[Featured Tool]

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.

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.

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

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 e² 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 commutation 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.

<table>
<thead>
<tr>
<th>Product name</th>
<th>Orderable part number</th>
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<tr>
<td>E2 Emulator</td>
<td>RTE0T00020KCE00000R</td>
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**Revision History**

<table>
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<th>Rev.</th>
<th>Date</th>
<th>Page</th>
<th>Summary</th>
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<tbody>
<tr>
<td>1.00</td>
<td>Aug.01.20</td>
<td>-</td>
<td>First edition issued</td>
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For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:

[www.renesas.com/contact/](http://www.renesas.com/contact/)

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