

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

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

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

# Connection of SH7144F E10A Emulator

HS7144KCM01H HS7144KCM02H HS7144KCI01H  
HS7144KCI02H with User System

# 1. Connecting the 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 of the related MCU.

Table 1.1 shows the type numbers of the emulator, the corresponding connector types, and the use of AUD function.

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

Type Number	Connector	AUD Function
HS7144KCM02H, HS7144KCI02H	36-pin connector	Available
HS7144KCM01H, HS7144KCI01H	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. The RAM monitoring function, which accesses (reads or writes) the memory contents during program execution, is also supported.
2. 14-pin type (without AUD function)  
The user cannot use the AUD trace function 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 connector for the emulator.

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

<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.

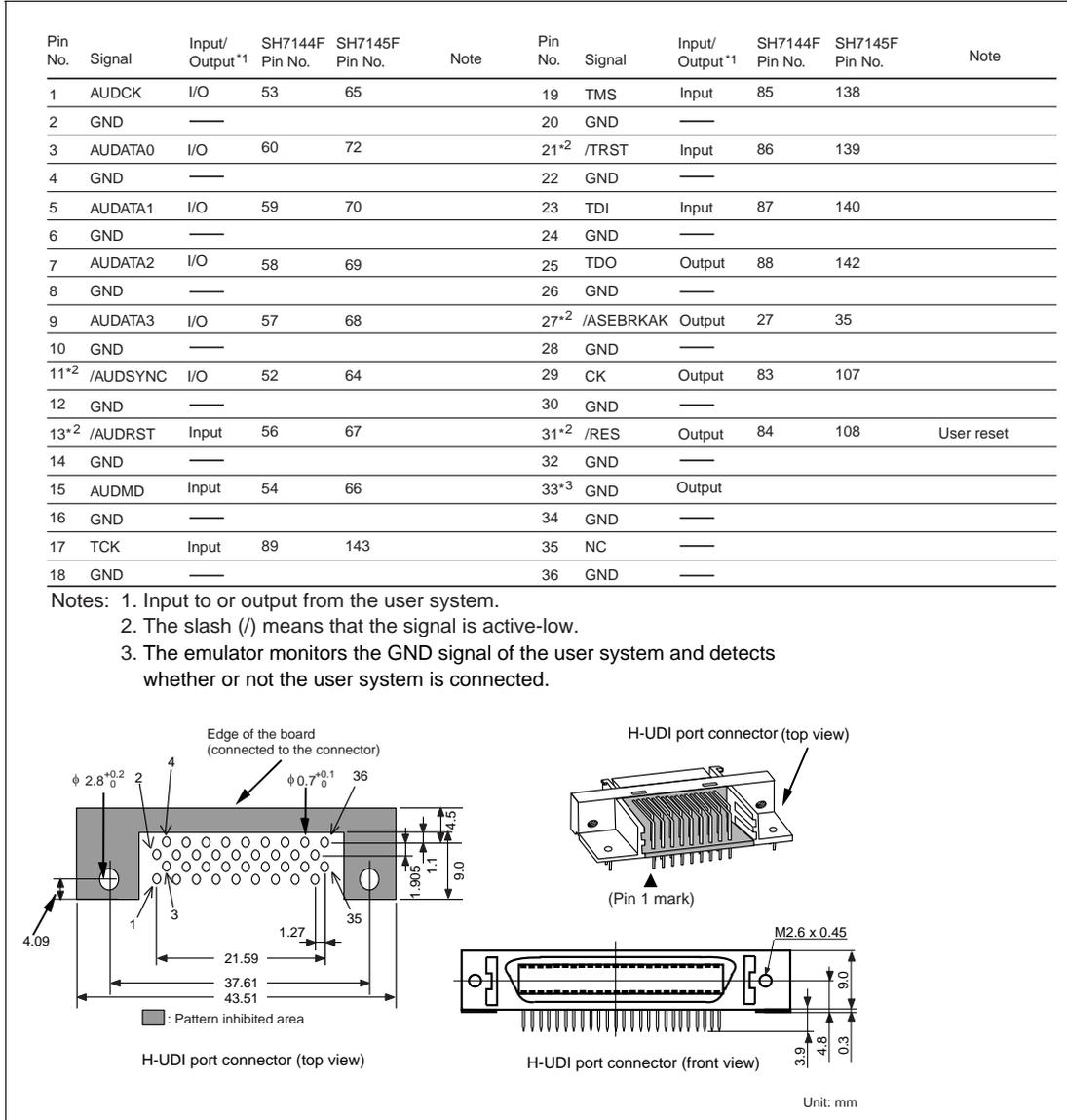
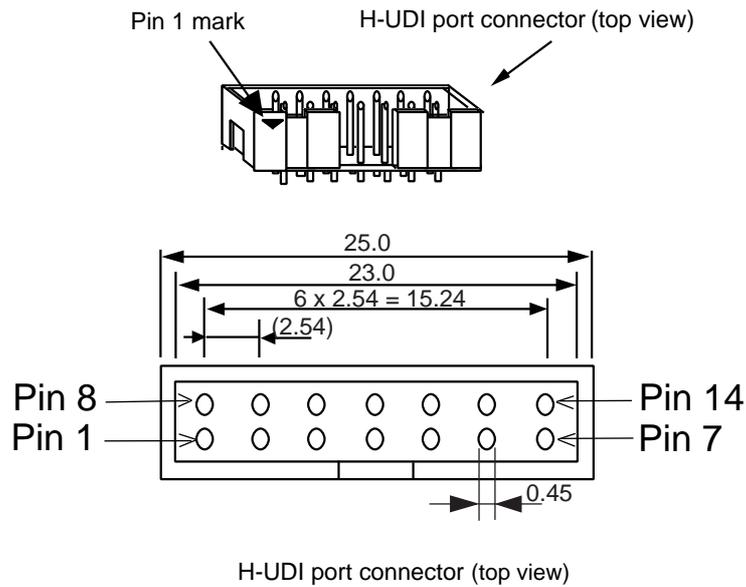


Figure 3.1 Pin Arrangement of the H-UDI Port Connector (36 Pins)

Pin No.	Signal	Input/ Output* <sup>1</sup>	SH7144F Pin No.	SH7145F Pin No.
1	TCK	Input	89	143
2* <sup>2</sup>	/TRST	Input	86	139
3	TDO	Output	88	142
4* <sup>2</sup>	/ASEBRKAK	Output	27	35
5	TMS	Input	85	138
6	TDI	Input	87	140
7* <sup>2</sup>	/RES	Output	84	108
11	N.C.	—	—	—
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.



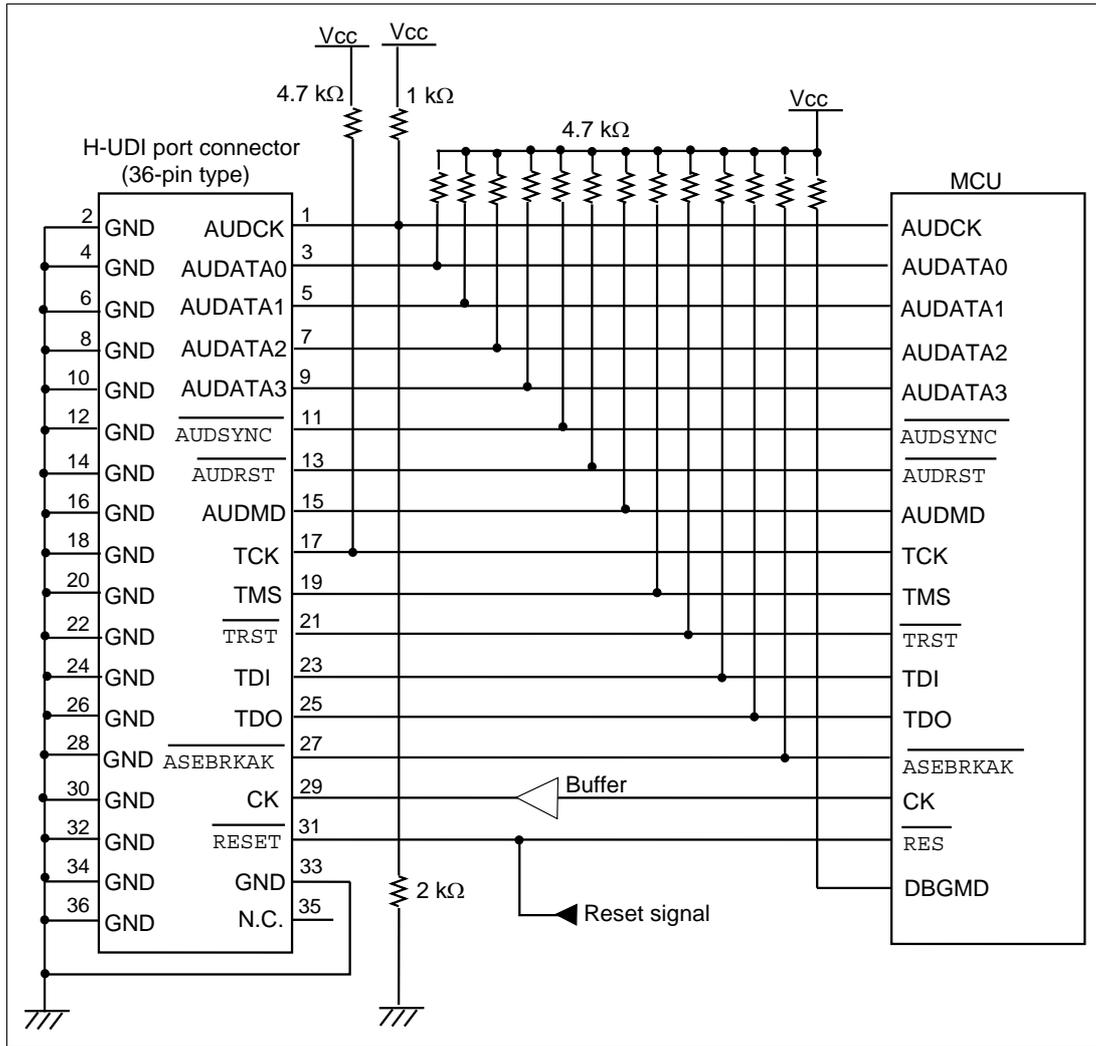
**Figure 3.2 Pin Arrangement of the H-UDI Port Connector (14 Pins)**

## 4. Recommended Circuit between the H-UDI Port Connector and the 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 /RES pin (SH7144F: pin 84, SH7145F: pin 108). 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. When the emulator is used, connect the CK pin between the H-UDI port connector and the MCU via a buffer (74LVC125 is recommended) as shown in figure 4.1.
  6. Note that the processing of the DBGMD pin (SH7144F: pin 33, SH7145F: pin 42) differs depending on whether or not the emulator is used. In addition, the DBGMD pin must be switched on the board because it is not controlled by the emulator.
    - (1) When the emulator is used: DBGMD = high
    - (2) When the emulator is not used: DBGMD = low
  7. The resistance values shown in figure 4.1 are recommended.
  8. 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.
  9. For the pin processing when the emulator is not used, refer to the hardware manual of the related MCU.

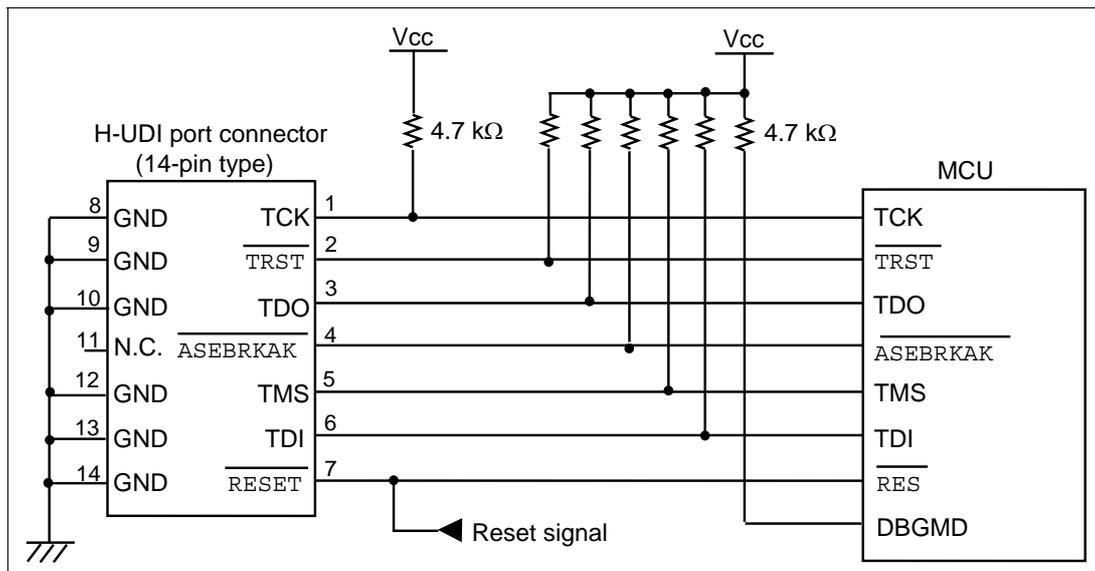


**Figure 4.1 Recommended Circuit for Connection between the H-UDI Port Connector and the MCU (36-Pin Type)**

## 4.2 Recommended Circuit (14-Pin Type)

Figure 4.2 shows a recommended circuit between the H-UDI port connector (14 pins) and the MCU.

- Notes:
1. Do not connect anything to the N.C. pin of the H-UDI port connector.
  2. The reset signal in the user system is input to the /RES pin (SH7144F: pin 84, SH7145F: pin 108). Connect this signal to the H-UDI port connector as the output from the user system.
  3. Note that the processing of the DBGMD pin (SH7144F: pin 33, SH7145F: pin 42) differs whether or not the emulator is used. In addition, the DBGMD pin must be switched on the board because it is not controlled by the emulator.
    - (1) When the emulator is used: DBGMD = high
    - (2) When the emulator is not used: DBGMD = low
  4. When a joined resistance is used for pull-up, it may be affected by a noise. Separate TCK from other resistances.
  5. The resistance values shown in figure 4.2 are recommended.
  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. For the pin processing when 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 the MCU (14-Pin Type)**

## 5. Limitations

### 5.1 Limitation on the SH7144F E10A Emulator

The AUD and H-UDI pins are multiplexed as shown in table 5.1. Note that function 1 cannot be used when the emulator is in use.

**Table 5.1 Multiplexed Functions for the SH7144F**

<b>Function 1</b>	<b>Function 2</b>
PE0/TIOC0A/DREQ0	TMS (H-UDI)
PE1/TIOC0B/DRAK0	TRST (H-UDI)
PE2/TIOC0C/DREQ1	TDI (H-UDI)
PE3/TIOC0D/DRAK1	TDO (H-UDI)
PE4/TIOC1A/RXD3	TCK (H-UDI)
PD15/D15*	AUDSYNC (AUD)
PD14/D14*	AUDCK (AUD)
PD13/D13*	AUDMD (AUD)
PD12/D12*	AUDRST (AUD)
PD11/D11*	AUDATA3 (AUD)
PD10/D10*	AUDATA2 (AUD)
PD9/D9*	AUDATA1 (AUD)
PD8/D8*	AUDATA0 (AUD)
PA15*	CK (AUD)

Note: Function 1 can be used when the AUD pins are not connected to the emulator.

## 5.2 Limitation on the SH7145F E10A Emulator

The AUD and H-UDI pins are multiplexed as shown in table 5.2. Note that function 1 cannot be used when the emulator is in use.

**Table 5.2 Multiplexed Functions for SH7145F**

<b>Function 1</b>	<b>Function 2</b>
PE9/TIOC3B/SCK3	TRST (H-UDI)
PE8/TIOC3A/SCK2	TMS (H-UDI)
PE11/TIOC3D/RXD3	TDO (H-UDI)
PE10/TIOC3C/TXD2	TDI (H-UDI)
PE12/TIOC4A/TXD3	TCK (H-UDI)
PA15*	CK (AUD)
PD23/D23/IRQ7*	AUDSYNC (AUD)
PD22/D22/IRQ6*	AUDCK (AUD)
PD21/D21/IRQ5*	AUDMD (AUD)
PD20/D20/IRQ4*	AUDRST (AUD)
PD19/D19/IRQ3*	AUDATA3 (AUD)
PD18/D18/IRQ2*	AUDATA2 (AUD)
PD17/D17/IRQ1*	AUDATA1 (AUD)
PD16/D16/IRQ0*	AUDATA0 (AUD)

Note: Function 1 can be used when the AUD pins are not connected to the emulator.