# QE for Capacitive Touch V3.1.0

## Release Note

Thank you very much for using the QE for Capacitive Touch V3.1.0.

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

## Contents

# 1.  About QE for Capacitive Touch

## 1.1     Summary

QE for Capacitive Touch is an assistance tool for applications and operates under the e$^2$ studio integrated development environment. In the development of an embedded system based on an RX family, RA family, RL78 family or Renesas Synergy MCU that incorporates the capacitive touch sensing unit (hereafter the CTSU), this product facilitates the easy initialization of touch interfaces and tuning of their sensitivity, thus reducing development times.

To use this product, you will first need to add a project for the RX family, RA family, RL78 family or Renesas Synergy MCU and the capacitive touch sensor-related CTSU driver and Touch middleware.

## 1.2     Functions

The three functions below make it easy to develop applications that involve capacitive touch sensors.

1.  Creating touch interface configurations
2.  Tuning
3.  Monitoring and parameter adjustment

Also, it is easy to develop gesture applications using e-AI. QE's three functions, "recording function", "AI generation function", and "monitoring and tuning function", support AI application development, which is a difficult process with many steps. Anyone can develop AI applications without the need for specialized AI skills

For more information, please refer to here.  https://www.renesas.com/qe-eai-gesture

## 1.3   New Functions

### 1.3.1   Supported CTSU2SL Touch IP

CTSU2SL touch IP is newly supported. ROM size 128KB and 256KB versions of RX140 with this touch IP will be available.

### 1.3.2   Gesture Recording Function Problem is Fixed

In V3.0.1 and V3.0.2, a problem that prevented gesture recording from starting has been fixed.

Target devices: RA2L1, RX231, RX140, RX671

## 1.4     Supported Environments

### 1.4.1   For Plugin Version

Windows 8.1 or Windows 10 (64-bit version)

Renesas e$^2$ studio 2022-04 (or later)

* If you are using a version of the e$^2$ studio earlier than 2022-04, please update it to 2022-04 or later.

### 1.4.2   For Standalone Version

Windows 8.1 or Windows 10 (64-bit version)

## 1.5    Supported Microcontrollers

- RX Family (only MCUs that incorporate the CTSU)
  - RX100 Series: RX113, RX130, RX140
  - RX200 Series: RX230, RX231, RX23W
  - RX600 Series: RX671
- RA Family (only MCUs that incorporate the CTSU)
  - RA2A Series: RA2A1
  - RA2E Series: RA2E1
  - RA2L Series: RA2L1
  - RA4M Series: RA4M1, RA4M2, RA4M3
  - RA4W Series: RA4W1
  - RA6M Series: RA6M1, RA6M2, RA6M3, RA6M4, RA6M5
- RL78 Family (only MCUs that incorporate the CTSU)
  - RL78/G23
- Renesas Synergy (only MCUs that incorporate the CTSU)
  - S1 Series: S124, S128, S1JA
  - S3 Series: S3A1, S3A3, S3A6, S3A7
  - S5 Series: S5D3, S5D5, S5D9
  - S7 Series: S7G2

## 1.6    Supported Software

- Driver and middleware for capacitive touch sensor
  - RX Firmware Integration Technology (FIT)
    - CTSU driver: r_ctsu V2.10 (or later)
    - Touch middleware: rm_touch V2.10 (or later)
  - RA Flexible Software Package (FSP)
    - CTSU driver: r_ctsu V3.5.0 (or later)
    - Touch middleware: rm_touch V3.5.0 (or later)
  - RL78 Software Integration System (SIS)
    - CTSU driver: r_ctsu V1.11 (or later)
    - Touch middleware: rm_touch V1.11 (or later)
  - Renesas Synergy Software Package (SSP)
    - CTSU driver: r_ctsuv2 V2.2.0 (or later)
    - Touch framework: sf_touch_ctsuv2 V2.2.0 (or later)

## 2.  Installation and Uninstallation

## 2.1    Installing This Product

Use either of the following procedure to install this product.

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

1.  Start e$^2$ studio.
2.  Select the "Renesas Views" – "Renesas Software Installer" menu of e$^2$ studio to open the "Renesas Software Installer" dialog box.
3.  Select the "Renesas QE" and click the "Next>" button
4.  Select the "QE for Capacitive Touch (v3.1.0)" check box, and click the "Finish" button.
5.  Check that the "Renesas QE for Capacitive Touch" check box is selected in the "Install" dialog box, and click the "Next>" button.
6.  Check that the "Renesas QE for Capacitive Touch" check box 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$^2$ studio. For details about how to use this product, see the "Help" menu of e$^2$ studio.

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

A downloaded zip file has both a plugin version and a standalone version.

#### 2.1.2.1  Install Plugin Version

1.  Extract the downloaded zip file.
2.  Start the e$^2$ studio.
3.  Click on "Help", and then click on the "Install New Software..." menu item to open the "Install" dialog box.
4.  Click on the "Add..." button to open the "Add Repository" dialog box.
5.  Click on the "Archive..." button, select the installation file (zip file under the QE-CapTouch folder) in the opened file selection dialog box, and then click on the "Open" button.
6.  Click on the "OK" button in the "Add Repository" dialog box.
7.  Expand the "Renesas QE" item shown in the "Install" dialog box, select the "Renesas QE for Capacitive Touch" check box, and then click on 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.
8.  Confirm that the installation target is "Renesas QE for Capacitive Touch", and then click on the "Next>" button.
9.  After checking the license, select the "I accept the terms of the license agreements" radio button if you agree it, and then click on the "Finish" button.
10. When the dialog box for selecting a trusted certificate appears, check the displayed certificate, and then click on the "OK" button to continue installation.
11. Restart the e$^2$ studio by following the instructions on the screen.
12. Start this product from the "Renesas Views" - "Renesas QE" menu of the e$^2$ studio.

### 2.1.2.2  Install Standalone Version

1. Extract the downloaded zip file.
2. Move the QE-CapTouch folder to any folder.
   * Avoid moving to the Windows folder or Program Files folder.
3. Start this product from the "QE-CapTouch\eclipse\qe-captouch.exe" file.


## 2.2      Updating This Product (for Plugin Version)

If you have already installed this product, you can update it in the same way as the procedure for installation.


## 2.3      Uninstalling This Product

Follow the procedure below to uninstall this product.


### 2.3.1  Uninstall Plugin Version

1. Start the e$^2$ 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 Capacitive Touch" displayed on the "Installed Software" tabbed page and click on the "Uninstall..." button to open the "Uninstall" dialog box.
5. Check the displayed information and click on the "Finish" button.
6. When you are prompted to restart the e$^2$ studio, restart it.


### 2.3.2  Uninstall Standalone Version

1. Delete the QE-CapTouch folder.

## 3.    Notes / Restrictions

## 3.1      Usage Considerations

Please pay attention to the following items.

### 3.1.1      Notes on Tuning

1.    If there are multiple debugging configurations in the target project, automatic tuning may fail. Delete debugging configurations that are not in use.
2.    When the "Automatic Tuning Processing" dialog box is waiting for key input, pressing the "Cancel" / "Help" button is not possible.
3.    The plugin version does not support a tuning function via serial communication.
4.    When using the version shown below, the value set in the "Target Value of Offset Tuning" field in the tuning process using advanced settings will not be applied and no effect will be obtained.
      ・    RX FIT V2.00 or earlier
      ・    RA FSP V3.4.0 or earlier
      ・    RL78 SIS V1.10 or earlier
      ・    Synergy SSP V2.1.0 or earlier
5.    When using FSP V3.5.0 or earlier with a product equipped with CTSU, the tuning function using serial communication cannot be used for the mutual capacitance method touch I/F with the DTC function enabled.
      Please use FSP V3.6.0 or later.

### 3.1.2      Notes on Monitoring

1.    When using FSP V3.3.0 or V3.4.0, the monitoring function cannot be used. Please set "Support for QE monitoring using UART" of rm_touch property to "Enabled". Or please use FSP V3.5.0 or later.
2.    When monitoring using serial communication on the RX family, set the TX buffer size of the SCI FIT module (r_sci_rx) to the same size as the QE monitoring buffer (g_touch_monitor_buf). The QE monitoring buffer size is the value defined by the TOUCH_MONITOR_BUFFER_SIZE macro.

### 3.1.3      Notes on Serial Connection

1.    Before connecting to RL78/G23-128p Fast Prototyping Board (FPB) using a serial port, see the documentation that came with the FPB.

### 3.1.4      Notes on Standalone Version

1.    It may be slow to enable / disable the internal toolbar buttons of each view. Please move the focus to another view once.
2.    The 3D gesture recognition is not available in the standalone version. Please use the plugin version.

### 3.1.5    Notes on TrustZone

1. When using TrustZone with RA6M4 etc., the tuning processing cannot be performed on the non-secure side. Please perform the tuning process on the secure side and use results on the non-secure side.

### 3.1.6    Notes on Automatic Judgement Function (Auto Sensing by Hardware)

1. When the touch threshold or hysteresis value is changed in the CapTouch Parameters view and then written to the target board, the value may not change to the specified value or may change to a value different from the specified value.
In the case of touch threshold, change the hysteresis value to a sufficiently small value before writing.
In case of hysteresis, please change the value of touch threshold to a sufficiently large value before writing.

### 3.1.7    Notes on Multiple Electrode Connection

1. If there are multiple methods using multiple electrode connections, the MEC virtual buttons (Mec00, Mec01...) may overlap in the CapTouch Board Monitor view.
Please configure the methods so that the touch I/F with the lowest numbered TS terminal in each method will not be the same touch I/F. (except for shielded terminals).

## 3.2    Functional Restrictions

There is a restriction in QE for Capacitive Touch V3.1.0.

### 3.2.1    Restrictions on Standalone Version

1. Help files are not existed.

### 3.2.2    Restrictions on 3D gesture recognition

1. If 3D Gesture (AI) is set as the second or later method in the Setup Configurations (Methods) dialog, an error occurs when starting gesture recording with the "Start Recording Gesture" button from the Gesture Data List dialog, and recording cannot be performed.

   [Workaround]
   Please set 3D gesture (AI) as the first method.

### 3.2.3    Restrictions on Automatic Judgement Function

1. When using the automatic judgment function, the count values displayed in the monitoring views are rarely incorrect.

   [Target Microcontrollers]
   RX140 (ROM Size 256KB)

[Workaround]
Please correct the following mistake in the applicable part of the sample code
(qe_touch_sample.c).

```
Incorrect)
gp_touch_monitor_buf[index++] = *gp_touch_monitor_id++;
Correct)
gp_touch_monitor_buf[index++] = (*gp_touch_monitor_id)++;
```

2. When using the automatic judgment function, a build error will occur if the GCC compiler is used.

[Target Microcontrollers]
RX140 (ROM Size 256KB)

[Workaround]
Please correct the following mistake in the applicable part of the sample code
(qe_touch_sample.c).

```
Incorrect)
#if (TOUCH_AUTO_JUGE_MONITOR == 0)
   (uint32_t)gp_touch_monitor_buf = (uint32_t)g_touch_monitor_buf;
   (uint32_t)gp_touch_monitor_id = (uint32_t)&g_touch_monitor_id;
   (uint32_t)gp_touch_monitor_size = (uint32_t)g_touch_monitor_size;
#else
   (uint32_t)gp_touch_monitor_buf = monitor_buf_address;
   (uint32_t)gp_touch_monitor_id = monitor_id_address;
   (uint32_t)gp_touch_monitor_size = monitor_size_address;
#endif
Correct)
#if (TOUCH_AUTO_JUGE_MONITOR == 0)
   gp_touch_monitor_buf  = (uint8_t *)g_touch_monitor_buf;
   gp_touch_monitor_id   = (uint8_t *)&g_touch_monitor_id;
   gp_touch_monitor_size = (uint16_t *)g_touch_monitor_size;
#else
   gp_touch_monitor_buf  = (uint8_t *)monitor_buf_address;
   gp_touch_monitor_id   = (uint8_t *)monitor_id_address;
   gp_touch_monitor_size = (uint16_t *)monitor_size_address;
#endif
```

## 4. Related Videos

Many videos about this product are published in the Renesas website.

- Getting Started with QE for Capacitive Touch for RX (old version)
  — https://www.renesas.com/video/getting-started-qe-capacitive-touch
- Getting Started with QE for Capacitive Touch for RL78
  — https://www.renesas.com/video/getting-started-qe-capacitive-touch-rl78
- QE for Capacitive Touch [Tutorial -Settings-] for RX (old version)
  — https://www.renesas.com/video/qe-capacitive-touch-tutorial-settings
- QE for Capacitive Touch [Tutorial -Tuning-] for RX (old version)
  — https://www.renesas.com/video/qe-capacitive-touch-tutorial-tuning
- QE for Capacitive Touch [Tutorial -Monitoring-] for RX (old version)
  — https://www.renesas.com/video/qe-capacitive-touch-tutorial-monitoring
- QE for Capacitive Touch Tutorial: Settings for RL78
  — https://www.renesas.com/video/qe-capacitive-touch-tutorial-settings-rl78
- QE for Capacitive Touch Tutorial: Tuning for RL78
  — https://www.renesas.com/video/qe-capacitive-touch-tutorial-tuning-rl78
- QE for Capacitive Touch Tutorial: Serial Monitoring for RL78
  — https://www.renesas.com/video/qe-capacitive-touch-tutorial-serial-monitoring-rl78
- QE for Capacitive Touch Feature - Measuring Standard Deviation
  — https://www.renesas.com/video/qe-capacitive-touch-feature-measuring-standard-deviation
- QE for Capacitive Touch Tips - Warning Message Appeared During Tuning
  — https://www.renesas.com/video/qe-capacitive-touch-tips-warning-message-appeared-during-tuning
- How to tune via serial communication using the standalone app of QE.
  — https://www.renesas.com/video/how-tune-serial-communication-using-standalone-app-qe
- How to migrate the touch modules from version 1.1 to version 2.0 using the compatible APIs with QE tool.
  — https://www.renesas.com/video/how-migrate-touch-modules-version-11-version-20-using-compatible-apis-qe-tool

- 3D Gesture AI Solution - QE for Capacitive Touch Makes It Easy To Develop a Contactless User Interface
  — https://www.renesas.com/video/3d-gesture-ai-solution-qe-capacitive-touch-makes-it-easy-develop-contactless-user-interface
- QE for Capacitive Touch Tutorial: How to create the gesture data
  — https://www.renesas.com/video/qe-capacitive-touch-tutorial-how-create-gesture-data
- QE for Capacitive Touch Tutorial: How to monitor gesture AI
  — https://www.renesas.com/video/qe-capacitive-touch-tutorial-how-monitor-gesture-ai

## Revision History

| Rev. | Date | Description | |
|------|------|------|------|
| | | **Page** | **Summary** |
| 1.00 | Apr.20.22 | - | First edition issued. |
| 1.10 | Nov.30.22 | Page 8-9 | Added new restrictions to 3.2 Functional Restrictions. |

# 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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