

# QE for Capacitive Touch[RA] V1.2.0

## Release Note

Thank you very much for using the QE for Capacitive Touch[RA] V1.2.0.

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 .....	2
1.1	Summary .....	2
1.2	Functions .....	2
1.3	New Functions.....	2
1.3.1	TrustZone project is now supported .....	2
1.3.2	New touch interface is now supported .....	2
1.3.3	CapTouch Pad Monitor RA (QE) View added.....	2
1.4	Supported Environment.....	3
1.5	Supported Microcontrollers .....	3
1.6	Supported FSP.....	3
2.	Installation and Uninstallation .....	4
2.1	Installing This Product .....	4
2.1.1	Install from the e <sup>2</sup> studio Installer .....	4
2.1.2	Using the QE Installer .....	4
2.2	Updating This Product.....	5
2.3	Uninstalling This Product.....	5
3.	Notes / Restrictions.....	6
3.1	Usage Considerations .....	6
3.1.1	Notes on Tuning .....	6
3.2	Functional Restrictions .....	6
3.2.1	Restrictions on Tuning.....	6
3.2.2	Restrictions on Configuration of Touch Interfaces .....	6
	Revision History .....	7

## 1. About QE for Capacitive Touch

### 1.1 Summary

QE for Capacitive Touch[RA] is an assistance tool for applications and operates under the e<sup>2</sup> studio integrated development environment. In the development of an embedded system based on an RA-family 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 QE for Capacitive Touch[RA], you will first need to add a project for the RA family MCU and the capacitive touch sensor-related CTSU driver and Touch middleware. In addition, QE for Capacitive Touch[RA] can easily set pin assignment for use with capacitive touch sensors in conjunction with RA Smart Configurator.

### 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

### 1.3 New Functions

#### 1.3.1 TrustZone project is now supported

This product can now be used in a project for a TrustZone device. For details, please refer to the help for QE for Capacitive Touch[RA] V1.2.0.

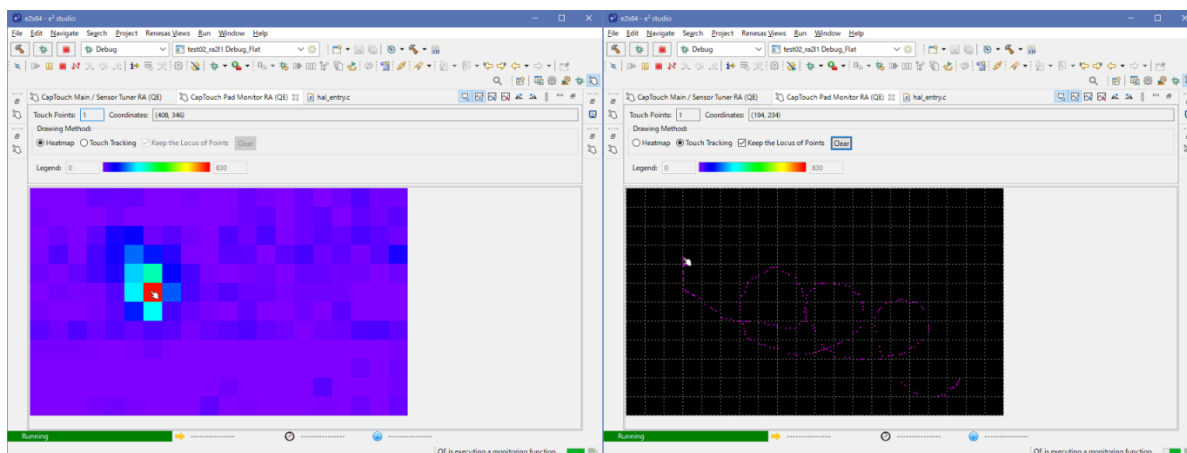
#### 1.3.2 New touch interface is now supported

The following touch interfaces are newly supported. It can be used with the Third-Generation Capacitive Touch Technology CTSU2 (on the RA2L1, etc.).

1. Touch pad  
A "Touch pad" is a touch interface with multiple transmitter/receiver electrodes wired in a diamond or mesh shape. The mutual capacitance parallel scanning method allows fast measurement of a large number of touch sensors and recognition of up to 10 touch coordinates.
2. Shield Pin  
CTSU2 supports "shield electrode" to improve noise immunity for self capacitance touch interfaces, such as buttons. A "Shield Pin" specifies a TS pin connected to a shield electrode.
3. Temperature Correction Pin  
CTSU2 supports a "temperature correction function" (RTRIM adjustment) to improve an accuracy of a measurement results of a touch interface. A "Temperature Correction Pin" specifies a TS pin with a 10 kΩ pull-down resistor connected.
4. Capacitance Sensor  
A "Capacitance Sensor" is not used as a touch interface, but as a sensor to detect changes in capacitance.
5. Current Sensor  
A "Current Sensor" is used not as a touch interface, but as a sensor to detect changes in weak current.

#### 1.3.3 CapTouch Pad Monitor RA (QE) View added

CapTouch Pad Monitor RA (QE) View has been newly added. In this view, you can confirm the behavior of the Touch Pad with a heat map or tracking map.



## 1.4 Supported Environment

Windows 8.1, and Windows 10

Renesas e<sup>2</sup> studio 2020-10 (or later)

\* If you are using a version of the e<sup>2</sup> studio earlier than 2020-10, please update it to 2020-10 or later.

## 1.5 Supported Microcontrollers

- RA Family (only MCUs that incorporate the CTSU)
  - RA2A Series: RA2A1
  - RA2L Series: RA2L1
  - RA4M Series: RA4M1, RA4M3
  - RA4W Series: RA4W1
  - RA6M Series: RA6M1, RA6M2, RA6M3, RA6M4

## 1.6 Supported FSP

- Driver and middleware for capacitive touch sensor
  - CTSU driver: r\_ctsu V2.2.0 (or later)
  - Touch middleware: rm\_touch 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 e<sup>2</sup> studio Installer

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 Capacitive Touch[RA] (v1.2.0)” check box, and click the “Finish” button.
5. Check that the “Renesas QE for Capacitive Touch[RA]” check box is selected in the “Install” dialog box, and click the “Next>” button.
6. Check that the “Renesas QE for Capacitive Touch[RA]” 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<sup>2</sup> 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.

#### 2.1.2 Using the QE Installer

1. Activate the e<sup>2</sup> studio.
2. Click on “Help”, and then click on the “Install New Software...” menu item to open the “Install” dialog box.
3. Click on the “Add...” button to open the “Add Repository” dialog box.
4. Click on the “Archive...” button, select the installation file (zip file) in the opened file selection dialog box, and then click on the “Open” button.
5. Click on 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 Capacitive Touch[RA]” 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.
7. Confirm that the installation target is “Renesas QE for Capacitive Touch[RA]”, and then click on the “Next>” button.
8. 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.
9. When the dialog box for selecting a trusted certificate appears, check the displayed certificate, and then click on the “OK” button to continue installation.
10. Restart the e<sup>2</sup> studio by following the instructions on the screen.
11. Start this product from the “Renesas Views” - “Renesas QE” menu of the e<sup>2</sup> studio.  
For details about how to use this product, see the “Help” menu of the e<sup>2</sup> studio.

## 2.2 Updating This Product

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.

1. Start the e<sup>2</sup> studio.
2. Select "Help -> About e<sup>2</sup> studio" to open the "About e<sup>2</sup> studio" dialog box.
3. Click the "Installation Details" button to open the "e<sup>2</sup> studio Installation Details" dialog box.
4. Select "Renesas QE for Capacitive Touch[RA]" 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<sup>2</sup> studio, restart it.

### 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 CTSU2 driver performs a three frequency measurement, and the default settings for the multiplication ratio are 0x37 and 0x47 based on 0x3F. These settings may not eliminate the synchronization noise, so we will change the default settings to 0x36 and 0x48 in the next version. (The difference from the reference value 0x3F changed from  $\pm 8$  to  $\pm 9$ .)

#### 3.2 Functional Restrictions

The following restrictions apply to QE for Capacitive Touch[RA] V1.2.0.

##### 3.2.1 Restrictions on Tuning

1. When the tuning process (Phase 1) is performed, the parasitic capacitance value may be negative in a rare case.

[Workaround]

Press the "Retry" button and measure the parasitic capacitance again.

2. Tuning process for "wheels with shield electrode" on RA2L1 does not give the correct results.

[Workaround]

After performing the normal tuning process, change the measurement frequency in the tuning process with the advanced tuning enabled.

##### 3.2.2 Restrictions on Configuration of Touch Interfaces

1. Although only one Touch pad is allowed on the system, you can define multiple Touch pads in the Create Configuration of Touch Interfaces Dialog Box.

[Workaround]

Define only one Touch pad in the Create Configuration of Touch Interfaces Dialog Box.

2. The Monitoring function will not work properly when Key pad (Mutual Simultaneous Scan) and Touch pad are defined in the same configuration of touch interface using FSP V2.0.0 or earlier. (It has been improved since FSP V2.1.0.)

[Workaround]

If you are using FSP V2.0.0 or earlier, update to V2.1.0 or later.

**Revision History**

Rev.	Date	Description	
		Page	Summary
1.00	Oct.06.20	-	First edition issued.
2.00	Dec.02.20	Page 2-3	Added "New touch interface is now supported" and "CapTouch Pad Monitor RA (QE) view added" to 1.3 New Functions.
		Page 3	Added RA2L1 and RA4M3 to 1.5 Supported Microcontrollers.
		Page 3	Update the version of 1.6 Supported FSP.
		Page 6	Added a new note to 3.1 Usage Considerations.
		Page 6	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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