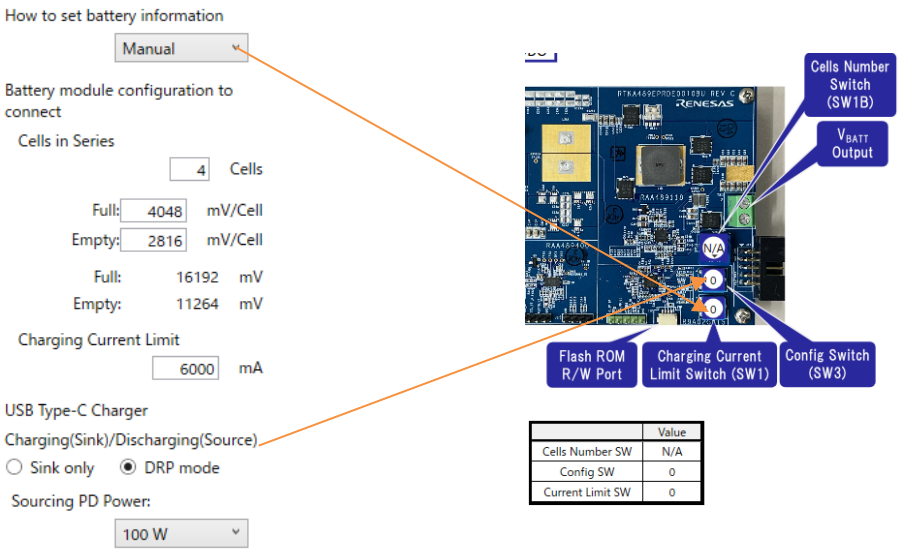
Figure 2-4 The Field E and the EVB setting vs "BMS" configuration



In "BMS" setting, this EVB frequently retrieves battery related information from RAJ240100 Filefish EVM. In this operating mode, this EVB uses the information obtained from RAJ240100 Filefish EVM instead of SW1B value to configure the On-Board Charger.

If the user wants to achieve power bank function with RTK-G015-EPRSinkCharger, please select DRP mode. Otherwise, select Sink only. In this operating mode, the FW cannot recognize the MaxSysVol, MinSysVol, and Charging Current Limits until R9A02G0151 retrieves the battery information from BMS. So, VIDWriter 1.2.1.0 cannot define the true max sourcing PD Power under sourcing mode. Therefore, the user should set the appropriate Max sourcing PD Power that battery module can support. See Section 2.3 about how to set maximum sourcing PDP.

Figure 2-5 The Field E and the EVB setting vs “Manual” configuration

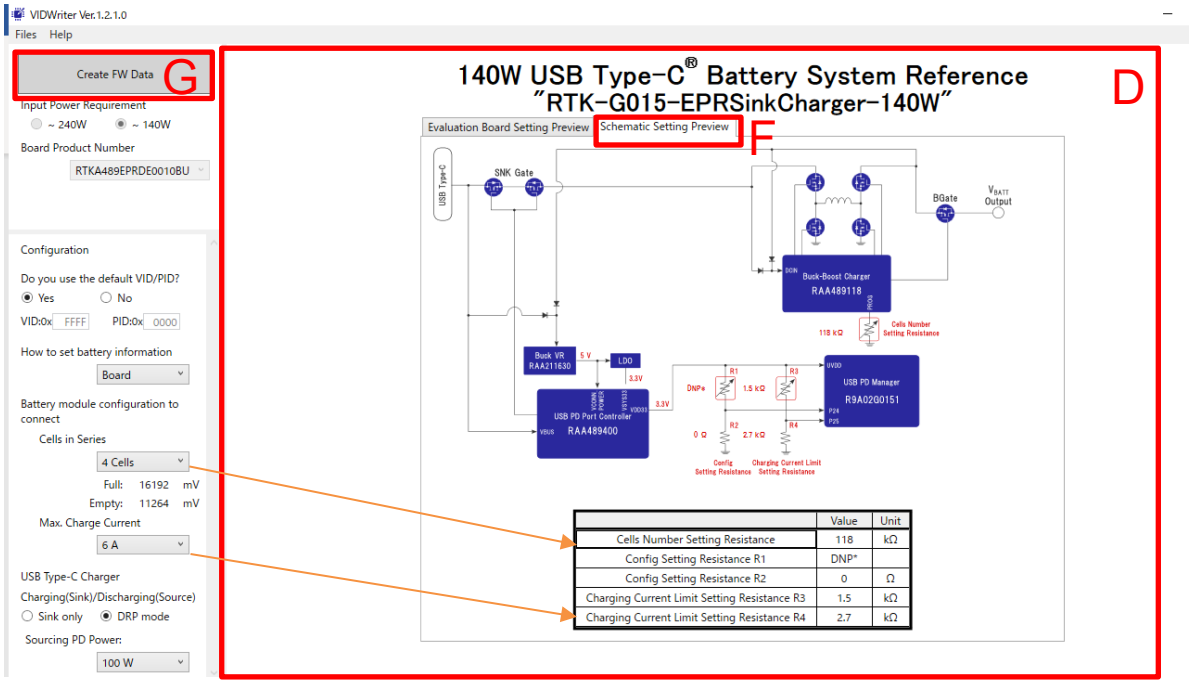


If there is no suitable charging current value on SW1 and/or user does not want to set “Full” and “Empty” as standard values, the user needs to set SW1 to SW position 0 and set the expected charging current value, “Full” and “Empty”. “Full” indicates the maximum battery charging voltage. “Empty” indicates the voltage at which the charger will trickle charge the battery at a low current level if VBAT is below.

If the user wants to achieve power bank function with RTK-G015-EPRSinkCharger, please select DRP mode. Otherwise, select Sink only. In the sourcing mode of Power Bank operating, the user selects the sourcing PD Power from the drop-down list. See Section 2.3 about the maximum sourcing PDP.

6) Press the "Schematic Setting Preview" F tab in field D and you will see the recommended turnkey schematics with appropriated parameters, such as Figure 2-6.

Figure 2-6 Main window for VIDWriter when press Schematic Setting



7) Finally, when you press the "Create FW Data" button, a file save dialog will be displayed. The default storage location is the "My Documents" folder. You can change the save location and file name of the ROM image as you like. If you rewrite this ROM image to R9A02G0151 on the evaluation board, please use Renesas Flash Programmer V3 as programming software. Refer to the following documents.

- Renesas Flash Programmer V3.13 Flash memory programming software User's Manual (R20UT5312EJ)
- List of MCUs supported by Renesas Flash Programmer V3 (R20UT3599EJ)
- On the development of flash memory programmer by user, refer to **RL78 microcontrollers (RL78 Protocol A) Programmer Edition Application Note (R01AN0815EJ).**

2.3 Sourcing mode

Note: The RTK-G015-EPRSinkCharger does not have a battery protection circuit on the board, so, Renesas strongly recommends using a battery module with Renesas' Battery Management System to avoid over-discharging under the power bank mode. RTK-G015-EPRSinkCharger can support power bank mode as long as the battery module uses protection circuit to avoid over-discharge, over-temperature, etc. However, this should be done at user's own risk.

Under sourcing mode for Power Bank operating, RTK-G015-EPRSinkCharger supports standard max sourcing PD Power as shown in Table 2-2 based on following formula.

Available sourcing power = MinSysVol X Charging Current Limit X 2

The standard PD Power in FW for RTK-G015-EPRSinkCharger
= Max supply current (3 or 5A) X Standard supply voltage (SPR: 5, 9, 15, or 20V, EPR: 28V)
= 15, 27, 45, or 60W(SPR and 3A cable), or 100W (SPR and 5A cable), or 140W (EPR)

The Max sourcing PD Power in FW ≤ Available sourcing power

The max sourcing PDP is calculated by the MinSysVol value and Charging Current Limit value. For example, if the MinSysVol is 11.2V and the charging current limit is 2A, the available sourcing power is 44.8W. As a result, the maximum sourcing PDP of the FW is 27W. When the MinSysVol is 19.6V and the charging current limit is 4A, the available sourcing power is 156.8W. Therefore, the user can choose either 15, 27, 45, 60, 100, or 140W as the Max sourcing PDP. The Max sourcing PDP is calculated by the above formula even though MaxSysVol, MinSysVol, and Charging Current Limits are set manually.

When the operating mode is "BMS", the FW cannot recognize the MaxSysVol, MinSysVol, and Charging Current Limits until R9A02G0151 retrieves the battery information from BMS. Therefore, the user should set the appropriate Max sourcing PD Power that battery module can support.

The USB-PD PDO list, which is used on PD negotiation, will be generated by this Max sourcing PDP.

Table 2-2 The supported maximum Type-C sourcing PD Power for Sourcing mode

	2A	4A	6A	8A	10A	12A
2 Cells in series	15W	45W	60W	60W	100W[2]	100W[2]
3 Cells in series	27W	60W	100W[2]	100W[2]	140W[1]	140W[1]
4 Cells in series	45W	60W	100W[2]	140W[1]	140W[1]	140W[1]
5 Cells in series	45W	100W[2]	140W[1]	140W[1]	140W[1]	140W[1]
6 Cells in series	60W	100W[2]	140W[1]	140W[1]	140W[1]	140W[1]
7 Cells in series	60W	140W[1]	140W[1]	140W[1]	140W[1]	140W[1]

[1] EPR cable is mandatory to realize this max PDP.
[2] EPR cable or 5A cable is mandatory to realize this max PDP.

Table 2-3 PDO list

	SPR PDO1	SPR PDO2	SPR PDO3	SPR PDO4	EPR PDO1	EPR PDO2
PDP 15W	5V/3A	-	-	-	-	-
PDP 27W	5V/3A	9V/3A	-	-	-	-
PDP 45W	5V/3A	9V/3A	15V/3A	20V/2.25A	-	-
PDP 60W	5V/3A	9V/3A	15V/3A	20V/3A	-	-
PDP 100W	5V/3A	9V/3A	15V/3A	20V/5A[1]	-	-
PDP 140W	5V/3A	9V/3A	15V/3A	20V/5A[1]	28V/5A[2]	28V AVS[2]

[1] When the connected cable does not have 5A capability, RTK-G015-EPRSinkCharger shall advertise 20V/3A PDO instead of 20V/5A PDO.
[2] When the connected cable does not have EPR capability, RTK-G015-EPRSinkCharger shall not advertise EPR PDO. So, MAX PDO will be 20V/5A PDO when the connected cable has 5A capability.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jun.11, 2024	-	Initial release
1.01	Sep.04, 2024	2	Changed document number of RAA489118 Short Form DS

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.

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