

[Featured Tool]

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Improved debugging efficiency for the RX and RL78 families

Introducing external trigger I/O function of the E2 emulator

## Outline

Renesas provides two on-chip debugging emulator and flash programmer products for MCU development: E2 emulator (E2) and E2 emulator Lite (E2 Lite).

The affordable E2 Lite can be used for educational and recreation purposes as well as professional system development.

In addition to the basic functions of E2 Lite, the advanced on-chip debugging emulator E2 can be combined with various solutions suited for the target MCU.

If you want to improve your development efficiency, the E2 emulator is a perfect choice.

This Tool News introduces you to the product overview of the E2, functional differences between the E2 and E2 Lite for use with RL78 and RX MCUs, and the external trigger I/O function, which is a key distinguishing feature of E2.



E2 Emulator

## 1. Product Overview

The E2 is an advanced on-chip debugging emulator and flash programmer designed for the purpose of improving development efficiency.

In addition to the basic debugging functions provided by E2 Lite (for example, breakpoint and trace), E2 also supports functions that previous on-chip debugging emulators had never provided: the external trigger I/O function and current consumption measurement function.

For details about the E2, refer to the following URL:

<https://www.renesas.com/e2>

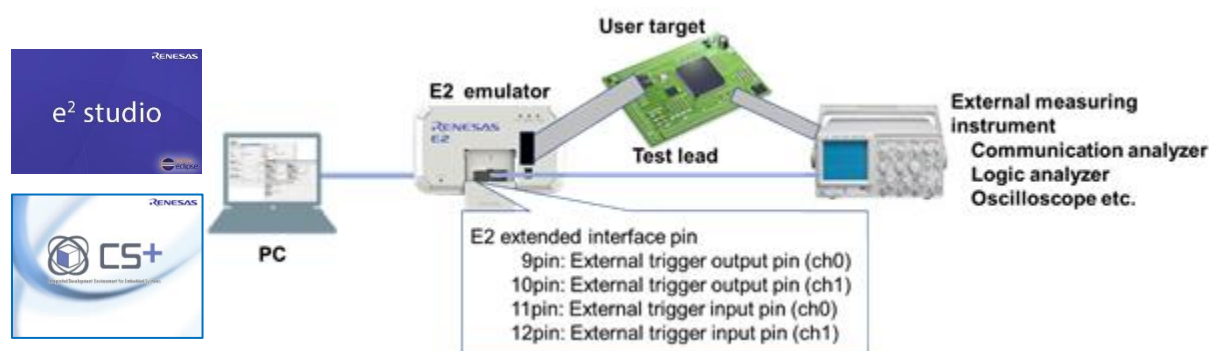
## 2. Functional Comparison

Highlighted in red are advantages of the E2 over E2 Lite.

Item		E2	E2 Lite
Target connector		14-pin (2.54 mm) connector 20-pin/14-pin conversion adapter included	14-pin (2.54 mm) connector
Debugging I/F	RL78	TOOL0 (1.0 Mbps)	As at left
	RX	JTAG TCK max. 16.5 MHz FINE max. 2 Mbps SCI	JTAG TCK max. 6 MHz FINE max. 1.5 Mbps SCI
Power supply function		1.8 V to 5.0 V	3.3 V
Hot plug-in function		A GND cable included in the product is used.	An optional (separately-sold) hot plug-in adapter is required.
External trigger input		Breaks can be set by external triggers.	Not provided
External trigger output		A trigger can be output when an event is generated.	Not provided
Current consumption tuning solution		Supported (For RX, only RX100 and RX200 series are supported)	Not provided

## 3. External Trigger I/O Functions

The E2 emulator provides external trigger input and output functions (two channels each) as its standard functions. The functions can be used just by connecting the E2 extended interface pin of the E2 emulator to the external measuring instrument with a test lead (included with the E2 emulator.)



The debug function of the e<sup>2</sup> studio and CS+ integrated development environment (hereinafter called the debugger) stops the program and waveform measurement of the external measuring instrument, linking the debugger with the external measuring instrument using the I/O of the external trigger as the condition.

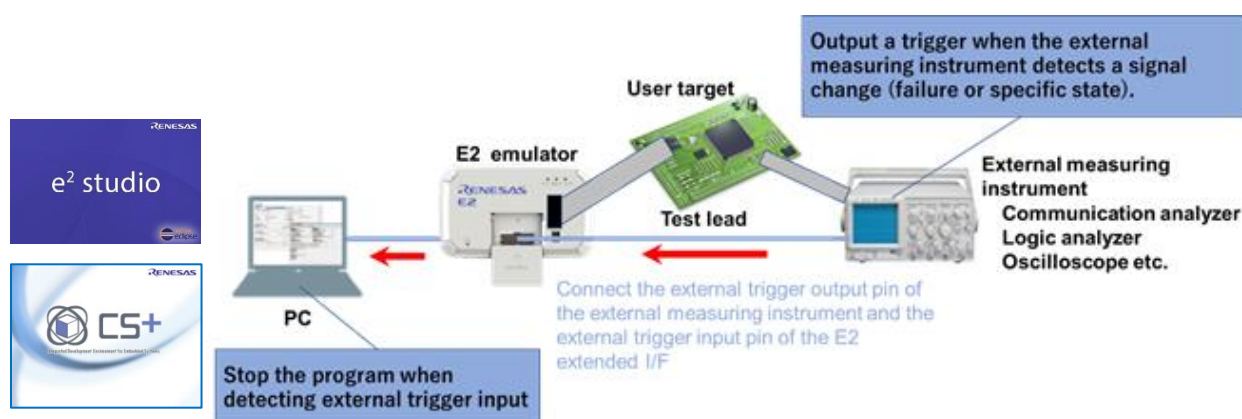
## 4. Use Cases of the External Trigger I/O Functions

### 4.1 External Trigger Input Function

When detecting a signal change (failure or specific state) on the user target, use this function to stop the program for verification.

The following is the general procedure.

- (1) Make the following settings in the debugger and the external measuring instrument, and then connect them.
  - Set "external trigger input" as the program stop condition.
  - Set the signal change (failure or specific state) trigger signal as an output.
- (2) When detecting "external trigger input" via the E2 emulator during program execution, the debugger stops the program execution.
- (3) Check and verify the execution log (trace) for the program stop location.



### 4.2 External Trigger Output Function

When detecting a program error, use this function to stop the waveform measurement and communication log recording in the external measuring instrument, and then perform verification.

The following is the general procedure.

- (1) Make the following settings in the debugger and the external measuring instrument, and then connect them.
  - Debugger: Set "event (external trigger output)" for a program error location.
  - Set the trigger signal from the E2 emulator as an input.
- (2) Upon detecting a "trigger signal" input via the E2 emulator, the external measuring instrument stops waveform measurement and communication log recording.
- (3) Check and verify the data of the external measuring instrument for the time when the program error is detected.



## 5. Purchasing the Product

For product ordering, contact your local Renesas Electronics sales office or distributor with the following information. For product pricing, make inquiries in the same manner.

Product name	Orderable part number
E2 Emulator	RTE0T00020KCE00000R

**Revision History**

Rev.	Date	Description	
		Page	Summary
1.00	Aug.01.20	-	First edition issued

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