

To our customers,

---

## Old Company Name in Catalogs and Other Documents

---

On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

Send any inquiries to <http://www.renesas.com/inquiry>.

## Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
  - “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.
  - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
  - “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

To all our customers

---

## **Regarding the change of names mentioned in the document, such as Hitachi Electric and Hitachi XX, to Renesas Technology Corp.**

---

The semiconductor operations of Mitsubishi Electric and Hitachi were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Hitachi, Hitachi, Ltd., Hitachi Semiconductors, and other Hitachi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Renesas Technology Home Page: <http://www.renesas.com>

Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

# Connection of SH7727 E10A Emulator

HS7727KCM01H HS7727KCM02H HS7727KCI01H  
HS7727KCI02H with User System

# 1. Connecting the E10A Emulator with the User System

To connect the E10A emulator (hereinafter referred to as the emulator), the H-UDI port connector must be installed on the user system to connect the user system interface cable. When designing the user system, refer to the recommended circuit between the H-UDI port connector and the MCU. In addition, read the E10A emulator user's manual and hardware manual for the related MCU.

Table 1.1 shows the type number of the E10A emulator, the corresponding connector type, and the use of AUD function.

**Table 1.1 Type Number, AUD Function, and Connector Type**

Type Number	Connector	AUD Function
HS7727KCM02H, HS7727KCI02H	36-pin connector	Available
HS7727KCM01H, HS7727KCI01H	14-pin connector	Not available

The H-UDI port connector has the 36-pin and 14-pin types as described below. Use them according to the purpose of the usage.

1. 36-pin type (with AUD function)  
The AUD trace function is supported. A large amount of trace information can be acquired in realtime.
2. 14-pin type (without AUD function)  
The AUD trace function cannot be used because only the H-UDI function is supported. For tracing, only the internal trace function is supported. Since the 14-pin type connector is smaller than the 36-pin type (1/2.5), the area where the connector is installed on the user system can be reduced.

## 2. Installing the H-UDI Port Connector on the User System

Table 2.1 shows the recommended H-UDI port connectors for the emulator.

**Table 2.1 Recommended H-UDI Port Connectors**

<b>Connector</b>	<b>Type Number</b>	<b>Manufacturer</b>	<b>Specifications</b>
36-pin connector	DX10M-36S	Hirose Electric Co., Ltd.	Screw type
	DX10M-36SE, DX10G1M-36SE		Lock-pin type
14-pin connector	2514-6002	Sumitomo 3M Limited	14-pin straight type

**Note:** When the 36-pin connector is used, do not connect any components under the H-UDI connector. When the 14-pin connector is used, do not install any components within 3 mm of the H-UDI port connector.

### 3. Pin Arrangement of the H-UDI Port Connector

Figures 3.1 and 3.2 show the pin arrangement of the 36-pin and 14-pin H-UDI port connectors, respectively.

Note: Note that the pin number assignment of the H-UDI port connector shown below differs from that of the connector manufacturer.

Pin No.	Signal	Input/ Output*1	MCU Pin No.		Note	Pin No.	Signal	Input/ Output*1	MCU Pin No.		Note
			FP-240	BP-240					FP-240	BP-240	
1	NC	—				19	TMS	Input	162	U7	
2	GND	—				20	GND	—			
3	AUDATA0	I/O	158	U8		21 <sup>+2</sup>	/TRST	Input	160	W8	
4	GND	—				22	GND	—			
5	AUDATA1	I/O	156	W9		23	TDI	Input	163	V7	
6	GND	—				24	GND	—			
7	AUDATA2	I/O	154	T9		25	TDO	Output	143	U12	
8	GND	—				26	GND	—			
9	AUDATA3	I/O	153	U9		27 <sup>+2</sup>	/ASEBRKAK	Output	151	U10	
10	GND	—				28	GND	—			
11 <sup>+2</sup>	/AUDSYNC	Output	104	N19		29	NC	—			
12	GND	—				30	GND	—			
13	NC	—				31 <sup>+2</sup>	/RESETP	Output	220	H1	
14	GND	—				32	GND	—			
15	NC	—				33 <sup>+3</sup>	GND	Output			
16	GND	—				34	GND	—			
17	TCK	Input	164	W7		35	AUDCK	Input	176	W3	
18	GND	—				36	GND	—			

Notes: 1. Input to or output from the user system.

2. The slash (/) means that the signal is active-low.

3. The emulator monitors the GND signal of the user system and detects whether or not the user system is connected.

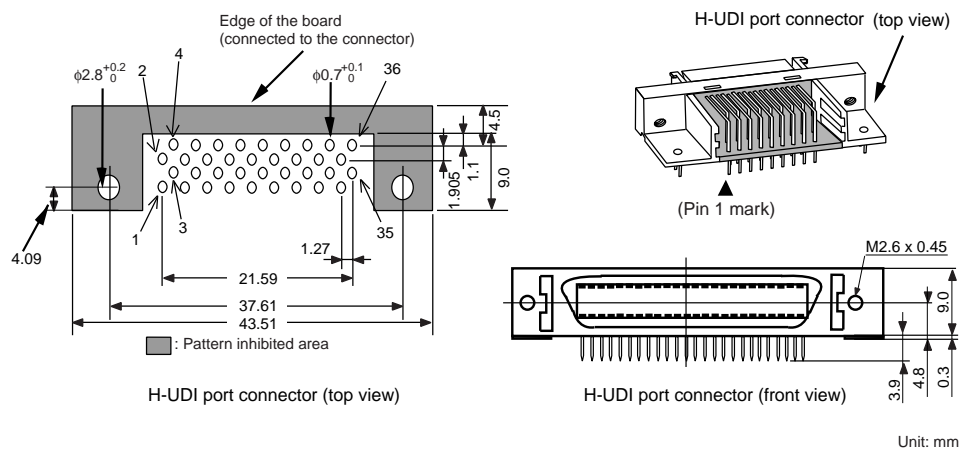
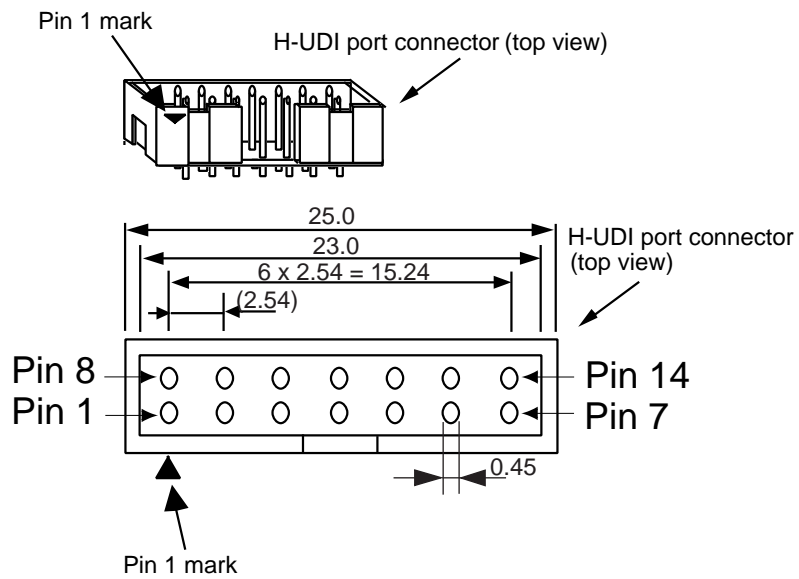


Figure 3.1 Pin Arrangement of the H-UDI Port Connector (36 Pins)



Pin No.	Signal	Input/ Output* <sup>1</sup>	MCU Pin No.		Note
			FP-240	BP-240	
1	TCK	Input	164	W7	
2* <sup>2</sup>	/TRST	Input	160	W8	
3	TDO	Output	143	U12	
4* <sup>2</sup>	/ASEBRKAK	Output	151	U10	
5	TMS	Input	162	U7	
6	TDI	Input	163	V7	
7* <sup>2</sup>	/RESETP	Output	220	H1	
11	Not connected	—	—	—	
8 to 10 and 12 to 13	GND	—	—	—	
14* <sup>3</sup>	GND	Output	—	—	

- Notes: 1. Input to or output from the user system.  
2. The slash (/) means that the signal is active-low.  
3. The emulator monitors the GND signal of the user system and detects whether or not the user system is connected.



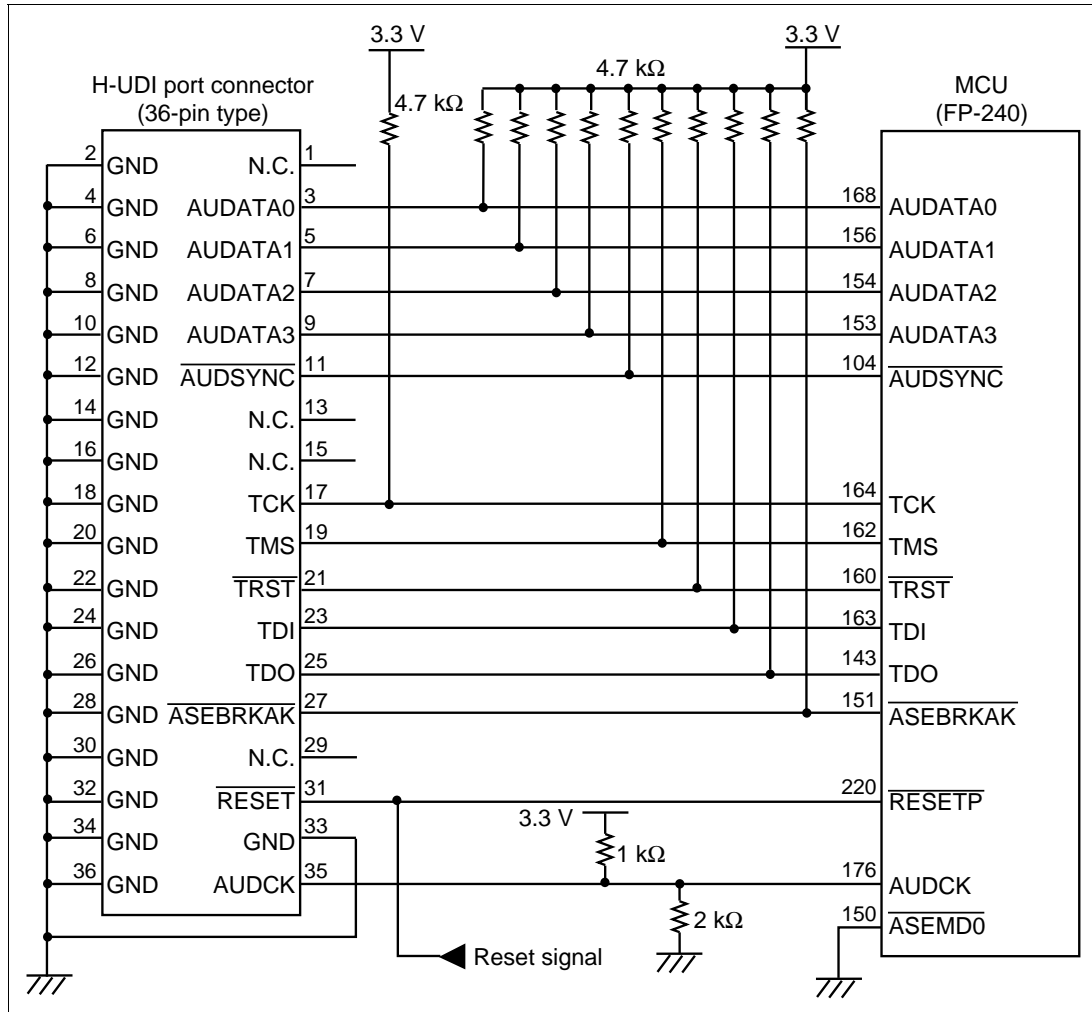
**Figure 3.2 Pin Arrangement of the H-UDI Port Connector (14 Pins)**

## 4. Recommended Circuit between the H-UDI Port Connector and MCU

### 4.1 Recommended Circuit (36-Pin Type)

Figure 4.1 shows a recommended circuit between the H-UDI port connector (36 pins) and the MCU.

- Notes:
1. Do not connect anything to the N.C. pin of the H-UDI port connector.
  2. When a joined resistance is used for pull-up, it may be affected by a noise. Separate TCK from other resistances.
  3. The reset signal in the user system is input to the /RESETP pin (pin 220) of the MCU. Connect this signal to the H-UDI port connector as the output from the user system.
  4. When the emulator is used, the AUDCK pin must be an end resistance (pulled up or down by a resistance of several kilo-ohms) because it may be affected by a reflected noise from the user system interface cable.
  5. The processing of the /ASEMD0 pin differs depending on whether the emulator is used or not. As the emulator does not control this pin, it must be controlled by a switch on the board.
    - (1) When the emulator is used: /ASEMD0 = low (ASE mode)
    - (2) When the emulator is not used: /ASEMD0 = high (normal mode)
  6. The pattern between the H-UDI port connector and the MCU must be as short as possible. Do not connect the signal lines to other components on the board.
  7. The resistance values shown in figure 4.1 are recommended.
  8. For the pin processing in cases where the emulator is not used, refer to the hardware manual of the related MCU.

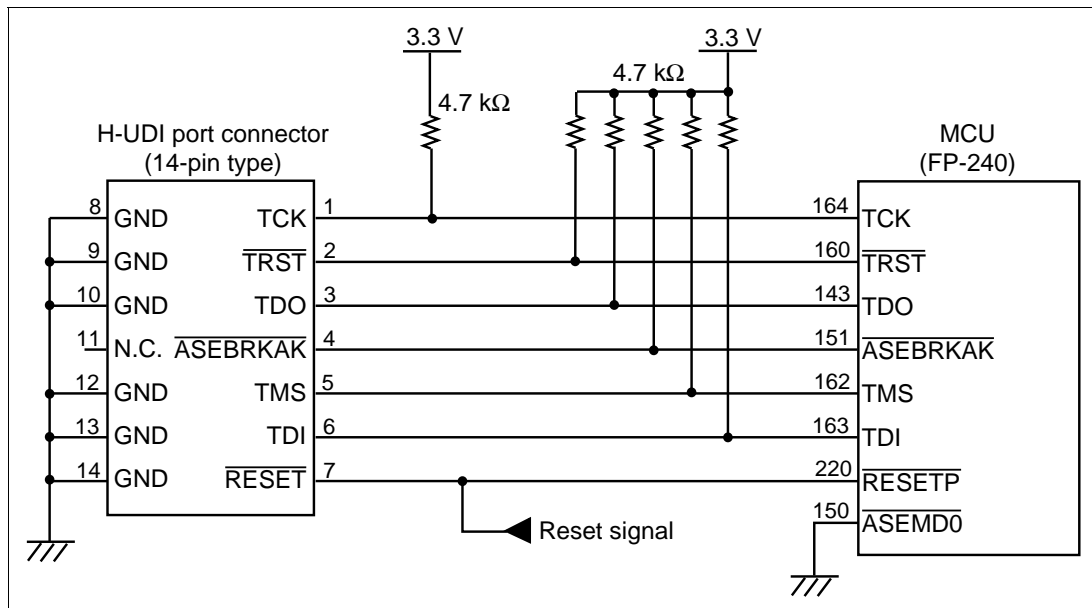


**Figure 4.1 Recommended Circuit for Connection between the H-UDI Port Connector and MCU (36-Pin Type)**

## 4.2 Recommended Circuit (14-Pin Type)

Figure 4.2 shows a recommended circuit between the H-UDI port connector and the MCU.

- Notes:
1. Do not connect anything to the N.C. pin of the H-UDI port connector.
  2. When a joined resistance is used for pull-up, it may be affected by a noise. Separate TCK from other resistances.
  3. The reset signal in the user system is input to the /RESETP pin (pin 220) of the MCU. Connect this signal to the H-UDI port connector as the output from the user system.
  4. The processing of the /ASEMD0 pin differs depending on whether the emulator is used or not. As the emulator does not control this pin, it must be controlled by a switch on the board.
    - (1) When the emulator is used: /ASEMD0 = low (ASE mode)
    - (2) When the emulator is not used: /ASEMD0 = high (normal mode)
  5. When the pins AUDATA0 and AUDATA1 are not used as input ports (PTG0 and PTG1) while using the 14-pin type emulator, these pins must be pulled up by a resistance of several kilo-ohms.
  6. The pattern between the H-UDI port connector and the MCU must be as short as possible. Do not connect the signal lines to other components on the board.
  7. The resistance values shown in figure 4.2 are recommended.
  8. For the pin processing in cases where the emulator is not used, refer to the hardware manual of the related MCU.



**Figure 4.2 Recommended Circuit for Connection between the H-UDI Port Connector and MCU (14-Pin Type)**

## 5. Limitations

The AUD and H-UDI pins are multiplexed as shown below. When the emulator is used, function 1 in table 5.1 is not available.

**Table 5.1 Multiplex Functions**

Port	Function 1	Function 2
E	PTE0 input/output (port)	TDO (H-UDI)
E	PTE7 input/output (port)/PCC0RDY*	/AUDSYNC (AUD)
F	PTF7 input (port)/PINT15 input (INTC)	TRST (AUD, H-UDI)
F	PTF6 input (port)/PINT14 input (INTC)	TMS (H-UDI)
F	PTF5 input (port)/PINT13 input (INTC)	TDI (H-UDI)
F	PTF4 input (port)/PINT12 input (INTC)	TCK (H-UDI)
G	PTG5 input (port)	/ASEBRKAK (H-UDI)
G	PTG3 input (port)/PCC0BVD2*	AUDATA3 (AUD)
G	PTG2 input (port)/PCC0BVD1*	AUDATA2 (AUD)
G	PTG1 input (port)/PCC0CD2*	AUDATA1 (AUD)
G	PTG0 input (port)/PCC0CD1*	AUDATA0 (AUD)
H	PTH6 input (port)/PCC0WAIT*	AUDCK (AUD)

**Note:** PTE7, PTG3, PTG2, PTG1, PTG0, and PTH6 can be used only when the AUD pins of the MCU are not connected to the emulator.