

# QE for Display[RX,RA] V3.6.0, QE for Camera[RA] V1.1.0

# **Release Note**

Thank you very much for your interest in QE for Display[RX,RA] V3.6.0, QE for Camera[RA] V1.1.0.

This document describes this product installation, restrictions and so on. Please read this document before using the product.

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# 1. About QE for Display[RX,RA] V3.6.0, QE for Camera[RA] V1.1.0

## 1.1 Summary

QE for Display[RX,RA] V3.6.0 and QE for Camera[RA] V1.1.0 are one of several Solution Toolkit which operate under the e2 studio integrated development environment.

In the following embedded system development, this product allows for easy initial adjustment of display connection (display timing adjustment and image quality adjustment) and create GUI. It also allows for easy initial adjustment of camera image capture (the size and starting position of the image capture) and display it on LCD. This shortens the development period.

- Display GUI on LCD using Graphic LCD Controller (a display controller mounted on the RX family and RA family<sup>\*</sup> of MCUs) image display function, emWin GUI software package and Aeropoint GUI for RX. (\* The standalone version does not support RA family of MCUs.)
- Display GUI on a serial-connected LCD using serial communication in the RX family and the emWin GUI software package.
- Capture external images using Capture Engine Unit (a capture module mounted on the RA family) and display them on LCD or save them in memory.

QE for Display[RX,RA] V3.6.0 and QE for Camera[RA] V1.1.0 are the same plug-in. Therefore, you can install both items by installing either one of the two. The software would be installed in e2 studio as " Renesas QE for Display[RX,RA]/QE for Camera[RA]".



# 1.2 New Functions / Changes

## 1.2.1 Support Graphics LCD Controller (GLCDC) for RA8E2 and RA8P1 MCU

This product supports the adjustment of Graphics LCD Controller (GLCDC) for RA8E2 and RA8P1 MCU. You can use the emWin GUI tool to create an image to display on the LCD, and adjust the GLCDC settings in real time to adjust the image display effect.



Figure 1-1 RA8E2 Graphics LCD Controller (GLCDC) Setting



Figure 1-2 RA8P1 Graphics LCD Controller (GLCDC) Setting



## 1.2.2 Support Capture Engine Unit (CEU) for RA8P1 MCU

This product supports the adjustment of Capture Engine Unit (CEU) for RA8P1 MCU. You can use the camera to capture external image data through the CEU module within the RA8P1 MCU and store the image data into memory. The size and starting position of the captured image can be adjusted dynamically.

	ient (Camera)	
ming Adjustment(CEU)		
Signal Type : Type 1 (DE+	DE) ~	
VCS [line] 0 + VCW [line] 640 +	HCS HCW	ýcs vcw
ł	HCS [pixel] 0 📮 HCW [pixel] 480	•
Input Setting		
Input Setting Data Bus Size	8bit	~
	8bit High	~
Data Bus Size		<b>~</b>
Data Bus Size HSYNC Polarity	High	_
Data Bus Size HSYNC Polarity VSYNC Polarity	High	~
Data Bus Size HSYNC Polarity VSYNC Polarity Data Sample Point	High High Rising edge of the camera clock	~
Data Bus Size HSYNC Polarity VSYNC Polarity Data Sample Point H-Sync Sample Point	High High Rising edge of the camera clock Rising edge of the camera clock	~ ~
Data Bus Size HSYNC Polarity VSYNC Polarity Data Sample Point H-Sync Sample Point V-Sync Sample Point	High High Rising edge of the camera clock Rising edge of the camera clock Rising edge of the camera clock	~ ~
Data Bus Size HSYNC Polarity VSYNC Polarity Data Sample Point H-Sync Sample Point V-Sync Sample Point Capture Mode	High High Rising edge of the camera clock Rising edge of the camera clock Rising edge of the camera clock Data Synchronous Fetch Mode	~ ~
Data Bus Size HSYNC Polarity VSYNC Polarity Data Sample Point H-Sync Sample Point V-Sync Sample Point Capture Mode Output Setting	High High Rising edge of the camera clock Rising edge of the camera clock Rising edge of the camera clock Data Synchronous Fetch Mode	> > > >

Figure 1-3 RA8P1 Capture Engine Unit (CEU) Setting



#### 1.2.3 Improvement on using emWin GUI

- 1. When using EK-RA6M3G board, it is no longer necessary to make the following two configurations.
  - Set LCD backlight P603 as "Output mode (Initial High)" mode in the Pins page of FSP Configuration.
  - Change the "Section Name of Frame Buffer" value of Graphic Layer n<sup>\*</sup> as ".bss" in the display adjustment view. (\* n = 1, 2)
- When using RA devices, you can directly add the "SEGGER emWin" component to the "Display User Interface Application" component. An additional "SEGGER emWin" component is no longer necessary to add.

			Generate Project Conter
HAL/Common Stacks		🗐 New Stad	ck > 🚔 Extend Stack > 📓 Remove
<pre>   g_ioport I/O Port     (r_ioport)     (</pre>	Display User Interface A	pplication	
	Add a GLCDC Driver	Image: SEGGER emWin         Image: SEGGER emWin RA Port         Image: SEGER emWin RA Port	<pre>(rm_emwin_port)  # D/AVE 2D Port Interface (r_drw)  # D/AVE 2D (r_drw) </pre>
			<b>()</b>

Figure 1-4 Add "SEGGER emWin" component



**1.2.4** Fixed the issue that DE signal TCON GUI setting is disabled when using custom LCD This product fixes the issue that the DE signal TCON GUI setting is disabled when using a custom LCD of type "Display Type 3".

Edit Custom Disp	olay Data			×
Maker/Type :	Custom_Maker			~
Model Name/Size :	Custom_Model1			
O Display Type 1 Display Type 2 Display Type 3	CLK IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	[		ert the existing data
Parameter		Min.	Тур.	Max.
Panel Clock Freque	ency (PCF) [MHz]	5.0	9.0	12.0
Panel Clock Period	(PCP) [ns]	83.33333333	111.1111111	200.0
Horizontal Frequer	ncy (HF) [KHz]	15.38461538	16.66666666	18.18181818
Horizontal Period (	(HP) [us]	55.0	60.0	65.0
Horizontal Total Pe	eriod (HTP) [Clock]	520	525	800
Horizontal Pulse W	/idth (HPW) [Clock]	1	1	-
Horizontal Display	Period (HDP) [Clock]	480	480	480
Horizontal Front Po	orch (HFP) [Clock]	4	5	65
Horizontal Back Po	orch (HBP) [Clock]	35	39	254
Vertical Frequency	(VF) [Hz]	-	-	1000.0
Vertical Period (VP	) [ms]	1.0	-	-
Vertical Total Perio	d (VTP) [Line]	277	288	400
Vertical Pulse Widt	h (VPW) [Line]	1	1	-
Vertical Display Pe	riod (VDP) [Line]	272	272	272
Vertical Front Porc	h (VFP) [Line]	2	8	97
Vertical Back Porch	h (VBP) [Line]	2	7	30
URL :				
		ОК	Cancel	Help

Figure 1-5 Custom LCD with "Display Type 3"

MCU/MPU Package Devel	loper Assist Browser	*Display/Cam	nera Tuning RX,RA (	QE) ×	🐼 et 🖪 🗞	(≈ □  8	- 0
Start Adjustment	Ð						^
LCD Maker/Type : Custom_Mak	ker (Custom)	~	Model Name/Size	Custom_Model1	l		~
Block Image TCON/LCD Setting	Timing Adjustment (LC	D) Graphic Lay	ver Setting Image Q	uality Adjustment			
Panel Driver Signal (TCON) Out	tput Selection						
Vsync:	TCON0 ~ High	h Active 🗸 🗸					
Hsync:	TCON1 ~ High	h Active $\ \ \lor$					
DE:	TCON2 V High	h Active 🗸					
LCD Setting							
LCD Output Format:	24bit (GLCDC_OUT_FC	ORMAT_24BITS	_RGB888) ~				
Timing of Output Data:	Falling (GLCDC_SIGNA	AL_SYNC_EDGE	FALLING) ~				
Background Color:	0x00 000000						
Bit-endian of Output Data:	Little Endian (GLCDC	ENDIAN_LITTLE	E) ~				
Pixel Order of Output Data:	BGR (GLCDC_COLOR	CORDER_BGR)	$\sim$				
LCD Backlight Control							
Enable Control							
Port Number: PORT0 v Bit F	Position: BIT0 $ \lor $ Low	Active ~					
LCD Reset Control							
Enable Control							
Port Number: PORT0 V Bit F	Position: BIT0 V Low	Active 🗸					

Figure 1-6 DE signal TCON GUI setting



## **1.3 Supported Environment**

- Windows 10, Windows 11
- Renesas e<sup>2</sup> studio 2025-04 (or later)
- CS+ for CC V8.12.00 (or later)
- > IAR EW for Renesas RX V5.10.1 (or later)
- RX Smart Configurator V2.22.0 (or later)

## **1.4 Supported Microcontroller**

The following table describes the supported microcontrollers and their functions.

Function	RX Family	RA Family
GLCDC	RX600 Series	RA6 Series
	RX65N groups*, RX651 groups*, RX66N groups	RA6M3 groups
	(* ROM capacity: 1.5 MB to 2 MB only)	RA8 Series RA8D1 groups, RA8E2 groups, RA8P1
	RX700 Series	groups
	RX72M groups*, RX72N groups	
	(* 100-pin is not supported)	
MIPI-PHY	-	RA8 Series
		RA8D1 groups
MIPI-DSI	-	RA8 Series
		RA8D1 groups
CEU	-	RA8 Series
		RA8D1 groups, RA8P1 groups
Serial	All RX family*	-
Connection	(*Only microcontrollers supported by Smart	
	Configurator)	

#### Table 1-1 Supported Microcontrollers and Functions

## **1.5 Supported Software**

- RX Firmware Integration Technology (FIT)
  - Graphic LCD Controller Module: r\_glcdc\_rx V1.60 (or later)
  - QE for Display Middleware Module: r\_qe\_display\_rx V1.10 (or later)
  - emWin v6.34 Module: r\_emwin\_rx V1.20 (V6.34.g.1.20) (or later)
  - Aeropoint Module: r\_aeropoint\_rx V1.00 (or later)
- RA Flexible Software Package (FSP) V6.0.0 (or later)

# 1.6 Supported LCD Controller for Serial Connection

- ➢ ST7715
- ≻ ILI9341



## 1.7 Supported Evaluation Board

- CEU Function
  - Evaluation Kit for RA8D1
  - Evaluation Kit for RA8P1

The following camera module is connected to the evaluation board.

- Evaluation Kit for RA8D1: ArduCam B0156
- > Evaluation Kit for RA8P1: ArduCam CU450\_OV5640
- GLCDC Function
  - Renesas Starter Kit+ for RX65N-2MB
  - Renesas Starter Kit+ for RX72N
  - RX65N Envision Kit
  - RX72N Envision Kit
  - Graphics Evaluation Kit for RA6M3
  - Evaluation Kit for RA8D1
  - Evaluation Kit for RA8E2
  - Evaluation Kit for RA8P1
- MIPI-PHY and MIPI-DSI Function
  - Evaluation Kit for RA8D1
- Serial Connection Function
  - Renesas Starter Kit for RX130-512KB
  - Renesas Starter Kit for RX140
  - Renesas Starter Kit for RX231
  - Renesas Solution Starter Kit for RX23W
  - Renesas Starter Kit+ for RX64M
  - Renesas Starter Kit for RX660
  - Renesas Starter Kit+ for RX671
  - Renesas Starter Kit+ for RX71M
  - Target Board for RX130
  - > Target Board for RX231
  - Target Board for RX23W
  - Target Board for RX23W module
  - Target Board for RX65N
  - Target Board for RX660
  - Target Board for RX671
  - Evaluation Kit for RX261
  - Fast Prototyping Board for RX261



The following LCD is connected to the evaluation board.

- Renesas Starter Kit / Renesas Solution Starter Kit: OKAYA RH128128T-1X44WN-B2 (Included in Starter Kit.)
- Evaluation Kit / Fast Prototyping Board / Target Board: Kuongshun Electronic MSP2807 (OEM products are also available.)



## 2. Installation and Uninstallation

## 2.1 Installing This Product

The following describes the installation methods of the plug-in version and the standalone version respectively.

## 2.1.1 Installing the Plug-in Version

Use either of the following procedures to install the plug-in version.

## 2.1.1.1 Install from the "Renesas Software Installer" menu of e2 studio

- 1. Start e<sup>2</sup> studio.
- 2. Select the [Renesas Views] [Renesas Software Installer] menu of e<sup>2</sup> studio to open the [Renesas Software Installer] dialog box.
- 3. Select the [Renesas QE] and click the [Next>] button
- 4. Select the [QE for Display[RX,RA] (v3.6.0)/QE for Camera[RA] (v1.1.0)] check box, and click the [Finish] button.
- 5. Check that [Renesas QE for Display[RX,RA]/QE for Camera[RA]] is selected in the [Install] dialog box, and click the [Next>] button.
- 6. Check that [Renesas QE for Display[RX,RA]/QE for Camera[RA]] is selected as the target of installation, and click the [Next>] button.
- 7. After confirming the license agreements, if you agree to the license, select the [I accept the terms of the license agreements] radio button, and click the [Finish] button.
- 8. If the dialog of the trust certificate is displayed, check that certificate, and click the [OK] button to continue installation.
- 9. When prompted to restart  $e^2$  studio, restart it.
- 10.Start this product from the [Renesas Views] [Renesas QE] menu of e<sup>2</sup> studio. For details about how to use this product, see the [Help] menu of e<sup>2</sup> studio.

#### 2.1.1.2 Install using QE (zip file) downloaded from the Renesas website

- 1. Start e<sup>2</sup> studio.
- 2. From the [Help] menu, select [Install New Software...] to open the [Install] dialog box.
- 3. Click the [Add...] button to open the [Add Repository] dialog box.
- 4. Click the [Archive] button, select "RenesasQE\_Display\_RXRA\_V360.zip" or
- "RenesasQE\_Camera\_RA\_V110.zip" in the opened dialog box, and click the [Open] button.
- 5. Click the [OK] button in the [Add Repository] dialog box.
- 6. Expand the [Renesas QE] item shown in the [Install] dialog box, select the [Renesas QE for Display[RX,RA] /QE for Camera[RA]] check box, and then click the [Next>] button.
  \* If you check off the [Contact all update sites during install to find required software] checkbox, you can shorten the installation time.
- 7. Check that [Renesas QE for Display[RX,RA]/QE for Camera[RA]] is selected as the target of installation, and click the [Next>] button.
- 8. After confirming the license agreements, if you agree to the license, select the [I accept the terms of the license agreements] radio button, and click the [Finish] button.
- 9. If the dialog of the trust certificate is displayed, check that certificate, and click the [OK] button to continue installation.
- 10. When prompted to restart e<sup>2</sup> studio, restart it.
- 11.Start this product from the [Renesas Views] [Renesas QE] menu of e<sup>2</sup> studio. For details about how to use this product, see the [Help] menu of e<sup>2</sup> studio.



#### 2.1.2 Installing the Standalone Version

- Extract ".zip" file to a user-specified location on the PC. Note: Please do not put the tool under OS program folder (C:\Program Files)
- 2. Start this product by double clicking "\QE-Display\eclipse\qe-display.exe".
- 3. For the first time this product starts, there is a dialog of license agreement. After checking the license, you can select "Agree" or "Disagree".

4	End User License Agreement		×
	USER LICENSE AGREEMENT	^	
	IMPORTANT-READ CAREFULLY:		
	This User License Agreement ("ULA") is a legal agreement between you (either a natural person or an entity) and Renesas Electronics Corporation ("Renesas") for the SOFTWARE PRODUCT. As used herein, "SOFTWARE PRODUCT" means the Renesas software product provided with this ULA, which includes computer software and may include associated media, printed materials, and "online" files or data. By installing, copying, or otherwise using the SOFTWARE PRODUCT, you agree to be bound by the terms of this ULA. If you do not agree to the terms of this ULA, do not install or use the SOFTWARE PRODUCT.		
	1.SOFTWARE PRODUCT LICENSE	~	
	Agree Disag	ree	

Figure 2-1 License Agreement Dialog

4. If "Agree" is selected in above step, the product is launched then you can use it; if "Disagree" is selected in above step, the product won't be launched.

## 2.2 Updating This Product

If you have already installed the plug-in version, you can update it in the same way as the procedure for installation 2.1.1.2

If you have already installed the standalone version, you can update it in the same way as the procedure for installation 2.1.2



# 2.3 Uninstalling This Product

The following describes how to uninstall the plug-in version and the standalone version respectively.

## 2.3.1 Uninstalling the Plug-in Version

Use the following procedure to uninstall this product.

- 1. Start e<sup>2</sup> studio.
- 2. Select [Help -> About  $e^2$  studio] to open the [About  $e^2$  studio] dialog box.
- 3. Click the [Installation Details] button to open the  $[e^2$  studio Installation Details] dialog box.
- 4. Select [Renesas QE for Display[RX,RA]/QE for Camera[RA]] displayed on the [Installed Software] tabbed page and click the [Uninstall...] button to open the [Uninstall] dialog box.
- 5. Check the displayed information and click the [Finish] button.
- 6. When prompted to restart  $e^2$  studio, restart it.

## 2.3.2 Uninstalling the Standalone Version

Delete the entire folder which .zip package is extracted.



## 3. Notes / Restrictions

## 3.1 Usage Considerations

## 3.1.1 About additional installation of the RA family environment

If you wish to install the RA family environment additionally to your e2 studio development environment, please uninstall this product once and install it again after the RA family environment installation is completed

## 3.1.2 About compatibility with the previous version of sample program

V2.0.0 or later is not compatible with the previous version (QE for Display[RX] V1.1.0 or below) of the sample program because V2.0.0 or later has many new items to set and macros to output to the header file. When updating to V2.0.0 or later, also update the Graphic LCD Controller Module (r\_glcdc\_rx) to V1.40 or later.

For your information, the relationship between the previous version of QE for Display[RX] and the Graphic LCD Controller Module is as follows.

- QE for Display[RX] V1.0.0 : r\_glcdc\_rx V1.00 V1.30
- QE for Display[RX] V1.1.0 : r\_glcdc\_rx V1.30

#### 3.1.3 How to transfer the data of the previous version (when using plug-in version)

To transfer the configuration data from the previous version, copy the configuration file from the workspace location below to the project-specific location.

Storage location of the previous version's configuration data

<workspace>/.metadata/.plugins/com.renesas.apltool.glcdc

Storage location of the V2.0.0 or later configuration data

<project>/.settings/.plugin/com.renesas.apltool.glcdc

#### 3.1.4 How to transfer the data from plug-in version to standalone version

To transfer the configuration data from the plug-in version, copy the configuration file from the plug-in version project's storage location below to the standalone version project's storage location.

Plug-in version side:

> Storage location of the previous version's configuration data

<workspace>/.metadata/.plugins/com.renesas.apltool.glcdc

Storage location of the V2.0.0 or later configuration data

<project>/.settings/.plugin/com.renesas.apltool.glcdc

Standalone version side:

Storage location of configuration data

<project>/.settings/.plugin/com.renesas.apltool.glcdc



#### 3.1.5 About the preset values of the evaluation board

When using the evaluation board, preset values are set for each setting item in QE for Display [RX,RA]/QE for Camera[RA].

Please configure the GLCDC input clock frequency according to the following requirements.

- > RX evaluation boards: Set PLL circuit frequency to 240MHz
- > RA evaluation boards: Set LCDCLK value according to the prompts



Figure 3-1 LCDCLK Setting Value Prompt

Please configure GPT input clock frequency according to the following requirements.

- EK-RA8D1 board: Set PCLKD frequency to 100MHz
- > EK-RA8P1 board: Set GTCLK frequency to 250MHz

#### 3.1.6 About PLLCLK and panel clock frequency setting of standalone version

In the standalone version, you need to enter the value of "PLL Circuit Frequency [MHz]" in the "Timing Adjustment" page according to the setting in the Smart Configurator clock page. Also, select the value of "Panel Clock Frequency [MHz]" according to the prompt after the control.

#### 3.1.7 Note on using the Aeropoint GUI (Library Setting)

When you use the RXv2 instruction set architecture on RX66N, RX72M, and RX72N, change the library set in the linker options to the following.

- 1. libcri\_AeropointLite\_RXv2\_CCRX.lib
- 2. libcri\_Atom\_Multiplayer\_RXv3\_CCRX.lib

#### 3.1.8 Note on parameter setting (when using RA family)

The maximum values of the following parameters differ between QE and FSP, if the maximum value is set in QE, it cannot be reflected in FSP

- QE : HTP (Max 2048) -> FSP : Horizontal total cycles (Max 2047)
- QE : VTP (Max 2048) -> FSP : Vertical total lines (Max 2047)
- QE : VDP (Max 2044) -> FSP : Vertical active video lines (Max 2043)

#### 3.1.9 Note on TrustZone projects usage (when using RA family)

When selecting RA projects, the real-time display adjustment result of TrustZone projects is not guaranteed. It is recommended to use Non-TrustZone project.



#### 3.1.10 Note on display settings of PC monitor

If the GUI text is overlapped or blocked as shown in the figure below on your PC, please set up your PC monitor according to the following recommended settings.

🗣 *Display Tuning RX (QE) ×		🔄 🖓 💷 🖇 🗖
tart Display Adjustmer		
Maker/Type : Newhaven Display International, Inc. $$	Model Name/Size : NHD-4.3-480272EF-ATXL#-CTP	$\sim$
Block Image TCON/LCD Setting Timing Adjustment Graphic	Layer Setting Image Quality Adjustment	
GLCDC		
Background generator Video timing generating Graphic Layer	Output Controller Brightness Contrast mma correcti Dither process ON/LCD Setti	
Buffer Area For Laver1 Laver2	Display	

Figure 3-2 GUI with Overlapped or Blocked Text

Recommended monitor settings:

- Scale: 100%
- Display resolution: 1920 x 1080

Scale and layout
Change the size of text, apps, and other items
100% (Recommended)
Advanced scaling settings
Display resolution
1920 × 1080 V

Figure 3-3 Recommended Monitor Settings



#### 3.1.11 Note on LCD/Camera Workflow (QE) view

1. If you press the "Maximize"/"Restore" button in the e2 studio window while playing a tutorial video with the video window maximized, you will not be able to maximize the video window again.

[Workaround]

Close and re-open the LCD/Camera Workflow (QE) view

2. The workflow cannot be opened if WebView2 Runtime is not installed on your PC.

[Workaround]

Download and install WebView2 (x64 version) from the Microsoft web page.(FAQ:3000670)

#### 3.1.12 Note on baud rate setting when using standalone version

Due to the limitation of the communication speed of the USB-to-serial IC (RL78G1C) installed on the Renesas Starter Kit and Envision Kit boards, for projects using these two types of Evaluation boards, if you use the USB-to-serial resources on the board, the maximum communication baud rate set in the standalone version cannot exceed 115200.

#### 3.1.13 Note on pin configuration settings of FSP modules (EK-RA8D1 board setting)

When using camera module, you need to do the following pin configuration settings.

1. Set the "Operation Mode" of "ETHER\_RMII" as "Disabled" in the Pins page of FSP Configuration. \*



Figure 3-4 ETHER\_RMII Pin Configuration for EK-RA8D1

\* Due to the conflict with CEU pin resources, the pins of ETHER\_RMII are not used.



2. Set the pin configuration of "CEU" in the Pins page of FSP Configuration. \*

ilter text	Name	Value	Lock	Link
Connectivity:OSPI	Pin Group Selection	Mixed		
Connectivity:SCI	Operation Mode	Custom		
Connectivity:SDHI	✓ Input/Output			$\langle \rangle$
Connectivity:SPI	VIO_CLK	P708	<b>1</b>	4
onnectivity:SSIE	VIO_D0	✓ P400	<b>1</b>	4
nectivity:USB FS	VIO_D1	✓ P401	e e e e e e e e e e e e e e e e e e e	4
ectivity:USB HS	VIO_D2	✓ P405	e e e e e e e e e e e e e e e e e e e	4
TAG/SWD	VIO_D3	✓ P406	e e e e e e e e e e e e e e e e e e e	4
g:TRACE	VIO_D4	P700	<b>a</b>	4
	VIO_D5	✓ P701	dî d	4
JS DRAM	VIO_D6	P702	a f	4
EU	VIO_D7	✓ P703	di d	4
	VIO_D8	None		
	VIO_D9	None		
CD ot:IRQ	VIO_D10	None		
CGC	VIO_D11	None		
SYSTEM	VIO_D12	None		
	VIO_D13	None		
ADC(Digital)	VIO_D14	None		
AC	VIO_D15	None		
GPT	VIO_FLD	None		
GPT OPS	VIO_HD	✓ P709	l 🔐	4
GPT_OPS GPT_POEG	VIO VD	✓ P710		4
-	<			
rs:RTC	<b>`</b>			

Figure 3-5 CEU Pin Configuration for EK-RA8D1

\* Due to the conflict with SDRAM pin resources, the upper 8-bit data pins of CEU are not used.

3. Set the pin configuration of "GPT3" in the Pins page of FSP Configuration.

Type filter text	Name	Value	Lock	Link
	Pin Group Selection	Mixed		
> Interrupt:IRQ	Operation Mode	GTIOCA or GTIOCB		
> V System:CGC	✓ Input/Output			$\langle \Box \rangle$
> V System:SYSTEM	GTIOC3A	✓ P403	a a	
> TRG:ADC(Digital) > TRG:CAC	GTIOC3B	None	-	$\Rightarrow$
> Timers:AGT				
GPT0				
GPT1				
GPT2				
✓ GPT3 GPT4				
GPT5				
GPT6				
GPT7				
GPT8				
GPT9				
GPT10				
GPT11				
GPT12				
GPT13				
> Timers:GPT_OPS				
> Timers:GPT_POEG				
> Timers:RTC	<			
> Timers:ULPT	<ul> <li>Module name: GPT3</li> </ul>			

Figure 3-6 GPT3 Pin Configuration for EK-RA8D1



# 3.1.14 Note on pin configuration settings of FSP modules (EK-RA8E2 board setting)

When using LCD module, you need to do the following pin configuration settings.

1. Set "LCD\_TCON3" pin of "GLCD" module as "None" in the Pins page of FSP Configuration.



Figure 3-7 GLCD Pin Configuration for EK-RA8E2

2. Set "P515" pin of "Ports" module as "Output mode (Initial High)" in the Pins page of FSP Configuration.



Figure 3-8 "LCD\_TCON3" Pin Configuration for EK-RA8E2



## 3.1.15 Note on pin configuration settings of FSP modules (EK-RA8P1 board setting)

When using LCD module, you need to do the following pin configuration settings.

1. Set "P514" pin of "Ports" module as "Output mode (Initial High)" in the Pins page of FSP Configuration.



Figure 3-9 "DISP\_BLEN" Pin Configuration for EK-RA8P1

2. Set "P606" pin of "Ports" module as "Output mode (Initial High)" in the Pins page of FSP Configuration.



Figure 3-10 "DISP\_RESET" Pin Configuration for EK-RA8P1



When using camera module, you need to do the following pin configuration settings.

1. Set the "Operation Mode" of "I3C0" as "Disabled" in the Pins page of FSP Configuration. \*

Type filter text		Name	Value	Lock	Link
> Analog:DAC12	^	Pin Group Selection	Mixed		
> CLKOUT:CLKOUT		Operation Mode	Disabled		
> CLKOUT:CMPOUT		✓ Input/Output			
> CLKOUT:ETHPHYCLK		I3C_SCL0	None		
> Connectivity:CANFD		I3C_SDA0	None		4
> Connectivity:ESWM_GMII/MII					
> < Connectivity:ESWM_RGMII					
> Connectivity:ESWM_RMII					
<ul> <li>Connectivity:I3C</li> </ul>					
13C0					
> 🗸 Connectivity:IIC					
> 🗸 Connectivity:OSPI					
> 🗸 Connectivity:PDM					
> 🗸 Connectivity:SCI					
> Connectivity:SDHI					
> Connectivity:SPI					
V V Connectivity:SSIE					
SSIE					
SSIE0					
SSIE1					
> 🗸 Connectivity:USB FS		Module name: I3C0			
> 🗸 Connectivity:USB HS					
> 🗸 Debug:JTAG/SWD					
> Debug:TRACE	~				

#### Figure 3-11 I3C0 Pin Configuration for EK-RA8P1

\* Due to the conflict with CEU pin resources, the pins of I3C0 are not used.

2. Set the "Operation Mode" of "SSIE0" as "Disabled" in the Pins page of FSP Configuration. \*

pe filter text	Name	Value	Lock	Link
Connectivity:ESWM RGMII	Pin Group Selection	Mixed		
Connectivity:ESWM_RMII	Operation Mode	Disabled		
> Connectivity:I3C	✓ Input/Output			<
<ul> <li>Connectivity.ISC</li> <li>Connectivity.IIC</li> </ul>	SSIBCK0	None		
<ul> <li>Connectivity:OSPI</li> </ul>	SSILRCK0	None		4
<ul> <li>Connectivity:PDM</li> </ul>	SSIRXD0	None		4
<ul> <li>Connectivity:PDW</li> <li>Connectivity:SCI</li> </ul>	SSITXD0	None		
Connectivity:SDHI Connectivity:SPI				
<ul> <li>Connectivity:SPI</li> <li>Connectivity:SSIE</li> </ul>				
✓ Connectivity:SSTE ✓ SSIE				
SSIE				
SSIE1				
<ul> <li>Connectivity:USB FS</li> </ul>				
<ul> <li>Connectivity:USB HS</li> </ul>				
<ul> <li>Debug:JTAG/SWD</li> </ul>				
Debug:TRACE				
ExBus:BUS				
ExBus:SDRAM				
MILCEU				
> HMI:GLCDC	Module name: SSIE0			
MINIGLEDC				
> Interrupt:IRQ				
> ✓ System:CGC				

#### Figure 3-12 SSIE0 Pin Configuration for EK-RA8P1

\* Due to the conflict with CEU pin resources, the pins of SSIE0 are not used.



3. Set the "Operation Mode" of "GLCDC" as "Disabled" in the Pins page of FSP Configuration. \*

/pe filter text	Name	Value	Lock	Link
> Analog:ACMPHS	Pin Group Selection	Mixed		
> Analog:ACMPHS A	Operation Mode	Disabled		
> Analog:ADC0	✓ Input/Output			
> Analog:DAC12	LCD_CLK	None		$\Rightarrow$
> CLKOUT:CLKOUT	LCD_DATA0	None		
> CLKOUT:CMPOUT	LCD_DATA1	None		
> CLKOUT:ETHPHYCLK	LCD_DATA2	None		
> Connectivity:CANFD	LCD_DATA3	None		$\Rightarrow$
Connectivity:ESWM GMII/MII	LCD_DATA4	None		
Connectivity:ESWM_GMII	LCD_DATA5	None		
Connectivity:ESWM_RMII	LCD_DATA6	None		$\langle \rangle$
> Connectivity:I3C	LCD_DATA7	None		
Connectivity:IIC	LCD_DATA8	None		
<ul> <li>Connectivity:ne</li> <li>Connectivity:OSPI</li> </ul>	LCD_DATA9	None		
Connectivity:OSP1     ✓ Connectivity:PDM	LCD_DATA10	None		
Connectivity:PDW     ✓ Connectivity:SCI	LCD_DATA11	None		
> Connectivity:SDHI	LCD_DATA12	None		
	LCD_DATA13	None		
	LCD_DATA14	None		
	LCD_DATA15	None		
Connectivity:USB FS     Connectivity:USB HS	LCD_DATA16	None		
> V Debug:JTAG/SWD	LCD_DATA17	None		
	LCD_DATA18	None		
Debug:TRACE     ExBus:BUS	LCD_DATA19	None		
> EXBUS:BUS	LCD_DATA20	None		
>   HMI:CEU	LCD DATA21	None		
<ul> <li>HMI:CEO</li> <li>HMI:GLCDC</li> </ul>	LCD_DATA22	None		
GLCDC	LCD_DATA23	None		
→ ✓ HMI:MIPI	LCD_EXTCLK	None		
> HMI:MIPI> Interrupt:IRQ	LCD_TCON0	None		
	LCD_TCON1	None		
	LCD_TCON2	None		
> TRG:ADC(Digital) > TRG:CAC	LCD_TCON3	None		
	_			
> V Timers:GPT > Timers:GPT OPS	Module name: GLCDC			

#### Figure 3-13 GLCDC Pin Configuration for EK-RA8P1

\* Due to the conflict with CEU pin resources, the pins of GLCDC are not used.



4. Set the pin configuration of "CEU" in the Pins page of FSP Configuration.

er text	Name	Value	Lock	Link
OUT:CLKOUT	Pin Group Selection	Mixed		
OUT:CMPOUT	Operation Mode	Custom		
DUT:ETHPHYCLK	✓ Input/Output			<
ectivity:CANFD	VIO_CLK	✓ PB04	<b>1</b>	0
vity:ESWM_GMII/MII	VIO_D0	✓ P400	<b>1</b>	
ivity:ESWM_GMII	VIO_D1	✓ P902	<b>1</b>	
tivity:ESWM RMII	VIO_D2	✓ P405	<b>_</b>	
ectivity:I3C	VIO_D3	✓ P406	<b>1</b>	
ectivity:IIC	VIO_D4	✓ P700	<b>1</b>	
nnectivity:OSPI	VIO_D5	✓ P701	<b>B</b>	
ectivity:PDM	VIO_D6	✓ P702	l 🔐	
ctivity:SCI	VIO_D7	🗸 P703	<b></b>	
tivity:SDHI	VIO_D8	None		
ity:SPI	VIO_D9	None		Ì
vity:SSIE	VIO_D10	None		
ivity:USB FS	VIO_D11	None		
ectivity:USB HS	VIO_D12	None		
ug:JTAG/SWD	VIO_D13	None		
Ig:TRACE	VIO_D14	None		
us:BUS	VIO_D15	None		
SDRAM	VIO_FLD	None		
EU	VIO_HD	✓ PB03	<b>B</b>	
-	VIO_VD	✓ PB02	e e e e e e e e e e e e e e e e e e e	
CDC				
PI				
rupt:IRQ	Module name: CEU			
tem:CGC	2			

Figure 3-14 CEU Pin Configuration for EK-RA8P1

## 3.1.16 Note on settings of captured image size

When using CEU to capture camera images, please set the captured image size according to the following table.

Evaluation Board	Use Case	Maximum Captured Image Size
EK-RA8D1	Only Use Camera Function	1280*960 pixels
	Use Display and Camera Function	480*852 pixels
EK-RA8P1	Only Use Camera Function	480*640 pixels

Table 3-1 CEU Maximum Captured Image Size

#### 3.1.17 Note on settings of "Graphic Layer Setting" for camera (EK-RA8D1 board setting)

When selecting the "Use Display and Camera Function" use case, please make the following settings in "Graphic Layer Setting".

- > Please use "Graphic Layer1" to make real time adjustments to the captured image.
- Set the value of "Width of Image Data" of "Graphic Layer1" to be no less than the width of the captured image.
- Set the selection of "Output Data Format" of "Graphic Layer1" as "RGB888 (GLCDC\_IN\_FORMAT\_32BITS\_RGB888)".

#### 3.1.18 Note on opening adjustment view

When creating an RA device project using QE for Display[RX,RA] V3.5.0, QE for Camera[RA] V1.0.0 or later, the adjustment view will not be displayed even if the "r\_glcdc" component is selected. The "Display User Interface Application" component needs to be added to open adjustment view.



## 3.1.19 Note on changing board operation

To use a different evaluation board, it is advised not to change the board selection in FSP or Smart Configurator within the current project. Instead, please create a new project for the new target board.

	Device Select	ion				
	Device select	1011			P 10 11	
	FSP version:	5.9.0		$\sim$	Board Details	
	Board:	EK-RA8D1	~	🖻	Evaluation kit for RA8D1 MCU Group	
	Deview	EK-RA6M4	^		Visit <u>https://www.renesas.com/ra/ek-ra8d1</u>	
	Device:	EK-RA6M5				
	Core:	EK-RA8D1 EK-RA8E2		$\sim$		
	RTOS:	EK-RA8M1		$\sim$		
		FPB-RAOE1				
		FPB-RA0E2 FPB-RA2E1				
		FPB-RA2E2				
		FPB-RA2E3				
		FPB-RA4E1				
		FPB-RA4E2 FPB-RA4T1				
		FPB-RA6E1				
		FPB-RA6E2				
		FPB-RA6T3				
		FPB-RA8E1 MCK-RA4T1				
		MCK-RA6T2				
		MCK-RA6T3				
		MCK-RA8T1				
		RSSK-RA2L1 RSSK-RA4L1				
		RSSK-RA6T1				
		VK-RA8M1				
		VOICE-RA2L1				
		VOICE-RA4E1	~			
vice s		Clocks Pins Interrup	1 1		Stacks Components Operation in FSP	
vice s		Clocks Pins Interrup	1 1			
		Clocks Pins Interrup	[Change			
evice se	election	Clocks Pins Interrup	[Change	Board]	Operation in FSP	2
evice se Board:	election election RSKRX65N-2MB	Clocks Pins Interrup	[Change	Board]		
evice se Board:	election election RSKRX65N-2MB	Clocks Pins Interrup Figure 3-15	[Change	Board]	Operation in FSP	2
evice se Board:	election election RSKRX65N-2MB R5F565NEDxFC	Clocks Pins Interrup Figure 3-15	Change	Board] device for RX65 R5F565NEDxFC	Operation in FSP	2
evice se Board: Device:	election election RSKRX65N-2MB R5F565NEDxFC Download more boards.	Clocks Pins Interrup Figure 3-15	Change Refactoring Change Device Select the new Current Device:	Board] device for RX65 RSF565NEDxFC RSKRX65N-2ME	Operation in FSP	
evice se Board: Device: <b>Featur</b>	election election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection	Clocks Pins Interrup Figure 3-15	Change Refactoring Change Device Select the new Current Device: Current Board: Target Board:	Board] device for RX65 R5F565NEDxFC R5KRX65N-2ME Custom	Operation in FSP	2
evice se Board: Device: <b>Featur</b> o add a	election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection a component, make the se	Clocks Pins Interrup Figure 3-15	Change Refactoring Change Device Select the new Current Device: Current Board: Target Board:	Board] device for RX65 RSF565NEDxFC RSKRX65N-2ME	Operation in FSP	2
evice se Board: Device: Featur o add a he conf	election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection a component, make the se igurations for each added	Clocks Pins Interrup Figure 3-15	Change Refactoring Change Device Select the new Current Device: Current Board: Target Board:	Board] device for RX65 R5F565NEDxFC R5KRX65N-2ME Custom CK-RX65N-V2 CK-RX65N-V2 CPUCardRX13	Display	
evice se Board: Device: Feature o add a he conf	election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection a component, make the se igurations for each added	Clocks Pins Interrup Figure 3-15	Change Refactoring Change Device Select the new Current Device: Current Board: Target Board:	Board] device for RX65 R5F565NEDxFC RSKRX65N-2ME Custom CK-RX65N-V2 CFUCardRX24	Display	
evice se Board: Device: Featur o add a he conf Feature App	election election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection a component, make the se figurations for each added is lication Header	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	Board] device for RX65 RSF565NEDxFC RSKRX65N-2ME Custom CK-RX65N-V2 CPUCardRX13 CPUCardRX13 CPUCardforRS	Image: Contract of the second state	
evice se Board: Device: Featur o add a he conf Feature App	election election RSKRX65N-2MB RSF565NEDxFC Download more boards. Download more boards. e Selection a component, make the se igurations for each added is igurations for each added troller Area Network	Clocks Pins Interrup Figure 3-15	Change Refactoring Change Device Select the new Current Device: Current Board: Target Board:	Board] device for RX65 RSF565NEDxFC RSKRX65N-2ME Custom CK-RX65N-2ME CK-RX65N-V2 CPUCardRX24 CPUCardRX24 CPUCardRX24 CPUCardforMS CPUCardforMS	Image: Contract of the second state	
Feature App Cont Ethe	election election RSKRX65N-2MB RSF565NEDxFC Download more boards. Download more boards. e Selection a component, make the se igurations for each added is igurations for each added troller Area Network	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	Board] device for RX65 RSF565NEDxFC RSKRX65N-2ME Custom CK-RX65N-V2 CPUCardRX13 CPUCardRX13 CPUCardforRS	Image: Contract of the second state	
evice so Board: Device: Feature App Cont Ethe Grap	election election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection a component, make the se figurations for each added is lication Header troller Area Network rnet	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	Board] device for RX65 RSF565NEDxFC RSKRX65N-2ME Custom CK-RX65N-V2 CPUCardForM CPUCardForM CPUCardforM CPUCArdforM CPUCArdforM CPUCArdforM CPUCAR CPUCA	Deperation in FSP	
Feature o add a he conf Feature App Conf Ethe Grap Inter LED:	election  RSKRX65N-2MB  RSF565NEDxFC  Download more boards.  e Selection a component, make the se figurations for each added ss figurations for each added ss ficture the selection the	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	Board] device for RX65 R5F565NEDxFC Custom CK-RX65N-2ME CUstom CK-RX65N-V2 CPUCardRX13 CPUCardRX14 CPUCardforRS CPUCardforRS CloudKitRX65N EK-RX261 EK-RX671	Deperation in FSP	
Feature o add a he conf Feature App Conf Ethe Grap Inter LEDs Pmo	election election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection a component, make the se figurations for each added ss fication Header truet bic LCD Controller -rC Bus s dd (2A: SPI, 3A: UART)	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	Board] device for RX65 R5F565NEDxFC RSF565NEDxFC RSKRX65N-V2 CUstom CK-RX65N-V2 CPUCardRX13 CPUCardRX13 CPUCardForM CPUCardforM CPUCArdforM CPUCARDFO CPUCArdforM CPUCARDFO	Deperation in FSP	
evice so Board: Device: Feature Appi Cont Ethe Grap Inter LED: Pmo Pote	election  RSKRX65N-2MB  RSF565NEDxFC  Download more boards.  e Selection a component, make the se figurations for each added is lication Header troller Area Network rnet obic LCD Controller -IC Bus s d (2A: SPI, 3A: UART) intiometer	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	device for RX65 R5F565NEDxFC R5F565NEDxFC R5KRX65N-2MB Custom CK-RX65N-V2 CPUCardRX13 CPUCardRX14 CPUCardForMS CloudKiRX65 CloudKiRX65 CloudKiRX65 EK-RX261 EK-RX261 EK-RX261 FPB-RX261 GR-R05E-RX263	Deperation in FSP	
evice so Board: Device: Peature o add a he conf Feature App Conf Ethe Grap Inter LED: Pmo Pote Qua	election election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection a component, make the se figurations for each added is fication Header troller Area Network rnet oblic LCD Controller r-IC Bus s d (2A: SPI, 3A: UART) mitiometer d Serial Peripheral Interfac	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	device for RX65 RSF565NEDxFC RSF565NEDxFC RSKRX65N-22ME Custom CK-RX65N-V2 CPUCard6rM2 CPUCard6rX13 CPUCard6rM2 CPUCardforRS CloudKitRX65 EK-RX261 EK-RX261 EK-RX261 GR-ROSE-RX61 MCB-RX261 GR-ROSE-RX61 MCB-RX261 T3	I Operation in FSP	
Featur o add a he conf Feature Conf Ethe Grap Pote Qua Rene	election  RSKRX65N-2MB  RSF565NEDxFC  Download more boards.  e Selection a component, make the se figurations for each added is lication Header troller Area Network rnet obic LCD Controller -IC Bus s d (2A: SPI, 3A: UART) intiometer	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	device for RX65 R5F565NEDxFC R5F565NEDxFC Custom CK-RX65N-2ME CUstom CK-RX65N-V2 CPUCardRX24 CPUCardRX24 CPUCardRX24 CPUCardForKS CloudK12K761 EK-RX671 EnvisionK1RX7 FPB-RX261 GR-RX5E-RX66 MCB-RX26T TJ MCB-RX26T TJ MCB-RX26T TJ	I Operation in FSP	
Featur o add a he conf Feature Conf Ethe Grap Pote Qua Rene	election election RSKRX65N-2MB RSF565NEDxFC Download more boards. e Selection a component, make the se figurations for each added ss ficution Header troller Area Network rnet obic LCD Controller r-IC Bus s d (2A: SPI, 3A: UART) ntiometer d Serial Peripheral Interface	Clocks Pins Interrup Figure 3-15	Change Device: Select the new Current Device: Current Board: Target Board:	Board] device for RX65 R5F565NEDxFC RSKRX65N-2ME Custom CK-RX65N- CK-RX65N- CK-RX65N- CK-RX65N- CVCardforRS CPUCardRX13' CPUCardforRS CPUCARS CPUCAR	I Operation in FSP	
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Figure 3-16 [Change Board] Operation in Smart Configurator



## 3.1.20 Note on Renesas e2 studio environment

This product recommends using e2 studio 2025-04. If you use e2 studio 2025-07, the "LCD/Camera Workflow (QE)" view and help content may not open properly.

🖵 LCD/Camera Workflow (QE) 🛛 🛛			- 0
🐺 QE for Display/QE for Camera			
	1. Preparation	2. LCD and Camera Adjustment	
1. Preparation -		Selecting a project	^
Selecting a project			
Selecting a LCD	Select the project that has been created.		
Selecting a camera			
2. LCD and Camera Adjustment 🗧	Select the use case.		
Installing the LCD controller			
Installing the camera controller			
LCD display adjustment			
Camera capture adjustment	Select a project		
Implementation	Use the e <sup>2</sup> studio to create a nev	ues LCD display or camera capture function. Project and select the Smart Configurator as the coding assistant tool. le Smart Configurator to set the clock source for the LCD or camera board.	
	Select the use case		
	Please refer to the following tab	le to select the use case to be used for configuring display or camera function.	
	Use case	Supported Device	
	Only Use Display Function	RABAIS group RABD (proup RABE) group RABE (proup RABE) (proup RABE) (RABE)	1
	Only Use Camera Function	RASDI group RASPI group	
	Use Display and Camera Function	RASD1 group	
	Notes		
	When using Aeropoint GUI as a such names.	GUI drawing tool, do not select a project whose name starts with a number. Aeropoint GUI does not support projects with	

Figure 3-17 Theme Color is Missing in Workflow

🔯 e² studio	_	×

Figure 3-18 Help Content Can't Open Properly

## 3.2 Functional Restrictions

There is no restriction in QE for Display[RX,RA] V3.6.0, QE for Camera[RA] V1.1.0.



# **Revision History**

		Description	
Rev.	Date	Page	Summary
1.00	Jul.1.25	-	First edition issued.



## 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 is supplied until the 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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