Integrated Development Environment e² studio

How to use Doxygen in e² studio

Introduction

Doxygen is a tool that generates documentation based on the Doxygen comments written in your program.

To easily use the documentation generation tool Doxygen on e² studio, use the Eclox plugin.

This document describes the basic operation procedures for generating documentation with Doxygen using the Eclox plugin.

Contents

1. Overview

1.1 e² studio and Doxygen

e² studio is an integrated development environment for Renesas microcontrollers based on the open source "Eclipse". By embedding various plugins of Eclipse, e² studio is possible to realize work with external tool and add/extend features.

Doxygen is a tool that generates documentation based on Doxygen comments written in your program. It generates documentation using source code and a Doxygen configuration file as input.

Eclox is a plugin that makes it easy to use the documentation generation tool Doxygen on Eclipse. The Eclox plugin provides the following functions:

- Generating and configuring Doxygen configuration files
- Controlling the execution of Doxygen commands

This document describes the standard operation procedures of installing the Eclox plugin and generating documentation with Doxygen using the Eclox plugin on e² studio.

Note: For information on the format of Doxygen comments, refer to the Doxygen manual (https://doxygen.nl/manual).

1.2 Workflow

The following shows the workflow for generating documentation by Doxygen using the Eclox plugin in e² studio. This document explains how to operate the procedures outlined in bold blue frames according to this workflow.

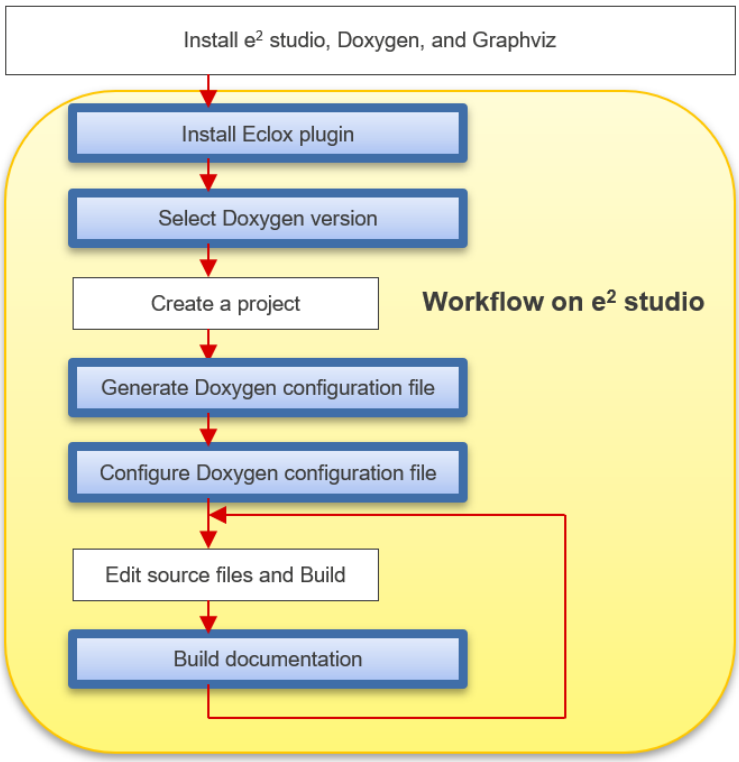

Figure 1

1.3 Environment

Renesas has confirmed the operating procedure explained in this document in the environment below.

Renesas does not warrant the general behavior of that tools' usage with e² studio as these are open-source software managed by third parties. We appreciate your understanding regarding any issues that may arise from their use.

[OS]

- OS: Windows 10 (64 bits)

[Tool]

- e² studio 2024-04
- Doxygen*1 *3 1.8.16 (Bundled with the Eclox plugin)
- Eclox*3 0.13.0
- Graphviz*2 *3 11.0.0

[Project]

- This document does not describe how to create a project. Please prepare the project yourself.

  This document uses a project for the RA family as an example.

  - Project name: sample
  - Board: EK-RA6M4
  - Toolchain: GCC ARM Embedded
  - Project type: Flat
  - FreeRTOS: FreeRTOS - Blinkey

*1: The latest version of Doxygen at the time of writing this document is 1.11.0.

*2: Doxygen uses an external program called Graphviz to generate diagrams such as class diagrams. If you use Doxygen, it is recommended that you install Graphviz.

*3: Doxygen, Eclox, and Graphiv are not Renesas products and therefore those software are not covered by technical support. For specific usage, please refer to "4. Reference Information" and read the manuals for each software.

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2. Setup

This chapter describes the procedure to install the Eclox plugin to e² studio and enable Doxygen on e² studio so that you can easily generate documentation using Doxygen on e² studio.

Before you begin installing the Eclox plugin, you should have the following ready:

- e² studio is installed correctly
- Doxygen is installed correctly

  (If you are using the version of Doxygen bundled with the Eclox plugin, you do not need to have Doxygen installed at this point.)
- Graphviz is installed correctly

2.1 Install Eclox plugin

The Eclox plugin can be easily installed from the Eclipse Marketplace.

To install the Eclox plugin to e² studio:

1) Launch e² studio and select the menu item [Help] > [Eclipse Marketplace...].
2) The [Eclipse Marketplace] window appears. On the [Find:] field, enter "Doxygen", and press the [Go] button.
3) The search result will show "eclox 0.13.0". Press the [Install] button.

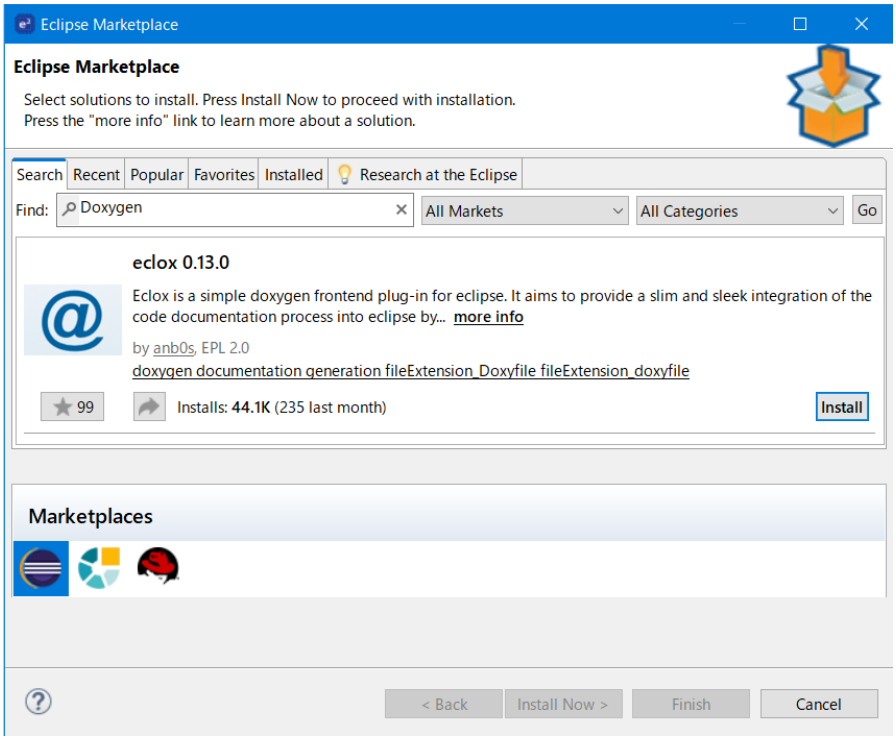

Figure 2

4) The [Confirm Selected Features] page appears on the same window. Press the [Confirm >] button.
5) The [Review Licenses] page appears on the same window. Select the "I accept the terms of the license agreements" and Press the [Finish] button.
6) Start installing the Eclox plugin to e² studio. During the installation process, the [Trust Authorities] dialog appears. Press the [Select All] button, then press the [Trust Selected] button.
7) Next, the [Trust Artifacts] dialog appears. Press the [Select All] button, then press the [Trust Selected] button.
8) Finally, the [Software Updates] message appears. Press the [Restart Now] button.

After restarting e² studio, the installation process is complete.

2.2 Select Doxygen version

To select Doxygen version:

1) Select the menu item [Window] > [Preferences] on e² studio.
2) The [Preferences] dialog appears. Move to the [Doxygen] panel after selecting the tree item [Doxygen].
3) Check Doxygen version number which you want to use.
   For the purposes of this document, check the "1.8.16" checkbox bundled with the Eclox plugin.

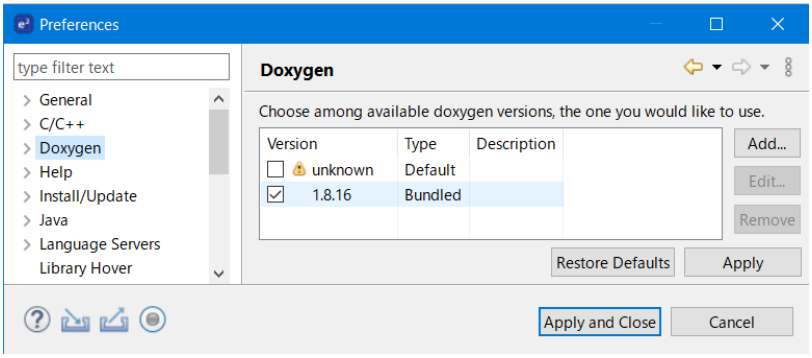

Figure 3

4) Press the [Apply and Close] button.

3. Documentation generation

To use Doxygen, you need to generate a Doxygen configuration file (file extension: .doxyfile) in your project for which you want to generate documentation, and write the settings for the format of the output documentation. By using the Eclox plugin, you can easily generate a Doxygen configuration file in e² studio and configure that file in the GUI.

This chapter describes the procedure for generating and configuring a Doxygen configuration file in e² studio to generate documentation.

3.1 Generate Doxygen configuration file

To generate a new Doxygen configuration file:

1) Select a target project in the [Project Explorer] view on e² studio.
2) Next, select the menu item [File] > [New] > [Other...].
3) The [Select a wizard] dialog appears. Select the tree item [Other] > [Doxyfile] in the [Wizard:] treebox and press [Next >] button.

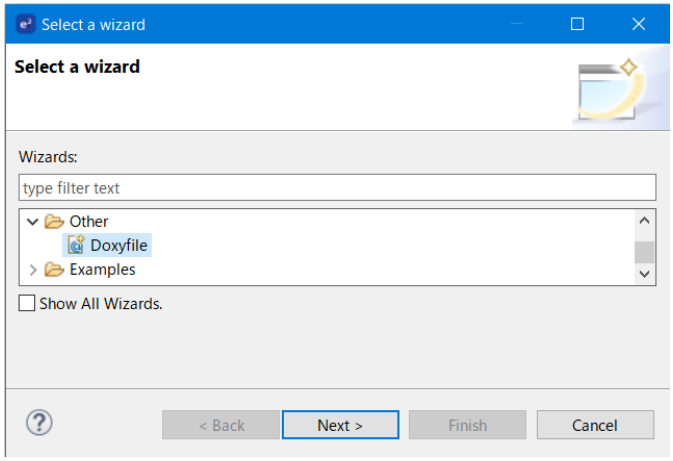

Figure 4

4) The [Doxygen Configuration] page in the [New Doxygen Configuration] dialog appears. The "Enter or select parent folder:" editbox and treebox are filled in for the selected project name. And, the "<project name>.doxyfile" is specified with the [Doxyfile name:] editbox as the default. Check them and edit them if necessary.

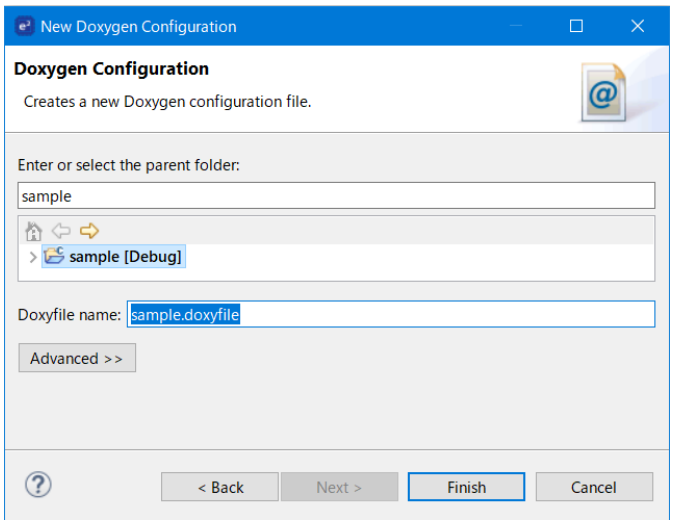

Figure 5

5) Next press the [Finish] button. Then, a Doxygen configuration file is generated in your project.

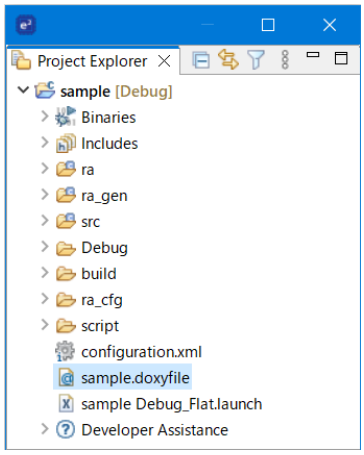

Figure 6

3.2 Configure Doxygen configuration file

When double-clicking the Doxygen configuration file in the [Project Explorer] view, the Doxygen configuration file editor appears. The editor has the [Basic] tab and the [Advanced] tab. You can configure your Doxygen configuration file in the editor.

3.2.1 [Basic] tab

The [Basic] tab allows you to configure basic settings for the generated documentation. Follow the explanation below to configure the settings on the [Basic] tab.

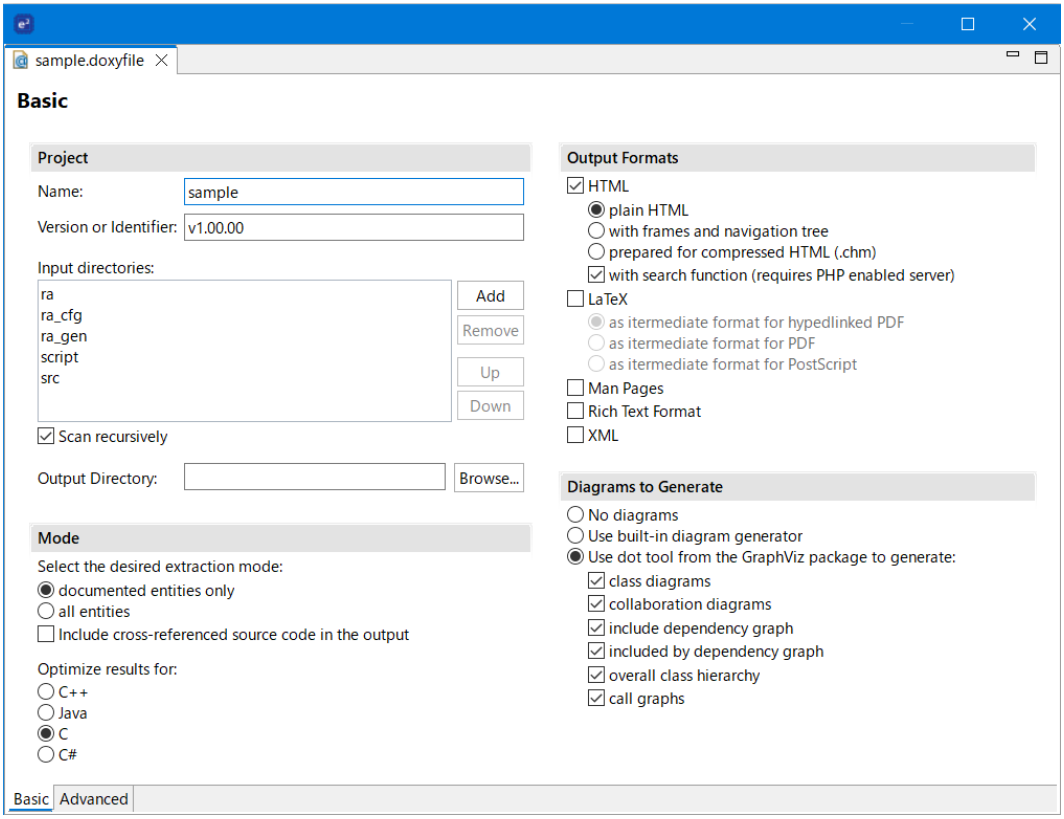

Figure 7

- [Project] area
  - [Name:] editbox

    Enter your project name. Documentation will be generated with this name as its title.

    For the purposes of this document, enter "sample" into this editbox.
  - [Version or identifier:] editbox

    Enter a version number of documentation.

    For the purposes of this document, enter "v1.00.00" into this editbox.
  - [Input directories] listbox

    Add folders of source files you want to document.

    For the purposes of this document, add "ra", "ra_cfg", "ra_gen", "script" and "src" to this listbox. And check the [Scan recursively] checkbox.
  - [Output directory] editbox

    Enter the output folder for documentation. You can specify the folder with pressing the [Browser...] button.

    When you select the "HTML" as the document format in the [Output Formats] area, the document will be generated in the html folder automatically. Hence, for the purposes of this document, leave this editbox blank.
- [Mode] area

  Select the desired extraction mode and program language.

  For the purposes of this document, select the "documented entities only" and the "C".
- [Output Formats] area

  Select the document format you want to generate.

  For the purposes of this document, select only "HTML".
- [Diagrams to Generate] are

  Select what you want to output to the document.

  Graphviz is the open-source software, cross-platform graph drawing tool. Doxygen can output advanced diagrams and graphs using the dot tool for Graphviz. If you want to output diagrams, check the "Use dot tool from the Graphviz package to generate" checkbox.

  For the purposes of this document, select the "Use dot tool from the Graphviz package to generate" and check all of its associated checkboxes.

3.2.2 [Advanced] tab

The [Advanced] tab allows you to configure detailed settings for the generated documentation. Some setting items on this tab overlap with the settings on the [Basic] tab. For items that cannot be configured on the [Basic] tab, configure the settings on the [Advanced] tab according to the following explanation.

Pressing the [Custom] button and entering the item name in the editbox will filter the [Settings] listbox, making it easier to find the item you want to configure.

- [Output Language]

  Enter the language name (default: "English") for the generated documentation.

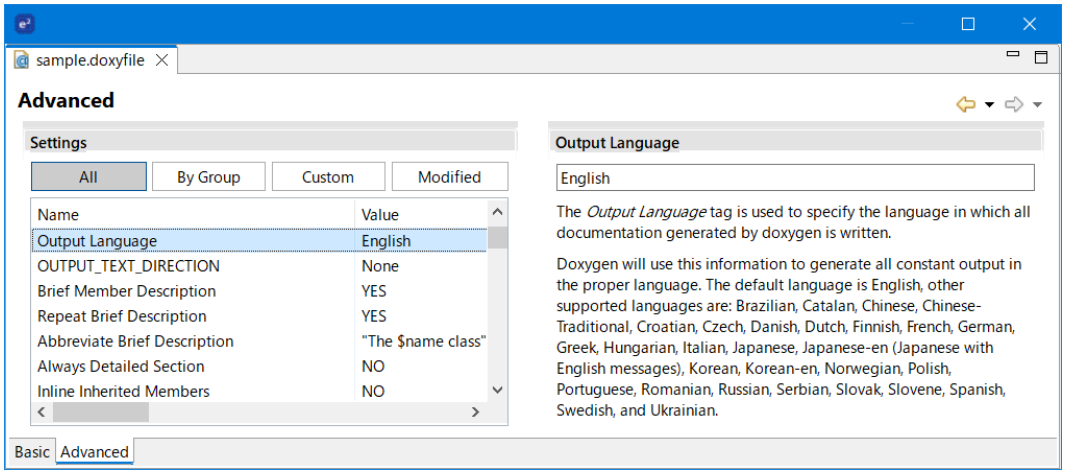

Figure 8

- [Input Encoding]

  Enter the encoding (default: "UTF-8") for the source files.

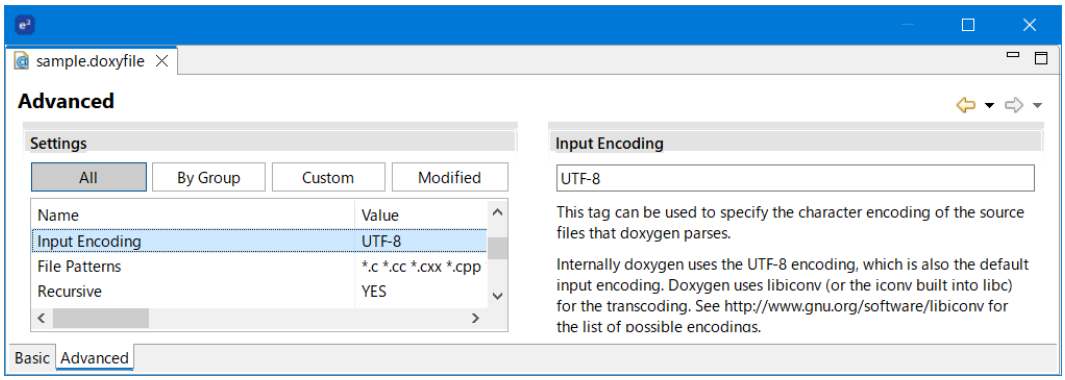

Figure 9

- [Extract All]

  For the purposes of this document, select "Yes, as this is the appropriate setting for generating C documentation (default: "No").

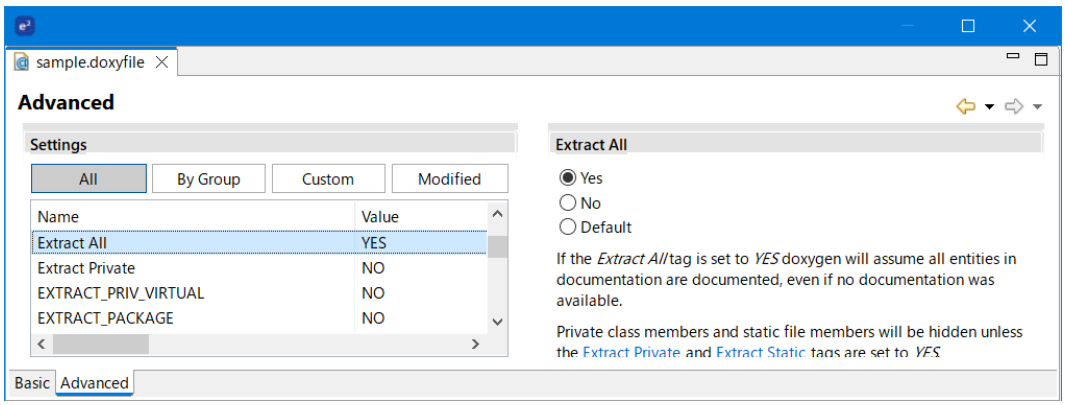

Figure 10

- [Generate Tree View]

  For the purposes of this document, select "Yes" as this is the appropriate setting for HTML generation (default: "No").

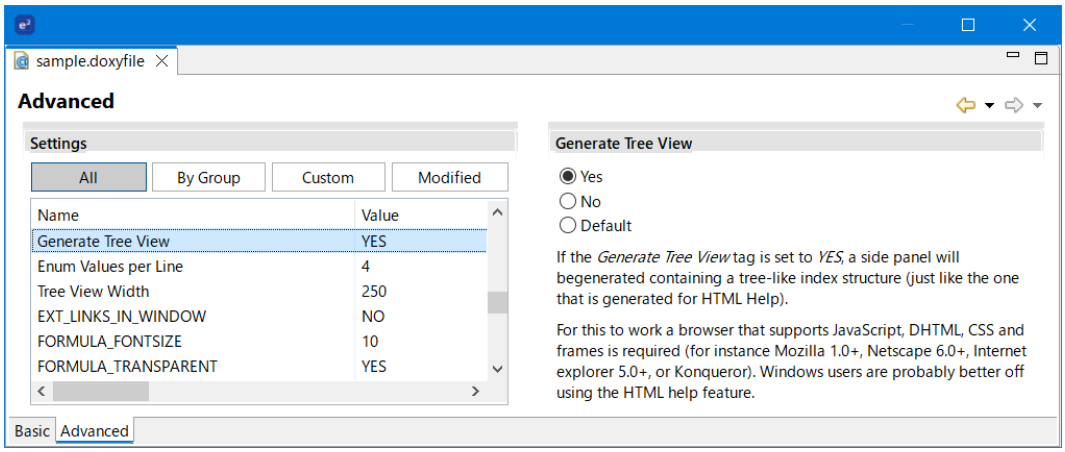

Figure 11

- [Dot Path]

  Enter the path to the Graphviz (default: blank). If the path contains space character, enclose it in double quotation marks "".

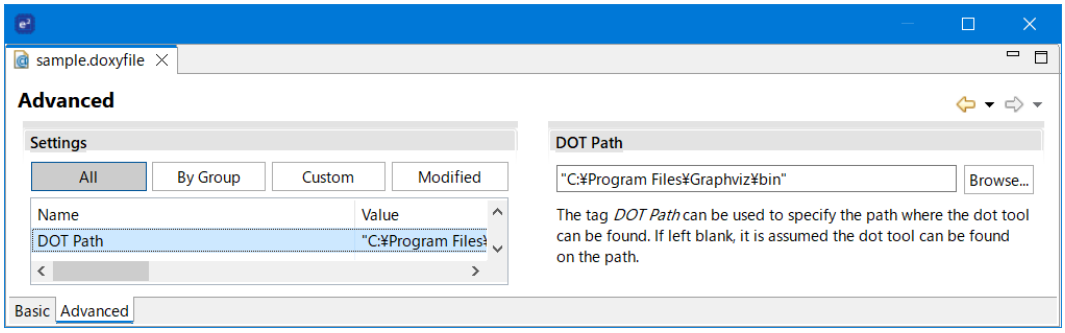

Figure 12

3.3 Build documentation

When you select your Doxygen configuration file in the [Project Explorer] view and select the menu item [Build Documentation] from the context menu, Doxygen will run, and documentation will be generated based on the Doxygen comments in the source files.

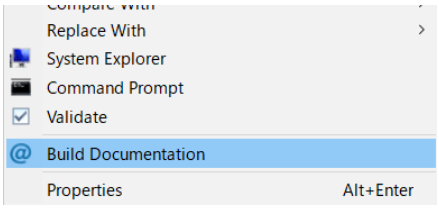

Figure 13

You can double-click the generated index.html in the [Project Explorer] view to launch a browser and display index.html.

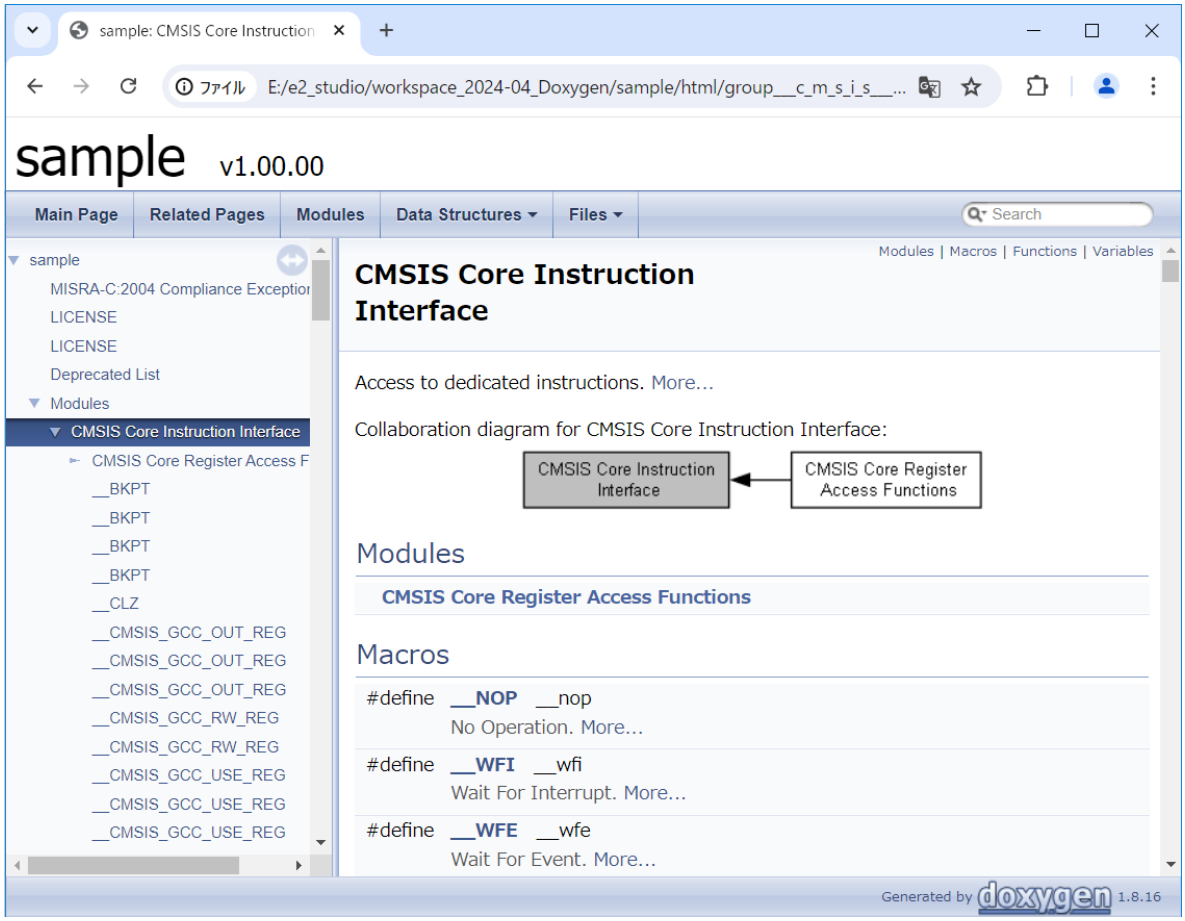

Figure 14

4. Reference Information

4.1 Web Site

- Doxygen home page URL:
  https://www.doxygen.nl/
- Eclox home page URL:
  https://anb0s.github.io/eclox/
- Graphviz home page URL:
  http://www.graphviz.org/

Revision History

Rev.	Date	Description	
		Page	Summary
Rev.1.00	Oct.01.12	All	Created new.
Rev.1.01	Jul.10.24	All	Review all pages and updated all according to the latest version description.

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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